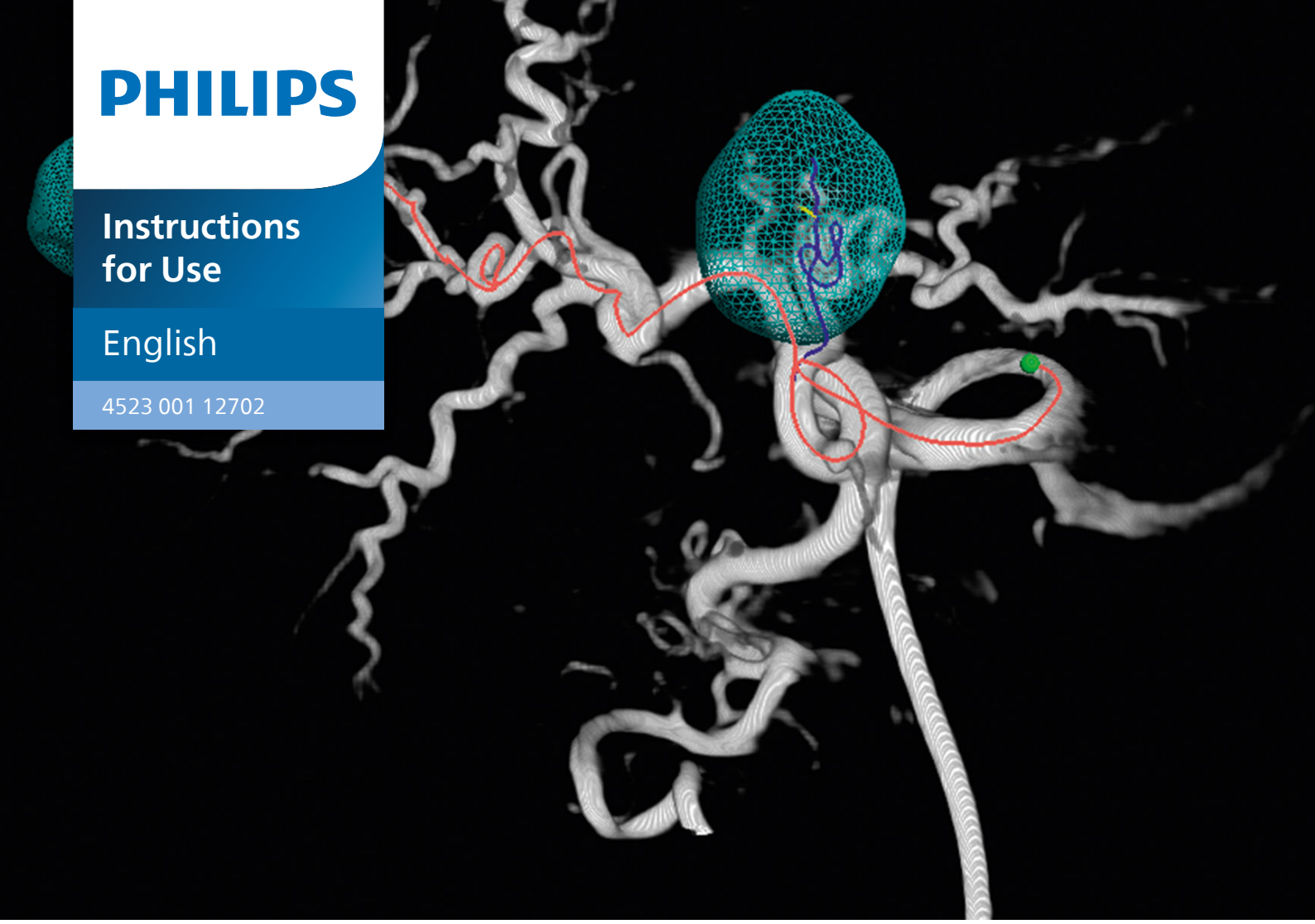
PHILIPS

Instructions for Use

English

4523 001 12702



EmboGuide

Release 1.4

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1 Introduction

About EmboGuide
EmboGuide is a software product (Interventional Tool) that runs on the Interventional Workspot. EmboGuide allows the physician to see and understand the exact nature and location of the lesion, and to create a plan for the most appropriate treatment.

To use EmboGuide, XperCT Dual must also be installed on the Interventional Workspot. XperCT volumes can be created from XperCT series or CBCT series, depending on the configuration of your system.

During intervention, EmboGuide provides additional guidance for navigating the catheter towards the lesion. EmboGuide also provides the means to monitor progress of the treatment and give insight before, during, and after the procedure to verify the results of the treatment.

EmboGuide supports the physician in the following workflow:
- Visualization
- Planning
- Image-based guidance
- Verification

Visualization
One of the key factors for interventional oncology procedures is the ability to see and understand the exact nature and location of the lesion. With embolization, for example, it is important to be able to delineate the lesion and identify its feeding vessels.

Visualization is also important after treatment to help the physician assess the result of the treatment, and to check whether parts of the tumor were missed. EmboGuide assists with visualization in the following ways:
- Support for MRI and CT data to be used for reference and comparison.
- Dual view to allow side by side comparison of different (pre- and post) data sets, as well as the ability to overlay different data sets for optimal visualization of tumor and feeding vessels together.
- 384^3 reconstruction for improved feeding vessel viewing (especially small vessels, which are hard to detect on reconstructions of lower resolution).

Planning
It is important to be able to delineate the tumor and identify its feeding vessels for embolization. EmboGuide supports the physician in the planning stage in the following ways:
- Lesion segmentation to isolate the tumor that is to be treated. Additionally, the size of the delineated tumor volume is displayed.
- Vessel analysis to highlight the lesion's feeding vessels. This assists with determining the path that the catheter should follow to deliver the embolization material to the tumor.

Image guidance
During the treatment, live fluoroscopy is overlaid on the 3D data sets and the graphical annotations made in the planning stage. This serves as a roadmap to guide the physician with the navigation of the catheter through the complex vessel structure to the embolization targets.

Verification
After embolization, EmboGuide provides tools to assess the outcome of the treatment. A new XperCT or CBCT run can be made to compare the pre- and post-situation, and to verify the effects of the treatment.

1.1 About these Instructions for Use

These Instructions for Use are intended to assist operators in the safe and effective operation of the product described. The "responsible organization" is considered to be the body with authority over the product and "operators" are those persons who actually use the product.

To identify the Instructions for Use and the software tool for which they are intended to be used, the product can be identified using the **About** box of the related software tool. The **About** box indicates the following:

- Name of the product
- Release number
- Date of manufacture
- Unique device identifier (UDI)

All Instructions for Use supplied with the software tool are identified using the name and release number (first two digits) of the software tool, as indicated in the footer of the document or on the **Home** page of the Electronic Instructions for Use. Before using these Instructions for Use with your system, ensure that it corresponds with the software tool installed.

The following Instructions for Use are supplied with the software tool:

- EmboGuide Instructions for Use
- XperCT Dual Instructions for Use
- Interventional Workspot Instructions for Use

These Instructions for Use may describe some products or features that are not available in all countries. Please contact your local sales representative for the availability of products and features in your region.

These Instructions for Use describe the most extensive configuration of EmboGuide, including any options that may be available. Depending on the configuration of your system, some of the features described may not be available.

Before attempting to operate the product, you must read these Instructions for Use, noting and strictly observing all **WARNING** and **CAUTION** notices.

Pay special attention to all the information given and procedures described in the Safety section.



WARNING
A warning alerts you to a potential serious outcome, adverse event, or safety hazard. Failure to observe a warning may result in death or serious injury to the operator or patient.



CAUTION
A caution alerts you when special care is necessary for the safe and effective use of the system. Failure to observe a caution may result in moderate injury to the operator or patient, or damage to the equipment, and presents a remote risk of more serious injury or environmental pollution.

NOTE
A note highlights unusual points to assist you when using the system.

Information about the acquisition of images with the correct protocol is contained in the relevant Instructions for Use of the compatible X-ray equipment. The operator is expected to have received training for the correct operation of the X-ray equipment.

1.2 Electronic Instructions for Use

These Instructions for Use are available to view on the screen while you are using the system.

Opening the Electronic Instructions for Use

1 To open the Electronic Instructions for Use, do one of the following:
- On the **Help** menu, click **Help**.
- Press F1 on the keyboard.



2 Click the drop down list in the upper-left corner of the window containing the Electronic Instructions for Use and select EmboGuide.

Using the Electronic Instructions for Use
- To move the window containing the Electronic Instructions for Use, drag the header bar to the desired location on the screen.
- To browse topic headings, use the table of contents in the left pane of the viewing window.
- To expand and close topic headings, click the arrow next to the heading. If a heading does not have an arrow next to it, it cannot be expanded further.
- To go directly to a topic, click the corresponding heading in the table of contents. The topic is displayed in the right pane of the viewing window.
- To move backward or forward through your browsing history, click **Back** or **Forward**.
- To close the Electronic Instructions for Use, click **Close**.
- To change the language of the Electronic Instructions for Use, click **Language** in the upper-right corner and select a language from the list.

NOTE
You can change the language of the Electronic Instructions for Use independently of the language that the product uses.

Searching the Electronic Instructions for Use
You can search the Electronic Instructions for Use using keywords to help you find topics of interest.

1 Click inside the search box and enter the keywords for your search query.



2 Click **Search** or press Enter to display the search results in the search window.

3 To view a topic, click it in the search results.

1.3 Intended Use

This Philips product is intended to be installed, used, and operated only in accordance with the safety procedures and operating instructions given in these Instructions for Use for the purposes for which it was designed.

The purposes for which the product is intended are given below. However, nothing stated in these Instructions for Use reduces operators' responsibilities for sound clinical judgment and best clinical procedure.

Installation, use, and operation of this product are subject to the law in the jurisdictions in which the product is being used. Operators must only operate the product in such a way as to not conflict with applicable laws, or regulations that have the force of law.

Uses of the product for purposes other than those intended and expressly stated by Philips, as well as incorrect use or operation, may relieve Philips (or its agent) from all or some responsibility for resultant non-compliance, damage, or injury.

CAUTION
Images created by the viewing application are artificially reconstructed images and the selected viewing settings may affect the image visualization. Diagnosis or treatment cannot be solely based on these images. All findings, decisions, and diagnoses must be confirmed by the use of conventional (2D) X-ray imaging.

CAUTION
In the United States, Federal law restricts this device to sale, distribution, and use by, or on the order of, a physician.

1.3.1 Intended Use of EmboGuide

Product Description
EmboGuide is a post processing software medical device intended to assist physicians in performing embolization of hypervascular tumors in the liver using interventional X-ray.

EmboGuide is an extension of XperCT and intended to be used in combination with a Philips Interventional X-ray system.

It provides tools to help the physician with analyzing the vasculature of lesions, and to identify and annotate the blood vessels that shall be embolized (feeding vessels).

It provides real-time overlay and registration of the 3D rotational angiography images on live 2D X-ray images from the Philips Interventional X-ray system of the same anatomy, which can be used as additional 3D image guidance to support the navigation of the device/catheter. Planning data, like the earlier annotated feeding vessels and/or 3D landmarks can be displayed on 2D-3D fused images as supporting information.

Indications for Use / Medical Purpose
EmboGuide is a post processing software medical device intended to assist physicians in performing embolization of hypervascular tumors in the liver using interventional X-ray. It provides tools to help the user with the analysis of 3D rotational angiography images. Its output is intended as an adjunct means to help with the planning and guidance of the embolization procedure. It provides real time overlay of 3D rotational angiography images on live 2D X-ray images of the same anatomy to support device/catheter guidance.

Intended Operator Profile
The operator is a physician (e.g. interventional radiologist) who is fully skilled and responsible for sound clinical judgment and for applying the best clinical procedure. The operator may also be an assisting nurse authorized by the physician.

Clinical environment
EmboGuide can be used in the control room and in the exam room of an interventional suite or operating room. The system is connected to a Philips Interventional X-ray system.

General safety and effectiveness
To facilitate safe and efficacious operation of the system by a trained healthcare professional, instructions for use are provided as part of the device labeling, as well as training at system handover.

Patient Population
EmboGuide is suitable for patients with medical conditions where embolization is considered as suitable therapy.

Contraindications
EmboGuide use X-ray images as the source data, obtained from compatible X-ray equipment. All contra-indications that apply for X-ray procedures (as described in the Instructions for Use for the compatible X-ray equipment) also apply for EmboGuide.

Operating principle
EmboGuide is a software medical device which uses 3D volume either reconstructed from XperCT runs or from CT/MRI data to overlay on the live 2D X-ray images acquired during the procedure to assist the clinical user in planning and performing the treatment.

1.4 Clinical Benefits

EmboGuide supports appropriate treatment of patients with hypervascular tumors in the liver by assisting the physician with the planning and guidance of embolization procedures.

In addition, EmboGuide can help to improve the identification of tumor feeding vessels.

1.5 Compatibility

EmboGuide can be used with the following systems:
- Interventional Workspot release 1.8 (or higher)
- Azurion release 4.0 (including third-digit changes)
- Azurion release 3.1 (including third-digit changes)
- Azurion release 3.0 (including third-digit changes)
- Azurion release 2.2 (including third-digit changes)
- Azurion release 2.1 (including third-digit changes)
- Allura release 8.x.102 (or higher)
- Allura release 8.x.100 (or higher)
- Allura release 8.x.30 (or higher)
- Allura release 7.2.16 (or 7.2.16.x)
- UNIQ/UNIQ Clarity release 1.0.200 (or higher)
- UNIQ/UNIQ Clarity release 1.0.100 (or higher)
- UNIQ/UNIQ Clarity release 1.0.30 (or higher)

NOTE
For details of compatible systems in China, contact Philips.

To make use of EmboGuide, XperCT Dual must also be installed on the Interventional Workspot.

The product described in these Instructions for Use should not be used in combination with other products or components unless such other products or components are expressly recognized as compatible by Philips. A list of such products and components is available from Philips.

Changes or additions to the product should only be carried out by Philips or by third parties expressly authorized by Philips to do so. Such changes or additions must comply with all applicable laws and regulations that have the force of law within the jurisdictions concerned, and with best engineering practice.

EmboGuide is only intended to be used with the PC hardware configuration on which it is initially installed by Philips. EmboGuide may only be installed or reinstalled by authorized service personnel.

1.6 Training

Operators of this product must have received adequate training on its safe and effective use before attempting to operate the product described in these Instructions for Use.

Training requirements for this type of device vary from country to country. Operators should ensure that they receive adequate training in accordance with local laws or regulations. As a minimum level of training, operators should read and understand these Instructions for Use.

NOTE
Do not use the product with patients or for any application until you have met the following conditions:

- ***You have read, understood, and know all the safety information, safety procedures, and emergency procedures contained in the Safety section.***
- ***You have received adequate and proper training in the product's safe and effective operation. If you are unsure of your ability to operate this product safely and effectively, do not use it.***

Additional training resources may be available from Philips. For more information about the availability of application training, including information on the duration and frequency of training, contact your local Philips representative.

1.7 Contacting Philips

You can contact Philips by post or using the Philips website.

Contact details	
Postal address	Philips Medical Systems Nederland B.V. Veenpluis 6 5684 PC Best The Netherlands
Website address	www.philips.com/healthcare

2 Safety

All Philips products are designed to meet stringent safety standards. To safeguard human safety all medical device software requires proper installation, use, and maintenance.

It is vital that you read, note, and where applicable, strictly observe all **DANGER** notices and safety markings on the outside of the IT equipment on which the medical device software has been installed.

To help ensure the safety of both patients and operators, it is vital that you strictly follow all directions under the heading Safety and all **WARNINGS** and **CAUTIONS** given throughout these Instructions for Use or displayed on the user interface.

Only qualified and authorized personnel may operate this product. In this context, qualified means those legally permitted to operate this type of medical electrical product in the jurisdictions in which the product is being used, and authorized means those authorized by the user of the product.

Personnel operating the product and personnel in the examination room must observe all laws and regulations which have the force of law within the jurisdictions concerned. If you are in any doubt about the laws and regulations which apply to the operation of this product, do not use it.

Emergency Procedures
Due to the nature of this product, there are no emergency procedures. For information about emergency procedures related to the X-ray equipment, refer to the Instructions for Use supplied with the X-ray system.

Radiation Safety
For information about radiation safety refer to the **Safety** section of the Instructions for Use supplied with the X-ray system.

Side Effects
EmboGuide has no known side effects.

Product Symbols
For information about the symbols that are used with this product, refer to the following website:

www.symbols.philips.com

2.1 Reporting a Serious Incident

If a serious incident occurs in relation to the device, it should be reported to Philips and the competent authority of the country where you are located.

A serious incident means any incident that directly or indirectly led to, might have led to, or in case of recurrence, could lead to, any of the following:
- The death of a patient, user, or other person.
- The serious deterioration of the state of health (temporary or permanent) of a patient, user, fetus, or other person.
- A serious public health threat.

For contact details, see Contacting Philips (page 10).

2.2 Symbols

The following symbols may be used on the device, its packaging, or any other related materials.

Symbol	Description
	**Manufacturer** This symbol indicates the manufacturer of the medical device or accessory. The date of manufacture may also be displayed with this symbol, displayed as four digits for the year and, where appropriate, two digits for the month and two digits for the day.
	**Date of Manufacture** This symbol indicates the date when the medical device was manufactured. The date of manufacture is displayed as four digits for the year and, where appropriate, two digits for the month and two digits for the day. It is displayed on the system label.
	**Batch Code** This symbol indicates the manufacturer's batch code so that the batch or lot can be identified.
	**Serial Number** This symbol indicates the manufacturer's serial number so that a specific medical device can be identified.
	**Model Number** This symbol indicates the model number or type number of the product.
	**Consult the Instructions for Use** This symbol indicates the need for the user to consult the Instructions for Use.
	**Caution** This symbol indicates that caution is necessary when operating the device or control close to where the symbol is placed, or that the current situation needs operator awareness or operator action to avoid undesirable consequences.
	**Medical Device** This symbol indicates that the item is a medical device.
	**Unique Device Identifier** This symbol indicates a carrier that contains unique device identifier information.
	**Electronic Instructions for Use** This symbol indicates that you can access the electronic Instructions for Use by pressing F1.
	**European Conformity** This symbol indicates that the equipment complies with applicable European directives and regulations. The number of the notified body is indicated, if applicable.
	**Prescription Device** In the United States, Federal law restricts this device to sale by or on the order of a physician.
	**Authorized Representative** This symbol indicates the authorized representative in the region indicated by XX.
	**UK Conformity Assessed** This symbol indicates that the equipment complies with applicable regulations in the United Kingdom. The number of the notified body is indicated, if applicable.

3 Overview of EmboGuide

This section provides an overview of the functions of EmboGuide.

3.1 View activity

Volumes are displayed and manipulated in the **View** activity.

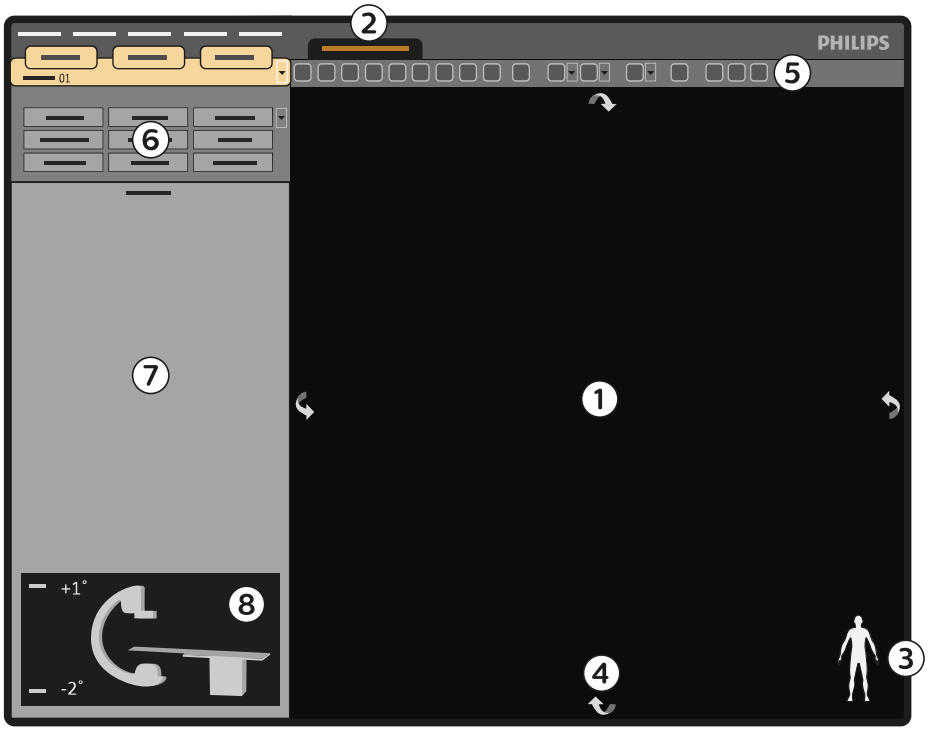


Figure 1 **View** activity overview

Legend			
1	Main display area	5	Toolbar
2	Reconstruction tabs	6	Function panel
3	Orientation indicator	7	Control panel
4	Rotation arrows	8	Stand orientation

The reconstruction is displayed in the main display area of the screen and is manipulated directly with the mouse and using function buttons in the control panel and the toolbar.

Snapshots and movies can be created at any time during processing. These are stored with the run and are available for viewing, storing or printing.

NOTE
The touch screen module can be used to control the application from the examination room, without leaving the patient.

3.2 Main display area

The main display area shows the reconstruction selected for investigation.

Several indicators are also displayed. A maximum of three reconstructions are possible.

3.2.1 Reconstruction tabs

Reconstruction 1 is by default the original reconstruction. Click the tab to display the reconstruction.

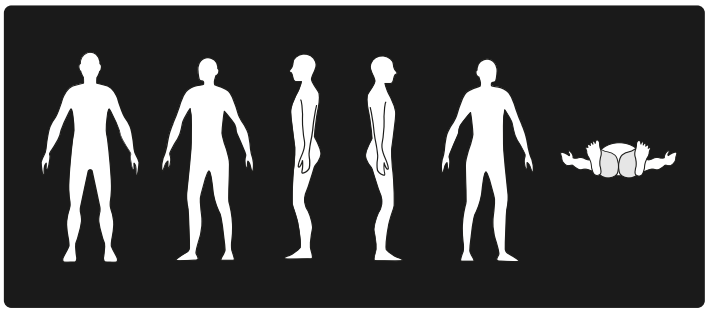
Reconstruction 2 and Reconstruction 3 are derived from further processing of the original reconstruction. Their tabs are only enabled if a second and third reconstruction are available.

NOTE
The Reconstruction tabs are used to indicate the status of the volume displayed in the main display area. If the displayed volume is from a subtracted run, the Reconstruction tabs indicate 'Subtraction'. If Overlay is enabled, the Reconstruction tabs indicate 'Overlay'.

3.2.2 Orientation indicator

The Orientation indicator can be displayed by selecting it from the View settings menu.

It indicates the orientation of the patient in relation to the operator, according to the way the reconstruction is displayed in the main display area. The orientation indicator rotates with the reconstruction.



3.2.3 Rotation arrows

Click on a rotation arrow to rotate the reconstruction 90° in the direction of the arrow.



3.2.4 Configuring view settings

The **View Settings** menu provides controls for configuring the interface.

Menu item	Description
Patient Info	The Patient info submenu allows one of three levels of detail to be selected. The levels available are: **None**, **Essential**, or **All**. The default setting is **Essential**.
Axes	Turns the display of axes on or off. The following axes are displayed: L-R (Left and Right), H-F (Head and Feet) and A-P (Anterior and Posterior).
Cubebox	Turns the display of the cubebox on or off. The cubebox depicts the outer boundaries of the reconstructed volume.
Orientation Indicator	Turns the display of the human anatomy model on or off. The anatomy model displays the orientation of the patient in relation to the view shown in the main display area.
Histogram Value	Turns the display of WW and WL settings in the histogram on or off.
Configure Tool Buttons	Opens the Configure Buttons dialog, allowing you to select which function buttons are visible in the function panel. The Histogram function button is always visible. Tools for which the appropriate license is not installed are unavailable. All available functions can be selected from the **Tools** menu, irrespective of whether they are displayed in the function panel.

3.3 Toolbar

The toolbar provides quick access to several tools for making direct modifications to the image in the main display area. Tools are selected by clicking on the appropriate button.



Select: Use this tool for basic functions such as moving objects within the view, making measurements, or making a freeform cut.



Rotate volume: Use this tool to rotate the volume in any direction in the main display area. Rotation is performed on any axis around the center of the display.



Rotate around an axis: Use this tool to rotate the volume around the fixed 'x' or 'y' axis (vertically or horizontally). Rotation is performed around the center of the display.



Rotate in a plane: Use this tool to rotate the volume around the fixed 'z' axis (perpendicular to the viewing plane). Rotation is performed around the center of the display.



Pan: Use this tool to move the reconstruction in the main display area.



Zoom: Use this tool to zoom in or zoom out of the view in the main display area.

NOTE
The zoom tool enlarges the view in the main display area, but does not increase the level of detail in the volume. To increase the level of detail, create a new reconstruction of the area of interest; this is known as 'reconstructive zooming'.



Contrast and Brightness: Use this tool to adjust the contrast and brightness of the main display area by dragging with the mouse.



Position interactor: This tool is used when viewing a volume as a slab. It allows you to select a suitable slab for viewing. Drag with the mouse to move through the volume.

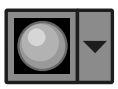


Movie interactor: Use this tool to review a 2D overlay run with the EmboGuide review functionality. It allows you to easily move backwards and forwards through the run by dragging the mouse.



Annotation: Use this tool to add an annotation. Up to five annotations can be defined for each reconstruction.

NOTE
Annotations are not repositioned if the reconstruction is rotated or modified.



Render Mode: Use this tool to set the render mode.

Available render modes	
	**Volume Rendered**
	**Volume Color Rendered**
	**Gradient Rendered**
	**Shaded Surface**

Available render modes	
	**Sum**
	**MIP**

If the selected render option is Volume Rendered or Volume Color Rendered, you can make an additional selection of render quality.

On the **Display** menu, click **Render Quality**, and then click one of the settings:
- **Normal**
- **High**

When render quality is set to high, depth perception is improved. However, performance may be reduced with this setting.



Viewing mode: By default, EmboGuide displays a 3D view in a 2x2 layout with three orthogonal views. A single, zoomed viewport can also be viewed, but the Viewing mode tool on the toolbar is not used in EmboGuide for switching the views. Instead, each viewport has a zoom button to enlarge the view.



Click the zoom button in the upper-right corner of a viewport to enlarge it in the main display area. Click the zoom button again to return to the 2x2 layout.



Default views: Use this tool to display a default view of the reconstruction.

Default views	
	**AP**
	**PA**
	**Lateral Left**
	**Lateral Right**
	**Caudo Cranial**
	**Cranio Caudal**

NOTE
Actual rotation and angulation values depend on the X- ray equipment in use.



Snapshot: Use this tool to take a snapshot of the main display area. You can export the snapshot in DICOM- or PC-compatible format using the **Export** activity.

NOTE
Use the View settings menu to ensure that the main display area contains the desired display settings for the snapshot.

NOTE
If patient information is displayed in the main display area, this is also captured in the snapshot. You must handle personal data in accordance with any privacy laws in force.



Hide primary volume (contrast): When available, this tool turns the visibility of the primary volume (contrast) on and off. It is always available when EmboGuide is active. It is also available in Overlay mode when the overlay volume is visible.

The primary volume cannot be hidden if the overlay volume is hidden. The primary volume is automatically hidden if a segmented volume is displayed.



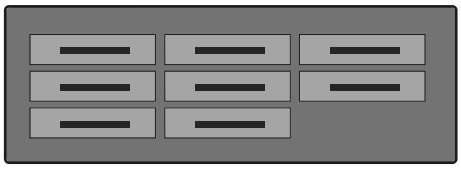
Hide overlay volume: When available, this tool turns the visibility of the overlay volume on and off. It is always available when EmboGuide is active. It is also available in Overlay mode when the primary volume is visible.



3D Overlay: This tool is not used in the software.

3.4 Function panel

An array of functions is provided for manipulating the volume. Functions are activated by clicking the corresponding function button in the function button panel.



You can configure which function buttons are visible in the function button panel using the **Configure tool buttons** option in the **View Settings** menu.

NOTE
The Histogram function button is always visible.

Clicking a function button opens the control panel for that function; the control panel appears below the function button panel.

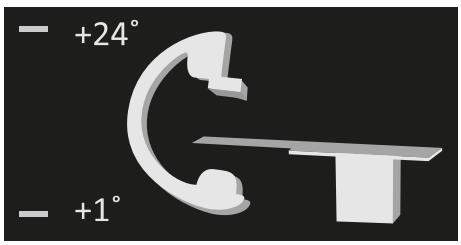
3.5 Control panel

The control panel provides access to the variable controls associated with each function button.

The contents of the control panel vary according to the selected function.

3.6 Stand orientation display

The stand orientation display is always visible at the bottom of the control panel. It provides a graphical representation of the stand position for the view currently displayed in the main display area (rotation and angulation information is not displayed if the 3D series is acquired with a tilted or cradled table).



NOTE
If you apply these values to the stand, it results in a projection in the X-ray equipment that is (apparently) identical to the one displayed in the software. However, even though the projections are identical, the images may still differ in a rotation around an axis perpendicular to the screen and could lead an inexperienced viewer to make a misinterpretation of the images. You can synchronize the orientations by pressing Follow C-arc on the touch screen module.

NOTE
Cardio angle indications (RAO/LAO, CRA/CAU) can be configured by a Service engineer, if preferred.

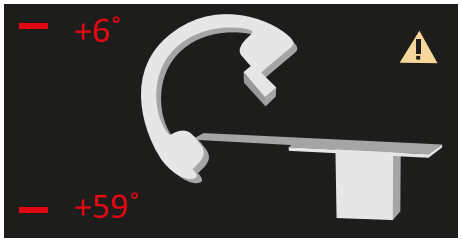
NOTE
When using 3D APC on the touch screen module, you may find that the orientation of the volume and current stand position are not synchronized (due to an unobtainable stand position). To synchronize the volume orientation with the stand position, press Follow C-arc.

NOTE
Follow C-arc and 3D APC are not available if the 3D series is acquired with a tilted or cradled table.

Biplane systems: lateral stand limitations
The presented rotation and angulation information can only be applied as displayed to the lateral stand if either one of the following conditions are satisfied:

- The frontal stand is in the SIDE position, the ROTATION angle is 0° and the ANGULATION is between +45° and -45°.
- The frontal stand is in the SIDE position, the ANGULATION angle is 0° and the ROTATION is between 0° and +90° (normal lateral stand) or between 0° and -90° (180° reversed lateral stand).

Unattainable projections
A warning symbol is displayed in the stand orientation display if the image orientation displayed cannot be obtained by the X-ray equipment. In particular orientations, however, the warning symbol is displayed although the orientation is in fact obtainable.



4 View activity

Direct mouse manipulation
You can access short cuts to tools using the mouse buttons and the mouse wheel (direct mouse manipulation). See Direct mouse manipulation (page 46) for details.

Overlay with EmboGuide
MR and CT data sets can be used as an overlay volume in EmboGuide for reference and comparison, providing optimal visualization of a tumor and the feeding vessels together in one view.

4.1 Overlay

Overlay allows you to superimpose one type of volume on another volume, providing supplementary information about the region of interest.

CAUTION
If the patient table supports table position tracking, rotational scans acquired with a tilted or cradled table are not supported in EmboGuide.

NOTE
The overlay on the 3D contrast image becomes unreliable if the patient moves during acquisition. You can detect that misalignment has occurred if the guidewire or intravascular tools appear outside the 3D contrast image.

NOTE
When using large CT/MR datasets, only part of the overlay volume can be registered with the primary volume. Roadmap accuracy cannot be guaranteed for parts of the volume that are not registered.

To use the Overlay function, you must first open a volume (primary volume) on which to position the overlay. The volume to be used as an overlay volume is then opened using the Overlay function panel.

NOTE
Reconstructions of 512^3 resolution cannot be used as the primary volume.

The following types of volume can be used as an overlay volume:
- XperCT
- CT
- MR

NOTE
Enabling Overlay mode automatically switches the rendering mode of the contrast volume to Volume Color Rendered. The overlay volume is displayed in Volume Rendered mode. Any changes you make using the Render Mode tool are applied to the overlay volume only.

NOTE
When Overlay is enabled, Analysis can only be performed on the contrast volume.

4.1.1 How to enable Overlay

This procedure provides details of enabling the **Overlay** function.

1 Open a suitable volume from the **Patients** screen.

2 Select the **Overlay** function by clicking the **Overlay** function button (if configured) or selecting **Overlay** from the **Tools** menu.

3 Click **Overlay** to enable **Overlay**.

4.1.2 Overlay with XperCT

When the matching overlay volume for the current contrast volume is an XperCT volume, the **Overlay** control panel displays the following controls.

These controls are also displayed if you select an XperCT volume from the **Remask** dialog.

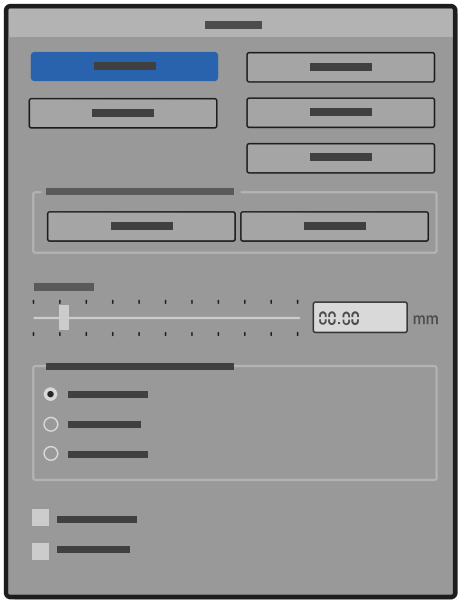


Figure 2 Overlay control panel - XperCT volume

How to view an XperCT overlay volume

If a matching overlay run has not been selected previously for the current primary volume, enabling Overlay opens the Remask dialog displaying available matching runs.

- Select the desired overlay run and click **Select** to view the overlay. (You can also double-click a run to open it).
- Selecting a new XperCT overlay run automatically opens the Match dialog so that the overlay run can be aligned with the contrast run.

Alternatively, if a matching overlay run has been selected previously the associated overlay volume is automatically superimposed on the primary volume in the main display area.

- Use the **Contrast and Brightness** tool to adjust the image clarity of the overlay.

Alignment of the overlay run with the contrast run can be adjusted at any time by clicking **Register** to open the Match dialog.

Performing registration

The registration dialog box is displayed whenever you register, re-register, or remask volumes. You use the registration dialog box to align the overlay volume with the primary volume before viewing the overlay.

Volume registration consists of two steps. The registration dialog box displays a dedicated screen for each step:

- Match Both Volumes - Step 1: in this step you can prepare the volumes for registration by adjusting the view of each volume independently in order to obtain matching views. This assists the registration process in Step 2.
- Match Both Volumes - Step 2: in this step you can match the registration of the volumes using manual adjustments or using an automatic process.

If the primary volume and the overlay volume have already been registered, the registration dialog box opens directly in Step 2.

Registration Step 1 - volume preparation

In Step 1, the primary volume and the overlay volume are displayed in separate views. You can adjust these views independently to obtain matching views in preparation for registration in Step 2.

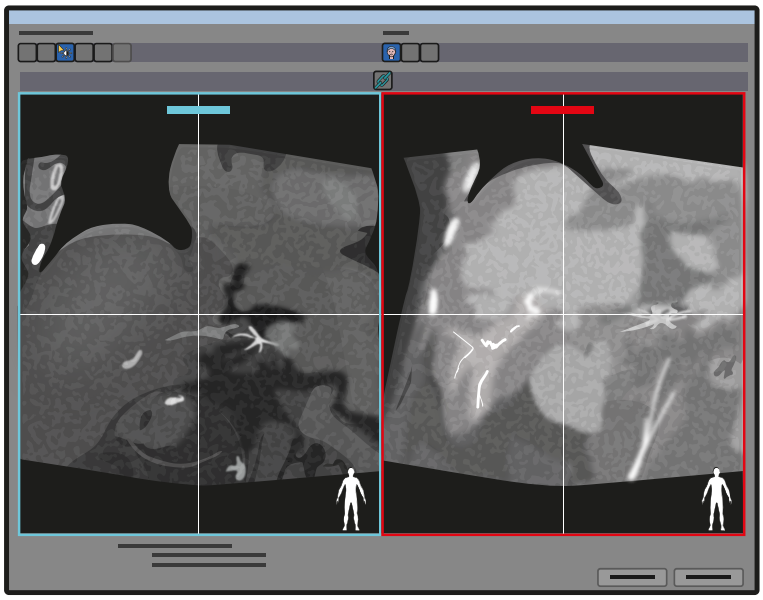


Figure 3 Registration Step 1 - volume preparation

Reference lines are displayed in each view to assist you with obtaining matching views.

1 Adjust the volumes for optimal viewing using the following tools:

	**Contrast and Brightness** You can adjust the contrast and brightness of each volume independently.
	**Zoom** Zooming is always applied to both volumes.



2 Click **Position interactor** in the registration dialog box, and then scroll through the primary volume and the overlay volume to find matching views with suitable landmarks.



3 To adjust the rotation of the overlay volume, use the **Rotate in a plane** tool.

The initial rotation point is the center of the volume. You can drag the rotation point to another position.

NOTE
The primary volume cannot be rotated.



4 To adjust the position of a view, use the **Pan** tool.



5 To link tools so that the interactions affect both volume views simultaneously, click **Link**.

When **Link** is enabled, the following tools are linked:

- Position interactor
- Pan
- Contrast and brightness

6 You can change the view orientation of the volumes:

	Coronal anterior
	Sagittal left
	Axial feet

Changing the view is useful for confirming that the orientation of the volumes match. The view setting is applied to both volumes.



7 To undo a registration action, click **Undo**.

Registration actions are actions that are performed with the **Pan**, **Rotate**, or **Position interactor** tool. You can undo these actions repeatedly, one by one.

8 Click **Next** to display Step 2 of the registration process.

Registration Step 2 - manual and automatic registration

In Step 2, the overlay volume is overlaid on the primary volume simultaneously in two different orientations.

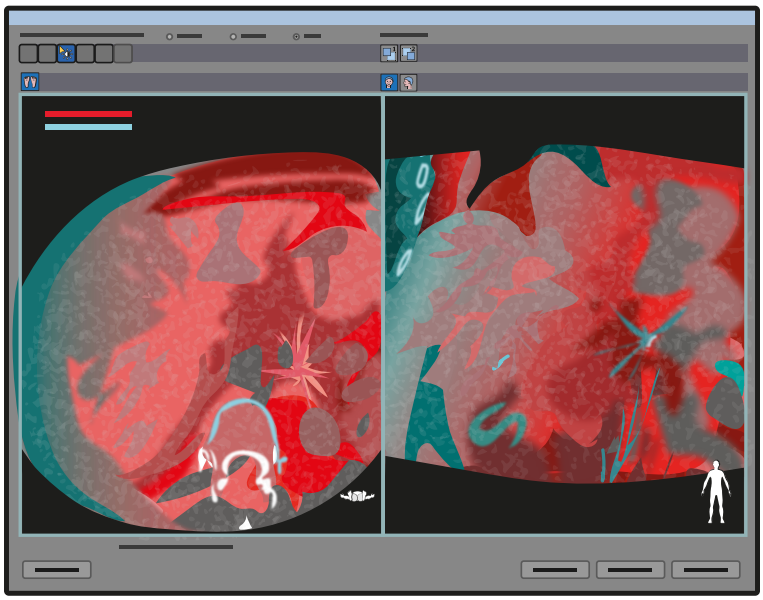


Figure 4 Registration Step 2 - manual and automatic registration

The view on the left is always displayed in axial orientation (caudo cranial). You can change the orientation of the view on the right. You can fine-tune the registration manually or automatically.

1 To match the registration of the volumes manually, set the interaction scope for the adjustment that you want to make.

You can apply interactions to:
- Primary
- Overlay
- Both

You can change the scope at any time.

2 After selecting the interaction scope, you can use the following tools to modify the registration of the volumes:

	**Zoom**
	**Rotate in a plane** You can only rotate the overlay volume.
	**Contrast and Brightness**
	**Pan**
	**Position interactor**



3 To undo a registration action, click **Undo**.

Registration actions are actions that are performed with the **Pan**, **Rotate**, or **Position interactor** tool. You can undo these actions repeatedly, one by one.

4 You can change the orientation of the view displayed on the right side of the registration dialog box:

	Coronal anterior
	Sagittal left

5 You can hide either of the volumes:

	Hide primary volume
	Hide overlay volume

6 As an alternative to manual registration, you can start automatic registration by clicking **Automatch**.

7 If the results of automatic or manual registration are not satisfactory, you can return to the volume preparation step by clicking **Back**.

8 If the results of automatic or manual registration are satisfactory, click **Finish** to close the registration dialog box.

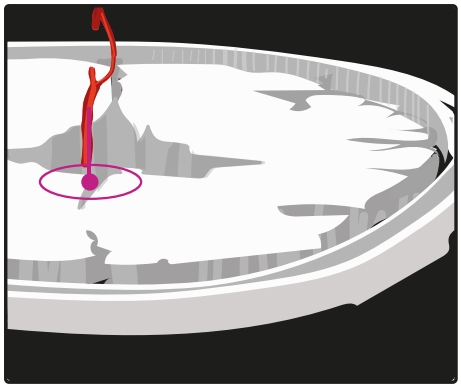
To accept the registration, you must also acknowledge the confirmation dialog box.

NOTE
To ensure accuracy during procedures, you should verify the registration of the matched volumes after using the registration dialog box.

Manipulating the XperCT overlay volume

The position of the overlay volume can be changed by positioning the cursor inside the purple circle around the slab handle, clicking the left mouse button and dragging in the desired direction.

The rotation point of the overlay volume can be changed by dragging the slab handle with the mouse.



4.1.3 Changing the view

Tools are available to adjust the view of the volume.

To hide the primary volume, select **Hide primary volume** on the toolbar.

To hide the overlay volume, select **Hide overlay volume** on the toolbar.

If the overlay volume is rendered as a slab, you can restrict the display of the primary volume and the overlay volume.

- Select **Clip Vessels** in the Overlay control panel to restrict display of the primary volume to the part that lies within the slab.
- Select **Bound Slab** in the Overlay control panel to restrict display of the overlay volume to the part that lies within the volume cube.

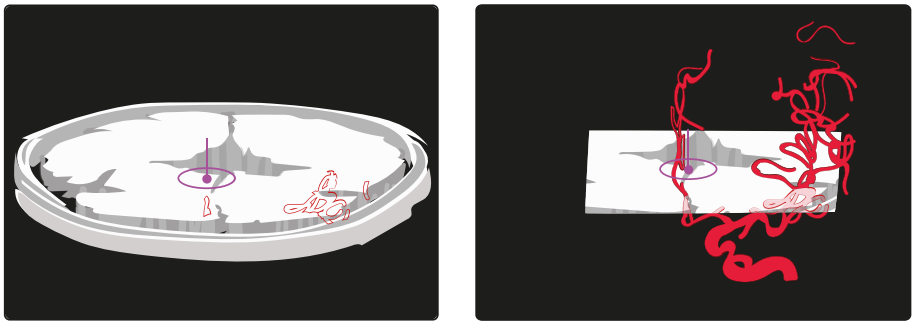


Figure 5 Clip Vessel (left) and Bound Slab (right)

4.1.4 Changing the slab

Tools are available to adjust the view of the slab.

To change the thickness of the slab, drag the **Slab Thickness** slider. Alternatively, enter a value directly in the field to the right of the slider.

To move through the volume and select a different slab, do one of the following:

- use the **Position interactor** tool from the toolbar
- position the cursor inside the purple circle around the slab handle, click the left mouse button and drag in the desired direction.

4.1.5 Cloning

You can overlay the primary volume with a copy of itself. This is known as cloning, and is similar to the **Overlay** function.

Cloned volumes do not require registration and are displayed as a slab. Enabling cloning automatically enables **Overlay**. The following functions are not available when cloning is enabled.

- **Remask**
- **Crop**
- **Register**
- Selection and remask of a second overlay volume

Cloning allows you to apply different histogram settings to the original volume and the clone volume. You can also make cuts on each of the volumes to focus on the region of interest.

1 To enable cloning, click **Clone** in the **Overlay** control panel.

A clone of primary volume is overlaid on the original volume. The clone overlay remains displayed while the **Clone** function is enabled.

2 To remove the clone volume, disable cloning by clicking **Clone** in the **Overlay** panel again.

4.1.6 Further functions with Overlay

The overlay volume is visible as long as Overlay mode is enabled in the Overlay control panel.

After configuring an overlay, you may switch to an alternate function. The following table describes functions that are available while Overlay mode is enabled.

Function	Available
Movie	Yes
Snapshot	Yes
VRML	No
Analysis	Analysis can be performed on the contrast volume only
Measurement	Distance measurement arrows can be automatically aligned on the contrast volume only Volume measurement cannot be performed
New reconstruction	No
Views	Yes
Subtraction	No
MPR	Yes
Cut	Only the Hide function can be used
XperCT	Yes
XperGuide	Yes, if the table was not tilted or cradled during acquisition of the rotational scan
EmboGuide	Yes, if the table was not tilted or cradled during acquisition of the rotational scan
Segmentation	Yes
Follow C-arc	Yes
3D APC	Yes, if the table was not tilted or cradled during acquisition of the rotational scan
Annotations	Yes

4.2 EmboGuide

Each workflow step is accessible through the **EmboGuide** control panel. You can switch between the workflow steps by clicking a workflow step button in the control panel.

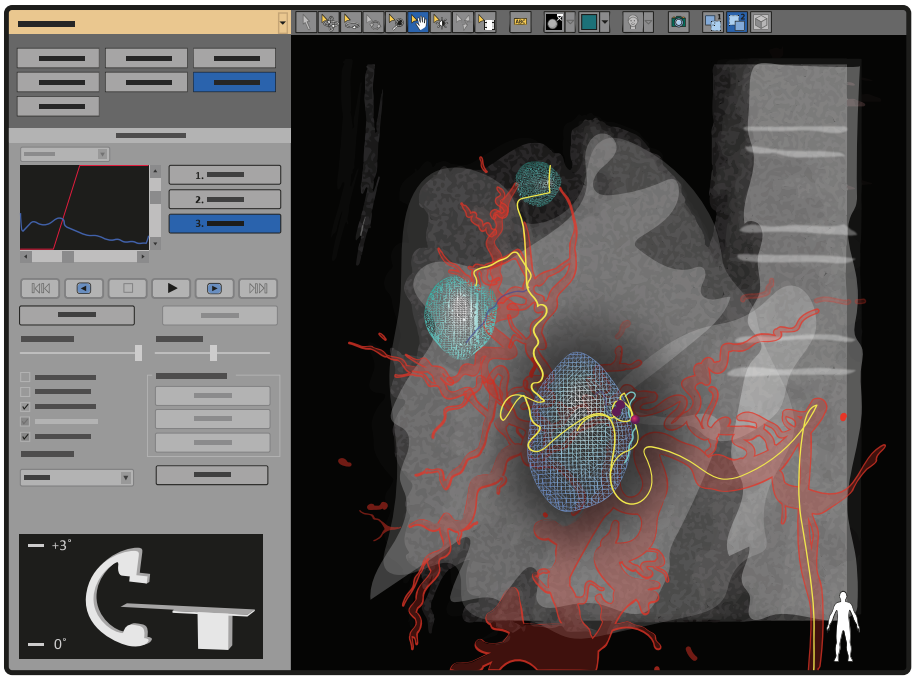


Figure 6 **EmboGuide** during live guidance with X-ray images

The EmboGuide function is divided into the following workflow steps:

- **Segment**: Provides semi-automatic tools for segmenting lesions. You select the location in which to start the segmentation process, and indicate the extent of the lesion. The system then calculates and displays the boundaries of the lesion. This is the default workflow step when you open a run for the first time in EmboGuide.
- **Planning**: Provides tools for detecting feeding vessels (manual and automatic) and placing landmarks. You can also remove structures in the view that are not relevant to the intervention. This workflow step is displayed if you open a run that already has feeding vessels defined.
- **Guidance**: Provides live guidance during catheter navigation with live X-ray images overlaid on the 3D created during the **Segment** and **Planning** workflow steps. This workflow step is displayed if you open a run that has a stored 2D overlay run, stored previously in the **Guidance** step of EmboGuide.

4.2.1 Preparing for EmboGuide with a dual phase run

This procedure provides details of the dual phase function.

1 Acquire a dual phase run on the X-ray system using one of the dedicated dual phase XperCT X-ray protocols.

For details of acquiring a dual phase run, please refer to the Instructions for Use of the X-ray system being used.

A dual phase run consists of two runs: a forward phase and a backward phase. Contrast is used during the forward phase of the run to visualize the arteries. After a brief pause, the backward phase is acquired. While the contrast medium has washed out of the arteries, the lesion holds the contrast medium for slightly longer, allowing the lesion to be visualized in the backward phase.

Both phases of the run are opened in the **Dual View** function of the **XperCT** slab viewer. The phases are automatically registered and are displayed side-by-side for comparison.

2 Verify that the region of interest is visible in both phases.

You can view the displayed slabs from multiple orientations and positions using the **Rotate** tool, **Zoom** tool, **Pan** tool, and **Position interactor** tool on the toolbar.

You can also adjust the visualization of the slabs using the **Contrast and Brightness** tool or the **Render Mode** tool, or by changing the Histogram preset or changing the slice thickness.

3 To change between viewing the volumes side-by-side and viewing the them as an overlay, drag the **Spacing** slider.

- Drag the slider to the right to view the volumes side-by-side.
- Drag the slider to the left to view the volumes together as an overlay.

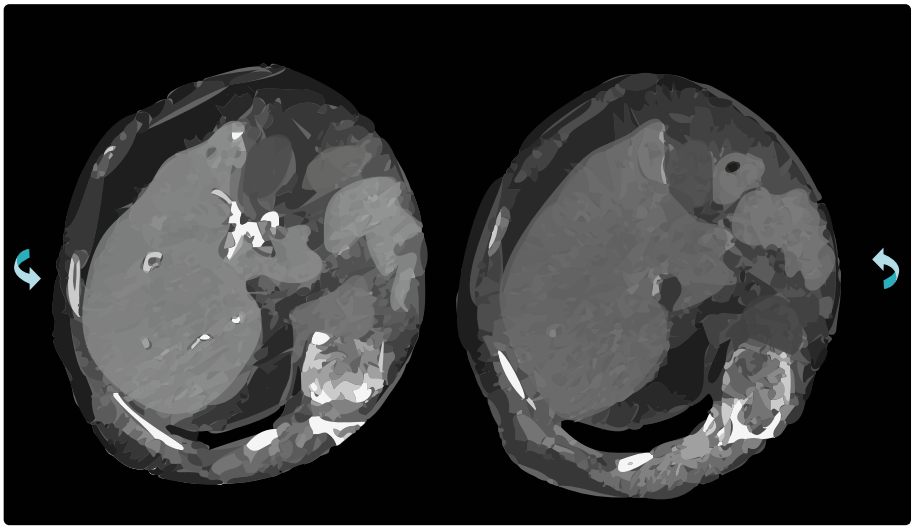


Figure 7 Dual View: viewing volumes side-by-side

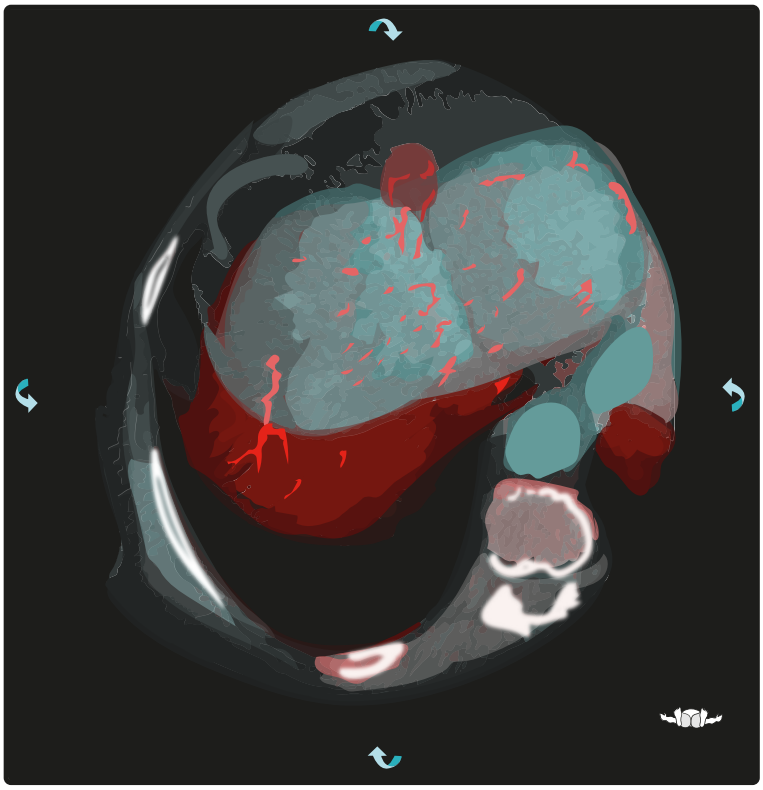


Figure 8 Dual View: viewing volumes as an overlay

When you move the **Spacing** slider fully to the left, the volumes are overlaid and color-coded to allow you to view differences in the volumes.

4 After inspecting the run and confirming that the clinical structures are visible, click **EmboGuide** in the function panel and start segmentation of the lesions.

Continue to Segmenting a lesion (page 29).

4.2.2 Preparing for EmboGuide with XperCT/CT/MR

This procedure provides details of using an overlay.

1 Open an XperCT run, CBCT run, CT volume, or MR volume in EmboGuide and select **EmboGuide** from the function panel.

2 Segment lesions in the volume using the **Segment** workflow step in the **EmboGuide** control panel.

For details of segmentation, refer to Segmenting a lesion (page 29).

3 Acquire a contrast-enhanced XperCT or CBCT run.

The run is automatically opened in the **XperCT** slab viewer.

4 Click **Overlay** in the XperCT control panel and select the previously segmented XperCT run or CT/MR volume.

5 Register the overlay volume with the primary volume.

For details of using the **XperCT** function, refer to the XperCT Dual Instructions for Use.

NOTE
Ensure that the contrast-enhanced XperCT or CBCT run is opened as the primary volume, and the segmented volume is opened as the overlay volume, otherwise the segmentation will not be visible in EmboGuide.

6 Verify that the clinical structures are clearly visible in both volumes.

You can view the displayed slabs from multiple orientations and positions using the **Rotate** tool, **Zoom** tool, **Pan** tool, and **Position interactor** tool on the toolbar.

You can also adjust the visualization of the slabs using the **Contrast and Brightness** tool or the **Render Mode** tool, or by changing the Histogram preset or changing the slice thickness.

7 After inspecting the volumes and confirming that the clinical structures are visible, click **EmboGuide** in the function panel.

8 After opening the **EmboGuide** function, click **Planning** in the **EmboGuide** control panel to start planning the embolization.

4.2.3 Segmenting a lesion

This procedure provides details of the **Segment** task.

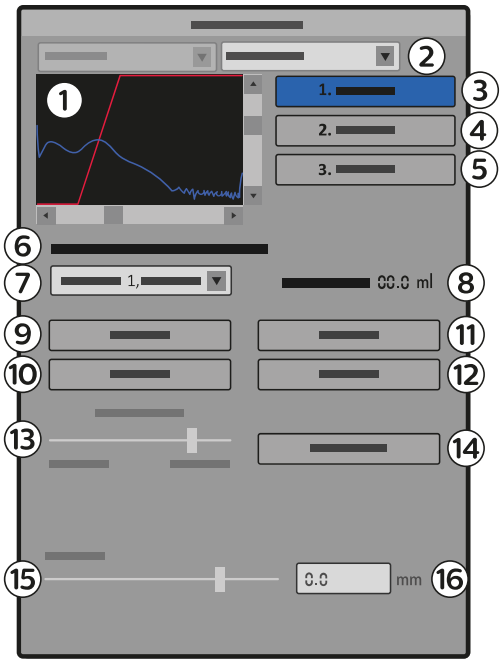


Figure 9 Segment control panel

Legend			
1	Histogram	9	New
2	Histogram preset selector	10	Modify
3	Segment workflow step	11	Delete
4	Planning workflow step	12	Undo
5	Guidance workflow step	13	Smoothness slider
6	Active volume	14	Reset Slices
7	Lesion selector	15	Slice Thickness slider
8	Volume of selected lesion segmentation	16	Slice Thickness

1 Click **Segment** in the **EmboGuide** control panel to start the lesion segmentation workflow step.

The main display area displays a 3D orthoviewer and three orthogonal views.

If the Overlay function is enabled when you start the Segmentation function, the primary volume is automatically hidden. The overlay volume is made visible for performing segmentation.




To change the volume to be used for segmentation, use the **Hide primary volume** tool or the **Hide overlay volume** tool on the toolbar to display only the volume that contains a lesion. The volume that you are currently using for segmentation is indicated in the control panel below the histogram.

2 You can adjust the thickness of the slabs in the orthogonal views by dragging the **Slice Thickness** slider in the EmboGuide control panel, or by entering a value in the **Slice Thickness** box.



3 Use the **Position interactor** tool on the toolbar to change the viewed slices in the orthoviewer and reference views and inspect the clinical structure.



4 Use the **Pan** tool on the toolbar to position an area of interest in the center of the viewport.



5 Use the **Zoom** tool on the toolbar to view an area of interest in detail.



6 To enlarge a view in the main display area, click the magnify button in the upper-right corner of a view.

- You can perform segmentation actions on the enlarged 2D views.
- To return to the main view, click the magnify button again.

7 When you find a lesion that you want to segment, click **New** in the control panel.

While you are creating a segmentation, the **Modify** button in the control is enabled.

8 Set the smoothness slider according to the nature of the lesion under investigation.

By default a smooth setting is applied. If the lesion is irregular, drag the slider to the left.

While defining a lesion segmentation, you can make several edits to the segmentation. Depending on the part of the lesion that you are segmenting, you can change the smoothness slider accordingly before each edit.

9 To define a segmentation, click the center of the lesion in one of the slice views and drag outward to the border of the lesion.

The segmentation is displayed in all viewports in the main displayed area.

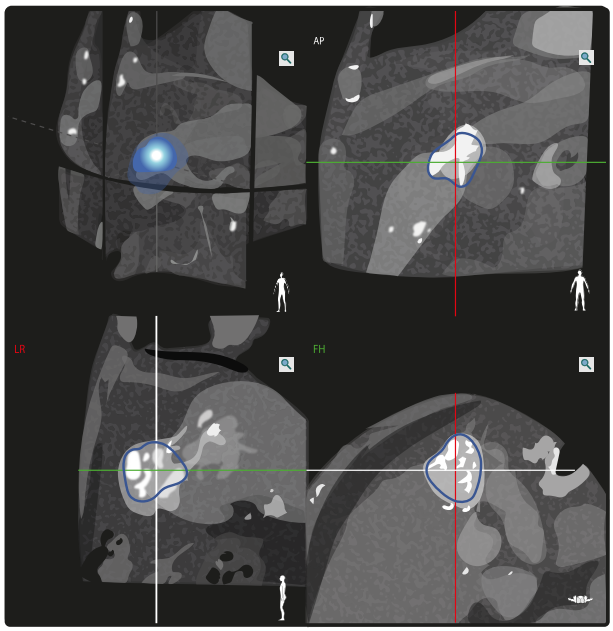


Figure 10 Lesion segment, as displayed in the 3D orthoviewer and orthogonal views

10 Repeat this step as desired to include all parts of the lesion in the segmentation.

- To add parts to the segmentation, position the pointer inside the segmentation and drag to the border. (The pointer turns yellow to indicate that the segmentation volume will be increased.)
- To remove parts from the segmentation, position the pointer outside the segmentation adjacent to the part of the border that you want to remove, and drag back over border. (The pointer turns gray to indicate that the segmentation volume will be reduced.)

While you are defining the segmentation, the volume of the current segmentation is displayed in the control panel and at the bottom of the main display area.



11 Step through the slices in all orientations using the **Position interactor** to verify that the segmentation is complete.



12 Modify the borders of the segmentation using the **Edit** tool, if desired.

13 To remove the last edit, click **Undo** in the control panel.

14 To delete the segmentation and start over, click **Delete** in the control panel.

15 When the segmentation is complete, click **Modify** to turn edit mode off.

The segmentation is added to the lesion selector below the histogram.

16 If there are more lesions in the volume that you want to segment, click **New** in the control panel and repeat the segmentation procedure to segment them.

The current segmentation is displayed in dark blue. Other segmentations are displayed in light blue.

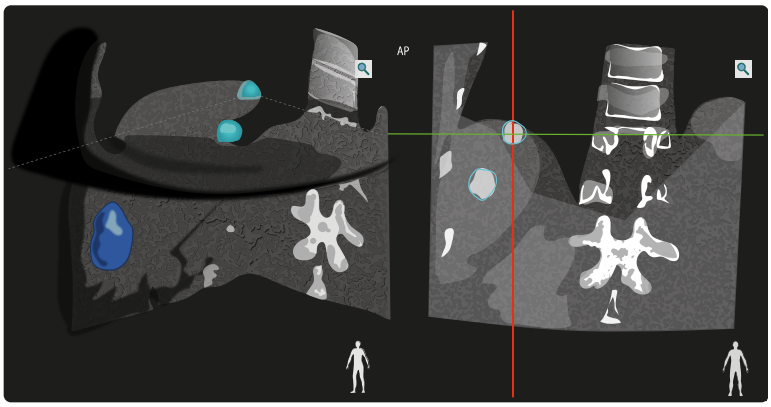


Figure 11 Defining multiple lesion segmentations

17 To select a different segmentation, do one of the following:

- Click the lesion selector in the control panel and select a segmentation.
- Click a segmentation in the orthoviewer or in one of the reference views.

Only lesion segmentations for the currently displayed volume are available.

18 To center the orthoviewer and the reference views on the segmentation currently selected in the control panel, click **Reset Slices**.

19 To make changes to the selected segmentation, click **Modify** in the control panel.

4.2.4 Planning for embolization

This procedure provides details of the **Planning** task.

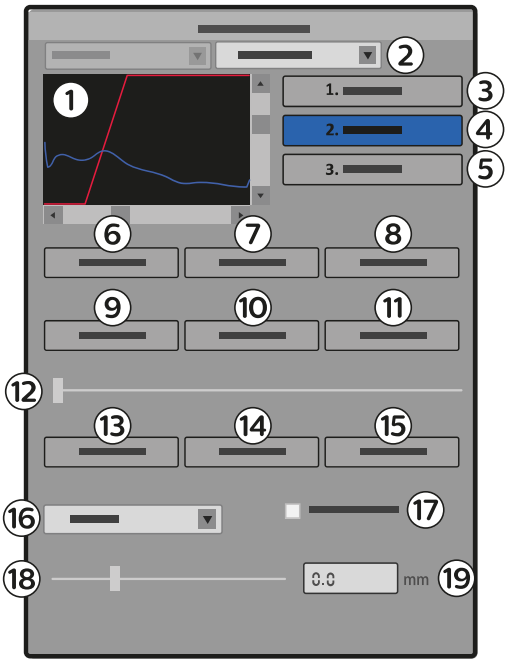


Figure 12 Planning control panel

Legend			
1	Histogram	11	Auto Detect (feeding vessels)
2	Histogram preset selector	12	Feeding vessel slider (to follow the path of a feeding vessel)
3	Segment workflow step	13	Add (landmark)
4	Planning workflow step	14	Delete Last (landmark)
5	Guidance workflow step	15	Delete All (landmarks)
6	Cut	16	Lesion selector
7	Undo (cut action)	17	Show Feeders
8	Undo All (cut actions)	18	Slice Thickness slider
9	Set Catheter / Add Feeder	19	Slice Thickness
10	Delete (feeding vessel)		

1 Click **Planning** in the **EmboGuide** control panel to start the embolization planning workflow step.

The main display area displays a 3D view and three orthogonal views. The overlay volume is hidden.

2 You can adjust the thickness of the slabs in the orthogonal views by dragging the **Slice Thickness** slider in the **EmboGuide** control panel, or by entering a value in the **Slice Thickness** box.

3 To select a lesion, do one of the following:

- Click a lesion in the 3D view.
- Use the lesion selector in the control panel to select a lesion segmentation. Using the lesion selector, you can choose to display all available lesion segmentations or just one lesion segmentation.

4 To remove structures in the view that are not relevant to the intervention (and to give a clearer view of the vessels and lesion segmentation during live guidance), do the following:

- Use the **Rotate** tool on the toolbar to rotate the 3D view so that the structure does not overlap the area of interest.
- Click **Cut** in the **EmboGuide** control panel.
- Drag around the structure with the pointer.
- Release the mouse button to complete the cut.

The structure is automatically removed when you release the mouse button.

5 To undo the last cut, click **Undo** in the **EmboGuide** control panel.

6 To undo all cuts, click **Undo All** in the **EmboGuide** control panel.

7 Click **Set Catheter** in the **EmboGuide** control panel, and then click on any part of the catheter in the 3D view or in any of the orthogonal views.

A marker is displayed in all views to indicate the catheter insertion point.

After the setting the catheter insertion point, the **Set Catheter** button changes to **Add Feeder** (described later in this procedure).

8 Click **Auto Detect** in the **EmboGuide** control panel to automatically identify all feeding vessels for the selected lesion segmentation.

NOTE
The Auto Detect function removes all previously defined feeding vessels, including manually defined feeding vessels. If you have already defined feeding vessels manually before using Auto Detect, you will have to define these feeding vessels again to add them to the embolization plan if they are not detected automatically. Previously defined feeding vessels are also deleted when you modify an existing lesion or add a new lesion.

Feeding vessels are marked with a line along their length from the lesion segmentation to the catheter insertion point. They are visible in all views. The currently selected feeding vessel is marked with a red line.

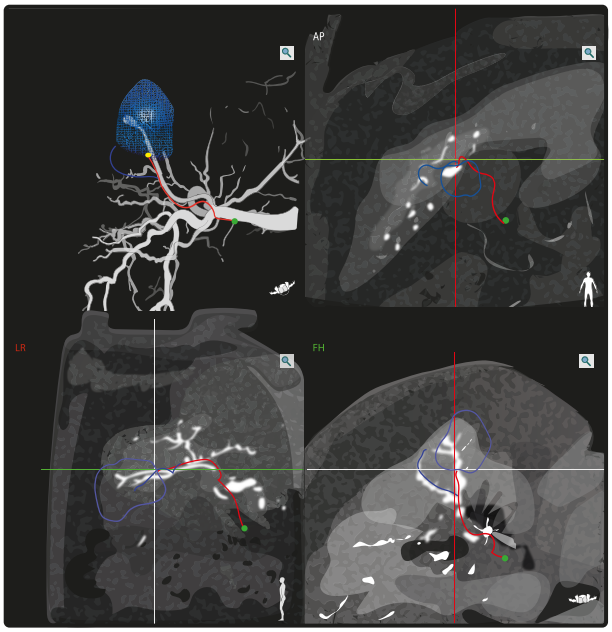


Figure 13 **Planning** workflow step, with feeding vessels detected

NOTE
To use Auto Detect, at least one lesion segmentation must be performed.

9 Verify that the feeding vessels have been correctly defined in the orthogonal views.

You can view the vessels from multiple orientations and positions using the **Rotate** tool, **Zoom** tool, **Pan** tool, and **Position interactor** tool on the toolbar.

You can also adjust the visualization of the vessels using the **Contrast and Brightness** tool or the **Render Mode** tool.

10 To add a feeding vessel manually, do the following:

- Locate the feeding vessel that you want to add to the embolization plan.
- Click **Add Feeder** in the **EmboGuide** control panel.
- Click on the distal point of the feeding vessel (the point at which it connects to the lesion).

The feeding vessel is marked with a line along its length to the catheter insertion point.

NOTE
A lesion segmentation does not have to be performed to add a manual feeding vessel.

11 Verify the feeding vessel in the orthogonal views.

12 If the feeding vessel is incorrectly defined, or if you want to remove the feeding vessel, click **Delete** in the **EmboGuide** control panel.

13 To view the path of a feeding vessel using an interactive marker, do the following:

- Click the feeding vessel to select it.
- Drag the feeding vessel slider in the **EmboGuide** control panel.

As you drag the slider, a marker traces the path of the selected feeding vessel in the 3D view. In the orthogonal views, the position of the marker (as viewed in the 3D view) is centered in the view.

14 To show or hide currently defined feeding vessels, select or clear the **Show Feeders** check box in the **EmboGuide** control panel.

15 To add a landmark indicating a point of interest, locate the point in one of the 2D orthogonal views, and then click the point to place a marker.

Markers are displayed in all views.

NOTE
You cannot move a landmark after it has been placed, but you can delete it, if desired.

16 To delete the last landmark, click **Delete Last** in the **EmboGuide** control panel.

17 To delete all landmarks, click **Delete All** in the **EmboGuide** control panel.

4.2.5 Performing live guidance

This procedure provides details of the **Guidance** task.

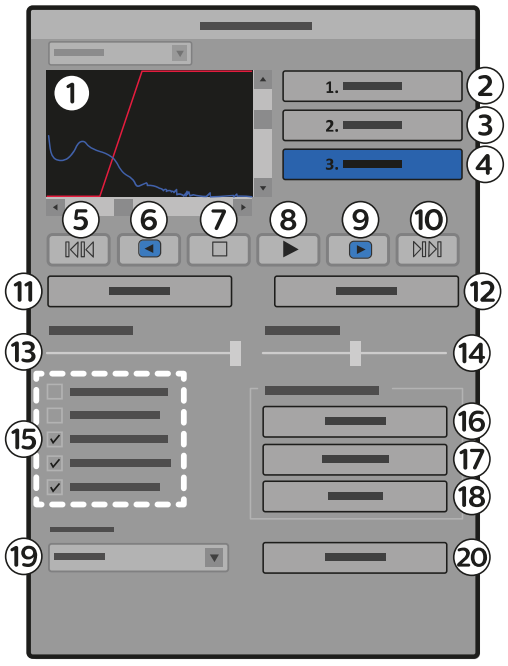


Figure 14 **Guidance** control panel

Legend			
1	Histogram	13	Landmarking slider
2	Segment workflow step	14	Blending slider
3	Planning workflow step	15	Visualization options • Catheter Boost • Reverse Angle • Invert Overlay • Show Aneurysm • Auto Cycle
4	Guidance workflow step		
5	Previous Run (run review)		
6	Previous Image (run review)		
7	Stop (run review)		
8	Play (run review)	16	Manual (motion compensation)
9	Next Image (run review)	17	Automatic (motion compensation)
10	Next Run (run review)	18	Reset (motion compensation)
11	Save Movie	19	Lesion selector
12	Save Run	20	Full Screen

1 Click **Guidance** in the **EmboGuide** control panel to start the live guidance workflow step.

The main display area displays a single 3D view, with the orientation of the 3D volume corresponding to the orientation of the C-arc.

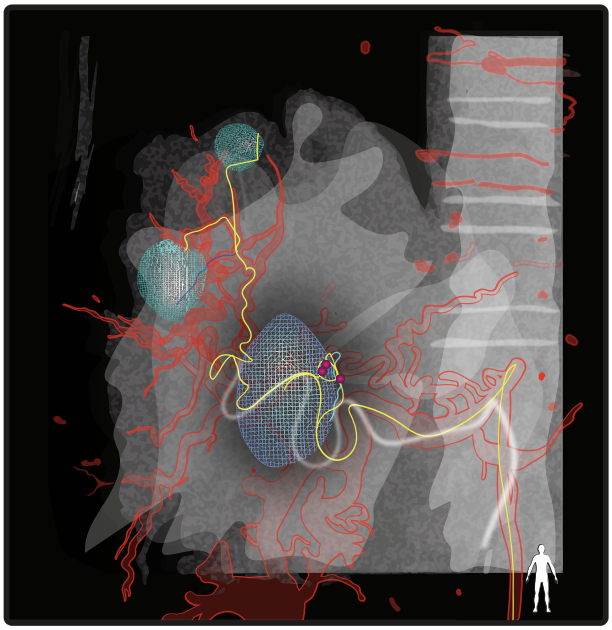


Figure 15 Guidance workflow step

The overlay volume is hidden; it is not required during live guidance because the lesion segmentation is visible as a colored graphic in the view.

2 Use the lesion selector in the **EmboGuide** control panel to select the lesion segmentation that you want to treat.

The lesion segmentation is displayed with feeding vessels marked in the main display area.

You can also select a lesion by clicking on it in the main display area.

3 Start fluoroscopy.

EmboGuide automatically switches to full-screen mode and overlays the live X-ray images on the 3D volume.

If Follow C-arc is enabled, it ensures that the orientation of the 3D volume corresponds to the orientation of the stand. An indicator in the stand viewport area is enabled when Follow C-arc is active.

2D-3D registration is performed automatically in the following situations:

- The patient orientation of each new 2D live series is equal to the patient orientation of the primary volume.
- For systems without image beam rotation:
  - The L-arm is not moved from the position where the 3D acquisition was acquired.
- For systems with image beam rotation:
  - The L-arm is moved to any of the following positions: -135, -90, -45, 0, 45, 90, or 135 degrees.
  - The difference between the current L-arm position and the L-arm position from where the 3D rotational scan was acquired must be ≤90 degrees.

If the L-arm is moved, a message is displayed to inform you that the alignment must be checked and correction performed manually, if necessary.

4 Use the combined image to guide the catheter to the target position and inject embolization substances in the feeding vessels.

Contrast is not needed.

5 During live guidance, you can configure the following visualization options in the **EmboGuide** control panel:

- **Landmarking**: Drag this slider to the left or right to modify the landmarking factor. The landmarking factor controls the amount of additional detail displayed around the vessels.
- **Blending**: Drag this slider to the left or right to modify the blending factor. The blending factor controls the contribution of the reference volume and the 2D overlay image to the overall composite image displayed in the main display area.
- **Catheter Boost**: The catheter boost filter improves the visibility of the catheter in the 2D overlay image when it is superimposed on the 3D volume.
- **Reverse Angle**: Viewing the 3D volume from the reverse angle can sometimes improve visibility if there is a structure blocking the view of the anatomy.
- **Invert Overlay**: This option inverts the color settings of the live X-ray run in the main display area.
- **Show Aneurysm**: This option is not used in EmboGuide.
- **Auto Cycle**: When this option is switched on, guidance series are replayed continuously after fluoroscopy is stopped. When this option is switched off, only the last image is displayed.

6 If automatic motion compensation is not enabled (for example, during an abdominal procedure), you can manually correct mismatches in the registration between the 3D image and the live X-ray image without leaving the live guidance workflow step. To correct the registration manually, do the following:

- Stop acquisition of live X-ray images.
- Click **Manual** in the **EmboGuide** control panel to enter manual correction mode. The last X-ray image is overlaid on the 3D view.
- Drag the 3D view to align it with the X-ray image.
- To undo your changes and start over, if desired, click **Reset** in the **EmboGuide** control panel.
- When the 3D view and the X-ray image are aligned, click **Manual** again to leave manual correction mode.
- Start acquisition of live X-ray images and continue with live guidance. The registration of the 3D view and the live X-ray images is automatically updated with your correction.

NOTE
Automatic motion compensation is only available for neuro or intercranial stent procedures.

7 Optional step: You can move to a different working position by moving the table, the C-arc, or the L-arm during acquisition.

8 Stop fluoroscopy when embolization of the lesion is complete.

9 Optional step: After the guiding the catheter, you can review and store the live run on the Interventional Tool.

For details, see Reviewing and storing runs (page 37).

10 If there are more lesions in the embolization plan, press **Lesions** on the touch screen module, and then press **Next Lesion** to select the next lesion.

11 Move the X-ray system stand to the working position for embolization of the displayed lesion and repeat this procedure until all lesions have been treated.

4.2.6 Reviewing and storing runs

This procedure provides details of reviewing and storing series.

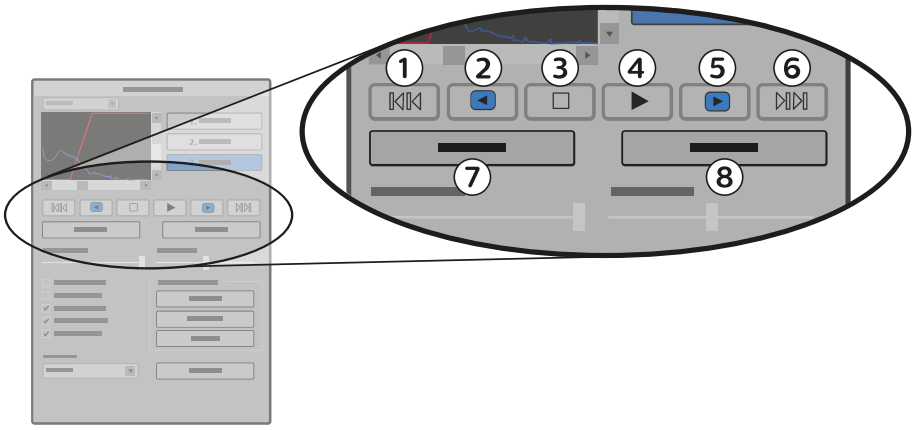


Figure 16 Run review controls in the **EmboGuide** control panel

Legend			
1	Previous Run	5	Next Image
2	Previous Image	6	Next Run
3	Stop	7	Save Movie
4	Play	8	Save Run

1 If acquisition of live X-ray images is in progress, stop acquisition.

2 Use the following run review controls in the **EmboGuide** control panel to review previously acquired runs.

- **Play**: Starts playback of the current run, starting from the first image. The run loops back to the beginning after last frame is displayed.
- **Stop**: Stops playback of the current run and displays the last viewed image.
- **Previous Image**: Steps through the images of the run frame by frame in the backward direction.
- **Next Image**: Steps through the images of the run frame by frame in the forward direction.
- **Previous Run**: Switches run review to the first image of the stored run before the currently displayed run, if available.
- **Next Run**: Switches run review to the first image of the run after the currently displayed run, if available.

During run review, the X-ray images are overlaid on the 3D view.

3 To store the currently displayed run of X-ray images, click **Save Run** in the **EmboGuide** control panel.

The run is stored without the 3D view.

NOTE
You can store the last acquired run only.

NOTE
Save Run is also available from the shortcut menu in the main display area or when full-screen mode is enabled.

4 To save a movie of the 3D view overlaid with the currently displayed run of X-ray images, click **Save Movie** in the **EmboGuide** control panel.

NOTE
Patient information that is displayed in the main display area when you save the movie is included in the movie and cannot be removed or de-identified later. To save a movie without displaying patient information, turn patient information off in the View Settings menu before saving the movie.

4.2.7 Assessing the intervention

You can use the **XperCT** function to compare XperCT or CBCT runs from before and after the intervention to assess the results of the intervention.

1 After the intervention, acquire an XperCT or CBCT run.

The run is automatically opened in the **XperCT** slab viewer.

2 Click **Overlay** in the **XperCT** control panel and select the XperCT or CBCT run that was acquired before the intervention.

3 Register the overlay volume with the primary volume.

For details of using the **XperCT** function, refer to the XperCT Dual Instructions for Use.

4 Examine the overlay volume and the primary volume at the location of the lesion (visible in the overlay volume) to assess the results of the intervention.

You can view the displayed slabs from multiple orientations and positions using the **Rotate** tool, **Zoom** tool, **Pan** tool, and **Position interactor** tool on the toolbar.

You can also adjust the visualization of the slabs using the **Contrast and Brightness** tool or the **Render Mode** tool.

Using **Dual View** in the **XperCT** function, you can view the two volume side-by-side for comparison.



5 Use the **Snapshot** tool on the toolbar to generate images for inclusion with the report of the intervention.

5 Touch screen module

The touch screen module option provides access to EmboGuide functions for performing live guidance in the examination room.

NOTE
It is only possible to use the touch screen module for the active examination on the X-ray system. The run, volume, or model that is open on the Interventional Workspot must be from the patient that is selected on the X-ray system.

5.1 Touch screen module functions - EmboGuide

To access the EmboGuide functions on the touch screen module, press the **Tools** main task button, then press **Interventional Tools**, and then press **EmboGuide**.



Histogram: Displays the Histogram functions.

Window Width: Adjusts the window width in the histogram.

Window Level: Adjusts the window level in the histogram.

Reset: Resets the histogram settings.

Volume: Selects either the primary volume or the overlay volume

Hide Volumes: Displays the Hide Volumes functions:

Hide Primary: Hides the primary volume.

Hide Overlay: Hides the overlay volume.

Motion Compensation: Displays the Motion Compensation functions:

Pan: Moves the 3D view. Use the directional arrows to align the 3D view with the X-ray image.

Manual: Turns manual motion compensation on or off.

Automatic: Turns automatic motion compensation on or off.

Reset: Resets any movements that you have made using the **Pan** function.

NOTE
If you use Manual motion compensation and then switch it off, the movement arrows remain active after it is switched off. Pressing one of the arrows switches Manual motion compensation on again.

Reset View: Resets the view to the initial position and zoom factor.

Review: Displays the Review functions:



Play: Starts playback of the current run, starting from the first image. The run loops back to the beginning after last frame is displayed.



Stop: Stops playback of the current run and displays the last viewed image.



Previous Run: Switches run review to the first image of the stored run before the currently displayed run, if available.



Previous Image: Steps through the images of the run frame by frame in the backward direction.



Next Image: Steps through the images of the run frame by frame in the forward direction.



Next Run: Switches run review to the first image of the run after the currently displayed run, if available.

View Options: Displays the View Options functions:



Contrast: Adjusts the contrast of the live X-ray run.



Brightness: Adjusts the brightness of the live X-ray run.

Blending: Adjusts the blending factor, which controls the contribution of the reference volume and the 2D overlay image to the overall composite image displayed in the main display area.

Landmarking: Adjusts the landmarking factor, which controls the amount of additional detail displayed around the vessels.



Invert: Inverts the color settings of the live X-ray run in the main display area.

Render Mode: Displays the Render Mode functions:

Volume: Applies the Volume render mode to the 3D view.

Shaded Surface: Applies the Shaded Surface render mode to the 3D view.



Snapshot: Takes a snapshot of the main display area.



Store Run: Stores the currently displayed run of X-ray images.

Lesions: Displays the Lesions functions:

Previous Lesion: Selects the previous lesion segmentation.

Next Lesion: Selects the next lesion segmentation.

None: Hides all lesion segmentations.

All: Displays all lesion segmentations.

Reverse Angle: Views the 3D volume from the reverse angle, which can sometimes improve visibility if there is a structure blocking the view of the anatomy.

Catheter Boost: Turns the catheter boost filter on, which improves the visibility of the catheter in the 2D overlay image when it is superimposed on the 3D volume.



Pan: Adjusts the position of the combined overlay image in the main display area.



Zoom: Adjusts the zoom factor of the combined overlay image in the main display area.

6 Maintenance

Clinical application is not allowed during maintenance and service.

Planned Maintenance
Planned maintenance is performed by qualified and authorized personnel. The frequency of planned maintenance depends on the X-ray equipment in use. The following program represents the minimum frequency:

- Geo verification should be performed every 12 months.

Philips provides a full planned maintenance and repair service on both a call basis and a contract basis. Full details are available from your Philips representative.

User Maintenance
CBCT calibration can be performed by the operator without assistance from technical support. The following schedule is recommended:

- CBCT calibration should be performed on each day that CBCT image acquisition is planned.
- CBCT calibration should be performed in the morning, prior to CBCT image acquisition.

For information about performing CBCT calibration, see the following section.

When you perform maintenance as the operator, you should always take all practical steps to make sure that the planned maintenance program is fully up to date before using the product with a patient.

6.1 CBCT Calibration

You can perform CBCT calibration without assistance from technical support. For example, if you notice artifacts in CBCT acquisitions, you should perform CBCT calibration. Calibration should not be performed from inside the examination room.

NOTE
The following procedure is automated. Follow the instructions provided on-screen, and interact with the system when instructed to do so.

1 On the **System** menu of the X-ray system, click **CBCT Calibration**.

2 In the **CBCT Calibration** dialog box, select a **Scan Type**:
   - **Propeller**
   - **Roll**

3 Follow the instructions provided in the **CBCT Calibration** dialog box to position the stand and table for the calibration procedure.

4 Click **Start Calibration** and press and hold the acquisition hand switch or foot switch.

   The system performs the calibration procedure.

5 Release the acquisition hand switch or foot switch when the system indicates that the calibration procedure is finished.

   NOTE
   If you release the hand switch or foot switch before the calibration procedure is complete, press the switch again to continue the procedure.

6 To stop the calibration procedure while it is in progress, click **Abort**.

7 Security

For more information about security and privacy relating to this product, and to find out more about your responsibilities, refer to the Instructions for Use for Philips Interventional Workspot.

8 Glossary

Abbreviations

Abbreviation	Explanation
2D	2-Dimensional
3D	3-Dimensional
AP	Antero-Posterior (slab orientation, from front to back)
CBCT	Cone-Beam Computed Tomography
CT	Computed Tomography
DICOM	Digital Imaging and Communications in Medicine
ID	Identification
JPEG	Joint Photographic Experts Group
MIP	Maximum Intensity Projection
MPR	Multiplanar Reconstruction
MR	Magnetic Resonance
PA	Postero-Anterior (from back to front)
Sum	Summation - summed up voxel values
WL	Window Level
WW	Window Width

9 Appendix

This section provides background information and reference information for EmboGuide.

9.1 Menus

The following menus are available in the View screen.

File menu		
Menu item	**Function**	
Exit	Closes the software and displays the log on screen for the next operator	

View Settings menu		
Menu item	**Function**	
Patient Info Items in the Patient Info submenus can only be displayed if the corresponding item is entered at acquisition	Turns patient information on or off in the main display area	
	Submenus:	
	None	
	Essential	Patient name
		Rotation
		Angulation
		Subtraction indicator
	All Additional to items displayed under 'Essential':	Date of Birth
		Gender
		Patient ID
		Exam ID
		Exam date
		Run number
		Run date
		Run time
		Hospital
		Physician
		Cube size
		Stand position
Axes	Turns the axes on and off in the main display area	
Cubebox	Turns the cubebox on and off in the main display area	
Orientation Indicator	Turns the orientation indicator on and off in the main display area	
Histogram Value	Turns the display of WW and WL settings in the histogram on or off	
Patient Orientation	Opens the patient orientation dialog to allow the operator to set the orientation of the patient (during the acquisition run), if applicable	
Configure Tool Buttons	Opens the tool buttons dialog to allow the operator to set the show\hide settings for each tool button	

Display menu		
Menu item	**Function**	
Switch to Patient Screen	Displays the Patients screen	
Switch to Print Screen	Displays the Print screen	
Switch to Export Screen	Displays the Export screen	
Viewing Mode	Switches the main display area between viewing modes	
	Submenu:	
	Normal View	
	Ortho View	

Display menu	
Menu item	**Function**
Render Mode	Switches the reconstruction between render modes
	Submenu:
	Volume Rendered
	Volume Color Rendered
	Gradient Rendered
	Shaded Surface
	SUM
	MIP
Render Quality	Adjusts the rendering quality when the render mode is Volume Rendered or Volume Color Rendered
	Submenu:
	Normal
	High
Filter	Turns the image sharpening filter on or off
	Submenu:
	Off
	Sharpen
	Sharpen More
Default View	Sets the reconstruction to a default view
	Submenu:
	AP
	PA
	Lateral Left
	Lateral Right
	Caudo Cranial
	Cranio Caudal
Reset View	Resets the view to the initial position, orientation and zoom
Reset Histogram	Resets the window levels of the Histogram to the initial settings
Invert	Inverts the colors in the main display area
Hide Primary volume	Hides the primary volume when Overlay is enabled
Hide Overlay volume	Hides the overlay volume when Overlay is enabled
Segmented / Unsegmented	Switches between 3D mode (segmented) or Slab mode (unsegmented) for the overlay volume

Tools menu	
Menu item	**Function**
Snapshot	Records a snapshot of the contents of the main display area (JPEG format, compatible with DICOM)
Stereo Snapshot	Records two snapshots of the contents of the main display area from different angles (JPEG format, compatible with DICOM)
VRML	Creates a VRML file of the reconstruction. VRML files are 3D models of the reconstruction. They can be exported and/or viewed using a web browser VRML files of CT, MR or 512^3 volumes are not permitted
Histogram	Activates the Histogram control panel
New Reconstruction	Activates the New control panel
Views	Activates the Views control panel
Analysis	Not used in the software
Measurement	Activates the Measurement control panel
Cut	Activates the Cut control panel
Movie	Activates the Movie control panel

Tools menu	
Menu item	**Function**
Subtraction	Not used in the software
Overlay	Activates the Overlay control panel
MPR	Activates the MPR control panel
XperCT	Activates the XperCT control panel
EmboGuide	Activates the EmboGuide control panel
Segmentation	Activates the Segmentation control panel
Annotation	Activates the Annotation toolbar function
Autospin	Turns Autospin on and off. Autospin allows you to rotate a reconstruction indefinitely in the main display area

Help menu	
Menu item	**Function**
About	Opens a window displaying further information about the software. Click OK to close the window
Help	Opens the electronic Instructions for Use

9.2 Direct mouse manipulation

You can access short cuts to tools using the mouse buttons and the mouse wheel (direct mouse manipulation).

9.2.1 Left mouse button

The left mouse button is always used for clicking buttons, controls and menus in the control panel area and the menu bar. In the main display area, the function of the left mouse button depends on the active tool.

Available actions are indicated by the mouse cursor when it is positioned in the main display area.

Standard mode		
The following actions are performed when the mouse is positioned over an object and dragged with the left mouse button		
Annotation border		Select and move annotation
Annotation content		Select annotation and place edit cursor at mouse position
Arrow		Move arrow
Slab - anchor point		Move slab along its normal path
Slab		Rotate slab
Slab		Move slab along its normal path

Rotate volume mode	
When the **Rotate volume** tool is active, the left mouse button rotates the volume	
	Rotate the volume freely in any direction

Rotate axis mode	
When the **Rotate axis** tool is active, the left mouse button rotates the volume around an axis	
	Drag to rotate the volume around an axis X axis - drag left and right Y axis - drag up and down

Pan mode	
When the **Pan** tool is active, the left mouse button pans the image	
	Pan the display in the direction of the mouse movement

Zoom mode	
When the **Zoom** tool is active, the left mouse button zooms the image	
	Drag to zoom the image Drag up to zoom in Drag down to zoom out

Contrast and brightness mode	
When the **Brightness and Contrast** tool is active, the left mouse button modifies the contrast and brightness	
	Drag to modify the contrast and brightness Drag right to increase contrast Drag left to decrease contrast Drag up to increase brightness Drag down to decrease brightness

Position interactor mode	
When the **Position interactor** tool is active, the left mouse button changes the position of the slab	
	Drag to change the position of the slab Drag up to move forwards through the volume Drag down to move backwards through the volume

Cut mode	
When **Cut** is active in the EmboGuide **Planning** workflow step, the left mouse button performs a cut action	
	Drag the pointer to draw a region that is cut automatically when the mouse button is released

Set Catheter Point mode	
In the EmboGuide **Planning** workflow step, this mode is enabled until a catheter point is set	
	Click to define the catheter insertion point at the pointer position in the 3D view.

Add Feeding Vessel mode	
In the EmboGuide **Planning** workflow step, this mode is enabled after you have set a catheter insertion point	
	Click on the end point of the feeding vessel (the point at which it connects to the lesion)

Add Landmark mode	
In the EmboGuide **Planning** workflow step, this mode is enabled when you click **Add** in the control panel to add a landmark in the main display area.	
	Click to add a landmark at the pointer position in the main display area

Lesion selection mode	
In the EmboGuide **Planning** workflow step, this mode is enabled when you position the pointer over a lesion	
	Click to select the lesion

XperCT measurement mode	
When **Measurement** is active in the **XperCT** function, the left mouse button makes measurements	
	Drag the mouse from the start to the end position -or- Click at the start position, then move the mouse and click at the end position

9.2.2 Right mouse button

The right mouse button has two main functions.

- Right-click (click and release) opens the context sensitive menu at the cursor position. This menu contains shortcuts for performing actions relevant to the situation and position of the cursor.
- Drag (click and hold) pans the image in the main display area. The mouse cursor changes to the pan cursor to indicate this function is active. When the right mouse button is released, the previously selected tool is restored.

Pan	
Dragging with the right mouse button pans the display	
	Pan the display in the direction of the mouse movement

9.2.3 Shortcut menu

Clicking the right mouse button once opens the shortcut menu at the cursor position.

This menu provides shortcuts to actions relevant to the current function and position of the mouse cursor. Menu items are available according the current context.

Context	Menu item	Action
Full-screen mode	Save Run	Stores the currently displayed run of X-ray images
General	Reset View	Resets the view to the initial position, orientation and zoom
Planning workflow step	Show All Lesions	Displays all lesion segmentations in the main display area
Guidance workflow step	Save Run	Stores the currently displayed run of X-ray images
Guidance workflow step: Manual motion correction	Reset Correction	Resets movements that you have applied to the 3D view during manual alignment with the X-ray image
Overlay	Define Center of Rotation	Sets the current location of the pointer as the center of rotation
Overlay	Reset Center of Rotation	Resets the center of rotation to the middle of the volume

9.2.4 Scroll wheel

The scroll wheel zooms the image in the main display area. This can be done either by turning the scroll wheel, or by clicking and dragging it:

Zoom	
The scroll wheel zooms the display (2 methods)	
	Turn the scroll wheel up to zoom in Turn the scroll wheel down to zoom out
	Click and hold the scroll wheel, then do one of the following: • Drag the mouse up to zoom in • Drag the mouse down to zoom out

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