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1.5kW Clearcut[™] Fiber Bragg Grating

DESCRIPTION

The 1.5kW Clearcut[™] Fiber Bragg Grating products are low insertion loss fiber bragg gratings for high power fiber lasers. With AFR's Clearcut[™] designing and packaging, the devices can handle more than 1.5kW pump power and 1.0 kW signal power. Available for customizing.

KEY FEATURES

- Low Temperature
- 1.0 to 3.0nm Bandwidth
- Volume or Customization
- 20 Year's High Power Components Manufacturing Experience Ensures Outstanding Reliability

SPECIFICATIONS

Parameter

Center wavelength	
Max. wavelength mismatch (OC relative HR)	
Min. core signal power handling	
Min. clad pump power handling	
High reflector (HR) / output coupler (OC)	
Peak reflectivity	
Reflection bandwidth (FWHM)	
Tolerance on reflection bandwidth	
Min. side mode suppression ratio	
Fiber type	
Pigtails length (on each side)	
Package dimensions	
Operating temperature (active cooling required)	
Storage temperature	



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Unit	Value		
nm	1080±1		
nm	0.2		
W	1000		
W	1500		
	HR	OC	
%	> 99	5-15	
nm	2-3	1.0	
nm	0.3	0.1	
dB	20	10	
	Core: 10-30µm; Cladding: 100-400µm		
m	> 1		
mm	60 (L) × 10.4 (W) × 5 (H)		
°C	-10 to +5		
°C	-40 to +85		

Total power: the signal power in the core and the pump power in the cladding (the slope efficiency is about 70%).

Measurement condition: the grating is recoated and suspended in the air without any active cooling (the environment temperature is 22-24°C).

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Active Components Packaging

DESCRIPTION

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AFR can manufacture various state-of-the-art active optical assemblies and modules, the packaging type include Butterfly, DIL, TO-CAN, Coaxial photo-electronics devices etc. AFR is equipped with all the related processes in house, our unique technique guarantee the outstanding stability for packaged devices. The devices we can provide including Pump laser, DFB laser, FP laser, SLED, PD, etc., which can be used for communication, sensing, CATV, medicine, industrial use etc.



SPECIFICATIONS

Parameter	Unit	Value
Fiber type (if necessary)		SM, PM, MM etc.
Lens type		Aspheric lens, Ball lens, Fiber lens etc.
Connector type (if necessary)		FC/APC, LC/UPC, SC/APC etc.
Helium leak rate	Pa.m³/s	< 5.0*10.9
Residual moisture level	ppm	< 5000
Storage humidity	% r.h.	< 85
Storage temperature	°C	-40 to +85

OPTIONS:

- Cooling or Uncooling Version
- Mini Types or Standard Types
- Different Gas Fillings
- PM or Unpolarized Fiber Cables



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Ultra Compact 1064nm 5W In-line Isolator

DESCRIPTION

Our Miniature 1064nm 5W Polariztion Insensitive In-line Isolator achieved low insertion loss and high isolation in a very small package size based on unique technology.

SPECIFICATIONS

Parameter
Center wavelength (λc)
Typ. peak isolation
Min. isolation, λc , 23 °C, all polarization states
Typ. insertion loss, 23 $^\circ\!C$
Max. insertion loss, 23 $^{\circ}\!\!C$ and input power 5 W
Min. return loss (Input/Output)
Max. average optical power
Max. peak power for ns Pulse
Max. tensile load
Fiber type
Operating temperature
Storage temperature

* IL is 0.5 dB higher, and RL is 5 dB lower for each connector added. ** Optional band pass filter available both for input and output port.

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Unit	Value
nm	1064
dB	35
dB	28
dB	1.5
dB	2.5
dB	50/50
W	5
kW	10
Ν	5
	specified by ordering info.
°C	10 to +50
°C	0 to +60

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1064nm 100/200W In-line Isolator

DESCRIPTION

The 1064 nm High Power Polarization Insensitive In-line Isolator is characterized with low insertion loss, high isolation, high power handling, high return loss, excellent environmental stability and reliability. It is ideal for fiber laser and laser processing applications.



KEY FEATURES

- Low Loss and Low Reflection
- High Power Handling
- Proprietary Thermal Management

SPECIFICATIONS

Parameter	Unit	Value		
Center wavelength (λc)	nm	1064		
Operating wavelength Range	nm	$\lambda c \pm 10$		
Min. isolation, λc , 23 $^\circ C$, all polarization states	dB	28		
Typ. insertion Loss, 23 [°] C	dB	0.3	0.5	
Max. insertion Loss, 23 °C	dB	0.4	0.8	
Min. return loss	in. return loss dB 50		50	
Max. average optical power	W	200	50 or 100	
Max. peak power for ns pulse	kW	30	20	
Max. tensile load		5		
Fiber type		Specified by ordering info		
Operating temperature	°C	10 to +50		
Storage temperature	°C	0 to +60		



200W SteadiBeam[®] Fiber Laser Isolator

DESCRIPTION

SteadiBeam[®] is the best Isolator designed for high power pulse fiber lasers. With multiple patented technologies, the SteadiBeam® delivers unparalleled performance of aberration-free and thermal lensing-free beam quality at any output power level. It also provides high isolation to reflection from all spatial angles.

KEY FEATURES

- Minimal Thermal Lensing
- Available for 50/100/200W
- Stable Beam Size and Divergence in Entire Power Range

SPECIFICATIONS

Parameter
Center wavelength (λc)
Max. insertion loss at 30°C, at λc
Typ. isolation at 30°C, at λc
Min. isolation at 30°C, at λc
Min. isolation at all temperature, at λc
Min. return loss
Nominal output beam diameter (1/e ²)
Beam diameter change with power
Beam circularity
M ² degradation
Max. average optical power
Max. peak power for ns pulse
Reverse power handling
Fiber types
Operating temperature
Storage temperature (non-condensing condition)

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Minimal Thermal Lensing Performance

SteadiBeam[®] Isolato 7.0 6.0 Regular Isolto 5.0 4.0 3.0 2.0 1.0 0.0 100 150 200 250 50 Output Power (W)

8.0

Unit	Value
nm	1064 ± 15
dB	0.4
dB	38
dB	30
dB	20
dB	50
mm	6.5 ± 0.5
µm/W	< 3
%	> 90
%	< 10
W	200
kW	30
W	50W (3 min Max.)
	Specified by ordering info
°C	10 to +50
°C	-10 to +60

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100W SeasonBeam[™] - Temperature Insensitive Fiber Laser Isolator

DESCRIPTION

AFR's SeasonBeam[™] Isolator proves solution to fiber lasers required to operate in wide temperature range. With its patented design, our SeasonBeam[™] isolator maintains high isolation in a temperature range of 0-55°C, can be used alone or in combination with AFR's SteadiBeam® technology for higher power isolators to eliminate thermal lensing effect.



KEY FEATURES

- Wide Operation Temperature Range
- No Active Cooling or Heating





SPECIFICATIONS

Parameter	Unit	Value
Center wavelength (λc)	nm	1064 ± 15
Max. insertion loss at 23°C, at λc	dB	0.4
Max. insertion loss at all temperature	dB	0.5
Typ. at 23°C, at λc isolation	dB	40
Min. isolation at 23°C, all polarization states, at λc	dB	35
Min. isolation at all temperature, λc all polarization states	dB	30
Min. return loss	dB	50
Nominal output beam diameter (1/e²)	mm	7.0 ± 0.5
Beam circularity	%	> 90
M ² degradation	%	< 10
Max. average optical power	W	20-100
Max. peak power for ns pulse	kW	35
Fiber type (input port)		Specified by ordering info
Operating temperature	°C	0 to +55
Storage temperature	°C	-20 to +70



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500W Fiber to Free Space Isolator

DESCRIPTION

AFR's High Power Fiber to Free Space Isolator (HPFSI) is the best choice for high power industrial pulse fiber lasers. A newly designed isolator can handle 500W average laser power and at competitive cost. It also can integrate with AFR's patented SteadiBeam[®] and SeasonBeam[™] technologies to achieve thermal lensing-free beam quality and temperature insensitive high isolation.

SPECIFICATIONS

Parameter
Operating wavelength (λc)
Max. insertion loss at 23°C, at λc
Typ. isolation at 23℃, at λc
Min. isolation at 23°C, at λc
Min. isolation at all temperature, at λc
Min. return loss
Nominal output beam diameter (1/e ²)
Beam circularity
M ² degradation
Max. average optical power
Max. peak power for ns pulse
Beam offset
Pointing error
Astigmatism

* Water cooling is optinal.

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Unit	Value
nm	1064 ± 30
dB	0.4
dB	38
dB	30
dB	20
dB	50
mm	2.0 ± 0.2
%	> 90
%	< 10
W	500
kW	50
mm	± 0.5
mrad	2.5
Zr	< 0.25

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200W LaseGuard[™] Free Space Isolator

DESCRIPTION

The High Power Free Space Isolator Series is designed for protecting your high power laser from back reflection at different wavelengths and beam sizes. The high isolation, low insertion loss and large aperture features make it flexible to fit different applications.

KEY FEATURES

- High Isolation
- Low Insertion Loss
- Minimal Thermal-lensing
- Optional $\lambda/2$ Plate Available for All Isolators



SPECIFICATIONS

Parameter	Unit	Value
Center wavelength (λ c)	nm	Specified by ordering info
Peak transmission	%	> 95
Peak isolation	dB	> 33
Input polarization		Specified by ordering info
Output polarization		Specified by ordering info
Power handling	W	200
Damage threshold		10J / cm2@10ns, 1J / cm2@8ps
Operating temperature	°C	10 to 30
Storage temperature	°C	-40 to 70



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800W Cladding Power Stripper

DESCRIPTION

The Cladding Power Stripper (CPS) is designed for efficiently stripping off residual cladding power, ASE and escaped core modes of double cladding fiber while preserving signal power and beam quality in core.

KEY FEATURES

- High Power Handling
- Minimal Signal Loss

SPECIFICATIONS

Parameter	Unit	Value		
Operating wavelength range	nm	800 - 2000		
Min. stripping efficiency	%	98		
Max. signal insertion loss	dB	0.3		
Fiber type for input and output		10/125 DCF or 20/130 DCF or 30/250 DCF		
Max. stripped power	W	20 50 200 800		
Package type	mm	P2 P5 P7 P8*		
Operating temperature	mm	-5 to +60		
Storage temperature	mm	-40 to +85		

* Water cooling is required

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6kW (N+1)x1 Laser Combiner Module

DESCRIPTION

AFR's High Power Laser Combiner Module is designed for combining the power from N units of kW class fiber lasers and one aiming beam with high efficiency. Available in bare fiber or Dragon[™] as the output of the module. Dragon[™] is a high power laser cable with QBH compatible output connector.

KEY FEATURES

- Low Transmission Loss
- kW Level Backward Power Handling
- Beam Quality Optimized
- Water Cooling Ports Equipped



SPECIFICATIONS

Parameter	Unit	Value
Product type		(N+1)×1/Nx1
Operation wavelength range	nm	1060-1080
Input fiber type		LMA-GDF-14/250-M or LMA GDF 20/400-M
Red beam fiber type		HI 1060 or LMA-GDF-10/125-M
Output fiber type*		100/120/360
Max. input power handling per port	W	2000
Backward power handing	W	1000
Output fiber length**	m	2
Armor cable length	m	20
Min. combining efficiency	%	97
Typ. combining efficiency	%	98
Package dimensions	mm	303 (L) × 203 (W) × 27 (H)

* Other fiber options available

* For Dragon™ output option, it is the fiber length between the combiner package and the armor cable.



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(6+1)×1 Backward Pump Combiner

DESCRIPTION

The High Power (6+1)×1 Backward Pump Combiner enables highly efficient combining of the powers from up to 6 multimode pump diodes into a double cladding output fiber while transfer the kW class signal laser in the reverse direction. Available for different fiber types.

KEY FEATURES

- Low Signal Insertion Loss
- High Coupling Efficiency
- Proprietary Fiber Tapering Technique



SPECIFICATIONS

Parameter	Unit	Value
Product type		Backward pu
Pump wavelength	nm	915
Signal wavelength	nm	1080
Fiber type for pump input		MM-S200/22
Fiber type for signal input		LMA-GDF-20/
Fiber type for signal output		LMA-GDF-20/
Max. signal insertion loss	dB	0.3
Typ. pump efficiency	%	98.0
Min. pump efficiency	%	97.0
Max. input pump power	W	300 × 6
Max. signal power	W	2500
Package dimensions	m	150 (L) × 15 (V
Operating temperature	°C	0 to +65
Storage temperature	°C	-40 to +85

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mp (6+1)×1 20-22A-HP or MM-S220/242-22A-HP /400-M /400-M W) × 10 (H)

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5kW N×1 Pump Combiner with Dragon™ **Laser Cable**

DESCRIPTION

AFR's High Power Pump Combiner with Dragon[™] laser cable is on the output side. The high power combiner is designed for combining the power from N multimode laser diodes with high efficiency. The Dragon™ is an high power laser cable with QBH compatible output connector.

KEY FEATURES

• Combiner and Dragon[™] Integrated

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- High Power Handling Capability
- Low Transmission Loss
- High Reflection Power Endurance
- Indirect Water Cooling to Dragon[™]



SPECIFICATIONS

Parameter	Unit	Value
Product type*		N × 1
Fiber type for input*		105/125 or 135/155, NA=0.22
Fiber type for output*		MM-S400/480-22FA, MM-S600/660-22FA
Pump wavelength range	nm	915 or 976
Max. combined power	W	5000
Output fiber length** tolerance	m	± 0.3
Typ. pump efficiency	%	98
Min. pump efficiency	%	96
Package dimensions	mm	160 (L) × 30 (W) × 12 (H)
Operating temperature	°C	required attachment to water cooling plate
Storage temperature	°C	-20 to +70

* Typically, the combiner should be designed with a brightness ratio smaller than 1.

** The fiber length between the combiner package and the armor cable



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2kW Nx1 Pump Combiner

DESCRIPTION

The 2kW N×1 Pump Combiner enables highly efficient combining of the powers from up to N multimode pump diodes into an output fiber. The output fiber should be a large core multimode fiber or a double cladding fiber. The maximum pump input ports number N is 19. The device can handle maximum 2000W combined power. Available for different fiber types.

KEY FEATURES

- High Power Handling
- High Coupling Efficiency
- Proprietary Fiber Tapering Technique

SPECIFICATIONS

Parameter	Unit
Product type*	
Fiber type for input*	
Fiber type for output*	
Pump wavelength range	nm
Max. combined power	W
Typ. pump efficiency	%
Min. pump efficiency	%
Package dimensions	mm
Heatsink temperature	°C
Storage temperature	°C

* Typically, the combiner should be designed with a brightness ratio smaller than 1.

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Value
N × 1
105/125, 135/155 or 220/242, NA 0.22
LMA-GDF-20/400-M or MM-S400/480-22FA
915-980
2000
98
96
100 (L) × 15 (W) × 10 (H)
5 to 40
-40 to +85

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2kW (N+1)×1 Pump & Signal Combiner

DESCRIPTION

The 2kW (N+1)×1 Pump & Signal Combiner enables highly efficient combining of the powers from N multimode pump diodes and a signal laser into a double cladding output fiber. The device can handle maximum 2000W combined power. Available for different fiber types.

KEY FEATURES

- High Power Handling
- High Coupling Efficiency
- Proprietary Fiber Tapering Technique



SPECIFICATIONS

Parameter	Unit	Value		
Product type		(6+1) x 1 (18+1) x 1		
Fiber type for input (pump channel)		220/242, NA 0.22	105/125, NA 0.22	
Fiber type for input (signal channel)		LMA-GDF-20/400-M	HI 1060	
Fiber type for output		Nufern LMA-GDF-20/400-M, 0.06/0.46 NA		
Pump wavelength range	nm	915-980		
Signal wavelength	nm	650, 1064 or 1080		
Max. combined power	W	2000		
Max. signal channel insertion loss	dB	0.8		
Typ. pump efficiency	%	98		
Min. pump efficiency	%	96		
Package dimensions	mm	100 (L) × 15 (W) × 10 (H)		
Heatsink temperature	°C	5 to 40		
Storage temperature	°C	-40 to +85		



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6.5kW N×1 Laser Combiner

DESCRIPTION

The High Power N×1 Laser Combiner is designed for combining the power from N units of kW class fiber lasers to one output fiber with high efficiency. Available for different fiber types for up to 6500W combined power.

KEY FEATURES

- High Power Transfer Efficiency
- Proprietary Fiber Tapering Technique
- Custom Configurations Available

SPECIFICATIONS

Parameter	Unit	Value
Product type		3 × 1 / 4 × 1 / 7 × 1
Laser wavelength range	nm	1080
Fiber type for input		Nufern LMA-GDF-20/130-M, NA 0.08/0.46
Fiber type for output		Nufern BD-S100/120/360-STN, NA 0.22
Max. combined power*	W	6500
Max. input power handling per port	W	2000
Typ. power transfer efficiency**	%	99
Min. power transfer efficiency**	%	98
Beam parameter product (BPP)	mm.mrad	< 4
Package dimensions	mm	170 (L) × 60 (W) × 22 (H)
Heatsink temperature	°C	5 to 40
Storage temperature	°C	-40 to +85

* Do not operate without proper high power termination (QBH cable, for example). ** The power transfer efficiency is tested by the power in the core of the fiber.

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Dragon[™] 6kW Laser Cable

DESCRIPTION

AFR's Dragon[™] 6kW product provides QBH compatible connector for high power fiber lasers up to 6000W. Technologies incorporated in the products include cladding mode stripping, indirect water cooling, protective window and safety interlock.

KEY FEATURES

- Low Transmission Loss
- High Power Handling
- High Reflection Power Endurance
- Indirect Water Cooling
- Safety Interlock



SPECIFICATIONS

Optical Parameter	Unit	Value
Operation wavelength	nm	900 - 1100
Fiber core diameter	μm	20 - 400
Numerical aperture (NA)	-	≤ 0.22
Max. transmission loss	%	2
Max. power handling	W	6000
Max. stripping cladding power	W	500
Backward power handling	W	500
Max. Z-position tolerance	μm	50
Fiber concentricity	μm	≤ 50
Max. angular deviation	mrad	20

Cooling Water Requirements	Unit	Value
Max. water pressure	L/min	1.5-3.0
Water temperature	Мра	0.8
Flow rate	°C	10-25
Water PH value	-	5.6-7.9
Water hose diameter	mm	ID/OD=4/6

Others	Unit	Value
Mechanical interface	-	Compatible with the Standard QBH Interface
Armor cable diameter	mm	13.3
Storage Temperature	°C	-20 to +70



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20	Years
2017	IPO in
960	Emplo
50	Patent
325,000	Sq-ft f





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Manufacturing Facility in Zhuhai

Cleanroom

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