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AutoScript TEM Software

Automation and new scientific results via Python-based scripting in transmission electron microscopy

Thermo Scientific™ AutoScript™ TEM Software opens up the microscope to a world of advanced functions for powerful automation and new workflows. It gives easy control of Thermo Scientific TEM platforms with a Python-based Application Programming Interface (API).

In transmission electron microcopy, automation and advanced user-customized software control have great potential to provide new insights in material science. Trying out unique techniques and experimental workflows enables the exploration of new scientific ideas. For this reason, Thermo Fisher Scientific has made the established AutoScript TEM Software (used on FIB-SEM systems) available for transmission electron microscope (TEM) systems.

Now, one universal scripting solution allows unification of procedures across different platforms in automation or live software feedback control of experiments. With AutoScript TEM Software, TEM-specific application programming interfaces (APIs) allow you to control the optics, apertures, and detectors in a Python environment. With this capability, you can control the microscope and create new workflows tailored to the needs of each laboratory.

AutoScript TEM Software also enables new tasks not possible with manual control. Finally, AutoScript TEM Software gives access to microscope features that could not be accessed with previous scripting functionality, such as simultaneous detector readout, beam alignments, and calibration.

AutoScript TEM Software is based on Python 3.5, a productive, open source scripting language that is supported by a large community and a vast range of libraries. An integrated development environment offers accessible and easy scripting functionality using syntax highlighting, auto-completion, and object browsing. AutoScript TEM Software's scalability addresses both simple and complex automation tasks, giving you the flexibility to run either from the local microscope support computer or from distributed computing clusters. Bringing advanced automation to every TEM, AutoScript TEM Software gives researchers and scientists the tools to make their systems more useful and productive.

Key features

Exploration of new scientific ideas not accessible by commercial mainstream software packages via unique scripting workflows.

Increased quality and statistically relevant results with higher reproducibility and accuracy by scripting of repetitive or tedious tasks.

Easy start into scripting applications with an integrated development environment (IDE) supporting object browsing, syntax highlighting with auto completion, and object browsing. Optional AutoScript TEM offline version with simulator available.

Highest productivity with the combination of unique Python processing and TEM control, which enables unattended, high-throughput multimodal imaging for more effective use of your time and tool time.

Supported by Python 3.5-based scripting environment: the most popular programming language available and the standard in scientific computing. Access to a vast collection of pre-installed libraries for scientific computing, data analysis, data visualization, image processing, documentation, and machine learning.
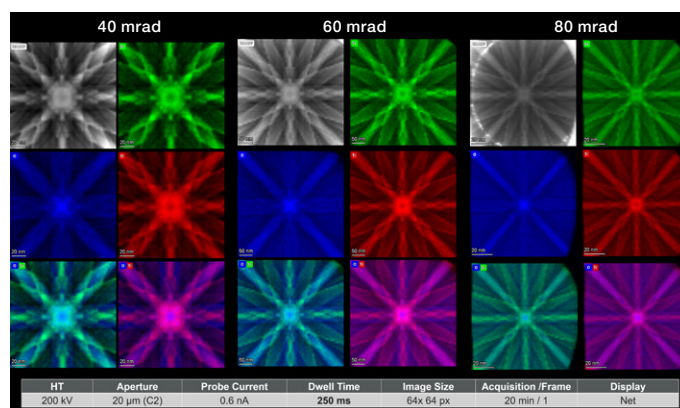

Figure 1. Rocking beam experiment on STO in (100) direction with different rocking angles. The acquisition is controlled by AutoScript TEM Software, and the elemental XEDS maps are displayed and processed by Thermo Scientific Velox™ Software. The lower row of images shows the ratio of Sr/O and Ti/O to illustrate the channeling effects in crystalline materials (ALCHEMI). The script was developed by Dr. Fumihiko Uesugi (NIMS, Japan) and is downloadable on thermofisher.com.
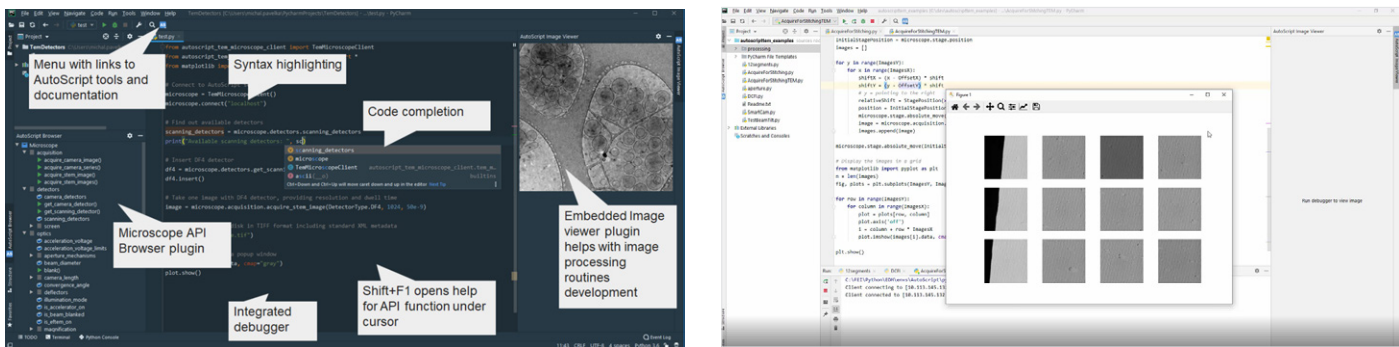
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Figure 2. Graphical user interface of AutoScript TEM Software (left) with descriptions. Example script for recording the 16 segments of the Panther STEM sensor using scripting (right).

AutoScript TEM Specifications	
Supported microscope controls	– **TEM Detectors** (insert, retract, gain, offset, individual segments)
	– **Optics** (mode, beam shift, tilt, magnification, rotation)
	– **Stage** (movement, position read-out)
	– **Apertures**
	– **Vacuum** (state), column valves controls
	– **Lorentz** mode support
	– **Acquisition** (camera and detector control, single image or a sequence, simultaneous acquisition from multiple detectors or segments)
	• TEM image acquisition with Thermo Scientific Ceta™, Falcon™, and SmartCam Cameras
	• STEM image acquisition with Fischione HAADF, Panther STEM, or Thermo Scientific BF/DF detector
	• Acquisition from any segment or combination of segments of Panther STEM
	• **Auto-functions**
	– TEM autofocus and astigmatism correction
	– STEM autofocus
	– AutoComa correction
System Requirements	• Thermo Scientific Spectra or Talos (S)TEM with Windows 10 operating system
Included in the AutoScript TEM Software package	• Python 3.5
	• Common packages: NumPy, SciPy, Pandas, OpenCV, SciKit-image, Matplotlib, Jupyter
	• Microscope control Python package
	• PyCharm Community IDE
	• Detailed online documentation
	• AutoScript TEM Software Offline with simulation (optional)
Application examples[2]	Simultaneous acquisition of 12 segmented STEM, focus series in S/TEM, SmartCam Aperture movement, metadata readout, rocking beam acquisition in XEDS

1. For latest list of functions, contact your sales representative.

2. Check for the latest scripts on thermofisher.com for AutoScript TEM Software.

Learn more at **thermofisher.com/EM-Sales**

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