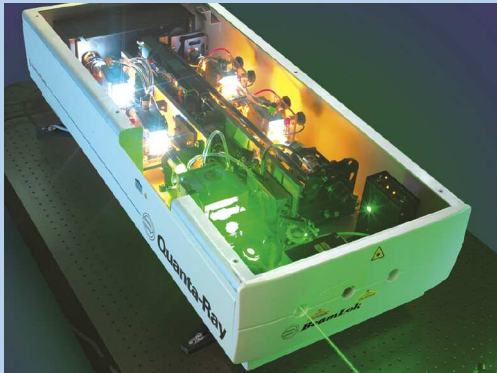


# Quanta-Ray® Nd:YAG Laser Family

UNSURPASSED PERFORMANCE, RELIABILITY, AND QUALITY



## The Quanta-Ray Advantage

- Repetition rates from 1 to 100 Hz with energies in excess of 2.5 J per pulse
- Gold elliptical pump chambers for the best efficiency, mode quality and longevity
- Sealed beam paths eliminating component degradation from dust and contaminants
- High-quality, high-damage-threshold optics from Spectra-Physics' dedicated in-house coating lab for lower costs of ownership
- Single-rod and dual-rod oscillators for high powers and the best mode quality in the industry
- Support by Newport's global services with worldwide local support

Spectra-Physics® Quanta-Ray® high-pulse energy Nd:YAG lasers are recognized world wide for their unsurpassed performance, reliability and quality. They incorporate pioneering technologies such as dual-rod oscillators, gold-coated elliptical pump chambers, internal sealed beam paths, and high-damage-threshold optics from Spectra-Physics' advanced coatings lab—all combine to create the best beam quality and highest energies in the industry.

The heart of the Quanta-Ray laser is its unique pump chamber. The chamber strikes the perfect balance between efficiency and beam mode quality by employing elliptical gold-coated reflectors to couple the lamps into the Nd:YAG rod. The gold surfaces provide high reflectivity at pump wavelengths while attenuating UV wavelengths. Proprietary diffusion techniques ensure uniform illumination of the Nd:YAG rod.

Quanta-Ray lasers are also the only lasers on the market to feature completely sealed internal beam paths through the use of nitrogen-purged beam tubes. Sealed beam paths greatly extend the longevity of optical coatings by shielding all optical components from harmful contaminants in even the harshest of environments. Spectra-Physics uses only Sol-Gel coated pockels cells. This coating greatly enhances the lifetime of the cells and improves the performance of the laser system. BBO FHGs give highest energies, best beam quality and highest damage thresholds. These features lead to the best "bumper-to-bumper" one-year warranty on all optics, mechanics and electronics available from a pulsed YAG supplier.

Newly incorporated modern digital signal processing (DSP) electronics in all Quanta-Ray Nd:YAG lasers provide a modern control system for the user. Direct digital interface and Graphical User Interface (GUI) enables intuitive control of the system and simplified integration with complex systems.

## APPLICATIONS

- Pumping of dye lasers, Ti:Sapphire lasers, OPAs and OPOs
- LIDAR
- Remote sensing
- LIBS
- Laser-induced fluorescence
- CARS
- Flow visualization
- Plastic and ceramic components marking
- Laser cleaning and ablation

 Spectra-Physics®  
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# Quanta-Ray® Pro Series

The Quanta-Ray® Pro series represents Spectra-Physics' highest pulse energy Nd:YAG lasers. They incorporate the Lab series single or dual-rod oscillators with two amplifier stages resulting in output energies up to 2.5 J per pulse. The patented intra-oscillator birefringence compensation design in the Lab series is the key to producing the superior beam quality that allows the Pro series to achieve higher repetition rates and higher average powers than any other high-power Nd:YAG laser on the market.

Options include BeamLok® for active beam pointing stabilization and D-Lok®. BeamLok enables the user to specify long-term pointing stability at less than  $\pm 25 \mu\text{rad}$  over an 8 hour period—all through a PC. D-Lok suppresses the problem of increasing divergence with aging flash-lamps resulting in guaranteed longer flash-lamp lifetimes and fewer downstream optical alignments. D-Lok also stabilizes any thermal imbalance in the Nd:YAG gain medium eliminating fluctuations in output beam polarization. Its high polarization purity enables high-efficiency harmonic generation and stable harmonic beam shapes.

## Quanta-Ray Pro Series Specifications

### Power Specifications<sup>1</sup>

Product	Pro-230-			Pro-250-			Pro-270-			Pro-290-			Pro-350-
	10 Hz	30 Hz	50 Hz	10 Hz	30 Hz	50 Hz	10 Hz	30 Hz	50 Hz	10 Hz <sup>4</sup>	30 Hz	50 Hz	10 Hz
Repetition Rate	10 Hz	30 Hz	50 Hz	10 Hz	30 Hz	50 Hz	10 Hz	30 Hz	50 Hz	10 Hz <sup>4</sup>	30 Hz	50 Hz	10 Hz
Energy (mJ/p) <sup>2</sup>													
1064 nm	1250 mJ	950 mJ	650 mJ	1500 mJ	1100 mJ	750 mJ	1750 mJ	1300 mJ	900 mJ	2000 mJ	1600 mJ	1000 mJ	2500 mJ
532 nm	650 mJ	475 mJ	300 mJ	800 mJ	550 mJ	350 mJ	900 mJ	600 mJ	400 mJ	1000 mJ	800 mJ	500 mJ	1400 mJ
355 nm <sup>2,3</sup>	375 mJ	300 mJ	140 mJ	425 mJ	325 mJ	160 mJ	475 mJ	350 mJ	225 mJ	550 mJ	375 mJ	275 mJ	750 mJ
EE0-355 nm <sup>3, 2,3</sup>	400 mJ	320 mJ	160 mJ	475 mJ	350 mJ	180 mJ	550 mJ	400 mJ	250 mJ	650 mJ	425 mJ	300 mJ	850 mJ
266 nm	140 mJ	80 mJ	40 mJ	165 mJ	85 mJ	55 mJ	175 mJ	90 mJ	65 mJ	200 mJ	110 mJ	80 mJ	250 mJ

### Performance Specifications

Wavelength	Pulse Width <sup>5</sup>	Short Term Energy Stability <sup>6</sup>	Long Term Power Drift <sup>7</sup>
1064 nm	8–12 ns	$\pm 2\%$	<3%
532 nm	1–2 ns <1064 nm	$\pm 3\%$	<5%
355 nm	2–3 ns <1064 nm	$\pm 4\%$	<6%
266 nm	3–4 ns <1064 nm	$\pm 8\%$	<10%

### Beam Specifications

Spatial Mode Profile <sup>8</sup>	Standard Fit	ESM Fit <sup>9</sup>
Near Field (1 m)	>70%	Contact Spectra-Physics
Far Field ( $\infty$ )	>95%	Contact Spectra-Physics
Modulation <sup>10</sup>	<40%	Contact Spectra-Physics
Beam Diameter <sup>11</sup>	Pro-200 <10 mm	Pro-300 <13 mm

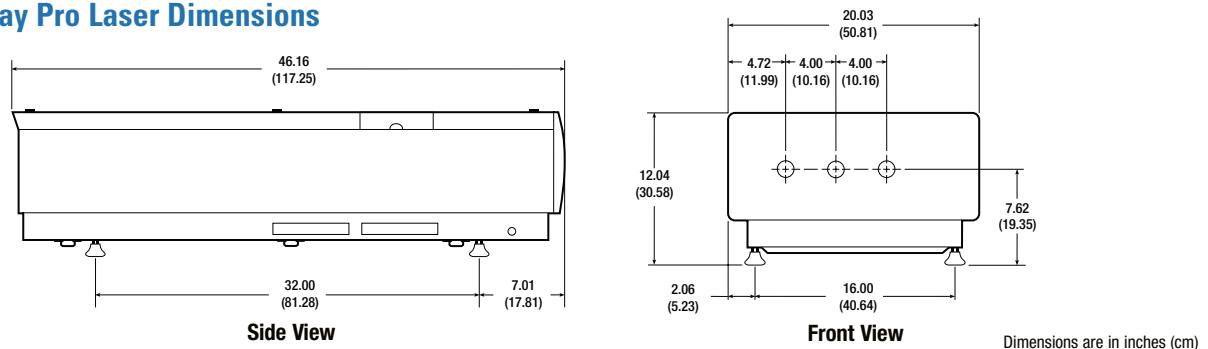
BeamLok Specifications	Standard Pro Series	With BeamLok/D-Lok
Beam Pointing Stability <sup>12</sup>	< $\pm 50 \mu\text{rad}\%$	< $\pm 25 \mu\text{rad}$
Beam Divergence <sup>13</sup>	<0.5 mrad	<2 x initial level
Lamp Lifetimes <sup>14</sup>	30 million pulses	40 million pulses

### Linewidth

Standard	<1.0 $\text{cm}^{-1}$
Injection Seeded <sup>15</sup>	<0.003 $\text{cm}^{-1}$
Timing Jitter <sup>16</sup>	<0.5 ns

Notes for specifications are on page 5.

## Quanta-Ray Pro Laser Dimensions



# Quanta-Ray® Lab Series

The Quanta-Ray® Lab series represent the intermediate range of oscillator-only lasers with output energies up to 1 J at 1064 nm. The Lab laser stands above its competitors because of its dual Nd:YAG rod and dual pump chamber oscillator configuration. This proprietary design provides intra-oscillator compensation for thermally-induced birefringence in the Nd:YAG rod, greatly reducing beam depolarization. This results in higher repetition rates, higher average powers and superior output beam quality than any other oscillator-only Nd:YAG laser on the market.

## Quanta-Ray Lab Series Specifications

### Power Specifications<sup>1</sup>

Product	Lab-130-			Lab-150-			Lab-170-			Lab-190-			
	10 Hz	30 Hz	50 Hz	10 Hz	30 Hz	50 Hz	10 Hz	30 Hz	50 Hz	10 Hz <sup>4</sup>	30 Hz	50 Hz	100 Hz
<b>Energy (mJ/p)<sup>2</sup></b>													
1064 nm	450 mJ	275 mJ	200 mJ	650 mJ	500 mJ	300 mJ	850 mJ	700 mJ	550 mJ	1000 mJ	800 mJ	600 mJ	325 mJ
532 nm	200 mJ	100 mJ	70 mJ	300 mJ	200 mJ	100 mJ	450 mJ	325 mJ	210 mJ	500 mJ	400 mJ	250 mJ	120 mJ
355 nm <sup>2,3</sup>	90 mJ	40 mJ	30 mJ	150 mJ	100 mJ	40 mJ	220 mJ	175 mJ	100 mJ	250 mJ	200 mJ	100 mJ	50 mJ
EEO-355 nm <sup>3, 2,3</sup>	--	--	--	--	--	--	240 mJ	--	--	300 mJ	--	--	--
266 nm	55 mJ	25 mJ	15 mJ	75 mJ	35 mJ	25 mJ	100 mJ	65 mJ	30 mJ	120 mJ	65 mJ	25 mJ	20 mJ

### Performance Specifications

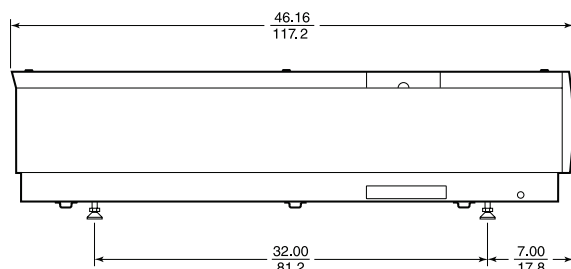
Wavelength	Pulse Width <sup>5</sup>	Short Term Energy Stability <sup>6</sup>	Long Term Power Drift <sup>7</sup>
1064 nm	8–12 ns	±2%	<3%
532 nm	1–2 ns <1064 nm	±3%	<5%
355 nm	2–3 ns <1064 nm	±4%	<6%
266 nm	3–4 ns <1064 nm	±8%	<10%

### Beam Specifications

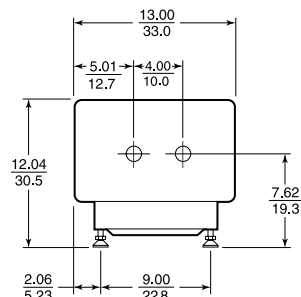
Spatial Mode Profile <sup>8</sup>	Standard Fit	ESM Fit <sup>9</sup>
Near Field (1 m)	>70%	Contact Spectra-Physics
Far Field (∞)	>95%	Contact Spectra-Physics
Modulation <sup>10</sup>	<40%	Contact Spectra-Physics
Beam Diameter <sup>11</sup>	<10 mm	
Beam Pointing Stability <sup>12</sup>	<±50 μrad%	
Beam Divergence <sup>13</sup>	<0.5 mrad	
Lamp Lifetimes <sup>14</sup>	30 million pulses	
<b>Linewidth</b>		
Standard	<1.0 cm <sup>-1</sup>	
Injection Seeded <sup>15</sup>	<0.003 cm <sup>-1</sup>	
Timing Jitter <sup>16</sup>	<0.5 ns	

Notes for specifications are on page 5.

## Quanta-Ray Lab Laser Dimensions



Side View



Front View

Dimensions are in inches (cm)

# Quanta-Ray® INDI Series

The Quanta-Ray INDI series are single-rod oscillator-only Nd:YAG lasers. They offer pulse energies up to 450 mJ at 1064 nm. The INDI is the most compact of the Quanta-Ray lasers, and is based upon the Quanta-Ray's unique combination of proprietary resonator design with gold-coated elliptical pump chambers to produce an output beam quality that is superior to other low-energy pulsed lasers available on the market.

## Quanta-Ray INDI Series Specifications

### Power Specifications<sup>1</sup>

Product	INDI-40-10	INDI-40-20
Repetition Rate	10 Hz	20 Hz
<b>Energy (mJ/p)<sup>2</sup></b>		
1064 nm	450 mJ	420 mJ
532 nm	200 mJ	160 mJ
355 nm <sup>23</sup>	100 mJ	100 mJ
266 nm	55 mJ	40 mJ

### Performance Specifications

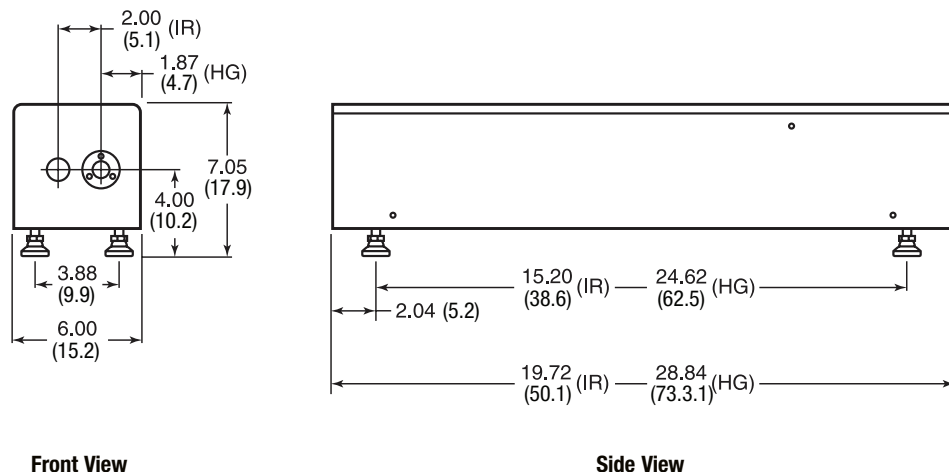
Pulse Width	6–9 ns
Short Term Energy Stability <sup>6</sup>	±2%
Long Term Power Drift <sup>7</sup>	<3%

### Beam Specifications

Spatial Mode Profile <sup>8</sup>	Standard Fit
Near Field (1 m) <sup>20</sup>	>70%
Far Field ( $\infty$ ) <sup>20</sup>	>95%
Modulation <sup>10, 20, 21</sup>	<30%
Beam Diameter <sup>11</sup>	<10 mm
Beam Pointing Stability <sup>12</sup>	<±100 $\mu$ rad
Beam Divergence <sup>13</sup>	<0.5 mrad
Timing Jitter <sup>16</sup>	<0.5 ns

Notes for specifications are on page 5.

## Quanta-Ray INDI Laser Dimensions



Dimensions are in inches (cm)

# Quanta-Ray®

## Quanta-Ray Service Requirements

	Quanta-Ray Pro	Quanta-Ray Lab	Quanta-Ray INDI
Water Service <sup>17, 18</sup>	10 Hz – 3.8 liters/min (1.0 US gallons/min) 30 Hz and 50 Hz – 7.6 liters/min (2.0 US gallons/min)	10 Hz, 30 Hz and 50 Hz – 7.6 liters/min (2.0 US gallons/min)	N/A
Electrical Service <sup>22</sup>	10/30/50 Hz: <30 A/<40 A/<50 A	10/30/50 Hz: <30 A/<40 A/<50 A	10/20 Hz: <15 A/<20 A
Voltage <sup>19</sup>	190–260 V, single phase, 50/60 Hz		
Umbilical Length	3 m (10 ft)		
Remote Cord Length	3 m (10 ft)		
Weight	Laser Head 84 kg (185 lb) Power Supply 114 kg (250 lb)	Laser Head 55 kg (120 lb) Power Supply 68 kg (150 lb)	Laser Head 11 kg (25 lb) (IR); 15 k (34 lb) (HG) Power Supply 60 kg (132 lb)
Power Supply Dimensions (L x W x H)	76.99 x 64.00 x 75.74 cm (30.3 x 25.2 x 29.8 in)	76.9 x 63.9 x 50.2 cm (30.31 x 25.18 x 19.75 in)	64.7 x 33.4 x 55.4 cm (25.46 x 13.13 x 21.81 in)

- All specifications, unless otherwise stated, are for Q-switched 1064 nm operation and are subject to change without notice.
- Harmonic energies are specified after separation using dichroic mirror pairs. It is also assumed that polarization of measured harmonic is in vertical polarization, making an "S" polarized reflection from dichroics. 532 nm energies are specified using Type II SHG. 355 nm energies are specified using Type II doubler. Using a Type I doubler in tripling process will result in a 10% increase in published 355 nm specification EXCEPT for the following models: INDI, Lab-130-10, Lab-190-10, Pro-250-10, Pro-230-10.
- High UV output option designed for OPO pumping, including injection seeder, harmonic generator, 355 nm dichroic separators, and beam dump.
- The Lab-190-10 is configured on a Quanta-Ray Pro platform. This allows for BeamLok in this model. For laser head size, please refer to Quanta-Ray Pro specifications.
- Normal full width half maximum (FWHM) pulse width 8-10 ns for all Lab series lasers except Lab 130-10 and Lab 190-10 versions, which is 9-12 ns. FWHM for Pro series lasers is 10-12 ns except for Pro 270-10, Pro 290-10, and Pro 350-10 versions which is 8-10 ns. The optional short pulse mode reduces the 1064 nm pulse width to approximately 2.5 ns and reduces the energy by approximately 10%. (Short pulse mode available on seeded versions on special request only).
- Pulse-to-pulse stability for >99% of pulses, measured over a 1 hour period.
- Over 8 hour period with temperature variations of  $\pm 3^{\circ}\text{C}$ .
- Near field spatial profiles measured <1 m from laser using commercially available beam diagnostic system. 70% refers to correlation between actual beam profile and least squares best fit Gaussian profile. Far field profiles are measured at focal plane of a 2 m focal length lens and measured between FWHM points. Specifications based on 10 Hz lasers.
- Enhanced spatial mode options can be tailored to meet your application needs. To obtain >85% Gaussian fits, energy can be reduced by 50%. Contact Spectra-Physics to establish specifications.
- Refers to maximum deviation from best fit Gaussian profile measured in near field (1 m) between FWHM points.
- Actual beam diameter will vary depending on laser configuration.
- Long term average pointing drift after warm up, over 8 hours  $\pm 3^{\circ}\text{C}$ . Shot-to-shot pointing stability  $\pm 25 \mu\text{rad}$ . Angle measured is polar angle.
- Full angle measured at FWHM points.
- IR energy within 10% of specified value.
- Insertion losses for systems using Model 6350 injection seeder are <15% at 1064 nm, 532 nm, and 266 nm.
- RMS jitter from Q-switched sync pulse at 10 Hz. Jitter is  $\leq 1$  ns RMS when using Model 6350 injection seeder at 10 Hz and  $\leq 1.5$  ns at 30 Hz. INDI cannot be seeded.
- INDI, Lab 130-10 and Lab 150-10 units are air cooled as standard. Water-cooled versions of INDI require WAT 50 (3.8 liters/min or 1 US gal/min). Water-cooled versions of Lab 130-10 and Lab 150-10 require PS101 (3.8 liters/min or 1.0 US gal/min). All seeded lasers must be water cooled.
- Minimum pressure 40 psi. Maximum pressure 60 psi.
- Input transformer has taps at 190, 200, 210, 220, 230, 240, 250, and 260 V. Once tap is chosen, actual input voltage differing by more than  $\pm 10\%$  may affect operation of laser.
- Measured on request.
- Fit to flat-top central 80% of beam near field.
- Max current draw of laser.
- Addition of LBP option for pumping Scan Series OPOs can result in a 5% loss of 355 nm energy.



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DS-09091 (06/11)