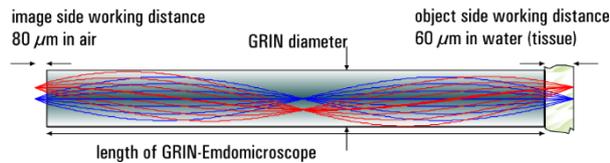


GRIN Needle Endomicroscopes for Fluorescence Microscopy

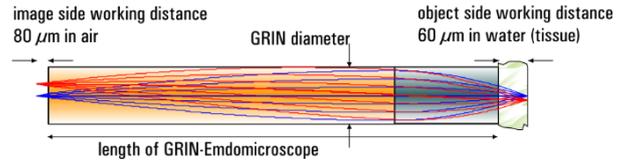
GRIN Needle Endomicroscopes are used for deep tissue imaging. They relay the micron-scale resolved image of the tissue over a longer length to a plane outside of the tissue at the other end of the needlescope. They are used with epi-fluorescence imaging (Design Wavelength 520 nm). The Endomicroscopes are fabricated as GRIN-singlets with NA = 0.50 on both sides or as GRIN-doublets with an object NA of 0.5 and an image NA of 0.19. Working distances on object side are specified in water or tissue, on image side in air. They are offered in different lengths resulting from adding 0.5 GRIN-pitches (periods) to the GRIN. Optional, they can be offered as side viewing needlescope by adding a 90° prism on object side.

Singlets:



- object side working distance in water: 60 μm
- image side working distance in air: 0 μm / 80 μm
- design wavelength: 520 nm
- NA Object / image side: 0.50 / 0.50
- Magnification: 1:1 / 1:-1 (depending on pitch length)

Doublets:

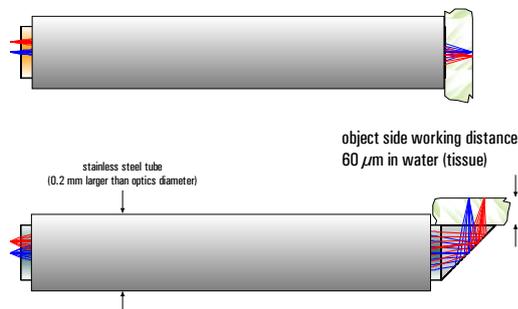


- object side working distance in water: 60 μm
- image side working distance in air: 80 μm
- design wavelength: 520 nm
- NA Object / image side: 0.50 / 0.19
- Magnification: 1:2.6 / 1:-2.6 (depending on pitch length)

Available lengths:

Diameter (mm)	Product Code	Image side working distance (μm)	Length (mm)
0.50	NEM-050-06-00-520-S-0.5p	0	2.22
	NEM-050-06-08-520-S-0.5p	80	2.08
	NEM-050-06-08-520-S-1.0p	80	4.38
	NEM-050-06-08-520-S-1.5p	80	6.67
	NEM-050-06-08-520-S-2.0p	80	8.96
1.00	NEM-100-06-00-520-S-0.5p	0	4.67
	NEM-100-06-08-520-S-0.5p	80	4.54
	NEM-100-06-08-520-S-1.0p	80	9.28
	NEM-100-06-08-520-S-1.5p	80	14.02

- Other diameters (0.35 mm, 0.60 mm, 0.85 mm, 1.80 mm or 2.00 mm), other working distances or other design wavelength are available on request



Available lengths:

Diameter (mm)	Product Code	Length (mm)
0.50	NEM-050-06-08-520-DS	3.98
	NEM-050-06-08-520-DM	10.08
	NEM-050-06-08-520-DL	16.19
1.00	NEM-100-06-08-520-DS	8.28
	NEM-100-06-08-520-DM	20.50

- Other diameters (0.35 mm, 1.8 mm), other working distances or other design wavelength are available on request

Notes:

- Diameters are sole GRIN-optics diameters
- Optional the Endomicroscopes can be delivered in medical-grade stainless steel tubes (1.4301), with outer diameters of 0.70 mm for 0.5 mm optics and 1.2 mm for 1.0 mm optics. The tubes are mounted flush on the object side (tissue, high NA) for the side viewing version the prism is not protected by the tube. On the image side, the optics sticks out of the tube by 50 – 500 μm. Please add -ST to the product code if desired.
- The lengths can have a tolerance of +/- 5 %.
- The lenses are non-coated. For customized projects, the lenses can be AR-coated.
- A side-viewing scope using microprisms may be also possible on a customized basis (see left).
- Please ask for combination with imaging fiber bundles (Fujikura) as customized solution.
- For tolerances, handling and storage see page 26

not available for following applications : Please note our partnership with Inscopix as our exclusive distributor for the field of non-confocal, single photon epi-fluorescence imaging for neuroscience applications in non-humans (see page 8).

Partnership

Brain Imaging – one of the most enabling applications of GRINTECH micro optics

Endomicroscopy using GRINTECH lenses and assemblies allows an *in-vivo* imaging access to deep tissue regions in the brain, especially in non-humans. It helps to understand disease formation and progression on a cellular level of the tissue.

To support our customers even better by providing appropriate biological techniques and protocols, GRINTECH has created a partnership with **Inscopix** Inc. in Palo Alto, California, one of the leading technology providers in neuroscience microscopic imaging.

Inscopix is distributing our products in the field of non-confocal, single photon epi-fluorescence imaging for neuroscience applications in non-humans since 2015 exclusively.

www.inscopix.com

Tolerances / Handling Instructions

Tolerances:

For of our single lenses we have the following fabrication tolerances and quality criteria:

Tolerances:

lens length z: $\pm 5\%$ due to variations of the gradient constant
working distance s: ± 0.02 mm (only LFRL- and CFRL lens series)
diameter d: $+ 0 / -0.01$ mm
- tighter diameter tolerances on request

Surface quality:

5 / 3 x 0.025; L 3 x 0.005; E 0
(defined by DIN ISO 10110-7:2000-02).
The surface quality is defined within 90 % of the lens diameter.
Outside of this area defects are allowed.

Storage and Handling of Lenses

Storage

GRIN lenses and lens systems should be stored in a dry environment. For short term storage, the plastic box or foam packing in which the lenses are shipped will provide adequate storage.

Recommended storage temperature: $-20^{\circ}\text{C} - 80^{\circ}\text{C}$.

Storage boxes should ensure that the lenses do not touch each other to prevent chipping and scratches. Best is to use the original box.

Handling

Lenses should be carefully handled with plastic tweezers, preferably those with a tapered end. Lenses should be picked up out of their individual compartments by firmly holding each on its side cylinder surface (not the polished ends). Especially small sized lenses may stick to the lens box material and can be lost during removal.

Cleaning

If it is necessary to clean the lens surfaces due some dust or other contaminant which may impair the optical performance GRINTECH generally recommends the use of ethyl alcohol as a cleaning solvent maybe combined with some smooth lintfree lens cleaning tissue. Acetone may also be used, but it should be pure enough otherwise it might leave some residue on the lens surface.