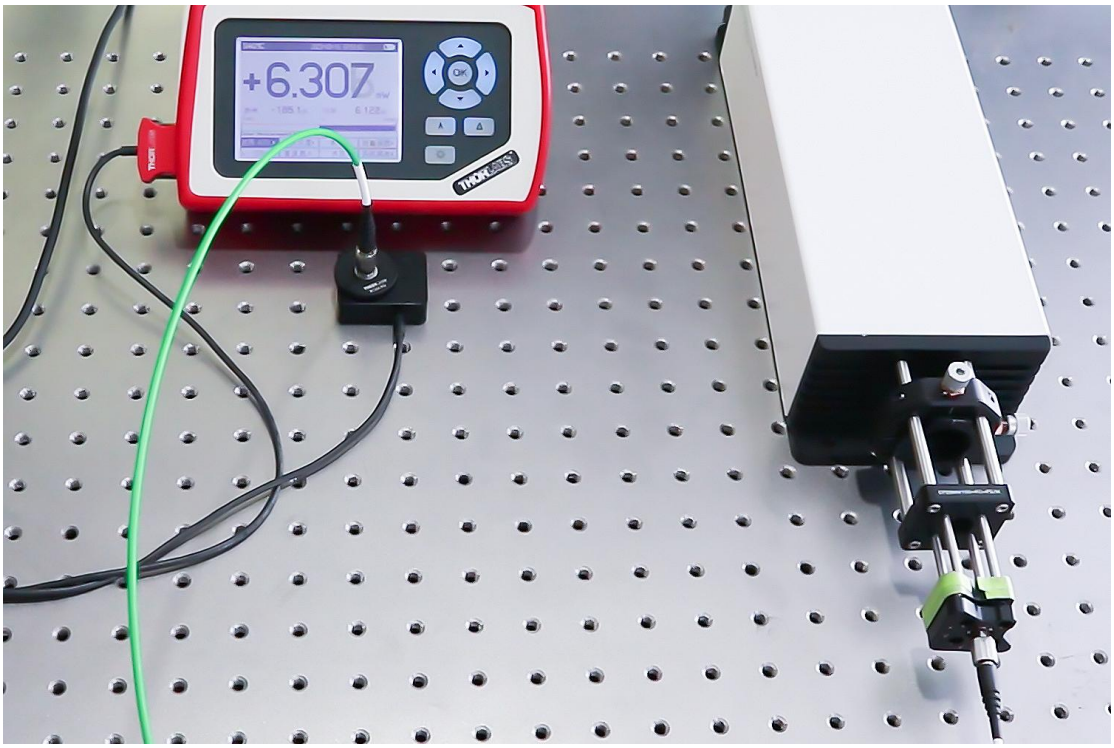
Mid-infrared hollow core fiber cage coupling system



Product Description

Lens AR coating Wavelength range: λ = 3 -12 μm; f = 50 mm; SMA connector; free space mounting; metric or imperial threads Customizable optical assemblies including lens coatings, focal lengths, and adapters

- ## Product features

Intelligent thermal management; efficient mid-infrared transmission; low absorption loss; high-temperature resistance; precision coupling design

- ## Part Number

MP-CP12MWLW50-SMA-FS

- ## Application area

Medical laser | Gas sensing | Thermal imaging system | Environmental monitoring | Scientific research experiments

- ## Core parameters

Lens AR coating
λ = 3-12 μm; f = 50 mm

- ## General Parameters

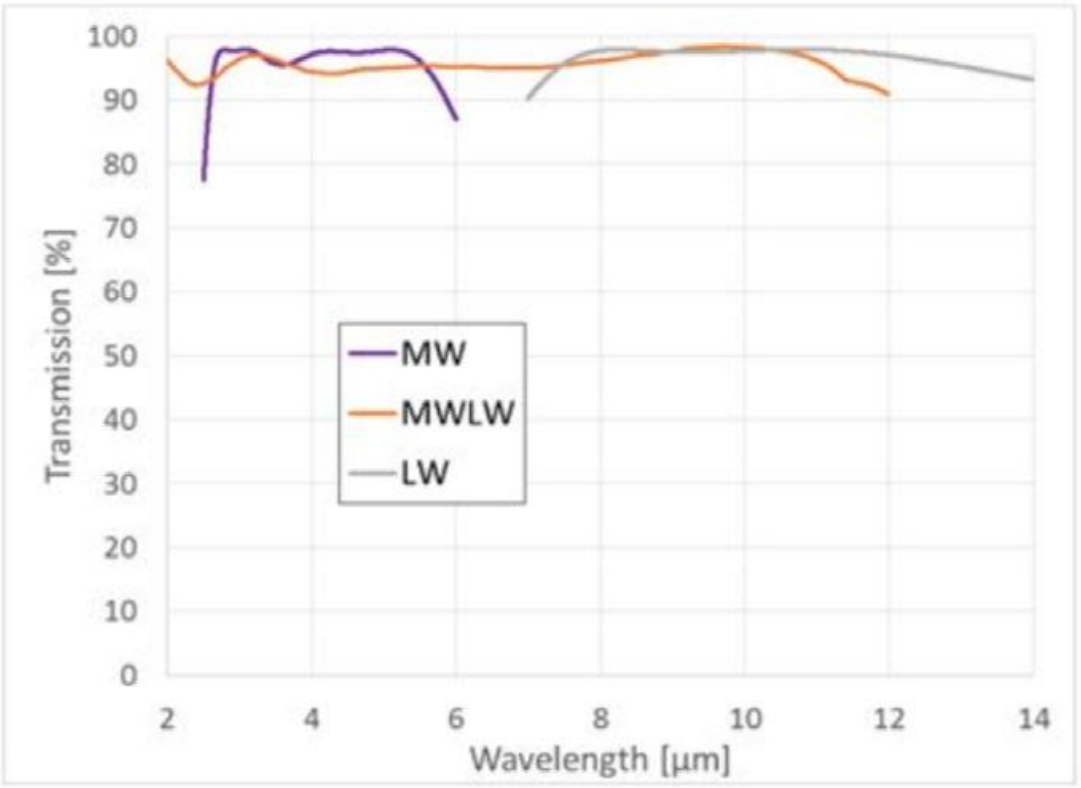
1. Lens AR coating (three wavelengths available)

Usually, lens materials and AR coatings are optimized for three different wavelength ranges, as shown in the figure.

MW:λ = 3 – 5 μm

MWLW: λ = 3 – 12 µm

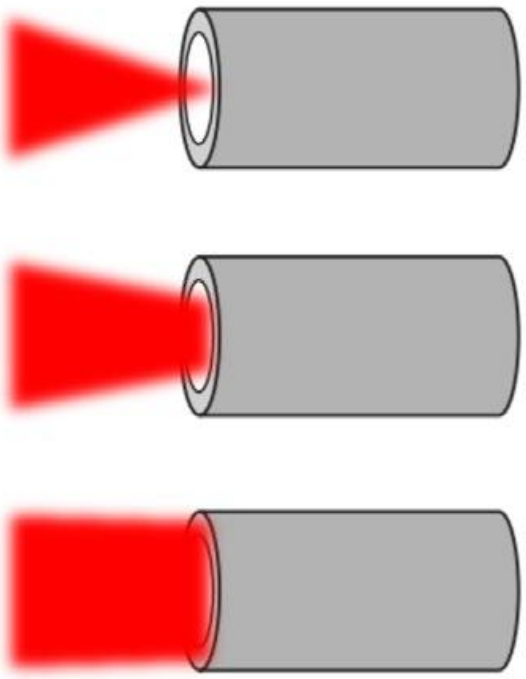
LW: λ = 8 – 12 µm



2. Focal Length Selection

In general, coupling light into a hollow-core fiber is relatively simple given the relatively large core. However, if the appropriate focal length optics are not used, both transmission and beam quality will be adversely affected. In general, the beam should enter the fiber directly with a relatively gradual focus. The best coupling into the lowest order mode occurs when the ratio of the focused spot

size to the fiber ID is 2ωo/(ID) = 0.64.



Under-fill: $2\omega_o / (ID) < 0.64$
Excite higher order modes

Optimal: $2\omega_o / (ID) = 0.64$
Low loss & high beam quality

Over-fill: $2\omega_o / (ID) > 0.64$
Beam is clipped

Based on the focused beam waist (1/e2 radius):

$$\omega_o = \frac{2\lambda}{\pi}\left(\frac{f}{D}\right)$$

← Lens focal length

← Laser beam diameter

Best focal length:

$$f_{opt} = 0.16\pi(ID)\left(\frac{D}{\lambda}\right)$$

The calculation of the best focus assumes an ideal collimated Gaussian input beam, non-ideal beams will have a larger focal spot. Therefore, we recommend choosing a focal length equal to or less than the best focal length. The table provides example recommendations for an input laser beam diameter (D=4 mm) and a fiber inner diameter (ID=300µm).

Example with D = 4 mm; ID = 300 µm

λ	f_{opt}	Recommend focal length
3 µm	201 mm	150 mm
5 µm	121 mm	100 mm
7 µm	86 mm	75 mm
9 µm	67 mm	50 mm

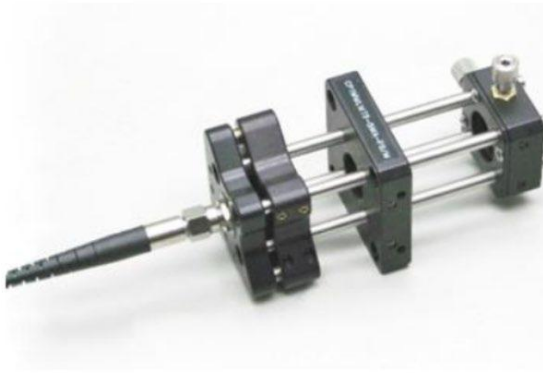
3. Connector Options

Optical assemblies can provide mating connectors for SMA or FC terminated fiber optic cables

4.Mounting Options

Coupled optics can be mounted on an optical table (i.e., free space) or directly on a Daylight Solutions laser head. Available free space (FS) versions have metric (M4) or imperial (#8-32) threads for attaching to a column. Our standard Daylight (DL) mount attaches to the laser heads of CW/Pulse, HedgeHog, Unicorn, and Uber Tuner models, and can also be used on mode-free hopping models with an adapter. A different version (DMC) is available for direct

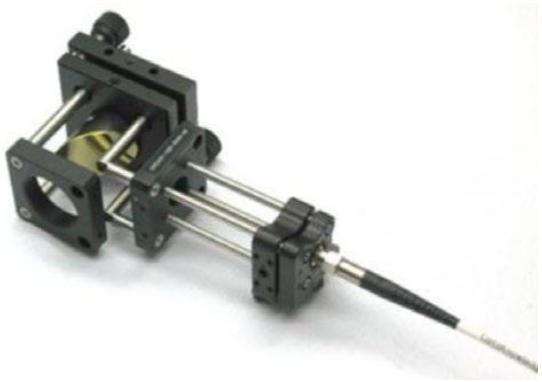
mounting to a Daylight MIRcat laser, although this requires manufacturer modifications to the MIRcat housing. If you have any questions, please provide your specific laser model and we will let you know which mount is appropriate.



5. OAP Assemblies

For high broadband applications, and those where back reflections from AR coated lenses are a concern, we offer optical assemblies that use off-axis parabolic (OAP) reflectors instead of lenses.

Note: OAP assemblies are more difficult to align than lens assemblies. If OAP is required, please inquire about available options.



6. Collimation/focusing components

Guiding Photonics can design custom optics optimized for low divergence output beams leaving hollow fibers. This includes simple single lens designs for collimation, as well as complex high NA multi-element designs for focusing to a diffraction-limited point.