

# **aeroGAIN-BASE-1.1**

High power ytterbium fiber gain module

- Truly single mode polarization maintaining system
- Excellent pointing stability
- Robust industrial construction
- 10  $\mu\text{m}$  or 15  $\mu\text{m}$  step-index fiber input
- Easy thermal management
- Long lifetime

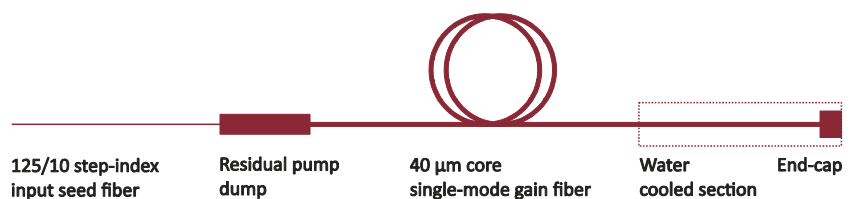


## Applications

- Ultrafast fiber lasers

The *aeroGAIN-BASE-1.1* is a high performance ytterbium fiber gain module designed for industrial manufacturers of pulsed fiber lasers, and is also suited as an easy entry into high power scientific setups. The module is equipped with a 10 or 15  $\mu\text{m}$  step-index standard single-mode fiber input that can easily be spliced to a seed source. The gain medium is our world-renowned DC-200/40-PZ-Yb fiber providing the largest single mode MFD in the industry. The gain fiber is heatsunk to the aluminum base-plate that can be clamped to e.g. a water chilled plate or an air-cooled heat sink. The output end of the module is equipped with a large AR coated endcap that provides mode expansion and reduces reflections. Excess pump light is removed by the integrated residual pump dump.

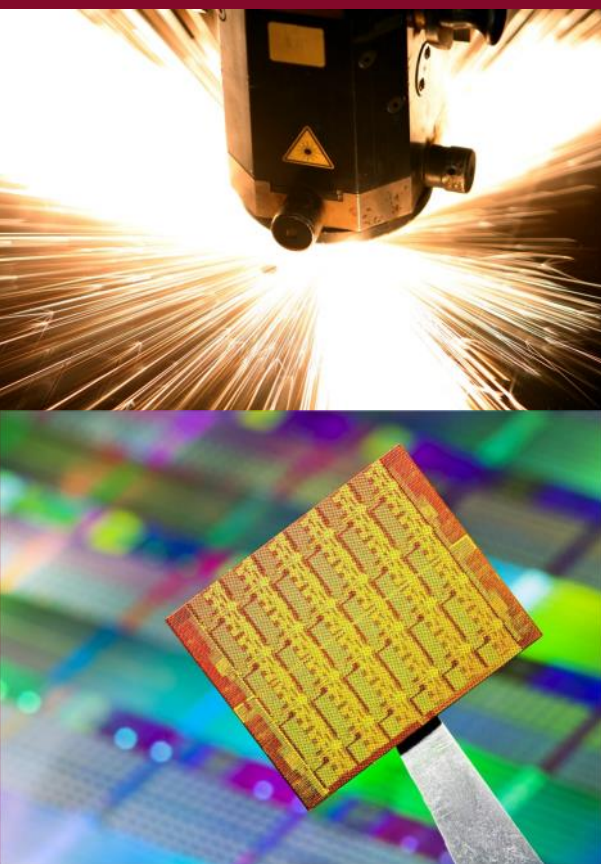
For optimal performance, the *aeroGAIN-BASE-1.1* is designed for counter propagating pumping through the output endcap. The end-cap and the last part of the gain fiber is mounted in a water cooled housing to ensure maximum performance and lifetime.

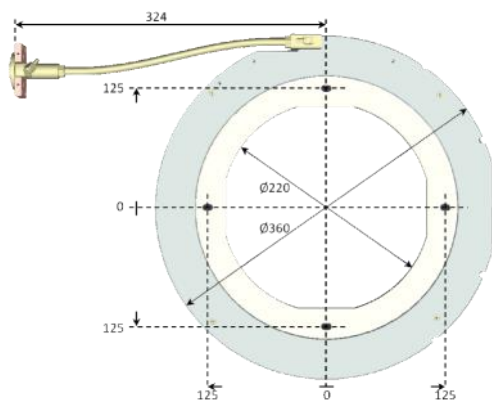


Model	Yb Fiber Length	Recommended signal wavelength
aeroGAIN-BASE-1.1	3.0 m	1064 nm

All modules are assembled and tested in cleanrooms, and come mounted on a tooling plate to ensure the endcap is clean. This tooling plate can also be used as a mount in the laboratory.

The *aeroGAIN-BASE* design has proven its industrial 24/7 reliability through a significant number of long term tests including continuous 25,000 hours operation at 55 W output power. Lifetime in specific OEM systems depends on pump power, pump wavelength, cooling efficiency etc. and NKT Photonics is available for supporting system design.





Output end-cap fixture

## Other aeroGAIN products

### aeroGAIN-ROD

When a 40  $\mu\text{m}$  core is not big enough our aeroGAIN-ROD modules deliver the ultimate gain solution. With MFDs in excess of 65  $\mu\text{m}$ , ROD systems sits at the very top of the amplifier chain reaching power levels normally only found in DPSS systems but with the benefits of a fiber waveguide and the efficient ytterbium material system.



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## Specifications

### Optical

#### Seed input

Signal wavelength	1060 – 1070 nm
Recommended signal input power	> 500 mW for high power operation
Recommended pulse duration	fs, ps or ns pulses shorter than 2 ns
Signal input fiber	- 10 $\mu\text{m}$ core PM 125 $\mu\text{m}$ / 250 $\mu\text{m}$ or - 15 $\mu\text{m}$ core PM 250 $\mu\text{m}$ / 350 $\mu\text{m}$

#### Signal Output

Max signal gain	< 20 dB
Rated output power	75 W
$M^2$	$\leq 1.3$
Mode field diameter	$31 \pm 2 \mu\text{m}$
PER	$\geq 15 \text{ dB}$
Typical optical efficiency*	> 70 %
Typical core to clad power ratio*	> 96 %

#### Pump Input

Pump center wavelength	$976 \pm 2 \text{ nm}$
Maximum pump power $P_p$	100 W @ fiber facet
Recommended pump type	Fiber delivered 200/0.22 (max NA<0.55)
Pump cladding diameter	$200 \pm 2 \mu\text{m}$

\* Evaluated with 2 W input power at 1064 nm and 75 W output power.

### Mechanical

Base plate dimensions (HxBxW)*	See drawing
Weight	1.8 kg (without tooling plate)
Length of input pigtail	1 m
Output end facet angle	0 degree
Endcap length / diameter	6 mm / 7 mm** - AR coated

\* The system is shipped on a larger tooling plate that can also be used for mounting the module during test

\*\* Open aperture

### Water cooling

Cooling flow for base	$4 \pm 2 \text{ liter/minute}$
Cooling flow in the tube	0.2 - 0.5 liter/minute
Cooling water temperature	$25 \pm 5^\circ\text{C}$
Max temperature of base-plate	$35^\circ\text{C}$

All NKT Photonics products are produced under our quality management system certified in accordance with the ISO 9001:2015 standard.



# aeroGAIN-BASE-1.2

High power ytterbium fiber gain module

- Truly single mode polarization maintaining system
- Excellent pointing stability
- Robust industrial construction
- 10  $\mu\text{m}$  or 15  $\mu\text{m}$  step-index fiber input
- Easy thermal management
- Long lifetime

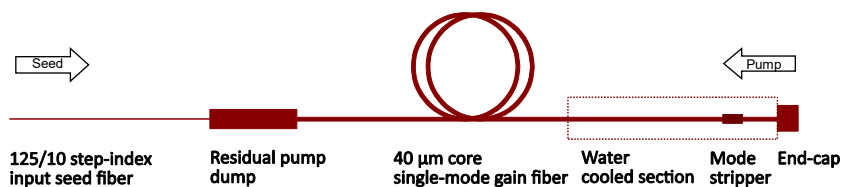


## Applications

- Ultrafast fiber lasers

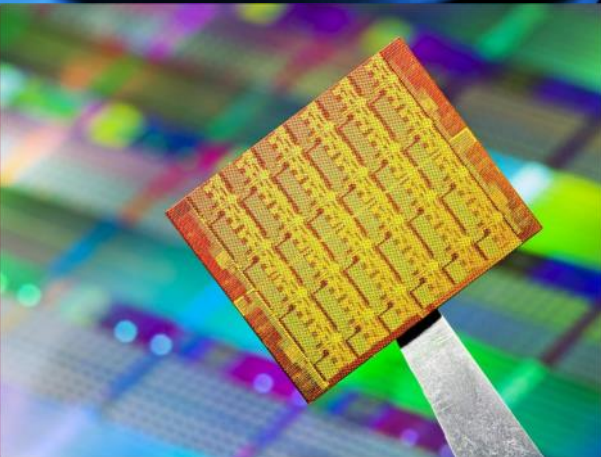
The aeroGAIN-BASE-1.2 is a high performance ytterbium fiber gain module designed for industrial manufacturers of pulsed fiber lasers, providing laser beams with high spectral and spatial brightness. It is also suited as an easy entry into ultrafast scientific setups. This model has a reduced size compared to other members in the aeroGAIN-BASE family. The module is equipped with either a 10 or 15  $\mu\text{m}$  step-index single-mode fiber input that can easily be spliced to a seed source. The gain medium is our industry leading DC-200/40-PZ-Yb fiber providing the largest single mode MFD in the industry. The gain fiber is heatsunk to the aluminum base-plate which can be clamped to e.g. a water chilled plate or an air-cooled heat sink. The output end of the module is equipped with a large AR coated endcap that provides mode expansion and reduces reflections. Excess pump light is removed by the integrated residual pump dump.

For optimal performance, the aeroGAIN-BASE-1.2 is designed for counter propagating pumping through the output end-cap. The end-cap and the last part of the gain fiber is mounted in a water cooled housing to ensure maximum performance and lifetime.



Model	Yb Fiber Length	Recommended signal wavelength
aeroGAIN-BASE-1.2	1.8 m	1030 - 1040 nm

The aeroGAIN-BASE design has proven its industrial 24/7 reliability through a significant number of long term tests including continuous 25,000 hours operation at 55 W output power. The design has been subjected to extensive HASS testing. Lifetime in specific OEM systems depends on pump power, pump wavelength, cooling efficiency etc. and NKT Photonics is available for supporting system design.



# Specifications

## Optical

### Seed input

Signal wavelength	1030 – 1040 nm
Recommended signal input power	> 500 mW
Recommended pulse duration	fs, ps or ns pulses
Signal input fiber	- 10 µm core PM 125 µm / 250 µm or - 15 µm core PM 250 µm / 350 µm

### Signal Output

Max signal gain	< 20 dB
Rated output power	75 W
M <sup>2</sup>	≤ 1.3
Mode field diameter	31 ± 2 µm
PER	≥ 15 dB
Typical optical efficiency*	> 70 %
Typical core to clad power ratio**	> 96 %

### Pump Input

Pump center wavelength	976 ± 2 nm
Maximum pump power P <sub>p</sub>	100 W @ fiber facet
Recommended pump type	Fiber delivered 200/0.22 (max NA<0.55)
Pump cladding diameter	200 ± 2 µm

\* At max power

\*\* Amplified signal

## Mechanical

Base plate dimensions (HxBxW)*	See drawing
Weight	1.8 kg (without tooling plate)
Length of input pigtail	1 m
Output end facet angle	0 degree
End-cap length / diameter	6 mm / 7 mm** - AR coated

\* The system is shipped on a larger tooling plate that can also be used for mounting the module during test

\*\* Open aperture

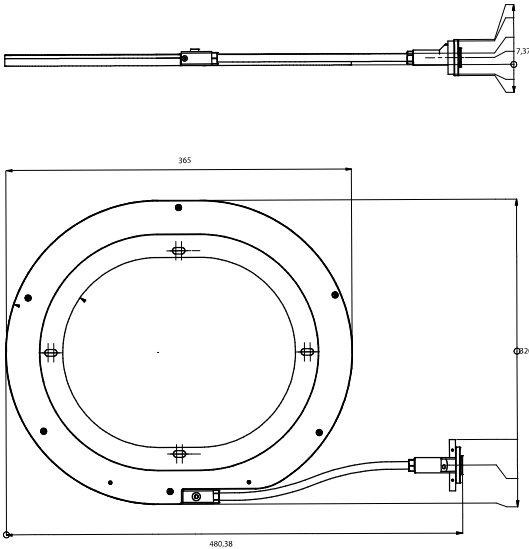
## Water cooling

Cooling flow for base	4 ± 2 liter/minute
Cooling flow in the tube	0.2—0.5 liter/minute
Cooling water temperature	25 ± 5°C
Max temperature of base-plate	35 °C

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aeroGAIN-BASE-1.2\_190312



## Other aeroGAIN products

### aeroGAIN-ROD

Whenever a 40 µm core is not large enough our aeroGAIN-ROD modules deliver the ultimate gain solution. With MFDs in excess of 65 µm, ROD systems sits at the very top of the amplifier chain reaching power levels normally only found in DPSS systems but with the benefits of a fiber waveguide and the efficient ytterbium material system.



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# aeroGAIN-BASE-1.3

High power ytterbium fiber gain module

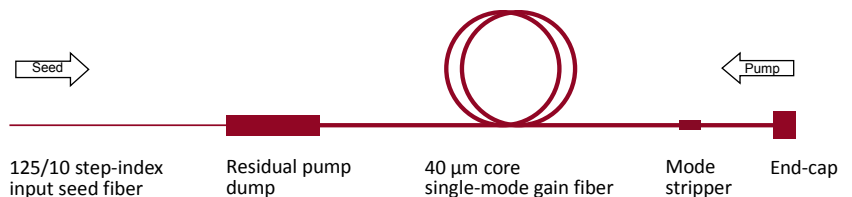
- Truly single mode polarization maintaining system
- Excellent pointing stability
- Robust industrial construction
- 10  $\mu\text{m}$  or 15  $\mu\text{m}$  step-index fiber input
- Easy thermal management
- Long lifetime



## Applications

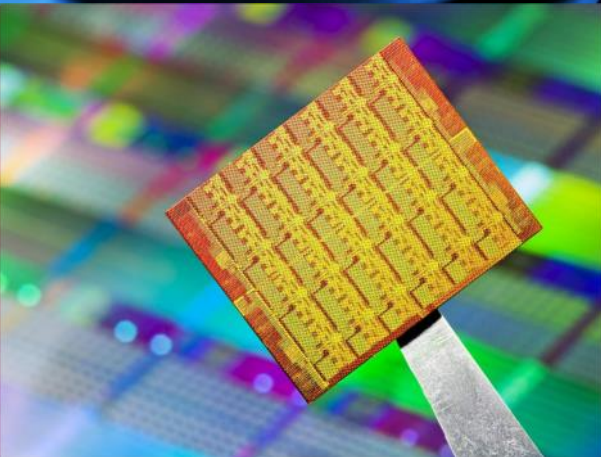
- Ultrafast fiber lasers

The aeroGAIN-BASE-1.3 is a high performance ytterbium fiber gain module designed for industrial manufacturers of pulsed fiber lasers, and is also suited as an easy entry into ultrafast scientific setups. The module is equipped with either a 10 or 15  $\mu\text{m}$  step-index single-mode fiber input that can easily be spliced to a seed source. The gain medium is our industry leading DC-200/40-PZ-Yb fiber providing the largest single mode MFD in the industry. This model of the aeroGAIN-BASE is without direct watercooling of the gain fiber. Instead, the gain fiber is heatsunk to the aluminum base-plate which can be clamped to e.g. a water chilled plate or an air-cooled heat sink. The output end of the module is equipped with a large AR coated end-cap that provides mode expansion and reduces reflections. The module is designed for counter-propagating pumping through the output end-cap for optimal performance in order to keep nonlinearity to a minimum. Excess pump light is removed by the integrated residual pump dump.



Model	Yb Fiber Length	Recommended signal wavelength
aeroGAIN-BASE-1.3	1.8 m	1030 - 1040 nm

All modules are assembled and tested in cleanrooms, and the design has proven its industrial 24/7 reliability through a significant number of long term tests including continuous 25,000 hours operation. Lifetime in specific OEM systems depends on pump power, pump wavelength, cooling efficiency etc. and NKT Photonics is available for supporting system design.



# Specifications

## Optical

### Seed input

Signal wavelength	1030 – 1040 nm
Recommended signal input power	> 500 mW
Recommended pulse duration	fs, ps or ns pulses
Signal input fiber	-10 µm core PM 125 µm / 250 µm or -15 µm core PM 250 µm / 350 µm

### Signal Output

Max signal gain	< 20 dB
Rated output power	30 W
M <sup>2</sup>	≤ 1.3
Mode field diameter	31 ± 2 µm
PER	≥ 15 dB
Typical optical efficiency*	> 70 %
Typical core to clad power ratio**	> 96 %

### Pump Input

Pump center wavelength	976 ± 2 nm
Maximum pump power P <sub>p</sub>	40 W @ fiber facet
Recommended pump type	Fiber delivered 200/0.22 (max NA<0.55)
Pump cladding diameter	200 ± 2 µm

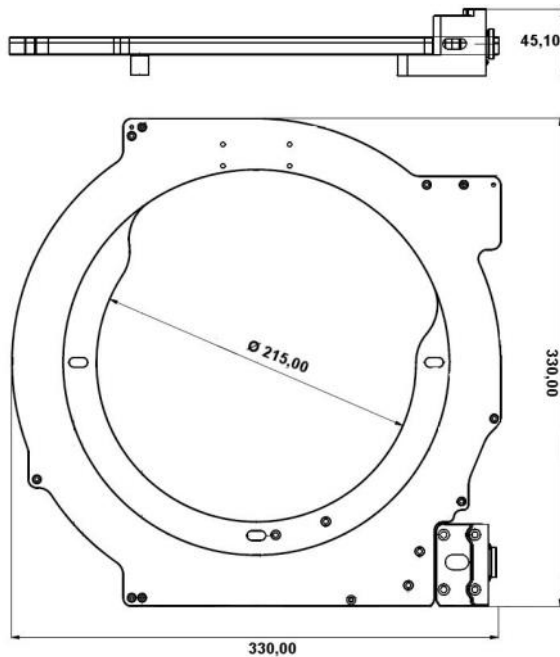
\* At max power

\*\* Amplified signal

## Mechanical

Weight	1.8 kg
Length of input pigtail	1 m
Output end facet angle	0 degree
Endcap length / diameter	6 mm / 7 mm* - AR coated

\* Open aperture



## Other aeroGAIN products

### aeroGAIN-ROD

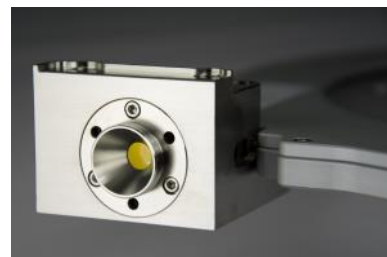
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