

Tunable optics for medical endoscopes



! The challenge

Endoscopes are moving toward higher resolution, smaller diameters, macro imaging and one-handed operation. In chip-on-scope and chip-on-tip designs, focusing must fit within tight optical, thermal and packaging constraints:

- Fixed-focus optics limit working-distance range and close-up capability.
- Manual focus rings occupy a hand and interrupt workflow.
- Mechanical stages add size and integration complexity.
- Distal actuation can add heat and complicate sealing or sterilization.

For example: at 60 fps, each frame interval is 16.7 ms. The EL-7-20's 7 ms settling time allows a focus step to complete within one interval, subject to system timing and autofocus control.

💡 Optotune's solution

Optotune's tunable lenses bring electronic focus control to chip-on-scope and chip-on-tip endoscopes without a translating lens group.

The EL-7-20 provides a 7 mm clear aperture (CA), a -6 to +8 dpt focal-power range and 7 ms settling for compact extracorporeal cameras while for distal imaging, Hx miniature lens cores offer 1.26-4.4 mm CA and sub-2 ms response when paired with a custom actuator.

The result is push-button or autofocus operation, wider working-distance and macro imaging in a compact, reduced motion, optical architecture.

Advantages

- ✦ **Electronic focus:** no moving lens group
- ✦ **Millisecond response:** down to 2 ms for miniature lens cores
- ✦ **Compact size:** 1.26-7 mm CA / 2.9-20 mm OD
- ✦ **Wider working distance:** from macro to overview imaging



Chip-on-scope one-touch focus

*Specification: EL-7-20; 7 mm CA; 20 mm OD;
7 ms settling.*

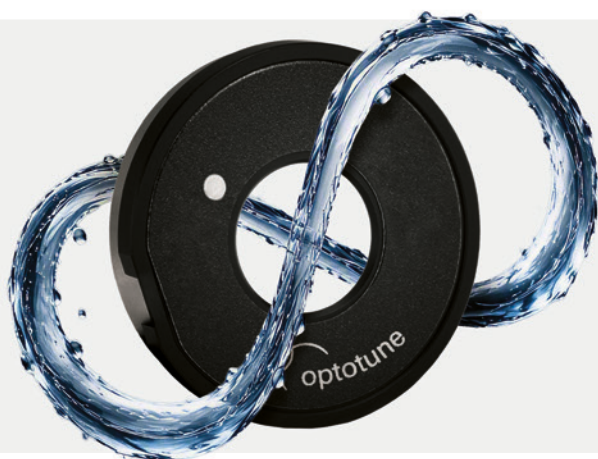
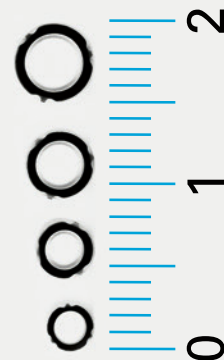
Replace a manual focus ring with button control or continuous autofocus in a compact proximal camera module, freeing the clinician's second hand.



Chip-on-tip macro imaging

*Specification: 1.26–4.4 mm lens cores;
<2 ms response; custom actuation*

Extend focus from close-up tissue inspection to longer working distances while keeping the camera compact.



Built for reliable integration

At <3.15 g and <50 mW over a 5 dpt tuning range, Optotune's liquid lenses combines a sealed optical-fluid core, elastic membrane and integrated temperature sensor with a specified lifetime of >1 billion cycles and is autoclave compatible.

Customer success story

A European endoscopy-camera OEM easily integrated Optotune's liquid lenses into its new design. Within 10 months, the camera passed all tests required for MDR conformity assessment and is now available for orders.

<10 ms

Fast focus settling

with push-button or autofocus operation



Sharp high-resolution

with shallower depth of field



One hand operation

improves efficiency and clinician comfort



Compatible

with multiple endoscope tubes

