

# FIBER-OPTIC COUPLING LENSES

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## Coupling Lenses for VIS-NIR

InnPho's Fiber-Optic Coupling Lenses are mounted in the industry standard **RMS Threaded Mount** favored in most laboratories. Transmittance of these AR-AR coated Lenses exceeds 96% at the peak wavelength. Performance is diffraction limited when Maximum Beam Diameter is not exceeded; see below.

<u>Catalog Number</u>	<u>Focal Length</u>	<u>Working Distance</u>	<u>Numerical Aperture</u>	<u>Maximum Beam Dia</u>	<u>Magnification</u>
LFO-2-4- $\lambda$	4.0 mm	3.6 mm	0.19	1.5 mm	40X
LFO-2-6- $\lambda$	6.0 mm	5.2 mm	0.17	2.0 mm	27X
LFO-2-9- $\lambda$	9.0 mm	8.1 mm	0.50	2.0 mm	18X
LFO-3-12- $\lambda$	12.0 mm	10.9 mm	0.30	2.5 mm	13X
LFO-3-15- $\lambda$	15.0 mm	13.4 mm	0.53	2.5 mm	11X

## Antireflection Coatings

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<u>Spectrum</u>	<u>Order as</u>
380 - 640 nm	- VIS
600 - 990 nm	- NIR
970 - 1100 nm	- YAG
1100 -1550 nm	- IR
1.9 - 2.15 $\mu$ m	- HoYAG



## Coupling Lenses

**Coupling a laser output** with maximum efficiency into a single-mode fiber requires a lens of extraordinary properties. Steep aspheric curves reduce back reflections, limiting feedback significantly in comparison to GRIN lenses. Optical performance must be diffraction limited. Insertion loss must be at an absolute minimum.

### Such performance is typical of

Laser Lenses for Fiber-Optic and Laser Diode applications. These are micro double-aspheric Lenses, designed for diffraction limited performance. Both surfaces are multilayer antireflection coated. Transmittance exceeds 99% at the peak wavelength.

**Mounted LLO series lenses** are AR coated and mounted in a Microscope Objective Cell with industry standard RMS thread. Also available in a 1" dia. x .250" thick post-mountable cell with 8-32 tapped hole. Other mounting options available. Please inquire.

**Unmounted LL series lenses** as above but unmounted.

## Interchangeable FiberPort Lenses and Replacement Bulkheads

Normally, the only difference between FiberPorts used in different applications is the lens focal length, usually determined by the application. All FiberPort Lenses are mounted in a Cell that is compatible with all FiberPort models. The Cell positions the principal plane of the Lens at one focal length distance from the polished fiber endface, resulting in collimation. FiberPort Lens Cells are magnetic, and are easily installed and interchanged on site.

Thus, for experimentation purposes, rather than interchanging FiberPorts (containing different focal length lenses), it is more economical to interchange Lenses, mounted in their magnetic Cell, using a single FiberPort.

## Anti Reflection Coatings

Spectrum	Order as
380-640 nm	-VIR
600-990 nm	-NIR
970-1100 nm	-YAG
1100-1550 nm	-IR
1900-2150 nm	-HoYAG*

\*LL-3-2, LLO-2-2 and LLO-8-8 not available for HoYAG.



LLO Aspheric Lenses in RMS Cells.

## Mounted Aspheric Lenses

Catalog Number	Focal Length	Working Distance	Numerical Aperture	Maximum Beam Dia.	Equivalent Magnification
LLO-4-18- $\lambda$ *	18.4 mm	17.0 mm	0.13	4.4 mm	10X
LLO-6-11- $\lambda$	11.0 mm	9.1 mm	0.30	6.5 mm	16X
LLO-8-8- $\lambda$ *	8.0 mm	5.5 mm	0.50	8.0 mm	20X
LLO-4-7- $\lambda$	7.5 mm	5.5 mm	0.30	4.5 mm	24X
LLO-4-4- $\lambda$	4.6 mm	2.4 mm	0.53	4.8 mm	40X
LLO-2-2- $\lambda$ *	2.0 mm	0.9 mm	0.50	2.0 mm	90X

\*not available for HoYAG.

NOTE: When ordering, specify wavelength, for example, LLO-4-4-NIR.

## Unmounted Aspheric Lenses

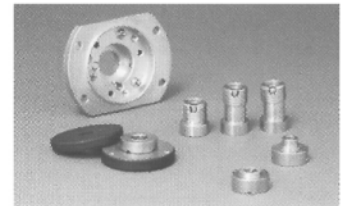
Catalog Number	Focal Length	Back Focal Length	Center Thickness	Numerical Aperture	Lens Diameter
LL-3-2- $\lambda$ *	2.0 mm	0.9 mm	2.0 mm	0.50	3.0 mm
LL-4-7- $\lambda$	7.5 mm	5.8 mm	2.7 mm	0.27	4.0 mm
LL-4-11- $\lambda$	11.0 mm	9.6 mm	2.2 mm	0.18	4.0 mm
LL-6-5- $\lambda$	4.8 mm	2.9 mm	3.1 mm	0.53	6.0 mm

\*not available for HoYAG.

NOTE: When ordering, specify wavelength, for example, LL-3-2-IR.

## Fiber Port Lens Cells

Catalog Number	Effective Focal Length
LLO-PAF-2- $\lambda$	2.0 mm
LLO-PAF-5- $\lambda$	4.6 mm
LLO-PAF-7- $\lambda$	7.5 mm
LLO-PAF-11- $\lambda$	11.0 mm
LLO-PAF-15- $\lambda$	15.4 mm



Lenses are easily interchanged in FiberPort.

$\lambda$ : Specify wavelength in nm.

## Bulkheads

Order	Description
FCBH-S	short bulkhead with tungsten insert (-2, -5, -7, -8)
FCBH-SA	NEW short angled bulkhead with tungsten insert (-18)
FCBH-L	long straight bulkhead with tungsten insert (-11, -15, -18)
FCBH-LA	long angled bulkhead with tungsten insert (-11, -15, -18)
SMA-C	CSMA bulkhead (-5, -8), original
SMA-S	short SMA bulkhead (-7)
SMA-L	long SMA bulkhead (-11)