

# Rapid NX

## High Power Industrial ps-Laser

As part of Coherent's picosecond laser lineup, the Rapid NX is a next generation picosecond laser system that encompasses all features of the existing Rapid-series at a significantly reduced cost of ownership. Thus, the Rapid NX is ideally suited for sophisticated marking, LED dicing, thin film removal, and small feature structuring. The short pulses facilitate non-thermal material processing thereby avoiding recast, micro-cracks, splatter of molten particles, delamination, and changes in material composition.

The Rapid NX is an industrial grade laser designed for 24/7 use under a diverse set of environmental conditions. With an adjustable repetition rate between 50 kHz and 1000 kHz, the user can dial in the best repetition rate for the process. In addition, the Rapid NX allows for seeder burst operation, providing a burst of pulses with only 25 ns time separation between pulses.

The Rapid NX distinguishes itself from the other ps-lasers by a significantly reduced footprint, weight and operating cost. As a standard feature, the Rapid NX offers pulse-on-demand. In this mode, a user can send an external trigger pulse and expect the optical pulse with a timing uncertainty of less than  $\pm 13$  ns. This precision is sufficient for even the most demanding beam deflection systems such as polygon scanners.



**Superior Reliability & Performance**

### **Rapid NX Advantages:**

- **7W at 1064 nm**
- **Repetition rate range from 50 kHz to 1000 kHz**
- **Up to 50  $\mu$ J pulse energy**
- **Pulse on demand**
- **Seeder burst mode**
- **High beam quality  $M^2 < 1.3$**
- **Superior beam parameter and pointing stability across the complete PRF range**
- **Fully field serviceable**
- **Low maintenance**

### **Rapid NX Applications:**

- **Drilling small apertures or structures (for electrical, bio-medical or fluidic devices) into difficult to machine materials**
- **Cutting or repairing masks for processes in the semiconductor, display or OLED technology**
- **Structuring solar cells**
- **Specialty marking**
- **LED dicing**

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### System Specifications

	Rapid NX
Fundamental Center Wavelength (nm)	1064.5 ±0.5
Output Energy <sup>1</sup>	7 µJ at 1064 nm, 1 MHz (7W) 12 µJ at 1064 nm, 500 kHz (6W) 25 µJ at 1064 nm, 200 kHz (5W) 40 µJ at 1064 nm, 100 kHz (4W) 50 µJ at 1064 nm, 50 kHz (2.5W)
Repetition Rate <sup>2</sup>	50 kHz to 1 MHz
Pulse Width <sup>3</sup> (ps)	10 to 15
Mode Quality <sup>4</sup>	M <sup>2</sup> <1.3
Beam Waist Diameter (mm)	1 ±0.2
Beam Waist Location	At output port ±25% of RR
Astigmatism	±25% of Rayleigh Range
Ellipticity	0.85 < e < 1.15
Polarization Ratio	>100:1
Polarization Direction	Vertical ±3° IR
Contrast Ratio <sup>5</sup>	>100:1
Beam Pointing Stability (µrad/°K)	±25
Pulse Stability <sup>6</sup> (%) (RMS)	<1 at 1 MHz
Pulse Stability <sup>7</sup> (%) (pk-pk)	<5
Power Stability <sup>8</sup> (%)	<±1 over 8 hours
Operation Temperature Stability within the Operating Temperature Band (°C)	±1
Warm-up Time (minutes)	
Cold Start	<15
Warm Start	<10
Long-term Pointing Stability at Fixed Rep-rate (µrad)	<±25 over 8 hours
Pulse Control	Process pulse picker as standard to deliver dynamic pulse control
Head Weight	28 kg (61.7 lbs.)
PSU Dimensions	19" rack mounted – 3U
External Comms <sup>9</sup>	RS-232, Ethernet
Power Consumption (VAC)(typical)	100 to 240, <500W

### Operating Specifications

Temperature (non-condensing)	
Laser Head	+15 to 30°C (59 to 86°F)
Power Supply	+15 to 30°C (59 to 86°F)
Vibration (g)	<0.05

### Shipping Specifications

Temperature	-20 to +50°C (-4 to 122°F)
Temperature Gradient	15°C (59°F) per hour
Relative Humidity (%)	5 to 90
Shock (g)	
Vertical	5 in 30 ms
Horizontal	5 in 30 ms

<sup>1</sup> At 1064 nm.

<sup>2</sup> Seed pulse frequency is in the range 40-42 MHz and any integer divisor of this seed clock frequency in the specified repetition rate range is accessible.

<sup>3</sup> Assuming a sech<sup>2</sup> fit.

<sup>4</sup> Valid over 100 kHz to 1 MHz for single pulse and over 50 kHz to 1 MHz in burst mode.

<sup>5</sup> Defined as the energy ratio of the main pulse and first post pulse.

<sup>6</sup> Measured over 1000 pulses – 1 sigma.

<sup>7</sup> For 1000 consecutive pulses.

<sup>8</sup> Pk-to-pk variation of the rolling average power (average power measured every 30 seconds and averaged over 5 minutes).

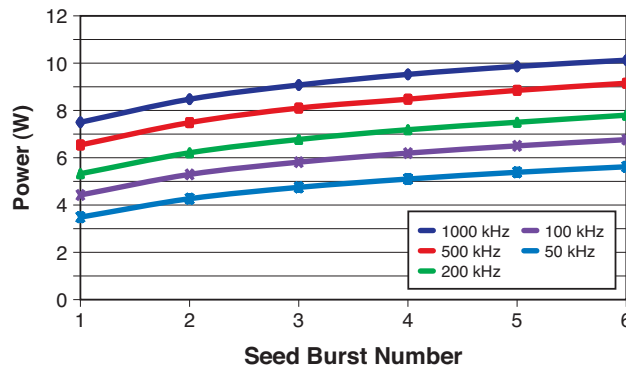
<sup>9</sup> Inputs on the PSU – USB as an option

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Rapid NX Pulse Control Modes	Description	Comments
Continuous	A continuous pulse train is emitted from the seed laser and amplified in the power amplifier at a fixed repetition rate within the specified range. This continuous pulse train can be turned off/on using the process pulse picker gate input.	50 kHz to 1 MHz
Process Burst	A continuous pulse train is emitted from the seed laser and amplified in the power amplifier at a fixed repetition rate within the specified range. A burst of m pulse is emitted from the pulse picker on a trigger input. If m = 1 then a single pulse is ejected on a trigger input.	50 kHz to 1 MHz $1 \leq m < 2^{16}$
Divided	A continuous pulse train is emitted from the seed laser and amplified in the power amplifier at a fixed repetition rate within the specified range. The pulse train is divided down using the process pulse picker to generate a pulse train at rep-rate/d.	50 kHz to 1 MHz $1 \leq d \leq 64,000$
Continuous with Seed Burst	A burst of n pulses separated by 25 ns is emitted from the seed and amplified in the power amplifier at a fixed repetition rate within the specified range. This continuous pulse train can be turned off/on using the process pulse picker gate input.	50 kHz to 1 MHz $1 \leq n \leq 6$ seed pulses in burst
Process Burst with Seed Burst	A burst of n pulses separated by 25 ns is emitted from the seed and amplified in the power amplifier at a fixed repetition rate within the specified range. A burst of m pulses (each containing n seed pulses) is emitted from the pulse picker on a trigger input. If m = 1 then a single pulse is ejected on a trigger input.	50 kHz to 1 MHz $1 \leq n \leq 6$ seed pulses in burst $1 \leq m \leq 2^{16}$ pulses in burst
Divided with Seed Burst	A burst of n pulses separated by 25 ns is emitted from the seed and amplified in the power amplifier at a fixed repetition rate within the specified range. The pulse train is divided down using the pulse picker to generate a pulse train at rep-rate/m.	50 kHz to 1 MHz $1 \leq n \leq 6$ seed pulses in burst $1 \leq d \leq 64,000$

**Typical Performance in Continuous Mode with Seeder Burst**

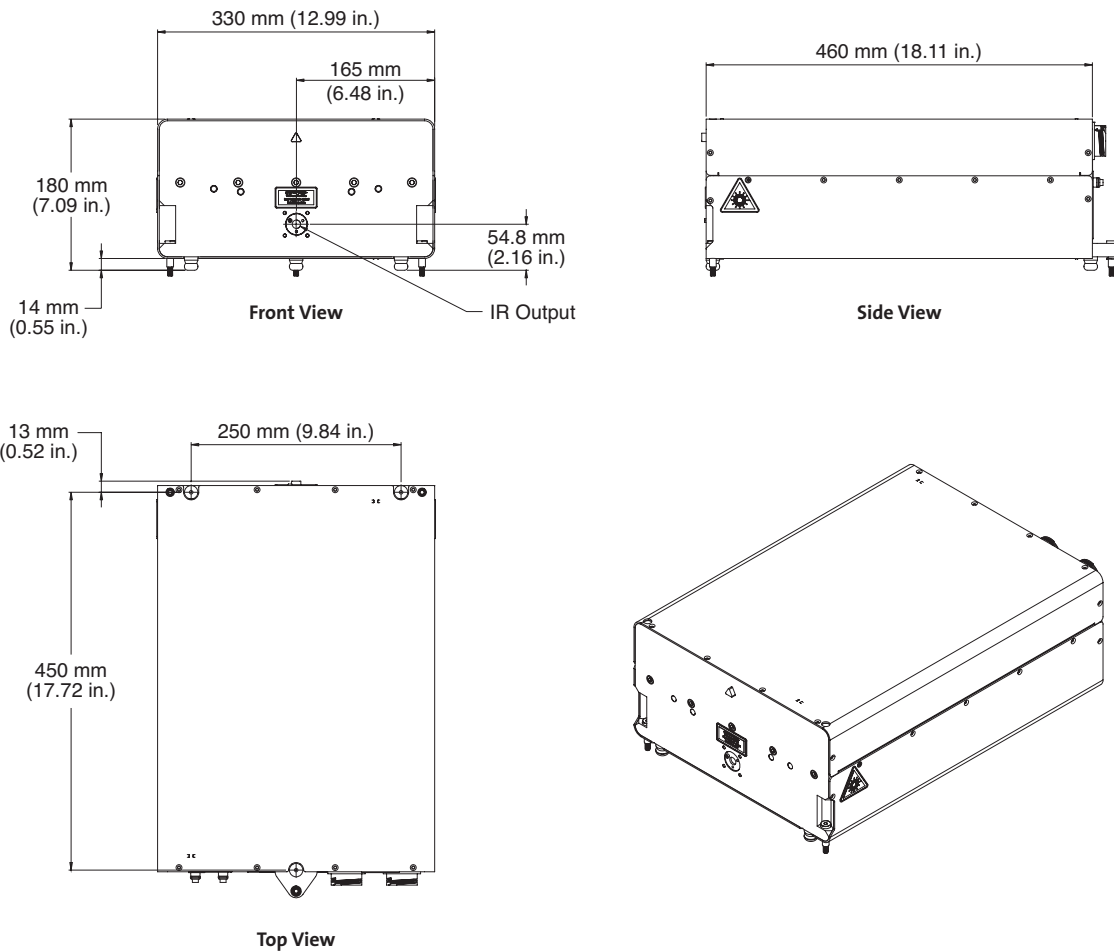


# Rapid NX

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## Mechanical Specifications

### Laser Head



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