Picosecond Lasers

Femtosecond Lasers

NL230 SERIES



BENEFITS

- ➤ Short duration 3 6 ns pulses ensures strong interaction with material, are highly suitable for LIBS
- User selectable wavelength single axis output is superior for experiments, where alternating wavelengths are required, like material ablation, LIBS
- Rugged, monolithic design enables laser usage in hash environment
- ➤ Diode pumped design provides quiet operation, eliminates the irritation of flash light
- ➤ Variety of interfaces USB, RS232, LAN, WLAN ensures easy control and integration with other equipment

The NL230 series diode-pumped short nanosecond lasers are designed to produce high-intensity, high-brightness pulses and are targeted for applications such as material ablation, Light Detection And Ranging (LIDAR), remote sensing, mass spectroscopy, OPO, Ti:Sapphire or dye laser pumping and many more. Diode pumping allows maintenance-free laser operation for an extended period of time - more than 3 years for an estimated eight working hours per day.

Because laser head components are placed in a robust, sealed and precisely machined monolithic aluminium block, this laser can reliably work in a harsh industrial environment with applications such as laser-induced breakdown spectroscopy (LIBS).

Second and third harmonic options allows for an expanded range of applications, where high pulse energy and high pulse to pulse stability are required.

For easy and seamless control and integration with other industrial equipment, the NL230 series laser is equipped with USB/RS232 interfaces and can be externally triggered with a jitter as low as < 0.5 ns rms.

NL230 series lasers are designed to work reliably 24/7 in an industrial environment

High Energy Q-switched DPSS Nd:YAG Lasers

FEATURES

- ▶ Diode-pumped
- Rugged sealed laser cavity
- ► Up to **190 mJ** at **1064 nm** pulse energy
- ▶ Up to 100 Hz pulse repetition rate
- ► Short pulse duration in the **3–6 ns** range
- Variable reflectivity output coupler for low-divergence beam
- Quiet operation: no more flashlamp firing sound
- Remote control via keypad and/or any controller running on any OS using REST API commands
- Optional temperature-stabilized second and third harmonic generators
- Electromechanical shutter (optional)
- Easy replaceable output window

APPLICATIONS

- ► LIBS (Light Induced Breakdown Spectroscopy)
- Material ablation
- ▶ OPO pumping
- ▶ Remote Sensing
- LIDAR (Light Detection And Ranging)
- ▶ Mass Spectroscopy
- ► LIF (Light Induced Fluorescence)



NL230 SERIES

SPECIFICATIONS 1)

NANOSECOND LASERS

at 1064 nm 190 mJ 150 mJ at 352 nm 100 mJ 90 mJ at 355 m 90 mJ at 355 nm 55 mJ 40 mJ Pulse energy stability (StdDev) 30 mJ 40	Model	NL231-50	NL231-100					
### ### ### ### ### ### ### ### ### ##	Pulse energy (not less than) 2)							
### ### ### ### ### ### ### ### ### ##	at 1064 nm	190 mJ	150 mJ					
Pulse energy stability (StdDev) ³⁾ at 1064 nm	at 532 nm	110 mJ	90 mJ					
at 1064 nm	at 355 nm	55 mJ	40 mJ					
at 532 nm at 335 nm color repetition rate at 355 nm color repetition rate 50 Hz 100 Hz	Pulse energy stability (StdDev) 3)	<u> </u>						
at 355 nm	at 1064 nm	<1%						
Pulse repetition rate 50 Hz 100 Hz Power drift ⁴¹	at 532 nm	< 2.5 %						
Power drift 4) Pulse duration 5) Linewidth Sa − 6 ns Sam profile 6) Beam profile 6) Beam divergence 7) Beam divergence 7) Beam divergence 70 Beam diameter 80 Optical pulse jitter (StDev) Internal triggering regime External triggering regime Satistandard Full Acateristics Laser head size (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm External chiller Umbilical length Beam pointing stability (StDev) Sam Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm External chiller Umbilical length Beam profile 6 Sam Sam OPERATING REQUIREMENTS Cooling (air cooled) 100 Relative humidity (non-condensing) Power requirements 100 − 240 V AC, single phase, 50/60 Hz Power consumption	at 355 nm	< 3.5 %						
Pulse duration ⁵⁾ Linewidth	Pulse repetition rate	50 Hz	100 Hz					
Linewidth <a href<="" td=""><td>Power drift ⁴⁾</td><td colspan="5">< ±1 %</td>	Power drift ⁴⁾	< ±1 %						
Beam profile 60 "Top Hat" in near field and close to Gaussian in far field Beam divergence 70 < 0.8 mrad Beam pointing stability (StDev) 80 < 60 µrad Polarization linear, > 90 % at 1064 nm Typical beam diameter 90	Pulse duration 5)	3 – 6 ns						
Beam divergence ⁷⁾ < 0.8 mrad Beam pointing stability (StDev) ⁽⁹⁾ ≤ 60 μrad Polarization linear, > 90 % at 1064 nm Typical beam diameter ⁽⁹⁾ 5 mm Optical pulse jitter (StDev) Internal triggering regime < 0.5 ns External triggering regime 10 min PHYSICAL CHARACTERISTICS Laser head size (W × L × H) 251 × 291 × 167 ± 3 mm Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) ⁽¹⁰⁾ external chiller Ambient temperature 18 − 30 °C Relative humidity (non-condensing) 20 − 80 % Power consumption < 1.0 kW	Linewidth	<1 cm ⁻¹ at 1064 nm						
Beam pointing stability (StDev) ® ≤60 μrad Polarization linear, >90 % at 1064 nm Typical beam diameter ® 5 mm Optical pulse jitter (StDev) Internal triggering regime < 0.5 ns External triggering regime < 0.5 ns Typical warm-up time 10 min PHYSICAL CHARACTERISTICS Laser head size (W × L × H) 251 × 291 × 167 ± 3 mm Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) ™ external chiller Ambient temperature 18−30 °C Relative humidity (non-condensing) 20−80 % Power consumption < 1.0 kW	Beam profile 6)	"Top Hat" in near field and close to Gaussian in far field						
Polarization linear, > 90 % at 1064 nm Typical beam diameter **) Optical pulse jitter (StDev) Internal triggering regime < 0.5 ns External triggering regime < 0.5 ns Typical warm-up time 10 min PHYSICAL CHARACTERISTICS Laser head size (W × L × H)	Beam divergence 7)	< 0.8 mrad						
Typical beam diameter 91 5 mm Optical pulse jitter (StDev) Internal triggering regime < 0.5 ns External triggering regime < 0.5 ns Typical warm-up time 10 min PHYSICAL CHARACTERISTICS Laser head size (W × L × H)	Beam pointing stability (StDev) 8)	≤ 60 µrad						
Optical pulse jitter (StDev) Internal triggering regime < 0.5 ns External triggering regime < 0.5 ns Typical warm-up time 10 min PHYSICAL CHARACTERISTICS Laser head size (W × L × H) 251 × 291 × 167 ± 3 mm Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption < 1.0 kW	Polarization	linear, > 90 % at 1064 nm						
Internal triggering regime < 0.5 ns External triggering regime < 0.5 ns Typical warm-up time 10 min PHYSICAL CHARACTERISTICS Laser head size (W × L × H) 251 × 291 × 167 ± 3 mm Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption < 1.0 kW	Typical beam diameter 9)	5 mm						
External triggering regime 7 ypical warm-up time PHYSICAL CHARACTERISTICS Laser head size (W × L × H) Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module External chiller Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) Ambient temperature Relative humidity (non-condensing) Power requirements 100 min 251 × 291 × 167 ± 3 mm 470 × 390 × 140 ± 3 mm inquire 18 × 390 × 140 ± 3 mm External chiller inquire 20 × 80 % Power requirements 18 × 30 °C Relative humidity (non-condensing) 20 × 80 % Power requirements 100 × 240 V AC, single phase, 50/60 Hz < 1.0 kW	Optical pulse jitter (StDev)							
Typical warm-up time 10 min PHYSICAL CHARACTERISTICS Laser head size (W × L × H) 251 × 291 × 167 ± 3 mm Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18-30 °C Relative humidity (non-condensing) 20-80 % Power requirements 100-240 V AC, single phase, 50/60 Hz Power consumption < 1.0 kW	Internal triggering regime	< 0.5 ns						
PHYSICAL CHARACTERISTICS Laser head size (W × L × H) Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller Inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) Ambient temperature Ambient temperature 18 – 30 °C Relative humidity (non-condensing) Power requirements 100 – 240 V AC, single phase, 50/60 Hz Power consumption < 1.0 kW	External triggering regime	< 0.5 ns						
Laser head size (W × L × H) Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) Power requirements 100–240 V AC, single phase, 50/60 Hz < 1.0 kW	Typical warm-up time	10 min						
Power supply unit (W × L × H) Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption < 1.0 kW	PHYSICAL CHARACTERISTICS							
Desktop case 470 × 390 × 140 ± 3 mm 19" module 483 × 390 × 140 ± 3 mm External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption < 1.0 kW	Laser head size (W \times L \times H)	251 × 291 × 167 ± 3 mm						
19" module External chiller Umbilical length OPERATING REQUIREMENTS Cooling (air cooled) 10) Ambient temperature Relative humidity (non-condensing) Power requirements 100-240 V AC, single phase, 50/60 Hz Power consumption 483 × 390 × 140 ± 3 mm inquire inquire external chiller external chiller 18-30 °C 20-80 % 100-240 V AC, single phase, 50/60 Hz	Power supply unit (W × L × H)							
External chiller inquire Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption <1.0 kW	Desktop case	470 × 390 × 140 ± 3 mm						
Umbilical length 3 m OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption <1.0 kW	19" module	483 × 390 × 140 ± 3 mm						
OPERATING REQUIREMENTS Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption < 1.0 kW	External chiller	inquire						
Cooling (air cooled) 10) external chiller Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption <1.0 kW	Umbilical length	3 m						
Ambient temperature 18–30 °C Relative humidity (non-condensing) 20–80 % Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption <1.0 kW	OPERATING REQUIREMENTS							
Relative humidity (non-condensing) Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption <1.0 kW	Cooling (air cooled) 10)	external chiller						
Power requirements 100–240 V AC, single phase, 50/60 Hz Power consumption <1.0 kW	Ambient temperature	18−30 °C						
Power consumption <1.0 kW	Relative humidity (non-condensing)	20-80 %						
The state of the s	Power requirements	100–240 V AC, single ph	ase, 50/60 Hz					
Cleanliness of the room not worse than ISO Class 9	Power consumption	<1.0 kW						
	Cleanliness of the room	not worse than ISO	Class 9					

- Due to continuous improvement, all specifications are subject to change. The parameters marked typical may vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 1064 nm and for basic system without options.
- Outputs are not simultaneous. Inquire for higher energy (up to 350 mJ at 50 Hz, 250 mJ at 100 Hz) custom models.
- ³⁾ Averaged from pulses, emitted during 30 sec time interval.
- 4) Measured over 8 hours period after 20 min warm-up when ambient temperature variation is less than ± 2 °C and humidity <± 5%.</p>

- 5) FWHM.
- 6) Near field (at the output aperture) TOP HAT fit is >80%.
- $^{7)}\,\,$ Full angle measured at the 1/e² level.
- Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element.
- ⁹⁾ Beam diameter is measured at 1064 nm at the 1/e² level.
- 10) Adequate room air conditioning should be provided.





PERFORMANCE

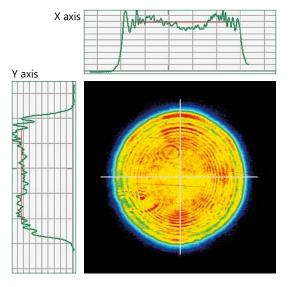


Fig 1. NL230 laser typical near field beam profile

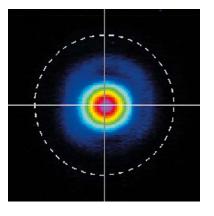
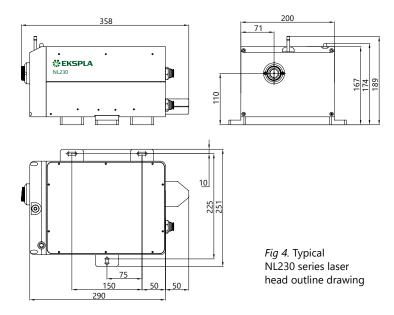


Fig 2. NL230 laser typical far field beam profile

Measure	P1.ddelay	P2.width	P3.area			_	 				
	,										
/alue	72.011 ns	5.507 ns	2.358455 mVs								
mean	72.044 ns	5.482 ns	2.355738 mVs					A			
nin	71.456 ns	5.167 ns	2.277066 mVs				 -	1			
ΙX	72.552 ns	5.970 ns	2.409653 mVs		-			H			
ev	156.11 ps	81.27 ps	16.89196 pVs	2			 		-	-	
num	4.697×10^{3}	4.697×10^{3}	4.697×10^{3}								

Fig 3. NL230 laser pulse waveform

OUTLINE DRAWINGS



ORDERING INFORMATION



Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.