Focus topics | March 2026

In the blink of an eye

- Turn downtime into uptime with Quickswap Filaments

comet
x-ray

Introduction

X-ray sources are called “open” if the X-ray generation tube can be opened for maintenance and then restarted. A significant benefit of this approach is that it enables running the source under aggressive conditions, for example, pushing the filament to its physical limits. Doing so makes it possible to provide high flux and high resolution, not available in sealed sources, where damage would occur too quickly to be economically viable.

While this approach can significantly reduce the total cost of ownership of an X-ray inspection system, it is important that routine maintenance be performed quickly and accurately to maximize the use of the X-ray inspection machine. This is relevant both in the lab and in factory environments. In extreme cases, every second counts toward the profitability of the overall production process, making downtime expensive.

However, a filament exchange typically requires a technician with specialized training and experience. Furthermore, the process can be slow and labor-intensive, with significant room for human error.

To solve these issues and greatly simplify X-ray source maintenance, Comet X-ray is introducing the Quickswap filament for the FXE series. Quickswap is a single integrated filament unit that comes pre-adjusted for optimum performance.

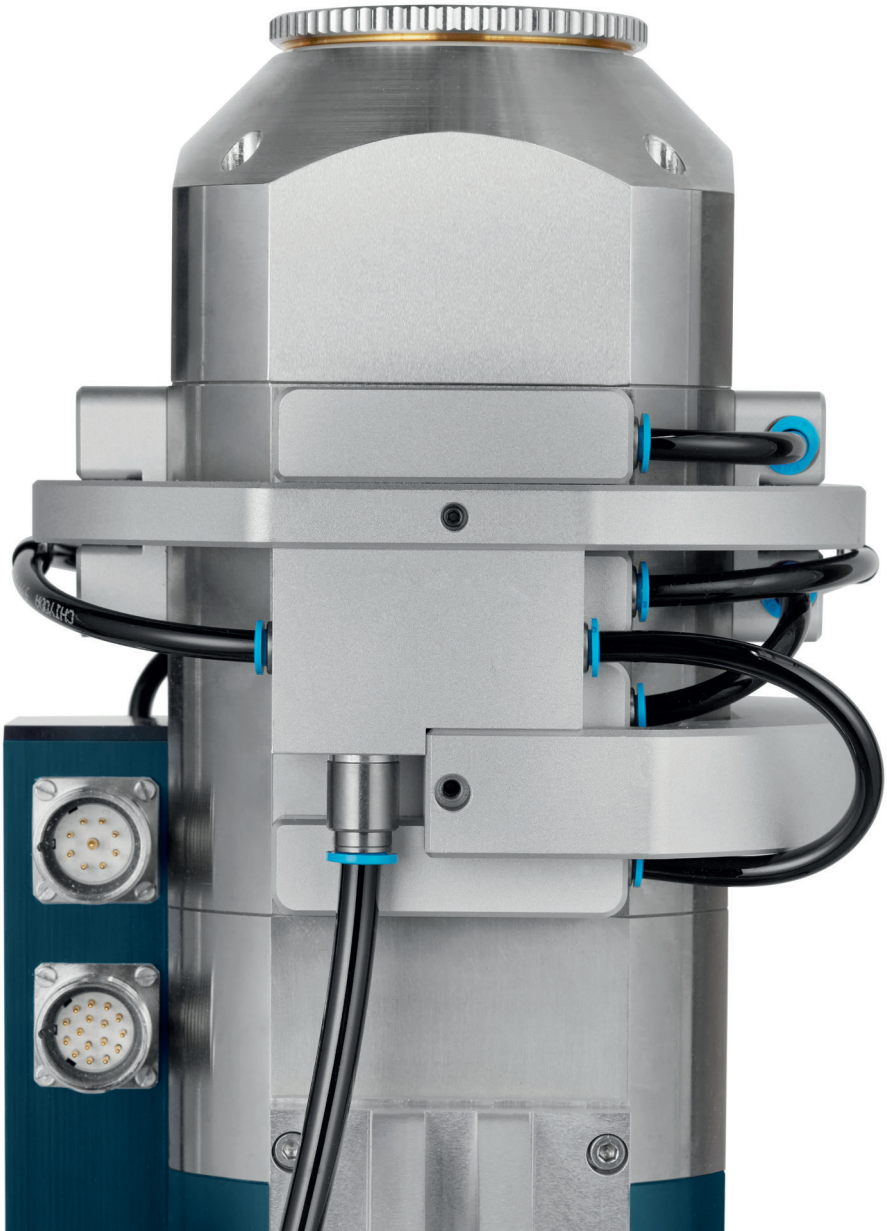
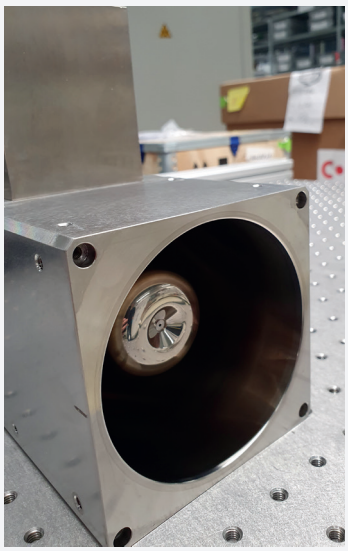
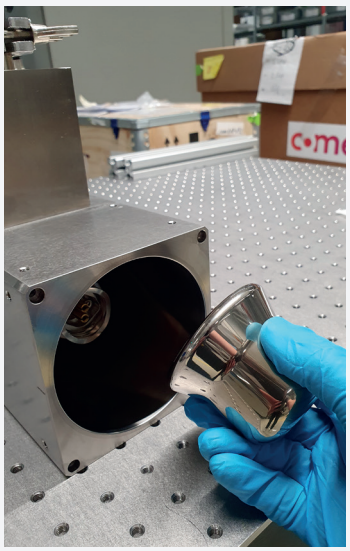


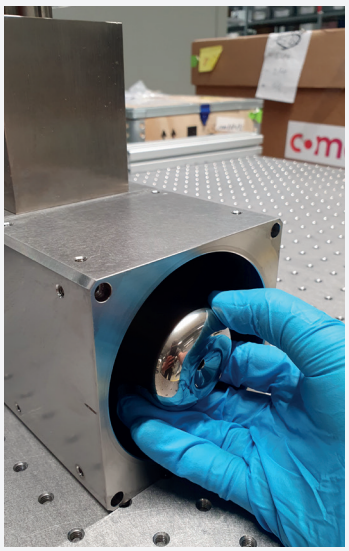
Figure 1. The Quickswap filament exchange process is performed quickly and easily.



1. The FXE unit must be vented and opened in preparation for filament exchange.



2. The grid cap is easily removed and the filament unit is simply exchanged. No adjustment or alignment is required by the operator.



3. Finally the grid cap is re-attached. The unit is now ready for vacuum preparation. The entire process of filament exchange lasts less than one minute.

Benefit 1: Easy and fast to use

Quickswap greatly simplifies maintenance of the FXE open tubes by removing the previously complicated filament exchange process.

Exchange with the new Quickswap is performed simply and quickly, as shown in Fig. 1. The grid cap is removed with a simple push-and-twist motion. The old filament cartridge is removed, and a new one is inserted into the fixed connectors. Finally, the grid cap is reinstalled. No tools are required. Simple. This exchange can be done in under 1 minute.

In contrast, the previous process included numerous steps, some of which required technical expertise. Several fine screws had to be loosened with standard tools, and an additional specialized tool was used to loosen and tighten the filament unit. In addition, the filament's height and centering required visual inspection and manual adjustment.

Polishing of a component was also recommended. Since these process steps were critical to achieving optimal performance once the unit was restarted, a skilled technician was required to perform the exchange, and the process could easily take more than 30 minutes.

Easier, more reliable, and reduced costs - the new Quickswap filament has several advantages.

Benefit 2: Reliable X-ray performance

The Quickswap filament comes pre-adjusted from the Comet factory. An FXE module equipped with Quickswap, therefore, reliably delivers the best performance without manual adjustment.

To give a clearer idea of the importance of adjustment in module performance, we will briefly look at 2 examples: filament height adjustment and the diameter of the "spray" aperture.

Firstly, if the filament height is not adjusted correctly, it can lead to sub-optimal imaging and a drastic reduction in filament lifetime. If the height is too small, the grid voltage cannot suppress electron emission, leading to leakage current. If the height is too high, the maximum target power cannot be reached, and the filament overheats as it tries to compensate for the reduced power.

This overheating can drastically shorten a filament's lifespan. The tolerance for correct positioning is only a few tens of µm and was previously achieved by manual adjustment. Quickswap completely eliminates the need for this adjustment and provides the optimal height with every exchange.

Secondly, the diameter of the spray aperture has a high impact on the filament lifetime. During X-ray generation, as material from the hot filament evaporates into the vacuum tube, soot and other impurities can accumulate inside the module. As a result, the spray aperture can become clogged with debris, reducing its diameter. The smaller the aperture diameter, the shorter the filament lifetime.

Quickswap completely eliminates the need for this check-and-cleaning step.

These two examples highlight the enormous benefit of Quickswap in reliably and efficiently delivering optimal X-ray output after a filament exchange.

Benefit 3: Reduced service costs

As described above, Quickswap removes the uncertainty related to filament exchange and initial filament adjustment. This removes significant sources of operator error, meaning the operator can easily achieve optimal module performance without specialized training. This is critical, as it means operators will experience increased productivity and fewer maintenance issues. It also reduces the barrier for entry to using open X-ray sources.

This means less time spent on service cases and more satisfied operators. As a result, the service costs will be significantly reduced and productivity increased.

Furthermore, it is possible to upgrade existing FXE modules in the field to Quickswap-capable modules. Comet IXM recommends upgrading to Quickswap so that all users can benefit from the simplicity, peace of mind, and reduced service costs it offers.



“An FXE module equipped with Quickswap reliably delivers the best performance without manual adjustment.”

Switch to the new Quickswap filament today for fast and reliable filament exchange!

The benefits of the Quickswap filament are:

- Removes complicated adjustment steps
- Accelerates the maintenance process
- Reliably provides optimal module performance
- Reduces service costs over the module lifetime
- Lowers the entry barrier for open microfocus systems

Quickswap is available for all products in the FXE series and can be upgraded to existing modules.

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