

# QAngio XA 3D 2.0

## Quick Start Manual



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<https://www.medisimaging.com>

On the Medis website, select "Products" and then the applicable product group. The user documentation can be found on that page.

A PDF reader is required to access the user documentation. If a PDF reader is not installed on the system, you can download the free Adobe reader. Visit the Adobe website at <https://get.adobe.com/reader/> and click "Download Adobe Reader" to download the PDF reader.

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# Legal Notices

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# Regulatory Information

## Intended Use

QAngio XA 3D is software intended to be used for performing calculations in X-ray angiographic images of the coronary arteries. These calculations are based on contours which are automatically detected in two angiographic views of the same vessel.

QAngio XA 3D enables interventional cardiologists and researchers to obtain accurate anatomical quantifications of one or more lesions in the analyzed coronary vessel segment, to determine the functional significance of the individual and consecutive multiple lesions, and to assess the best viewing angles which can be helpful for optimal visualization of the lesion during PCI (percutaneous coronary intervention) treatment.

The analysis results obtained with QAngio XA 3D are intended for use by cardiologists and researchers:

- to provide quantitative results of coronary vessel segments based on a 3D reconstructed model;
- to inform the clinical decision making process with respect to the diagnosis and possible PCI treatment options of the coronary vessels;
- to evaluate the procedural success of such coronary interventions.

## Indications For Use

QAngio XA 3D is indicated for use in clinical settings where validated and reproducible quantified results are needed to support the assessment of coronary vessels in X-ray angiographic images, for use on individual patients with coronary artery disease.

When the quantified results provided by QAngio XA 3D are used in a clinical setting on X-ray images of an individual patient, they can be used to support the clinical decisions making for the diagnosis of the patient or the evaluation of the treatment applied. In this case, the results are explicitly not to be regarded as the sole, irrefutable basis for clinical diagnosis, and they are only intended for use by the responsible clinicians.

## QFR Usage

QFR results needs to be used in a “hybrid” QFR - FFR decision making approach:

- $QFR < 0.78$  sufficiently high sensitivity to treat the patient in the cathlab;
- $QFR > 0.84$ , sufficiently high specificity to follow the patient medically;
- QFR in the gray zone  $[0.78, 0.84]$ : use pressure wire and FFR measurement following the associated medical guidelines.

In order to obtain a correct QFR result, users need to be trained and certified by Medis Medical Imaging Systems.

## Limitations

The two 2D angiographic images used for the 3D vessel reconstruction need to be taken with at least 25 degrees difference in viewing angle.

QFR measurements have not been evaluated for non-coronary arteries, pediatric patients, and cardiac patients with the following conditions:

- Tachycardia with frequency above 100 bpm
- Systolic aortic resting blood pressure below 75 mm Hg
- Atrial fibrillation


nor for the following lesions and vessels:


- Culprit lesions in Acute Coronary Syndrome
- Bifurcation lesions with 1,1,1 Medina classification
- Aorto-ostial artery stenoses or ostial right coronary artery stenoses
- Distal Left Main lesions in combination with a proximal Circumflex lesion
- Vessels with retrograde fillings
- Bypass grafts
- Grafted coronary arteries
- Myocardial bridging

QFR measurements cannot be performed accurately under the following conditions:


- When no nitroglycerin has been administered either systemic nor intracoronary;
- Too much overlap of other vessels with the lesion or areas just around the lesion in the target vessel in one or both angiographic acquisitions;
- Too much foreshortening of the target coronary artery in one or both angiographic acquisitions.

## WARNINGS


 QAngio XA 3D must be used by cardiologists or trained technicians who are qualified to perform cardiac analysis. If the analysis results are used to reach a diagnosis, the results must be interpreted by a qualified medical professional. In clinical practice QAngio XA 3D should not be used for purposes other than those indicated in the section Intended Use.

 Users must have sufficient proficiency in the selected operating language, read this manual, become familiar with the software, and must be certified by Medis before using QAngio XA 3D in a clinical environment in order to obtain reliable analysis results.

## Note on Monitor Aspect Ratio and Resolution

 The shapes of objects and calipers displayed may get slightly distorted when the resolution is set to an aspect ratio different than the monitor's physical aspect ratio. This distortion does **NOT** affect the accuracy of measurements or analyses. To avoid distortion, set the resolution of the monitor to an aspect ratio equal to the physical aspect ratio. LCD monitors typically operate best at their native resolution. Microsoft Windows recommends a resolution when it has sufficient information to do so.

## European Regulations

 <p>1639</p>	<p>QAngio XA 3D is qualified as a class IIa medical device. It complies with the requirements of the Dutch Medical Devices Decree (Besluit Medische Hulpmiddelen, Stb. 243/1995) and the European Medical Device Directive 93/42/EEC.</p>
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## North American Regulations

QAngio XA 3D complies with the requirements of the Canadian Medical Devices Regulations and has been licensed as a Class II medical device.

## South American Regulations

QAngio XA 3D complies with the requirements of the Brazilian National Health Surveillance Agency and has been licensed as a Class II medical device.

## Asia-Pacific Regulations

QAngio XA 3D complies with the requirements of the Australian Therapeutic Goods Administration and has been licensed as a Class IIa medical device.

QAngio XA 3D complies with the requirements of the Singapore Health Sciences Authority and has been licensed as a Class B medical device.

QAngio XA 3D complies with the requirements of the Indonesian National Agency of Drug and Food Control and has been licensed as a Class IIa medical device.

QAngio XA 3D complies with the requirements of the Malaysian Medical Device Authority and has been licensed as a Class B medical device.

# Conventions Used

The following conventions are used throughout this manual to indicate mouse and keyboard actions and to refer to elements in the user interface.

## Mouse

Click	Press and release the primary mouse button. If you are left-handed, you may have set the right mouse button as your primary mouse button.
Click and drag	Press and hold the primary mouse button. Drag the mouse to perform a function. Release the primary mouse button. If you are left-handed, you may have set the right mouse button as your primary mouse button.
Right-click	Press and release the secondary mouse button. If you are left-handed, you may have set the left mouse button as your secondary mouse button.
Middle-click	Press and release the wheel button or the middle mouse button. If you have a two-button mouse, press and release the left and the right mouse button simultaneously.
Double-click	Press and release the primary mouse button twice.
Wheel	Rotate the mouse scroll wheel.

## Keyboard

SHIFT+click	Press and hold down the SHIFT key on your keyboard while you click a button or object.
CTRL+K	Press and hold down the CTRL key on your keyboard while you press K, then release both keys.

## Typographical Conventions

On the <b>Annotations</b> node of the <b>Procedures</b> pane...	Names of buttons, fields, menus, menu options, and tab names are capitalized and in bold.
<b>Procedures &gt; Text Annotation</b>	A sequence of menu options that you select to perform a specific task is indicated by angular brackets.
Label: <code>Aortic root</code>	Text that you type or that appears on the screen, such as annotation labels, is displayed in <code>Courier New</code> .



## Symbols Used



**Tip:** Provides helpful information or an alternative working method.



**Note:** Brings additional information to your attention.



**Caution:** Tells you to be careful when performing a task.



**Warning:** Warns you for a potentially dangerous situation in the image representation or analysis, which may lead to incorrect results. You are advised to follow the instructions to avoid this.

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# Introduction

## 1 About QAngio XA 3D

QAngio XA 3D is the Medis software solution for the quantification of coronary vessels in 3D using two angiographic projections.

## 2 System Requirements

### 2.1 Hardware

#### QAngio XA 3D:

- Intel or compatible quad-core processor
- 4 GB of RAM
- 250 GB of available hard disk space  
(if you want to store images locally, make sure you have enough disk space)
- 3-button mouse, scroll-wheel recommended
- CD-ROM player to install the software from CD-ROM
- Widescreen monitor supporting a minimum resolution of 1920x1080 pixels
- Video card supporting OpenGL and with 512 MB memory
- Network interface card of at least 100MBit/s to access, receive, and send images over the network

#### Sentinel license server:

- Intel or compatible processor with a minimum speed of 550 MHz
- 128 MB of RAM
- 1 GB of available hard disk space
- Network interface card

#### NOTES:

- All hardware must be compliant with the operating system
- For the license server, a PC with a fixed IP address or a reserved IP address in the DNS server is strongly recommended

### 2.2 Operating System

#### QAngio XA 3D:


- Microsoft Windows 7, SP1, 64 bit version
- Microsoft Windows 8.1, 64 bit version
- Microsoft Windows 10, 64 bit version
- Microsoft Windows Server 2008 R2, SP1, 64 bit version
- Microsoft Windows Server 2012 R2, 64 bit version
- Microsoft Windows Server 2016, 64 bit version

#### Sentinel license server:

- Microsoft Windows 7, 32 and 64 bit version
- Microsoft Windows 8, 32 and 64 bit version
- Microsoft Windows 8.1, 32 and 64 bit version
- Microsoft Windows 10, 32 and 64 bit version
- Microsoft Windows Server 2008, 32 and 64 bit version
- Microsoft Windows Server 2008 R2, 64-bit version
- Microsoft Windows Server 2012, 64-bit version
- Microsoft Windows Server 2012 R2, 64-bit version
- Microsoft Windows Server 2016, 64 bit version

## 3 Support

Medis is committed to offering high-quality products and services. If you have questions about the software or if you would like to make suggestions for improvements in the software or in the documentation, please contact the Medis helpdesk.

If you contact the Medis helpdesk by e-mail, mention the name of the software and the version number in the subject field. To look up the version number of your software, select  > **Help** > **About** from the Medis Suite Main toolbar.

### North and South America

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## 4 Startup from Medis Suite

To enhance your image processing workflow, QAngio XA 3D is launched from Medis Suite in different analysis modes. Each launch mode will provide a different image analysis option, with dedicated functionality and viewport layouts.

The following launch modes for QAngio XA 3D are available in Medis Suite:



3D Single vessel analysis



3D Bifurcation vessel analysis



QFR: quantitative flow reserve analysis

Detailed information on how to start the QAngio XA 3D app and load images is described in the Medis Suite user manual.



Availability of the launch modes is dependent on the available licenses. If you would like to purchase a license for one or more of the QAngio XA 3D analysis modules, please contact Medis.

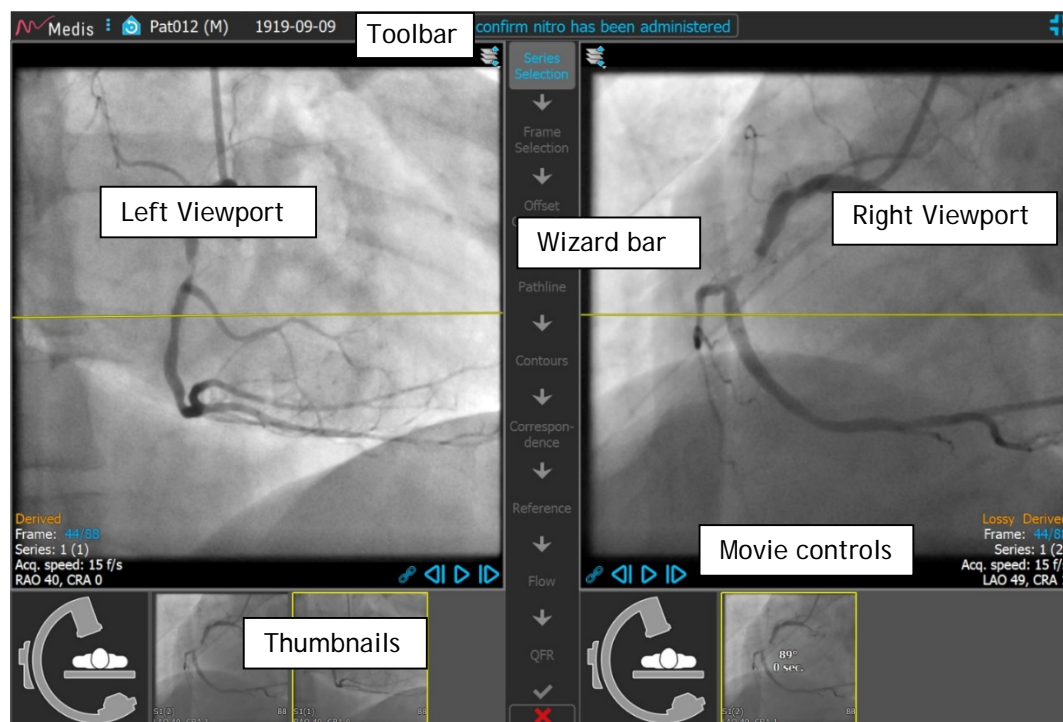


You can load the patient images before or after starting QAngio XA 3D. In both cases the images will automatically be loaded into QAngio XA 3D.

## 5 QAngio XA 3D Workspace

### 5.1 Overview


The main workspace of QAngio XA 3D consists of viewports, a toolbar, a wizard bar and optional thumbnails.



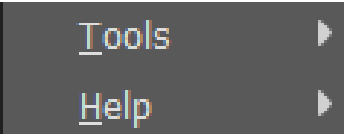
### 5.2 Menu

The main menu contains commands to activate the application functionality.

To make the menu visible:





- Click on the menu icon  in the toolbar of the QAngio XA 3D app.

The menu commands are organized into two main menus: **Tools** and **Help**. For some of these commands, tool buttons are available in the toolbars as shortcuts.

Menu	Command	Description
	Tools	Access to options and tools
	Help	Access to user documentation and information about Medis Suite and QAngio XA 3D



## 5.3 Toolbar

Icon	Function
	Show the menu
	Go to the initial view state, reset zoom \ pan \ window width \ window level
	Show the application in full screen mode. Only present if application is in windowed mode.
	Show the application in windowed mode. Only present if application is in full screen mode.

Besides these icons the toolbar also shows the patient's name, gender and birthdate.

The toolbar is also used for interactive text messages and resulting status.

E.g. After selecting the series in a QFR analysis, it blinks in orange: "Click here to confirm nitro has been administered. After confirmation this changes to "Nitro confirmed" (not blinking).

## 5.4 Wizard bar

The vertical wizard bar is shown between the two viewports and represents the steps required to perform the analysis. The content of the wizard bar is dependent on the analysis you are performing: 3D single vessel, 3D bifurcation, or QFR.

## 5.5 Context menu

A context menu can be activated by clicking the right mouse button in a viewport, diagram or table. The contents of this menu is dependent on the analysis you are performing, the clicked item, the wizard step and the state within a step.

# Working with QAngio XA 3D

## 6 Viewing

### 6.1 Image viewports

Many analysis wizard steps have two image viewports that can display two matching images of the same study. See 7.1 Wizard Step 1: Series selection for info about the image requirement.

#### 6.1.1 Resizing a viewport

To maximize a viewport:

- Double-click the viewport.

This maximizes the viewport, so that it takes up the maximum space.

To return to the original viewport layout:

- Double-click the image again.

#### 6.1.2 Mouse mode

The behavior of the left mouse button depends on the mouse mode: stacking, zooming, panning, or window width and level. The active mouse mode is displayed in the mouse mode icon in the top corner of the image viewport.

To cycle through the different mouse modes:






- Select the mouse mode icon to activate the next mouse mode.

To activate a specific mouse mode:

- Select and hold the mouse mode icon until it shows the mouse mode menu, and select the requested mouse mode.






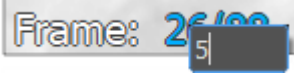
Or;

- Right click in the image viewport to activate the viewport context menu, and select the requested mouse mode from the menu.

Icon	Function	Result of dragging the mouse			
		Up	Down	Left	Right
	Stacking	Previous frame	Next frame	Previous frame	Next frame
	Zooming	Zoom in	Zoom out	-	-
	Panning	Image up	Image down	Image left	Image right
	Window width/level	Decrease level (darker)	Increase level (brighter)	Decrease window (more contrast)	Increase window (less contrast)
	Rotate	Rotate around the axis perpendicular on the mouse movement. Only available in the 3D viewport.			


### 6.1.3 Frame selection


You can move forward or backward through frames in the image in several ways. Moving through frames only applies to the selected viewport, unless synchronization is active, see 6.1.4 Synchronization. The active frame number is shown at the bottom of the viewport.

Action	Button in Viewport	Key on keyboard	Mouse scroll wheel	Left mouse button (stacking mode)
Select next frame		→	Scroll down	Mouse drag right or down
Select previous frame		←	Scroll up	Mouse drag left or up
Select first frame		Home		
Select last frame		End		
Play the cine forward		Ctrl + →		
Play the cine backward		Ctrl + ←		
Stop playing the cine				
Toggle synchronization				
Select frame	Right click on the frame number in bottom corner of the viewport and enter the frame number. E.g. 			

### 6.1.4 Synchronization

Frame synchronization helps you to simultaneously navigate through images in both viewports. The image in the left viewport is considered as the primary image, and the image in the right viewport is considered secondary.


When synchronized, the  icon is shown at the lower part of the viewport. Both viewports will always show the image with the same frame number.

When not synchronized, the  icon is shown at the lower part of the viewport or no icon is shown at all. Changing the frame selection in one viewport does not affect the other viewport.




Frame synchronization is only available for corresponding biplane images.

To switch synchronization off:

- Click the  icon in the image overlay to switch off synchronization.

To switch synchronization on:

- Click the  icon in the image overlay to switch on synchronization.

## 6.1.5 Initial View State

To reset the zooming, panning and window width and level settings to the initial view state:

- In the toolbar, click  to reset the zooming, panning and window width and level.

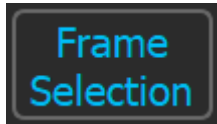


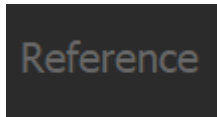


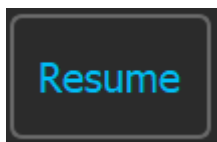
## 7 Performing an Analysis

QAngio XA 3D supports the analysis of single vessel segments in 3D, bifurcation vessel segments in 3D, and the analysis of the quantitative flow reserve (QFR).

To start an analysis, select the appropriate launch mode in Medis Suite (see also Chapter 4). Any images loaded in Medis Suite will be loaded automatically in QAngio XA 3D, and the analysis will be started.

For a new analysis, QAngio XA 3D will by default switch to full screen layout, providing you with the best window layout for the subsequent analysis steps. If you reload a Medis Suite session that has QAngio XA 3D analyses, they will be restored and activate QAngio XA 3D in review mode.

A wizard will guide you through the steps necessary to perform the analysis. The wizard steps are represented by the wizard bar between the two images. The wizard steps depend on the type of the analysis.

Wizard bar	
	Buttons with blue text on a dark background indicate completed steps. Any of these buttons can be pressed to jump to the corresponding wizard step.
	The Button with blue text on a grey background indicates the active step.
	The button with the blue arrow can be pressed to proceed to the next step of the analysis. This button is only enabled when all required data for the active wizard step is available.
	Buttons with grey text on a dark background are disabled. The wizard step has not been performed.
	Cancel button. Select the button to cancel the analysis and discard all changes. For a new analysis, cancelling the analysis will close the QAngio XA 3D app and remove it from the Medis Suite session.
	Finish button. Select the button to complete the analysis. The wizard will be closed and QAngio XA 3D will show the analysis in review mode. The analysis results will become available in the Medis Suite report.
	When you have passed the Frame Selection step and activate another frame than the one used for the analysis, the wizard will be paused. All buttons in the wizard bar will be disabled except for a Resume button which will be displayed at the bottom of the wizard bar. Select the Resume button to activate the analysis frames, and resume the analysis.

## 7.1 Wizard Step 1: Series selection

The analysis starts with the series selection step. The objective of this step is to obtain two appropriate images to be used in the 3D reconstruction of the vessel segment.

### 7.1.1 Image requirements

QAngio XA 3D only loads DICOM greyscale XA images with square pixels (pixel aspect ratio 1:1) that include isocenter calibration data.

To perform the QFR analysis, it is advised to use non-hyperemic contrast images. If you need to perform QFR analysis on hyperemic images, please contact Medis to obtain a special license for that purpose.

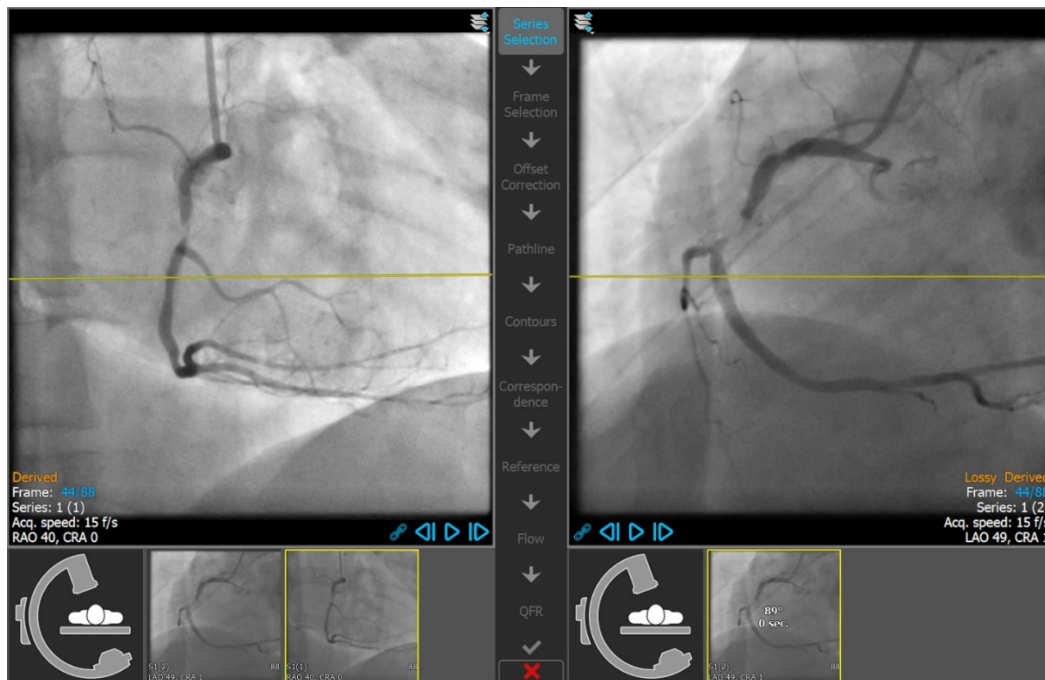
Once an image is loaded into the left-hand viewport, only images that will make a suitable analysis pair can be loaded into the right-hand viewport. The acquisition angle of the two images must be larger than 25°, and the images must be acquired less than 120 minutes apart.

### 7.1.2 Selecting from existing series

To select the two series for analysis:

1. Click on a thumbnail under the left viewport.
    - The image will be loaded in the left viewport.
    - Thumbnails of matching images appear under the right viewport.
  2. Click on a thumbnail under the right viewport (not needed if already loaded)
    - The image will be loaded in the right viewport
  3. In case of a QFR analysis click on the blinking text in the toolbar to confirm that nitroglycerin has been administered.
- If only one image is loaded (in the left-hand viewport), the yellow line indicates the projection of an image with acquisition angles as set in the **Acquisition** guide.
  - If both images are loaded, on each image the projection line of the other image is shown. The projection line represents the X-ray beam that hits the center of the other image.

Best results are obtained when this line is perpendicular to the vessel of interest.




### 7.1.3 Acquisition Guide

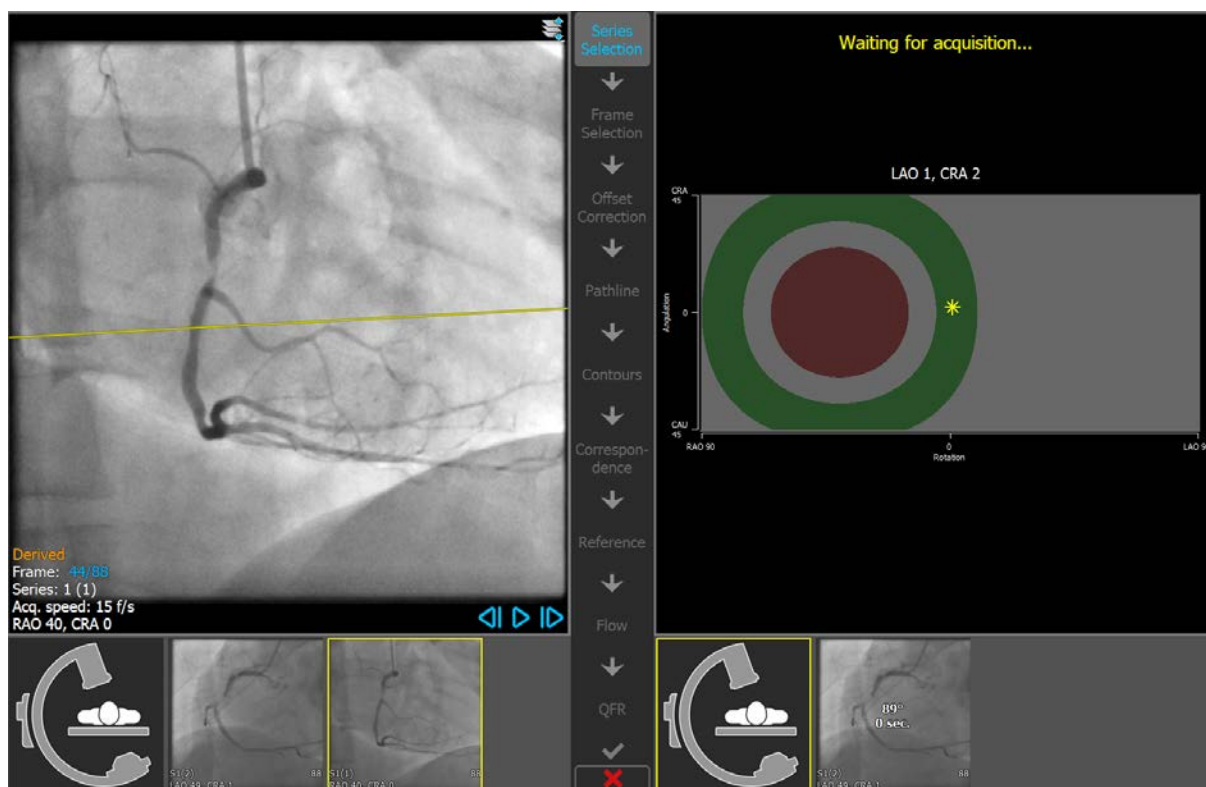
The Acquisition Guide helps to find suitable rotation and angulation angles for a matching second acquisition if the first acquisition is loaded in the left-hand viewport.

To view the acquisition guide:


- Click on the thumbnail with the C-arm image under the right viewport


For the selected rotation and angulation angle, marked with , the projection line is shown on the image in the left-hand viewport:





To change the rotation and angulation angle:

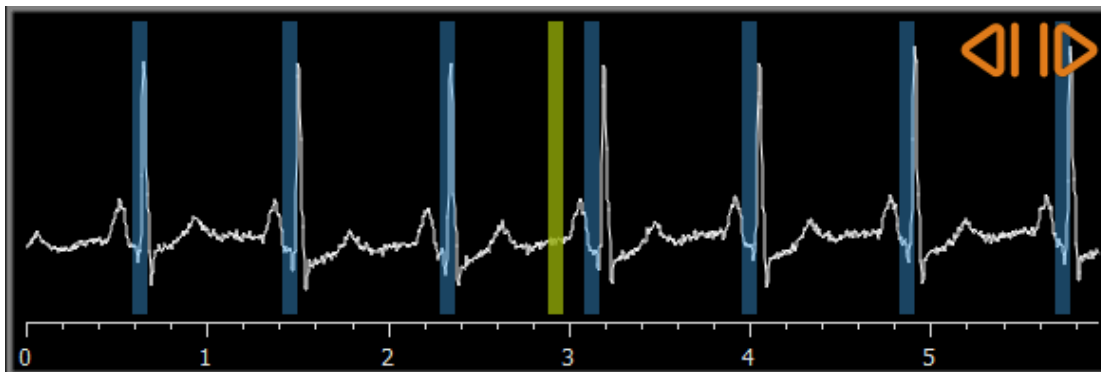
- Drag the marker  to the desired rotation and angulation.

Press  to proceed to the next step.

## 7.2 Wizard step 2: Frame selection

The objective of the frame selection step is to select a pair of frames to be analyzed. It is advised to select frames that are on (or just before) the end diastolic (ED) phase of the heart cycle.

If ECG signals are available with the image data, they will be displayed in a diagram underneath each image viewport.





To select a frame using the ECG diagram:


- Drag the green vertical bar to the desired location.

Or,

- Click in the ECG diagram to place the vertical bar (and thus select the related frame) directly at the desired location.

Or,

- Click on  to select the same phase in the previous cardiac cycle.
- Click on  to select the same phase in the next cardiac cycle.

Press  to proceed to the next step.

## 7.3 Wizard Step 3: Offset correction

The objective of the offset correction step is to provide an accurate image offset correction, allowing QAngio XA 3D to create a 3D space from the two images.

### To apply offset correction:

1. In the left-hand viewport, click on an anatomical landmark.

This will mark the landmark in the left viewport and display a corresponding projection line of this landmark in the right-hand viewport.

2. In the right-hand viewport, click on the same anatomical landmark.

This will mark the landmark in the right-hand viewport and display a corresponding projection line in the left-hand viewport. The offset correction is now performed automatically.

### To verify successful image offset correction:


- Click in the left-hand or right-hand viewport to select a landmark.

This will display a corresponding projection line in the other viewport, which can be checked with the anatomical landmark.

### To delete a checkpoint:

- With the right mouse button click on the circle in the image.

The circle and projection line in the other viewport will be removed.

Press  to proceed to the next step.

## 7.4 Wizard Step 4: Pathlines

The objective of the pathline step is to create a set of pathlines that define the vessel segment of interest.

### To create pathlines:

- Click in the left-hand viewport to mark the proximal point of the vessel segment.
- For a single vessel analysis, click once in the left-hand viewport to mark the distal point of the vessel segment.

For a bifurcation analysis, click twice in the left hand viewport to mark both distal points of the bifurcated vessel segments.

QAngio XA 3D will automatically detect the pathlines and contours in both viewports.

- If needed, drag the proximal or distal point(s) of the vessel segment in either the left- or right-hand viewport to correct their locations.


### To edit a pathline:

It might be that a wrong pathline is found (e.g. when the vessel is crossed by another vessel). In that case you can add one or more support points to guide the pathline through the segment of interest. If editing is required, correct the pathline before making corrections to the contours.

- Click a point on the pathline and drag it to the correct position.  
This creates a support point and redetects the pathline and the contours.
- If needed add more support points or drag existing support points to better locations.

### To delete a pathline support point:

- Right-click on the support point to delete it.  
The pathlines between the proximal and distal points and the contours are redetected automatically.

Press  to proceed to the next step.

## 7.5 Wizard Step 5: Contours


The objective of the contour step is to assert that the vessel contours are correct. You can verify and optionally correct the automatically detected contours. On entering the contour step for the first time, the image will be zoomed for a better look at the contours.

To edit a contour:

- Click a point on the contour and drag it to the correct position.  
This will create a contour support point and redetect the corresponding contour.
- If needed add more support points or drag them to better locations.

To delete a contour support point:

- Right-click on the support point.  
The point is deleted, and the corresponding contour is redetected.

Press  to proceed to the next step.

## 7.6 Wizard Step 6: Correspondence

The objective of the correspondence step is to assert that the correspondence between the diameter functions of the left and right projections is correct.

Two extra viewports are displayed: a 3D model of the analyzed vessel segment and one (single vessel) or two (bifurcation) diagrams with the diameter functions of both vessel projections. This diagram is very useful to evaluate how well the diameters correspond between the two images.

The first time this step is entered, the left viewport shows a correspondence marker in the vessel. This marker is also present in the diagram, but not yet in the right viewport.

**To evaluate the correspondence:**

- Examine the diameter functions in the diagram.
- Drag the correspondence marker in the left viewport or in the diagram.

A correspondence marker in the right viewport is created and moves along while you drag the marker in the left viewport, indicating how the two markers correspond.




For a bifurcation analysis, the correspondence markers will make one marker pair if they are placed in the proximal segment. They will make two marker pairs if they are placed in the distal segments, but they cannot be set independently from each other. The correspondence markers cannot be placed in the bifurcation core.

If you are not satisfied with the correspondence, you can force a corresponding location in the vessel.

**To force a corresponding location in the vessel:**

- Drag the correspondence marker in the left viewport to a position you want to correct, preferably an anatomical landmark that is also visible in the right image.
- Drag the correspondence marker in the right viewport to the same anatomical landmark.

The correspondence markers turn red to indicate that a corresponding location has been forced by the user. The diameter functions are recalculated. The 3D model and the diameter functions in the diagram are updated as result of the newly calculated diameter functions.

Press  to proceed to the next step.

## 7.7 Wizard Step 7: Reference

The objective of the reference step is to obtain correct reference diameter functions and lesions markers.

QAngio XA 3D will determine and display the following:

- The 3D vessel model, including optimal viewing angles and foreshortening.
- The 2D and 3D reference contours, indicating the vessel contours had the vessel been healthy.
- One or more lesions, each having a table displaying the following lesion parameters: percentage diameter stenosis, minimal lumen diameter (MLD), and the lesion length.



In a **3D Single Vessel analysis**, up to 3 lesions are automatically detected, and you will have an option to define a custom lesion.

In a **3D Bifurcation analysis**, up to 4 lesions are automatically detected, with a minimum of 1 and a maximum of 3 per bifurcation branch. There is no option for a custom lesion. No lesions will be automatically detected in the bifurcation core. The lesion identifier shows in which bifurcation branch the lesion was detected (e.g. "Lesion 1 (A)" is the first lesion that was detected in branch A).

For the selected lesion, QAngio XA 3D will display the following:

- The proximal (P) and distal (D) lesion markers, indicating the start and end of the detected lesion.
- The obstruction (O) marker, indicating the maximal obstruction in the lesion.

### 7.7.1 Correcting Reference Contours

#### 3D Single Vessel and QFR Analyses

There are two ways for correcting the reference contour:

- You can mark two healthy parts of the vessel segment as "normal areas".

Or:

- You can set a fixed reference diameter for the proximal part of the vessel in combination with a 'normal area' for the distal part.

To correct the reference contours by normal areas:

- Click the button **Normals** (above the diagram) to put the reference contours in normal area mode. Two normal areas will appear in the image and in the diagram.
- Click and drag the areas to the required positions, either in an image or in the diagram. You can resize the areas by dragging an edge. The reference contours will be recalculated automatically.

To correct the reference contours by a fixed proximal reference diameter:

- Click the button **Fixed prox** (above the diagram) to put the reference contours in fixed proximal reference mode. A marker (proximal) and a normal area (distal) will appear in the image and the diagram.
- Adjust the normal area either in an image or in the diagram by:
  - Dragging the area to the desired position and/or
  - Resizing the area by dragging an edge.The reference contours will be recalculated automatically.
- Adjust the reference diameter value at the position of the proximal marker by selecting a value in the dropdown menu.

### 3D Bifurcation Analysis

For the 3D bifurcation analysis, you can set a fixed reference diameter for the proximal and two distal sections of the bifurcation.

To correct the reference contours by a fixed proximal or distal reference diameter:

- Adjust the reference diameter value for the proximal section, or either of the two distal sections by selecting a diameter value from the dropdown menu.

Based on the selected reference diameters in the proximal segment and the two distal segments, the HK reference ratio is calculated and displayed. In healthy bifurcations, the value is approximately 1.00.

## 7.7.2 Correcting Lesion Markers

Multiple lesions can be detected in a single vessel segment. The maximum number of automatically detected lesions can be set in the options.

To correct the lesion markers:

- If needed, select the desired lesion by clicking on its lesion table.
- Click and drag the obstruction (O) marker to the required position.
- Click and drag the proximal (P) and distal (D) markers to the required positions.

To reset the lesion markers to the automatically detected position:

- Select **Reset lesion** from the lesion table's context menu.

To reset all lesion markers to the automatically detected position:

- Select **Reset all lesions** from the lesion table's context menu.




**To delete a lesion:**


- Select **Delete lesion** from the lesion table's context menu.

**To create an user defined (custom) lesion:**

- Click on the **User (+)** table.
- Drag the obstruction marker (O) to the required position
- Optionally correct the proximal (P) and distal (D) markers.

### 7.7.3 Accept the analysis results

In a 3D single vessel analysis or a 3D bifurcation analysis, this is the last wizard step. Press  to end the wizard. The analysis results will now become available in the Medis Suite report and will be stored if the Medis Suite session is saved. QAngio XA 3D will enter the review state of this analysis.

In a QFR analysis two more wizard steps are present. Press  to proceed to the next step.

## 7.8 Wizard Step 8: Flow

The objective of the flow step is to calculate the blood flow and/or QFR results. This step is only present in QFR analyses.

The calculation of the QFR values is dependent on the vessel segment type.

To select the segment type:

- Click on the appropriate button: **Left Main / LAD** or **Other coronary**

The QFR values can be calculated based on an estimated fixed blood flow value, which is referred to as Fixed Flow QFR. Initially **Fixed flow** is selected, but more accurate results can be obtained by performing a frame count.

To perform frame count:

- Click the button **Frame counting** to enable the frame count.

The frame counting is performed on the image displayed in large viewport.

To change the frame count image:

- Double click on one of the analysis images, presented by thumbnails at the right side of the wizard bar.

Or,

- Click on one of the images in the study, presented by thumbnails under the large viewport.


To perform frame count:

- Navigate through the frames until the start of the contrast bolus reaches the end of the analyzed segment, indicated by the distal frame count marker (e). Drag the distal frame count marker if the exact arrival of the contrast bolus does not match the initial location.

Press **End frame**.

- Navigate through the frames until the start of the contrast bolus reaches the start of the analyzed segment, indicated by the proximal frame count marker (s). Drag the proximal frame count marker if the exact arrival of the contrast bolus does not match the initial location.

Press **Start frame**.

Press  to proceed to the next step.

## 7.9 Wizard Step 9: QFR

The last wizard step summarizes all analysis results. The 3D model is now colored according the QFR values and an additional diagram is present to show the QFR values below the diameter function.

**To determine the QFR value at a specific location in the vessel segment:**

- Drag the index marker (i) in an image or in the diagram.  
While dragging the QFR value at the index marker is displayed in the 3D viewport.

Now that the QFR results are available, you may decide that another lesion is more significant. Selecting lesions and editing/reverting lesion markers is the same as in the reference step, 7.7.



QFR results needs to be used in a “hybrid” QFR - FFR decision making approach:


- QFR < 0.78 sufficiently high sensitivity to treat the patient in the cath lab;
- QFR > 0.84, sufficiently high specificity to follow the patient medically;
- QFR in the gray zone [0.78, 0.84]: use pressure wire and FFR measurement following the associated medical guidelines.

**To create an extra lesion:**

- Click on the User table (+)
- Drag the obstruction marker (O) to the required position
- Optionally correct the proximal (P) and distal (D) markers

**To delete a lesion:**

- Click right mouse button on lesion table and select **Delete lesion**

Press  to end the wizard. The analysis results will now become available in the Medis Suite report and will be stored if the Medis Suite session is saved. QAngio XA 3D will enter the review state of this analysis.

## 7.10 Review mode

The review mode shows the relevant values, images and diagrams of an analysis. The review mode is activated after completing an analysis, or when an analysis is restored from a Medis Suite session.

**To determine the QFR value at a specific location in the vessel segment:**

- Drag the index marker (i) in an image or in the diagram.

The QFR value at the index marker is displayed in the 3D viewport.

**To select another lesion:**


- Click on the corresponding lesion table in the 3D viewport.

The lesion markers in all images and diagrams will be updated.

**To View any image in the large viewport:**

- Double click in the viewport you want to be enlarged.

**To edit the analysis:**

- Click  in the toolbar.

## 7.11 Report

After completing an analysis, the report in Medis Suite will include all analysis information. While editing an analysis, the report content is removed from the report and re-added after completion.

Details on the reporting functionality can be found in the Medis Suite user manual.