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DATASHEET

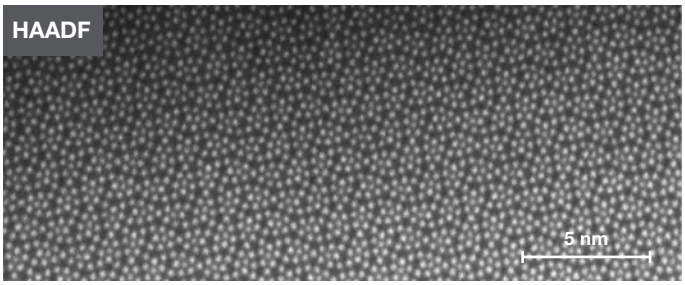
Talos F200i S/TEM

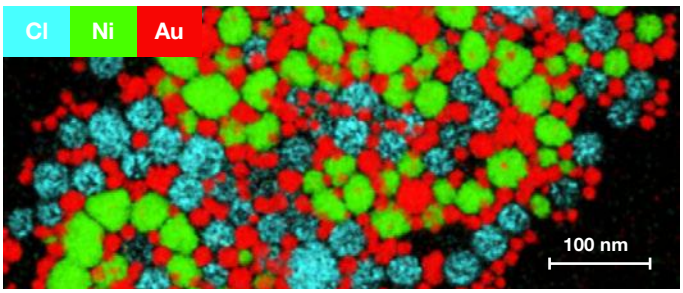
More productivity, more flexibility —more materials science

The Thermo Scientific Talos F200i scanning/transmission electron microscope (S/TEM) for high-resolution imaging and analysis applications is now available with the symmetrically positioned Dual 100mm^2 Racetrack detectors ("Dual-X") for the highest analytical throughput.

The Thermo Scientific™ Talos™ F200i S/TEM is a 20-200 kV field emission (scanning) transmission electron microscope uniquely designed for performance and productivity across a wide range of materials science samples and applications.

Its standard X-TWIN pole piece gap—giving the highest flexibility in applications—combined with a reproducibly performing electron column opens opportunities for high-resolution 2D and 3D characterization, *in situ* dynamic observations, and diffraction applications. The Talos F200i S/TEM is equipped with the 4k × 4k Ceta 16M camera, which provides large field of view and fast imaging with high sensitivity on a 64-bit platform. You can select the best EDS for your needs; a wide range of solutions can be added, from single 30 mm^2 to dual 100 mm^2 detectors.





Key Benefits

Available with dual EDS technology. Choose the best EDS detector for your needs, ranging from a single 30 mm^2 detector to dual 100 mm^2 detectors for high throughput (or low-dose) analytics

High-quality S/TEM images and accurate EDS. Acquire high-quality TEM or S/TEM images with the innovative and intuitive Velox Software user interface in very a simple way. Unique EDS absorption correction in Velox Software enables the most accurate quantification

Best all-round *in situ* capabilities. Add tomography or *in situ* sample holders. Fast cameras, smart software, and our wide X-TWIN objective lens gap enable 3D imaging and *in situ* data acquisition with minimal compromise to resolution and analytical capabilities

Increased productivity. Ultra-stable column and remote operation with SmartCam and constant-power objective lenses for swift mode and HT switches. Fast and easy switching for multi-user environments

Most repeatable data. All daily TEM tunings, such as focus, eucentric height, beam shift, condenser aperture, beam tilt pivot points and rotation center are automated, ensuring you always start from optimum imaging conditions. Experiments can be repeated reproducibly, allowing more focus on research instead of the tool

Large field-of-view imaging at high speed. The 4k × 4k Ceta CMOS camera with its large field of view enables live digital zooming with high sensitivity and high speed over the entire high-tension range

Compact design. Smaller footprint and dimensions facilitate accommodating this tool in more challenging spaces while reducing infrastructure and support costs

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Designed for multi-user and multi-discipline environments and equipped with the Thermo Scientific™ Velox™ Software user interface (immediately familiar because it is shared across all Thermo Scientific TEM platforms), the Talos F200i S/TEM is also ideal for novice users. All TEM daily tunings have been automated to provide the best and most reproducible setup. This automation eases the learning curve for novice operators, reduces tensions in a multi-user environment, and improves time-to-data for the experienced operator.

Flexible EDS analysis

Side-entry retractable Energy Dispersive X-ray Spectroscopy (EDS) detectors can be added to the configuration to enable chemical analysis. The Talos F200i S/TEM can be configured with a wide range of EDS solutions, ranging from single 30 mm^2 to large dual 100 mm^2 Racetrack. These are all fully embedded in Velox Software to enable unique absorption correction for the most accurate quantification. Dual-X in Velox Software also enables automated EDS tomography.

More productivity

Image quality is sometimes reduced by the influence of drift, vibrations or other instabilities during acquisition. This prevents you from obtaining the best-quality S/TEM images, since only short exposure times can be chosen or beam damage occurs. Drift corrected frame integration (DCFI) is a new acquisition strategy that overcomes this problem, allowing imaging with high contrast and high signal-to-noise ratio. Add integrated Differential Phase Contrast (iDPC) to more reliably and accurately image light and heavy elements simultaneously, even at low dose. To further enhance productivity, especially in multi-user, multi-material environments, the constant-power objective lenses and low-hysteresis design allow for straightforward reproducible mode and high-tension switches. The Talos F200i S/TEM also features educational online help. Simply pressing F1 with the mouse hovering over a control panel quickly opens relevant information.

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Our high-brightness X-FEG combined with the high-speed Dual-X EDS detectors enables chemical analysis at lower doses on a wider range of samples, including beam-sensitive materials.

Maps Software

Thermo Scientific™ Maps™ Software for TEM and EDS enables intuitive image-based navigation over a whole sample and easy correlation of results across imaging platforms. In order to retrieve large-area imaging at high resolution, Maps Software automatically acquires and stitches the images to document the entire area of interest with exceptional quality. For example, you can run an automated characterization of nanoparticles over thousands of square microns. Maps Software can be used across multiple tools or within one tool. It supports image import, overlay and alignment from other microscopes; for example, an SEM, microCT or light microscope. For instance, this enables zooming from correlated, low-magnification TEM and/or SEM to HRTEM, which provides valuable contextual and/or correlative information. The need for large-area correlative imaging at high resolution has increased recently because it allows researchers to retrieve statistically meaningful data on nanoparticles and catalysis samples and for precipitates in metals. Additionally, Thermo Scientific™ Avizo™ Software makes it possible to perform automated on-the-fly processing and statistics such as size, surface area, perimeter, distribution and chemical composition of nanoparticles or precipitates, using automated workflows.

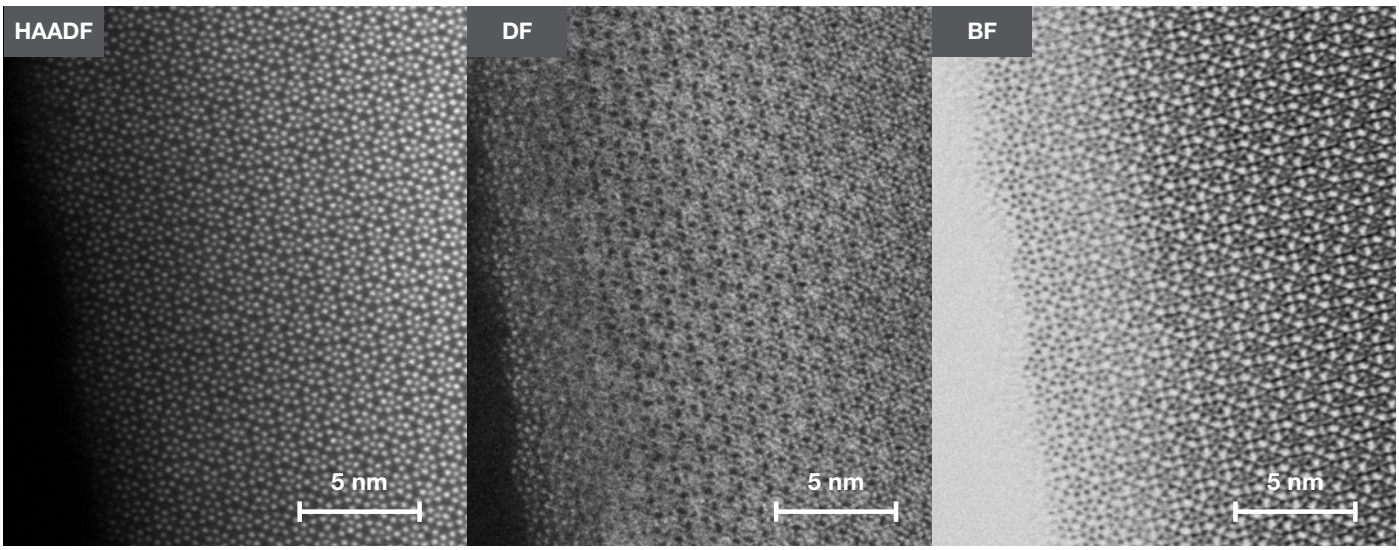

Figure 1. HAADF, DF and BF HRSTEM images of potassium tungsten niobate [001] showing the flexibility and stability of the Talos F200i S/TEM.

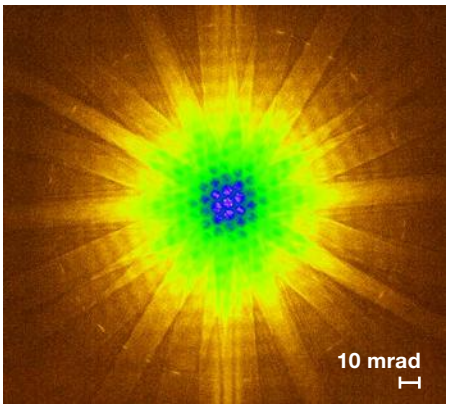

Figure 2. CBED pattern on silicon [011] acquired with small camera length showing Talos F200i S/TEM flexibility and superior dynamic range of the Ceta 16M camera.

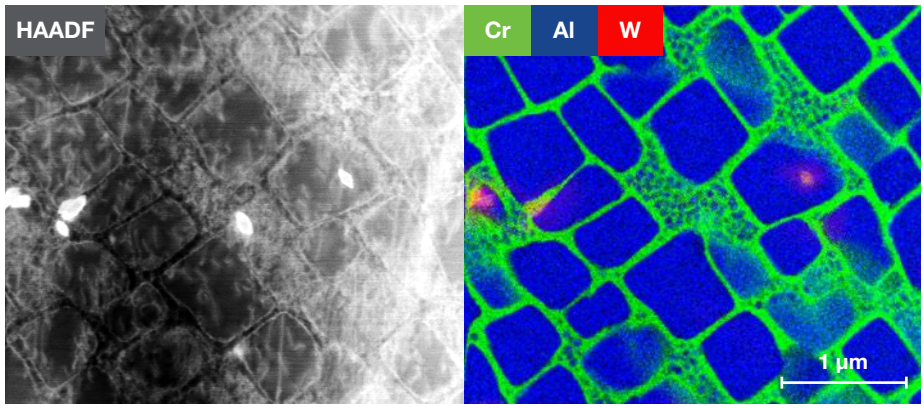

Figure 3. Example of HAADF STEM and EDS mapping with a Bruker X-flash 30 detector on a NiAl superalloy.

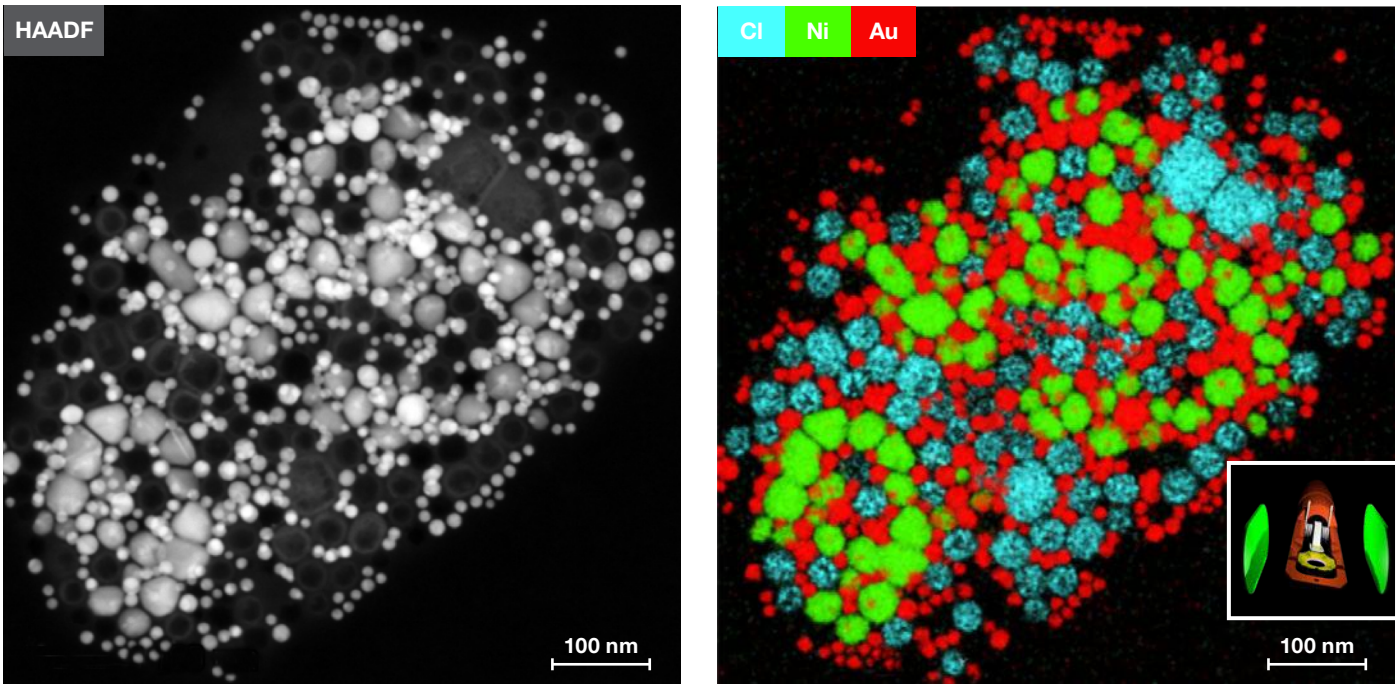

Figure 4. Example of large-area, high-resolution HAADF STEM and EDS mapping with Dual Bruker X-flash 100 Racetrack detectors ("Dual-X") on gold-nickel nanoparticles, acquired in less than one minute. *Sample sourtesy J. Bursik, Institute of Physics of Materials, Brno.*

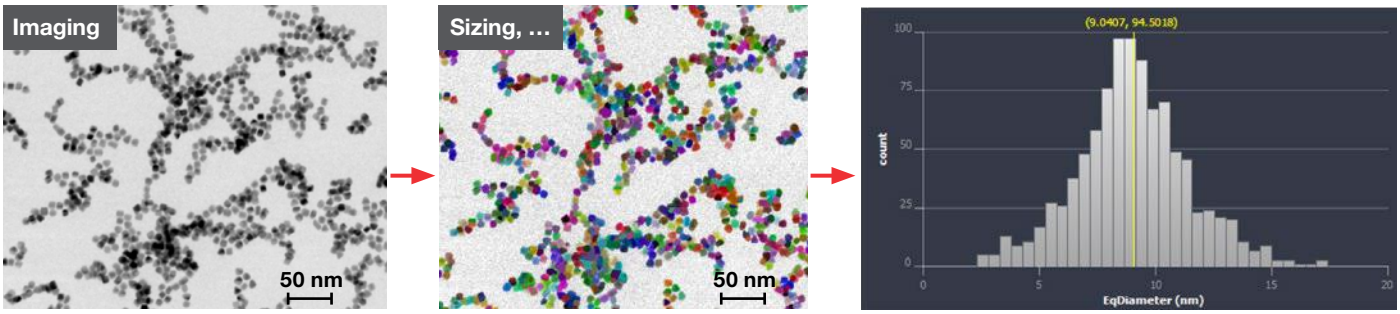

Figure 5. Avizo Software used on nanoparticles for automated on-the-fly processing with high statistics. *Sample courtesy of Prof. B. Gorman and Prof. R. Richards, Colorado School of Mines.*

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Key specifications	
TEM line resolution	≤0.10 nm
TEM information limit	≤0.12 nm
Maximum full convergence angle for LACBED	≥100 mrad
Maximum Diffraction angle	24°
STEM resolution	≤0.16 nm
EDS	Side-entry, retractable
Gun type	Field Emission Gun or High-Brightness Field Emission Gun

Full Specifications

TEM	
Line resolution	≤0.10 nm

Operating system	
Controller	Windows 7
Remote controllable	Yes

Vacuum system	
Airlock pumping	Oil- and vibration-free
Cold trap	Standard
Long-duration Dewar	Optional; at least 4 days stand-time (between refills)

STEM imaging *	
STEM resolution	≤0.16 nm
Detectors	HAADF and/or On-axis BF/DF

Energy disersive x-ray spectroscopy (EDS) *	
Detector size (Bruker X-flash)	30, 100 and Dual 100 Also other sizes and brands available.
Retractable	Yes, motorized
EDS energy resolution	129 eV

Specimen manipulation	
Z-movement total travel (standard holders)	±0.375 mm
Maximum alpha tilt with tomography holder (High field-of-view holder)	±90°
Specimen drift (standard holders)	≤0.5 nm/min

CETA 16M camera **	
Sensor	4096 × 4096 14 µm pixel CMOS
Standard Frame rate	4k × 4k: 1 fps 2k × 2k: 8 fps 1k × 1k: 18 fps 512 × 512: 25 fps
Mounting position	On-axis, bottom-mounted, retractable
Frame rate with Ceta 16M camera speed enhancement*	4k x 4k: 40 fps 2k x 2k: 80 fps 1k x 1k: 160 fps 512 x 512: 320 fps
Dedicated Ceta 16M camera analysis computer*	4 TB, fast data offloading
Ceta 16M camera storage server*	72 TB, fast data offloading

* Optional
** Optional - can be removed from the configuration if STEM-only imaging and/or analysis is required.

Installation Requirements

The Talos F200i S/TEM has small dimensions with a small footprint, hence, easy transportation of the instrument into the microscope location. Please contact your sales representative for a complete pre-installation requirements document.

Find out more at **thermofisher.com/EM-Sales**

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