

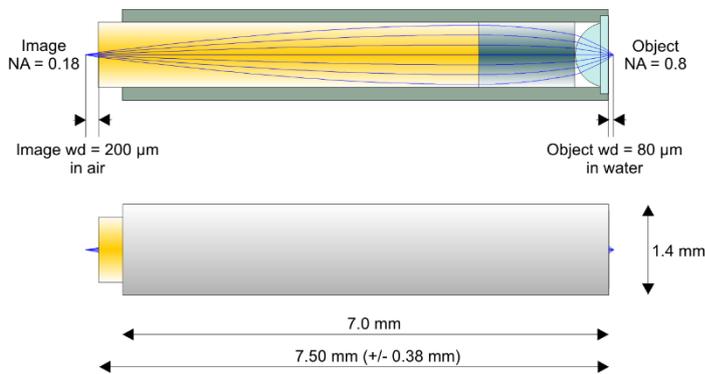
## High-NA Endoscopic Imaging Objective for Fluorescence Microscopy

GRINTECH's high-NA Endoscopic Imaging Objectives cascade the optical power of a plano-convex lens and a GRIN lens with aberration compensation to achieve an object NA of 0.8.

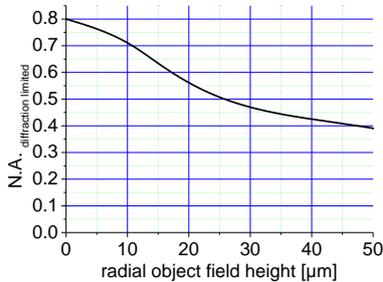
**Applications:** In vivo endomicroscopy, fluorescence microscopy, tissue imaging, flexible fluorescence microscopy, NA conversion

**Product Code:** GT-MO-080-018-488

- Features:**
- Object NA = 0.80
  - Object working distance 80  $\mu\text{m}$  (water)
  - Image NA = 0.18
  - Magnification 4.65 x
  - Recommended Excitation 488 nm
  - Mounted in stainless steel holder

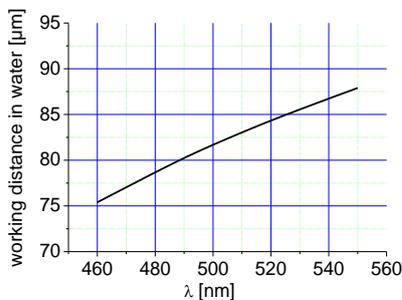


Diffraction limited NA versus Field



(from optical design simulation according to Marechal criterion @ 488 nm, wavefront RMS  $\leq 0.07 \lambda$ )

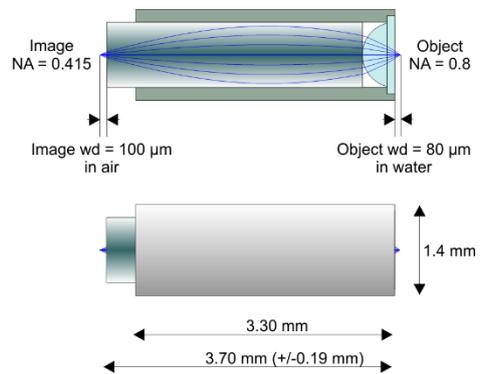
Chromatic Aberration in Object Space



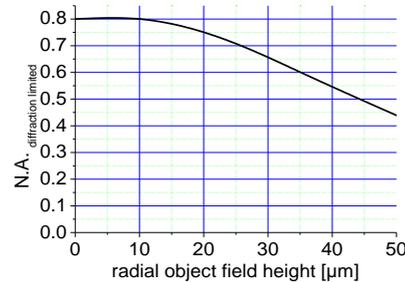
Variations due to modifications of the production process are possible. It is the user's responsibility to determine suitability for the user's purpose. For tolerances, handling and storage see page 26  
Pat. US 7,511,891

**Product Code:** GT-MO-080-0415-488

- Features:**
- Object NA = 0.80
  - Object working distance 80  $\mu\text{m}$  (water)
  - Image NA = 0.415
  - Magnification 1.92 x
  - Recommended Excitation 488 nm
  - Mounted in stainless steel holder

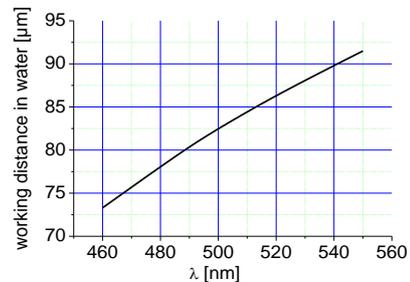


Diffraction limited NA versus Field



(from optical design simulation according to Marechal criterion @ 488 nm, wavefront RMS  $\leq 0.07 \lambda$ )

Chromatic Aberration in Object Space



## 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.