

# *aeroLASE-PA100*

**Preliminary**

## *Polarizing High Power Fiber Amplifier Module*

### DESCRIPTION

The *aeroLASE-PA100* is a high-power polarizing fiber amplifier assembly which enables you, in a straight forward way, to boost pulses to ultra high power levels at 1  $\mu\text{m}$ . The module combines the extreme pulse amplification properties of our DC-200/40-PZ-Yb fiber with a unique high power pump/signal combiner.

The module allows for easy launch of more than 100W of pump power into the active fiber and is compatible with cost effective single emitter diodes. The *aeroLASE-PA100* features counter propagating pumping and yet unprecedented isolation of more than 40 dB between signal and pump diodes necessary for reliable system integration.

The *aeroLASE-PA100* is the ideal device for generating ultra high peak powers and pulse energies with superior beam quality, polarization and spectral properties.

### TECHNICAL ADVANTAGES

- Largest single mode cores for high power handling
- Short fiber length for reduced nonlinearities
- Handles ultra high peak power and pulse energies
- High pump power handling (counter propagating)
- High signal to pump isolation
- Polarizing
- Diffraction limited - truly single mode output

### COMMERCIAL ADVANTAGES

- Easy system integration
- Short time to market for your own products

### SPECIFICATIONS

#### AMPLIFIER FIBER

Active fiber DC-200/40-PZ-Yb

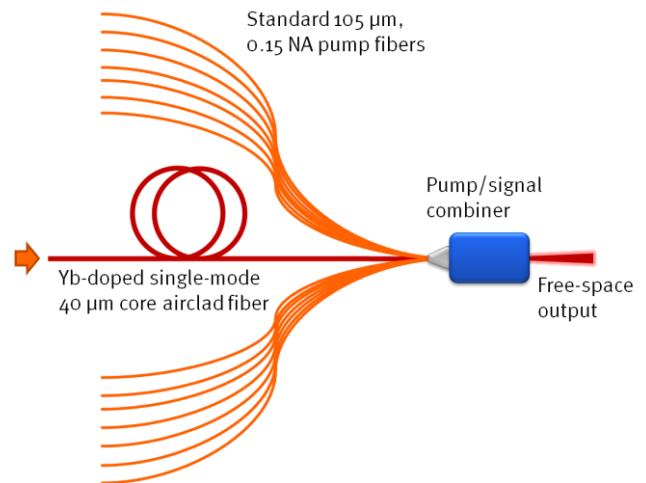
#### PUMP FIBERS

Geometry: 106/122  $\mu\text{m}$   
 Quantity: 14  
 NA: 0.15  
 Power capability: > 100 W  
 Signal to pump isolation: > 40 dB

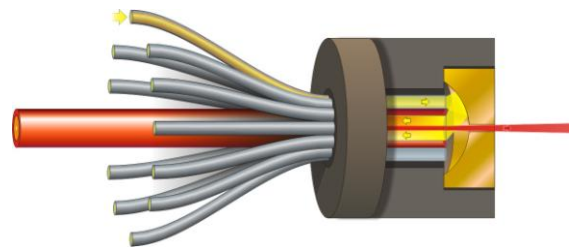
#### SIGNAL

Input interface: Sealed fiber or pigtail to 6  $\mu\text{m}$  (or larger) PM fibre  
 Input sealing length: < 150  $\mu\text{m}$   
 Input fiber angle: > 4 deg (typical)  
 Output interface: Free space, no beam expansion

### SCHEMATICS



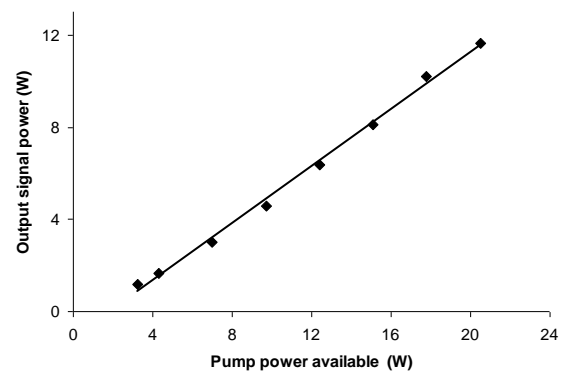
Schematic of the *aeroLASE-PA100*



Schematic of the pump/signal combiner

### PERFORMANCE

Typical slope efficiency is > 60% (plot shows 976 nm pumped system with 10ns, 100 kHz pulses).



## CUSTOM SOLUTIONS

Devices optimized for different pump wavelengths and with different signal input parameters are available upon request.

Please ask for preamplifier and post-amplifier solutions as well as interfacing solutions such as isolators.

## ACTIVE FIBER

The DC-200/40-PZ-Yb fiber is a state of the art Yb-doped airclad fiber, which combines a 40 μm single mode, single polarization signal core with a high numerical aperture, 200 μm pump cladding. This ensures easy pump coupling and high beam quality. The single-polarization operation is obtained by microstructuring the inner cladding with stress applying parts, whereby high birefringence is obtained without sacrificing beam quality.

## FIBER ADVANTAGES

- Single mode polarized signal
- High absorption
- High numerical aperture pump core
- Circular pump core
- Efficient pump absorption – no skew rays
- Large mode area signal core

## OPTICAL PROPERTIES OF THE ACTIVE FIBER

### Signal core

Mode properties ∴	Single mode
M @ 1060 nm ∴	< 1.3
Mode field diameter:	29 ± 2 μm
Mode field area:	650 ± 100 μm <sup>2</sup>
NA @ 1060 nm:	~ 0.03

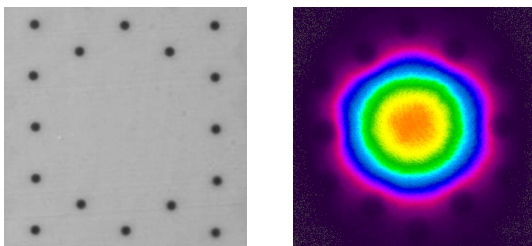
### Multimode pump core

Numerical aperture @ 950 nm:	0.55 ± 0.05
Pump absorption @ 920 nm:	~ 3 dB/m
Pump absorption @ 976 nm:	~ 10 dB/m
Slope efficiency ∴	TBD

### Polarization Parameters

Birefringence ∙ n:	> 1.0 · 10 <sup>-6</sup>
Polarization Extinction Ratio:	> 15 dB

## CORE



Left: Optical microscope picture of the core region.  
Right: Near field measured at 1060 nm.

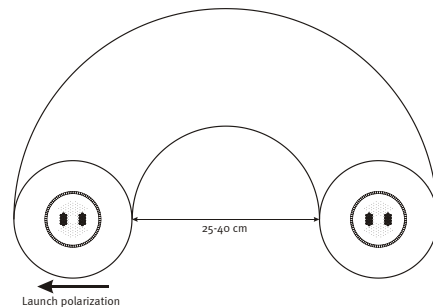
## PHYSICAL PROPERTIES

Signal core diameter:	40 ± 2 μm
Inner cladding diameter, ID:	200 ± 5 μm
Outer cladding diameter, OD:	450 ± 20 μm
Coating diameter:	620 ± 30 μm
Outer and inner cladding material:	Pure silica
Coating material, single layer:	HT acrylate

Covered by U.S. Patents 5907652, 6334019, 6603912, 6888992, 7116875, 7289709, Patent pending WO27006317

## OPERATING THE FIBER

∞ The fiber would typically be delivered precoiled and fixed to an aluminum ring. If this is not the case, it is recommended to orient the fiber with the slow axis in the bending plane (see illustrated below) and to use a bending diameter in the range 25-40 cm. Best PER is obtained when operating the fiber in the slow axis. Degradation of the PER and efficiency can occur if the fiber is twisted in the coil (i.e. if the polarization axes are not oriented identically at in- and output).



## OEM ASSEMBLY UNIT



## SAFETY CONSIDERATIONS

The laser light emitted from this laser system is invisible and will be harmful to the human eye. Proper laser safety eyewear must be worn during operation.

