

RIO ORION™ Series 1064nm Narrow Linewidth Laser Module

Key features

- Single longitudinal mode
- Center wavelength: 1061nm-1067nm
- Very low phase noise
- Very narrow linewidth, long coherence length
- Ultra-low RIN
- Excellent SMSR
- Unmatched wavelength stability over life and temperature
- Wavelength tunability
- Direct power modulation
- Very low sensitivity to vibration and acoustic noise
- SMF and PM fiber pigtail options
- Compact size, low power dissipation
- Easy to set-up and use
- Digital controller and firmware with multiple interface options (SPI, RS-232, RS-485)
- Telecordia GR-468 qualified platform
- RoHS compliant

Applications

- Seeding of fiber and solid-state lasers
- Second Harmonic Generation (SHG)
- Optical Parametric Oscillator (OPOs)
- LIDAR
- Laser Spectroscopy
- Metrology

Data Sheet
July 2020



Description

The ORION™ devices are compact laser modules employing the RIO high-performance External Cavity Laser (ECL). This laser design is based on RIO's proprietary planar technology (**PLANEX™**) and consists of a gain chip and a planar lightwave circuit including waveguides with Bragg gratings, forming a laser cavity with significant advantages.

The ORION™ modules provide a stable, self-contained, easy-to-use alternative to complicated, sensitive to the ambient environment and expensive fiber laser sources, or other narrow linewidth laser alternatives.

The ORION™ module employs low noise, digital laser bias current and temperature control circuitry to set and monitor laser performance. External monitoring and control can be accomplished via standard interfaces, using RIO-supplied software. The ORION™ module is an ideal source for seeding of high-power fiber and solid state lasers, second harmonic generation and optical parametric oscillators, spectroscopy and other industrial and scientific applications, coherent Doppler LIDAR, metrology and optical sensing.

Absolute Maximum Ratings

Operation of the device beyond these maximum conditions may degrade device performance, lead to device failure, shorten product lifetime, and invalidates the device warranty.

Parameter	Min	Max	Unit
Storage temperature	- 40	+ 85	°C
Module supply voltage		5.5	V
ESD-susceptibility		500	V
Fiber bend radius	35		mm
Tensile strength, fiber to the package		5	N

Optical and Electrical Specifications

At recommended TEC set temperature T_s and bias current I_b

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Output Optical Power	P_{out}	CW	See ordering information			mW
Power Stability over case temperature range	dP_{out}	5 to +50 °C		±20		%
Center Wavelength ¹	λ		1061		1067	nm
Wavelength tuning range ²	$\Delta\lambda_T$	via TEC temperature change	20 ³			pm
Wavelength stability over case temperature range	$d\lambda$	5 to +50 °C		±50		pm
Relative Intensity Noise	RIN	≥ 1kHz		-135		dB/Hz
Side Mode Suppression Ratio	SMSR	CW, at specified P_{out}	50			dB
Optical S/N Ratio	S/N	From spontaneous noise levels at +/- 1 nm from λ , 50 pm RBW	60			dB
Polarization Extinction Ratio ³	PER	For PM option, polarization and connector key aligned to slow axis	17	20		dB
Optical Isolation	ISO		23			dB
Voltage Supply	V_{cc}		4.75	5	5.25	V
Fast Frequency modulation bandwidth ⁵	f_m	Sinusoidal modulation	DC		100 ⁶	kHz
Frequency fast tuning efficiency ⁵	η_m	Sinusoidal modulation at 10 kHz	50	100		MHz/V
Tuning voltage magnitude ⁵	V_{tune}		-4		+4	V

1. Customized wavelength and build tolerance are available. See ordering information.
2. Phase continuous wavelength tuning by changing TEC temperature settings. Some performance parameters will change over tuning range.
3. Tuning range is not symmetric around center wavelength, 20pm range is +7pm to -13pm as a minimum.
4. With PM-fiber PANDA option. See ordering information page.
5. Features for Modulation option
6. Tuning efficiency will vary over modulation bandwidth. Contact RIO for more information.

Linewidth and Phase Noise Specifications

At recommended TEC set temperature T_s and bias current I_b ,

Parameter	Symbol	Conditions	Grade 1	Grade 3	Unit
Spectral Linewidth	$\Delta\lambda_L$	FWHM ¹	≤ 15	≤ 5	kHz
Phase Noise	PN	Typical, @ 10 Hz	-	74	μrad/rt(Hz)-m
		Typical, @ 200 Hz	-	13	

1. Value based on Lorentzian linewidth model.

Thermal Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating temperature range (case)	T_c		+5		+50	°C
Power Dissipation	P_d	Over case temperature range			5	W
Total current	I_{max}	Over case temperature range			1.1	A

Connectors

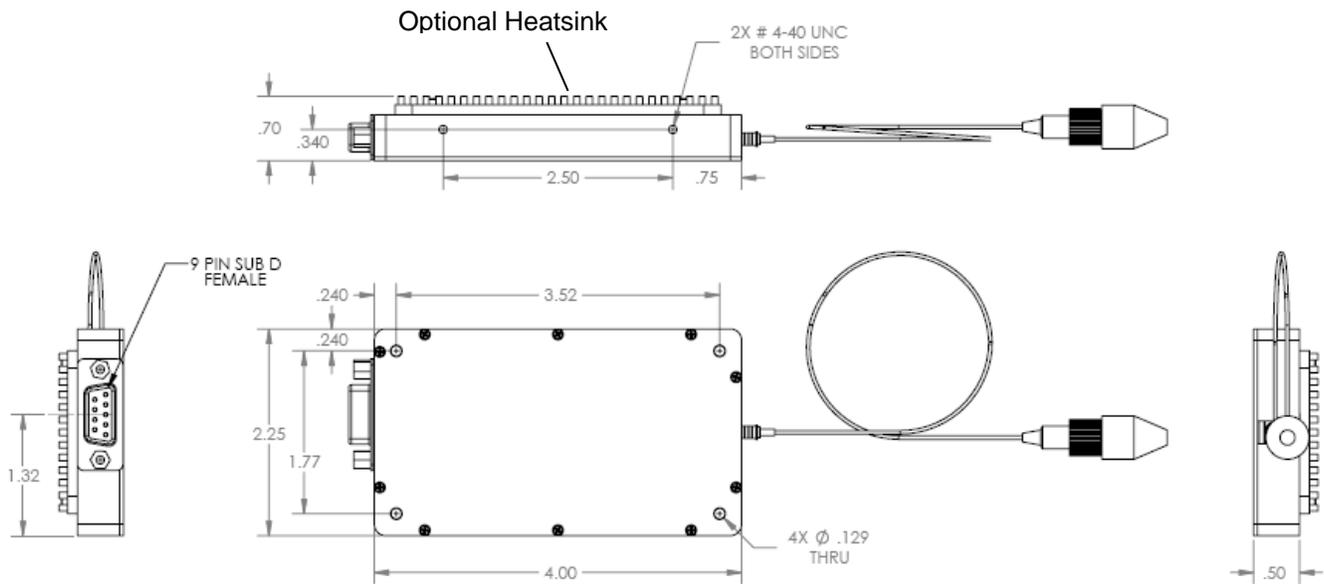
#	Description
A	FC/APC connector on pigtailed fiber.
B	Interface D-9 Female connector for power supply, external monitoring and control.

Interface connector B

Pin #	Function SPI	Function RS-232	Function RS-485	Note
1	Vcc +5V	Vcc +5V	Vcc +5V	4.75 V Min, 5.25V Max, Regulated, Low noise (<100mVp-p)
2	MISO (output)	Tx	Data +; 1 kΩ diff impedance	
3	MOSI (input)	Rx	Data -; 1 kΩ diff impedance	
4	Modulation (input)	Modulation (input)	Modulation (input)	1 kΩ impedance
5	GND	GND	GND	
6	/Ready-Warning (output)	/Ready-Warning (output)	/Ready-Warning (output)	Active low, needs external pull up
7	/SPI SS (input)	Not used	Not used	
8	SPI CLK (input)	Not used	Not used	
9	/Enable (input)	/Enable (input)	/Enable (input)	12K internal pull up to Vcc (active low)
Configuration	4-wire SPI slave. Bit order: MSB first. Bit rate: ≤ 2 MHz . MISO and MOSI: 3.3V drive, TTL level compatible, data centered on rising clk. /SS: Slave Select (active low). CLK: Idle state is low, data clocked on rising edge.	9600 Baud. 8 Data Bits. No Parity Bit. 1 Stop Bit. No Flow Control. TTL asynchronous serial option available at request	9600 Baud. 8 Data Bits. No Parity Bit. 1 Stop Bit. No Flow Control.	

Mechanical Diagram

Units: Inch



ORION Housing Material Options:

- Electroless Nickel-plated Aluminum (standard)
- Nickel-plated Copper (optional)

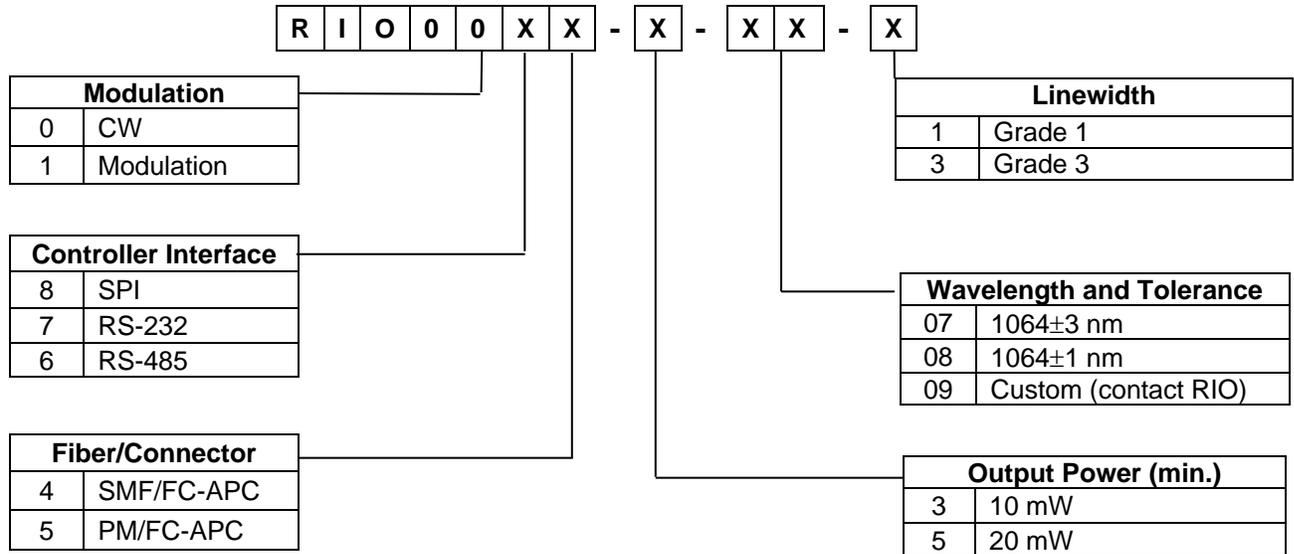
Pigtail options (FC/APC connector):

- Hi 1060 SMF, 900 μm loose tube, 1 m
- SM98 PMF PANDA, 900 μm loose tube, 1m, key aligned to slow axis

Certifications

- CE certified

Ordering Information



Accessories

Accessory PN	Description
RIO008X-KIT	5V DC power supply, GUI software & USB/SPI Aardvark adaptor with interface cable
RIO018X-KIT	5V DC power supply, GUI software & USB/SPI Aardvark adaptor with interface cable (w. BNC port for modulation)
RIO007X-KIT	5V DC power supply, GUI software & RS232 interface cable
RIO017X-KIT	5V DC power supply, GUI software & RS232 interface cable (with BNC port for modulation)
RIO006X-KIT	5V DC power supply, GUI software & RS485 interface cable
RIO016X-KIT	5V DC power supply, GUI software & RS485 interface cable (with BNC port for modulation)
RIO0HS	External heatsink w/ hardware

Laser Safety Information

The ORION laser module is classified as FDA/CDRH Class IIIb laser products per CDRH, 21 CFR 1040 laser safety requirements, and complies as Class 3B laser product per international standard IEC 60825-1, 2014.

DANGER

INVISIBLE LASER RADIATION
AVOID DIRECT EXPOSURE TO BEAM

MAX. OUTPUT POWER: 50 mW max
WAVELENGTH: 1.0 μm
BEAM DIVERGENCE AT FIBER
OUTPUT: 0.23 rad
CLASS IIIb LASER, CDRH, 21 CFR 1040
CLASS 3B LASER, IEC60825-1

LASER APERTURE

AVOID EXPOSURE
Invisible laser radiation is emitted from end of fiber or connector