



Amira-Avizo Software version 2024.2

Release notes

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Introduction

This document covers the most important new features, improvements, and changes in this version of Thermo Scientific™ Amira™ Software and Avizo™ Software. In addition, you will find a list of new Xtras including video tutorials, recipes, and workflows which have been published in the [Xtras Library](#) since the previous release.

Visit our [Customer Support and Service Center](#) to access services and resources that help you make the best use of your product.

We value your feedback. If you encounter any problems or have any suggestions for improvement, do not hesitate to [contact us](#).

Definitions and glossary

OS requirements:

While we have a list of supported operating systems (OS) for our software, some functionalities may only work on certain dedicated operating systems. For each functionality, we will indicate whether it works with all supported operating systems or only dedicated systems.

Licensing

Amira and Avizo Software are available as packages that can be enhanced with extensions geared to specific tasks or industries. These packages include:

- Standard packages
 - Amira 3D Software
 - Avizo 3D Software

- Advanced packages
 - Amira 3D Pro Software
 - 3D Cell Biology Package for Amira Software
 - EM Systems Package for Amira Software
 - Avizo 3D Pro Software
 - 3D Industrial Inspection Package for Avizo Software
 - EM Systems Package for Avizo Software

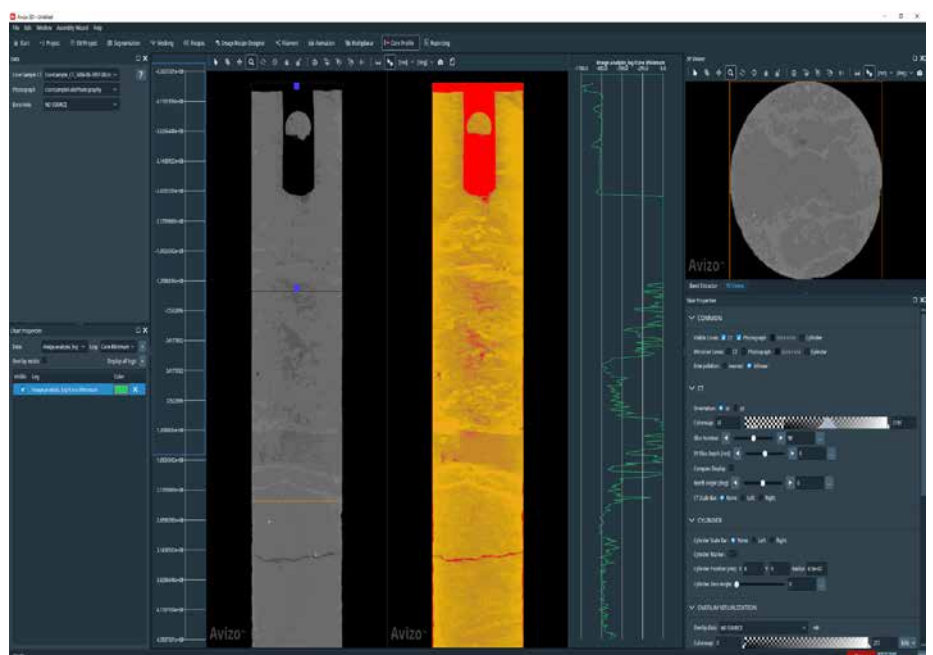
PerGeos Software features in Avizo product line: New features and extensions

Avizo3D Software has been enhanced with new Digital Rock Analysis extensions to offer a scalable and supported solution for your projects, nearly equivalent to the experience of using Thermo Scientific PerGeos Software. While this alternative solution may not guarantee complete compatibility with PerGeos Software projects or the full feature set of PerGeos Software, it also brings numerous capabilities and advancements not available currently in PerGeos Software. This transition will ensure that PerGeos Software capabilities are provided within a platform that will be evolving for years to come.

The new extensions are XCore Profile, XModeling & Simulation, and DRA Custom (which requires XModeling & Simulation). In addition, a new DECT Xtra has been released and is available from our Xtra website. Here's a summary of the various PerGeos Software features and functionalities that have been migrated into Avizo Software and are available through these new extensions, as well some additional functionalities ported into Avizo 3D Pro Software or available through the Xtra capability:

XCore Profile extension

The XCore Profile extension is a dedicated workspace that enables co-visualization of whole-core CT, core photography, and petrophysical logs in a single environment. XCore Profile also creates virtual logs based on whole-core CT data for further calibration and communication of how changes in rock type impact how petrophysical properties are measured down-hole, and they also allow creation of template reports for processing routine analysis.



Core Profile workroom in Avizo Software, with a core CT volume, a core 2D photograph, and well logs.

- **New workrooms:**
 - Core Profile workroom, with the following limitations:
 - Annotations have not been ported
 - Workroom state cannot be saved/reloaded anymore
 - Reporting workroom:
 - PerGeos Software template reports have been ported
- **New modules:**
 - Dip and Strike
 - Heterogeneity Logs
 - Porosity Multiphase Mean Logs
- **Other:**
 - Reader Spreadsheet Well Log LAS
 - Assembly Wizard executable

OS requirements: All supported platforms.

Licensing: XCore Profile extension requires Avizo3D Pro Software.

XModeling & Simulation extension

The XModeling & Simulation extension proposes many processing capabilities for digital rock analysis. It provides a workflow to generate and extract a pore network model (PNM) based on 3D image data. It provides insight into pore and throat size distributions as a natural outcome of producing a pore network model. It also offers a powerful suite of advanced models for rock property analysis and simulations to obtain properties such as absolute permeability, formation factor, thermal properties, molecular diffusion.

To get the most out of the new XModeling & Simulation extension, we highly recommend using it in conjunction with the XWind extension, which provides a fast and robust meshing engine to automatically create simulation inputs from 3D labeled images. Meshes can be exported to major solver's format, along with boundary conditions.

- **New modules:**
 - Ganglia Count
 - Ganglia Intersect

OS requirements: All supported platforms.

Licensing: XModeling & Simulation extension requires Avizo3D Pro Software.

DRA Custom extension

IMPORTANT: The DRA Custom extension will be only delivered to existing PerGeos customers with an active maintenance service that also have a PerGeos Petrophysics or Pore Network Flow or Pore Network Statistics extensions, or a combination of those extensions. The DRA Custom extension will have very limited support compared to other Avizo extensions. This extension encompasses additional processing modules (listed below) but will be deprecated at the end of 2025.

The DRA Custom extension provides advanced capabilities for two-phase flow simulation. Properties such as capillary pressure, relative permeability resistivity index, and residual oil saturation can be obtained using this powerful, industry-validated technology.

The solution provides additional modules such as **Pore Network Model Extraction** (Grain Based PNM Generation, Pore Based PNM Generation), **Formation Factor Random Walk**, **Nuclear Magnetic Resonance**, **Absolute Permeability Lattice Boltzmann**, **Flow Simulation View**, **Two Phase Flow Simulation**, **Simulated Mercury Injection**.

OS requirements: All supported platforms.

Licensing: DRA custom extension requires Avizo 3D Pro Software and XModeling & Simulation extension.

Other PerGeos features now available in Avizo 3D Pro

- Refactored tutorials to match Avizo Software user interface
- Crop Core
- Color Auto Classification
- Ortho Slice LDA on in-memory data
- Xtras:
 - Digital Rock Data (data sets from PerGeos Software installer)
 - DECT features (upon request): Dual Energy Computed Tomography Xtra adds value to whole-core CT analysis workflows by providing actual density information that can be compared to density logs and used for further characterization of rock formations. This enables you to compare whole-core CT images across multiple formations and wells.
 - DECT Xtra is available on-demand and may be subject to the sale of consulting services depending on the customer's DECT expertise.

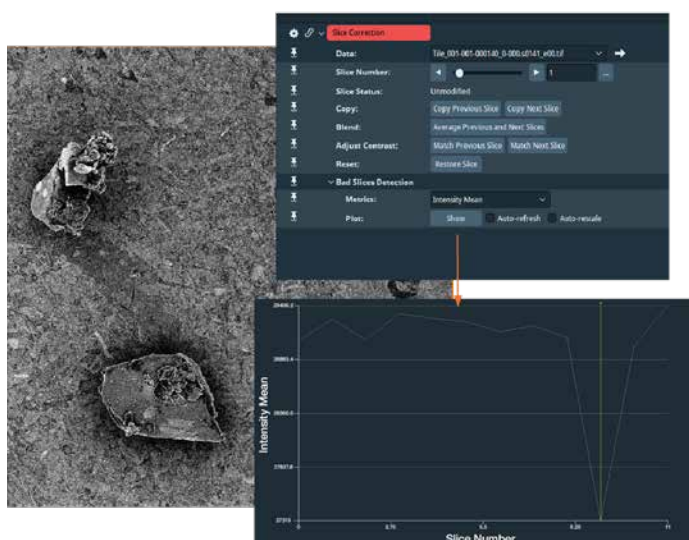
OS requirements: All supported platforms.

Licensing: DECT Xtra extension requires Avizo 3D Pro Software.

New modules in Amira-Avizo

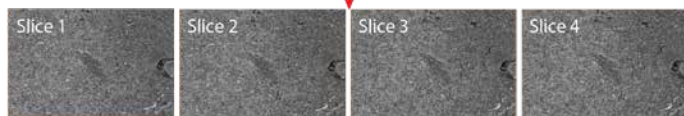
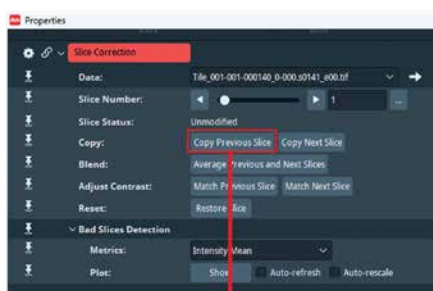
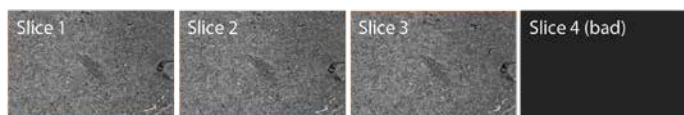
Slice Correction module for enhancing FIB-SEM 3D reconstructions

When working with FIB-SEM slices, artifacts during acquisition might result in inaccurate 3D reconstructions and subsequent poor segmentation quality. Slices that display artifacts are referred to “bad slices.” Examples of bad slices are slices that include contamination, black images, saturated images, etc. Replacing bad slices by taking into account neighboring good slices is a standard way to overcome this challenge.



Plot of intensity along slices to identify bad slices. **Metrics available:** Intensity mean, normalized cross-correlation, SSIM (structural similarity index measure).

The new Slice Correction module implemented in the software allows you to detect bad slices and correct them using approaches well-established in the scientific literature. This module allows you to correct individual slices manually.



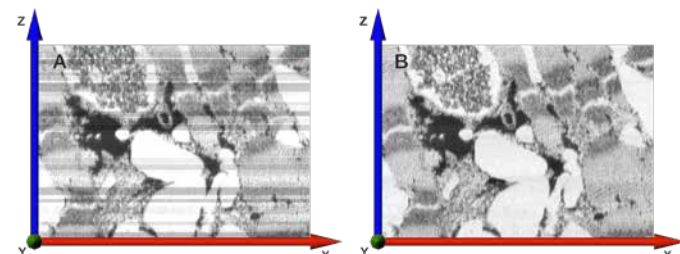
The Slice Correction module enables to manually replace bad slices using the copy option.

OS requirements: All supported platforms. *Note that parameters related to the bad slice detection are available only for Windows.*

Licensing: Amira-Avizo Software for EM Systems.

Stack Normalization module for improving 3D image quality

During imaging of 3D stacks, some slices may have different brightness and contrast values compared to the majority of slices in the stack. This not only lowers the aesthetic quality of data but can also be very problematic when you perform segmentation of the images with conventional tools or using AI models.



Serial block face EM data in cross-section showing unequal image intensity along the Z axis (A). Intensity of images has been normalized, and slices with higher or lower intensities have disappeared (B).

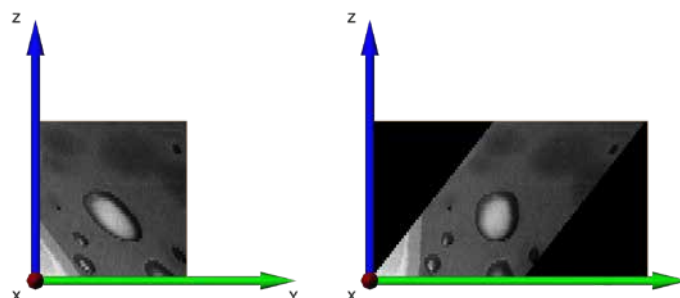
This new module performs a linear scaling of the gray level values of each slice of an image stack to match the intensity levels in all slices of the 3D data. The linear scaling can be performed using either intensity range (normalization) or the mean value and the standard deviation (standardization).

OS requirements: Windows only.

Licensing: Advanced packages.

Shear module for geometric correction of FIB-SEM data

Depending on how the data was collected during acquisition, you may have undesired geometric artifacts. For example, with a FIB-SEM acquisition, the non-zero angle between the milling beam and the electron beam can produce such geometric artifacts. As a result, 3D structures inside the data look sheared and need to be geometrically corrected. The Shear module can correct the shearing artifacts according to the parameters you provide.



Data set (in Avizo, data/fib/MoSi2-sheared.am) is derived from images of a sample of molybdenum disilicide (MoSi₂), a material used in furnace heating elements. Raw image (left) with oval shapes due to the geometric artifact; data after shear correction (right). *Images courtesy of C. Kong, University of New South Wales, Australia.*

This module is an updated and extended version of the previous Shear module that already existed in the software. The extended functionality allows you to freely select the shift axis for shearing correction. In addition, the updated tool has also gained in precision.

OS requirements: Windows only.

Licensing: Standard packages.

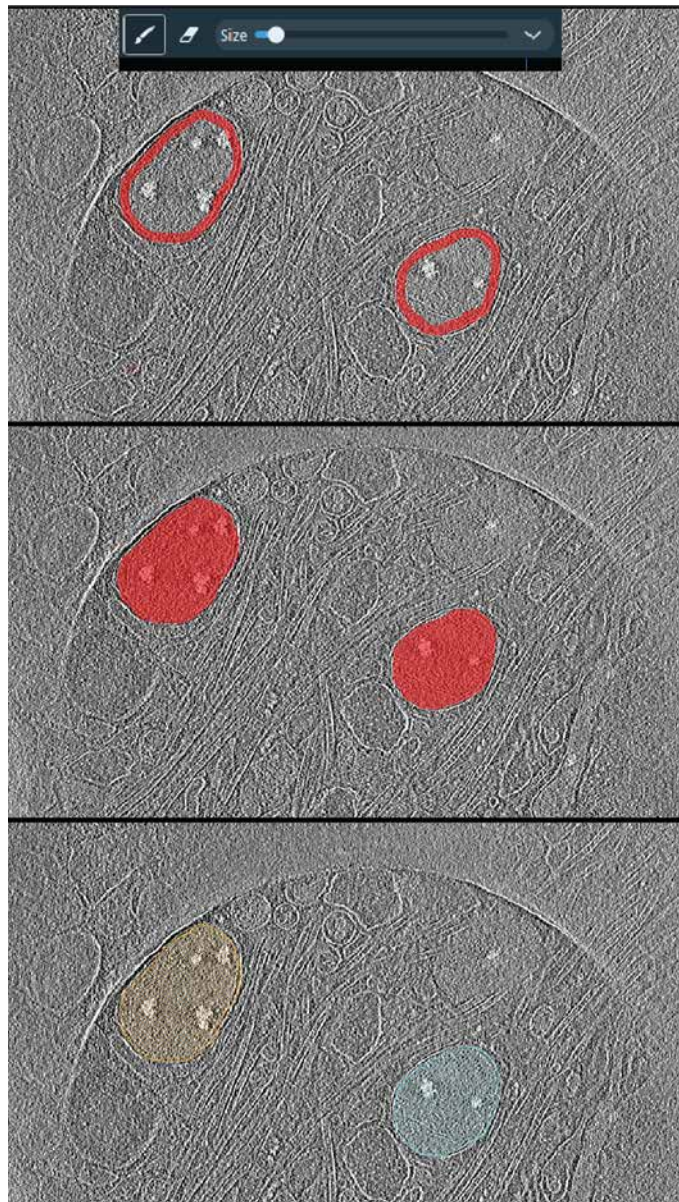
Segmentation+ Workroom

The capabilities and ergonomics of the Segmentation+ workroom have been further expanded. We greatly appreciate your feedback and encourage you to continue sharing your thoughts and suggestions to help us enhance your experience further.

New tools and improvements

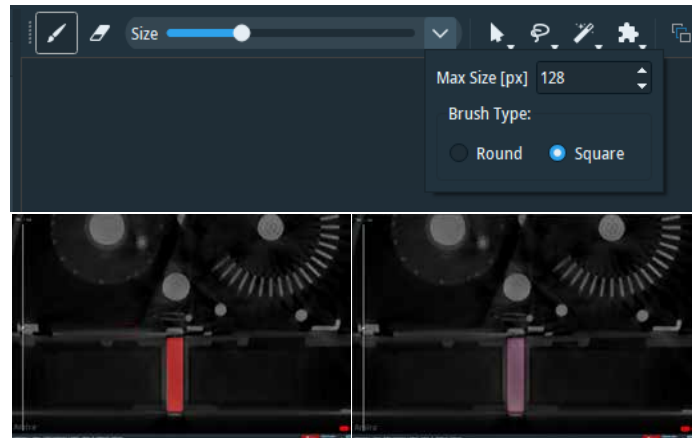
- **Brush/Eraser:**

- Removal of mouse cursor: The mouse cursor that indicates the tool state during brush actions has been removed. In brush mode, the brush circle will be displayed in red, while in eraser mode, the brush circle will be displayed in green.
- Local fill hole option: A new feature allows you to fill a selection locally starting from the brush circle. Simply right-click using the brush to apply the fill operation. Conversely, when using the Eraser, right-click on a selection to erase it.



New feature in the brush tool. A selection can be filled starting from the brush circle. *Image courtesy of Chen et al., 2017 Nature Methods.*

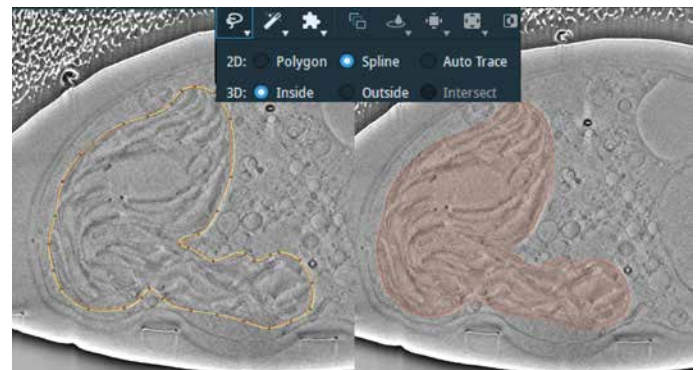
- Square Brush option: You can now choose the shape of the brush; i.e., a round or a square shape.



New feature available in the brush tool. You can select an object using the Square brush type. *Data courtesy CryptoMuseum.*

- **Lasso:**

- Improved BSpline on 2D lasso: Enhancements have been made to the BSpline option, making it easier to select curved shapes. The curve now passes through the check points, and the roundish constraint has been increased for more accurate results.



Improvements to the Lasso tool in Spline mode make selecting curved areas easier with only a few clicks.

Ergonomics

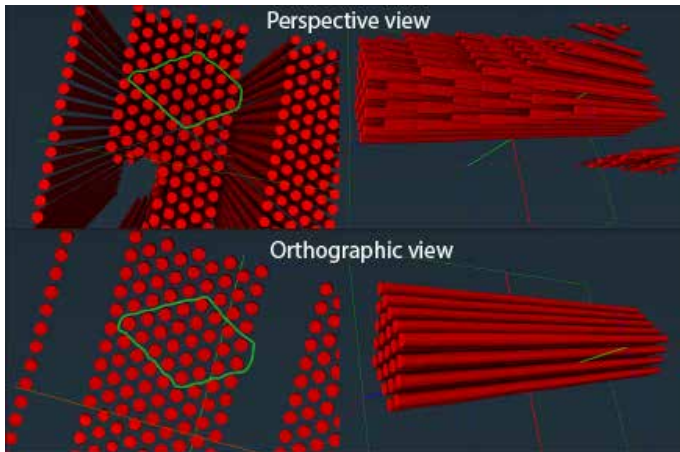
- **Activate/Deactivate preview:**

Some tools such as Masking, Top Hat, or Remove Island generate a preview to help you tune some parameters to obtain the desired results. The new option to activate or deactivate the preview allows you to switch between the original image and the preview, enhancing your understanding of the effects of the parameters.

- **3D Viewer**

- New option to switch between orthographic and perspective modes.
 - Perspective mode adds depth to the scene by rendering the objects based on their position and distance to the camera. Use the perspective mode for general visualization of 3D objects and images.

- Orthographic mode preserves dimensions in the scene so that they are consistent and measurable. Use the orthographic mode to measure distances or precisely align 3D objects.



Perspective view with 3D lasso casts a cone-shaped selection. With Orthographic view, it is easier to make selections along an axis without distortion.

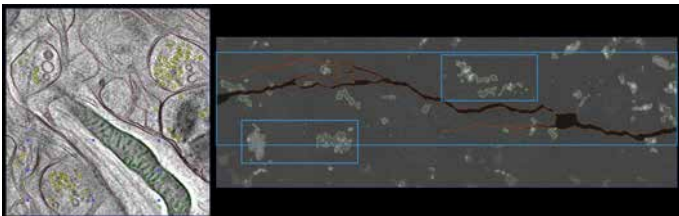
OS requirements: All supported platforms.

Licensing: Standard packages.

Improvement of the AI-Assisted tool

The AI-Assisted Segmentation tool enables you to segment complex images with minimal effort and without requiring extensive knowledge in image processing. This interactive tool initially employed a shallow neural network to quickly deliver results. In the latest version, it now incorporates deeper and more powerful models, allowing the AI-Assisted Segmentation tool to handle most of the segmentation tasks efficiently.

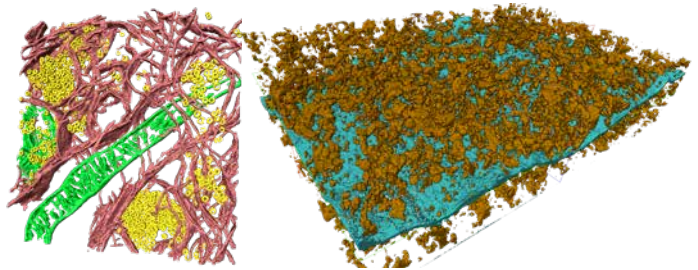
- **ROI sets:**
With the AI-Assisted Segmentation tool, you can annotate small portions of an image to train either shallow or deep neural networks for segmentation purposes. In this release, the previously used Patch Set approach was ameliorated with the more efficient ROI Sets approach. ROI Sets enables you to annotate sub-parts of an image more effectively by allowing the definition of broader regions and offering additional functionalities such as moving and resizing.



ROI annotation function permits flexible region selection for training deep learning models. Notice that it is now easier to focus on slender features like cracks and membranes. *Data courtesy Benjamin Cooper, Max Planck Institute for Experimental Medicine, Göttingen Germany (left image). Data courtesy Richard Ketcham and collaborators (right image).*

- **Description of the tool:**

The AI-Assisted Segmentation tool is available in the advanced tools panel of the new Segmentation Editor. You can create shallow or deep models or reuse an already-trained model. The neural network is trained from the contents of the image ROIs and provides a segmentation of either the current slice or the entire volume. Models that have been trained in Segmentation+ can be reused in the project workroom through the DL modules.



Multi-material VGG16 and VGG19 predictions within the Segmentation+ Workroom. *Data courtesy Benjamin Cooper, Max Planck Institute for Experimental Medicine, Göttingen Germany (left image). Data courtesy Richard Ketcham (right image).*

Hardware requirements: NVIDIA GPU supporting CUDA Compute Capability 5.2 or higher with up-to-date drivers. CPU must support the AVX2 extensions.

OS requirements: All supported platforms.

Licensing: Advanced packages.

Xtra Recipe Library

The following Xtras have been published or updated since the previous release. Note that some Xtras have specific product, license, or OS requirements and may require specific installation procedures.

- ROI and Patch extractor module deployment
- Avizo 3D for Industrial Inspection: Metrology Workroom Data
- Digital Rock Data

Compatibility notes

- **Python environment for deep learning:**
Support for Python 3.11. Previous versions will no longer be compatible. With the 2024.2 installer, deep learning packages are installed in the default Python environment. Consequently, you will be able to use all deep learning resources without manual installation through the product.

End of Support

The following modules, which were previously announced as deprecated several versions ago, have been definitively removed. Old projects referencing such modules will generate error messages when opened in Amira or Avizo Software 2024.2. Please update your projects using the proposed replacement modules below.

Deprecated module (command)	Deprecated since	Replacement module (command)
Splats (HxSplats)	Avizo 2024.2	None
Embossed Slice (HxUnstructuredMeshBumpSlice)	Avizo 2024.2	Cross Section (HxUnstructuredMeshCrossSection)
Movie Player (HxMoviePlayer)	Avizo 2024.2	None
Movie Data (HxMovieData)	Avizo 2024.2	None
Legacy Measure (HxMeasureTools)	Avizo 2024.2	Advanced Measure (HxMeasure)
Patch Extractor	Avizo 2024.2	None

XPand extension requirements

To add custom extensions to Amira, Avizo (XPand extension), and PerGeos Software, you will need:

- Microsoft Visual Studio 2019 version 16.2 (v142) on Windows
- gcc 9.x on Linux Ubuntu 20.04

Operating systems

Amira and Avizo Software version 2024.2 runs on:

- Microsoft Windows 10 (64-bit).
- Microsoft Windows 11 (64-bit)
- Linux x86 64 (64-bit) running on Intel64/AMD64 architecture and Ubuntu 20.04 (desktop)

Our products are tested on the following configurations:

Platform	GPU	Driver number
Windows 10	NVidia Tesla T4	551.61
Windows 11	NVidia RTX A4500	551.86
Ubuntu-20.04	NVidia T1000	550.54

Resolved Issues

Name	ID	Description
Large Data Preferences	AA-30496	It is now possible to increase the threshold value to match the available RAM on the machine.
Reporting Export	AA-30495	The export/save report feature has been reworked to avoid misunderstandings regarding snapshots export.
Seg+ Preferences	AA-30312	A new preferences tab dedicated to the new segmentation editor has been added to clarify the preferences available for this tool.
Bio-Formats	AA-30130	Bio-Format 7.2.0 has been updated to resolve an issue opening CZI files.
OrthoSliceLDM	AA-28379	In the case of an adjusted histogram range, the precision and number of colors for the OrthosliceLDM rendering have been reworked to avoid a loss in rendering quality compared to basic OrthoSlice.

 Learn more at thermofisher.com/amira-avizo

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