Tomography

Versions 5.0 - 5.21 Release Notes

PN 307499

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Contents

1   Introduction

1.1   Purpose

This document describes the Thermo Scientific Tomography software releases.

1.2   Audience and scope

These release notes are intended for users of the Thermo Scientific Tomography software and those who manage the installation of Thermo Scientific Tomography software on the microscope computer.

This document describes the content of the most recent and few historic Tomography releases.

1.3   Hardware requirements

The Tomography software can be used on the Microscope PC of Thermo Scientific and FEI TEM systems with a compatible microscope software release and a compatible camera and/or detector.

1.4 System, software and configuration compatibility

The following tables show the compatible microscope software versions, the preferred Tomography software versions per microscope software version, and the system configuration compatibility.

Although the Tomography software is backward compatible with a limited range of microscope software versions, some of the new features and improvements may be available only for the most recent supported microscope software version(s).

1.4.1 Preferred Tomography version per microscope software version

Titan	Talos	Tecnai	Tomography	Remarks
3.17 – 3.23	2.17 – 2.23	—	5.21	
3.17	2.17	—	5.20.1	
3.16	2.16	—	5.19	
3.15	2.15	—	5.18	
3.14	2.14	—	5.17	
3.13	2.13	—	5.16	
3.12	2.12	—	5.15	
3.11	2.11	—	5.14	
3.10	2.10	—	5.13	
3.9	2.9	—	5.12	
3.8	2.8	—	5.11	
3.7	2.7	—	5.10	
3.6	2.6	—	5.9	
3.5	2.5	—	5.8	
3.4	2.4	—	5.7.1	
3.3	2.3	—	5.6	
3.2	2.2	—	5.5	
3.0 – 3.1	2.0 – 2.1	—	5.4.1	
2.15	1.15	—	5.7.1	
2.14	1.14	—	5.3	
2.13	1.13	—	5.2	
2.12	1.12	—	5.1	

Titan	Talos	Tecnai	Tomography	Remarks
2.11	1.11	—	4.12	
—	—	5.7	4.9	
2.6 – 2.10	1.6 – 1.10	5.6	4.7	Titan 2.6 requires patch 649671.
2.5	1.5	—	4.5.0	
2.4	1.4	—	4.4.1	
2.0 – 2.3	1.0 – 1.3	—	4.4.0	
1.6	—	4.6.4	4.1.2	Last release for Windows XP.

1.4.2 Compatible microscope software versions per Tomography version

Tomography	Titan	Talos	Remarks
5.21	3.17 – 3.23	2.17 – 2.23	
5.20.1	3.17 – 3.22	2.17 – 2.22	
5.19	3.16 – 3.21	2.16 – 2.21	
5.18	3.15 – 3.20	2.15 – 2.20	
5.17	3.14 – 3.19	2.14 – 2.19	
5.16	3.13 – 3.18	2.13 – 2.18	
5.15	3.12 – 3.17	2.12 – 2.17	
5.14	3.11 – 3.16	2.11 – 2.16	
5.13	3.10 – 3.15	2.10 – 2.15	
5.12	3.9 – 3.14	2.9 – 2.14	
5.11	3.8 – 3.13	2.8 – 2.13	
5.10	3.7 – 3.12	2.7 – 2.12	
5.9	3.6 – 3.11	2.6 – 2.11	For STEM / EDS experiments, Tomography 4.X is no longer required.
5.8	3.5 – 3.10	2.5 – 2.10	Tomography 4.21 for STEM / EDS experiments is available as a *separate* software installation.
5.7.1	2.15 3.4 – 3.9	1.15 2.4 – 2.9	● Preferred over Tomography 5.7 ● Last release to support Windows 7 based microscope software (Titan 2.X and Talos 1.X). ● Tomography 4.20 for STEM / EDS experiments is available as a *separate* software installation.

Tomography	Titan	Talos	Remarks
5.7.0	3.4 – 3.9	2.4 – 2.9	Tomography 4.20 for STEM / EDS experiments is available as a *separate* software installation.
5.6	2.15 3.3 – 3.8	1.15 2.3 – 2.8	Tomography 4.19 for STEM / EDS experiments is available as a *separate* software installation.
5.5	2.15 3.2 – 3.7	1.15 2.2 – 2.7	Tomography 4.18 for STEM / EDS experiments is available as a *separate* software installation.
5.4.1	2.15 – 3.6	1.15 – 2.6	Tomography 4.17 for STEM / EDS experiments is available as a *separate* software installation.
5.4.0	2.15 – 3.6	1.15 – 2.6	**Tomography 5.4 is withdrawn.** **Do not install Tomography 5.4.**
5.3	2.14 – 3.5	1.14 – 2.5	Tomography 4.16 for STEM / EDS experiments is available as a *separate* software installation.
5.2	2.13 – 3.4	1.13 – 2.4	Tomography 4.15 for STEM / EDS experiments is automatically installed with Tomography 5.2
5.1	2.12 – 3.3	1.12 – 2.3	Tomography 4.14 for STEM / EDS experiments is automatically installed with Tomography 5.1
5.0.1	2.12 – 3.2	1.12 – 2.2	Tomography 4.13.1 for STEM / EDS experiments is automatically installed with Tomography 5.0.1
5.0.0	2.12 – 3.2	1.12 – 2.2	● First release for Windows 10 ● Tomography 4.13 for STEM / EDS experiments is automatically installed with Tomography 5.0.

1.4.3 Compatible CryoFlow and TQM versions per Tomography version

Tomography	CryoFlow	TQM	SDP	Remarks
5.21	1.24 – 1.27	1.8 – 1.11	2.15, 3.1 – 3.3	
5.20.1	1.26	1.10	3.2	
5.19	1.25	1.9	3.2	
5.18	1.24	1.8		
5.17	1.23	1.7		
5.16	1.22	1.6		
5.15	1.21	1.5		
5.14	1.20	1.4		
5.13	1.19	1.3		

Tomography	CryoFlow	TQM	SDP	Remarks
5.12	1.18	1.2		
5.11	1.17	1.1		

1.4.4   Compatible Maps TEM versions per Tomography version

Tomography	Maps TEM	Remarks
5.21	3.31.1	• "Thermo Scientific Maps Data Exchange Service" needs to be installed, see Maps User Guide 3.31.1.
5.20.1	3.30.1	• "Thermo Scientific Maps Data Exchange Service" needs to be installed, see Maps User Guide 3.30.1.
5.19	3.29.1	• "Thermo Scientific Maps Data Exchange Service" needs to be installed, see Maps User Guide 3.29.1. • Use Maps TEM 3.27.1 to install "Thermo Scientific Maps Data Exchange Service".
5.18	3.28.1	• "Thermo Scientific Maps Data Exchange Service" needs to be installed, see Maps User Guide 3.28.1. • Use Maps TEM 3.27.1 to install "Thermo Scientific Maps Data Exchange Service".
5.17	3.27.1	"Thermo Scientific Maps Data Exchange Service" needs to be installed, see Maps User Guide 3.27.1.

1.4.5   Compatible cameras for Tomography

Camera	Supported	Remarks
Ceta	Yes	• All Ceta Sensor Packages. • With and without Speed Enhancement (Ceta-2).
Falcon 4	Yes	Tomography
Falcon 4i	Yes	• Tomography 5.9 and later. • Requires Titan 3.10 / Talos 2.10 and later.
Falcon 3EC	Yes	
Falcon I / II	No	Tomography 4.13.1 and earlier.
Gatan Orius	Yes	
Gatan OneView	Yes	
Gatan US1000XP	Yes	
Gatan US1000/4000	No	Not supported in Windows 10.

Note	The compatible cameras may not all be supported by the compatible microscope software versions. See the TEM Server Release Notes for a definitive list of supported cameras.

1.4.6   Compatible energy filters for Tomography

Energy Filter	Supported	Remarks
Selectris / Selectris X	Yes	Requires Titan 3.6 / Talos 2.6 and later.
Gatan Enfinium SE / ER	Yes	With US1000 camera.
Gatan Quantum 963 / 964 / 965 / 966	Yes	
Gatan (Bio)Quantum 967 / 968	Yes	With Gatan K2 camera.
Gatan BioQuantum 1967	Yes	With Gatan K3 camera
Gatan Continuum 1065 ER / 1066 / 1066 HR / 1067 / 1069 / 1069 HR / 1077 S	Yes	

Note	The compatible energy filters may not all be supported by the compatible microscope software versions. See the TEM Server Release Notes for a definitive list of supported energy filters.

1.4.7   Compatible detectors for Tomography

Detector	Supported	Remarks
HAADF	Yes	
BF/DF Retractable	Yes	
BF/DF Retractable Mk2	Yes	
Panther STEM (BF-S/DF-S)	Yes	
Gatan 805 / 807 BF/DF	Yes	
Super-X-G1 / G1 Lite	No	Not supported in Windows 10.
Super-X-G2 / G2 Lite	Yes	
Dual-X / Single-X	Yes	

Note	The compatible detectors may not all be supported by the compatible microscope software versions. See the TEM Server Release Notes for a definitive list of supported detectors.

2 Tomography 5.21

In Tomography 5.21, we have introduced improvements, including faster multi-shot acquisition and the ability to select an acceptable threshold for Autocoma.

2.1 Improvements

- Systems with a CFEG source automatically perform flashing as needed before starting Atlas acquisition.
- Users can select the remaining coma threshold from two available values:
  - Low = 160 nm (for purified samples to achieve the highest data quality)
  - Medium = 400 nm (for samples with less clear Thon Rings in FFT, such as lamella)
- Improved the speed of multi-shot tilt series.
- Improved the application's responsiveness during Search Map queue acquisition.

2.2 Solved issues

ID	Description	Remark
TOMO-5325	Tracking does not function on very low dose images from Gatan.	

3   Tomography 5.20.1

The issue where the defocus value was not resetting after a tilt series is resolved in this release.

ID	Description	Remark
TOMO-7649	Defocus value is not reset after tilt series.	

4 Tomography 5.20

Tomography 5.20 introduces the option to define Search Maps while the Queue is running, as well as the option to fully edit batch positions on Search Maps. Some improvements include running Auto-eucentric function around the lamella pre-tilt and introducing the Linear mode for Falcon 4(i) cameras.

4.1 New features

Set-up Search Maps: You are able to add new Search Maps, edit and delete existing Search Maps, and define Lamella orientation, while the Search Map queue acquisition is in progress.

4.2 Improvements

- The status of Batch Positions and Search Maps changes to In Progress when they are acquired.
- The added batch positions can be fully edited on the Search Map, including the position of the main (primary) exposure area.
- When Search Maps are acquired as part of the queue, their Auto-eucentric function is performed around the pre-tilt of the lamella (as specified by the Alpha tilt of the Search Map) to increase the accuracy of eucentric height and robustness. This applies only when the Lamella option is activated in the session setup.
- Linear mode for data acquisition with Falcon 4(i) camera.
- Binning for data acquisition with Ceta camera.
- Readout area selection for auto eucentric.
- You are notified when the TMP is running when starting the Autostigmate/Autocoma auto functions.

4.3 Solved issues

ID	Description	Remark
TOMO-7053	Tomography does not communicate with Maps.	
TOMO-7326	Tomo 5.19 does not apply Atlas Targeting Correction when acquiring Atlas on side-entry loader.	
TOMO-6590	Tomography: Tilt Series status is "IDLE" during acquisition.	
TOMO-7182	Tomo crashes when calibrations are invalid because of SM dimensions.	
TOMO-7242	Tomography 5.19 does not close column valves automatically.	

5 Tomography 5.19

Tomography 5.19 introduces improvements in Search Map definition and acquisition, allowing for even faster experiment setup. Next to that, some known issues have been resolved.

5.1 Improvements

- Tomo Live is enabled by the new CryoFlow software, which serves as a successor to Athena software.
- You are able to create a new Tomography session and define Search Maps during Atlas acquisition/screening.
- Some parameters of Auto Eucentric are automatically pre-defined for the user during Search Map Queue acquisition.

  To ensure the optimal running of Search Map queue acquisition, Auto Eucentric uses the LM preset for rough steps only before the first Search Map. Any other Auto Eucentric then skips the LM rough step. Between each Auto eucentric, the Z height is not reset to 0.

5.2 Solved issues

ID	Description	Remark
TOMO-6886	Time estimation for Adjust ZLP is not correct.	
TOMO-6907	User is not forgotten after logging out from CryoFlow.	
TOMO-6688	Image Filters are not used during Optimized Position calibration.	

6 Tomography 5.18

Tomography 5.18 introduces new features and improvements which largely improve the experiment setup for Tomography users. Next to that, multiple issues have been resolved.

6.1 New features

- **Batch positions can be defined while tilt series is running**
  - The newly defined batch positions are automatically acquired according to order in the list.
  - You are able to edit position of template areas, defocus and comments while tilt series is running.
- **Lamella Option in Session setup**
  - There is a new Lamella option in the Tomography session. This option provides functionality connected to Lamella use case (Maps TEM AutoSync, Defining lamella orientation).
  - You will be warned about missing lamella orientation.
- **Editing batch positions on Search Maps**: You are able to edit the positions of template areas (excluding the primary exposure area) on the Search Map.

6.2 Improvements

Specific parameters have been changed for newly installed applications:

- Switch Angle of tracking has been changed to 80 degrees
- High Angle Period has been changed to 1.

The locations of Search Map tiles are not shown by default. You can make the tiles visible in the "Pin" menu of Search Map image.

6.3 Solved issues

ID	Description	Remark
TOMO-6483	Measured image shift during holder calibration is not applied after a branch switch.	
TOMO-6378	K3 dual camera does not offer all supported options.	
TOMO-6593	Error shown that gain reference cannot be copied for Gatan cameras without CryoFlow.	
TOMO-6671	Fraction Path is incorrect in MDOC for Gatan cameras without CryoFlow.	
TOMO-6407	Exposure preset is not logged in Health Monitor.	

7 Tomography 5.17

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.17 introduces a new Beta feature that allows simple acquisition on the specified angle, targeting sparse particles.

Moreover, this release introduces automatic synchronization of data between Tomography and Maps TEM.

7.1 New features

- **Targeted single acquisition** is possible in Tomo on Slab like samples in Batch mode, it can be activated in the Acquisition flap out as a Beta feature. During Targeted single acquisition, automatic acquisition is executed only on the specified angle.
- **Data Exchange with Maps TEM** is possible for systems with Maps TEM installed. The following data can now be automatically synchronized between both applications:
  - Annotations created in Maps, including sites of interest, areas of interest, and lamella information.
  - Batch positions created in Tomography, including exposure, tracking, focus, and condition areas.

7.2 Solved issues

ID	Description	Remark
TOMO-6116	CryoFlow login is still "green", but the user was logged out. This issue is resolved from CryoFlow version 1.23 onwards.	
TOMO-4236	Crash when changing to a Preset that uses LM mode while the EDS detector is disconnected.	
TOMO-6267	Batch tilt series cannot be started with holder predictions if the start angle is not equal to the start angle of holder calibration with 0.01 degree precision.	

8   Tomography 5.16

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.16 introduces a new feature in Tomo Live workflow and several improvements including more robust multi-shot tracking and easier search map definition.

8.1   New features

Creating CryoFlow folders and workflows: It is possible to create CryoFlow folders and workflows in Tomography.

8.2   Improvements

- **Queued search maps**: Position and size of the queued search maps can be edited.
- **Improvement of tracking**: Tracking of multi-shot exposure areas off-axis has been significantly improved.

8.3   Solved issues

ID	Description	Remark
TOMO-6012	Feature Shift in Multi-shot Areas on Non-flat Samples: In multi-shot acquisitions, the feature may gradually shift away from the image center as the Alpha tilt increases. *Applies to Tomo 5.14 onwards.*	
	Define the acquisition with a single exposure area	
TOMO-6080	Tomo crashes on start when tomo session folder is set as root (D:\ or Z:\) in Tomo 5.15	
	Do not use root of a storage for saving Tomography session	

9　Tomography 5.15

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.15 introduces a new feature of loading existing Tomography Sessions and several improvements and bug fixes.

Moreover, this release reintroduces the anticipated Compression feature for Data Acquisition TIFF images for Falcon 4i Systems, significantly reducing data file sizes.

9.1　New features

- **Compression for Data Acquisition Images**:
  - On Falcon 4i Systems, you can enable LZW Compression for Data Acquisition images at *Preparation > Exposure Settings > Compression*. The compression is applied on Data Acquisition images stored in TIFF at native 4k x 4k resolution.
  - This feature uses non-gain-normalized compression.
  - To activate this feature, set **Fractions** to **manual** or **max**, specify the number of fractions desired, and set **Compression** to **Yes**.

Note	*Requires TEM Server 7.17 (Titan 3.17 / Talos 2.17)*

- **Gain Reference Copy for EER or TIFF Output**: When using a Falcon4(i) camera and EER or TIFF as output for the data acquisition preset, a copy of the gain reference is now supplied in the folder containing the movies.

- **Load Tomography session**: You can now load existing Tomography sessions which contain Experiment Settings, CryoFlow Settings, Output Settings, Email Settings, and data saved in the corresponding Storage Folder.

9.2　Improvements

- During automatic Search Map acquisition, an Overview image is acquired at the center of each Search Map.

- You can now delete acquired search maps.

Count of Search Maps/Batch Positions: The interface now shows the number of (acquired/all) batch positions in the Batch Positions task, and the number of (acquired/all) search maps in the Search Maps task.

9.3　Solved issues

ID	Description	Remarks
TOMO-5643	Auto Stigmate and Auto Coma fail when Ceta is selected with the *Align* option set to *Yes*.	

10   Tomography 5.14

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.14 introduces a new feature, several improvements, and bug fixes to enhance the user experience and streamline the workflow. In this release, we are excited to highlight the following major updates:

New Feature: Continue working on screened Atlas without stage loading.

Users can now view and select an acquired Atlas in the Tomo tab under the new **Sample** workflow step and prepare their experiment on it, without having the Atlas loaded on stage.
This feature is available for systems with an autoloader.

Highlighted Improvements:

- Dramatically increased thumbnail loading speed for Batch Tilt Series in Movie Player.
- Optimized position calibration in STEM uses autofocus settings specified by the user.

10.1   New features

- Work with Screened Atlases without Loading on Stage
    - Users can now view and select an acquired Atlas in the Tomo tab within the new *Sample* workflow step to prepare their experiment.
    - No need to load the Atlas on stage.
    - Initiating a queue of Search Maps on an Atlas not loaded on stage will automatically trigger the load.
    - To work on a different screened Atlas, simply create a new Tomo session and proceed with Search Maps definition.

    This feature is available only for systems equipped with an autoloader.
- Autofocus settings used during Optimized position calibration in STEM can be changed in **Auto functions → Autofocus Linear**. The calibration process utilizes the Autofocus Linear settings specified by the user.

10.2   Improvements

- Movie Player in Tilt Series in Batch Mode: Dramatically improved the loading speed of movies by using saved thumbnails.
    - The loading speed has been significantly improved for all image sizes, providing a better user experience.
    - For the 4k x 4k image size, the improvement is even more substantial with a 20 times faster loading speed, reduced from 20 seconds to just 1 second.
- Search Maps acquired as part of a Queue now display a highlighted Z height, indicating that they have been acquired at Eucentric height. Additionally, all images acquired using the *Move Stage here and Acquire* function on a Search Map at Eucentric height will also be highlighted.

- Atlas targeting correction automatically temporarily retracts Objective aperture (if it is enabled and inserted).

- MicroProbe STEM Option Hidden for Unsupported Systems.
  - The MicroProbe STEM option is now hidden in the interface for microscope systems that do not have the MicroProbe STEM hardware configuration, making the interface cleaner and less confusing.

11   Tomography 5.13

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.13 includes some improvements, and one major feature. It is now possible to link parameters from the Optics settings of the high SA preset to those in the Exposure presets.

Note that the LZW compression feature is removed temporarily while undergoing maintenance.

11.1   New features

- You can now link the Optics settings of high SA presets to the Exposure preset. Parameters of the Optics settings that can be linked are the ProbeMode, Magnification, Spot Size, Illuminated Area, Intensity, Insert Slit and Slit Width.
- The LZW compression feature is temporarily removed.

11.2   Improvements

- **Auto Functions tab**: For each Auto Function task, Tomography now selects the relevant preset automatically. For example, for the Autofocus task, the Autofocus preset is selected automatically.
- **Acquisition and Optics Settings task**: The ribbon is now much cleaner. Some redundant parameters have been removed from the User Interface; other parameters have been moved from the main ribbon into expandable trays.
- The default path for data storage is drive D (if available).

11.3   Solved issues

ID	Issue Description and Workaround
TOMO-4312	Certain controls on the Ribbon in the Data Acquisition task in STEM mode used to be incorrectly displayed when the Tomography window is not maximized while the Windows Settings > Display Settings > Scaling is greater than 100%. This issue is fixed.

12   Tomography 5.12

| **Note**	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.12 is focused on more accurate targeting and acquisition. It introduces the following major new features:

- Calibrations for more accurate targeting of identifiable features. *Beta release*.
- Dose Symmetric group sizes of 2, 3 and 4.
- Trigger *ZLP Adjustment* and *Phase Plate Activation* every N^{th} tilt series.
- A measurement tool for the Image Display.
- A Lamella orientation tool.

12.1   New features

Targeting Correction task

- The Targeting Correction task provides calibrations that result in greater accuracy when acquiring a feature of interest during automated Data Acquisition. It also improves the alignment between tiles of Atlas and Search Map images.
- The calibration for Targeting Correction is available for Atlas and Search presets.
- Calculates a correction factor using the difference between the specified and measured distance.
- The following images show an Atlas before and after the Targeting correction.
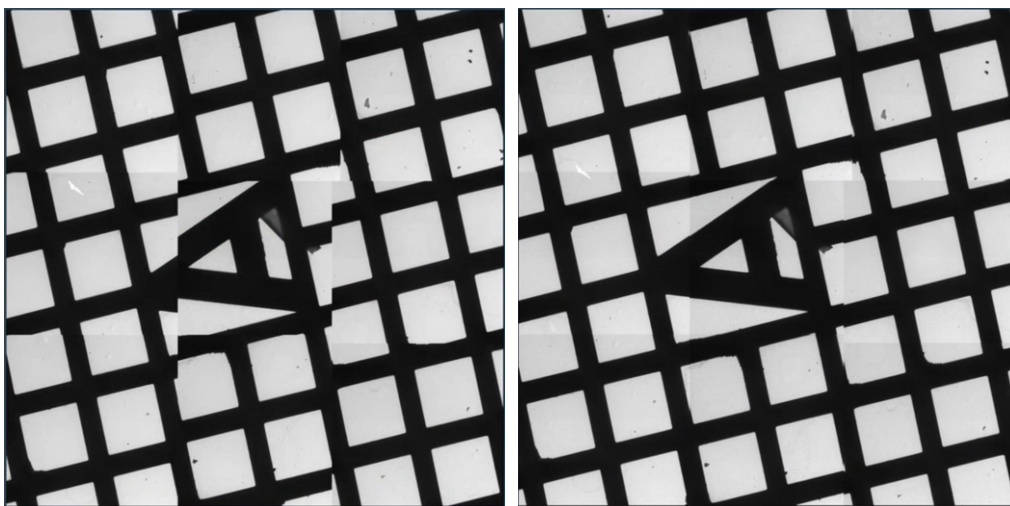
This feature is in Beta. For feedback and questions, please contact tomo5@thermofisher.com.

Dose Symmetric Scheme

- In the settings of Dose Symmetric Scheme, you can now select the number of tilts in one sweep by setting the **Group Size** to 2, 3, or 4. Previously, Group Size 2 was the only option.
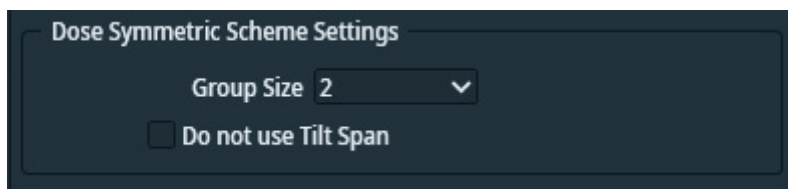
Periodic triggers for *Adjust ZLP* and *Phase Plate Activation*

- The *Adjust ZLP* and *Phase Plate Activation* functions can now be triggered at the start of every N^{th} tilt series rather than at the start of every tilt series.

Measurement tool for the Image Display

- A measurement tool is introduced to measure distances on the Image Display.
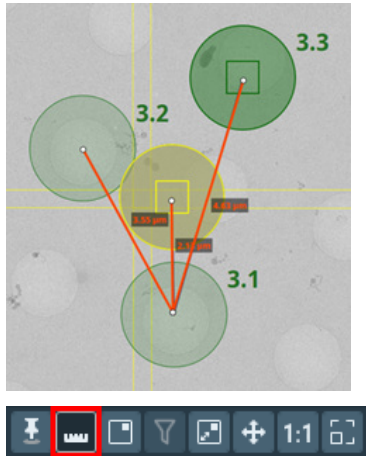
Define lamella orientation

- Allows a user to correct for small discrepancies in specimen orientation in order to align a lamella with the tilt axis.
- Lamella orientation can be measured in the Search Maps task.
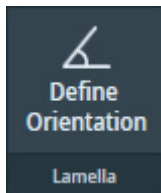
12.2   Improvements

- Scrolling through messages in the Status window disables auto-scrolling. To resume auto-scrolling, scroll all the way to the bottom of the message log.
- In Multi-shot acquisition: if the *Tracking After* functionality is activated, it is now performed for all exposure areas.
- Image Markers have been consolidated into a single menu that acts as a legend and a show/hide control panel. The menu is available in the Image Display toolbar.
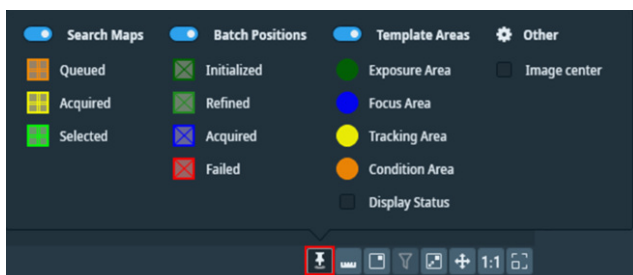
12.3   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

ID	Description	Remarks
TOMO-4988	The Date format in the `MDOC` file has been changed from `yy-mmm-dd` to `dd-mmm-yyyy`.	
TOMO-5097	The MRC images that Tomography outputs for EDS are now sorted correctly.	

13 Tomography 5.11

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.11 is focused on the usability of new features. It introduces the following major new features:

● Additional Exposure Areas in the Batch Position template can now be defined off-axis.
● Multiple Search Maps can now be acquired automatically and unattended.
● Tilt series can be reconstructed into tomograms using Tomo Live for easier review and quality control.
● Support for Ceta-F camera, as well as compressed TIF on Falcon 4(i) cameras.

13.1 New features

Tomo Live and CryoFlow Support.
● This Tomo release introduces an optional add-on, Tomo Live. Tomo Live offers:
   ● automatic reconstruction of the tomogram during batch acquisition for the purpose of review and quality control.
   ● reconstructed datasets which can be viewed anywhere using our web-based portal.
   ● filtering based on certain parameters and/or manual rating.
   ● exporting in batches ready for segmentation and processing.
● Tomo now supports CryoFlow.

Preparation > Acquisition and Optics Settings > Exposure preset
● **Compression**: To save storage space with fractions files, the Compression option is available in the Data Acquisition Preset when supported.
   Requires Falcon 4(i) camera and TEM 7.13 and higher.
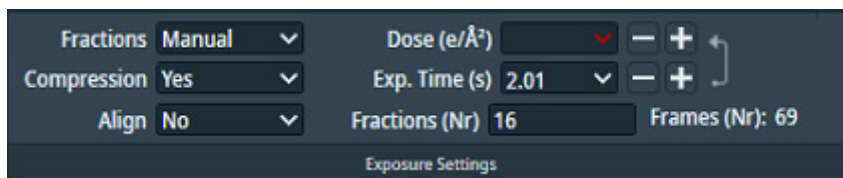
Tomography > Batch Position

● **Off-axis Multishot Acquisition**: You can now define additional Exposure Areas off the tilt axis. It is recommended that additional Exposure Areas remain within a certain proximity to the primary Exposure Area. When an exposure area is set farther from the center than recommended, Tomo indicates that by changing its color from green to red.
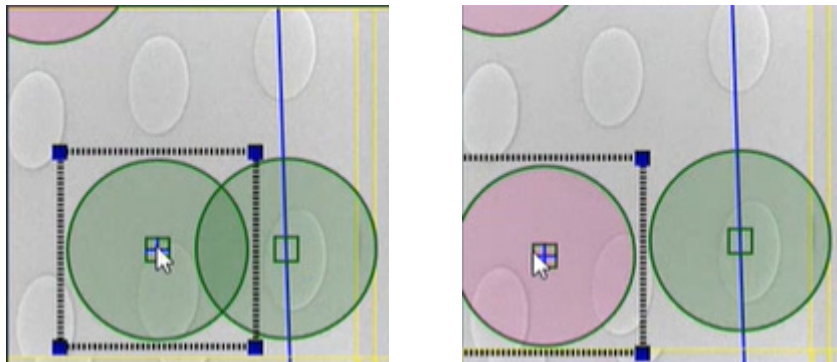
Note that when using CryoFlow*, it is not advised to use Multishot with more than five Exposure Areas.*

Note: Currently, there are limitations when using this feature with lamella samples. If you face an issue, please contact tomo5@thermofisher.com*.*

Tomography > Search Maps

● **Automatic acquisition of Search maps:** You can now add Search Maps to a queue allowing you to run multiple Search Maps with one click.

Ceta-F Support: Tomo now supports Ceta-F capabilities.

13.2   Improvements

● Two new options are introduced to improve the eucentric height by stage tilt:
  Found in **Auto Functions** > **Auto-eucentric height** > **Auto Function Settings**.
  ● Use LM preset initially: Use the LM preset for the initial measurement while selected preset is used in the final phase. This is recommended when far from Eucentric height.
  ● Reduce Z movements when unable to converge: When eucentric height does not converge, reduce the Z compensation movement by 25%.
● Increased image resolution for larger-sized Search Maps. A much higher number of pixels is used which makes it easier to distinguish visual features in larger Search Maps.
● Smarter CFEG flashing.

13.3   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

ID	Description	Remarks
TOMO-4654	Tilt MRC images are lost if the storage session folder and and OffloadData folder are the same.	
TOMO-4266	Tomography is partially unresponsive after changing mail recipients in Session Setup during an automated acquisition.	
TOMO-4929	Fractionating is not supported for BM-Ceta.	
96533	Falcon 3EC: When a tilt-series has been stopped, it cannot be restarted from the beginning. The Dose Fraction images that are already on the Storage Server cannot be overwritten, so the already acquired tilt steps of the restarted Tilt Series will fail.	

14   Tomography 5.10

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.10 introduces the following major new features and improvements:

- Add Batch Positions in Search Map view for a faster preparation.
- Add additional Exposure Areas in the Batch Position template for increased throughput.
- Improved centering accuracy for Tilt Series with a non-zero Start Angle.

14.1   Mandatory and Breaking Changes

None Identified.

14.2   New features

Tomography > **Batch Positions** and **Sample Navigation**

- The *context menu > Reset Template Areas* option returns the Focus Area and Tracking Area to the center of the image.

Tomography > **Batch Positions**

- It is now possible to define Batch Positions in the Search Map view, so it is no longer necessary to acquire a Search image for each individual Batch Position.
- The new Add Exposure function (*Beta*) adds an additional Exposure Area to a Tilt Series, without adding additional Tracking and Focus Areas.
  - Additional Exposure Areas can only be located on the Tilt Axis.
  - Each Exposure Area can have its own *Defocus value* and *Comment*.
- The locations of the template areas of a previously defined Batch Position can be edited.
  The primary Exposure Area remains fixed in the center of the template.

Tomography > **Data Acquisition**

- For Tilt Series with a so-called Continuous Scheme, the centering procedure is optimized.
  (In a Continuous Scheme, the *Start Angle* is equal to the *Max. Negative Angle* or the
  Max. Positive Angle, so that the entire Tilt Series is acquired in a single branch).
  The centering sequence is as follows:
  - Center with the stage at 0 degrees at Search magnification.
  - Center with Beam Shift at the Start Angle at Search magnification.
  - Center with Beam Shift at the Start Angle at Tracking magnification.
    - In STEM mode, Tomography now first runs the Autofocus function to ensure accurate centering.
    - The new *Skip High Mag Centering* option skips the centering action at Tracking magnification. Use this option when the centering accuracy at Search magnification is sufficient for good quality Tilt Series.
      The *Skip High Mag Centering* option is only available under specific conditions. See the Tomography User Manual for detailed information.
- In a STEM-EDS experiment, the *EDS Period* setting limits the acquisition of Spectrum Images to the specified tilt step interval.
- The new *Stop after position* function stops the automated run after the ongoing Tilt Series at the current Batch Position is completed.

14.3   Improvements

Tomography > **Batch Positions** and **Sample Navigation**

- The *image display* > *context menu* now offers the *Show Image Center* option.
- The *Stage Z* height at which the image is acquired is displayed below the image display.
- Search Map:
  - The parameters for Search Map acquisition are no longer reverted to their default values when the Tomography software is closed.
  - The order in which tiles are acquired is now automatically determined by the Tomography software.

Tomography > **Data Acquisition**

- The maximum values for the *Max. Negative Angle* and *Max. Positive Angle* are now validated against the actual range of the stage.
  Requires TEM Server 7.10 or later.
- The estimated time to completion is updated during the automated Data Acquisition.
- Health Monitoring now records the following data for Tilt Series: :
  - The type of tilt scheme.
  - The state of the Tilt Series.
  - The throughput.

Tomography > **Movie Player**

After loading is completed, the Movie Player shows the middle frame of the Tilt Series.

14.4   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

ID	Description	Remarks
TOMO-4371	Value for RotationAngle in MDOC file is incorrect.	
TOMO-4603	Auto-focus in STEM fails because filters are not used.	
TOMO-4615	Tomography crashes when switching off diffraction in STEM mode when Continuum S / Enfinium detector is present.	

15   Tomography 5.9

Note	As of Tomography 5.9, there is no separate STEM Tomography 4.X installation.

Tomography 5.9 introduces the following major new features and improvements:

● Full support for STEM and EDS Tomography.
● Automatic column valve control.
● The Search Map acquisition can now also be done with Image/Beam Shift.

15.1   Mandatory and Breaking Changes

Tomography STEM 4.X is not compatible with TEM Server 7.11 or later. The Tomography 5.9 installer does not automatically remove Tomography STEM 4.X.

Tomography STEM 4.X must be manually removed when:

● Tomography 5.9 or later is installed on a system with TEM Server 7.11 or later.
● The microscope software is updated from TEM Server 7.10 or earlier to TEM Server 7.11 or later.

15.2   Installed Packages

Application	Version	Remarks
Tomography	5.9	TEM, EFTEM STEM and EDS Tomography experiments. *As of this release, there is no separate STEM Tomography 4.X installation.*

15.3   New features

General

- The STEM Tomography 5.9 application supports all functionalities that are relevant for STEM and EDS Tomography experiments, and that are available in:
  - The most recent STEM Tomography 4.X release.

    Due to workflow changes and ongoing development of the Tomography 5.X software, not all functionality in STEM Tomography 4.X is still relevant. For example, the manual focus and tracking functionalities are not available in Tomography STEM 5.9.
  - The TEM Tomography 5.9 application.

    Not all TEM and EFTEM functionalities are also relevant for STEM and/or EDS acquisition, for example Phase Plate functions and the Auto Zero Loss auto function have no relevance for STEM / EDS use cases.
- The Column Valves are fully controlled by Tomography.

  Tomography displays a request for confirmation to open the Column Valves. If the TEM Server denies the request, for example due to insufficient vacuum levels, then an error message appears.

Tomography > **Batch Positions** and **Sample Navigation**

- It is now possible to use Image/Beam Shift to acquire Tiles for the Search Map.

  This is Beta functionality. For feedback and questions, please contact tomo5@thermofisher.com.
- On Talos systems, it is possible to manually specify a beam diameter that must be used to visualize the Template Areas. The specified value has no impact on the Optics Settings in the used Presets.

Tomography > **Data Acquisition**

Tomography now gives an estimated duration for the automated Data Acquisition run.

15.4   Improvements

Tomography > **Batch Positions** and **Sample Navigation**

- The Search Map no longer has to be square. It is now also possible to acquire a Search Map with a different number of tiles in the X and Y directions.
- The *Apply Stage Backlash* option is removed. When the stage is used to navigate to the next Search Map tile, then Tomography now always applies the stage backlash correction.

15.5   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

ID	Description	Remarks
TOMO-4026	Image size is now set correctly in all scenarios.	
TOMO-4206	Filtered FFT is updated automatically when a new image is acquired.	
TOMO-4292	Range for dose-measurement on Falcon 4 and Falcon 4i is not always displayed correctly.	

16   Tomography 5.8

Note   As of Tomography 5.8, Windows 7 is no longer supported.

Tomography 5.8 introduces the following major new features and improvements:

- The new Search Map functionality enables easier, faster and more accurate target selection than the Atlas and Overview views, and with a wider field of view than the Search view.
- Dose Symmetric Holder Calibration.

Tomography 5.8 also reintroduces limited support for STEM experiments. If the system is in STEM mode when the Tomography software is started, then Tomography will automatically present the STEM functionalities.

Note   The STEM functionality in Tomography 5.8 is limited and is still in a *Beta* status.

For feedback and questions about the STEM functionality in Tomography 5.8, please send a message to tomo5@thermofisher.com.

For STEM experiments that are not yet fully supported, please use Tomography STEM 4.21.

16.1   Mandatory and Breaking Changes

None Identified.

16.2   Installed Packages

Application	Version	Remarks
Tomography	5.8	- TEM and EFTEM Tomography experiments. - Limited support for STEM Tomography experiments (Beta).

16.3   New features

Auto Functions > **Auto-eucentric by stage tilt**

Minimum cross correlation quality is replaced by *Maximum Z deviation*.

Tomography > **Sample Navigation**

The new *Sample Navigation* task is available for single Tilt Series experiments. The Sample Navigation task offers navigation and target selection functionalities, similar to the Batch Positions task.

Tomography > **Batch Positions** and **Sample Navigation**

The image acquisition and display in the Batch Positions and Sample Navigation tasks are revised.

● The Image Display has three new toggle buttons at the bottom:
  ● *Show/hide tile locations* to toggle the visibility of tile boundaries in the Search Map image.
  ● *Show/hide tilt axis* was previously a checkbox.
  ● *Show/hide template areas* was previously a checkbox.
● The radio buttons at the top of the Image Display are replaced by a process flow. The steps of this flow correspond to the *Acquisition* functions in the ribbon bar:
  ● *Acquire Atlas* switches to the *Atlas* > *Screening* task.
  ● *Acquire Overview* has no changes.
  ● *Acquire Search Map* has similar functionality as the Atlas Acquisition function, but with a higher magnification for more accurate navigation.
  ● *Acquire Search* has no changes.

Note   For proper performance and use of the Search Map functionality, all alignments and calibrations must be completed very accurately.

If the alignment and calibration results are not accurate and consistent, then navigation via the Search Map can be inaccurate, or the Search Map can show artifacts. For example: a single physical feature that is near the corner of a Search Map tile could also appear in the corners of the adjacent Search Map tiles.

Tomography > **Batch Positions**

● The Defocus values can now be generated for all Batch Positions at once, after the Batch Positions have been defined. It is also still possible to specify a Defocus value for each individual Batch Position.
● In the new *Select Positions* mode it is possible to select a subset in the Batch Positions List, and acquire Tilt Series for only the selected positions. When in *Select Positions* mode, *Data Acquisition* > *Start Batch* is replaced by *Acquire [N] Positions*.

Tomography > **Data Acquisition**

● Holder Calibration is now also available for the Dose Symmetric tilt scheme.
● When the Dose Symmetric tilt scheme is selected, then Tomography calculates the minimum and maximum tilt angles, based on the *Start Angle* and the *Range*.
● It is now possible to skip a Batch Position during the acquisition run.

16.4 Improvements

Tomography > **Batch Positions**

The visibility of the Batch Position markers is improved, especially for clusters of nearby Batch Positions.

Tomography > **Data Acquisition**

- The Image Info panel now also shows the Field of View.
- Holder prediction and Holder Calibration:
  The Holder Calibration is now specific for:
  - All non-symmetric tilt schemes: the Start Angle and the holder type.
  - Dose Symmetric Scheme: the Start Angle, the holder type, and the Tilt Step.
    When the Dose Symmetric tilt scheme is selected, then *Corrections > Holder Predictions > Tilt Step* is disabled. For the Dose Symmetric scheme, interpolation and extrapolation of the calibrated values at specific tilt angles does not make sense.

16.5 Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

ID	Description	Remarks
TOMO-3824	Tilt series aborts with message "Could not update Template Areas after image acquisition"	
TOMO-4002	SubFramePath in MDOC file contains incorrect filename	

17   Tomography 5.7.0 and Tomography 5.7.1

In Tomography 5.7 it is possible to view an acquired Tilt Series, and to view the Holder Calibration curve.

17.1   Mandatory and Breaking Changes

None Identified.

17.2   Installed Packages

Application	Version	Remarks
Tomography	5.7	For TEM and EFTEM Tomography experiments.

17.3   New features

Tomography > **Batch Positions**
- The color of the Batch Position markers in the image display indicates their status.
- Depending on the zoom level, the markers in the image are displayed differently. When zoomed out, local clusters of Batch Positions are grouped as a single marker with the number of grouped Batch Positions. When zoomed in, Batch Positions are expanded to their Template Areas. This makes it possible to check for overlapping Template Areas among nearby Batch Positions.

Tomography > **Data Acquisition**
The most recent Holder Prediction Calibration curve for the current Max. Negative Angle,
Max. Positive Angle and Start Angle can be viewed. nearby Batch Positions.

Tomography > **Movie Player**
An acquired Tilt Series can now be played back as a video, and can be exported as an H.264 MPEG4 video.

17.4   Improvements

None Identified.

17.5 Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

Solved in Tomography 5.7.0

ID	Description	Remarks
TOMO-3340	● Gatan K3 camera changes mode when Tomography toggles between Acquisition and Optics Presets. ● Gatan K3 camera changes dose calculation when Tomography changes mode from Super Resolution to Counted mode.	
TOMO-3637	Scale bar for non-square images shows wrong value	
TOMO-3664	Histogram stretching of cross correlation image in Data Acquisition is incorrect	
TOMO-3713	MDOC file copying fails if fractions and integrated images are saved in the same session directory	
TOMO-3714	Cross-correlation for certain cameras can be incorrect	

Solved in Tomography 5.7.1

ID	Description	Remarks
TOMO-3838	Process keeps running when application is closed	—

18   Tomography 5.6

The highlights of the Tomography 5.6 release are:

- New user interface style.
- New annotations and improved user-friendliness in the *Tomography > Batch Positions* task.
- The new *Atlas > Screening > Single Atlas* functionality can acquire an Atlas of the specimen on the stage when the status of that specimen is unknown, for example when the Autoloader cassette is undocked.

18.1   Mandatory and Breaking Changes

None Identified.

18.2   Installed Packages

Application	Version	Remarks
Tomography	5.6	For TEM and EFTEM Tomography experiments.

18.3   New features

Atlas > **Screening**

The **Single Atlas** functionality can acquire an Atlas of the specimen on the stage when the status of that specimen is unknown, for example when there is no cassette in the Autoloader or when the Autoloader is not initialized yet.

Tomography > **Batch Positions**

- In the image display, the annotation type can be selected:
    - *Rough Positions* mode shows the position and status of the Batch Positions.
    - *Template Areas* mode shows the beam diameter and field of view of the Template Areas. In this view it is possible to verify that Exposure Areas do not overlap with the Tracking or Focus Areas of other Batch Positions.
- The selection of markers in the Image Display and rows in Batch Positions list is synchronized.
    - When a marker is selected, then the corresponding row in the Batch Positions list is automatically selected.
    - When a row in the Batch Positions list is selected, then the corresponding marker is highlighted in the Image Display. If the Batch Position is in a different area than currently displayed, then Tomography first loads the Overview or Search image of the Batch Position area.

Tomography > **Data Acquisition**

The Tilt Series metadata is saved in a separate MDOC file.

For a specification of the MDOC format, see: IMOD autodoc format specification.

18.4 Improvements

General

- The User Interface styling is updated.
  In the User Manual, most screenshots are not updated yet.
- TIA is no longer a prerequisite to start Tomography.
  Requires TEM Server 7.7 or later.

Tomography > **Batch Positions**

- The Overview image of a Grid Square remains available when a new Overview image is acquired for a different Grid Square.
- In the image display, the Batch Position annotations maintain their displayed dimensions instead of zooming in/out with the image.
- The performance of the Batch Positions image display is improved.

Tomography > **Data Acquisition**

A warning appears if the Autoloader TMP is running when a Tilt Series starts.

18.5 Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

The following Known Issues are solved in Tomography 5.6.

ID	Description	Remarks
TOMO-3275	After manually stopping a Batch Position refinement procedure, Tomography can not be closed sometimes.	

19   Tomography 5.5

The highlights of the Tomography 5.5 release are:

● The Acquire Overview function in the Tomography > Batch Positions task.

● Usability improvements for the Phase Plate functionalities.

19.1   Mandatory and Breaking Changes

None Identified.

19.2   Installed Packages

Application	Version	Remarks
Tomography	5.5	For TEM and EFTEM Tomography experiments.

19.3   New features

Installation and **Licensing**
For first-time installations, a 90-day Trial License is available to evaluate the software.

Tomography > **Template Definition** and **Batch Positions**
The *Condition Area with Stage* function is now available.

Tomography > **Batch Positions**
The *Acquire Overview* function acquires and displays an image of the Grid Square in which the Batch Positions are identified with labeled markers. The color of each marker corresponds with the status of the Batch Position. The Overview image makes it easier to navigate and to identify the locations for new and exisiting Batch Positions.

Tomography > **Data Acquisition**
The Phase Plate acceleration settings are now also accessible in the Data Acquisition task. The settings are synchronized with the *Preparation* > *Activate Phase Plate* task.

19.4   Improvements

Tomography > **Data Acquisition**
● On systems with a CFEG, High Temperature (High T) flashing is now available during the automated Data Acquisition run. The choice between *High T* and *Low T* flashing is made by the microscope software.

● The layout of the settings in the ribbon bar for the Phase Plate settings is revised for better ease-of-use.

19.5   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

There are no major solved issues in this release.

20   Tomography 5.4.0 and Tomography 5.4.1

Note   The Tomography 5.4.0 release is withdrawn.

Do not install Tomography 5.4.0, please install the Tomography 5.4.1 release.

The highlights of the Tomography 5.4.X release are:

- The Thermo Scientific Selectris and Selectris X energy filters are now supported.
  Requires TEM Server 7.6.
- New Atlas functionalities for batch mode Tomography sessions:
  - Better navigation while adding Batch Positions.
  - Show the location and status of Batch Positions.
- Support for *non-gain normalized LZW-compressed TIFF images* of dose fractions on Gatan K3 camera.
- Status e-mails at the end of an automated run.

The Tomography software installation no longer automatically includes STEM Tomography 4.X. To perform tomography experiments with STEM and/or EDS detectors, install STEM Tomography 4.17 as a separate software application.

20.1   Mandatory and Breaking Changes

None Identified.

20.2   Installed Packages

Application	Version	Remarks
Tomography	5.4.1	For TEM and EFTEM Tomography experiments.

20.3   New features

Tomography > **Session Setup**

- For the Gatan K3 camera, the following output formats are available for dose fraction images:
  - Gain-normalised MRC images.
  - Non-gain normalised LZW-compressed TIFF images.
    For non-gain normalised images, a gain reference image will be saved as well.
- After a single or batch tilt series ends, an e-mail can be sent to a list of e-mail addresses. The e-mail contains limited status information about the automated acquisition.

Tomography > **Batch Positions**
- If an Atlas image is available for the currently loaded specimen, then this Atlas image can be used to:
  - Navigate to different locations on the specimen.
  - Display the location and status of batch positions.
- It is possible to add batch positions with different start angles.

20.4   Improvements

General

Error handling and validation on start-up has improved.

Tomography > **Data Acquisition**

The status shows better feedback for a paused acquisition run.

20.5   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

The following Known Issues are solved in Tomography 5.4 w.r.t Tomography 5.3.

ID	Description	Remarks
—	—	*None*

The following Known Issues are solved in Tomography 5.4.1 w.r.t Tomography 5.4.

ID	Description	Remarks
TOMO-3129	MRC images saved in Tomography 5.4 cannot be opened in Inspect3D and/or Amira/Avizo.	Issue is introduced in Tomography 5.4.

21 Tomography 5.3

The highlights of the Tomography 5.3 release are:
- Improved ease-of-use of adding Batch Positions.
- Support for CFEG.
- Support for the Electron Event Registration (EER) mode with the Falcon 4 camera.
- Re-introduction of data collection with Health Monitoring during the Automated Acquisition run.

The Tomography software installation no longer automatically includes STEM Tomography 4.X. To perform tomography experiments with STEM and/or EDS detectors, install STEM Tomography 4.16 as a separate software application.

21.1 Mandatory and Breaking Changes

None Identified.

21.2 Installed Packages

Application	Version	Remarks
Tomography	5.3	For TEM and EFTEM Tomography experiments.

21.3 New features

Preparation > **Acquisition and Optics Settings**
- In the Exposure Preset it is possible to select the C2 Aperture. The other Presets automatically use the same C2 Aperture, except for the Atlas Preset. By default, the Atlas Preset uses the largest available C2 Aperture, although it can be changed.
- For Falcon 4, Tomography now supports the Electron Event Registration (EER) mode.
  In EER mode, the camera records the individual electrons that hit the Sensor Package. The acquired data consists of an `*.eer` file with a Gain Reference image, and an integrated image. The EER data format requires special software for processing.

Tomography > **Batch Positions**
- Before adding a Batch Position, it is now possible to tilt the stage to the desired start angle. Previously, this action needed to be done with the *TEM User Interface > Stage* control panel or with the Handpanels.
- To give priority to the most interesting or most promising features of interest, it is now possible to manually determine the order in which Tomography processes the Batch Position during Automated Acquisition.

Tomography > **Data Acquisition**
- To improve the accuracy of single Tilt Series acquisitions of Rod-like specimen with a continuous tilt scheme (Start Angle is equal to the *Max Negative Angle* or *Max Positive Angle*):
  - At 0 degrees tilt the feature of interest can be centered with the stage.
  - At the start angle the feature of interest can be centered with image shift.

  This functionality is not available for:
  - Batch mode
  - Slab-like specimens
  - Tilt Series with a Start Angle that is not equal to
    the *Max Negative Angle* or *Max Positive Angle*.

  For all other experiments, the feature on the image must be centered at the start angle with the stage.
- On systems with a CFEG, the tip is automatically flashed during the Automated Acquisition run to ensure a stable and optimal electron beam.
  Only on systems with TEM Server 7.5 or later (Titan 3.5 or later).
- Health Monitoring collects data during the Automated Acquisition.

21.4   Improvements

Preparation > **Acquisition and Optics Presets**
- In the Exposure Preset for a Falcon 4 camera:
  - The **Exposure Settings** > **Align** option is now also available.
    Only on systems with TEM Server 7.5 or later (Titan 3.5 or later, Talos 2.5 or later).
  - The **Exposure Settings** > **Mode**: **Linear** option is disabled to ensure that acquisitions are done in *Counted* or *Electron Event Recording (EER)* mode.
  - The limits for the *green area* in the **Dose Rate** are adjusted to better represent the capabilities of the Falcon 4 Sensor Package.
- The size of the **Optics Settings** > **Get** and **Set** buttons is increased to reduce the chance of unintentionally selecting the wrong function.
- Gatan K3:
  If CDS is enabled in Gatan GMS, then acquisitions can be performed with CDS mode.
  Only on systems with TEM Server 7.5 or later (Titan 3.5 or later, Talos 2.5 or later).

Auto Functions > **Auto Zero-Loss**
The robustness of the Auto Zero-Loss function is improved.

Tomography > **Session Setup**
The *Rod-like* specimen is supported again.

Tomography > **Batch Positions**
The size of the Template Areas is now updated to reflect the current settings of the respective Presets.

Tomography > **Data Acquisition**
The filter settings for *Tracking After* are now applied correctly.

21.5   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

The following Known Issues are solved in Tomography 5.3 w.r.t Tomography 5.2.

ID	Description	Remarks
2603	Cross correlation of tracking after images uses incorrect filter settings.	—
2604	Application doesn't start up when no magnification calibration is done.	—
2607	Annotation of template areas in Low Dose mode can end up next to the tilt axis.	—
2608	Annotation of template areas in Low Dose mode are not updated after changing camera size or illuminated area.	—

22   Tomography 5.2

The Tomography 5.2 release introduces the Screening task for the automated acquisition of Atlases for multiple specimens on a system with an Autoloader. This release also re-introduces the Switch Angle functionality, and brings significant ease-of-use improvements in the Tomography workflow.

22.1   Mandatory and Breaking Changes

None Identified.

22.2   Installed Packages

Application	Version	Remarks
Tomography	5.2	For TEM and EFTEM Tomography experiments.
STEM Tomography	4.15	For STEM / EDS Tomography experiments.

22.3   New features

Atlas > **Atlas** and **Screening**
- If the microscope has an Autoloader, then the new Screening task is available. The Screening task automatically acquires Atlases for a selection of multiple specimens in the Autoloader.
- If no Autoloader is present, then the Atlas task is available to acquire an Atlas from the specimen on the stage.

Tomography > **Automated Acquisition**
- The Switch Angle functionality is no longer disabled.
- For the Gatan K3 camera, the Automated Acquisition procedure acquires a fresh Dark Reference at the start of each Tilt Series.
  This feature requires TEM Server 7.4 or later.
- On Talos L120 systems, the Thermionic Filament can now be switched off at the end of a run.

22.4   Improvements

Preparation > **Acquisition and Optics Presets**
The Condition Preset is replaced by the Thon Ring Preset.

Preparation > **Optimized Position**
- The Auto Eucentric and Auto Focus functions are added to the Ribbon bar.
- The Optimized Position procedure now automatically selects the Focus Preset. It is no longer necessary to manually pre-select the Focus Preset before executing the Optimized Position prcoedure.

22.5   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

The following Known Issues are solved in Tomography 5.2 w.r.t Tomography 5.1.

ID	Description	Remarks
2253	The input fields Tomography > Data Acquisition > Switch Angle, High Tilt Step and High Angle Period in are not available.	--
2308	Image acquisition of Gatan K2/K3 fractions fails when using exposure time adjustment.	--
2412	In Preparation > Acquisition and Optics Presets > Presets: Focus, the Defocus parameter is not disabled.	--
2431	It is possible to start a new task, for example a Tilt Series acquisition or a Preview, before an ongoing task is completed. This may cause the software to crash.	--
2482	Crash when quitting the application, instead of ignoring start-up errors.	--
2492	When no cameras are available, the application cannot start and might crash.	--

23 Tomography 5.1

The Tomography 5.1 release re-introduces the Optimized Position calibration and the Holder Prediction calibration. It is no longer necessary to perform these calibrations in Tomography TEM 4.X.

23.1 Mandatory and Breaking Changes

None Identified.

23.2 Installed Packages

Application	Version	Remarks
Tomography	5.1	For TEM and EFTEM Tomography experiments.
STEM Tomography	4.14	For STEM / EDS Tomography experiments.

23.3 New features

Preparation > **Optimized Position**

The Optimized Position calibration is re-introduced.

It is no longer necessary to perform this calibration in Tomography TEM 4.X. If a calibration result is available from Tomography TEM 4.X, then Tomography 5.1 will attempt to load it and convert it to a Tomography 5.X compatible format.

Tomography > **Data Acquisition**

The Holder Calibration and Holder Prediction functions are re-introduced.

It is no longer necessary to perform this calibration in Tomography TEM 4.X. If a calibration result is available from Tomography TEM 4.X, then Tomography 5.1 will attempt to load it and convert it to a Tomography 5.X compatible format.

23.4 Improvements

Auto Functions > **Calibrations**

The Calibrations section in the Task panel is now collapsed by default. This decreases the chance of accidentally starting the Autofocus calibration when the intention was to start a stand-alone execution the Autofocus Auto Function.

23.5 Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

The following Known Issues are solved in Tomography 5.1 w.r.t Tomography 5.0.

ID	Description	Remarks
2343	Batch position in EFTEM could not be added after refining / acquiring data	--

24   Tomography 5.0.0 and Tomography 5.0.1

The Tomography 5.0 release is the first Tomography release with a redesigned Graphical User Interface. Tomography now shares its new Look & Feel with the other Thermo Scientific TEM and CryoEM application software products, EPU and EPU-D.

24.1   Mandatory and Breaking Changes

None Identified.

24.2   Installed Packages

Application	Version	Remarks
TEM Tomography	5.0.1	For regular TEM Tomography experiments.
	4.13.1	For Optimized Position Calibration and Holder Calibration.
STEM Tomography	4.13.1	For STEM / EDS Tomography experiments.

24.3   New features

New user interface
- The TEM Tomography application now features the same look & feel and the other TEM / CryoEM applications: EPU and EPU-D.
- The setup of the following functionalities has been redesigned for improved ease-of-use:
  - Batch Positions
  - Tilt Series
  - Image Filter settings

Preparation > **Acquisition and Optics Presets**
The Gatan Quantum 1967 (with K3 camera) is now supported.

Tomography > **Data Acquisition**
The Dose Symmetric Tilt Scheme schedules the tilt angle sequence so that the accumulated dose at low tilt angles is minimized. On dose-sensitive specimens, the Dose Symmetric Tilt Scheme provides the highest quality images for 3D reconstruction.

24.4   Improvements

Tomography > Data acquisition
The new Tomography acquisition engine provides faster and more robust automated acquisition.

24.5   Solved issues

Besides the Solved Issues that are listed below, numerous smaller issues have been solved that were not listed as Known Issues for preceding releases.

The following Known Issues are solved in Tomography 5.0 w.r.t Tomography 4.12.

ID	Description	Remarks
38215	It is possible to refine a position at which data has already been taken. Then data will be overwritten in next run.	--

The following Known Issues are solved in Tomography 4.13 w.r.t Tomography 4.12

ID	Description	Remarks
2290	Phase plate activation and conditioning don't start, and the application needs to be stopped in Task Manager	

The following issues are solved in Tomography 5.0.1 w.r.t Tomography 5.0

ID	Description	Remarks
2193	Crash when creating a new Atlas session and renaming the directory	
2237	Crash when quitting the application, instead of ignoring start-up errors	
2255	Batch position is duplicated in the Batch Position list	
2266	Visualization of the tilt axis in the Template Definition is incorrect on non-square cameras	
TOMO-389 2268	Auto ZLP periodicity is incorrect for the dose-symmetric tilt scheme	
2306	Batch position in EFTEM could not be added after refining previous positions	
38213	Using the grid in the batch position view, you can trigger unload of images during critical steps in refinement or during Tilt Series.	

The following issues are solved in Tomography 4.13.1 w.r.t Tomography 4.13

ID	Description	Remarks
2170	Crash on importing presets	

25   Known Issues

Although a large amount of effort is spent to assure the quality of the Tomography software, it can still contain issues that affect your preferred workflow.

This chapter describes only the Known Issues for the most recent Tomography release.

Historic Known Issues that are solved in the current release or in a preceding Tomography release are not listed here. For an overview of the Known Issues in a specific historic release, see the Release Notes document that is included in that software release.

ID	Issue Description and Workaround
NPD-6089	Autostigmate and Autocoma will fail on TEM SW 7.17.1 - 7.20.1 with Gatan cameras.
	Install TEM SW patch that fixes missing pixel size in the metadata.

ID	Issue Description and Workaround
115829	Throughput issue when using K2 on Bioquantum. Calls to the energy filter can add significant delays. These delays can happen when switching between data acquisition and foil hole acquisition, or between data acquisitions, depending on which function creates the problem.
	Reset the camera and GMS, then reboot the Gatan PC.

ID	Issue Description and Workaround
44890	Storing of calibrations in the Auto Functions tab fails if the user does not have administrator privileges.
	Run the Auto Function calibrations on an account with administrator rights.

ID	Issue Description and Workaround
RDTS-1837	Emails are not being sent, either at the end of the Tilt Series or when using the *Test* button.
	- Contact your IT department to allow SMTP basic authentication for the Mail Service. - Contact Service to reconfigure the Mail Service on the Microscope PC and Network PC.

26   Copyright, Limited Rights and Revision History

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Revision Table

Revision	Date	Description of Changes
5.0	OCT-2019	● New Release Notes document for Tomography ● Release Notes for Tomography 5.0 (incl. Tomography 4.13)
5.0.1	NOV-2019	Update for Tomography 5.0.1 (incl. Tomography 4.13.1)
5.1	FEB-2020	Update for Tomography 5.1 (incl. Tomography 4.14 for STEM / EDS)
5.2	APR-2020	Update for Tomography 5.2 (incl. Tomography 4.15 for STEM / EDS)
5.3	JUL-2020	Update for Tomography 5.3
5.4	OCT-2020	Update for Tomography 5.4
5.4.1	NOV-2020	Update for Tomography 5.4.1
5.5	JAN-2021	Update for Tomography 5.5
5.6	APR-2021	Update for Tomography 5.6
5.7	JUL-2021	Update for Tomography 5.7
5.7.1	AUG-2021	Update for Tomography 5.7.1
5.8	OCT-2021	Update for Tomography 5.8
5.9	JAN-2022	Update for Tomography 5.9 (Tomography for STEM mode is integrated in this release)
5.10	APR-2022	Update for Tomography 5.10
5.11	AUG-2022	Update for Tomography 5.11
5.12	OCT-2022	Update for Tomography 5.12
5.13	JAN-2023	Update for Tomography 5.13
5.14	APR-2023	Update for Tomography 5.14
5.15	JUL-2023	Update for Tomography 5.15
5.16	OCT-2023	Update for Tomography 5.16
5.17	JAN-2024	Update for Tomography 5.17
5.18	APR-2024	Update for Tomography 5.18
5.19	AUG-2024	Update for Tomography 5.19
5.20	OCT-2024	Update for Tomography 5.20

Revision	Date	Description of Changes
		SDR46958: Athena SW renamed to CryoFlow
5.20.1	DEC-2024	Update for Tomography 5.20.1
5.21	JAN-2025	Update for Tomography 5.21

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