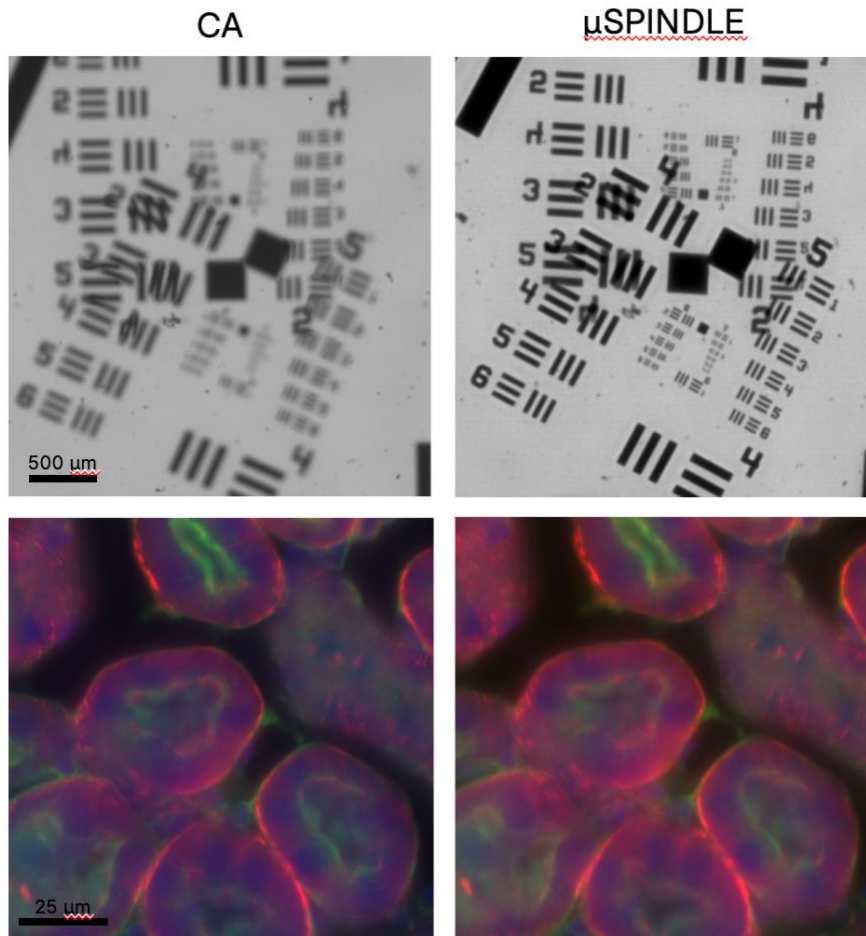


## μSPINDLE™: ULTRACOMPACT MODULE FOR INLINE INSPECTION, HIGH-THROUGHPUT IMAGING, AND OEM INTEGRATION

μSPINDLE is the most compact module in the SPINDLE® family, consisting of a slim precision-machined body and centered DHO phase mask. By adding DHO ePSF technology directly behind the objective lens in a form factor that is merely 2 cm thick, μSPINDLE offers a streamlined path to **instantaneously upgrade current or next-generation imaging systems where space, weight, and reliable operation are key considerations.**

Featuring an **ultracompact form factor, stable phase mask placement and alignment, integration with 3DTRAX® image processing and analysis software, and attachment-thread customization options to match common objective lenses and imaging systems,** μSPINDLE is compatible with DHO's full library of depth-tuneable phase masks. It is particularly suitable for a broad range of high-throughput, single-task applications, including **inline microelectronics/optics inspection, high-content screening, diagnostics, flow cytometry, and more.**

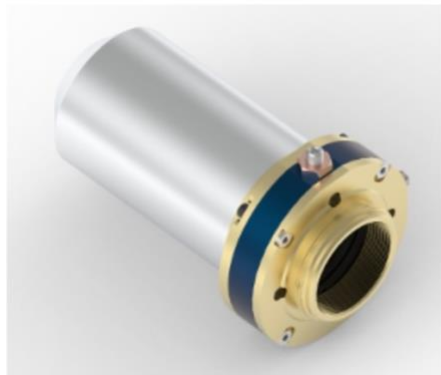
With no electrical components, no software drivers, and easy hardware alignment, μSPINDLE has robust long-term performance and minimal maintenance needs.



**μSPINDLE for industrial inspection:** μSPINDLE and Deep Focus phase mask attached to 20x objective lens imaging two US Airforce resolution targets stacked 0.5 mm apart. In-focus depth compared with clear aperture (CA) is increased by 3x with μSPINDLE, enabling both target surfaces to be sharply imaged.

**μSPINDLE for life sciences:** μSPINDLE and Deep Focus phase mask attached to 60x objective lens enables the replacement of traditional five-slice imaging with a single image capture when imaging kidney cells.

μSPINDLE is compatible with DHO's full line of phase masks, making it suitable for a broad array of applications for which it enables high-throughput, high-resolution extended depth imaging.



*μSPINDLE seamlessly slots into an imaging system's optical path by attaching at the back aperture of an objective lens. With a diameter only a few mm larger than the lens and an additional thickness of <20 mm, it adds extended depth, 3D imaging capabilities with minimal impact on the form factor of the system.*

## TECHNICAL SPECIFICATIONS

Phase mask compatibility	All DHO phase masks: 3D ePSF (Double Helix, Single Helix), Deep Focus ePSF
System integration	Compatible with transmitted (backlighting), coaxial (epi), ring, darkfield, and light sheet (selective plane) illumination modes; attaches to back of objective lens via precision threading
Dimensions	40 mm diameter x 20 mm thick – 16 mm thick excluding external attachment threads
Field of view	No restrictions for many objectives – minimal restrictions for others
Transmission efficiency	As good as ePSF phase mask
Objective lens compatibility	High and low magnification, NA ≤ 0.5; threading is customizable
Example application areas	<p><u>Life Sciences</u></p> <ul style="list-style-type: none"> <li>High-content screening</li> <li>Diagnostics</li> <li>Flow cytometry</li> </ul> <p><u>Inspection</u></p> <ul style="list-style-type: none"> <li>3D surface metrology</li> <li>Extended-depth inspection</li> <li>Inspecting curved or out-of-plane samples</li> </ul>