

# Collimating optics for fibers

These optics are inexpensive useful devices if you are using quartz fibers or fiber bundles. They focus light into a bundle, or collimate the output from a bundle. They fit on the end of any fiber or liquid light guide with an 11 mm O.D. Our fibers can all have 11 mm ends, with the appropriate adapter in use.

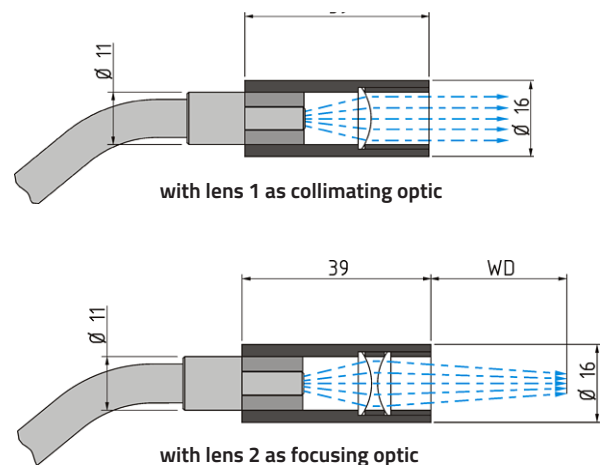
## Collimating and focusing optics

These optics are primarily used to collimate the diverging output from a fiber. The principle of operation is shown in the fig. below. The optic comes with one quartz lens, F/1.7, 19 mm focal length which captures and collimates the output cone from fused silica fibers or bundles, if these are placed one focal length away from the lens.

The optic holder is prepared to accept a second optional lens, so the collimated beam can be focused one focal length away from lens 2.

Choose lens 2 from the table below based on the image magnification and working distance required. The working distance is 7 mm less than the focal length of lens 2. The nominal magnification is defined as the ratio of the focal lengths of lens 2 to lens 1. With a 1.5 mm diameter bundle, the choice of the 25 mm focal length lens results in a 2 mm diameter illuminated area.

The optic can be positioned on the fiber to produce a more diverging or converging beam.



Dimensions [mm]

## Image quality

You cannot produce a well-collimated beam from a large aperture fiber bundle. The smallest divergence angle for a perfect optical system is given by:

$$q = \arctan (d/f)$$

with:

q = full angle divergence  
d = fiber bundle diameter  
f = lens effective focal length

Best results are obtained by large core fibers with diameters smaller than 600 µm. (The collimated beam of a 400 µm diameter fiber includes rays with angles from 0 - 1.2° to the optical axis).

Principle of operation:

Ordering information Quartz collimating/focusing optic (collimating lens included)				LLZ010
focusing lens has to be ordered separately				
Lens 2 options for focusing optics				
Focal length [mm]	Working distance* [mm]	Magnifi- cation*	Output beam (F/No.)**	Part number
19	12	1	1.7	3-41210
25	18	1.3	2.3	3-41220
38	31	2	3.4	3-41230
50	43	2.6	4.5	3-41240
75	68	3.9	6.8	3-41250
* To change working distance and magnification, move the fiber bundle.				
** Assumes lens 1 is filled by the beam from the fiber bundle.				