COHERENT®

StingRay

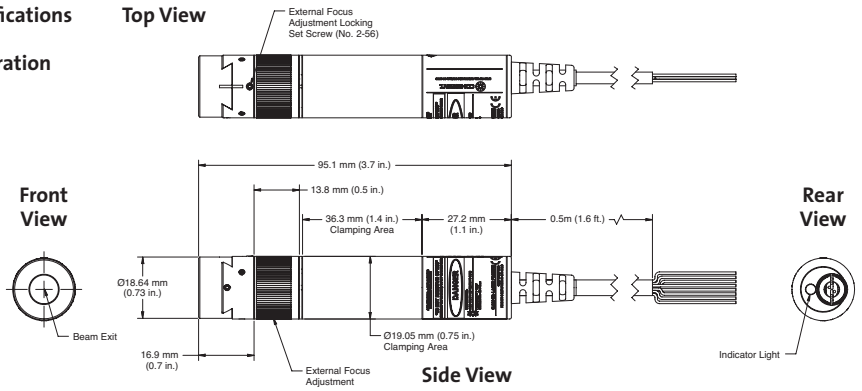
Structured Light Pattern Generating Laser

Features

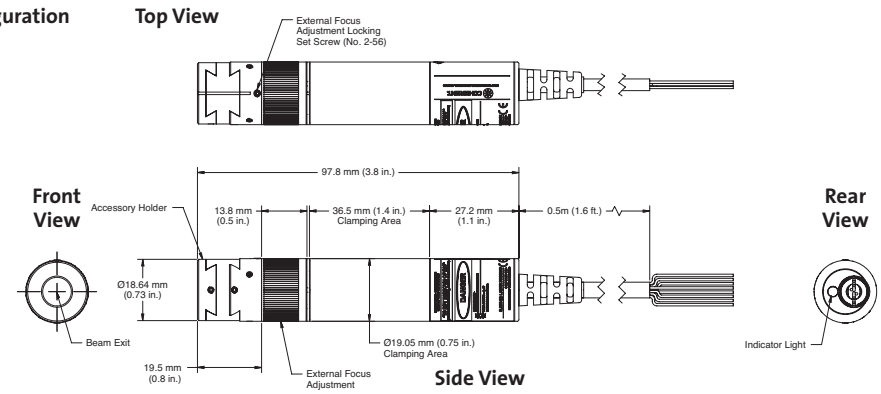
- 520 nm to 830 nm
- Power up to 200 mW
- Uniformity up to 95%
- External focusability
- Wide range of patterns and fan angles
- ESD, Over Temp, Reverse Polarity,
- Rugged, shock and vibration resistant design
- 1D and 2D flat top compatible
- Pointing <10 µrad/°C
- Microprocessor controlled
- Advanced service monitor
- RS-232 controllable with GUI interface
- Dynamic line balancing
- Auto Scaling input power 5 to 24 VDC

Mechanical Specifications

Standard Configuration



Accessory Configuration



Superior Reliability & Performance

StingRay™

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System Specifications

	StingRay-520	StingRay-639	StingRay-640	StingRay-655	StingRay-660
Wavelength[1] (nm)	520	639	640	655	660
Wavelength Tolerance (±nm)	+10/-5	+4/-9	±2	±5	+7/-10
Output Power (mW - Max.)	50	10	35	5	35
Spatial Mode			TEM_{00}		
M^2 (Beam Quality)			<1.5		
Fan Angles (degrees at 80% clip)			1, 5, 10, 20, 30, 45, 60, 75, 90		
Straightness (%) >25 mm Line			0.1		
Pointing Stability Over Temp. (µrad/°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.,±3°C)			<2		
Warm-Up Time (minutes)(from Cold Start)			<5		
Laser Drive Modes			CW, Analog, Digital, Fast Digital		
Digital Modulation					
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 (VDC)			0 to 1 Off - 4 to 5 On / 0 to 1 On - 4 to 5 Off		
Fast Digital Modulation[2]					
Maximum Bandwidth (MHz)			2		
Rise Time (10% to 90%)(nsec)			<50		
Fall Time (90% to 10%)(nsec)			<50		
Modulation Depth (%)			100		
Operation Range (VDC)			0 to 1 Off - 4 to 5 On / 0 to 1 On - 4 to 5 Off		
Analog Modulation					
Maximum Bandwidth (KHz)			500 (Constant Power)		
Rise Time (10% to 90%)(nsec)			<500		
Fall Time (90% to 10%)(nsec)			<500		
Modulation Depth (%)			100		
Linear Range (VDC)			0.5 to 5 / 0 to 4.5		
Operating Voltage (VDC)			5 to 24[3]		
Operating Current (mA)-(Max. at 25°C)	200	100	160	85	135
Connector (optional)			Hirose HR-10P-12S		
Slow Start Delay (msec)			5[4]		
Input Impedance (kOhm)			1.5		
Beam Angle (mrad)			<3		
ESD Protection			Level 4		
Power Consumption (W)	5 Max.		3 Max.		
Heat Dissipation of Laser Head (W)	5 Max.		3 Max.		
Ambient Temperature					
Operating Condition (°C)			-10 to 50[5]		
Non-Operating Condition (°C)			-20 to 60		
Shock Tolerance (g)(6 ms)			30		

[1] Center Wavelength at 25°C.
[2] Constant current configuration only.
[3] 520 nm lasers have best efficiency >12 VDC.
[4] If enabled.
[5] 520 nm lasers are 10 to 40°C.

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System Specifications

	StingRay-660	StingRay-660	StingRay-685	StingRay-785	StingRay-830
Wavelength[1] (nm)	660	660	685	785	830
Wavelength Tolerance (±nm)	±6	±6	±15	±10	±10
Output Power (mW - Max.)	50	100	50	90	200
Spatial Mode			TEM_{00}		
M^2 (Beam Quality)			<1.5		
Fan Angles (degrees at 80% clip)			1, 5, 10, 20, 30, 45, 60, 75, 90		
Straightness (%) >25 mm Line			0.1		
Pointing Stability Over Temp. (µrad/°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.,±3°C)			<2		
Warm-Up Time (minutes)(from Cold Start)			<5		
Laser Drive Modes			CW, Analog, Digital, Fast Digital		
Digital Modulation					
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 (VDC)			0 to 1 Off - 4 to 5 On / 0 to 1 On - 4 to 5 Off		
Fast Digital Modulation[2]					
Maximum Bandwidth (MHz)			2		
Rise Time (10% to 90%)(nsec)			<50		
Fall Time (90% to 10%)(nsec)			<50		
Modulation Depth (%)			100		
Operation Range (VDC)			0 to 1 Off - 4 to 5 On / 0 to 1 On - 4 to 5 Off		
Analog Modulation					
Maximum Bandwidth (KHz)			500 (Constant Power)		
Rise Time (10% to 90%)(nsec)			<500		
Fall Time (90% to 10%)(nsec)			<500		
Modulation Depth (%)			100		
Linear Range (VDC)			0.5 to 5 / 0 to 4.5		
Operating Voltage (VDC)			5 to 24		
Operating Current (mA)-(Max. at 25°C)	185	260	190	210	350
Connector (optional)			Hirose HR-10P-12S		
Slow Start Delay (msec)			5[3]		
Input Impedance (kOhm)			1.5		
Beam Angle (mrad)			<3		
ESD Protection			Level 4		
Power Consumption (W)			3 Max.		
Heat Dissipation of Laser Head (W)			3 Max.		
Ambient Temperature					
Operating Condition (°C)			-10 to 50		
Non-Operating Condition (°C)			-20 to 60		
Shock Tolerance (g)(6 ms)			30		

[1] Center Wavelength at 25°C.
[2] Constant current configuration only.
[3] If enabled.

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Mechanical Specifications (see drawing)

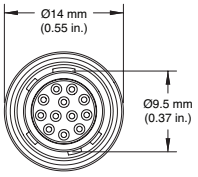
Weight (g)	<70
Length (mm)	95/98[1]
Diameter (mm)	19.05
Material	Black annodized AL 6061 T1

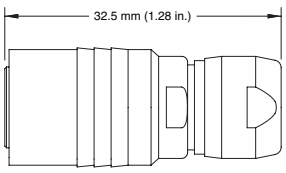
RS-232 Commands[2] (optional)

Commands	Description
CDRH	Enables/Disables CDRH Delay
BAUD	Set Baud Rate
HAND	Enables/Disables SCPI Handshaking
HOUR	Reports System Lasing Hours
MOD	Reports Laser Model
PNUM	Reports Part Number
SNUM	Reports Serial Number
USER	Stores User Defined Identification
POW:LEV	Reports Diode Laser Power
DIOD	Reports Diode Temperature
INT	Reports Internal Temperature
HIGH	Reports Diode High Temperate Set
MPOL	Sets Modulation Polarity
AMPL	Sets Laser Output Power
STAT	Reports System Status
CUR:LEV	Reports Diode Current

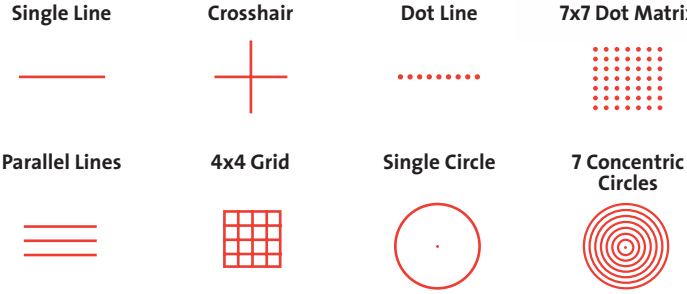
Pinout

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





Available Patterns[3]



[1] 95 mm for Standard Configuration, 98 mm for Accessory Configuration.
[2] See Users manual for full Host command set.
[2] Other Pattens available upon request, contact your local Coherent Sales resource.

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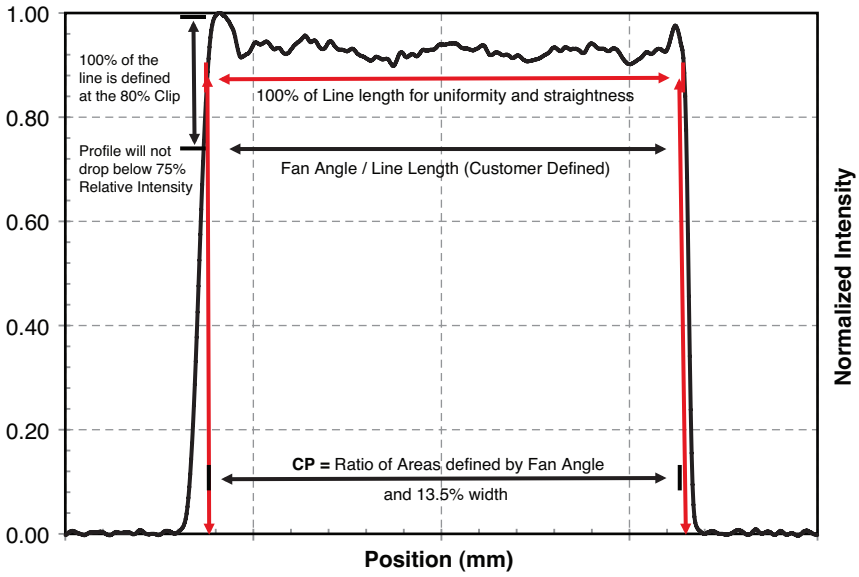
Flat-Top Intensity Profile



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

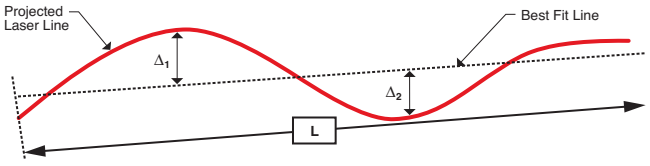
Measured as a percent of the normalized intensity

Straightness

Deviation from best fit line

$\Delta = \Delta_1 + \Delta_2$

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



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 StingRay-AM and StingRay-DM product options.

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

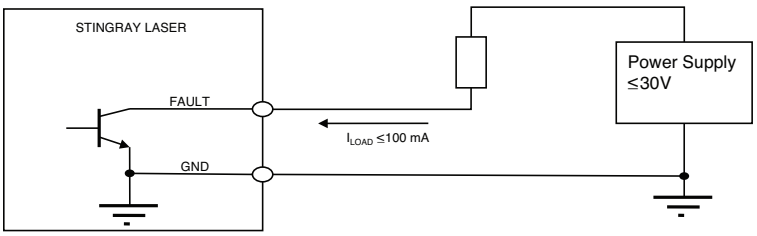
- Over temperature
- Circuit malfunction
- Absence of the input modulating signal
- Critical drop of laser diode output power due to aging

Fault Output Circuit[1]

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.

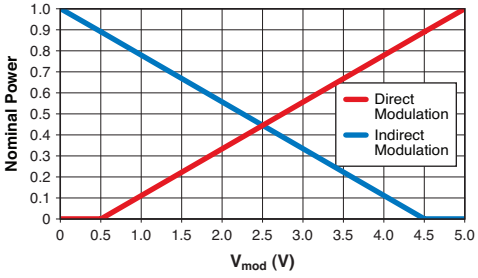
Figure 1



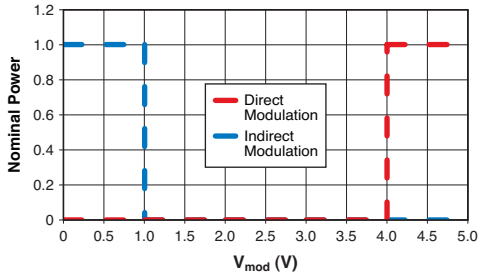
Modulation Timing

Modulation	F_{max}	Direct (VDC)	Inverse (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
		ON	
		1 to 4	1 to 4
		UNDEFINED	
Fast TTL	2 MHz	0 to 1	4 to 5
		OFF	
		4 to 5	0 to 1
		ON	
		1 to 4	1 to 4
		UNDEFINED	

Laser Power vs. Analog Modulation



Laser Power vs. Digital Modulation



[1] Not available with Fast TTL configuration

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Ordering Example (STR-660-100-T-FL-L03-1.5-45-S-Tx-1)

Product Line	Wavelength	Power	Modulation	Cable
STR	520	1	A[1]	FL[2]
	640	5	RA[3]	HR[4]
	660	10	T[5]	P[6]
	685	20	FT[7]	B[8]
	785	35	RT[9]	
	830	50	RFT[10]	
		75		
		100		
		150		
		200		

Optic		Interbeam Angle	Fan Angle	Focus	COMM
L[11]	01	0.07	1	S[12]	Tx[13]
H[14]	03	0.09	5	E[15]	
C[16]	04	0.11	10		
M[17]	05	0.15	15		
G[18]	07	0.23	20		
SQ[19]	09	0.38	30		
D[20]	11	0.41	45		
	15	0.5	60		
	19	0.77	75		
	33	1.11			
	59	1.5			
	65	1.9			
	99	2.34			
		5			
		5.4			
		9.7			
		11.4			
		11.7			

Option

1 - Custom Focus Distance
2 - Uniformity/Straightness Measurement
3 - Safety Class Adjustment
4 - Delivered Power Adjustment

Ordering Information

	01 L/D	03 L/D	05 L/D	07 L/D	09 L/D
Pattern	1 Line / Dot	3 Lines / Dots	5 Lines / Dots	7 Lines / Dots	9 Lines / Dots
Intrabeam Angle	-	1.5, 5, 11.7	0.23, 1.55	5, 8.75	0.07, 0.11

	11 L/D	15 L/D	19 L/D	33 L/D	65 L/D
Pattern	11 Lines / Dots	15 Lines / Dots	19 Line / Dots	33 Lines / Dots	65 Lines / Dots
Intrabeam Angle	1.5	2.3	0.77	0.09, 0.38	0.41

	99 L/D	SQ1	G44	01H	C01
Pattern	99 Lines / Dots	1 Square	4 x 4 Grid	Crosshair	1 Circle
Intrabeam Angle	0.149	2.9	2.44	-	0.77, 11.4

	CC7	M77	M19	Custom
Pattern	7 Circles	7 x 7 dot matrix	19 x 19 dot matrix	
Intrabeam Angle	0.77	1.9	0.77	

Wavelength	520	640	655	660	685
Diode Power	5, 10, 20, 35, 50	1, 5, 10, 20, 35	1,5	10, 20, 35, 50, 100	20, 35, 50

Wavelength	785	830
Diode Power	35, 75, 90	100, 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] L = Line. [12] S = Standard. [13] Tx = RS-232 Option. [14] H = Cross Hair. [15] E = Extended. [16] C = Circle. [17] M = Matrix. [18] G = Grid. [19] SQ = Square. [20] D = Dot

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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 StingRay 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.

COHERENT®

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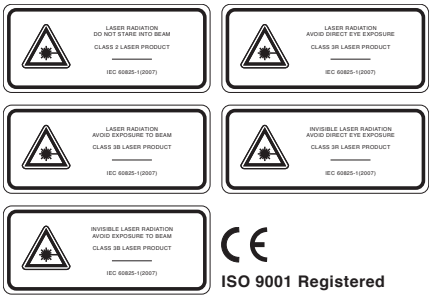

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Printed in the U.S.A. MC-017-13-0M0213