

Coherent StingRay μ Focus

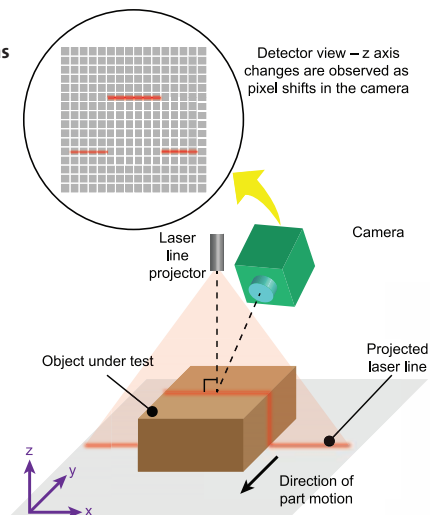
Micro-focus Structured Light Laser

In today's world of expanding 3D vision systems, the camera and laser are equal partners in the accuracy, stability and repeatability of the measurements made and used by these applications. The requirements on the laser for uniformity, power, pointing and electrical stability are far above a typical illumination system requirements.

The Coherent StingRay laser platform is a re-vision of this technology, taking technology and best practices from leading edge applications in Bioinstrumentation and Laser Measurement and Control. The Coherent StingRay laser incorporates state of the art electronics, optics and mechanics to provide a compact, highly flexible and reliable laser source that re-sets the standard in Machine Vision.

The Coherent StingRay μ Focus laser is an extension to the StingRay platform which incorporates superior optics to provide thinner more precise Gaussian widths while maintaining the market leading flat top performance. This line width reduction of $\sim 40\%$ enables higher resolution measurement of smaller and closer spaced features.

Triangulation Configurations



Coherent StingRay μ Focus Features:

- 520 nm to 830 nm
- Power up to 200 mW
- Uniformity up to 95%
- External focusability
- Pointing $<10 \mu\text{rad}/^\circ\text{C}$
- Microprocessor controlled
- Advanced service monitor
- RS-232 controllable with GUI interface
- Auto scaling input power 5 to 24 VDC
- 40% reduction in line width as compared to standard StingRay

Coherent StingRay μ Focus Applications:

- Non-contact Height Measurements
- Automotive Production
- Extrusion Measurements
- Medical/Dental
- Transportation
- Wood Processing
- Steel Production
- Microelectronics Inspection
- Food Portioning/Inspection
- Glass Inspection

Superior Reliability & Performance

www.Coherent.com/StingRayUFocus

Coherent StingRay μ Focus

Micro-focus Structured Light Laser

System Specifications	Coherent StingRay μ F-520	Coherent StingRay μ F-660	Coherent StingRay μ F-660	Coherent StingRay μ F-785	Coherent StingRay μ F-830
Wavelength ¹ (nm)	520	660	660	785	830
Wavelength Tolerance (\pm nm)	+10/-5	+7/-10	+4/-8	+12/-8	\pm 10
Output Power (mW - Max. ²)	50	25	100	90	200
Spatial Mode	TEM ₀₀				
M ² (Beam Quality)	<1.5				
Fan Angles (degrees at 80% clip)	30, 45, 60, Dot				
Straightness (%) Line	\leq 0.1				
Pointing Stability Over Temp. (μ rad/ $^{\circ}$ C)	<10				
RMS Noise (%) (20 Hz to 20 MHz)	<0.5				
Peak-to-Peak Noise (%) (20 Hz to 20 MHz)	<1				
Long-Term Power Stability (%) (8 hrs., \pm 3 $^{\circ}$ C)	<2				
Warm-Up Time (minutes) (from Cold Start)	<5				
Laser Drive Modes	CW, Analog, Digital, Fast Digital				
Digital Modulation	100 (Constant Power)				
Maximum Bandwidth (kHz)	100 (Constant Power)				
Rise Time (10% to 90%) (nsec)	<700				
Fall Time (90% to 10%) (nsec)	<700				
Modulation Depth (%)	100				
Operation Range ³ (VDC)	0 to 1 Off - 4 to 5 On / 0 to 1 On - 4 to 5 Off				
Fast Digital Modulation ⁴	2				
Maximum Bandwidth (MHz)	2				
Rise Time (10% to 90%) (nsec)	<50				
Fall Time (90% to 10%) (nsec)	<50				
Modulation Depth (%)	100				
Operation Range ³ (VDC)	0 to 1 Off - 4 to 5 On / 0 to 1 On - 4 to 5 Off				
Analog Modulation	500 (Constant Power)				
Maximum Bandwidth (KHz)	500 (Constant Power)				
Rise Time (10% to 90%) (nsec)	<700				
Fall Time (90% to 10%) (nsec)	<700				
Modulation Depth (%)	100				
Linear Range ³ (VDC)	0.5 to 5 / 0 to 4.5				
Operating Voltage ⁵ (VDC)	5 to 24				
Operating Current (mA) - (Max. at 25 $^{\circ}$ C)	200	135	260	210	350
Connector (optional)	Hirose HR-10P-12S				
Slow Start Delay ⁶ (sec)	5				
Input Impedance (kOhm)	1.5				
Beam Angle (mrad)	<3				
ESD Protection	EN61326-1				
Power Consumption (W)	5 Max.		3 Max.		
Heat Dissipation of Laser Head (W)	5 Max.		3 Max.		
Ambient Temperature					
Operating Condition ⁷ ($^{\circ}$ C)	-10 to 50				
Non-Operating Condition ($^{\circ}$ C)	-20 to 60				
Shock Tolerance (g) (6 ms)	30				
Working Distance (mm)	100 to Collimated				
Mechanical Specifications					
Weight (g)	<70				
Length ⁸ (mm)	95/98				
Diameter (mm)	19.05				
Material	Black anodized AL 6061 T1				
Cable Length (mm)					
FL	500				
HR	1000				
P	500				
B	500				

¹ Center Wavelength at 25 $^{\circ}$ C. ² Delivered power. ³ Input voltage should not exceed 10 VDC. ⁴ Constant current configuration only. ⁵ 520 nm lasers have best efficiency >12 VDC. ⁶ If enabled. ⁷ 520 nm lasers are 10 to 40 $^{\circ}$ C. ⁸ 95 mm for Standard Configuration, 98 mm for Accessory Configuration.

Coherent StingRay μ Focus

Micro-focus Structured Light Laser

RS-232 Commands/Queries¹

Commands ²	Description
SOUR:AM:STAT	Switches laser on/off
SYST:CDRH	Enables/disables CDRH delay
SYST:INF:USER	Enters
SYST:COMM:BAUD	Sets serial communications baud rate
SYST:COMM:HAND	Enables/disables SCPI handshaking
SYST:COMM:PROM	Enables/disables interactive prompt

Queries ³	Description
*IDN?	Device ID query
SOUR:AM:STAT?	Queries laser on/off state
SYST:CDRH?	Queries CDRH delay state
SYST:INF:USER?	Queries user-defined name
SYST:DIOD:HOURL?	Queries laser diode usage hours
SYST:FAUL?	Queries system fault
SYST:INF:FVER?	Queries firmware version
SYST:INF:MDAT?	Queries manufacture date
SYST:INF:MOD?	Queries Coherent laser model
SYST:INF:PNUM?	Queries Coherent part number
SYST:INF:SNUM?	Queries serial number
SYST:STAT?	Queries system status
SOUR:AM:SOUR?	Queries device operating mode
SOUR:CURR:LEV?	Queries diode operating current
SOUR:POW:LEV?	Queries diode operating power
SOUR:TEMP:DIOD?	Queries diode temperature

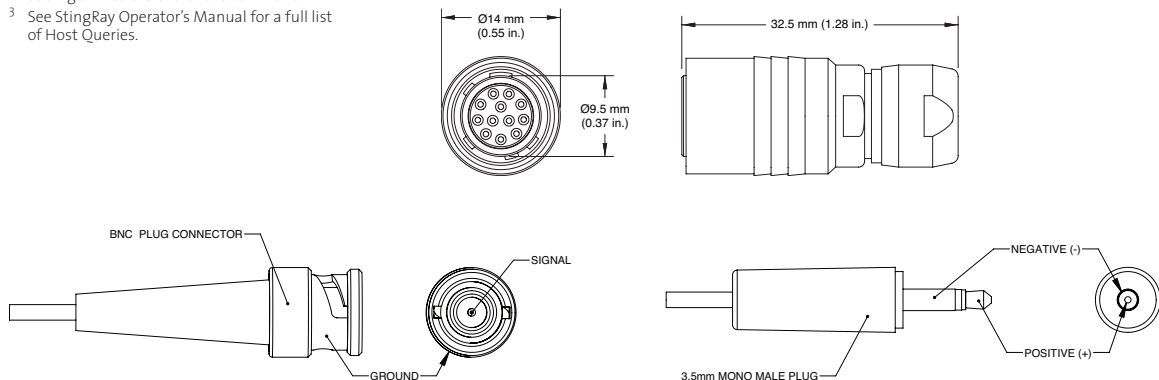
Pinout

Color	Description	Pin (optional Hirose connector)
Standard		
Red	V _{in}	9
Black	V _{in} Gnd	1
Green	Fault	10
Optional		
White	RS ₂₃₂ Recv	4
White/Black	RS ₂₃₂ Gnd	5
Orange	RS ₂₃₂ Trans	6
Blue	V _{mod}	2
Red/Black	V _{mod} Gnd	3

¹ See Users manual for full Host command set.

² All six Commands can be sent as a Query by adding a "?" to the end of the command.

³ See StingRay Operator's Manual for a full list of Host Queries.



Coherent StingRay μ Focus

Micro-focus Structured Light Laser

Available Patterns

Single Line



Dot Line



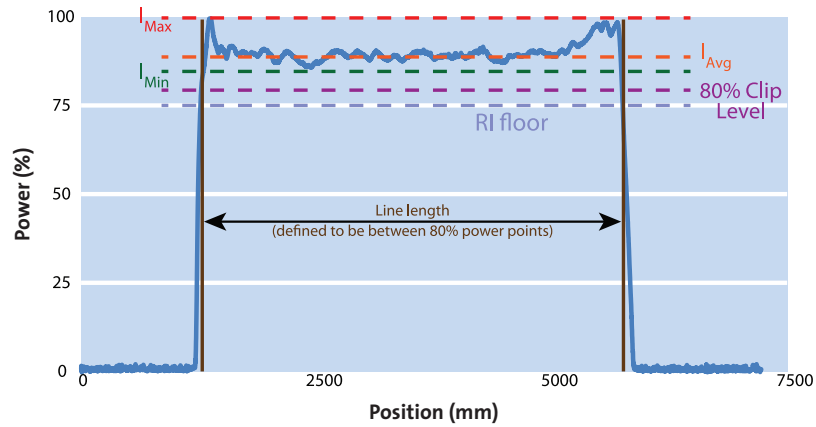
Single Dot



Parallel Lines



Flat-Top Intensity Profile



Definitions

Uniformity

Max relative intensity variation over 100% of the line

$$U = (I_{max} - I_{min}) \div (I_{max} + I_{min})$$

Contained Power

Power contained in the 100% line at the 80% Clip versus the power contained in the 13.5% Clip

$$CP = 80\%P \div 13.5\%P$$

Line Length / Fan Angle

FA is the angle of the projection taken at the 80% Clip

Line length is the physical length at a given working distance taken at the 80% Clip

Relative Illumination Floor

This is the minimum relative intensity at any point on the define line length

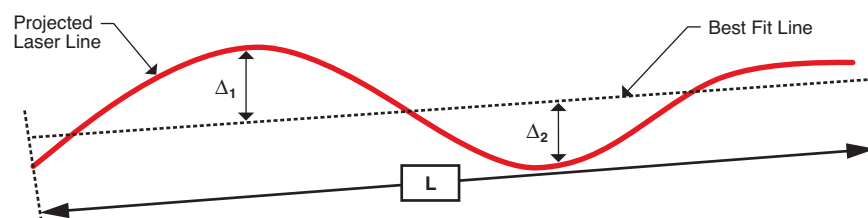
Measured as a percent of the normalized intensity

Straightness

Deviation from best fit line

$$\Delta = \Delta_1 + \Delta_2$$

$$S = (\Delta/L) * 100$$



Coherent StingRay μ Focus

Micro-focus Structured Light Laser

Fault Conditions

Built-in microcontroller probes most critical parameters of the circuit with ADCs such as:

- Temperature
 - Photodiode output voltage
 - Laser diode voltage
 - Laser diode current
 - Value of inverted and non-inverted modulating signal in case of Coherent StingRay-AM and Coherent StingRay-DM product options.

Based on the results of the parameter measurement microcontroller can detect following fault conditions

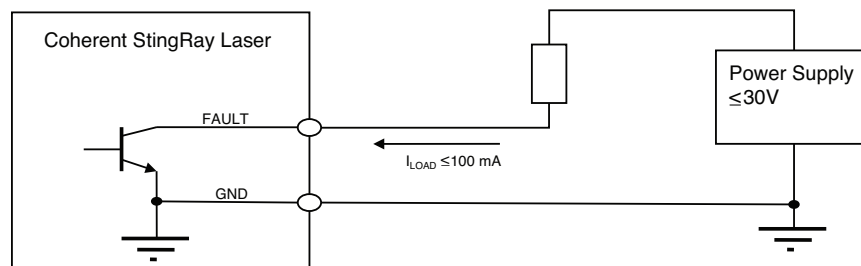
- Over temperature
- Circuit malfunction
- Absence of the input modulating signal
- Critical drop of laser diode output power due to aging

Fault Output Circuit¹

Fault output is an open collector of the transistor that allows wire junction OR functionality with fault signals from other devices. The output can tolerate voltage up to 30V and can drain the current up to 100 mA. The circuit is protected from over current by recoverable fuse.

The load should be connected between the voltage source and the open collector output as shown Figure 1.

Figure 1



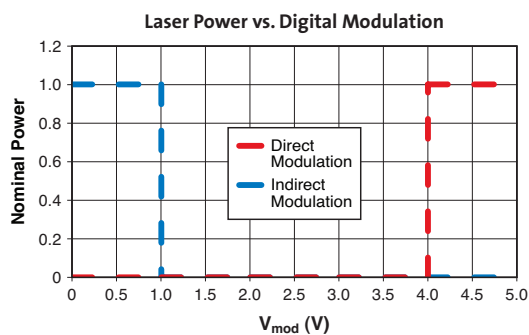
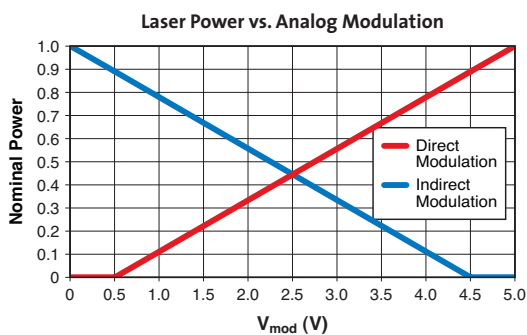
¹ Not available with Fast TTL configuration.

Modulation Timing²

Modulation	Fmax	Direct ³ (VDC)	Inverse ³ (VDC)
Analog	500 KHz	0 to 0.5	4.5 to 5
		OFF	
		0.5 to 5	0 to 4.5
		Linear Region	
TTL	100 KHz	0 to 1	4 to 5
		OFF	
		4 to 5	0 to 1
		1 to 4	1 to 4
		UNDEFINED	
Fast TTL	2 MHz	0 to 1	4 to 5
		OFF	
		4 to 5	0 to 1
		1 to 4	1 to 4
		UNDEFINED	

² Lasers equipped with modulation must have a load on the modulation input for proper operation.

³ Input voltage should not exceed 10 VDC.



Coherent StingRay μ Focus

Micro-focus Structured Light Laser

Model Configuration: STR μ FL-Wav-Pwr-Mod-Cable-Optic-IA-FA-Focus-Comm-Opt

Product Line	Wavelength	Power	Modulation	Cable
STR μ FL	520	5	A ¹	FL ²
	660	10	RA ³	HR ⁴
	785	20	T ⁵	P ⁶
	830	35	FT ⁷	B ⁸
		50	RT ⁹	
		75	RFT ¹⁰	
		90		
		100		
		150		
		200		

Optic	Interbeam Angle	Fan Angle	Focus ¹¹	COMM
L ¹² 01	0.15	30	S ¹³	Tx ¹⁴
D ¹⁵ 03	0.23	45	E ¹⁶	
05	0.38	60		
15	0.41			
19	0.5			
33	0.77			
65	1.5			
99	1.55			
	2.31			
	5			

Option

- 1 - Custom Focus Distance (100 mm to 2000 mm)
- 2 - Uniformity/Straightness Measurement
- 3 - Safety Class Adjustment
- 4 - Delivered Power Adjustment

Ordering Information (Multiple feature options only available for 660 nm)

	01 L/D	03 L/D	05 L/D	15 L/D
Pattern	1 Line / Dot	3 Lines / Dots	5 Lines / Dots	15 Lines / Dots
Intrabeam Angle	-	1.5, 5	1.55	2.3

	19 L/D	33 L/D	65 L/D	99 L/D
Pattern	19 Line / Dots	33 Lines / Dots	65 Line / Dots	99 Lines / Dots
Intrabeam Angle	0.77	0.38	0.41	0.15

Wavelength	520	660	785	830
Delivered Power	5, 10, 20, 35, 50	10, 20, 35, 50, 100	20, 35, 50, 75, 90	75, 150, 200

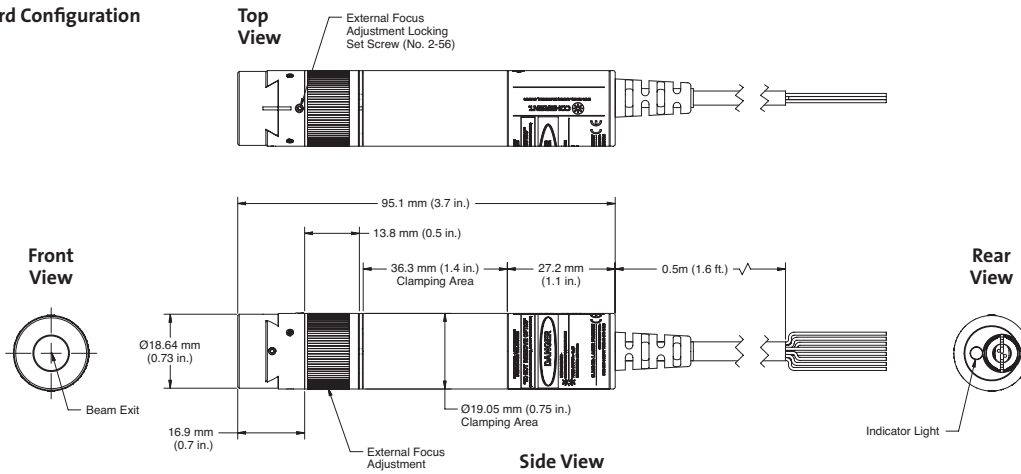
¹ A = Analog, ² FL = Flying Lead Cable, ³ RA = Reverse Analog, ⁴ HR = Hirose Cable, ⁵ T = Digital, ⁶ P = Legacy Power Cable, ⁷ FT = Fast Digital, ⁸ B = Legacy Power and BNC Cable, ⁹ RT = Reverse Digital, ¹⁰ RFT = Reverse Fast Digital, ¹¹ "S" focus is fast axis, "E" focus is slow axis, ¹² L = Line, ¹³ S = Standard, ¹⁴ Tx = RS-232 Option, ¹⁵ D = Dot, ¹⁶ E = Extended.

Coherent StingRay μ Focus

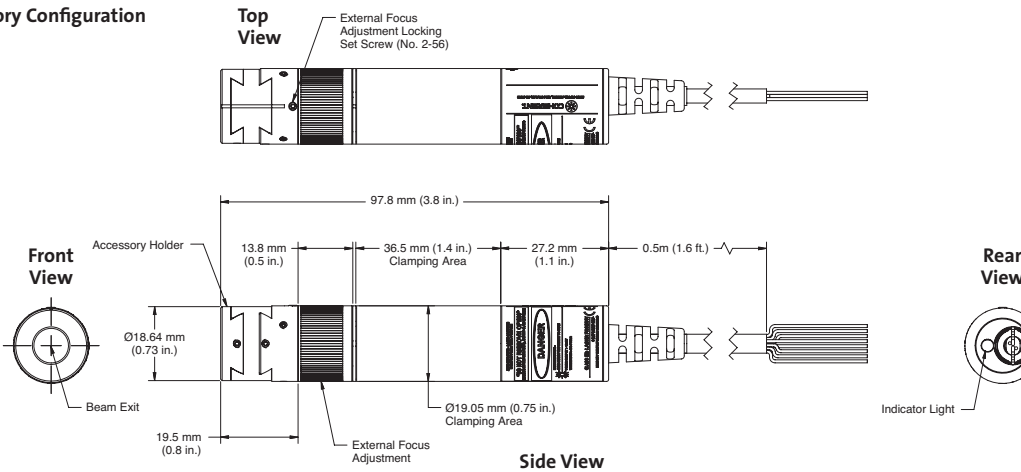
Micro-focus Structured Light Laser

Mechanical Specifications

Standard Configuration



Accessory Configuration



 **COHERENT**
www.Coherent.com

Coherent, Inc.,
27650 SW 95th Avenue
Wilsonville, OR 97070
phone (800) 343-4912
(408) 764-4042
fax (503) 454-5727
e-mail LAS.sales@Coherent.com

Benelux +31 (30) 280 6060
China +86 (10) 8215 3600
France +33 (0)1 8038 1000
Germany/Austria/
Switzerland +49 (6071) 968 333
Italy +39 (02) 31 03 951
Japan +81 (3) 5635 8700
Korea +82 (2) 460 7900
Taiwan +886 (3) 505 2900
UK/Ireland +44 (1353) 658 833

Coherent follows a policy of continuous product improvement. Specifications are subject to change without notice.

Coherent's scientific and industrial lasers are certified to comply with the Federal Regulations (21 CFR Subchapter J) as administered by the Center for Devices and Radiological Health on all systems ordered for shipment after August 2, 1976.

Coherent offers a limited warranty for all Coherent StingRay μ Focus lasers. For full details of this warranty coverage, please refer to the Service section at www.Coherent.com or contact your local Sales or Service Representative.

