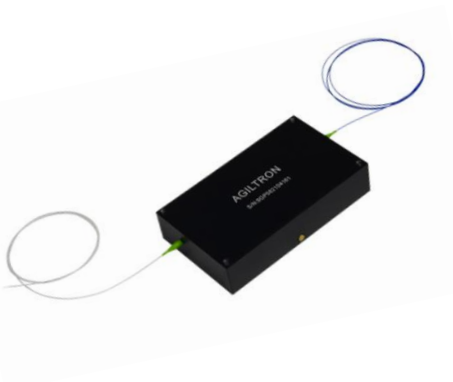


High Speed Fiber Optical Power Regulator

Up to 35dB dynamic range, 350-2500nm, up to 20W, bidirectional



The optical power regulator is a module that maintains a constant output power regardless of the input fluctuations. This is achieved by using a high speed electro-optical attenuator coupled with a detector to tap a small amount of light from the output and feeds it into a closed-loop control circuit to maintain a custom output power. It has a dynamic range of up to 35dB; beyond this, it can not control. The regulation output power range is preset according to customer specs and the setting can be changed manually via a pot. The module can also compensate for slow polarization-dependent loss changes and fast optical power surges. The optical power regulator provides an ultimate solution for optical power stabilizing and limiting. The non-mechanical device has passed the most stringent mil-spec and space flight qualifications and is designed for over 20 years of continuous operation. The module comes with a wall-plug 12V power supply.

The output is always lower than the input. Due to the photorefractive effects, wavelength shorter than 800nm, special crystals must be used that increase cost. Moreover, for smaller core fibers, beam expanding is also required to increase reliability which further increases production cost.

Features

- No Moving Parts
- High Reliability
- High Speed
- Precision

Applications

- Laser Power Regulation
- Surge Power Prevention
- Power Balance
- Instrumentation

Specifications

Parameter	Min	Typical	Max	Unit	
Central Wavelength	350		2500	nm	
Insertion Loss ^[1]	1260 - 1650nm	1.0	1.4	dB	
	960 - 1100nm	1.2	1.6	dB	
	760 - 960nm	1.5	1.8	dB	
Dynamic Attenuation Range	Single -Stage	18	25	30	dB
	Dual-Stage	35	40	45	dB
Return Loss	45	50		dB	
Response Time			400	µsec	
Power Adjustment Resolution	Continuous			dB	
Operating Optical Power (CW)		0.5	20 ^[2]	W	
Operating Temperature	-5 ~ 70			°C	
Storage Temperature	-40 ~ 85			°C	

[1]: Excluding connectors. Including the power tapping for feedback control.
 [2]: High power version > 2W may have the different arrangement in module package

Warning: The device mounted on the PCB is an OEM module designed for system integration only, not for general uses. Do not touch the PCB by hand. The electrical static can kill the chips even without a power plug-in, and unpleasant electrical shock may also be felt. For laboratory use, please buy a protected Turnkey system.

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Operation Instruction

- ❑ The output power level P_{Set} (dBm) is preset per customer's request or in default. The preset P_{Set} (dBm) can be adjusted manually through knob within +/-15dB range.
- ❑ Plug in the accompanied power supply.
- ❑ When the input power exceeds the power setting, the device starts regulating output to be constant.
- ❑ No response on the input power lower than the preset level.

Dimension of Module (Unit: mm)



*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

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Ordering Information (Part Number)

Prefix	Input Power ^[1]	Wavelength	Output power ^[1]	Dynamic	Fiber Type	Fiber Length	Connector ^{[2][3]}
NOPR-	< 0.5W = 11 10W = 10 1W = 01 2W = 02 5W = 05 20W = 20	1060 = 1 2000 = 2 1310 = 3 1480 = 4 1550 = 5 1625 = 6 780 = 7 850 = 8 650 = E 550 = F 400 = G Special = 0	0.001W = A1 0.002W = A2 ... 0.01W = B1 0.02W = B2 ... 0.1W = C1 0.2W = C2 ... 1W = D1 2W = D2 ... 9W = D9 10W = 10 ... 20W = 20 Special = S0	18dB = 1 35dB = 2	SMF-28 = 1 HI1060 = 2 HI780 = 3 PM1550 = 5 PM850 = 8 PM980 = 9 Special = 0	0.25m = 1 0.5m = 2 1.0 m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 ST/PC = 6 LC/PC = 7 LC/APC = A LC/UPC = U Special = 0

[1]: Output power must be smaller than the input power.

[2]: High power connector available, please contact sales.

Regular fiber connector has PER ~22dB. Connector with PER >27 dB is available using special process

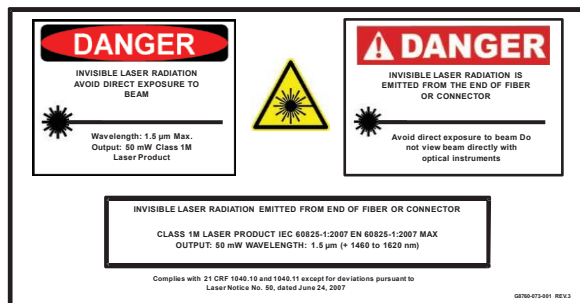
[3]. The connector cannot be installed directly onto bare fiber, as it is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer can remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SM28 fiber and decreases further with smaller core fibers.

Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. All versions of this laser are Class 1M laser products, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5 μm.

Maximum power = 30 mW.



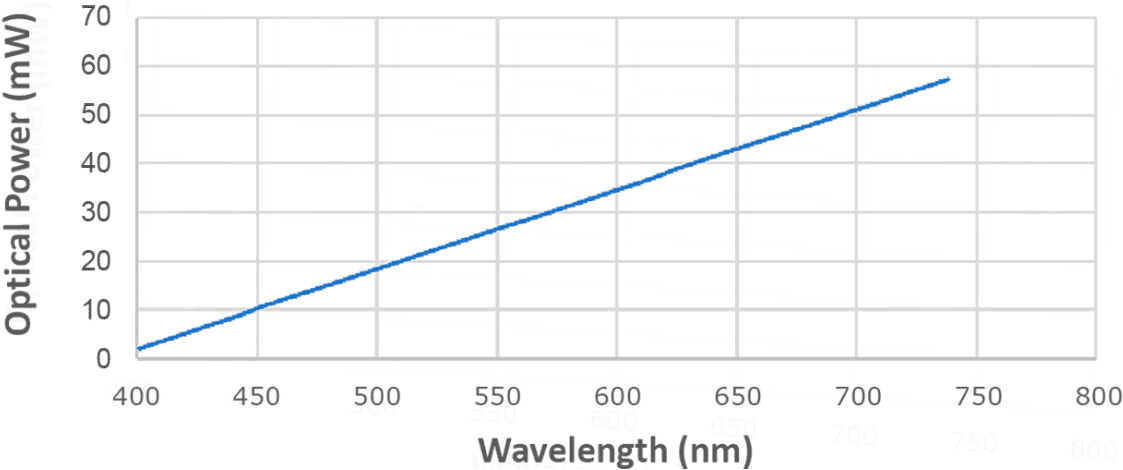
*Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

*IEC is a registered trademark of the International Electrotechnical Commission.

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Optical Power Handling vs Wavelength for Standard SM Fibers





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Q&A

Operation Manual

1. Connect a control signal to the SMA connector on the PCB.
2. Attach the accompanied power supply (typically a wall-pluggable unit).
3. The device should then function properly.

Note: Do not alter device factory settings.

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Application Notes

Fiber Core Alignment

Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

Fiber Cleanliness

Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

Maximum Optical Input Power

Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.