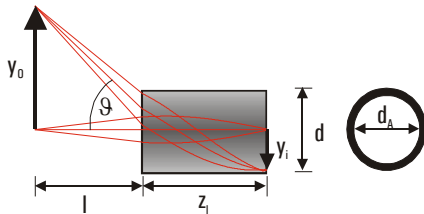


## GRIN Objective Lenses for Endoscopy

- Gradient index lenses for endoscopic imaging optics
- Non-toxic silver-based glass material
- view angle  $\vartheta = \pm 30^\circ$
- Plane surfaces, low chromatic aberration
- Combination with prisms and beam splitter cubes on request
- Aperture and field stops (black chromium coating ring on lens surface generated by photolithography) are available on request
- Certification: Biological safety – toxicology (EN ISO 10993-1)
- Design wavelength: 570 nm



Diameter d (mm)	Working distance l (mm)	Lens length <sup>1</sup> z <sub>i</sub> (mm)	Parax. Magnification M = y <sub>o</sub> /y <sub>i</sub>	Refractive index at the center of the profile n <sub>o</sub>	Product code
2.0*	Infinity	4.79	--	1.635	GT-IFRL-200-inf-50-CC*
2.0	20	5.06	-10.78	1.635	GT-IFRL-200-020-50-CC
	10	5.33	-5.46	1.635	GT-IFRL-200-010-50-CC
	5	5.84	-2.86	1.635	GT-IFRL-200-005-50-CC
1.8*	Infinity	4.19	--	1.635	GT-IFRL-180-inf-50-CC*
1.8	20	4.40	-12.29	1.635	GT-IFRL-180-020-50-CC
	10	4.61	-6.21	1.635	GT-IFRL-180-010-50-CC
	5	5.01	-3.22	1.635	GT-IFRL-180-005-50-CC
1.0	Infinity	2.23	--	1.635	GT-IFRL-100-inf-50-CC
	20	2.29	-23.1	1.635	GT-IFRL-100-020-50-CC
	10	2.35	-11.58	1.635	GT-IFRL-100-010-50-CC
	5	2.46	-5.86	1.635	GT-IFRL-100-005-50-CC
0.85	Infinity	1.93	--	1.635	GT-IFRL-085-inf-50-CC
	10	2.02	-13.34	1.635	GT-IFRL-085-010-50-CC
	5	2.11	-6.73	1.635	GT-IFRL-085-005-50-CC
0.6	Infinity	1.32	--	1.635	GT-IFRL-060-inf-50-CC
	10	1.36	-19.48	1.635	GT-IFRL-060-010-50-CC
	5	1.40	-9.78	1.635	GT-IFRL-060-005-50-CC
0.5	Infinity	1.13	--	1.635	GT-IFRL-050-inf-50-CC
	10	1.16	-22.71	1.635	GT-IFRL-050-010-50-CC
	5	1.19	-11.39	1.635	GT-IFRL-050-005-50-CC
0.35	5	0.79	-16.9	1.635	GT-IFRL-035-005-50-CC
0.25	5	0.56	-23.63	1.635	GT-IFRL-025-005-50-CC

- Working distance and lens length deviating from these standards are available on request
- ZEMAX files can be [DOWNLOADED](#) from our website
- For tolerances, handling and storage see page 26

GRIN rod lenses are offered without antireflection coatings as standard. Antireflection coatings (R < 1.0 % for the design wavelength and incidence angles of 0 ... 30° corresponding to measurements on a reference substrate) can be offered:

Coating Code: NC: no coating (reflection loss approx. 12 %) - standard  
C1:  $\lambda = 450 \dots 690 \text{ nm}$

One - sided coatings are available on request.

Order example:

GT - IFRL - 100 - 010 - 50 - CC
GT GRINTECH
IFRL Imaging Focusing Rod Lens
100 Diameter: 0.25, 0.35, 0.5, 0.6, 0.85, 1.0, 1.8 or 2.0 mm
010 Working distance: 5, 10, 20 mm or infinity
50 NA: 0.50
CC Coating Code: NC or C1

Variations due to modifications of the production process are possible. It is the user's responsibility to determine suitability for the user's purpose.

**Note:** GRINTECH objective lenses can be combined with GRIN relay lenses to complete endoscopic imaging systems by gluing the optical surfaces directly together. Prisms to change the direction of view can also be glued directly on the front surface of the objective lens.

We are happy to advise you.

**\* 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](http://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:  $\pm 0.02$  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.