5. Press the **Post proc.** button.

   ⇨ The **Post processing** operating mode is activated.

Fig. 91: **Post processing** operating mode

Now you can post-process the selected image. You can browse through the active patient folder on the reference screen using the arrow buttons. In addition, you can mark and delete individual images.

14.3 Contrast and brightness adjustment of individual images (Windowing)

Function

The **Windowing** function allows you to adjust the contrast and brightness of the image on the live screen. These settings affect only the selected image. When you save an image, the modified windowing values are saved as well, even if you have retrieved the image from the archive.

After activating the **Windowing** function, you can select a number of gray levels, which are then stretched over the entire range of 1024 gray levels of the original image on the live screen. To achieve this effect, you set the width and the level of the so-called contrast window.

The number of gray levels defines the width of the contrast window. The width of the contrast window affects the image contrast. 1024 gray levels correspond to the value W 100.

The position of the selected gray levels on the original image grayscale (ranging from 0 to 1024 gray levels) defines the level of the contrast window. The level of the contrast window affects the image brightness.

Example:

You select all gray levels between 325 and 875. These gray levels are then mapped (stretched) to the range of 0 to 1024 gray levels in the processed image. This enhances the contrast.

Digitally signed by Grabazei Alexandru
Date: 2019.12.16 16:55:06 EET
Reason: MoldSign Signature
Location: Moldova

Gray levels 0 to 324 of the original image are displayed as black, and gray levels 876 to 1024 of the original image are displayed as white. This means that the processed image is darker than the original image.

There are two different windowing modes available:

- Standard windowing:
  The standard windowing mode allows you to freely choose the level and width of the contrast window.
- Step windowing:
  With step windowing, you choose between several predefined windowing steps. These windowing steps are preset and cannot be modified.

The chosen windowing values are shown on the screen as **W X** and **L Y**.

To set the brightness and contrast in standard windowing mode, do the following:

1. Press the **Contrast/Brightness** button.
   ⇨ The windowing setting controls appear.

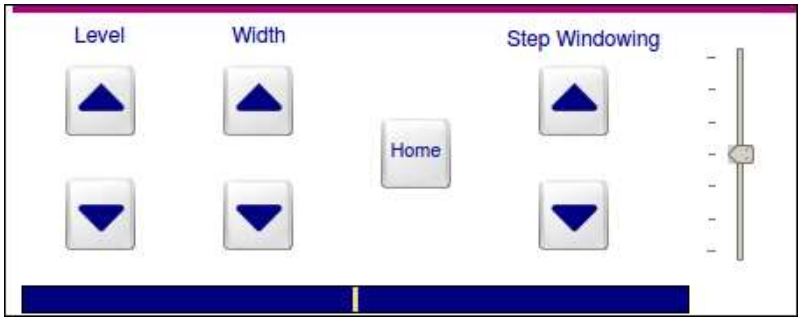


Fig. 92: Standard windowing

2. Under **Width**, set the number of gray levels using the arrow buttons.
   ⇨ The chosen width is indicated by the length of the blue bar in the dynamic control area. The changes become immediately visible in the live screen image.

3. Under **Level**, set the brightness range using the arrow buttons.
   ⇨ The chosen level is indicated by the position of the slider in the dynamic control area. The changes become immediately visible in the live screen image.

4. To restore the factory settings (level 50, width 100), press the **Home** button.

To set the brightness and contrast in step windowing mode, do the following:

1. Press the **Contrast/Brightness** button.
   ⇨ The corresponding controls appear in the dynamic control area.

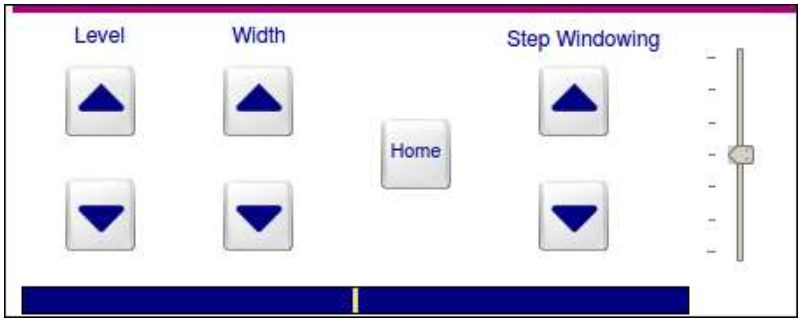


Fig. 93: Screen settings and step windowing

2. Select the desired windowing step using the arrow buttons.
   ⇨ The settings become immediately visible in the live screen image.

3. To restore the factory settings for step windowing, press the **Home** button.
   ⇨ Step windowing is reset to step 0. Simultaneously, brightness and contrast are reset to their default values.

4. Press the **Contrast/Brightness** button.
   ⇨ The corresponding controls appear in the dynamic control area.

14.4 Edge filter

You can adjust the edge filter in the **Post processing** operating mode.

Edge enhancement

The edge filter allows you to select a greater or lesser degree of edge enhancement within the image. There are 4 levels available:

Level	Meaning
Off	No edge enhancement (original fluoroscopic image)
1	Slight edge enhancement
2	Medium edge enhancement

Level	Meaning
3	Strong edge enhancement
-1	Unsharp mask to suppress noise

Table 23: Edge filter levels

To set the edge filter for the image, do the following:

1. Press the **Filter** button.
   ⇨ The corresponding controls appear in the dynamic control area.

Fig. 94: Filter settings

2. Select the desired edge filter level by pressing the corresponding button.
   ⇨ The filter setting becomes immediately visible in the live screen image. The chosen edge filter level is shown on the screen as **RTE X**.

3. Press the **Filter** button.
   ⇨ The corresponding controls appear in the dynamic control area.

14.5 Digital zoom

The **Zoom** function allows you to enlarge a certain image area. There are three zoom levels available. You can select the desired image area either with the arrow buttons or with the integrated touchpad (1).

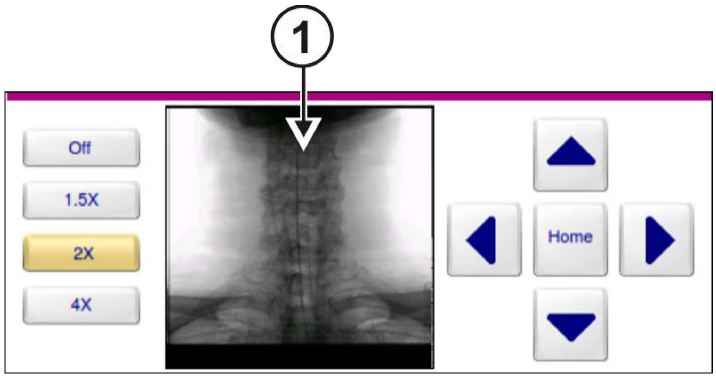
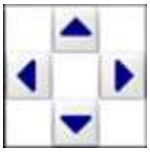


Fig. 95: **Zoom** function in the **Post processing** operating mode

To enlarge an image area, do the following:

1. Press the **Zoom** button.
   ⇨ The active image also appears on the reference screen.
   The corresponding controls appear in the dynamic control area.

2. Select the desired zoom factor by pressing the corresponding button, e.g. **4 X**.
   ⇨ A marking circle appears in the center of the image on the reference screen. The image area which is enclosed by the marking circle is displayed on the live screen with the chosen zoom level.



3. Move the marking circle to the desired image area using the arrow buttons.
   ⇨ The chosen image area is displayed on the reference screen with the chosen zoom level.

4. To move the marking circle back to the center of the live image, press the **Home** button.

5. Press the **Zoom** button.
   ⇨ The corresponding controls appear in the dynamic control area.

To enlarge an image area with the help of the touchpad, do the following:

1. Press the **Zoom** button.
   ⇨ The active image also appears on the reference screen.
   The corresponding controls appear in the dynamic control area.

2. Move the circle to the desired position by gliding your finger slightly across the touchpad.

   ⇨ The chosen image area is displayed on the reference screen with the chosen zoom level.

3. To move the marking circle back to the center of the live image, press the **Home** button.

4. Press the **Zoom** button.

   ⇨ The corresponding controls appear in the dynamic control area.

14.6 Grayscale inversion

Function

The **Grayscale Inversion** function allows you to view the active image with a negative grayscale.

To display an image with a negative (or positive) grayscale, do the following:

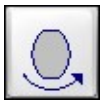
1. Press the **Grayscale Inversion** button.

   ⇨ The image is displayed with negative grayscale on the live screen.

2. Press the **Grayscale Inversion** button again.

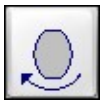
   ⇨ The image is again displayed with a positive grayscale.

14.7 Image rotation



1. Press the **Rotate Image CCW** button (counter-clockwise direction) until the image orientation on the live screen is as desired.

   ⇨ The image is rotated steplessly in counter-clockwise direction.



2. Press the **Rotate Image CW** button (clockwise direction) until the image orientation on the live screen is as desired.

   ⇨ The image is rotated steplessly in clockwise direction.

   The chosen angle of rotation is shown on the screen as **R X**.

Systems with flat-panel detector

As soon as an image is rotated, it assumes a circular shape. The image has a square shape only when in the following angle positions: 0°/360°, 90°, 180°, 270°.

14.8 Horizontal and vertical image reversal

1. Press the **Reverse Up/Down** button.
   ⇨ On the live screen, the image appears with top and bottom reversed, and a symbol for up/down reversal is displayed.

2. Press the **Reverse Left/Right** button.
   ⇨ On the live screen, the image appears with left and right side reversed, and a symbol for left/right reversal is displayed.

Image reversal is symbolized on the screen by an **R** which is either mirrored left-right or upside-down.

14.9 Digital collimation (image crop)

1. Press the **Close Vertical Slot Collimator** button until the collimator aperture on the live screen is as desired.
   ⇨ The vertical slot collimator closes steplessly.

2. Press the **Open Vertical Slot Collimator** button until the collimator aperture on the live screen is as desired.
   ⇨ The vertical slot collimator opens steplessly.

3. Press the **Close Horizontal Slot Collimator** button until the collimator aperture on the live screen is as desired.
   ⇨ The horizontal slot collimator closes steplessly.

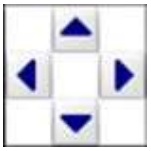
4. Press the **Open Horizontal Slot Collimator** button until the collimator aperture on the live screen is as desired.
   ⇨ The horizontal slot collimator opens steplessly.

14.10 Marking and deleting images

Browsing through the patient folder

You can browse through an active patient folder in the **Post processing** operating mode without having to switch to the **Archive** operating mode. The live screen always shows the selected image at full size.

To mark one or more images, do the following:



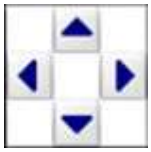
1. Select the desired image on the live screen using the arrow buttons.

2. Press the **Mark** button.

   ⇨ The image is now marked and flagged with an **M**.

3. To mark additional images, repeat the procedure.

To unmark an image, do the following:

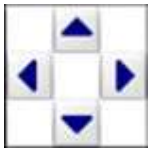


1. Select the desired marked image on the reference screen using the arrow buttons.

2. Press the **Mark** button.

You can protect images against being deleted. When you try to delete a folder which contains protected images, the folder itself as well as the protected images remain on the hard disk.

To protect one or more images, do the following:



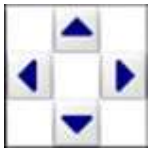
1. Select the desired image on the reference screen using the arrow buttons.

2. Press the **Protect** button.

   ⇨ The image is now protected and flagged with a **P**.

3. To protect additional images, repeat the procedure.

To unprotect an image, do the following:



1. Select the desired protected image using the arrow buttons.

2. Press the **Protect** button.

   ⇨ The image becomes unprotected.

NOTE

Patient folders containing protected images cannot be deleted automatically. If many folders on the hard disk contain protected images, the Auto-Delete function will not delete them, and you will be unable to save new images.

To avoid this situation, regularly back up the patient folders which are still needed to external storage media or to a DICOM server. You can then manually delete those patient folders or unprotect them and allow the Auto-Delete function to free up space on your hard disk.

To delete one or more images from a patient folder, do the following:

1. Mark the images you want to delete and press the **Delete marked items** button.

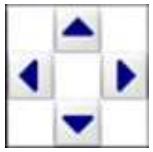
   ⇨ A confirmation prompt is displayed.

   or

2. Mark the images you want to keep and press the **Delete unmarked items** button.

   ⇨ A confirmation prompt is displayed.

   or



3. Select the individual image you want to delete using the arrow buttons.

NOTE

Deleted images are irretrievably lost.

Back up the images you want to keep before deleting them, or make sure that they are really no longer needed (→ *Chapter 10.3.1.4 “Saving patient folders or images” on page 163*).

4. Press the **Delete** button.

   ⇨ A confirmation prompt is displayed.

5. Confirm by pressing the **Yes** button.

   ⇨ The image is deleted from the patient folder.

   If there are any protected images among the ones you have selected, they will not be deleted.

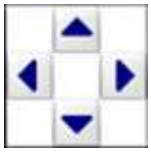
14.11 Outputting post-processed images

Output options

You can save individual images to hard disk or print them on the video printer in the **Post processing** operating mode as well. These actions are always applied to the selected image or to the marked images.

When you save an image, all changes applied to it are saved as well and will be visible the next time you open the image. However, you can post-process an image as often as desired, thus undoing any changes you have made before.

To print images on the video printer, do the following:



1. Select the image you want to print.

   or

2. Mark the image or the images you want to print.

3. Press the **Print** button.

   ⇨ The marked cine loops are printed on the integrated video printer. A progress indicator in a message window on the control panel informs you about the status of the print operation.

   The **Cancel** button appears, enabling you to interrupt the print operation.

   Once they have been printed, the images become unmarked.

15 Measurement

15.1 Measuring functions

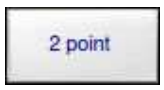
General

The system lets you measure various distances and angles in a saved fluoroscopic image. You can use the same measuring method several times in an image.

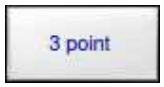
Fig. 96: **Measurement** operating mode

The following functions are available for that purpose:

- **Calibration:**
  To have an absolute scale for measurements, you must acquire the length of a reference object prior to each measurement.

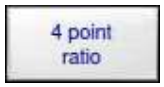


- Length or distance (**2 point**):
  To measure the length of a line.



- 3-point measurement (**3 point**):
  To measure the lengths of two contiguous lines and the interior angle between them. In addition, the angle difference to a full circle is calculated.

- 4-point measurement (**4 point**):
  To measure the lengths of two noncontiguous lines and the angle between them. In addition, the angle difference to 180° is calculated.



- 4-point ratio measurement (**4 point ratio**)
  To compute the length ratio between two lines.

All measurements you perform in a fluoroscopic image are shown simultaneously in the image. The measuring points are identified by capital letters which are assigned in alphabetic order. This means that the designation of the measuring points may vary, depending on the order in which you perform the different measurements.

Measuring inaccuracy

The larger the distance between the object of measurement and the image receptor, the more inaccurate the measurement will be. Therefore position the object of measurement as closely as possible to the image receptor or use the electronic magnification function, especially if the object of measurement is very small.

The measuring resolution on the screen is 512 × 512 pixels. With a ∅ 23 cm image intensifier, this results in a pixel pitch of 230/512 = 0.45 mm in relation to the object of measurement.

The measuring resolution on the screen is 512 × 512 pixels. With a 20.5 cm × 20.5 cm CMOS flat-panel detector, this results in a pixel pitch of 205 mm/512 = 0.40 mm in relation to the object of measurement.

NOTE

To achieve a higher resolution, use smaller electronic image formats.

Zoom function

If you change the zoom factor after making a measurement, the measured values will no longer be correct. In this case, the message **Measurement invalid due to zoom factor change** is displayed on the control panel.

Thumbnail mosaic

The measurements, texts, markers or arrows you have added to the image are not visible in the thumbnail mosaic view.

Cine loop

When you perform a measurement on a cine loop image and save it, this measurement is saved for a selected image of the cine loop and this image will be saved separately.

15.2 Calibrating

To have an absolute scale for a measurement, you must first acquire a reference length. For that purpose, you must screen a reference object of a known length or distance (e.g. a ruler or a balloon catheter with radiopaque markers). Then you mark the known distance or length in the fluoroscopic image and enter the corresponding value manually (Fig. 98).

Validity of the calibration

Measurements on a fluoroscopic image will only provide accurate results if, during the acquisition of the relevant calibration image, the reference object has been placed in exactly the same plane as the object to be measured later.

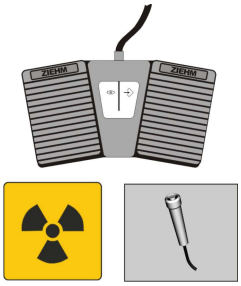
In the following cases, you must perform a new calibration before measurement:

- If the position of the patient or the C-arm has changed after the calibration.
- If you have activated a different patient folder.
- If you have created a new patient folder.
- If you have switched the system off and back on.

Designation of the measuring points

To perform a calibration, do the following:

The measuring points may have different designations, depending on the order in which the measurements are performed. In the following procedure, the measuring points are designated as **A** and **B** by way of example.



1. Screen the reference object in the **Fluoroscopy** operating mode.

CAUTION

CAUTION

Risk of injury by X-rays!

Put on X-ray protective clothing before you initiate radiation.

The reference object must be in the same plane as the object you want to measure later.

⇨ The image is displayed on the live screen.

2. Press the **Measure** tab.

⇨ The **Measurement** operating mode is activated.

3. Press the **Calibration** button.

⇨ The corresponding controls appear in the dynamic control area.

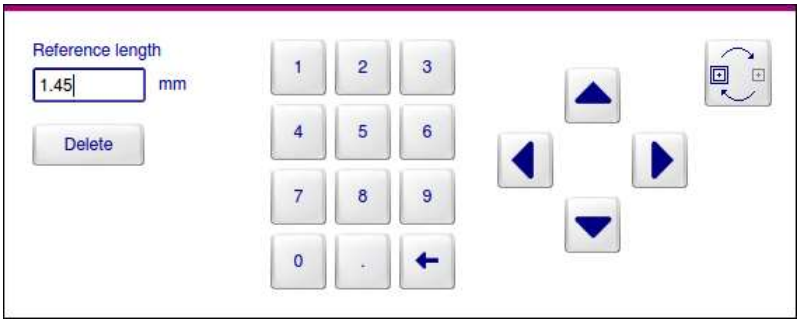
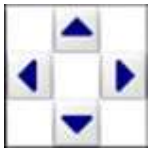


Fig. 97: **Calibration** function

Two white marker squares appear in the fluoroscopic image on the live screen; they mark the exact measuring points. The measuring points are called **A** and **B**, and the marker square next to point **A** is highlighted by a double frame.

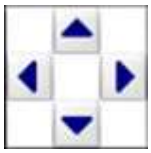
The two marker squares are connected by a line. This line symbolizes the reference length which is to be determined.



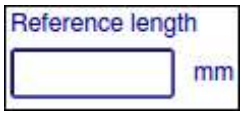
4. Move marker square **A** with the four arrow buttons to the desired first measuring point on the reference object, e.g. the first radiopaque marker on a balloon catheter.

5. Press the **Next measuring point** button.

⇨ Marker square **B** is now highlighted by a double frame.



6. Move the second marker square with the four arrow buttons to the desired second measuring point on the reference object, e.g. the second radiopaque marker on a balloon catheter.



7. Enter the length of the reference object in the **Reference length** input box.

8. Press the **Enter** key.

9. To edit the length you have entered, press the **Delete** button and enter another value.

10. Press the **OK** button.

⇨ The acquired and saved calibration value remains in force until you switch off the system.

15.3 Measuring a length or distance

This function measures the distance between two freely-definable points.

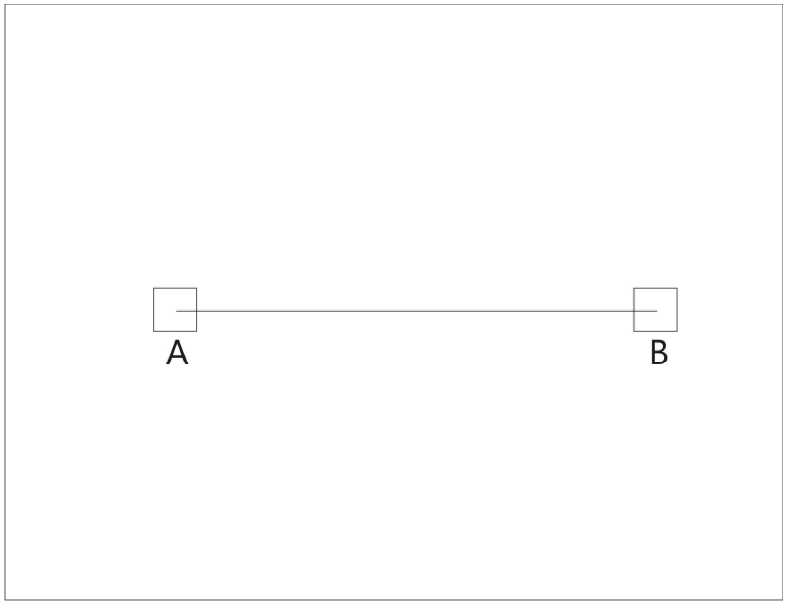


Fig. 98: Length or distance measurement

Prerequisite

To be able to measure a length or distance, you must perform a calibration first. The calibration value remains in force until you switch off the system.

Designation of the measuring points

To measure a length or distance, do the following:

The measuring points may have different designations, depending on the order in which the measurements are performed. In the following procedure, the measuring points are designated as **A** and **B** by way of example.

1. Open the desired image in the **Archive** operating mode.

2. Press the **Measure** tab.

   ⇨ The **Measurement** operating mode is activated. The selected image is displayed at full size on the live screen.

3. Press the **2 point** button.

NOTE
If the **2 point** button is unavailable, you must perform a calibration first.

⇨ The corresponding controls appear in the dynamic control area.

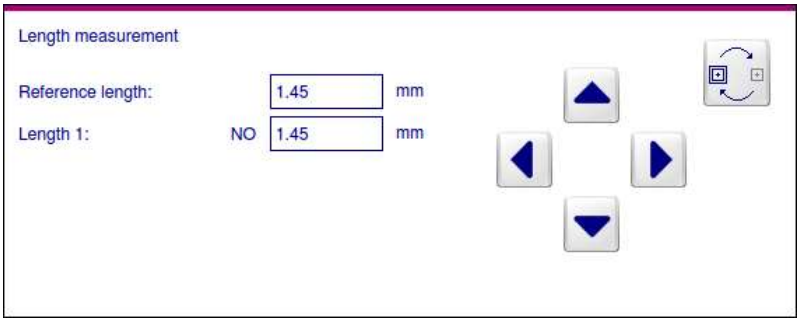
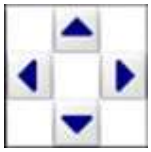


Fig. 99: **Length or distance** measurement

Two white marker squares appear in the fluoroscopic image on the live screen; they mark the exact measuring points. The measuring points are called **A** and **B**, and the marker square next to point **A** is highlighted by a double frame.

The two marker squares are connected by a line. This line symbolizes the reference length which is to be determined.



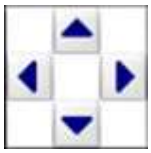
4. Move marker square **A** to the starting point of the desired line using the four arrow buttons.

⇨ In the **Reference length** field, the reference length which was entered during calibration is displayed.

The **Length 1** read-only box shows the current length of the distance.

5. Once the marker square is on the desired starting point, press the **Next measuring point** button.

⇨ Marker square **B** is now highlighted by a double frame.

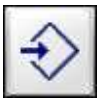


6. Move the second marker square to the final point of the desired length or distance using the four arrow buttons.

⇨ The current length of the distance is shown in the **Length 1** read-only box on the control panel. The value is instantly readjusted as soon as you change the position of any of the measuring points.

7. To correct the position of a measuring point, press the **Next measuring point** button until the desired marker square starts flashing and then move it to the desired new position.
   ⇨ The length of the modified distance is shown in the **Length 1** read-only box on the control panel.

8. Press the **OK** button.



9. Press the **Save** button.
   ⇨ The image is saved together with the measurement.

Editing a distance or length measurement

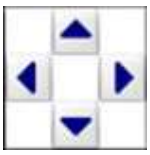
You can edit any distance or length measurement as long as the patient folder containing the image with the respective measurement has not been saved.

NOTE
When you have saved images containing measurements you cannot edit any distance/length measurements in these images. The arrow buttons are unavailable. However, you can delete any existing length or distance measurements and make new ones.

To edit a distance or length measurement, do the following:

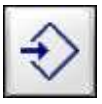
1. Press the **Edit** button.
   ⇨ The marker square is on one of the measuring points.

2. Press the **Next measuring point** button until the marker square is on the measuring point whose position you want to change.



3. Move the marker square to the desired new position using the arrow buttons.

4. Press the **OK** button.



5. Press the **Save** button.
   ⇨ You can repeat this editing procedure as often as you want as long as the patient folder is active.

To delete a length or distance measurement, do the following:

Press the **Delete** button.

⇨ The measured length or distance is deleted.

To jump from one measurement to the next one, do the following:

1. Press the **Edit** button.

   ⇨ The marker square is on one of the measuring points of the first measurement.

2. Press the **Edit** button.

   ⇨ The marker square jumps to one of the measuring points of the next measurement.

3. Repeat these two steps until the marker square is on one of the measuring points of the desired measurement.

15.4 3-point measurement

A 3-point measurement determines the lengths of two contiguous lines, the angle (1) between them and the angle difference (2) to a full circle.

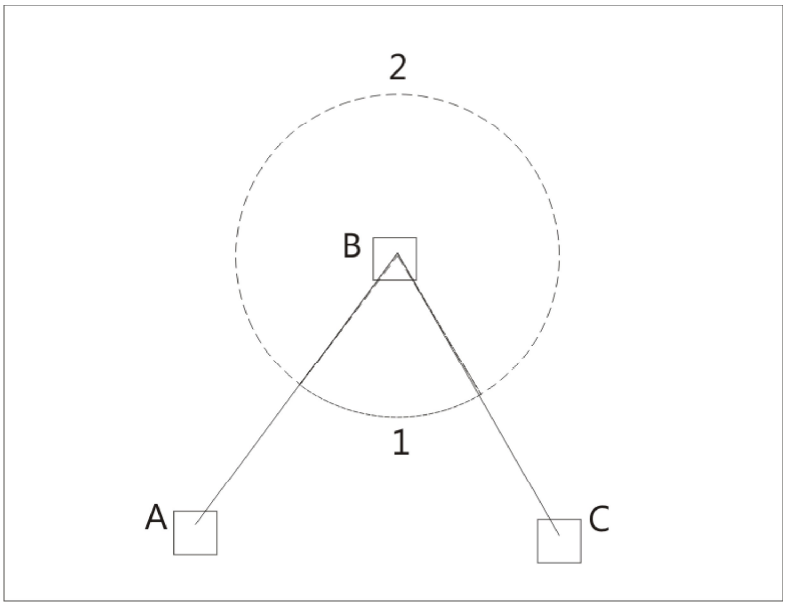


Fig. 100: 3-point measurement

Prerequisite

To be able to measure a length or distance, you must perform a calibration first. The calibration value remains in force until you switch off the system.

Designation of the measuring points

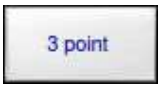
To perform a 3-point measurement, do the following:

The measuring points may have different designations, depending on the order in which the measurements are performed. In the following procedure, the measuring points are designated as **A, B** and **C** by way of example.

1. Open the desired image in the **Archive** operating mode.

2. Press the **Measure** tab.

   ⇨ The **Measurement** operating mode is activated. The selected image is displayed at full size on the live screen.



3. Press the **3 point** button.

NOTE

If the **3 point** button is unavailable, you must perform a calibration first.

   ⇨ The corresponding controls appear in the dynamic control area.

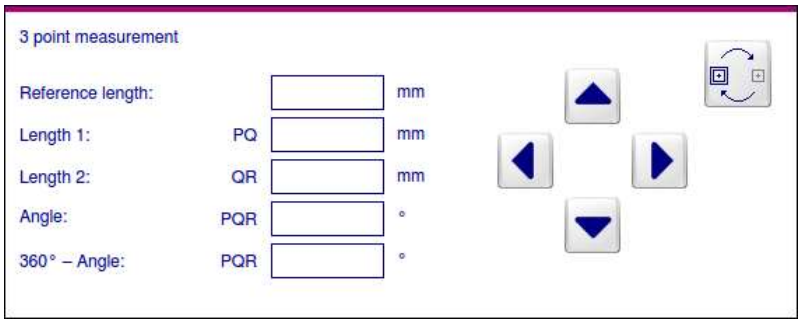
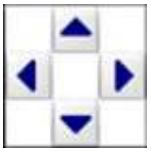


Fig. 101: **3-Point Measurement** function

Three white marker squares appear in the fluoroscopic image on the live screen; they mark the exact measuring points. The measuring points are called **A, B** and **C**, and the marker square next to point **A** is highlighted by a double frame.



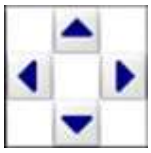
4. Move the marker square to the desired point **A** using the four arrow buttons.

5. Press the **Next measuring point** button.

   ⇨ Marker square **B** is now highlighted by a double frame.

   In the **Reference length** field, the reference length which was entered during calibration is displayed.

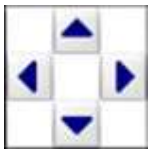
   The current length and angle values are displayed together with their designations in the **Length 1** (distance 1), **Length 2** (distance 2), **Angle** (interior angle) and **360° – Angle** (angle difference to a full circle) read-only boxes. The values are instantly readjusted as soon as you change the position of any of the measuring points.



6. Move the second marker square to the desired point **B** using the four arrow buttons.

7. Press the **Next measuring point** button.

   ⇨ Marker square **C** is now highlighted by a double frame.

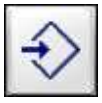


8. Move the third marker square to the desired point **C** using the four arrow buttons.

9. To correct the position of a measuring point, press the **Next measuring point** button until the desired marker square starts flashing and then move it to the desired new position.

   ⇨ The new values of the modified distances are shown in the respective boxes on the control panel.

10. Press the **OK** button.



11. Press the **Save** button.

    ⇨ The image is saved together with the measurement.

Editing a 3-point measurement

You can edit any 3-point measurement as long as the patient folder containing the image with the respective measurement has not been saved.

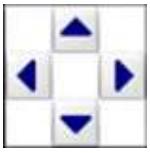
NOTE

When you have saved images containing measurements you cannot edit any distance/length measurements in these images. The arrow buttons are unavailable. However, you can delete any existing length or distance measurements and make new ones.

To edit a 3-point measurement, do the following:

1. Press the **Edit** button.
   ⇨ The marker square is on one of the measuring points.

2. Press the **Next measuring point** button until the marker square is on the measuring point whose position you want to change.



3. Move the marker square to the desired new position using the arrow buttons.

4. Press the **OK** button.

5. Press the **Save** button.
   ⇨ You can repeat this editing procedure as often as you want as long as the patient folder is active.

To delete a 3-point measurement, do the following:

Press the **Delete** button.
⇨ The 3-point measurement is deleted.

To jump from one measurement to the next one, do the following:

1. Press the **Edit** button.
   ⇨ The marker square is on one of the measuring points of the first measurement.

2. Press the **Edit** button.
   ⇨ The marker square jumps to one of the measuring points of the next measurement.
3. Repeat these two steps until the marker square is on one of the measuring points of the desired measurement.

15.5 4-point measurement

A 4-point measurement determines the lengths of two noncontiguous lines, the angle (1) between them and the angle difference to 180° (2).

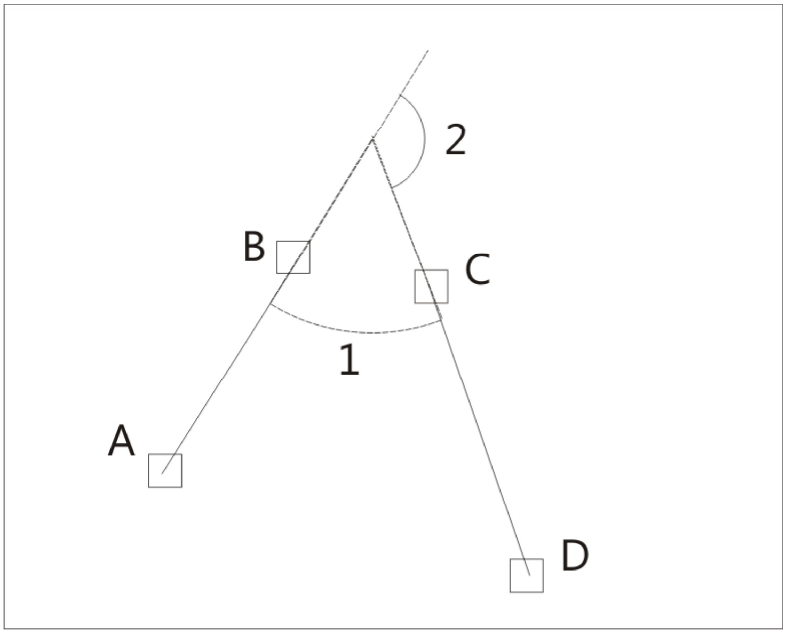


Fig. 102: 4-point measurement

Prerequisite

To be able to measure a length or distance, you must perform a calibration first. The calibration value remains in force until you switch off the system.

Designation of the measuring points

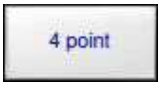
To perform a 4-point measurement, do the following:

The measuring points may have different designations, depending on the order in which the measurements are performed. In the following procedure, the measuring points are designated as **A, B,C** and **D** by way of example.

1. Open the desired image in the **Archive** operating mode.

2. Press the **Measure** tab.

   ⇨ The **Measurement** operating mode is activated. The selected image is displayed at full size on the live screen.



3. Press the **4 point** button.

NOTE
If the **4 point** button is unavailable, you must perform a calibration first.

⇨ The corresponding controls appear in the dynamic control area.

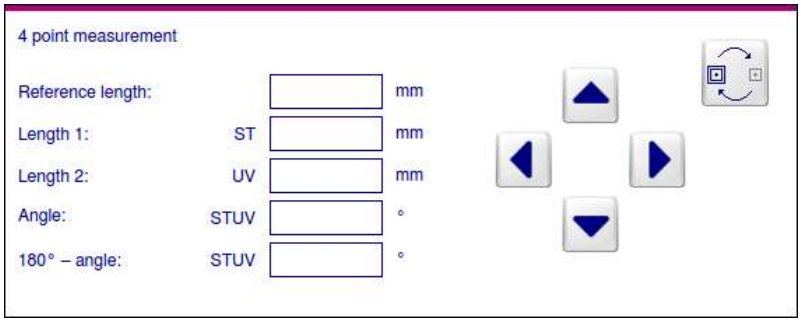
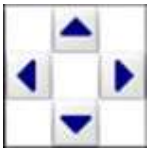


Fig. 103: **4-Point Measurement** function

Four white marker squares appear in the fluoroscopic image on the live screen; they mark the exact measuring points. The measuring points are called **A, B, C** and **D**, and the marker square next to point **A** is highlighted by a double frame.



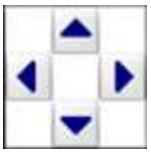
4. Move the marker square to the desired point **A** using the four arrow buttons.

5. Press the **Next measuring point** button.

⇨ Marker square **B** is now highlighted by a double frame.

In the **Reference length** field, the reference length which was entered during calibration is displayed.

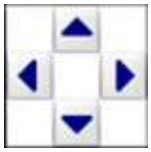
The current length and angle values are displayed together with their designations in the **Length 1** (distance 1), **Length 2** (distance 2), **Angle** (interior angle) and **180° – Angle** read-only boxes. The values are instantly readjusted as soon as you change the position of any of the measuring points.



6. Move the second marker square to the desired point **B** using the four arrow buttons.

7. Press the **Next measuring point** button.
   ⇨ Marker square **C** is now highlighted by a double frame.
8. Move the third marker square to the desired point **C** using the four arrow buttons.

9. Press the **Next measuring point** button.
   ⇨ Marker square **D** is now highlighted by a double frame.



10. Move the marker square to the desired point **D** using the four arrow buttons.

11. To correct the position of a measuring point, press the **Next measuring point** button until the desired marker square starts flashing and then move it to the desired new position.
    ⇨ The new values of the modified distances are shown in the respective boxes on the control panel.

12. Press the **OK** button.

13. Press the **Save** button.
    ⇨ The image is saved together with the measurement.

Editing a 4-point measurement

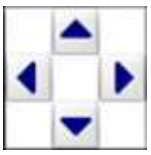
You can edit any 4-point measurement as long as the patient folder containing the image with the respective measurement has not been saved.

NOTE
When you have saved images containing measurements you cannot edit any distance/length measurements in these images. The arrow buttons are unavailable. However, you can delete any existing length or distance measurements and make new ones.

To edit a 4-point measurement, do the following:

1. Press the **Edit** button.
   ⇨ The marker square is on one of the measuring points.

2. Press the **Next measuring point** button until the marker square is on the measuring point whose position you want to change.



3. Move the marker square to the desired new position using the arrow buttons.

4. Press the **OK** button.

5. Press the **Save** button.

   ⇨ You can repeat this editing procedure as often as you want as long as the patient folder is active.

To delete a 4-point measurement, do the following:

Press the **Delete** button.

⇨ The 4-point measurement is deleted.

To jump from one measurement to the next one, do the following:

1. Press the **Edit** button.

   ⇨ The marker square is on one of the measuring points of the first measurement.

2. Press the **Edit** button.

   ⇨ The marker square jumps to one of the measuring points of the next measurement.

3. Repeat these two steps until the marker square is on one of the measuring points of the desired measurement.

15.6 4-point ratio measurement

A 4-point ratio measurement determines the lengths of two noncontiguous lines and their length ratio.

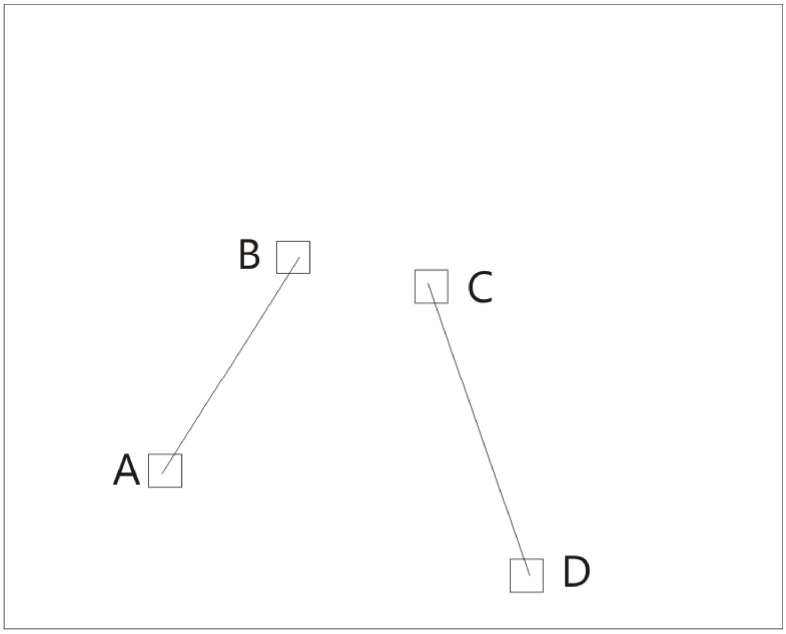


Fig. 104: 4-point ratio measurement

Prerequisite

To be able to measure a length or distance, you must perform a calibration first. The calibration value remains in force until you switch off the system.

Designation of the measuring points

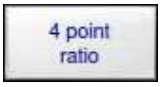
To perform a 4-point ratio measurement, do the following:

The measuring points may have different designations, depending on the order in which the measurements are performed. In the following procedure, the measuring points are designated as **A, B,C** and **D** by way of example.

1. Open the desired image in the **Archive** operating mode.

2. Press the **Measure** tab.

   ⇨ The **Measurement** operating mode is activated. The selected image is displayed at full size on the live screen.



3. Press the **4 point ratio** button.

NOTE
If the **4 point ratio** button is unavailable, you must perform a calibration first.

⇨ The corresponding controls appear in the dynamic control area.

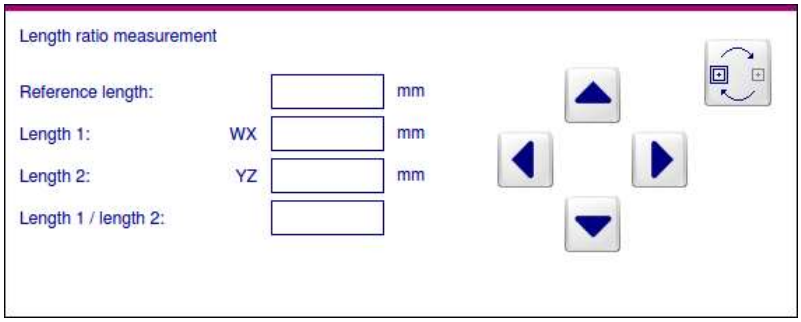
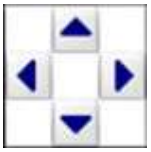


Fig. 105: **4 point ratio measurement** function

Four white marker squares appear in the fluoroscopic image on the live screen; they mark the exact measuring points. The measuring points are called **A, B, C** and **D**, and the marker square next to point **A** is highlighted by a double frame.



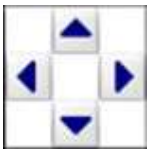
4. Move the marker square to the desired point **A** using the four arrow buttons.

5. Press the **Next measuring point** button.

⇨ Marker square **B** is now highlighted by a double frame.

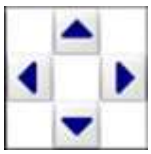
In the **Reference length** field, the reference length which was entered during calibration is displayed.

The current length and length ratio values are displayed in the **Length 1** (distance 1), **Length 2** (distance 2) and **Length 1 / Length 2** (length ratio) read-only boxes. The values are instantly readjusted as soon as you change the position of any of the measuring points.



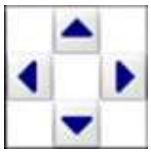
6. Move the second marker square to the desired point **B** using the four arrow buttons.

7. Press the **Next measuring point** button.
   ⇨ Marker square **C** is now highlighted by a double frame.



8. Move the third marker square to the desired point **C** using the four arrow buttons.

9. Press the **Next measuring point** button.
   ⇨ Marker square **D** is now highlighted by a double frame.



10. Move the marker square to the desired point **D** using the four arrow buttons.

11. To correct the position of a measuring point, press the **Next measuring point** button until the desired marker square starts flashing and then move it to the desired new position.
    ⇨ The new values of the modified distances are shown in the respective boxes on the control panel.

12. Press the **OK** button.

13. Press the **Save** button.
    ⇨ The image is saved together with the measurement.

Editing a 4-point ratio measurement

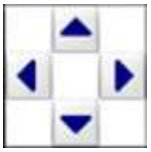
You can edit any 4-point ratio measurement as long as the patient folder containing the image with the respective measurement has not been saved.

NOTE
When you have saved images containing measurements you cannot edit any 4-point ratio measurements in these images. The arrow buttons are unavailable. However, you can delete any existing 4-point ratio measurements and make new ones.

To edit a 4-point ratio measurement, do the following:

1. Press the **Edit** button.
   ⇨ The marker square is on one of the measuring points.

2. Press the **Next measuring point** button until the marker square is on the measuring point whose position you want to change.



3. Move the marker square to the desired new position using the arrow buttons.

4. Press the **OK** button.

5. Press the **Save** button.

   ⇨ You can repeat this editing procedure as often as you want as long as the patient folder is active.

To delete a 4-point ratio measurement, do the following:

Press the **Delete** button.

⇨ The 4-point ratio measurement is deleted.

To jump from one measurement to the next one, do the following:

1. Press the **Edit** button.

   ⇨ The marker square is on one of the measuring points of the first measurement.

2. Press the **Edit** button.

   ⇨ The marker square jumps to one of the measuring points of the next measurement.

3. Repeat these two steps until the marker square is on one of the measuring points of the desired measurement.

16 Text and image information

16.1 Overview

Shape of displayed image

The image normally has a circular shape.

On systems with flat-panel detector, the image normally has a square shape. As soon as the image is rotated on systems with flat-panel detector, it assumes a circular shape for technical reasons. The image has a square shape only when in the following angle positions: 0°/360°, 90°, 180°, 270°.

Image information

Some image information is always displayed automatically as text on the screen. Detailed patient and image data can be found on the control panel.

In addition, you may enter your own text or markers directly onto the fluoroscopic image in a text annotation area on the screen and save a note together with the image.

16.2 Image information on the screen

16.2.1 Upper left corner of the screen

Patient data

In this area, the last name, first name, patient ID and date of birth of the patient are displayed. Patient data is entered or corrected in the **Patient** operating mode.

16.2.2 Upper right corner of the screen

Hospital data

In this area, the name of the hospital, attending physician and hospital department are displayed.

The default hospital data can be entered in the **Configuration** operating mode under **Basic settings** and may be corrected later in the **Patient** operating mode, if necessary.

Image number and flag

As soon as you have saved an image, its image number is displayed. For marked or protected images, the flag **M** or **P** is displayed directly behind the image number.

DICOM status

If the image has already been transferred to a DICOM server or imported from a DICOM server into the system, it is flagged as follows:

- **DICOM D**: The image has been transferred successfully to the DICOM server
- **DICOM C**: The image has been transferred successfully to the DICOM server and stored safely (**Storage Commitment**)
- **DICOM R**: The image has been imported from the DICOM server into the system

Image type If a cine loop, DSA, MSA or RSA image is displayed, it is flagged correspondingly (**CINE, DSA, MSA, RSA**).

16.2.3 Lower left corner of the screen

Image reversal Image reversal is symbolized on the screen by an **R** which is either mirrored upside-down or left-right. This symbol appears in the following cases:

- The live image is reversed.
- An image which has been saved with reversal is displayed.

Recursive filter The chosen recursive filter level is shown as **NR X**.

Edge filter The chosen edge filter level is shown as **RTE X**.

LIH filter The chosen stack filter level is shown as **LIH X**.

Angle of rotation The angle of rotation which has been chosen for the image is shown as **R X**.

Windowing values The chosen windowing values are shown on the screen as **W X** and **L Y**.

Acquisition time and acquisition date The time and date of acquisition are automatically assigned by the system and cannot be edited.

16.2.4 Lower right corner of the screen

Fluoroscopy parameters The following fluoroscopy parameters are displayed here:

- Tube voltage in kV
- Tube current in mA
- Total radiation time accumulated so far for the active patient folder in seconds
- Dose area product in the selected unit (depending on the selected option)
- Cumulative air kerma and current air kerma rate (depending on the selected option)

The values are automatically assigned by the system and cannot be edited.

Image magnification level Furthermore, the image magnification level chosen for the image is shown as **MAG X**.

Anatomical program

Below the fluoroscopy parameters, an abbreviation indicates which anatomical program was used for generating the image:

Abbreviation	Anatomical program
Bone	Bones (Ziehm Solo)
BoneT	Trunk (Ziehm Solo FD)
BoneE	Extremities / cervical spine / head (Ziehm Solo FD)
HRT	Heart
ABD	Abdomen
URO	Uro
SOFT	Soft
LP SP	Long Procedure Spine
DSA	DSA
MSA	MSA
RSA	RSA

Table 24: Abbreviations for anatomical programs

16.2.5 Abbreviations in the mosaic view

In the mosaic view, abbreviations are displayed below the images indicating the type of image or folder:

Abbreviation	Anatomical program
CINE	Cine loop (folder)
CINE (DSA)	DSA cine loop (folder)
CINE (DSAC)	DSA cine loop with CO_2 as contrast medium (folder)
CINE (SUB)	Subtraction cine loop (folder)
CINE (SUBC)	Subtraction cine loop with CO_2 as contrast medium (folder)
MPR	Multiplanar reconstruction
SCRN	Screenshot
SECO	Slice views (folder)

Table 25: Abbreviations in the mosaic view

16.3 Entering and editing text

You can activate the **Text** mode from any of the following operating modes:

- **Fluoroscopy**
- **Post processing**
- **Measurement**

Simply press the **Text** button the corresponding operating mode.

⇨ The **Text** mode is activated.

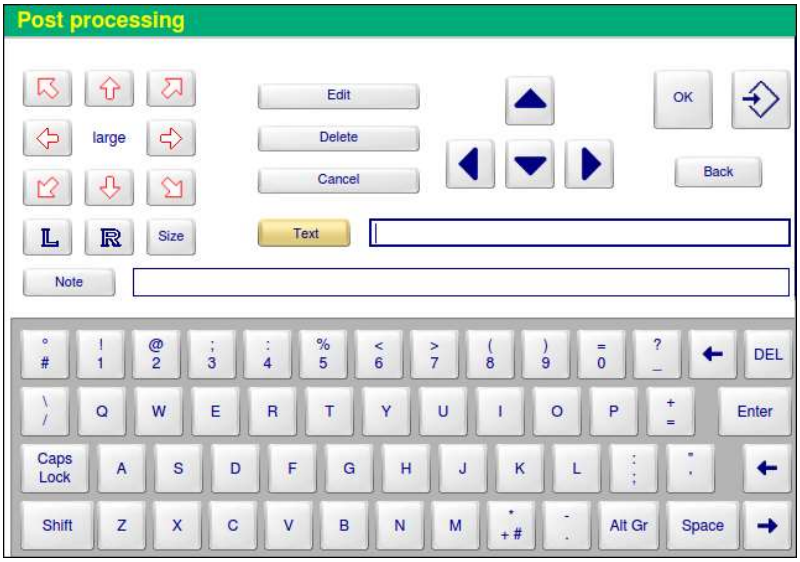


Fig. 106: **Text** mode

You may add the following elements to a fluoroscopic image on the live screen:

- Any desired text
- An arrow in various sizes pointing to different directions

- The markers **L** or **R** in various sizes

Both arrows and marking letters are available in three sizes (**large**, **medium**, **small**). The chosen size is indicated in the center of the arrow block. The default size is always **large**. The size can be modified with the **Size** button.

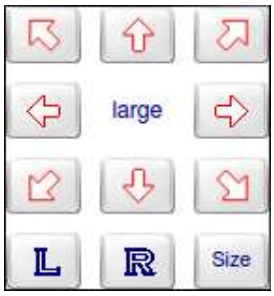


Fig. 107: Arrow block and size indication

Thumbnail mosaic

The measurements, texts, markers or arrows you have added to the image are not visible in the thumbnail mosaic view.

Note

In the **Text** mode, you may furthermore enter a note on the current image. This note is displayed in the **Archive** operating mode together with the image information.

To add a text to the fluoroscopic image, do the following:

1. Press the **Text** button.
   ⇨ The cursor on the control panel jumps to the text input box.
2. Enter the desired text using the alphanumeric keypad which is displayed on the control panel.

NOTE

To type an uppercase letter, press and release the **Shift** key before entering the respective letter. The **Shift** key acts on one subsequent letter. To type several consecutive uppercase letters, press the **Caps Lock** key before entering the letters.

   ⇨ The text appears both in the input box on the control panel and in the fluoroscopic image on the screen. The text in the fluoroscopic image is surrounded by a frame.
3. Move the text to the desired position using the arrow buttons.

4. To undo your input, press the **Cancel** button.
   ⇨ The text is deleted.

   or

5. To confirm your input, press the **OK** button.
   ⇨ The frame disappears. The text input box on the control panel is cleared.

6. Press the **Save** button.

7. Press the **Back** button.
   ⇨ The previously active operating mode is reactivated.

To add a marker to the fluoroscopic image, do the following:

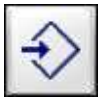
1. Select the arrow or the marking letter you want to insert by pressing the corresponding button.
   ⇨ The arrow or the marking letter appear in the fluoroscopic image on the screen.
2. Move the arrow or marking letter to the desired position using the arrow buttons.

3. Press the **Size** button until the desired size has been reached.
   ⇨ The chosen size (large, medium, small) is indicated in the center of the arrow block.

4. To undo your input, press the **Cancel** button.
   ⇨ The arrow or marking letter and its position are deleted.

   or

5. To confirm your input, press the **OK** button.



6. Press the **Save** button.

7. Press the **Back** button.
   ⇨ The previously active operating mode is reactivated.

To edit a text annotation, do the following:

1. Press the **Edit** button until the cursor on the screen is on the annotation you want to change.
2. Enter the new text using the alphanumeric keypad.

To delete a text annotation, do the following:

1. Press the **Edit** button until the cursor on the screen is on the annotation you want to delete.

2. Press the **Delete** button.

To edit a marker, do the following:

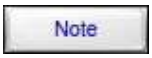
1. Press the **Edit** button until the cursor on the screen is on the annotation you want to change.
2. Make the desired changes.

To delete a marker, do the following:

1. Press the **Edit** button until the cursor on the screen is on the marker you want to delete.

2. Press the **Delete** button.

To enter a note on an image, do the following:



1. Press the **Note** button.
   ⇨ The cursor on the control panel jumps to the note input box.
2. Enter the desired note using the alphanumeric keypad which is displayed on the control panel.

NOTE
To type an uppercase letter, press and release the **Shift** key before entering the respective letter. The **Shift** key acts on one subsequent letter. To type several consecutive uppercase letters, press the **Caps Lock** key before entering the letters.

3. Press the **Save** button.

16.4 Anatomical Marking Tool (AMT) option

Use AMT to apply markings and labels to fluoroscopic images. The fluoroscopic image remains unchanged and is enhanced by an additional drawing plane. This drawing plane is displayed for all images and cine loops subsequently acquired

NOTE
AMT is only an auxiliary means to apply markings and labels to fluoroscopic images.

The final decision lies with the attending physician or attending surgeon to ensure that the current fluoroscopic image and the existing drawing plane are entirely congruent.

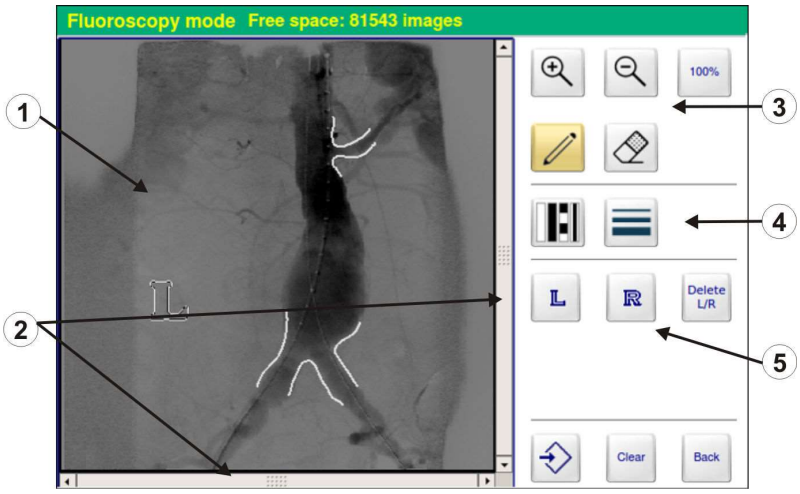


Fig. 108: AMT elements

1 Image editing workspace
2 Scrollbar
3 Zoom and tools selection
4 Pen selection
5 Labeling functions

16.4.1 AMT controls on the control panel

Symbol(s)	Meaning
	Drawing function Activates AMT and opens the image editing workspace
	Pen Selects the drawing mode
	Eraser Selects the eraser mode
	Line Width Opens a drop-down list to select the line width from
	Line Style Opens a drop-down list to select the line style from
	Zoom In Selects the zoom in mode and magnifies the image area by one step
	Zoom Out Minimizes the image area by one step

Symbol(s)	Meaning
	100% Shows the fluoroscopic image as full screen image
 	L or R label Inserts the character L or R respectively one time only
	Delete L/R Deletes existing L and R labels
	Save Saves the current image including drawing plane as a new image
	Delete Deletes the drawing plane of the current image
	Back Terminates AMT and closes the image editing workspace

16.4.2 Basic marking and labeling functions

Activate drawing function

To activate the drawing function, do the following:

In the **Fluoroscopy** or **Vascular** operating modes, press the **Drawing function** in the SmartEye, to activate the drawing function.

⇨ The image editing workspace appears on the control panel: The AMT controls appear in the dynamic control area.

NOTE

If you press a radiation button or foot switch while AMT is activated, AMT is terminated. Markings and labels persist but will not be saved.

Press the **Save** button, to save the current fluoroscopic image including the drawing plane as a new image.

The drawing function provides the following possibilities:

Use Zoom In

To use the zoom, do the following:

1. Press the **Zoom In** button to activate the zoom in mode.
   ⇨ The button is highlighted in yellow.
2. With activated zoom in mode touch the desired location in the SmartEye to magnify this image area by one step.

   or
3. Press the button again, to select the next zoom in level from the image center.

4. Press the **Zoom Out** button to minimize the image area by one step.

Use scrollbar

To use the scrollbar, do the following:

If you have magnified an image area, use the scrollbar to relocate it.

1. Press and relocate the slider of a scrollbar until the desired area is displayed.

   or
2. Press the arrow buttons at the end of a scrollbar, to relocate the image area step by step into the desired direction.

Reset Zoom In

To reset the zoom, do the following:

Press the **100%** button to reset the image area to full screen size of the fluoroscopic image.

Use pen

To use the Pen function, do the following:

Press the **Pen** button to activate the drawing mode.

⇨ The button is highlighted in yellow. You can add markings to the fluoroscopic image.

Set line width

To define the line width, do the following:

Press the **Line Width** button to set the line width.

⇨ A menu showing the available line width opens. Select the desired line width. All subsequent markings are performed using this line width.

Set line style

To define the line style, do the following:

Press the **Line Style** button to set the line style.

⇨ A menu showing the available line styles opens. Select the desired line style. All subsequent markings are performed using this line style.

Use eraser

To use the Eraser function, do the following:

Press the **Eraser** button to activate the eraser mode.

⇨ The button is highlighted in yellow. You can remove markings from the fluoroscopic image.

Apply L/R labels

To apply L/R labels to the fluoroscopic image, do the following:

Press the **Label L** or **Label R** button to apply a label.

⇨ The button is highlighted in yellow. You can apply one label **L** or **R** to each fluoroscopic image.

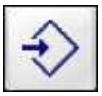
By touching the image editing workspace repeatedly, you can correct the current label position, provided one of the label buttons is activated.

Delete L/R labels

To delete the L/R labels, do the following:

Press the **Delete L/R** button to delete all L and R labels.

Save



To save markings and labels, do the following:

Press the **Save** button, to save the current fluoroscopic image including all markings and labels as a new image.

Clear

To clear the current drawing plane, do the following:

Press the **Clear** button to clear the current drawing plane.

⇨ A confirmation prompt is displayed, whether you want to delete all markings and labels. Press the **Yes** button to confirm the delete operation. Press the **No** button to abort the delete operation.

Back

To close the image editing workspace, do the following:

Press the **Back** button to close the image editing workspace and return to the previous operating mode.

⇨ The **Drawing function** button is shown with yellow contours. All markings and labels remain visible in the fluoroscopic image and in the SmartEye.

NOTE

If you close the image editing workspace by pressing the **Back** button, markings and labels are not saved automatically.

Before closing the image editing workspace, press the **Save** button, to save the current fluoroscopic image including the drawing plane as a new image.

16.4.3 Redisplay and edit drawing plane

Activate drawing function

If you applied markings and labels to a fluoroscopic image and meanwhile have returned to the **Fluoroscopy** or **Vascular** operating mode, or if you have opened an image from the Archive, you can reactivate the drawing function.

To activate the drawing function, do the following:

Press the **Drawing function** button shown with yellow contours in the SmartEye.

⇨ If markings and labels are displayed, the image editing workspace opens instantly.

Existing markings and labels included in the fluoroscopic image are not shown under the following conditions:

- Rotated or reversed fluoroscopic image
- Fluoroscopic image was moved to another screen using the **Image Swapping** button.

In this case a message window is displayed, if you press the **Drawing function** button shown with yellow contours in the SmartEye. You can now determine further operations as follows:

Display

To display the drawing plane, do the following:

Press the **Display** button to display the drawing plane.

⇨ Existing markings and labels included in the fluoroscopic image and in the SmartEye are displayed.

NOTE

If you have acquired a new fluoroscopic image in the meantime, the drawing plane may not be fully congruent with the fluoroscopic image.

In this case delete the existing drawing plane and mark and label the image again.

Edit

To edit the drawing plane, do the following:

Press the **Edit** button to edit the drawing plane.

⇨ Existing markings and labels included in the fluoroscopic image are displayed in the image editing workspace. You can edit or enhance this drawing plane.

Delete

To delete the drawing plane, do the following:

Press the **Delete** button to delete the drawing plane.

⇨ Existing markings and labels are deleted. The fluoroscopic image is shown in the image editing workspace. You can create a new drawing plane.

17 Laser Positioning Device

As an option, the system may be equipped with a laser positioning device at the generator and/or image receptor.

Safety instructions

The laser positioning device generates a laser-beam crosshair, the central point of which marks the position of the central X-ray beam on the patient.

For safety reasons, the laser positioning device is switched off automatically after 1 minute.

⚠ WARNING

WARNING

Laser radiation – Do not stare into beam or view directly with optical instruments (Laser Class 2M according to IEC 60825-1).

Please observe the provisions of the IEC TR 60825-14 for operation of the laser positioning devices as well as national legislation and regulations.

Viewing the laser beam apertures with certain optical instruments (e.g. eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.

⚠ CAUTION

CAUTION

(USA)

LASER RADIATION – DO NOT STARE INTO BEAM

Class 2M Laser Product (Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007)

17.1 Applications

You can use the laser positioning device for the following tasks:

- As alignment aid for positioning the C-arm
- For localization of foreign bodies and implants

⚠ CAUTION

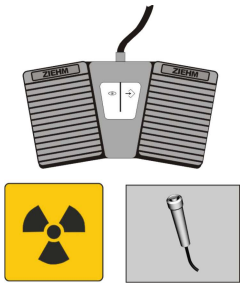
CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Positioning aid

To position the C-arm exactly above the patient without having to initiate radiation, do the following:

1. Press the **Laser** button.
   ⇨ A laser-beam crosshair is generated, the central point of which corresponds to the position of the central X-ray beam.
2. Position the C-arm in such a way above the patient that the central point of the laser-beam crosshair is exactly in the center of the region of interest.



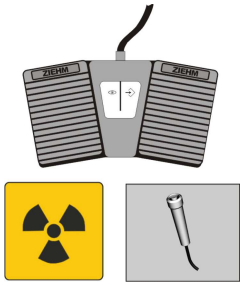
3. Initiate radiation.

> **CAUTION**
>
> **CAUTION**
>
> Risk of injury by X-rays!
>
> Put on X-ray protective clothing before you initiate radiation.

For localization of foreign bodies and implants

You can use the laser positioning device also for localization of foreign bodies and implants. For that purpose, you must activate the on-screen crosshair first.

To localize a foreign body or an implant with the help of the laser positioning device, do the following:



1. Initiate radiation.
   ⇨ The foreign body or implant becomes visible in the image on the live screen.

> **CAUTION**
>
> **CAUTION**
>
> Risk of injury by X-rays!
>
> Put on X-ray protective clothing before you initiate radiation.

2. Position the C-arm in such a way above the patient that the center of the crosshair on the screen lies exactly over the foreign body or implant in the fluoroscopic image.

3. Press the **Laser** button.
   ⇨ The laser positioning device's laser-beam crosshair now marks the patient's skin exactly above the point where the foreign body or the implant lies. This allows a precise determination of the point of surgical incision.

18 Direct Radiography

This chapter applies to systems with image intensifier only.

NOTE
This function has not been tested for interventional procedures in accordance with IEC 60601-2-43.

NOTE
Intentional misuse of the **Radiography** operating mode may increase image delay time compared to **Fluoroscopy** operating mode.

18.1 Overview

The system can also be used for making direct radiographic film exposures (n/a for Germany).

Direct radiographies are only possible if your system is equipped with a film cassette holder (optional accessory).

18.2 Fitting the film cassette holder

To fit the film cassette holder for direct radiographic exposures onto the image intensifier, do the following:

1. Pull the spring-loaded securing lever (1) on the film cassette holder (2) outwards.
2. Slide the film cassette holder over the supporting ridge on the image intensifier (3).
3. Release the spring-loaded securing lever. It will engage above the supporting ridge, so securing the cassette holder safely in place.
4. Insert a loaded film cassette (4) fully into the film cassette holder from the side.

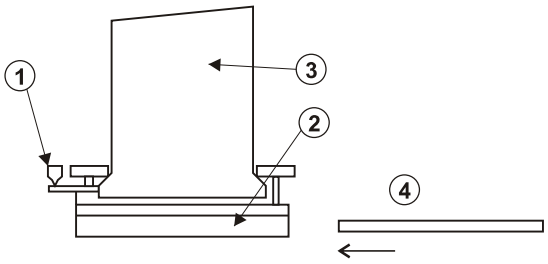


Fig. 109: Fitting the film cassette holder and inserting the film cassette

18.3 Making a direct radiographic exposure

For direct radiography, you can set the following maximum collimator apertures for the film or cassette size used:

Image intensifier ∅ 23 cm:

- 24 cm; the visible image has a diameter of 23 cm

WARNING

Make sure that the selected collimator aperture does not exceed the cassette size used.

Manual settings

For tube voltage, use the value that the system has automatically selected during the previous fluoroscopy. You may correct this value manually if necessary.

The mAs value (tube current in mA × time in s) is always set manually.

For limit values (mA, kV, mAs) in this operating mode and exposure time refer to the technical data in the appendix of this document. The system automatically adjusts this value to reach the manually set value. The exposure time is computed automatically from the manually set values and cannot be set individually. It appears rounded to the first digit after the decimal point on the display.

To make a direct radiographic exposure, do the following:

WARNING

Make sure that the film cassette holder is properly attached to the image intensifier, so that the cassette cannot fall down onto the patient!

NOTE
Make sure that the source/skin distance is at least 45 cm.

1. Press the **Radiogr.** tab.

   ⇨ The **Radiography** operating mode is activated. The corresponding controls appear in the dynamic control area.

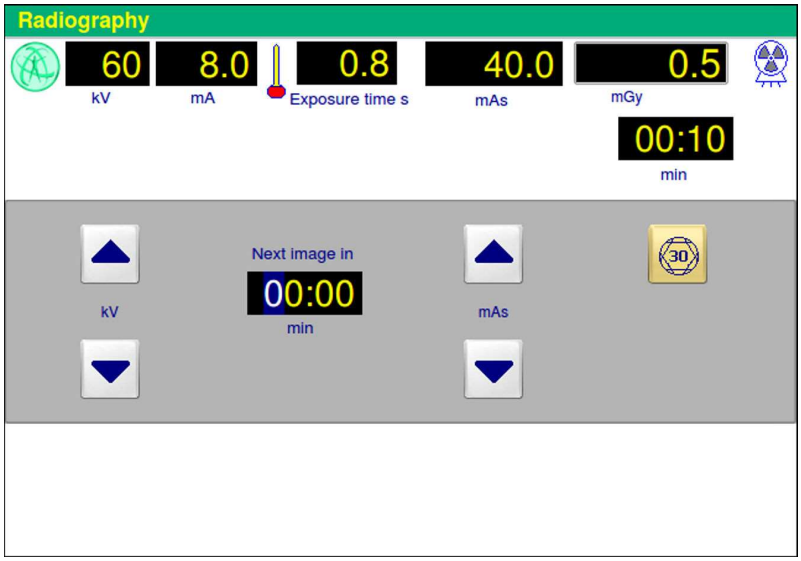


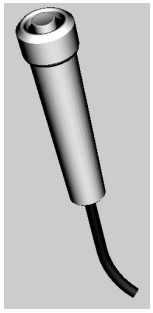
Fig. 110: **Radiography** operating mode

2. Set the desired tube voltage value using the arrow buttons.

   ⇨ The selected value appears on the Voltage display.

3. Set the desired **tube current × time (mAs)** value using the arrow buttons.

⇨ The selected value appears on the mAs display.



4. Initiate radiation using the hand switch.

   In the **Radiography** operating mode, you cannot initiate radiation with the foot switch.

CAUTION

CAUTION

Risk of injury by X-rays!

Put on X-ray protective clothing before you initiate radiation.

⇨ An audible alarm will sound throughout the exposure time. Radiation is terminated automatically after the computed exposure time. You can interrupt the exposure before the computed exposure time has elapsed by releasing the hand switch.

5. Withdraw the film cassette.
6. Remove the film cassette holder from the image intensifier.

19 Configuration

19.1 Overview

General

A large number of parameters can be preset for the system:

The following controls are provided for this purpose:

- **Config – Operation settings** operating mode
- **Config – Basic settings** operating mode
- **Config – Cine/DSA/Dose** operating mode
- **Config – Storage media** operating mode
- **Config – Accessories** operating mode

Service settings

The control panel provides access to the **Service settings**. This access is password-protected. Settings and/or actions can and must be made by trained service engineers only.

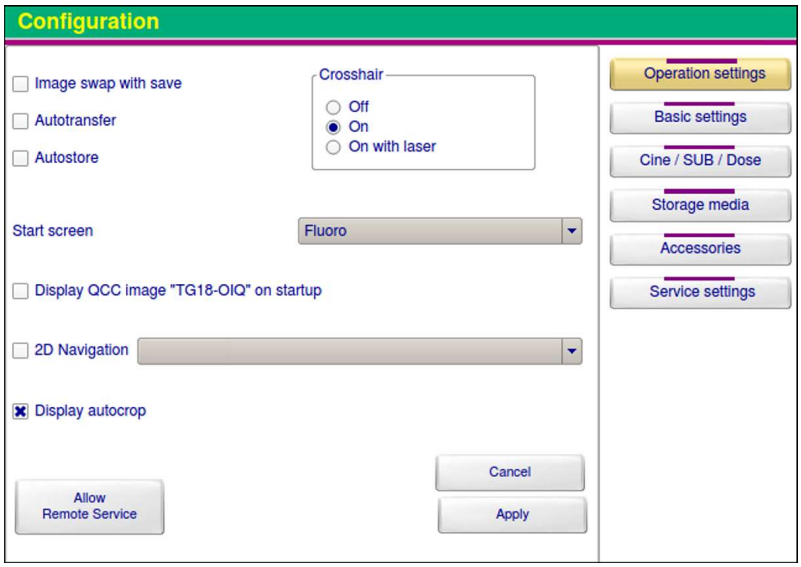


Fig. 111: **Configuration** operating mode

19.2 Operation settings

Function

Under **Operation settings** you define the settings which determine the operational conditions during fluoroscopy.

Activate the Configuration operating mode.

Press the **Config** tab.

⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

19.2.1 Autotransfer

Moving the fluoroscopic image

Under **Autotransfer** you activate or deactivate the **Autotransfer** (automatic image swapping) function.

Fig. 112: Autotransfer

- **Autotransfer** activated:
  When you initiate radiation, the fluoroscopic image on the live screen is moved automatically to the reference screen.
- **Autotransfer** deactivated:
  When you initiate radiation, the present fluoroscopic image on the live screen is automatically deleted.

When you switch on the system, the **Autotransfer** function is deactivated by default.

To activate the Autotransfer function, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

2. Press the **Autotransfer** option.
   ⇨ The check box is checkmarked.

3. Press the **Apply** button.
   ⇨ The **Autotransfer** function is activated.

19.2.2 Autostore

Under **Autostore** you activate or deactivate the **Autostore** (automatic saving) function.

Fig. 113: Autostore

- **Autostore** activated:
  During each fluoroscopy, a new image will be saved automatically as soon as you terminate radiation.
- **Autostore** deactivated:
  The system does not save the images automatically. You must save the desired fluoroscopic images manually (→ *Chapter 8.9 “Save” on page 128*).

Alternatively, you can activate the **Autostore** function by means of the **Save** button (→ *“Autostore function” on page 128*).

When you switch on the system, the **Autostore** function is deactivated by default.

To activate the Autostore function, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

2. Press the **Autostore** option.
   ⇨ The check box is checkmarked.

3. Press the **Apply** button.
   ⇨ The **Autostore** function is activated.

19.2.3 Image swap with save

Under **Image swap with save** you activate and deactivate the **Image swap with save** function.

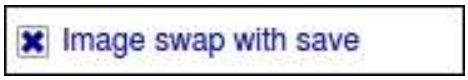


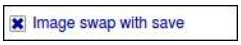
Fig. 114: Image swap with save

- **Image swap with save** activated:
  As soon as you move a live image to the reference screen, this image is saved automatically.
- **Image swap with save** deactivated:
  The system does not automatically save the image that is moved to the reference screen. You must save the image manually (→ *Chapter 8.9 “Save” on page 128*) before moving it to the reference screen with the Image Swapping button.

When you switch on the system, the **Image swap with save** function is deactivated by default. If you activate the **Image swap with save** function during operation, it will be deactivated automatically when you switch off the system.

To activate the Image swap with save function, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.



2. Press the **Image swap with save** option.
   ⇨ The check box is checkmarked.

3. Press the **Apply** button.
   ⇨ The **Image swap with save** function remains active until you switch off the system.

19.2.4 Displaying a crosshair

Positioning aid

Under **Crosshair** you determine whether a crosshair is displayed as positioning aid (e.g. for localization of foreign bodies and implants) in the image on the live screen during fluoroscopy. The central point of the crosshair corresponds to the position of the central X-ray beam. In addition you can set whether you want to activate the **Crosshair** together with the laser positioning device when pressing the **Laser** button.

By default, the crosshair is permanently deactivated. By changing this setting, the setting saved last will be applied for further sessions.

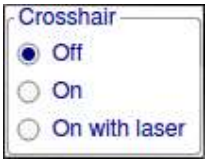


Fig. 115: Crosshair

The following table shows the crosshair setting options and their meanings.

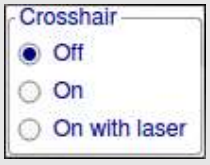
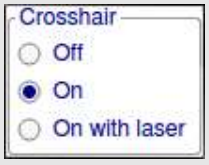
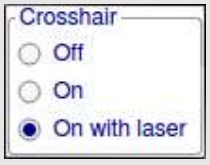
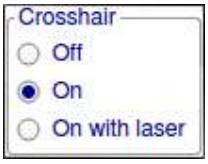
		
The crosshair is permanently hidden. The **Laser** button (in the operating modes **Fluoroscopy** or **Vascular**) only switches on the laser positioning device.	The crosshair is permanently shown. The **Laser** button (in the operating modes **Fluoroscopy** or **Vascular**) only switches on the laser positioning device.	If you switch to the operating mode **Fluoroscopy** or **Vascular**, the laser positioning device is hidden. By pressing the **Laser** button, the crosshair is shown and hidden.

Table 26: Correlation of crosshair and **Laser** button

To display the crosshair, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

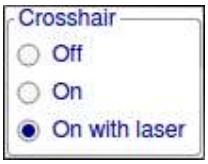


2. Select the **On** setting.
   ⇨ The setting is selected.

3. Press the **Apply** button.
   ⇨ The crosshair remains displayed until you switch off the system.

To have the crosshair activated with the Laser button, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.



2. Select the **On with laser** setting.
   ⇨ The setting is selected.

3. Press the **Apply** button.
   ⇨ When you press the **Laser** button, the crosshair is activated together with the laser positioning device. The laser positioning device switches off automatically after 1 minute.

19.2.5 Defining the start screen

Under **Start screen** you determine which operating mode is activated by default after power-up of the system.

Fig. 116: Start screen

- **Fluoro**:
  After power-up of the system, the **Fluoroscopy** operating mode is activated.

or

- **Subtraction**
  After power-up of the system, the **Subtraction** operating mode is activated.

or

- **Patient**:
  After power-up of the system, the **Patient** operating mode is activated.

The default start screen is configured according to the customer's wishes.

To define the start screen, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.
2. Select the desired operating mode

3. Press the **Apply** button.
   ⇨ As from the next power-up of the system, the selected operating mode will be activated automatically.

19.2.6 QCC image for consistency test according to DIN 6868-157

Under **Display QCC image TG18-OIQ on startup** you activate or deactivate the display of a QCC image for consistency test.

Fig. 117: QCC image

- **QCC image** activated:
  After power-up of the system, a QCC image is displayed on both screens. Using this test image, you can perform the consistency test according to DIN 6868-157 on both screens.
- **QCC image** deactivated:
  The QCC image is not displayed.

To activate the display of the QCC image, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The Operation settings controls appear.

2. Press the **Display QCC image TG18-OIQ on startup** option.
   ⇨ The check box is checkmarked.

3. Press the **Apply** button.
   ⇨ A QCC image is displayed on both screens after power-up of the system.

19.2.7 2D Navigation

NOTE
The **2D Navigation** check box is displayed only if your system is equipped with the **NaviPort 2D** option.

Transferring data to navigation system

Under **2D Navigation** you activate or deactivate the **NaviPort 2D** function.

Fig. 118: 2D Navigation

- **2D Navigation** activated:
  When you initiate radiation, the present fluoroscopic image on the live screen is automatically sent to the navigation system.
- **2D Navigation** deactivated:
  When you initiate radiation, the fluoroscopic image is not sent to the navigation system.

When you switch on the system, the **2D Navigation** function is deactivated by default.

To activate the 2D Navigation function, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

2. Press the **2D Navigation** option.
   ⇨ The check box is checkmarked.

3. Press the **Apply** button.
   ⇨ The **2D Navigation** function is activated.

19.2.8 Display autocrop

Under **Display autocrop** you activate or deactivate the **Display autocrop** function. This setting affects all fluoroscopy operations.

Fig. 119: Display autocrop

- **Display autocrop** activated:
  A filter is applied to all collimated areas of the fluoroscopic image and dims them additionally. All collimator edges are not dimmed additionally and remain visible.
- **Display autocrop** deactivated:
  No filter is applied to collimated areas of the fluoroscopic image.

To activate the Display autocrop function, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.
   The **Operation settings** controls appear.

2. Press the **Display autocrop** option.
   ⇨ The check box is checkmarked.

3. Press the **Apply** button.
   ⇨ The **Display autocrop** function is activated.

19.2.9 Allow Remote Service

With **Allow Remote Service** you activate the remote service of the system with restricted access to system functions, provided this service feature has been unlocked for the system.

Fig. 120: Allow Remote Service

For further information refer to the corresponding Addendum.

19.2.10 Discarding the operation settings

After having defined or modified the operation settings, these settings must be applied explicitly in order to become valid in the system. As long as the settings or changes have not been applied yet, you can discard them, so that the previous settings remain valid.

To discard the operation settings which have not been applied yet, do the following:

1. Press the **Cancel** button.

   or

2. Quit the **Configuration** operating mode without applying the settings.

19.3 Basic settings

Function

Under **Basic settings** you make different settings which directly affect the screen display, e.g. default data for the date or hospital department.

Usually, the basic settings are made by a service engineer when putting the system into service. However, you can modify the basic settings if you wish to.

Press the **Basic settings** button.

⇨ The corresponding controls appear in the dynamic control area.

19.3.1 Setting the system date and the system time

The system date and the system time must be entered once in order to enable the system to store and display the date and time of saving together with the image data.

Date format

The displayed date format may vary depending on the customer-specific settings (order of day, month and year; dot or slash as date separator). The set date format also applies to patient data displayed in the **Patient** (→ *Chapter 10.2 “Managing patient data” on page 147*) and **Archive** (→ *Chapter 10.3 “Image data management” on page 158*) operating modes. Throughout this document, the **DD.MM.YYYY** date format is used.

If you want to change the date format, contact your in-house service engineer.

To set the system date and system time, do the following:

1. Press the **Config** tab.

   ⇨ The **Configuration** operating mode is activated.

2. Press the **Basic settings** button.

   ⇨ The corresponding controls appear in the dynamic control area.

3. Press the **Time** tab.

   ⇨ The button is highlighted in yellow, and the cursor jumps to the **Time** input box.

4. Enter the system time in the **Time** input box using the format hh:mm:ss.

5. Press the **Date** button.

   ⇨ The button is highlighted in yellow, and the cursor jumps to the **Date** input box.

6. Enter the system date in the **Date** input box.

7. Press the **Apply** button.

19.3.2 Selecting the live screen

Under **Live image** you determine which screen will act as the live screen.

The live screen is the screen where the live fluoroscopic image is displayed. The other screen serves as reference screen, where the saved fluoroscopic images from the image memory are opened and displayed.

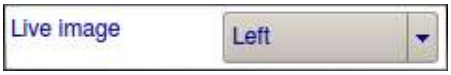


Fig. 121: Determining the live screen

- **Live image left:**
  The left screen is the live screen, and the right screen is the reference screen
- **Live image right:**
  The right screen is the live screen, and the left screen is the reference screen

To define the live screen, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.

2. Press the **Basic settings** button.
   ⇨ The corresponding controls appear in the dynamic control area.

3. Choose the **Live image left** or **Live image right** setting from the drop-down list box

4. Press the **Apply** button.

19.3.3 Entering the hospital data

In order to avoid having to type the same hospital data for each new patient folder you create, you can preset default data for the **Hospital**, **Department** and **Physician** input boxes (→ *Chapter 10.2.2 “Creating a new patient folder” on page 155*). This data appears automatically in the **Patient** operating mode.

To define default data for the Hospital, Department and Physician input boxes, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.

2. Press the **Basic settings** button.
   ⇨ The corresponding controls appear in the dynamic control area.

3. Press the **Hospital** button.
   ⇨ The button will appear in yellow, and the cursor jumps to the **Hospital** input box.
4. Enter the desired name in the **Hospital** input box.

5. Press the **Department** button and enter the desired name in the **Department** input box.

6. Press the **Physician** button and enter the desired name in the **Physician** input box.

7. Press the **Apply** button.

19.3.4 Discarding the basic settings

After having defined or modified the basic settings, these settings must be applied explicitly in order to become valid in the system. As long as the settings or changes have not been applied yet, you can discard them, so that the previous settings remain valid.

To discard the operation settings which have not been applied yet, do the following:

1. Press the **Cancel** button.

   or

2. Quit the **Configuration** operating mode without applying the settings.

19.4 Cine/DSA/Dose

Function

Under **Cine/DSA/Dose** you make various settings for the cine loop and the subtraction modes.

Press the **Cine/DSA/Dose** button.
⇨ The corresponding controls appear in the dynamic control area.

19.4.1 Cine loop settings

Under **Cine** you preset the frame rate (speed) and the mode that are used for acquiring cine loops. You can change these preset values during operation for each cine loop you acquire. During radiation time, all generated images are automatically saved.

Fig. 122: Cine loop settings

Frame rate function

To preset the frame rate for cine loops, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

2. Press the **Cine/DSA/Dose** button.
   ⇨ The corresponding controls appear in the dynamic control area.

3. Select the desired frame rate (number of frames per second) under **Rate** with the help of the arrow buttons.

4. Press the **Apply** button.
   ⇨ When you acquire a cine loop, the selected value is preset under **Frames/s** (→ *Chapter 12.3 “Opening a saved cine loop” on page 214*).

Autoplay function

Under **Autoplay** you activate or deactivate the **Autoplay** (automatic cine loop playback) function.

Fig. 123: Autoplay

- **Autoplay** activated:
  After you have acquired a cine loop, it is replayed automatically.
- **Autoplay** deactivated:
  You must start cine loop playback manually.

To activate the Autoplay function, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

2. Press the **Cine/DSA/Dose** button.
   ⇨ The corresponding controls appear in the dynamic control area.

3. Press the **Autoplay** option.
   ⇨ The check box is checkmarked.

4. Press the **Apply** button.
   ⇨ The **Autoplay** function is activated.

19.4.2 Showing or hiding the native image

Under **DSA native on** you determine whether the native image is displayed on the reference screen during generation of a DSA/MSA/RSA.

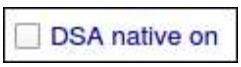
Fig. 124: Showing or hiding the DSA native image

- **DSA native on** activated:
  When you generate a DSA cine loop or MSA/RSA images, the native image is displayed on the reference screen.
- **DSA native on** deactivated:
  When you generate a DSA cine loop or MSA/RSA images, no native image is displayed.
  Before switching to the **Subtraction** operating mode, you may open a reference image on the reference screen, which remains displayed there during the entire subtraction process.

To display the DSA native image in the subtraction mode, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

2. Press the **Cine/DSA/Dose** button.
   ⇨ The corresponding controls appear in the dynamic control area.



3. Press the **DSA native on** option.

4. Press the **Apply** button.
   ⇨ When you generate a DSA cine loop or MSA/RSA images, the native image is displayed on the reference screen.

19.4.3 Threshold cumulative air kerma

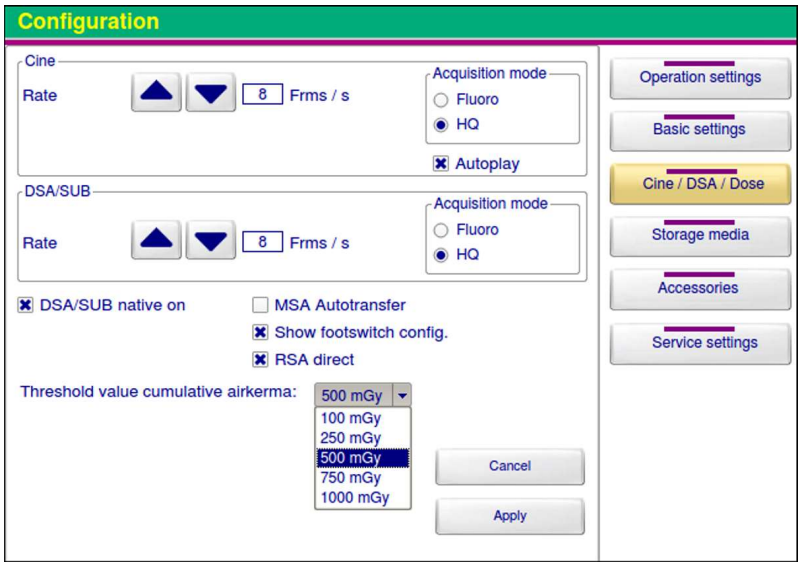


Fig. 125: Defining the threshold cumulative air kerma

Under **Threshold cumulative air kerma** you define a threshold value which might result in potential skin injuries.

If this threshold value is exceeded, the air kerma display changes, depending on the selected option.

- The font color of the **Air Kerma** display on the control panel changes from yellow to orange.
- The display of the cumulative air kerma on the live screen is highlighted by a white frame.

To define the threshold value for cumulative air kerma, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.

2. Press the **Cine/DSA/Dose** button.
   ⇨ The corresponding controls appear in the dynamic control area.

3. Press the **Down Arrow** button in the **Threshold cumulative air kerma** drop-down list box.

   ⇨ All available threshold values are displayed in the drop-down list box.

4. Select the desired value by pressing the respective item.

5. Press the **Apply** button.

   ⇨ The selected threshold value is now stored.

19.4.4 Show foot switch configuration

Under **Show foot switch configuration** you activate and deactivate the display of the foot switch configuration in the title bar and on the live screen.

Fig. 126: Show foot switch configuration

- **Show foot switch configuration** activated:
  The current foot switch configuration is displayed in the title bar.
- **Show foot switch configuration** deactivated:
  The current foot switch configuration is not displayed.

19.4.5 Discarding the cine loop and subtraction mode settings

After having defined or modified the settings on this tab, these settings must be applied explicitly in order to become valid in the system. As long as the settings or changes have not been applied yet, you can discard them, so that the previous settings remain valid.

To discard the operation settings which have not been applied yet, do the following:

1. Press the **Cancel** button.

   or

2. Quit the **Configuration** operating mode without applying the settings.

19.5 Storage media

Function

Under **Storage media** you can define the graphics formats used for saving images to different storage media. Furthermore, you can delete data from different external storage media.

Storage formats

Depending on your chosen system configuration, you can save one or more images in various storage formats to different storage media. Some formats with reduced resolution and color depth are also available.

Formats	File type	Resolution	Color depth	File size/ image
16 bit TIF	∗.tif	1024 × 1024	16 Bit	2 MB
DICOM	-	1024 × 1024	16 Bit	2 MB
Multimedia (cine loop)	∗.avi	512 × 512	8 Bit	depends on the length of the cine loop
DICOM	-	512 × 512	8 Bit	256 kB
JPEG	∗.jpg	512 × 512	8 Bit	256 kB

Table 27: Formats for storage media CD/DVD and USB

NOTE
Saving image data with a resolution of 512 × 512 pixels may lead to information loss. If possible, save image data with a resolution of 1024 × 1024 pixels.

19.5.1 Defining the USB storage medium format

Storage formats

For saving selected images to a USB storage medium in the **Archive** operating mode, the following storage formats are available:

- TIF with a color depth of 16 bit (for further use on a PC)
- JPEG with a resolution of 512 × 512 pixels and a color depth of 8 bit (for further use on a PC)
- DICOM (for further use on a DICOM network or viewing with a DICOM viewer in 1024 × 1024 pixels/16 bit original format)
- DICOM with a resolution of 512 × 512 pixels and a color depth of 8 bit (for further use on a DICOM network or viewing with a DICOM viewer)
- Multimedia (JPG and AVI files for viewing or replaying on the PC)

Under **USB format** you determine which of these storage formats is used for saving images to a USB stick. There is no possibility to set the desired storage format on the spot in the **Archive** operating mode when saving images.

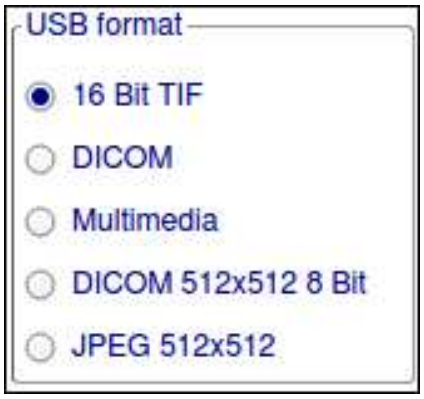


Fig. 127: USB format

To define the USB stick storage format, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.

2. Press the **Storage media** button.
3. Press the desired storage format option under **USB Format**.

4. Press the **Apply** button.

19.5.2 Defining the CD/DVD storage format

DVD writer

With the DVD writer, data can be written to both CDs and DVDs.

Storage formats

For writing selected images to CD/DVD in the **Archive** operating mode, the following storage formats are available:

- TIF with a color depth of 16 bit (for further use on a PC)
- JPEG with a resolution of 512 × 512 pixels and a color depth of 8 bit (for further use on a PC)
- DICOM (for further use on a DICOM network or viewing with a DICOM viewer in 1024 × 1024 pixels/16 bit original format)
- DICOM with a resolution of 512 × 512 pixels and a color depth of 8 bit (for further use on a DICOM network or viewing with a DICOM viewer)
- Multimedia (JPG and AVI files for viewing or replaying on the PC)

Under **CD/DVD format** you determine which of these storage formats is used for writing images to CD or DVD. There is no possibility to set the desired storage format on the spot in the **Archive** operating mode when saving images.

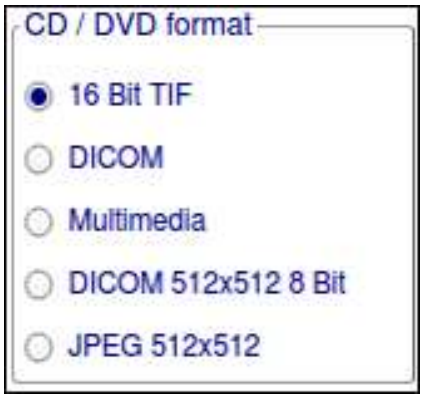


Fig. 128: CD/DVD format

To define the CD/DVD storage format, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.

2. Press the **Storage media** button.
3. Press the desired storage format option under **CD/DVD format**.

4. Press the **Apply** button.

19.5.3 Deleting data from storage media

To delete all images from a USB storage medium, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.

2. Press the **Storage media** button.

3. Press the **Erase USB media** button.
   ⇨ The following confirmation prompt is displayed:
   Do you really want to erase the USB Stick? yes / no

4. Confirm by pressing the **Yes** button.
   ⇨ All images and other files are deleted from the USB stick.

19.5.4 Selecting a DICOM storage server

You can select the desired DICOM storage server from the **Storage server** drop-down list box below the storage formats. You can access only the servers that have been enabled by your in-house service engineer.

Please contact your in-house service engineer if you want to access further servers.

To select a DICOM storage server, do the following:

1. Press the **Down Arrow** button.
   ⇨ All available servers are displayed in the drop-down list:

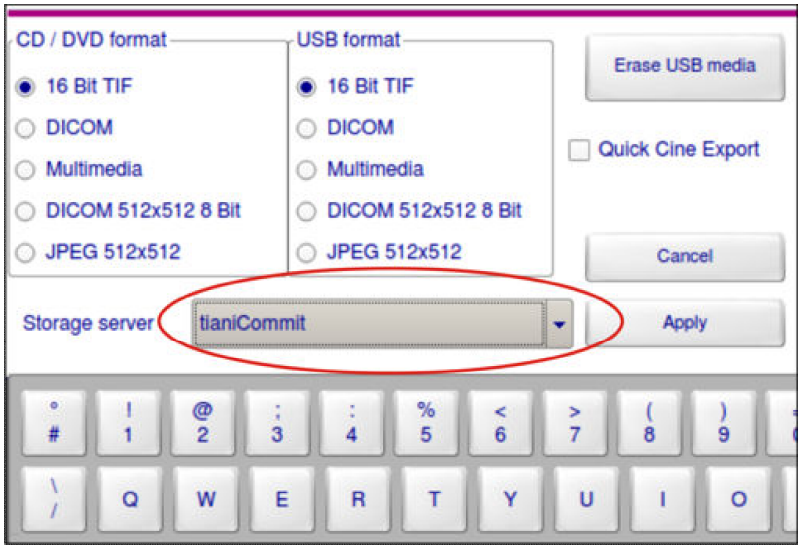


Fig. 129: Selecting a storage server

2. Select the desired item.

3. Press the **Apply** button.
   ⇨ The desired DICOM storage server is selected.

19.5.5 Quick Cine Export

Under **Quick Cine Export** you can activate or deactivate the **Quick Cine Export** function (export of a reduced number of images in order to save them on a storage medium).

Fig. 130: **Quick Cine Export** function

- **Quick Cine Export** active:
  When exporting cine loops in order to store them to USB, CD/DVD or the DICOM storage server, the frame rate is reduced to 4 fps.
- **Quick Cine Export** deactivated:
  When exporting cine loops in order to store them to USB, CD/DVD or the DICOM storage server, all acquired frames are transferred.

To activate the Quick Cine Export function, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated. The **Operation settings** controls appear.

2. Press the **Storage media** button.

3. Press the **Quick Cine Export** check box.
   ⇨ The check box is checkmarked.

4. Press the **Apply** button.
   ⇨ The **Quick Cine Export** function remains active until you switch off the system.

19.6 Accessories

Function

Under **Accessories** you set up various settings controlling the mode of operation for optional components.

To display the settings of optional components, do the following:

Press the **Accessories** button.
⇨ The corresponding controls appear in the dynamic control area.

19.6.1 Wireless Video

Under **Wireless Video** you activate or deactivate the **Wireless Video** function.

- **Wireless Video** activated:
  Activates the wireless transmission of fluoroscopic images from the system to external monitors.
- **Wireless Video** deactivated:
  Deactivates the wireless transmission of fluoroscopic images from the system to external monitors.
  For further information refer to the corresponding Addendum.

To activate the Wireless Video function, do the following:

1. Press the **Config** tab.
   The **Configuration** operating mode is activated.

2. Press the **Accessories** button.
   The corresponding controls appear in the dynamic control area.

3. Press the **Wireless Video** option.
   The check box is checkmarked.

4. Press the **Apply** button.
   The **Wireless Video** function is activated.

19.6.2 Registering the Wireless Dual Plus foot switch

Usually the Wireless Dual Plus foot switch is registered after power-up of the system. If the Wireless Dual Plus foot switch was not registered after power-up or if the registration failed, you can perform the registration any time during operation.

To register the foot switch in the system, do the following:

1. Press the **Config** tab.
   ⇨ The **Configuration** operating mode is activated.

2. Press the **Accessories** button.
   ⇨ The corresponding controls appear in the dynamic control area.

3. Press the **Register Wireless foot switch** button.
   ⇨ The registration is initiated. For further information refer to the *Addendum Wireless Dual Plus foot switch*.

20 Appendix A

20.1 Regular checks

As owner or operator perform the following checks at regular intervals:

Check	Interval	Remarks
Generator	Monthly	Inspect for physical damage.
Radiation key	Monthly	Must initiate radiation only if pressed permanently. Releasing them must terminate radiation after 1 s max. (depending on the LIH filter settings).
Radiation signals	Monthly	During the exposure, the yellow radiation indication lamp on the monitor housing must be illuminated.
Audible alarm during direct radiographic exposure	Monthly	In direct radiography mode, the audible alarm must sound during the whole exposure time.
Audible alarm in fluoroscopy mode after 5 minutes	Monthly	In fluoroscopy mode, the audible alarm must sound after 5 minutes. Switch off alarm by resetting the radiation time on the control panel. The total radiation time remains displayed.
Audible alarm during fluoroscopic exposure	Monthly	Must sound during fluoroscopic exposure if required by the owner's/operator's regulatory authority or by the owner/operator.
Information labels	Monthly	All warning and information labels must be properly attached and easily legible.
Power cable and power plug	Monthly	Must not show any signs of physical damage.
Mobile stand wheels	Whenever necessary	Clean when dirty.

Table 28: Regular checks

NOTE

For a detailed maintenance schedule, refer to the corresponding *Technical Manual*.

USA: Please also note the corresponding *Periodical Maintenance and Performance Inspection Manual*.

Technical information necessary to repair or upgrade the system will be made available by Ziehm Imaging GmbH to authorized and qualified personnel upon request.

20.2 Medical devices log book

As owner of the system you are committed to maintain a medical devices log book. Use it to record all operating times, checks and maintenance events are recorded.

20.3 Cleaning, disinfection, sterilization

NOTICE

NOTICE

Use the system only in a clean condition and comply with the hygiene schedule.

Preparation

Always switch off the system and disconnect it from the power supply before cleaning or disinfecting it.

20.3.1 Cleaning

For cleaning the system, use a slightly damp cloth and detergents based on the following ingredients:

- Alcohol, e.g. Incidin Liquid
- Hydrogen peroxide, e.g. Optim 33TB
- Quaternary ammonium compounds, e.g. terralin protect
- Aldehyde, e.g. Kohrsolin FF
- Alkylamine, e.g. Incidin PLUS
- Chlorine, e.g. Diversey Titan Chlor Plus

During application, adhere to the following manufacturer's instructions:

- Instructions for use
- Safety instructions
- Mixing ratio

NOTE

If the unit presents dirt stains that cannot be removed with the method described above, contact your in-house service engineer.

NOTICE

NOTICE

Take care that no liquids penetrate into the unit through sockets, plugs, ventilation holes or gaps (integrated external devices). Never apply spray cleaners directly onto the unit!

CAUTION

CAUTION

Never use any of the following substances, as they may corrode the surfaces (coated materials, plastics, etc.):

- Pure alcohol
- Solvents
- Products based on phenol
- Fluids like ether
- White spirit
- Turpentine
- Trichloroethylene
- Perchlorethylene
- Iodine

Never use sprays, since the liquid droplets may penetrate inside the unit, endangering safe system operation. Electronic components may be damaged, and explosive air/solvent vapor mixtures may develop.

If any liquids penetrate into the unit, switch off the system immediately and disconnect it from the power supply. For troubleshooting contact your service engineer.

Cleaning the display screens

Consider that the display screens are equipped with an antireflexion coating. Its physical integrity is required for consistent image quality.

Therefore, for cleaning always use a soft cotton cloth and dampen it with mild detergent mixed with water or specific TFT screen cleaner. Wipe the screens and adjacent painted surfaces dry with a soft cotton cloth immediately after cleaning.

NOTICE

NOTICE

Damage hazard for antifireflexion coating!

Inappropriate use of detergents and disinfectants may damage or destroy the antireflexion coating. This may affect image quality and implies that under certain conditions they do no longer comply with DIN 6868-157 (Germany only).

For this reason, do not use aggressive detergents or disinfectants different from our specification.

Don not use rough cleaning sponges and avoid rubbing intensively.

20.3.2 Disinfection

For disinfecting the system, use a slightly damp cloth and disinfectants based on the following ingredients:

- Alcohol, e.g. Incidin Liquid
- Hydrogen peroxide, e.g. Optim 33TB
- Quaternary ammonium compounds, e.g. terralin protect
- Aldehyde, e.g. Kohrsolin FF
- Alkylamine, e.g. Incidin PLUS
- Chlorine, e.g. Diversey Titan Chlor Plus

During application, adhere to the following manufacturer's instructions:

- Instructions for use
- Safety instructions
- Mixing ratio

NOTE

We recommend users in Canada to use the following disinfectant:

– Optim 33 TB (Canadian Drug Identification Number (DIN) 02282488)

CAUTION

CAUTION

Never use any of the following substances, as they may corrode the surfaces (coated materials, plastics, etc.):

– Pure alcohol
– Solvents
– Products based on phenol
– Fluids like ether
– White spirit
– Turpentine
– Trichloroethylene
– Perchlorethylene
– Iodine

Never use sprays, since the liquid droplets may penetrate inside the unit, endangering safe system operation. Electronic components may be damaged, and explosive air/solvent vapor mixtures may develop.

If any liquids penetrate into the unit, switch off the system immediately and disconnect it from the power supply. For troubleshooting contact your service engineer.

20.3.3 Sterilization

The system is not sterile and cannot be sterilized.

The disposable drapes (optional third party accessories) are sterile upon delivery.

CAUTION

The disposable drapes are not resterilizable.

Be sure to discard the disposable drapes properly after use!

For attaching the sterile disposable drapes to the C-arm, see the enclosed instructions.

20.4 Malfunctions

20.4.1 Types of malfunctions

The following types of malfunctions are detected and indicated:

- Alerts during power-up
- Errors during power-up
- Alerts during operation
- Errors during operation

20.4.1.1 Alerts during power-up

Alert messages are displayed in a message window on the control panel. An audible alarm sounds. If you get an alert message during system power-up, you can close the message window and continue to work with the system. However, the system will not be fully operational.

Press the **Yes** button in the message window.

⇨ The message window is closed.

20.4.1.2 Errors during power-up

Error messages are displayed in a message window on the control panel. An audible alarm sounds. Although you can close the message window, you cannot continue to work with the system.

Press the **Yes** button in the message window.

⇨ The message window is closed. In some cases, a new message window with another error message is displayed.

WARNING

WARNING

If an error message is displayed, the system is not ready for operation!

The error must be corrected by the Service department of the Ziehm Imaging GmbH.

Please communicate the error code number (E…) and the serial number of the system to the Service department of the Ziehm Imaging GmbH.

20.4.1.3 Alerts during operation

Alert messages are displayed in a message window on the control panel. An audible alarm sounds. If you get an alert message during system operation, radiation is not interrupted, and you can continue to initiate radiation. However, the system will not be fully operational.

Press the **Yes** button in the message window.

⇨ The message window is closed.

20.4.1.4 Errors during operation

Error messages are displayed in a message window on the control panel. An audible alarm sounds. Radiation is interrupted and you can no longer initiate any radiation.

Press the **Yes** button in the message window.

⇨ The message window is closed. In some cases, a new message window with another error message is displayed.

WARNING

If an error message is displayed, the system is not ready for operation!

The error must be corrected by the Service department of the Ziehm Imaging GmbH.

Please communicate the error code number (E…) and the serial number of the system to the Service department of the Ziehm Imaging GmbH.

WARNING

Please contact the Service department of the Ziehm Imaging GmbH also if a certain error occurs frequently.

20.4.2 List of errors, alerts and status messages

If an alert or status message is displayed, do the following:

Press the **Yes** button in the message window.

⇨ The message window is closed. You may continue to work. The system is not fully operational.

If any errors occur, contact the Service department of the Ziehm Imaging GmbH.

Code	Type	Description
1000	Error	Thin filament defective during power-up
1001	Error	Thick filament defective during power-up
1002	Error	No V-Sync at generator during power-up
1003	Error	Please wait, the operating temperature of at least 13 °C has not yet been reached.
1004	Alert	Please wait, the generator must cool down below 72 °C.
1005	Error	Please wait, the operating temperature of at least 13 °C has not yet been reached.
1006	Alert	Please wait, the generator must cool down below 72 °C.

Code	Type	Description
1007	Error	Wrong EEPROM checksum during power-up
1008	Error	Generator error
1009	Error	Generator error
1010	Error	HW signal X-ray active during power-up
1011	Error	CAN X-ray Enable active during power-up
1012	Error	Generator error
1013	Error	Generator error
1014	Error	Oil overtemperature switch active during power-up, call service
1015	Error	Wrong machine data version detected during power-up
1016	Error	Moisture sensor alarm during power-up, call service
1017	Error	Test of 'FAULT' signal failed
1018	Error	Debug switch is on
1056	Alert	X-ray Enable error
1057	Alert	Generator life monitoring missing
1058	Alert	Generator error
1059	Alert	X-ray break by external CAN module
1060	Alert	Signal / X-ray missing
1061	Alert	Generator error
1062	Alert	Nominal kV value greater max. kV value
1063	Alert	Nominal mA value greater max. mA value
1064	Alert	Nominal power value greater max. power value
1065	Alert	Nominal kV value less min. kV value
1066	Alert	CAN fault line active
1068	Alert	No V-Sync at generator during operation
1069	Alert	Temperature sensor 1 value beyond permissible range
1070	Alert	Temperature sensor 2 value beyond permissible range
1071	Alert	Signal / X-ray without radiation
1072	Alert	Oil overtemperature switch active during operation, call service
1073	Alert	Moisture sensor alarm during operation, call service
1075	Error	Test of rotating anode failed during operation
1076	Alert	Serial numbers of generator and mobile stand do not match.
1083	Alert	Generator error
1084	Alert	Generator error

Code	Type	Description
1085	Alert	Average power in Burst mode > 600 Watt
1086	Alert	mA value too high for thin filament
1087	Alert	Max. anode capacity reached in Burst mode
1088	Alert	Energy reserve of the boost CAPs too small
1095	Alert	Generator overheated, recovery time %d seconds[a]
1099	Alert	Generator error %d[a]
1100	Error	Hand switch 1 pressed during power-up
1101	Error	Hand switch 2 pressed during power-up
1102	Error	Foot switch 1 pressed during power-up
1103	Error	Foot switch 2 pressed during power-up
1104	Error	Foot switch 3 or fluoroscopy key on Solo support arm pressed during power-up
1105	Error	Foot switch 4 pressed during power-up
1106	Error	Foot switch 5 or right Solo hand switch pressed during power-up
1107	Error	Foot switch 6 pressed during power-up
1108	Error	Short-circuit in hand switch 1 during power-up
1109	Error	Short-circuit in hand switch 2 during power-up
1110	Error	Short-circuit in foot switch 1 during power-up
1111	Error	Short-circuit in foot switch 2 during power-up
1112	Error	Short-circuit in foot switch 3 or fluoroscopy key on Solo support arm
1113	Error	Short-circuit in foot switch 4 during power-up
1114	Error	Short-circuit in foot switch 5 or right Solo hand switch during power-up
1115	Error	Short-circuit in foot switch 6 during power-up
1116	Error	X-ray Enable active during power-up
1117	Error	Internal communication error during power-up
1118	Error	Wrong EEPROM checksum during power-up
1121	Alert	Hardware interface configuration for wireless footswitch defective
1122	Alert	Wireless foot switch module not available
1132	Error	Hand switch 9 pressed during power-up
1133	Error	Hand switch 10 pressed during power-up
1134	Error	Foot switch 11 pressed during power-up
1135	Error	Foot switch 12 pressed during power-up

Code	Type	Description
1136	Error	Foot switch 13 pressed during power-up
1137	Error	Foot switch 14 pressed during power-up
1138	Error	Foot switch 15 pressed during power-up
1139	Error	Foot switch 16 pressed during power-up
1140	Error	Short-circuit in switch 9 during power-up
1141	Error	Short-circuit in hand switch 10 during power-up
1142	Error	Short-circuit in switch 11 during power-up
1143	Error	Short-circuit in switch 12 during power-up
1144	Error	Short-circuit in foot switch 13 during power-up
1145	Error	Short-circuit in foot switch 14 during power-up
1146	Error	Short-circuit in foot switch 15 during power-up
1147	Error	Short-circuit in foot switch 16 during power-up
1164	Alert	Short-circuit in hand switch 1 without X-ray command
1165	Alert	Short-circuit in hand switch 2 without X-ray command
1166	Alert	Short-circuit in foot switch 1 without X-ray command
1167	Alert	Short-circuit in foot switch 2 without X-ray command
1168	Alert	Short-circuit in foot switch 3 or fluoroscopy key on Solo support arm without X-ray command
1169	Alert	Short-circuit in foot switch 4 without X-ray command
1170	Alert	Short-circuit in foot switch 5 or right Solo hand switch without X-ray command
1171	Alert	Short-circuit in foot switch 6 without X-ray command
1172	Alert	X-ray Enable without pressing hand switch or foot switch
1173	Alert	CAN fault line active
1174	Alert	Internal communication error during operation
1175	Alert	Image memory life-monitoring error
1176	Alert	Heat exchanger fan blocked
1177	Alert	Flow in cooling circuit too low!
1178	Error	No flow in cooling circuit!
1179	Error	Coolant pump inactive during X-ray start!
1180	Alert	Short-circuit in hand switch 9 without X-ray command
1181	Alert	Short-circuit in hand switch 10 without X-ray command
1182	Alert	Short-circuit in foot switch 11 without X-ray command
1183	Alert	Short-circuit in foot switch 12 without X-ray command

Code	Type	Description
1184	Alert	Short-circuit in foot switch 13 without X-ray command
1185	Alert	Short-circuit in foot switch 14 without X-ray command
1186	Alert	Short-circuit in foot switch 15 without X-ray command
1187	Alert	Short-circuit in foot switch 16 without X-ray command
1189	Alert	Wireless foot switch battery running low
1199	Error	Main interface fault %d[a]
1300	Alert	Main PPS power-up error
1301	Error	Main PPS overtemperature error during power-up
1302	Alert	Main PPS power-up error
1303	Alert	Main PPS power-up error
1304	Alert	Main PPS Wrong EEPROM checksum during power-up
1310	Alert	PPS power-up error
1311	Error	PPS overtemperature error during operation
1315	Alert	CAN fault line active during operation
1320	Alert	Slave1 PPS power-up error
1321	Error	Slave1 PPS overtemperature error during power-up
1322	Alert	Slave1 PPS power-up error
1323	Alert	Slave1 PPS power-up error
1324	Alert	Slave1 PPS Wrong EEPROM checksum during power-up
1330	Alert	Slave1 PPS power-up error
1331	Error	Slave1 PPS overtemperature error during operation
1335	Alert	Slave1 PPS CAN error line active during operation
1340	Alert	Slave2 PPS power-up error
1341	Error	Slave2 PPS overtemperature error during power-up
1342	Alert	Slave2 PPS power-up error
1343	Alert	Slave2 PPS power-up error
1344	Alert	Slave2 PPS Wrong EEPROM checksum during power-up
1350	Alert	Slave2 PPS power-up error
1351	Error	Slave2 PPS overtemperature error during operation
1355	Alert	Slave2 PPS CAN error line active during operation
1390	Error	Main PPS power-up error: %d[a]
1391	Error	Main PPS error: %d
1392	Error	Slave1 PPS power-up error: %d[a]

Code	Type	Description
1393	Error	Slave1 PPS error: %d
1394	Error	Slave2 PPS power-up error: %d
1395	Error	Slave2 PPS error: %d
1400	Alert	Servo rotation position error
1401	Alert	Servo rotation not connected
1402	Alert	Servo rotation not ready
1403	Alert	Servo iris position error
1404	Alert	Servo iris not connected
1405	Alert	Servo iris not ready
1406	Alert	Servo slot 1 position error
1407	Alert	Servo slot 1 not connected
1408	Alert	Servo slot 1 not ready
1409	Alert	Servo slot 2 position error
1410	Alert	Servo slot 2 not connected
1411	Alert	Servo slot 2 not ready
1412	Alert	Servo corner position error
1413	Alert	Servo corner not connected
1414	Alert	Servo corner not ready
1420	Alert	DAP meter incompatible or not available. Error %d[a]
1421	Alert	DAP meter error %d[a]
1448	Alert	Collimator startup error %d[a]
1449	Alert	Vision Track unknown error: %d[a]
1450	Alert	Servo position error
1451	Alert	Servo not connected
1452	Alert	Servo not ready
1499	Alert	II power supply unknown error: %d[a]
1628	Alert	Switch on printer
1629	Alert	Paper missing or not properly inserted or no video signal sent to the printer
1630	Alert	Printer 2 busy error
1649	Error	U578 error %d[a]
1700	Alert	kVmA table: kV not ascending
1701	Alert	kVmA table: Power not ascending

Code	Type	Description
1702	Alert	kVmA table not finished
1705	Alert	No external video signal
1708	Alert	Generator pulse error
1709	Alert	No V-Sync
1710	Alert	No interrupt
1711	Alert	No Communication PPC-generator
1712	Alert	Wrong mA value from generator
1713	Alert	X-ray not allowed
1714	Alert	Max. mA value cannot be read.
1716	Error	Image memory power-up error
1717	Error	Image memory power-up error
1718	Alert	Image memory power-up error
1719	Error	Gain adjustment not possible
1720	Error	Image memory error
1721	Error	Image memory error
1722	Error	V-Sync corrupt 30/25 Hz
1723	Error	Video standard unknown
1724	Alert	Image memory error
1725	Alert	M-Data unknown
1726	Alert	Collimator does not support DAP values.
1727	Alert	Flat-panel detector not supported by this version.
1728	Alert	Flat-panel detector communication error
1732	Error	Image memory power-up error
1733	Error	Image memory power-up error
1734	Error	Image memory power-up error
1735	Error	Image memory power-up error
1736	Error	Image memory power-up error
1737	Error	Image memory power-up error
1738	Error	No external video signal
1740	Alert	Hardware does not support grid regulation
1741	Alert	Hardware does not support motion detection
1742	Alert	Hardware does not support DAP calculation
1743	Alert	Hardware does not support automatic dose reduction

Code	Type	Description
1747	Error	Black level >= White level! Check connectors on command processor
1756	Error	FFC board not available
1757	Error	FFC not working properly
1759	Error	Generator version and PPC version not compatible
1760	Error	High resolution with pulse width 0 not allowed
1761	Error	Flat-panel detector video signal missing
1764	Error	Exposure value curve: kV entries missing
1765	Error	Exposure value curve: Segment transformation failed
1766	Error	Exposure value curve: Table invalid
1767	Error	Exposure value curve: Curve segment overlap insufficient
1768	Error	Exposure value curve: Internal error
1769	Error	Exposure value curve: 2 identical kv/mA entries in table
1770	Error	Exposure value curve: Inconstant EV increase
1771	Error	Exposure value curve: kV value lower than allowed minimum value
1772	Error	Exposure value curve: Table size exceeded
1779	Error	Radiation without valid kV/mA curve
1790	Alert	PPC CAN exception error: %d[a]
1800	Alert	Radiation indication lamp defective during power-up
1801	Alert	Wrong EEPROM checksum during power-up
1802	Alert	Image memory power-up error
1803	Alert	Image memory power-up error
1804	Alert	No communication with left flatscreen
1805	Alert	No communication with right flatscreen
1806	Alert	Image memory power-up error
1807	Alert	Image memory power-up error
1808	Alert	Switch on printer
1849	Alert	ELWMS unknown power up error: %d[a]
1850	Alert	Radiation indication lamp defective during operation
1865	Alert	U578 execution failed
1899	Alert	U578 error: %d[a]
1900	Alert	Video processor firmware version too low

Code	Type	Description
1910	Alert	Kernel module version too low
1911	Alert	Framegrabber firmware version too low
2902	Alert	C Axis error
2903	Alert	Y Axis error
2904	Alert	Z Axis error
2906	Alert	CAN fault line active
2915	Alert	Internal error
2916	Alert	Internal CAN error
2917	Alert	Internal CAN error
2918	Alert	Internal error
2919	Alert	Internal error
2920	Alert	Internal error
2921	Alert	Internal error
2922	Alert	Y Axis ISO speed error
2923	Alert	Z Axis ISO speed error
2924	Alert	ISO error
2925	Alert	Internal error Distance Control
2926	Alert	Internal error
2927	Alert	Internal error Distance Control
2928	Alert	Internal error Distance Control
2929	Alert	Internal error Distance Control
2930	Alert	Internal error Distance Control
2931	Alert	Internal error
2932	Alert	Emergency stop error
2934	Alert	Internal error Distance Control
2936	Alert	Navigation system error
2951	Alert	Release all brakes in order to use ISO mode
2953	Alert	Motion restricted. Check brake locks
2954	Alert	Gear error
2957	Alert	Removable anti-scatter grid missing. Image quality may be affected.
2964	Alert	Kinematic module error: %d[a]
3004	Alert	Axis %d hardware overcurrent[b]

Code	Type	Description
3005	Alert	Axis %d software overcurrent[b]
3006	Alert	Axis %d contouring error[b]
3008	Alert	Axis %d not enabled[b]
3010	Alert	Axis %d solenoid current error[b]
3011	Alert	Axis %d engine temperature error[b]
3012	Alert	Axis %d hardware voltage too low[b]
3013	Alert	Axis %d software voltage too low[b]
3014	Alert	Axis %d watchdog error[b]
3015	Alert	Axis %d tacho error[b]
3016	Alert	Axis %d encoder error[b]
3017	Alert	Axis %d encoder error[b]
3018	Alert	Axis %d encoder range error[b]
3020	Alert	Axis %d port extender error[b]
3023	Alert	Axis %d engine error[b]
3024	Alert	Axis %d engine error[b]
3026	Alert	Axis %d in autarkic mode[b]
12000	Alert	Function assigned to X-ray switch (%d), ignored[a]
12001	Alert	Function assigned to X-ray switch (%d), ignored[a]
12002	Alert	XRaySwitch / FunctionSwitch mismatch in mappings of machine-data.ini
12003	Alert	CAN Modules missing: %d[a]
12004	Alert	Hard disk full. Image cannot be stored.
12006	Alert	machinedata.ini in main interface missing
12007	Alert	machinedata.ini written to main interface
12009	Error	Generator machine data inconsistent, call service
12025	Message	Operation mode changed, initiate radiation
12028	Error	3D software not responding. Restart system.
12034	Error	License not available
12041	Alert	Flat-panel detector communication error
12042	Message	Signature check completed
12045	Alert	Radiation locked by key switch
12050	Alert	Option stick defective

Code	Type	Description
12051	Alert	Main interface defective (serial number)
12052	Alert	Serial numbers of mobile stand and monitor cart do not match.
12053	Alert	Cannot create dose report: Not current patient.
12054	Alert	Cannot create dose report: No dose data available.
12055	Alert	Failed to load file %d[a].
12057	Error	Machinedata.ini does not match capture device frequency
12058	Alert	Internal warning
12059	Error	Internal error
12060	Error	CAN Manager transport error
12061	Error	CAN Manager AckBusOff
12062	Error	CAN Manager AckNoTxd
12063	Alert	Thin filament defective. System switches to restricted mode with thick filament.
12070	Error	CAN Master failed
12071	Error	CAN module CameraIrisProxy failed
12072	Alert	CAN module Collimator failed
12073	Error	CAN module Generator failed
12074	Error	CAN module MainInterface failed
12075	Error	CAN module Regulation failed
12076	Error	CAN module MainPrePowerSupply failed
12077	Error	CAN module SlavePrePowerSupply 1 failed
12078	Error	CAN module SlavePrePowerSupply 2 failed
12079	Error	CAN module ELWMS failed
12080	Error	CAN module Kinematics failed
12081	Error	Unknown error in CAN Master. Error %d[a]
12082	Error	Software update script not found
12083	Error	Initializing software update failed[a].
12084	Error	Software update failed with error %d[a].
12098	Alert	Cannot delete file '%d'. Access denied[c].
12100	Alert	No paper available.
12101	Alert	Printer not ready.
12102	Alert	Printer not ready.

Code	Type	Description
12103	Alert	Printer not ready.
12104	Alert	Cover open.

Table 29: List of errors and alerts

a. %d is a placeholder for a number

b. %d is a placeholder for one of the letters A, Y, C or Z for axis designation

c. %d is a placeholder for a filename

20.5 Circuit breaker

The system is equipped with a circuit breaker on the mobile stand.

- 2 × 15 A at 220 V_{AC}, 230 V_{AC}, 240 V_{AC}
- 2 × 20 A at 100 V_{AC}, 120 V_{AC}, 200 V_{AC}

ON-OFF-circuit breaker with rocker switch

If the circuit breaker on the mobile stand has triggered (rocker switch in **OFF** position, circuit breaker is not illuminated), you can switch it on again.

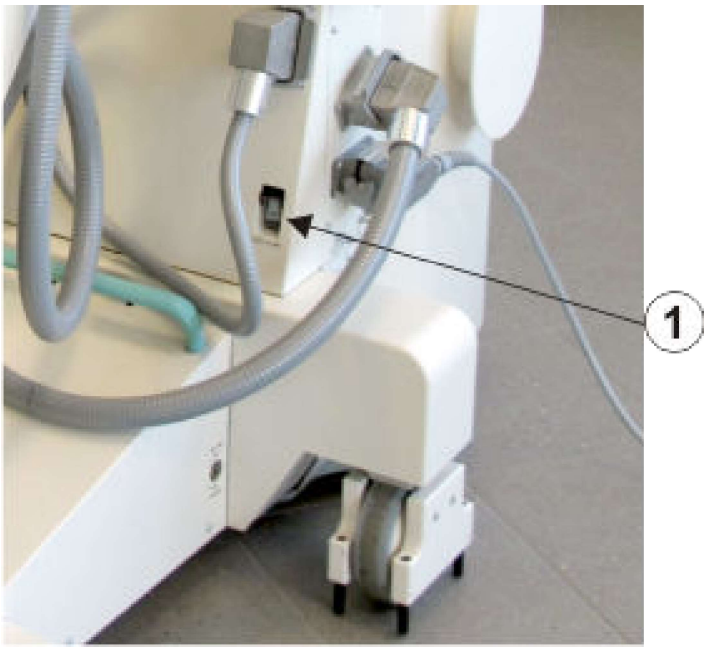


Fig. 131: Mobile stand with circuit breaker (1)

To switch on the circuit breaker again, do the following:

Press rocker switch to **ON** position.

⇨ The circuit breaker is illuminated.

20.6 Type labels

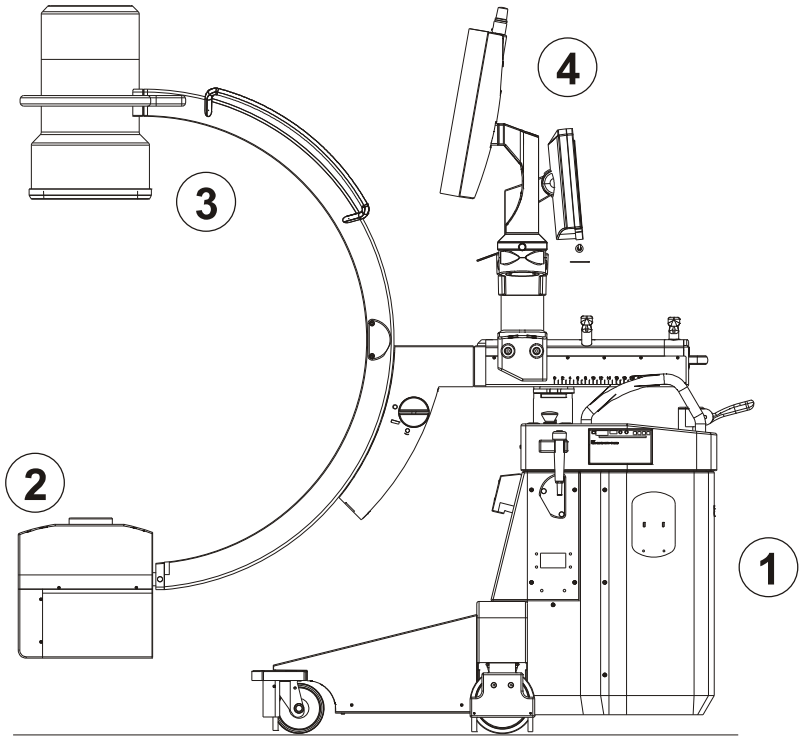


Fig. 132: Type labels on the mobile stand Ziehm Solo

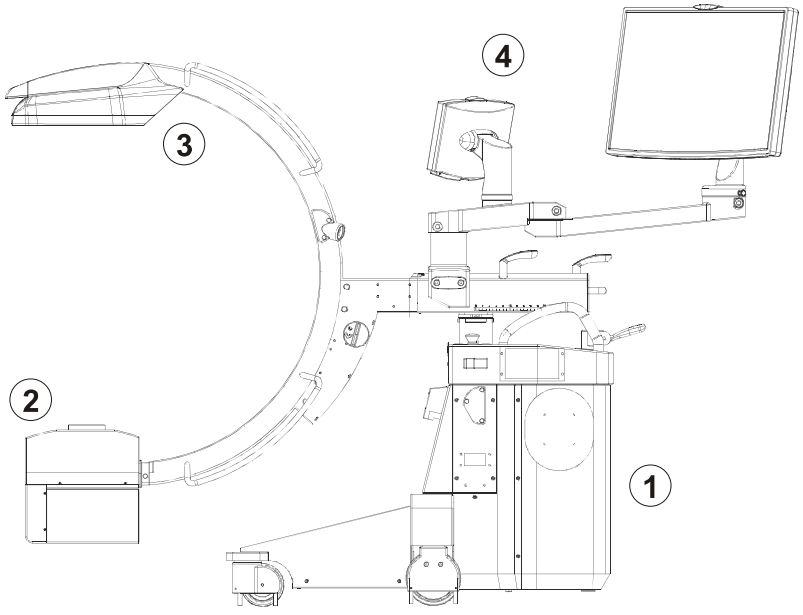
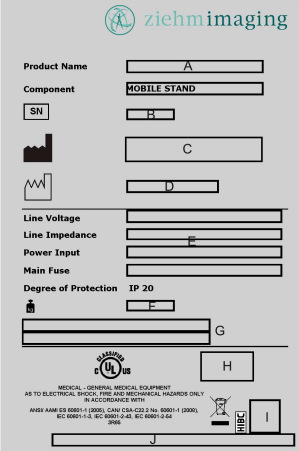
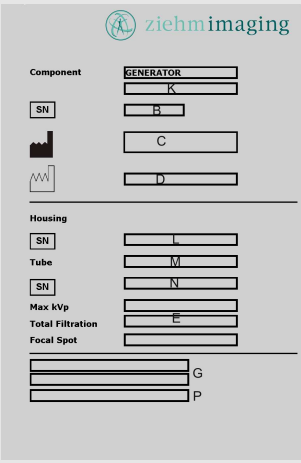
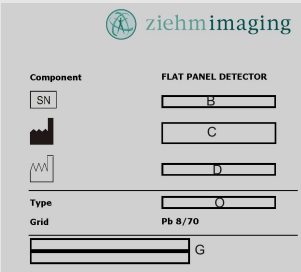
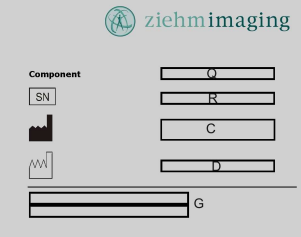
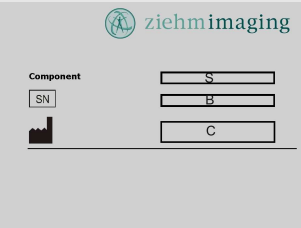
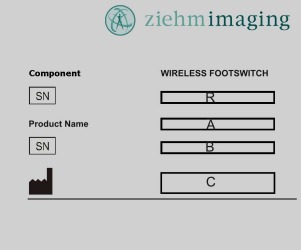
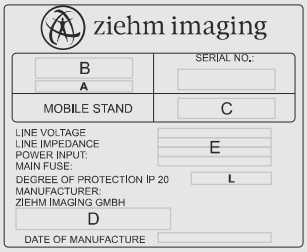
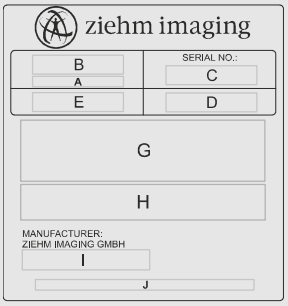


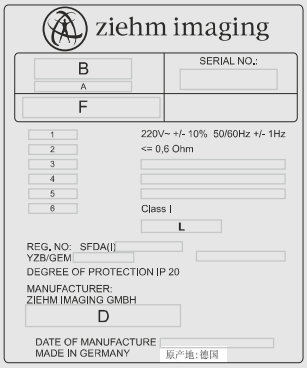
Fig. 133: Type labels on the mobile stand Ziehm Solo FD

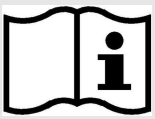
The labels shown in the table are examples and serve illustrative purposes only. Size and color may differ from reality.

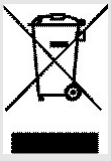
Pos.	Type labels	Comments
1		**A**: Device type **B**: Serial number **C**: Address of manufacturer **D**: Manufacturing date **E**: Technical details **F**: Weight in kilograms (if required by law) **G**: Statement of compliance with CDRH regulations (USA / Canada only) **H**: CE mark (if applicable) **I**: UDI data matrix **J**: UDI code
2		**K**: Generator type **L**: Serial number generator housing **M**: Generic term for generator tube **N**: Serial number generator tube
3		**O**: Flat-panel detector type **P**: Statement of compliance with the relevant national edition of IEC 60601-2-54

Pos.	Type labels	Comments
2, 3, 4		**Q**: System component, text values: CONTROL PANEL X-RAY CONTROL COLLIMATOR INTEGRATED LASER LASER AIMING DEVICE **R**: Serial number component **S**: Flatscreen type
1		
1		
1		**A**: Device type **B**: Model **C**: Serial number **D**: CE mark (if applicable) **H**: Statement of compliance with CDRH regulations (USA / Canada only) **I**: Address of manufacturer **J**: Manufacturing details **L**: Weight in kilograms (if required by law)

Pos.	Type labels	Comments
2		**A**: Device type **B**: Model **C**: Serial number **D**: CE mark (if applicable)
3		**E**: Generic term for GENERATOR **F**: Generic term for IMAGE RECEPTOR **G**: Technical details **H**: Statement of compliance with CDRH regulations (USA / Canada only)
2, 3, 4		**I**: Address of manufacturer **J:** Manufacturing details **K**: System component, text values: CONTROL PANEL X-RAY CONTROL (USA/Canada only) VISION TRACK BEAM LIMITING (USA/Canada only) INTEGRATED LASER (USA/Canada only) LASER AIMING DEVICE (USA/Canada only)

Pos.	Type labels	Comments
1		China only **A**: Device type **B**: Model **D**: Address of manufacturer **E**: For details, see technical data **F:** Chinese translation of item **A** Chinese translation of: LINE VOLTAGE (1) LINE IMPEDANCE (2) POWER INPUT (3) MAINS FUSE (4) OPERATING MODE (5) PROTECTION CLASS (6) **L**: Weight in kilograms (if required by law)
3, 4		CAUTION Laser radiation!
3, 4		CAUTION Radiation! Country-specific versions/translations similar to illustration.
1		No access! Radiation-controlled area has a radius of 4 m! Country-specific versions/translations similar to illustration.

Pos.	Type labels	Comments
3, 4		CAUTION Laser radiation! Country-specific versions/translations similar to illustration. **A**: Max. power output in mW *see Technical Data* **B**: Year of issue of relevant national regulation of the country of installation
3, 4		Systems with laser positioning device only Country-specific versions/translations similar to illustration. (according to relevant national regulation of the country of installation) **A**: Max. power output in mW *see Technical Data* **B**: Year of issue of relevant national regulation of the country of installation
3, 4		Systems with laser positioning device only (USA/Canada only)
3, 4		Systems with laser positioning device only (USA/Canada only)
3, 4		Systems with laser positioning device only (USA/Canada only)
		Do not expose foot switch to magnetic fields
1, 2		Follow instructions for use (i.e. operating instructions)!
2		Observe instructions for use (i.e. operating instructions)!

Pos.	Type labels	Comments
2		Equipotential grounding
2		Spare GND connection
2		Protection Class I, Type B
		Weight in kilograms (if required by law)
		Manufacturing date
		Manufacturer address
		Serial number
		Separate collection acc. to WEEE directive
		Do not top load

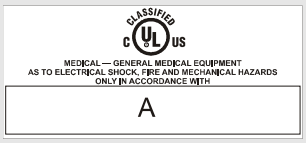
Pos.	Type labels	Comments
4		For Canada only
3	**WARNING:** THIS X-RAY UNIT MAY BE DANGEROUS TO PATIENT AND OPERATOR UNLESS SAFE EXPOSURE FACTORS, OPERATING INSTRUCTIONS AND MAINTENANCE SCHEDULES ARE OBSERVED.	USA/Canada only Country-specific versions/translations similar to illustration.
3	**DANGER:** EXPLOSION HAZARD! DO NOT USE IN PRESENCE OF FLAMMABLE ANESTHETICS.	USA/Canada only Country-specific versions/translations similar to illustration.
1		USA/Canada only **A**: List of relevant standards

Table 30: Type labels

20.7 Radiation window opening

Ziehm Solo

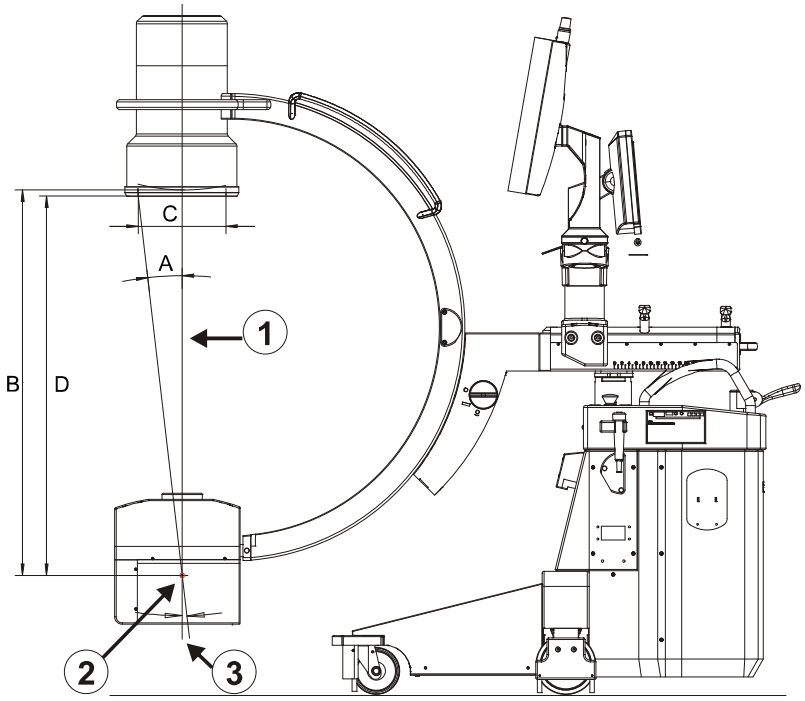


Fig. 134: Radiation window opening

1 Reference axis
2 Focal spot (red dot)
3 Anode angle
A Target angle
B Source/imaging plane distance
C Maximum radiation image area
D Source/image receptor distance

For corresponding values referred to by this illustration and following illustrations refer to the technical data section.

Ziehm Solo FD

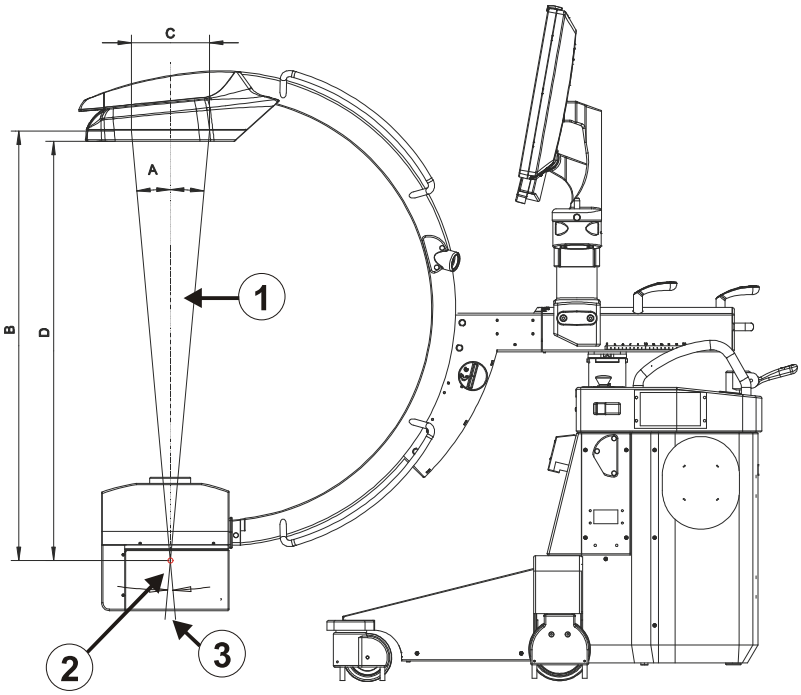


Fig. 135: Radiation window opening

1 Reference axis
2 Focal spot (red dot)
3 Anode angle
A Target angle
B Source/imaging plane distance
C Maximum radiation image area
D Source/image receptor distance

For corresponding values referred to by this illustration refer to the technical data section.

20.8 Heat capacity

Heating characteristic at 110 kV / 3.2 mA

(800,000 J heat capacity, 50 W continuous heat dissipation)

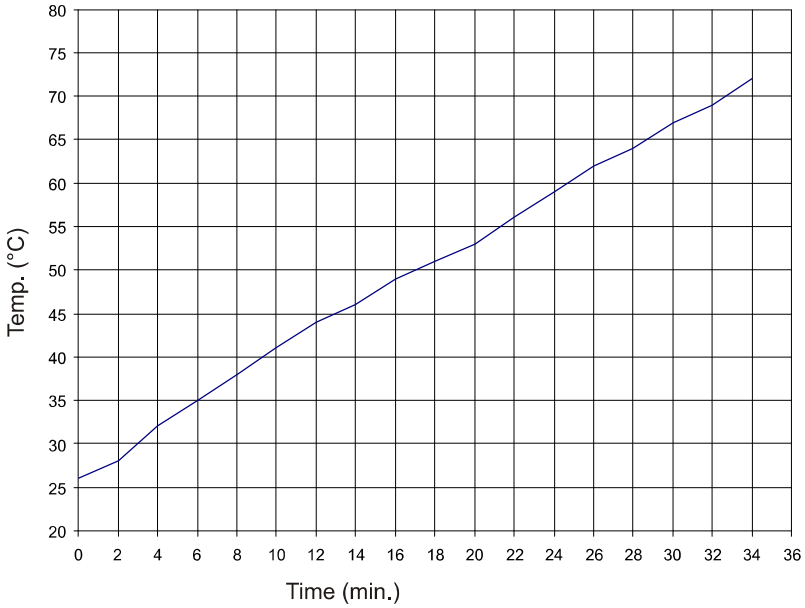


Fig. 136: Heating characteristic (Model D-064R)

Cooling characteristic

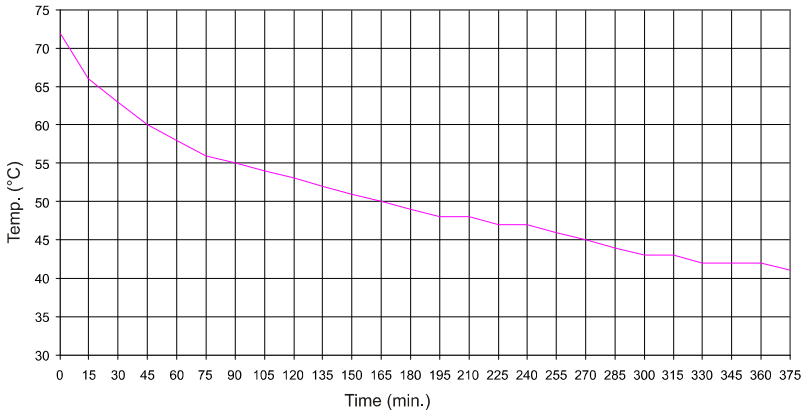


Fig. 137: Cooling characteristic (Model D-064R)

20.9 Scattered radiation in the significant zone of occupancy

20.9.1 Ziehm Solo

Distribution of scattered radiation in the significant zone of occupancy of the mobile stand

Measurement conditions in accordance with EN 60601-1-3

Exposure conditions: Automatic control, 76 kV / 5.9 mA / 448 W

Rectangular water phantom 25 cm × 25 cm × 15 cm + 1.5 mm Cu

Measuring instrument: Radcal 9015

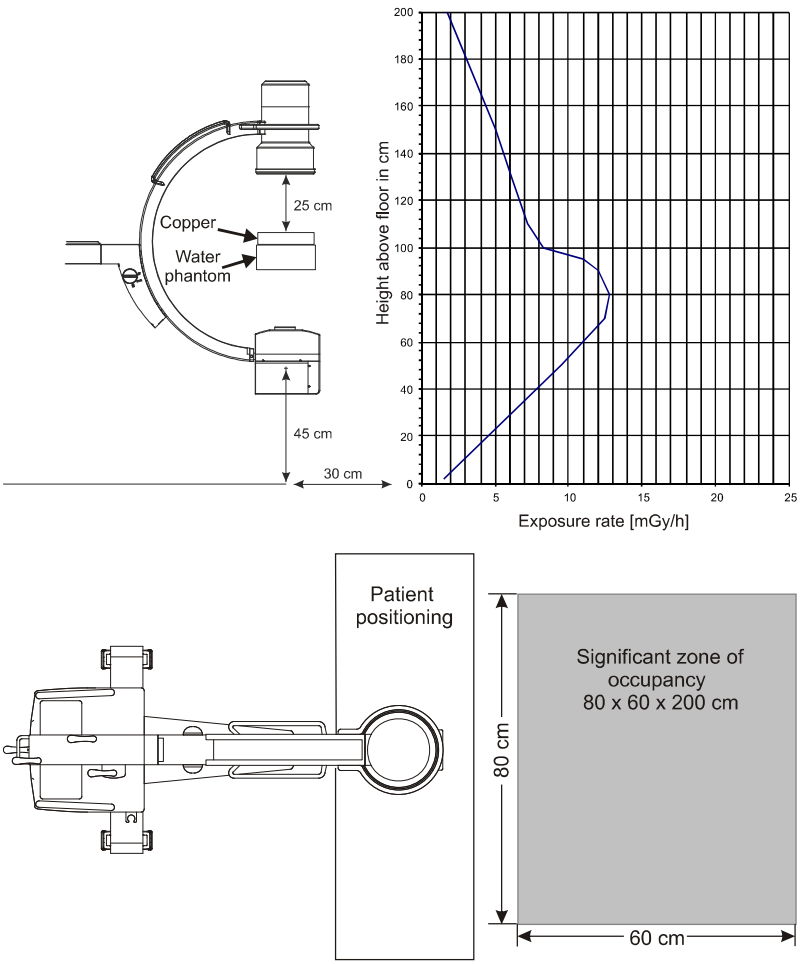


Fig. 138: Scattered radiation of the Ziehm Solo

20.9.2 Ziehm Solo FD

Distribution of scattered radiation in the significant zone of occupancy of the mobile stand

Measurement conditions in accordance with EN 60601-1-3

Exposure conditions: Automatic control, 120 kV / 8.7 mA / 600 W / 23 ms pulse width / 25 pulses/s

Rectangular water phantom 25 cm × 25 cm × 15 cm + 1.5 mm Cu

Measuring instrument: Radcal 9015

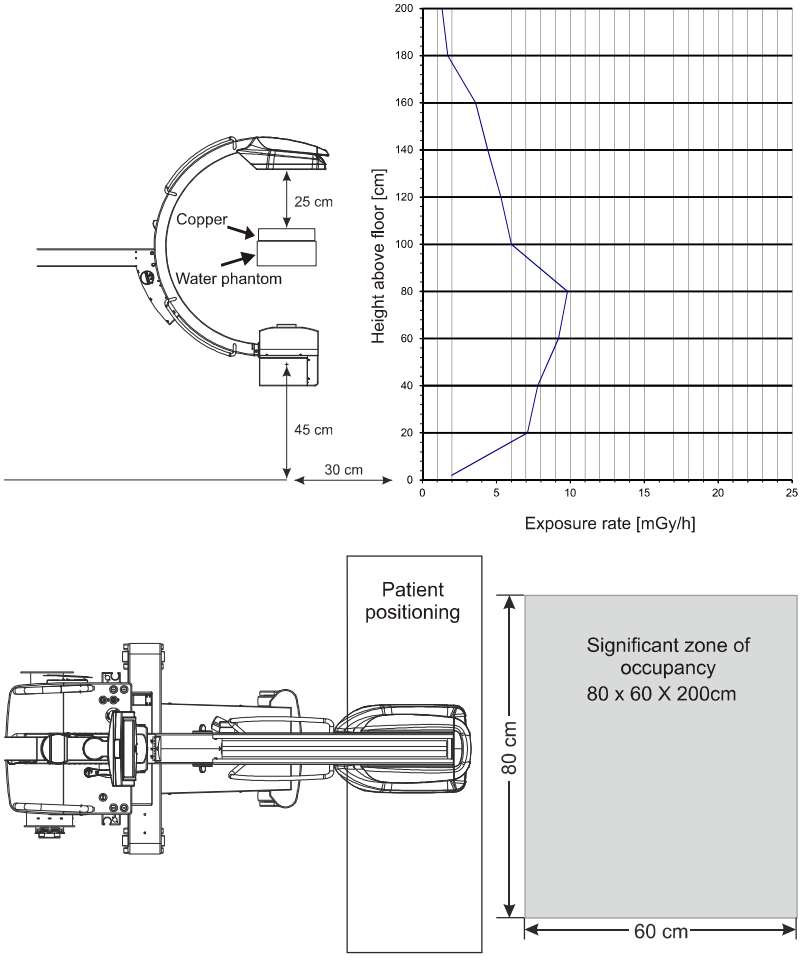


Fig. 139: Scattered radiation of the Ziehm Solo FD

20.10 Dimensions

The specified dimensions are nominal values (in millimeters) and are subject to general tolerances according to EN ISO 13920 D.

Ziehm Solo mobile stand

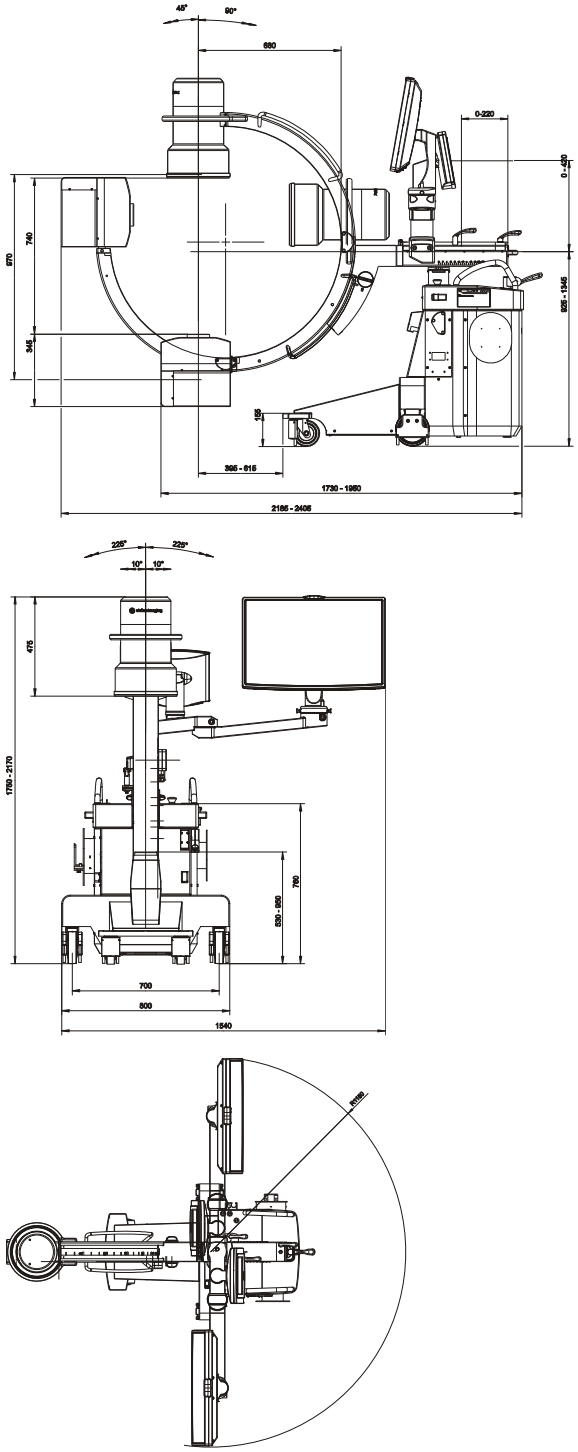


Fig. 140: Dimensions of Ziehm Solo mobile stand

Ziehm Solo FD mobile stand

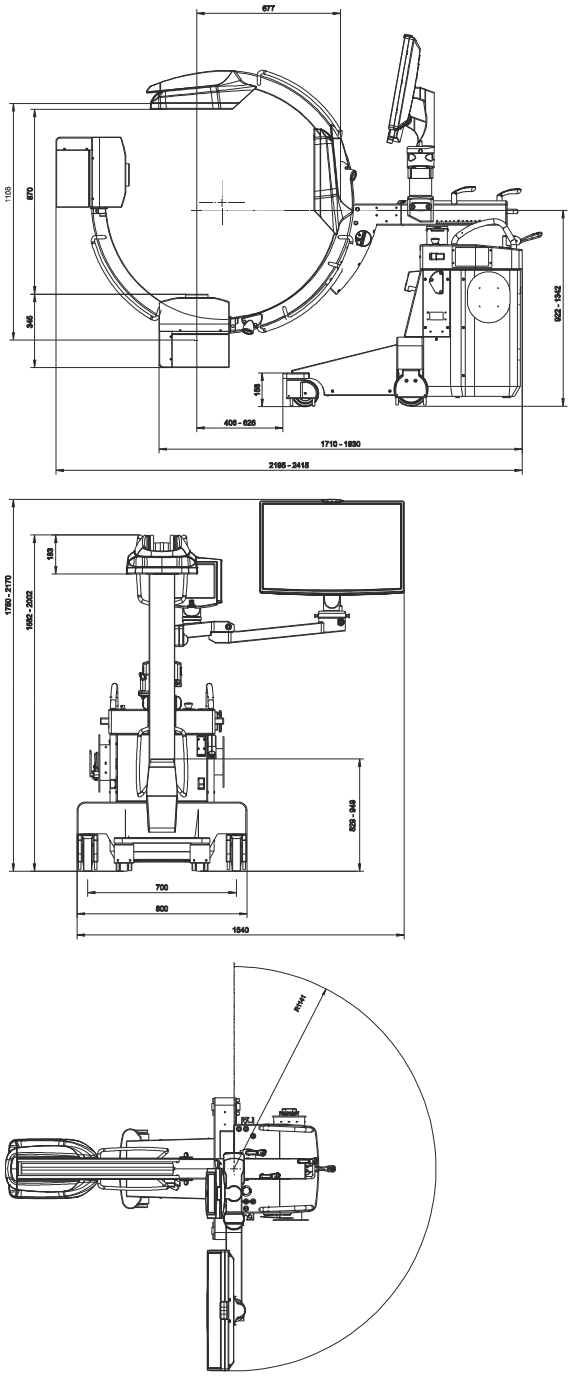


Fig. 141: Dimensions of Ziehm Solo FD mobile stand

Ziehm Solo mobile stand without monitor support arm

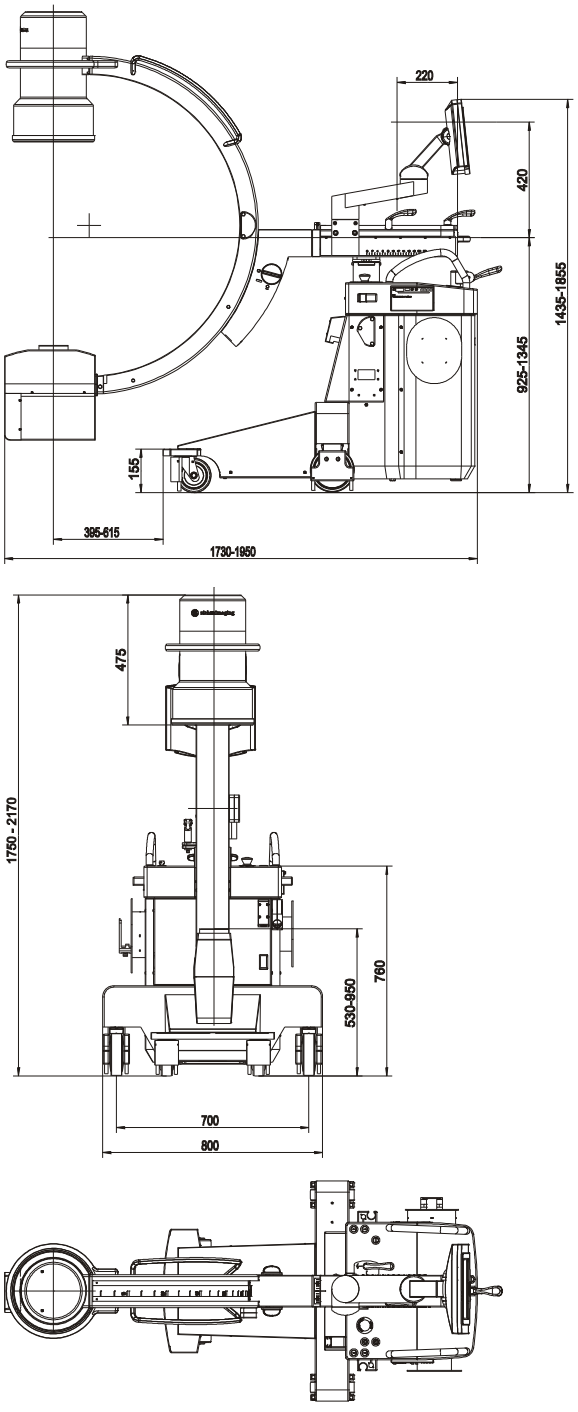


Fig. 142: Dimensions of mobile stand without monitor support arm

Ziehm Solo Option Portable mobile stand

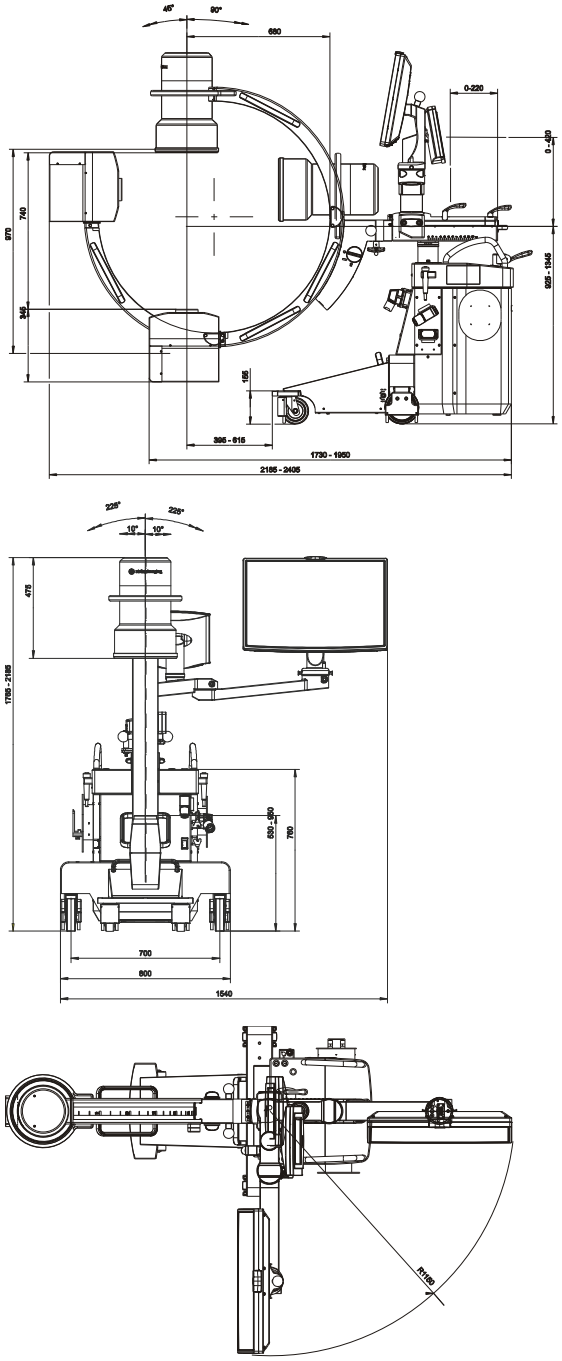


Fig. 143: Dimensions of Ziehm Solo Option Portable mobile stand

Ziehm Solo Option Portable M2 mobile stand

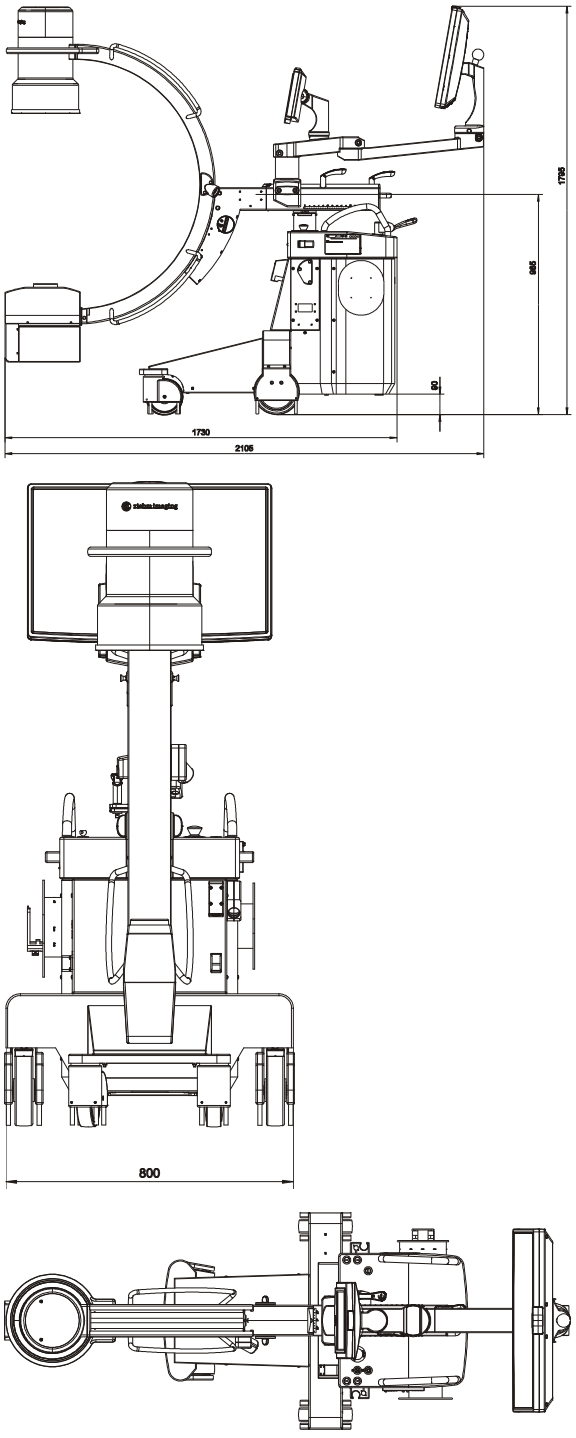


Fig. 144: Dimensions of Ziehm Solo Option Portable M2 mobile stand

Ziehm Solo Option Portable mobile stand with transport wheels

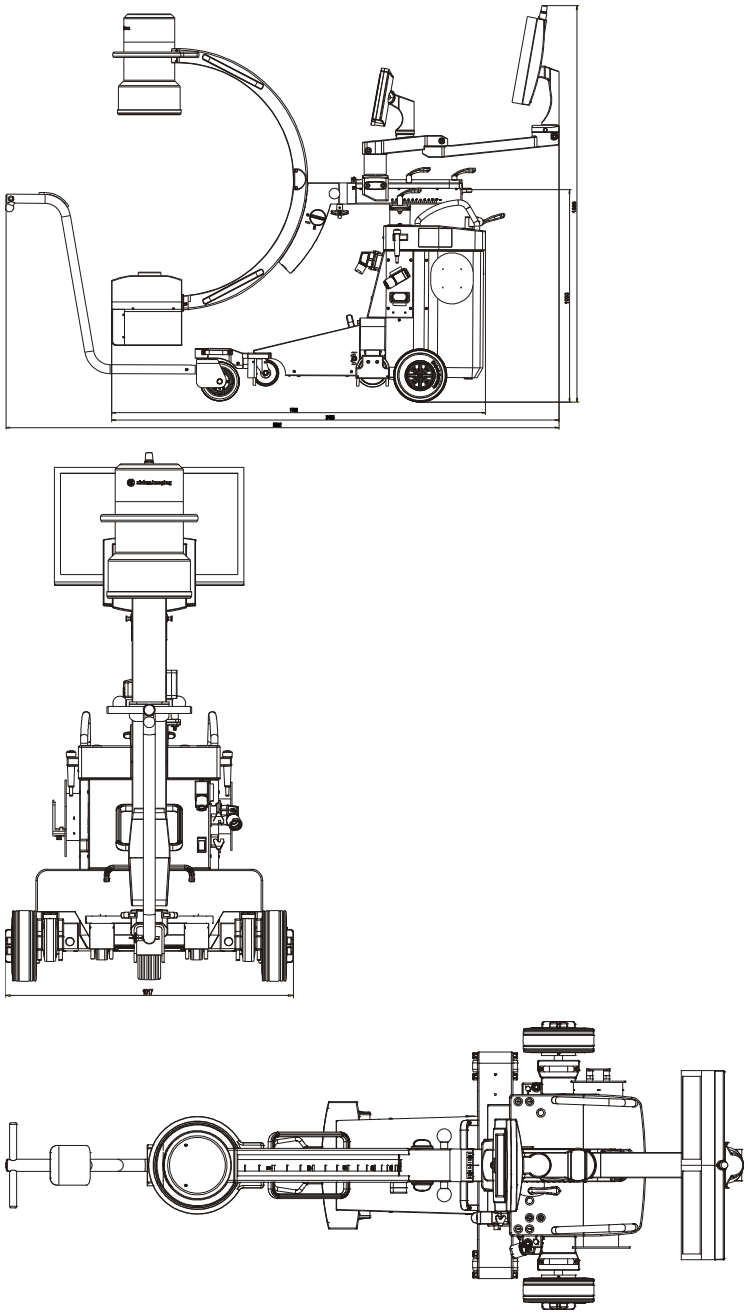


Fig. 145: Dimensions of Ziehm Solo Option Portable mobile stand with transport wheels

Ziehm Solo Option Portable M2 mobile stand with transport wheels

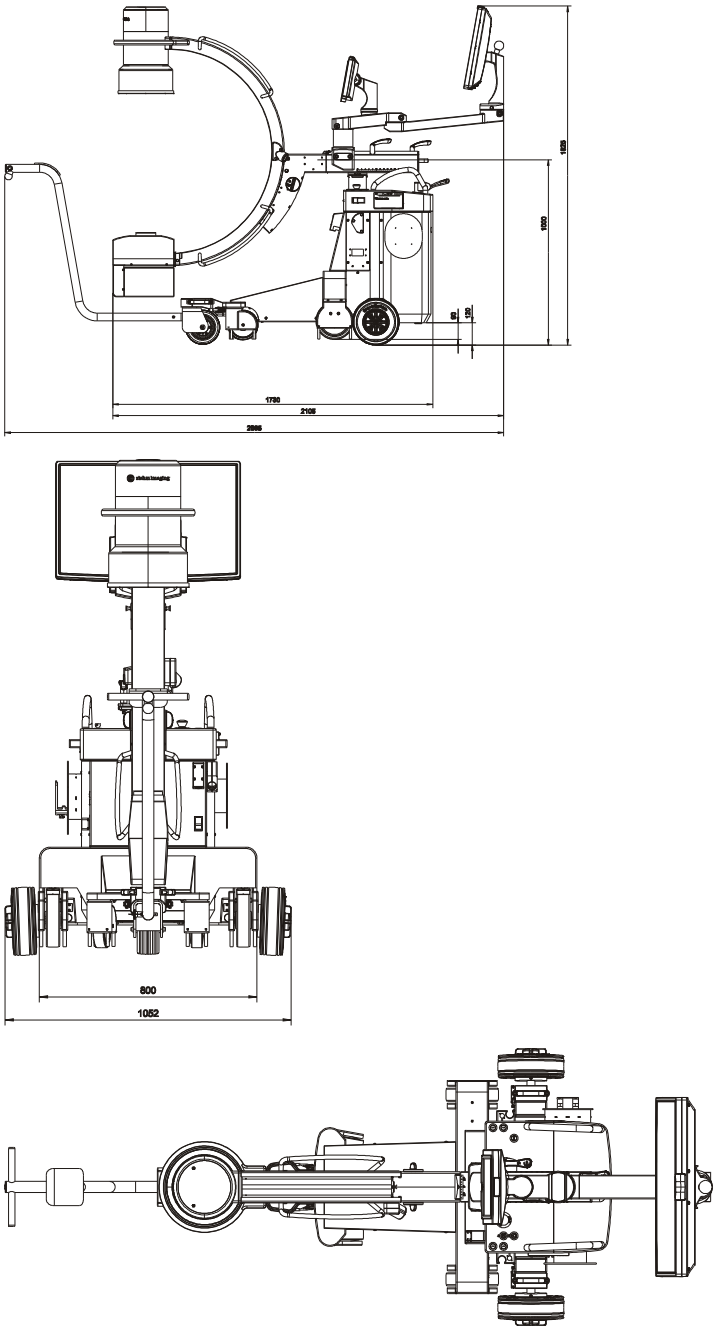


Fig. 146: Dimensions of Ziehm Solo Option Portable M2 mobile stand with transport wheels

Ziehm Solo Option Portable mobile stand without monitor support arm

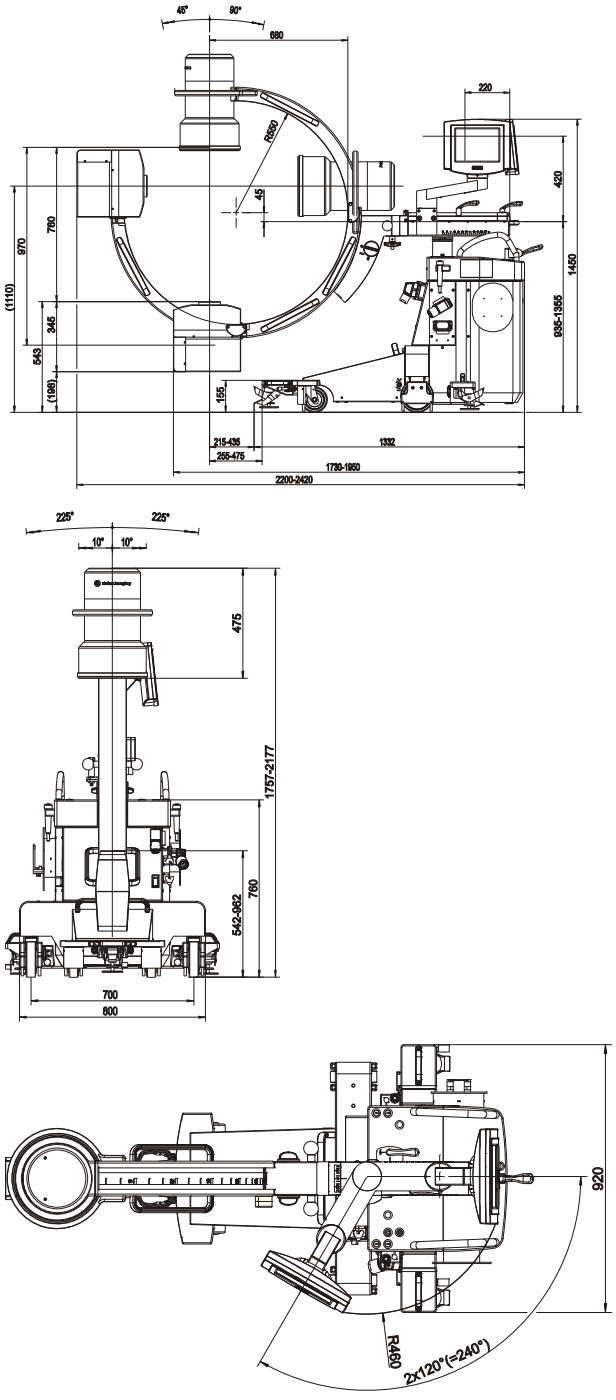


Fig. 147: Dimensions of Ziehm Solo Option Portable mobile stand without monitor support arm

20.11 Technical Data

20.11.1 General technical data

20.11.1.1 Image intensifier

Tube	
Scintillator	Cesium iodide (CsI)
Electronic magnification levels	23 / 15 / 10 cm
Anti-scatter grid	Pb 8/40

Table 31: Ziehm Solo

20.11.1.2 Flat-panel detector

Detector	
Scintillator	Cesium iodide (CsI)
Active screen area	20.5 cm × 20.5 cm
Resolution (FOV)	2048 × 2048 pixels (20.5 cm × 20.5 cm)
Magnification 1	1536 × 1536 pixels (15.4 cm × 15.4 cm)
Magnification 2	1024 × 1024 pixels (10.2 cm × 10.2 cm)
Anti-scatter grid	Pb 8/70 Ratio 8:1 focused

Table 32: Ziehm Solo FD

20.11.1.3 Monitors

19" DUO flatscreen	
Screen size (diagonal)	483 mm (19")
Resolution	1280 × 1024 pixels

27" High-Brightness Full HD flatscreen	
Screen size (diagonal)	686 mm (27")
Resolution	1920 × 1080 pixels

20.11.1.4 Video output

Video standard output
SDI, 60 Hz refresh rate
CCIR, 50 Hz refresh rate, like PAL, no color
EIA 343, 60 Hz refresh rate, like NTSC, no color

20.11.1.5 Environmental conditions

During storage/transport	
Temperature	-5°C to +55°C
Relative air humidity	20% – 70%
Pressure	790 mbar – 1060 mbar
Max.vibration	10 Hz – 150 Hz
Shock / vibration	25 g at 6 ms / 0.35 mm peak

During operation	
Temperature	+13 °C to +35 °C
Relative air humidity	20% – 70% (non-condensing)
Pressure	790 mbar – 1060 mbar

NOTICE

NOTICE

Temperatures of 40°C or higher and relative air humidity of 60% or higher may cause stains on the printer's heat-sensitive paper.

20.11.1.6 Dimensions of C-arm

Source/image receptor distance	
Ziehm Solo	950 mm ± 10 mm
Ziehm Solo FD	1086 mm ± 10 mm

Source/imaging plane distance	
Ziehm Solo	970 mm ± 10 mm
Ziehm Solo FD	1108 mm ± 10 mm

C-arm depth	
	680 mm ± 10 mm

Max. radiation image area	
Ziehm Solo	Diameter of 230 mm
Ziehm Solo FD	205 mm × 205 mm

Vertical free space (generator/image intensifier)	
Ziehm Solo	756 mm ± 10 mm

Vertical free space with laser positioning device on the generator	
Ziehm Solo	740 mm ± 10 mm

Vertical free space (generator/flat-panel detector)	
Ziehm Solo FD	870 mm ± 10 mm

Directions of movement	
Orbital rotation	
Ziehm Solo	135° (+45° – -90°)
Ziehm Solo FD	165° (+45° – -120°)
Angulation	± 225°
Swiveling (panning)	± 10°
Horizontal movement	220 mm
Vertical movement	420 mm

20.11.1.7 Weight

Mobile stand[1]	
Ziehm Solo	343 kg ± 4%
Ziehm Solo with Viewing Station or external monitor	323 kg ± 4%
Option Adapter for Lithotripter Procedures	353 kg ± 4%
Option Portable	360 kg ± 3%

Mobile stand[1]	
Option Portable with transport wheels	400 kg ± 3%
Option Portable M2	360 kg ± 3%
Option Portable M2 with transport wheels	400 kg ± 3%
Ziehm Solo FD	347 kg ± 3%
Ziehm Solo FD with Viewing Station or external monitor	323 kg ± 4%

Viewing Station[2]	
	122 kg ± 8%

[1]Depending on system configuration and balance weights

[2]Depending on system configuration

20.11.2 Systems with a voltage rating of 100 V, 120 V, 200 V

The system is available with different anode voltages. For the corresponding specific data, refer to → *Chapter 20.11.2.2 “Data dependent from anode voltage (110 kV)” on page 367* and → *Chapter 20.11.2.3 “Data dependent from anode voltage (120 kV) ” on page 369*.

The following technical data do not depend on the anode voltage and apply in general.

20.11.2.1 Data independent from anode voltage

System

Systems with a voltage/ frequency rating of:	**100 V_{AC} ± 10%, 50/60 Hz**	**120 V_{AC} ± 10%, 50/60 Hz**	**200 V_{AC} ± 10%, 50/60 Hz**
Power supply fuse rating			
	C 20 A or C 32 A (tripping characteristic C acc. to VDE 0641, Part 11; EN 60898 + IEC 60898)		
Quality of power supply			
	Overvoltage category II acc. to IEC 60664-1		
Maximum line impedance			
	≤ 0,3 Ω		≤ 0,6 Ω
Required residual current circuit breaker (RCD)			
	$I_N \geq 20$ A, I_{AN} = 30 mA		$I_N \geq 16$ A, I_{AN} = 30 mA
Typical current consumption			
	10 A continuous 22 A momentary		8 A continuous 16 A momentary
Typical power consumption, momentary			
	2040 VA (60 Hz)	2060 VA (60 Hz)	3120 VA (60 Hz)
Power supply in standby mode			
	350 VA (3.5 A)	350 VA (3 A)	360 VA (2 A)
The values depend on the integrated documentation systems.			
Power input fuse			
	20 A slow (circuit breaker)		15 A slow (circuit breaker)
Equipment protection classification			
	Protection Class I, Type B, ordinary equipment, continuous operation		
Radiation controlled area			
	4 m (national regulations may differ)		

Table 33: Systems with a voltage rating of 100 V, 120 V, 200 V – general data

Generator

Systems with a voltage / frequency rating of:	**100 V_{AC} ± 10%, 50/60 Hz**	**120 V_{AC} ± 10%, 50/60 Hz**	**200 V_{AC} ± 10%, 50/60 Hz**
Typical operating data with patient phantom			
Fluoroscopy			
	80 kV / 9 mA		
Direct Radiography			
Ziehm Solo	80 kV / 9 mA		
Nominal electric power (acc. to IEC 60601-2-7 / IEC 60601-2-54)			
Ziehm Solo	1000 W at 100 kV / 10 mA / 0.1 s		
Ziehm Solo FD	2000 W at 100 kV / 20 mA / 0.1 s		
X-ray tube			
	Single-focus stationary-anode tube		
Focal spot nominal size, in relation to reference axis			
	0.6 acc. to IEC 60336		
Focal spot horizontal tolerance, in relation to reference axis			
	± 0.5 mm (controlled)		
Anode angle, in relation to reference axis			
	9°		
Anode material			
	Tungsten		
Target angle			
Ziehm Solo	6.8°		
Ziehm Solo FD	5.2°		
Max. X-ray tube loading factors			
	1h; 3 mA at 110 kV		10800 mAs/h

Table 34: Systems with a voltage rating of 100 V, 120 V, 200 V – general data

20.11.2.2 Data dependent from anode voltage (110 kV)

Generator

Systems with a voltage / frequency rating of:	**100 V_{AC} ± 10%, 50/60 Hz**	**120 V_{AC} ± 10%, 50/60 Hz**	**200 V_{AC} ± 10%, 50/60 Hz**
Clinical operating parameters			
Direct Radiography			

Systems with a voltage / frequency rating of:	**100 V_{AC} ± 10%, 50/60 Hz**	**120 V_{AC} ± 10%, 50/60 Hz**	**200 V_{AC} ± 10%, 50/60 Hz**
Ziehm Solo	40-110 kV 2.0 mA min./ 10 mA max. 0.2 mAs min./ 100 mAs max. 0.1-12.7 s		
Fluoroscopy			
	40-110 kV 0.2-16.2 mA		40-110 kV 0.2-16 mA
Pulsed fluoroscopy			
Ziehm Solo	Pulse width 10–30 ms 1, 2, 4, 8, 12.5, 25 pulses/s (on systems with 50 Hz) 1, 2, 5, 10, 15, 30 pulses/s (on systems with 60 Hz)		
Ziehm Solo FD	Pulse width 10-40 ms 1, 2, 4, 8, 12.5, 25 pulses/s 1, 2, 5, 10, 15, 30 pulses/s		
Digital radiography (snapshot)			
	40-110 kV 1.5 mA min. / 18 mA max.		40-110 kV 1.5 mA min. / 20 mA max.
Operating frequency	40 kHz		
Max. operating data			
Fluoroscopy			
	110 kV / 10 mA 70 kV / 16.2 mA		110 kV / 10 mA 110 kV / 15 mA
Direct Radiography			
Ziehm Solo	110 kV / 8.6 mA 60 kV / 10 mA		
Digital radiography (snapshot)			
	110 kV / 12 mA 70 kV / 18 mA		110 kV / 18 mA 80 kV / 20 mA
Max. power output			
Fluoroscopy			

Systems with a voltage / frequency rating of:	100 V_{AC} ± 10%, 50/60 Hz	120 V_{AC} ± 10%, 50/60 Hz	200 V_{AC} ± 10%, 50/60 Hz
	1100 W (110 kV / 10 mA)		1650 W (110 kV / 15 mA)
Direct Radiography			
Ziehm Solo	946 W (110 kV / 8.6 mA)		
Digital radiography (snapshot)			
	1320 W (110 kV / 12 mA)		1980 W (110 kV / 18 mA)
Total filtration			
	≥ 3.9 mm aluminum equivalent + 0.1 mm Cu		

Table 35: Systems with a voltage rating of 100 V, 120 V, 200 V – anode voltage of 110 kV

20.11.2.3 Data dependent from anode voltage (120 kV)

Generator

Systems with a voltage / frequency rating of:	100 V_{AC} ± 10%, 50/60 Hz	120 V_{AC} ± 10%, 50/60 Hz	200 V_{AC} ± 10%, 50/60 Hz
Clinical operating parameters			
Direct Radiography			
Ziehm Solo	40-120 kV 2.0 mA min./ 10 mA max. 0.2 mAs min./ 100 mAs max. 0.1-12.7 s		
Fluoroscopy			
Ziehm Solo	40-120 kV 0.2-16.2 mA		40-120 kV 0.2-16 mA
Ziehm Solo FD	40-120 kV 0.2-20 mA		
Pulsed fluoroscopy			

Systems with a voltage / frequency rating of:	**100 V_{AC} ± 10%, 50/60 Hz**	**120 V_{AC} ± 10%, 50/60 Hz**	**200 V_{AC} ± 10%, 50/60 Hz**
Ziehm Solo	Pulse width 10–30 ms 1, 2, 4, 8, 12.5, 25 pulses/s (on systems with 50 Hz) 1, 2, 5, 10, 15, 30 pulses/s (on systems with 60 Hz)		
Ziehm Solo FD	Pulse width 10-40 ms 1, 2, 4, 8, 12.5, 25 pulses/s 1, 2, 5, 10, 15, 30 pulses/s		
Digital radiography (snapshot)			
Ziehm Solo	40-120 kV 1.5 mA min. / 16.8 mA max.		40-120 kV 1.5 mA min. / 20 mA max.
Ziehm Solo FD	40-120 kV 1.5 mA min. / 24 mA max.		
Operating frequency	40 kHz		
Max. operating data			
Fluoroscopy			
Ziehm Solo	120 kV / 13.7 mA 70 kV / 16.2 mA		120 kV / 12.2 mA 60 kV / 16 mA
Ziehm Solo FD	120 kV / 13.8 mA 70 kV / 20 mA		
Direct Radiography			
Ziehm Solo	120 kV / 7.9 mA 60 kV / 10 mA		
Digital radiography (snapshot)			
Ziehm Solo	120 kV / 11 mA 70 kV / 18 mA		120 kV / 16 mA 80 kV / 20 mA
Power shot Ziehm Solo FD	120 kV / 16.6 mA 70 kV / 24 mA		
Power shot Ziehm Solo FD	100 kV / 24 mA / 2400 W / 0.04 s		
Max. power output			
Fluoroscopy			

Systems with a voltage / frequency rating of:	100 V_{AC} ± 10%, 50/60 Hz	120 V_{AC} ± 10%, 50/60 Hz	200 V_{AC} ± 10%, 50/60 Hz
Ziehm Solo	1644 W (120 kV / 13.7 mA)		1464 W (120 kV / 12.2 mA)
Ziehm Solo FD	1656 W (120 kV / 13.8 mA)		
Direct Radiography			
Ziehm Solo	948 W (120 kV / 7.9 mA)		
Digital radiography (snapshot)			
Ziehm Solo	1320 W (120 kV / 11 mA)		1920 W (120 kV / 16 mA)
Ziehm Solo FD	1992 W (120 kV / 16.6 mA)		
Total filtration			
	≥ 4.3mm aluminum equivalent + 0.1 mm Cu		

Table 36: Systems with a voltage rating of 100 V, 120 V, 200 V – anode voltage of 120 kV

20.11.3 Systems with a voltage rating of 220 V, 230 V, 240 V

The system is available with different anode voltages. For the corresponding specific data, refer to → *Chapter 20.11.3.2 "Data dependent from anode voltage (110 kV)" on page 373* and → *Chapter 20.11.3.3 "Data dependent from anode voltage (120 kV)" on page 375*.

The following technical data do not depend on the anode voltage and apply in general.

20.11.3.1 Data independent from anode voltage

System

Systems with a voltage / frequency rating of:	220 V_{AC} ± 10%, 50/60 Hz	230 V_{AC} ± 10%, 50/60 Hz	240 V_{AC} ± 10%, 50/60 Hz
Power supply fuse rating			
	C 16 A (tripping characteristic C acc. to VDE 0641, Part 11; EN 60898 + IEC 60898)		
Quality of power supply			
	Overvoltage category II acc. to IEC 60664-1		
Required residual current circuit breaker (RCD)			
	I_N ≥ 16 A, I_{AN} = 30 mA		

Systems with a voltage / frequency rating of:	**220 V_{AC} ± 10%, 50/60 Hz**	**230 V_{AC} ± 10%, 50/60 Hz**	**240 V_{AC} ± 10%, 50/60 Hz**
Typical current consumption			
	8 A continuous 16 A momentary		
Typical power consumption, momentary			
	3150 VA (50 Hz)	3170 VA (50 Hz)	3130 VA (50 Hz)
Power supply in standby mode			
	360 VA (approx. 16 A)	370 VA (approx. 16 A)	
The values depend on the integrated documentation systems.			
Power input fuse			
	15 A slow (circuit breaker)		
Maximum line impedance			
	≤ 0,6 Ω		
Equipment protection classification			
	Protection Class I, Type B, ordinary equipment, continuous operation		
Radiation controlled area			
	4 m (national regulations may differ)		

Table 37: Systems with a voltage rating of 220 V, 230 V, 240 V – general data

Generator

Systems with a voltage / frequency rating of:	**220 V_{AC} ± 10%, 50/60 Hz**	**230 V_{AC} ± 10%, 50/60 Hz**	**240 V_{AC} ± 10%, 50/60 Hz**
Typical operating data with patient phantom			
Fluoroscopy			
	80 kV / 9 mA		
Direct Radiography			
Ziehm Solo	80 kV / 9 mA		
Nominal electric power (acc. to IEC 60601-2-7 / IEC 60601-2-54)			
Ziehm Solo	1000 W at 100 kV / 10 mA / 0.1 s		
Ziehm Solo FD	2000 W at 100 kV / 20 mA / 0.1 s		
X-ray tube			
	Single-focus stationary-anode tube		
Focal spot nominal size, in relation to reference axis			

Systems with a voltage / frequency rating of:	220 V_{AC} ± 10%, 50/60 Hz	230 V_{AC} ± 10%, 50/60 Hz	240 V_{AC} ± 10%, 50/60 Hz
	0.6 acc. to IEC 60336		
Focal spot horizontal tolerance, in relation to reference axis			
	± 0.5 mm (controlled)		
Anode angle, in relation to reference axis			
	9°		
Anode material			
	Tungsten		
Target angle			
Ziehm Solo	6.8°		
Ziehm Solo FD	5.2°		
Max. X-ray tube loading factors			
	1h; 3 mA at 110 kV		10800 mAs/h

Table 38: Systems with a voltage rating of 220 V, 230 V, 240 V – general data

20.11.3.2 Data dependent from anode voltage (110 kV)

Generator

Systems with a voltage / frequency rating of:	220 V_{AC} ± 10%, 50/60 Hz	230 V_{AC} ± 10%, 50/60 Hz	240 V_{AC} ± 10%, 50/60 Hz
Clinical operating parameters			
Direct Radiography			
Ziehm Solo	40-110 kV 2.0 mA min./ 10 mA max. 0.2 mAs min./ 100 mAs max. 0.1-12.7 s		
Fluoroscopy			
	40-110 kV 0.2-16 mA		
Pulsed fluoroscopy			

Systems with a voltage / frequency rating of:	**220 V_{AC} ± 10%, 50/60 Hz**	**230 V_{AC} ± 10%, 50/60 Hz**	**240 V_{AC} ± 10%, 50/60 Hz**
Ziehm Solo	Pulse width 10–30 ms 1, 2, 4, 8, 12.5, 25 pulses/s (on systems with 50 Hz) 1, 2, 5, 10, 15, 30 pulses/s (on systems with 60 Hz)		
Ziehm Solo FD	Pulse width 10-40 ms 1, 2, 4, 8, 12.5, 25 pulses/s 1, 2, 5, 10, 15, 30 pulses/s		
Digital radiography (snapshot)			
	40-110 kV 1.5 mA min./ 20 mA max.		
Operating frequency	40 kHz		
Max. operating data			
Fluoroscopy			
	110 kV / 10 mA 80 kV / 16 mA		
Direct Radiography			
Ziehm Solo	110 kV / 8.6 mA 60 kV / 10 mA		
Digital radiography (snapshot)			
	110 kV / 18 mA 80 kV / 20 mA		
Max. power output			
Fluoroscopy			
	1650 W (110 kV / 15 mA)		
Direct Radiography			
Ziehm Solo	946 W (110 kV / 8.6 mA)		
Digital radiography (snapshot)			
	1980 W (110 kV / 18 mA)		
Total filtration			
	≥ 3.9 mm aluminum equivalent + 0.1 mm Cu		

Table 39: Systems with a voltage rating of 220 V, 230 V, 240 V – anode voltage of 110 kV

20.11.3.3 Data dependent from anode voltage (120 kV)

Generator

Systems with a voltage / frequency rating of:	**220 V_{AC} ± 10%, 50/60 Hz**	**230 V_{AC} ± 10%, 50/60 Hz**	**240 V_{AC} ± 10%, 50/60 Hz**
Clinical operating parameters			
Direct Radiography			
Ziehm Solo	40-120 kV 2.0 mA min./ 10 mA max. 0.2 mAs min./ 100 mAs max. 0.1-12.7 s		
Fluoroscopy			
Ziehm Solo	40-120 kV 0.2-16 mA		
Ziehm Solo FD	40-120 kV 0.2-20 mA		
Pulsed fluoroscopy			
Ziehm Solo	Pulse width 10–30 ms 1, 2, 4, 8, 12.5, 25 pulses/s (on systems with 50 Hz) 1, 2, 5, 10, 15, 30 pulses/s (on systems with 60 Hz)		
Ziehm Solo FD	Pulse width 10-40 ms 1, 2, 4, 8, 12.5, 25 pulses/s 1, 2, 5, 10, 15, 30 pulses/s		
Digital radiography (snapshot)			
Ziehm Solo	40-120 kV 1.5 mA min./ 20 mA max.		
Ziehm Solo FD	40-120 kV 1.5 mA min./ 24 mA max.		
Operating frequency	40 kHz		
Max. operating data			
Fluoroscopy			

Systems with a voltage / frequency rating of:	220 V_{AC} ± 10%, 50/60 Hz	230 V_{AC} ± 10%, 50/60 Hz	240 V_{AC} ± 10%, 50/60 Hz
Ziehm Solo	120 kV / 12.2 mA 60 kV / 16 mA		
Ziehm Solo FD	120 kV / 13.8 mA 70 kV / 20 mA		
Direct Radiography			
Ziehm Solo	120 kV / 7.9 mA 60 kV / 10 mA		
Digital radiography (snapshot)			
Ziehm Solo	120 kV / 16 mA 80 kV / 20 mA		
Ziehm Solo FD	120 kV / 16.6 mA 70 kV / 24 mA		
Power shot Ziehm Solo FD	100 kV / 24 mA / 2400 W / 0.04 s		
Max. power output			
Fluoroscopy			
Ziehm Solo	1464 W (120 kV / 12.2 mA)		
Ziehm Solo FD	1656 W (120 kV / 13.8 mA)		
Direct Radiography			
Ziehm Solo	948 W (120 kV / 7.9 mA)		
Digital radiography (snapshot)			
Ziehm Solo	1920 W (120 kV / 16 mA)		
Ziehm Solo FD	1992 W (120 kV / 16.6 mA)		
Total filtration			
	≥ 4.3mm aluminum equivalent + 0.1 mm Cu		

Table 40: Systems with a voltage rating of 220 V, 230 V, 240 V – anode voltage of 120 kV

20.11.4 Laser Positioning Device

Laser position	Max. power output	Beam divergence	Wavelength	Laser Class
Image receptor	< 3.9 mW	> 90°	635 nm	Class 2M acc. to IEC 60825-1
Generator	< 3.3 mW	> 56°		

Table 41: Technical data of laser positioning device (Ziehm Solo)

Laser position	Max. power output	Beam divergence	Wavelength	Laser Class
Image receptor	< 3.9 mW	> 130°	635 nm	Class 2M acc. to IEC 60825-1
Generator	< 3.3 mW	> 56°		

Table 42: Technical data of laser positioning device (Ziehm Solo FD)

20.11.5 Dose meter

Additional absorption	3 mm Al
Sensitivity (75 kV; 2.7 mm Al HVL)	≥ 700 pC/mGy • cm²
Measuring range of DAP power	0.1 – 10^4 mGy • cm²/s
Voltage range	40 – 150 kV
Voltage correction	refer to figure Voltage correction of VacuDAP C dose meter
Aluminum equivalent	< 0.4 mm

Table 43: Technical data VacuDAP C Dose meter

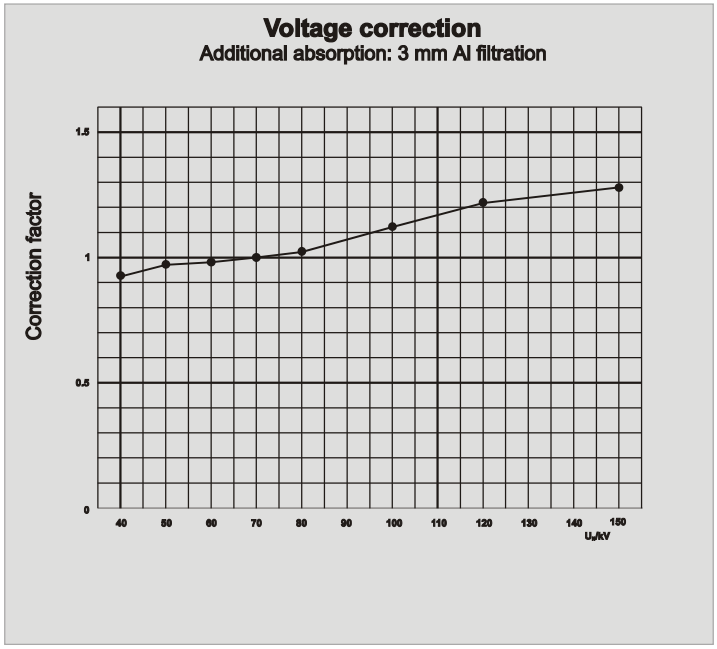


Fig. 148: Voltage correction of VacuDAP C dose meter

21 Appendix B

21.1 Approved third-party components

The following third-party components are authorized by Ziehm Imaging GmbH:

- Interfaces for navigation systems:
  - Brainlab navigation systems (2D)
- Printers:
  - Sony® UP-X898MD

Never use any other third-party components than the ones specified above.

NOTE

It is the responsibility of each owner/operator to check the approval of the third-party components in the operators' countries.

Please refer to the operating instructions of the respective third-party components.

22 Glossary

Button	Button on the Solo Center → touch screen
C-arm	Pivot-mounted system component with → generator and → image receptor
CCD camera	CCD (charge-coupled device) for processing the fluoroscopic image
Control panel	→ Touch screen for operation and data input, also referred to as Vision Center or Solo Center
Coupling cable	Coupling cable between → Viewing Station or Remote Solo Center and → mobile stand
Electromagnetic compatibility (EMC)	Ability of an electrotechnical device to not interfere with other devices by undesired electrical or electromagnetic effects or to not be disturbed by other devices
Flat-panel detector	System component or receiving and processing X-rays using direct digital technology
Generator	System component for directed emission of X-rays
Horizontal carriage	Horizontally movable part of the → swivel arm
Image intensifier	System component with integrated → CCD camera for receiving and processing X-rays using conventional analog technology.
Image receptor	System component for receiving X-rays, either an → image intensifier or a → flat-panel detector
Interface panel	Recessed area with connections for various peripheral devices
Key	Every mechanical (haptic) sensor element
Lifting column	Vertically movable support of the → swivel arm
Mobile stand	Movable cart carrying the → C-arm and the → control panel
Swivel arm	Horizontally movable and tiltable support of the → C-arm
Touchscreen	Touch-sensitive touch pad on the Solo Center
Transport position	Setting up the system components for transportation in order to avoid damages on the system components.
WLAN (Wireless LAN)	Data transmission via wireless network connection
Zero position	→ C-arm adjustment to the following positions: – Orbital rotation 0° – Angulation 0° – Lowest possible value for horizontal position – Lowest possible value for vertical position

23 Index

1, 2, 3 ...

2 point (button) 265
3 point (button) 269
4 point (button) 272
4 point ratio (button) 276
360° - Angle (read-only box) 269

A

Abdomen (anatomical program) 115
Abdomen (button) 85
Accessories, optional 23
Acquiring
  Cine loop 214
Active Cooling
  Advanced Active Cooling 131
Add (button 152
Adjust Iris Collimator (button) (SmartEye) 91, 140
Adjust Slot Collimator (button) (SmartEye) 91
Administrator
  Initial login 151
Air Kerma (display) 85
Air Kerma Rate (display) 85
Alarm (radiation time) 131
  switching off 131
Alert messages 132
Alerts
  During operation 328
  During power-up 327
  List of errors and alerts 329
Alphanumeric keypad 94
Anatomical programs 115
  Abdomen 115
  activating 115
  Bolus 115
  Bones 115
  Deactivating 115
  Extremities / cervical spine / head . . 115
  Extremities Vascular 115
  Heart 115
  Soft 115
  Trunk 115
  Trunk Vascular 115
Angle of rotation
  Information on the screen 282
Angulation
  C-arm 71
Anti-scatter grid 39, 42
  mounting 43
  removing 39, 42
Archive
  Inverting the entire archive 162
Archive (operating mode) 207
Archive (tab) 93, 158, 187, 214
Arrow
  Adding to an image 285
Auto-delete function 129
Automatic exposure rate control 109
Autostore
  activating 128, 302
Autotransfer
  activating 302

B

Back (button) 149
Back (button) (SmartEye) 91
Backup
  Patient folders 182
  Restoring from CD/DVD 187
  Restoring from USB storage medium 184
  Selecting patient folders 183
  Selection using search criteria 183
  Selection using the image creation date 183
  To CD/DVD 186
  USB storage medium 183

Backup (button) 184, 187
Backup copy
Restoring from CD/DVD 187
Restoring from USB storage medium 184
Selecting patient folders 183
Selection using search criteria 183
Selection using the image creation date 183
To CD/DVD 186
USB storage medium 183
Basic configuration
Hardware 20
Software 20
Basic settings
Entering the hospital data 310
Selecting the live screen 310
System date 309
System time 309
Basic settings (button) 309, 310
Bolus (anatomical programs) 115
Bones (anatomical program) 115
Bones (button) 85
Brake
Mobile stand 67
Button ‘2 point’ 265
Button ‘3 point’ 269
Button ‘4 point ratio’ 276
Button ‘4 point’ 272
Button ‘Abdomen’ 85
Button ‘Add’ 152
Button ‘Adjust Iris Collimator’ (button) (SmartEye) 91, 140
Button ‘Adjust Slot Collimator’ (SmartEye) 91
Button ‘Back’ 149
Button ‘Back’ (SmartEye) 91
Button ‘Backup’ 184, 187
Button ‘Basic settings’ 309, 310
Button ‘Bones’ 85
Button ‘Calibration’ 263
Button ‘CD/DVD’ 164, 178, 225, 231
Button ‘CD/DVD’ (Backup) 187
Button ‘Cine’ 85, 214
Button ‘Cine/DSA/Dose’ 311, 312
Button ‘Clean up’ 218, 245
Button ‘Complete’ 218
Button ‘Contrast/Brightness’ 137, 251
Button ‘Contrast/Brightness’ (SmartEye) 91, 137
Button ‘Date’ 309
Button ‘Delete log file’ 154
Button ‘Delete marked items’ 161, 162, 174, 222
Button ‘Delete Selections’ 181
Button ‘Delete unmarked items’ . . . 175, 259
Button ‘Delete’ 175, 259
Button ‘Delete’ (Measurement) 263
Button ‘Department’ 310
Button ‘DICOM Print’ 204, 205
Button ‘DICOM Store’ 196, 198, 199, 201, 203, 204
Button ‘Erase USB media’ 318
Button ‘Extremities/cervical spine/head’ . 85
Button ‘Filter’ 85, 134, 135, 136
Button ‘Full-Screen Image’ 171
Button ‘Grayscale Inversion’ 145, 256
Button ‘Grayscale Inversion’ (SmartEye) 91
Button ‘Heart’ 85
Button ‘High Level Control’ 214
Button ‘Horizontal Slot Collimator’
Close 257
Open 257
Button ‘Hospital’ 310
Button ‘Image Rotation’ (SmartEye) 91
Button ‘Image Swapping’ 142
Button ‘Invert All’ 162
Button ‘Iris Collimator’ (button) (SmartEye) 91, 140, 141
Button ‘Laser’ 85, 296
Button ‘Last name’ 149
Button ‘LM’ 246

Button ‘Login’ 149
Button ‘Long Procedure Spine’ 85
Button ‘Low Dose’ 85
Button ‘Magnify’ 139
Button ‘Manual Exposure Rate Setting’ . . 85
Button ‘Mark’ 161, 173, 207, 221, 257
Button ‘Metal’ 85
Button ‘Mosaic’ 171
Button ‘Motion’ 85
Button ‘MPPS Discontinue’ 196, 198, 199, 201
Button ‘New’ 155, 156, 167, 192
Button ‘Next measuring point’ 263
Button ‘Obese Patient’ 85
Button ‘P-Sh’ 245
Button ‘Password’ 149
Button ‘Patient ID’ 192
Button ‘Pediatrics / Low Dose’ 85
Button ‘Physician’ 310
Button ‘Play’ 214, 217, 238
Button ‘Print Live Screen Image’ . . . 91, 229
Button ‘Print’ 223
Button ‘Protect’ 174, 221, 258
Button ‘Pulsed fluoroscopy’ 85
Button ‘Query’ 192
Button ‘Reset Collimator’ (SmartEye) 91, 141
Reset Collimator (button) SmartEye) 140
Button ‘Reset Contrast/Brightness’ 91
Button ‘Reset Image Rotation’ (SmartEye) 91, 144
Button ‘Restore from CD/DVD’ 187
Button ‘Restore from USB Stick’ 184
Button ‘Retrieve’ 207, 209
Button ‘Reverse Left/Right’ 144, 257
Button ‘Reverse Up/Down’ 144, 257
Button ‘Reverse Up/Down’ (SmartEye) . . 91
Button ‘Rotate Collimator’ (SmartEye) 91, 140, 141
Button ‘Rotate Image CCW’ 256
Button ‘Rotate Image CW’ 144, 256
Button ‘Save’ 85, 214
Button ‘Search’ (Archive operating mode) 165, 167, 214
Button ‘Search’ (Patient operating mode) 156, 167
Button ‘Secure patient folders’ 154
Button ‘Snapshot’ 85
Button ‘Soft’ 85
Button ‘Start Img’ 218
Button ‘Stop Img’ 218
Button ‘Stop’ 214, 217, 218, 245
Button ‘Storage media’ . 316, 317, 318, 319
Button ‘Time’ 309
Button ‘Trunk’ 85
Button ‘Update’ 151, 154, 207, 209
Button ‘Uro’ 85
Button ‘USB’ 225
USB (button) 164, 178
Button ‘USB’ (Backup) 184
Button ‘Vascular’ 93
Button ‘Vertical Slot Collimator’
Close 257
Open 257
Button ‘Windowing’ 251
Button ‘Worklist’ 195, 197, 199, 200
Button ‘Zoom’ 254
Button Down Arrow 85
Button Up Arrow 85
Buttons
SmartEye 91
Buttons on the control panel 81, 85

C

C-arm
Angulation 71
Horizontal movement 74
Movements 69
Orbital rotation 69
Cables
Power cable 101
Calibrating 262

Calibration (button) 263
CD/DVD
Backup copy 186
Restoring backed-up data 187
Saving a cine loop 225
Saving images 178
Saving patient folders 164
Saving single cine loop images 231
Storage format 317
CD/DVD (button in Backup) 187
CD/DVD (button) 164, 178, 225, 231
Check box ‘Live Image left’ 310
Checks
Regular checks 323
Cine (button) 85, 214
Cine loop 213, 219, 221
Acquiring 214
Applications 213
Changing the playback speed . 217, 238
Cleaning up 218, 245
Controlling 217
Deleting 222
Deleting single images 229
Frame rate 213
Marking 221
Marking single images 227
Mosaic view 226
Opening 214
Presetting the frame rate 312
Printing on video printer 223
Printing single images 229
Processing 217
Processing single images 226
Protecting 221
Protecting single images 228
Replaying 214, 217, 220
Saving single images to USB storage medium 231
Saving to hard disk 213
Saving to USB storage medium 225
Start Img 218
Stop Img 218
Trimming 218
Unprotecting 221
Writing single images to CD/DVD . . . 231
Writing to CD/DVD 225
Cine loop start image 218
Cine loop stop image 218
Cine/DSA/Dose (button) 311, 312
Clean up (button) 218, 245
Cleaning 324
Detergents 324
Screen 325
Collimators
Iris collimator 140
Virtual collimator 142
Comparing images 180
Complete (button) 218
Config (tab) 93, 301, 312, 313
Configuration
CD/DVD storage format 317
Cine/DSA/Dose 311
Delete data 318
Deleting all images from a USB storage medium 318
Discarding the basic settings 311
Discarding the operation settings . . . 308
Entering the hospital data 310
Selecting the live screen 310
System date 309
System time 309
USB stick storage format 316
Contrast/Brightness (button) 137, 251
Contrast/Brightness (button) (SmartEye) 91
Control panel
Elements 81
Operating modes 93
Cooling system, active 131
Crosshair
Showing 304

Current (display) 85

D

Data Management 147
Date (button) 309
Date format 309
Delete
All images from a USB storage medium 318
Cine loop 222
Image 174
Patient folders 161
Single cine loop images 229
Delete (button in Measurement mode) . 263
Delete (button) 175, 259
Delete log file (button) 154
Delete marked items (button) 161, 162, 174, 222
Delete protection
Removing from a cine loop 221
Removing from an image 174, 258
Delete Selections (button) 181
Delete unmarked items (button) . . 175, 259
Department (button) 310
Department (input box) 310
DICOM
Downloading patient data 192
Retrieving a Worklist 193
Saving options 202
Selecting a storage server 319
DICOM network printer
Printing images 204
DICOM Print (button) 204, 205
DICOM server
Downloading patient data 192
Importing images 207
Retrieving a Worklist 193
Saving patient folders 202
DICOM Store 202
DICOM Store (button) 196, 198, 199, 201, 203, 204
Digital radiography 112
Digital zoom
Zoom factor 254
Direct radiography
Generating 297
Disinfection 326
Display 160
Air Kerma 85
Air Kerma Rate 85
Current 85
Dose area product 85
Pulse width % 85
Radiation Time 85
Voltage 85
Displays
Pulses/s 85
Radiation time 131
Displays on the control panel 81
Dose Area Product (display) 85
Dose meter
Technical Data 377
Dose reduction 113
Automatic 113
manual 113
Down Arrow (button) 85
DSA 234

E

Edge filter 135
Information on the screen 282
Levels 135, 253
Edge filter (post-processing) 253
Edges
Enhancement 135, 253
Electronic image magnification 139
Emergencies
Switching off 105
EMERGENCY STOP button 105
Enhancement
Edges 135, 253

Entire archive
Grayscale inversion 162
Environmental compatibility 15
Erase USB media (button) 318
Error
During operation 328
During power-up 327
List of errors and alerts 329
Error messages 132
Exposure rate control, automatic 109
Exposure rate setting, manual 113
Extremities Vascular (anatomical program) 115
Extremities/cervical spine/head (anatomical program) 115
Extremities/cervical spine/head (button) . 85

F

Film cassette
Loading 297
Film cassette holder
Fitting 297
Filter (button) 85, 134, 135, 136
Filters
Edge filter 135
Edge filter (post-processing) 253
In the live image 134
LIH filter 136
Noise suppression 134, 136
Recursive filter 134
Fluoro (tab) 93
Fluoroscopy (operating mode) 85, 109
Defining as start screen 305
Fluoroscopy modes 109
Digital radiography (snapshot) 112
Pulsed fluoroscopy 110
Fluoroscopy operating mode
Systems with image intensifier 84
Fluoroscopy parameters
Information on the screen 282
Fluoroscopy programs 115
Foot switch
Dual Plus 98
Dual Plus labeling 98
Two-pedal foot switch 96
Four-Point (button) 272
Four-Point Ratio (button) 276
Frame rate
Cine loop 213
Full-Screen Image (button) 171
Full-size image 172
Displaying an image at full size 172
Functions
Low Dose 118
SmartArchive 88

G

Grayscale Inversion
All images 162
Entire archive 162
Undoing grayscale inversion 162
Grayscale Inversion (button) 145, 256
Grayscale Inversion (button) (SmartEye) 91
Grayscale inversion (post-processing)
Image 256

H

Hand switch 96
Hard disk 160
Save image 128
Saving a cine loop 213
Hard disk space 160
Heart (anatomical program) 115
Heart (button) 85
High Level Control (button) 214
HIPAA
Assigning a (user) group 152
Creating a new User ID 152
Health Insurance Portability and Accountability Act 149
Managing patient data securely 149
User login 149

Horizontal image reversal 133, 144
Information on the screen 282
Horizontal image reversal (post-processing) 257
Horizontal movement
C-arm 74
Horizontal slot collimator
Close (button) 257
Open (button) 257
Hospital (button) 310
Hospital (input box) 310
Hospital data
Entering 310
Information on the screen 281

I

Image 174, 258
Adding a marker 285
Adding an arrow 285
Adding text 285
Comparing 142
Delete protection 174, 258
Deleting 174
Displaying at full size 172
Edge enhancement 135, 253
Grayscale inversion (post-processing) 256
Horizontal image reversal 144
Importing from DICOM server 207
Inverting all images 162
Marking 173, 257
Mirroring (reversal) (post-processing) 257
Printing live screen images on video printer 130
Printing on DICOM network printer . . 204
Printing on video printer 175, 260
Processing 170
Protecting 174, 221, 258
Rotating 144
Rotating (post-processing) 256
Saving to hard disk 128
Saving to USB storage medium 225
Undoing the grayscale inversion of all images 162
Unmarking 173, 257
Unprotecting 174, 258
Vertical image reversal 144
Image data
Managing 158
Image information 281
Image number 128
Information on the screen 281
Image reversal
Reverse Left/Right 144
Reverse Up/Down 144
Image rotation 144
Image Rotation (button) (SmartEye) 91
Image rotation (post-processing) 256
Image swapping 142
Image Swapping (button) 142
Image Swapping (button) (SmartEye) . . . 91
images
Saving to USB storage medium 178
Images
Writing to CD/DVD 178
Importing
Images from DICOM server 207
Input box ‘Department’ 310
Input box ‘Hospital’ 310
Input box ‘Physician’ 310
Input box ‘Reference Length’ 263
Input box ‘Time’ 309
Invert All (button) 162
Iris collimator 140
Iris Collimator (button) (SmartEye) 91, 140, 141

K

Key ‘MSA’ 239
Key ‘RSA’ 241

Key switch 106
Power on 106
X-ray 107
Keypad, alphanumeric 94

L

Landmarking 246
Laser
Laser Class 55, 295
Laser Positioning Device 55
Maintenance 55
Laser (button) 85, 296
Laser Positioning Device
Applications 295
Technical Data 376
Last name (button) 149
Length 1 (read-only box) 265, 269, 272, 276
Length or distance
Measuring 265
LIH filter 136
Information on the screen 282
Noise suppression 136
Number of images 136
Live image left (option button) 310
Live screen 37
defining 310
LM (button) 246
Locking
X-rays 106, 107
Login (button) 149
Long Procedure Spine (button) 85
Low Dose (button) 85
Low Dose (function) 118

M

Magnification, electronic 139
Magnify (button) 139
Manual dose reduction 113
Manual Exposure Rate Setting 113
Manual Exposure Rate Setting (button) . . 85
Mark (button) 161, 173, 207, 221, 257
Marker
Adding to an image 285
Deleting 286
Editing 286
Marking
Cine loop 221
Image 173, 257
Patient folders 161
Single cine loop images 227
Mask image 235
Measure (tab) 93, 263, 265, 272
Measurement
2-point measurement 265
3-point measurement 268
4-point measurement 271
4-point ratio measurement 275
Button ‘Delete’ 263
Calibrating 262
Length or distance 265
Reference length 265, 269, 276
Reference object 262
Measurement (operating mode) 261
Measuring functions 261
Metal (button) 85
Metal Correction 117
Mobile stand
Brake 67
Steering 67
Mosaic (button) 171
Mosaic view 159
Motion (button) 85
Movement
C-arm 69
MPPS Discontinue (button) 196, 198, 199, 201
MSA 235
MSA (key) 239
MSA image
Generating 239

N

Native image 235
Hiding 313
Showing 313
Navigation
activating 307
New (button) 155, 156, 167, 192
Next measuring point (button) 263
Noise suppression
LIH filter 136
Recursive filter 134
Note on the image 285

O

Obese Patient (button) 85
OFF switches 95, 102
ON/OFF switches 95, 102
Operating modes 93
Archive 207
Fluoroscopy 109
Measurement 261
Patient 207
Post processing 257, 260
Operation settings
CD/DVD storage format 317
Defining the start screen 305
Discarding 308
USB stick storage format 316
Optional accessories 23
Options
Hardware 21
Software 21
Orbital rotation
C-arm 69

P

P-Sh (button) 245
Password (button) 149
Patient (operating mode) 207
activating 148
Defining as start screen 305
Patient (tab) 93, 148, 155, 156, 167
Patient data
Data security (HIPAA) 149
Downloading from DICOM server . . . 192
Editing 156
Entering manually 155
Information on the screen 281
Managing 147
Secure management (HIPAA) 149
Patient folders 147
activating 167
Backup 182
Backup to CD/DVD 186
Backup to USB storage medium . . . 183
Creating a new patient folder 155
Deleting 161
Displaying image information 167
Editing data 156
Marking 161
Processing 160
Saving to USB storage medium 164
Search criteria 165
Searching 156, 165
Storage capacity 147
Subject 148
Unmarking 161
Writing to CD/DVD 164
Patient ID (button) 192
Patient number
Display 148
Length 147
Pediatrics / Low Dose (button) 85
Physician (button) 310
Physician (input box) 310
Pixel Shift 245
Play (button) 214, 217, 238
Post proc. (tab) 93, 250
Post processing
Activating an image 250

Contrast and Brightness 251
Digital collimation 257
Edge filter 253
Image crop 257
Image reversal 257
Image rotation 256
Inverting the image grayscale 256
Printing images on video printer 260
Post processing (operating mode) 257, 260
Post-Processing Images 249
Power cable 101
Pre-magnification
Pre-magnification 139
PreMag
Pre-magnification 139
Print (button) 223
Print Live Screen Image (button) . . . 91, 229
Printing
Cine loops on video printer 223
Images on DICOM network printer . . 204
Images on video printer 175, 260
Live screen images on video printer 130
Measured values 130
Single cine loop images on video printer 229
Text information 130
Processing 219
Protect (button) 174, 221, 258
Protecting 174, 258
Cine loop 221
Image 221
Protective grounding 54
Pulse width % (display) 85
Pulsed fluoroscopy 110
Pulsed fluoroscopy (button) 85
Pulses/s (display) 85

Q

Query (button) 192
Quick Cine Export 319

R

Radiation controlled area 51
Radiation time
Alarm 131
Warning function 131
Radiation time (display) 85, 131
Read-only box ‘360° – Angle’ 269
Read-only box ‘Length 1’ 265, 269, 272, 276
Read-only box ‘Reference Length’ 265, 269, 272, 276
Recursive filter 134
Information on the screen 282
Levels 134
Noise suppression 134
Reference Length (input box) 263
Reference Length (read-only box) 265, 269, 272, 276
Reference screen 37
Reset Collimator (button) SmartEye) 91, 141
Reset Contrast/Brightness (button) 91
Reset Image Rotation 144
Reset Image Rotation (button) (SmartEye) 91, 144
Restore from CD/DVD (button) 187
Restore from USB Stick (button) 184
Retrieve (button) 207, 209
Reverse Left/Right 144
Reverse Left/Right (button) 144, 257
Reverse Up/Down 144
Reverse Up/Down (button) 144, 257
Reverse Up/Down (button) (SmartEye) . . 91
Rotate Collimator (button) (SmartEye) 91, 140, 141
Rotate Image CCW (button) 256
Rotate Image CW (button) 144, 256
RSA 235
RSA (key) 241
RSA image
Acquiring 241

S

Safety instructions
- Definition 16
- Electromagnetic compatibility 52
- Equipotential grounding 54
- General safety instructions 49
- Laser radiation 55
- Printer 56
- Protective grounding 54
- System failure 57
- X-rays 51

Save
- Cine loops to CD/DVD 225
- Cine loops to hard disk 213
- Images to CD/DVD 178
- Images to hard disk 128
- Images to USB storage medium 178, 225
- Patient folders to CD/DVD 164
- Patient folders to DICOM server 202
- Patient folders to USB 164
- Single cine loop images to CD/DVD 231
- Single cine loop images to USB storage medium 231

Save (button) 85, 214
Screen assignment 37
Search (button in Archive operating mode) 165, 167, 214
Search (button in Patient operating mode) 156, 167
Search criteria for patient folders 165
Secure patient folders (button) 154
Security key switch 106
Selection
- Operating mode 93

Service life 15
Slot collimator 141
SmartArchive (function) 88
SmartControl 91
SmartEye
- Buttons 91

Snapshot 112
Snapshot (button) 85
Soft (anatomical program) 115
Soft (button) 85
Software version 15
Solo Center 81
Standard fluoroscopy 109
Standard windowing (post-processing) . 251
Start Img (button) 218
Start screen
- defining 305

Steering
- Mobile stand 67

Step windowing (post-processing) 251
Sterilization 326
Stop (button) 214, 217, 218, 245
Stop Img (button) 218
Storage format
- CD/DVD 317
- USB storage medium 316

Storage media (button) . 316, 317, 318, 319
Subject 148
Subtracted image 235
Subtraction (operating mode)
- Defining as start screen 305

Subtraction mode
- Acquiring an RSA image 241
- DSA 234
- Generate MSA image 239
- Landmarking 246
- Mask image 235
- MSA 235
- Native image 235
- Pixel Shift 245
- RSA 235
- Subtracted image 235

Switches
- Hand switch 96
- ON/OFF 95

Switching off
In emergency situations 105
System 104
Switching on
System 102
System
ON/OFF switches 102
Preparing 101
Switching off 104
Switching on 102
System date 309
System time 309

T

Tab ‘Archive’ 93, 158, 187, 214
Tab ‘Config’ 93, 301, 312, 313
Tab ‘Fluoro’ 93
Tab ‘Measure’ 93, 263, 265, 272
Tab ‘Patient’ 93, 148, 155, 156, 167
Tab ‘Post proc.’ 93, 250
Temperature in the generator 131
Temperature symbol 85, 131
Text
Adding to an image 285
Deleting 286
Editing 286
Text Functions 281
third-party components
authorized 379
Three-point (button) 269
Time (button) 309
Time (input box) 309
Transport position
General 59
Trunk (anatomical program) 115
Trunk (button) 85
Trunk Vascular (anatomical program) . . 115
Two-Point (button) 265
Typographical conventions 15

U

Unmarking 221
Up Arrow (button) 85
Update (button) 151, 154, 207, 209
Uro (button) 85
USB (button in Backup) 184
USB (button) 225
USB stick
Deleting all images 318
Restoring backed-up data 184
Save image 225
Saving images 178
Saving patient folders 164
Saving single cine loop images 231
USB storage medium
Backup copy 183
Storage format 316
User administration
Assigning a (user) group 152
Creating a new User ID 152
User login 149

V

Vascular (button) 93
Vascular (operating mode)
Defining as start screen 305
Vertical image reversal 133, 144
Information on the screen 282
Vertical image reversal (post-processing)
. 257
Vertical Slot Collimator
Close (button) 257
Open (button) 257
Video
VIDEO OUT 38
Video signal 38
Video printer
Print Live Screen Image 130
Printing a cine loop 223
Printing images 175, 260

Virtual collimator 142
Voltage (display) 85

W

Warning function (radiation time) 131
Warning symbols
Temperature 85, 131
X-rays 85, 126, 131
Windowing
Restore Factory Defaults (SmartEye) 137
Restore initial state (SmartEye) 137
Restoring the factory settings 251
Windowing (button) 251
Windowing values
Information on the screen 282
Worklist
Downloading from DICOM server . . . 193
Worklist (button) 195, 197, 199, 200
Writing
Backup to CD/DVD 186
Cine loops to CD/DVD 225
Images to CD/DVD 178
Patient folders to CD/DVD 164
Single cine loop images to CD/DVD 231

X

X-ray protective equipment 23
X-ray symbol 85, 126, 131

Z

Zoom
Zoom factor 254
Zoom (button) 254
Zoom factor
Digital zoom 254

23 Index