

# Resolution, but make it greater

Finer resolution. Clearer insights.  
The FXE-160 Nano CT delivers  
greater resolving power and higher  
power density than ever before.

## Adapt to the market

As industrial components continue to reduce in size, X-ray inspection is crucial for detecting microscopic defects across a range of applications, from materials science to electronics failure analysis to biological samples. At the same time, obtaining high-quality data as quickly as possible so users can spend more time analyzing their data and produc-

ing actionable insights is also critical. This calls for high-power X-ray output and a stable, high-resolution beam.

The FXE-160 Nano CT can rapidly examine sub-micron defects across a wide range of lab applications by leveraging external cooling and higher resolution.

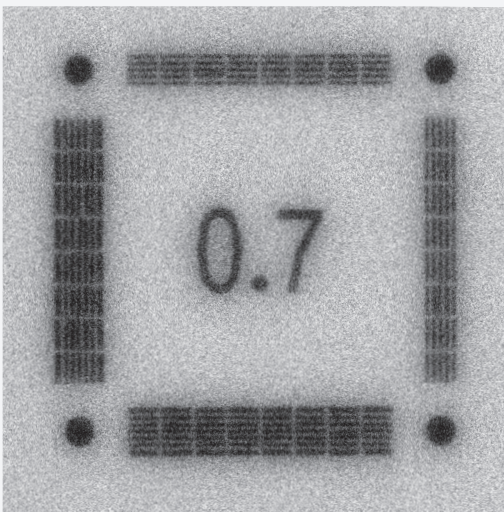
## Improved resolution

By increasing the FXE-160 Nano CT module's ultimate resolving power, it is now capable of 0.7  $\mu\text{m}$  resolution when using the high-power target. Figure 1 displays a typical image of a standard mask sample with clearly resolved 0.7  $\mu\text{m}$  structures. The vertical and horizontal structures are clearly simultaneously resolved with high contrast.

Note: achieving such high resolution also requires that the full imaging chain be optimized, for example, by choosing appropriate optical magnification and detector properties. This is the integrator's responsibility.

The maximum power density of each focusing mode has also increased. This means there is no compromise in power associated with the improved resolution. Therefore, finer details can be resolved with the same imaging speed as previously.

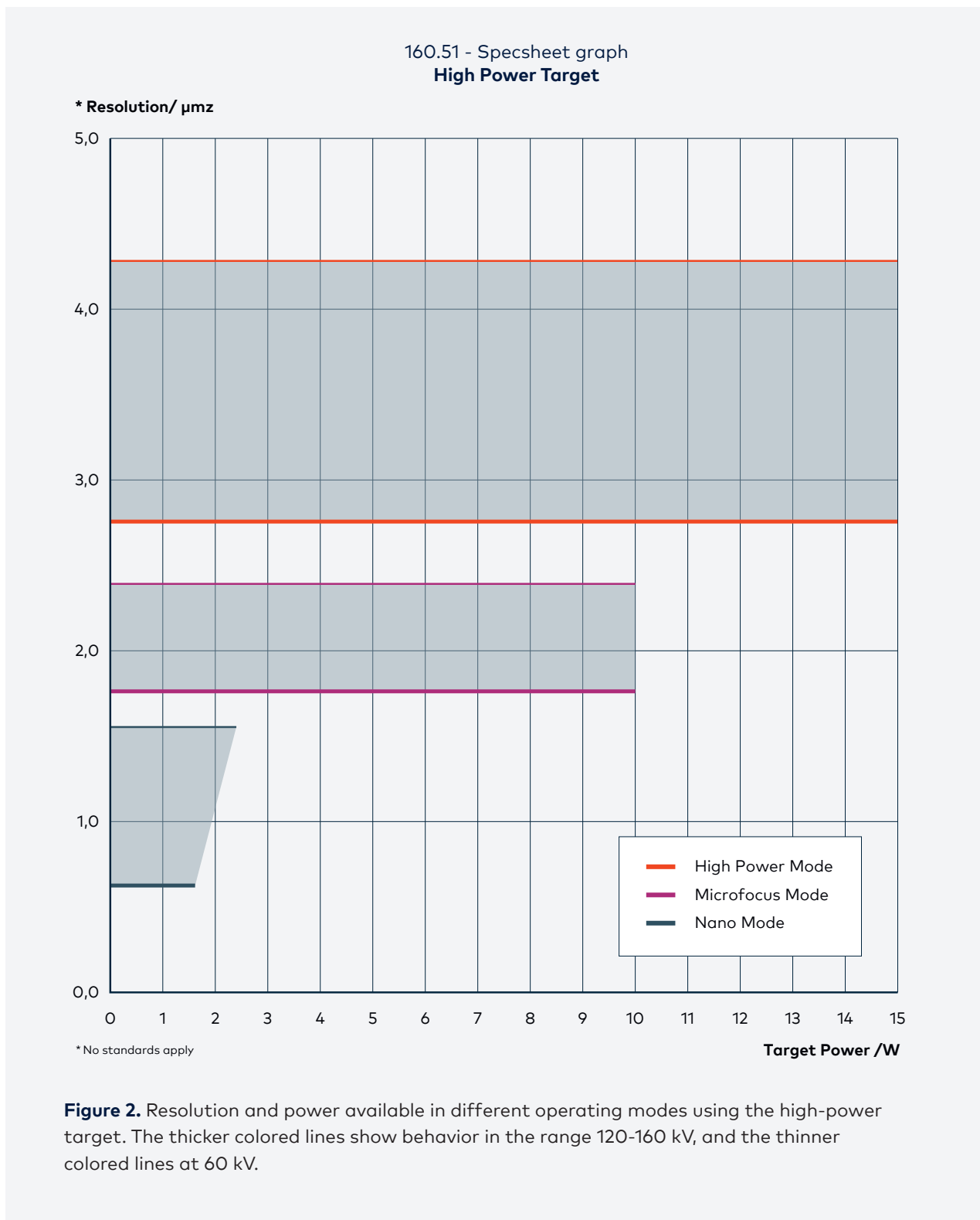
The high-power mode can reach a resolution of 2.8  $\mu\text{m}$  at up to 15 W target power. The microfocus mode can reach a resolution of 1.8  $\mu\text{m}$  at up to 10 W of target power. And finally, the highest resolution achievable with the high-power target in nanofocus mode is 0.7  $\mu\text{m}$  with a target power of up to 1.6 W.



**Figure 1.** The 0.7  $\mu\text{m}$  structures are clearly resolved by the FXE 160 nano CT.

**“The maximum power density of each focusing mode has also increased. This means there is no compromise in power associated with the improved resolution.”**

The performance is summarized in Figure 2, focusing on resolutions below 5  $\mu\text{m}$ . The spread of values in the graph represents the dependency of resolution on the accelerating voltage. The resolution is highest in the voltage range 120-160 kV, marked by the thick colored line in the graph for each operating mode.



# Reliable stability

Fully exploiting the higher resolution capabilities of the FXE 160 Nano CT is best achieved in combination with the external cooling option which provides excellent focal spot stability. A highly stable focal spot is critical for long-term imaging measurements, particularly at very high resolutions or when producing detailed reconstructed images with 3D tomography. Cooling also enables the tube to operate continuously for long periods without overheating.

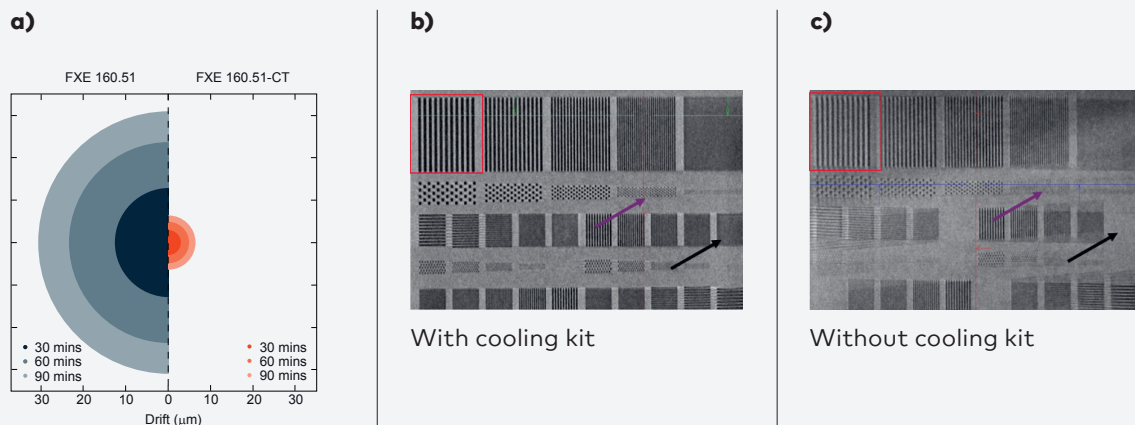
To highlight the benefits of external cooling on imaging performance, we measured the X-ray focal spot position over time. The results were compared using the FXE 160 nano and FXE 160 nano CT modules in microfocus mode. The differences between cooled and uncooled tubes are immediately apparent in Fig. 3a.

The circles' diameters represent the spatial extent of focal spot drift at the corresponding time, indicated by the different colors.

A cooled tube produces a significant reduction in spot drift, with a total drift of only 2  $\mu\text{m}$  over 1 hour following a 30-minute warm-up period. In comparison, for the uncooled tube, the drift value is 18  $\mu\text{m}$  for the same period.

The value of this increased stability in the X-ray spot position is directly evident in the test images shown in Fig. 3b and 3c. With cooling included, smaller features can be resolved (purple arrow) due to reduced focal-spot motion. Even for larger feature sizes of 10  $\mu\text{m}$  (red rectangle), the contrast is significantly increased.

The FXE-160 Nano CT now offers increased resolution of 0.7  $\mu\text{m}$ , higher power density, and improved focal spot stability.



**Figure 3. Comparative cooling results**

- a)** Drift measurements for FXE 160 nano (left) and a cooled FXE 160 nano CT module (right).
- b)** Test images obtained with and
- c)** without the cooling kit, highlighting a significant performance enhancement with cooling.

### **The benefits of the improved FXE-160 Nano CT are:**

- Achieve finer detail detection: 0.7  $\mu\text{m}$  resolution with the high-power target (HPT) improves the accuracy of imaging tiny features.
- Process samples quickly: increased power density across all operational modes enables fast, high-quality imaging.
- Reduce errors and improve consistency: increased focal spot stability supports reliable imaging, especially over long periods or at high resolutions.

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