

# RAPID FX

## High Energy Industrial fs-Laser for Micromachining

As part of Coherent's industrial ultrafast laser lineup, the RAPID FX is a next generation industrial laser system that extends the pulse duration of the RAPID-series to the femtosecond regime. The RAPID FX is ideally suited for applications that benefit from even shorter pulses: Femtosecond pulses allow for true non-thermal material processing, allowing for very clean processing results.

The RAPID FX is a laser system designed and manufactured for 24/7 use under wide environmental conditions. High average power operation at >10 Watts at 100 kHz allows for high throughput machining. With the integrated process shutter, the user can select single pulses out of the 100 kHz or 200 kHz pulse train.

The system uses a fiber seed laser to generate femtosecond pulses at 1030 nm. The pulses are amplified and conditioned in a thermally stable amplifier with superior beam quality. Both pulse-to-pulse energy stability and beam pointing stability deliver best-in-class performance among femtosecond micro-machining products.



**Superior Reliability & Performance**

### **RAPID FX Advantages:**

- **Pulse width <900 fs**
- **Repetition rate up to 200 kHz with pulse-on-demand operation**
- **Up to 100  $\mu$ J pulse energy at 100 kHz - 10 Watt average power at 1030 nm**
- **High beam quality  $M^2 <1.4$**
- **Integrated AOM process shutter; no optical leakage**
- **High stability and reliability; ready for industrial environment operation**
- **Compact laser head 68 cm x 26 cm x 29 cm contains all electronics; external chiller required**

### **RAPID FX Applications:**

- **Percussion drilling of small apertures for injector nozzles in metal**
- **High precision machining of medical parts**
- **Low-k scribing**
- **Micromachining of glass and sapphire parts**

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### System Specifications

	RAPID FX
Center Wavelength (nm)	1030 ± 5
Average Power (W)	≥10
Output Energy (μJ)(at 100 kHz)	100
Repetition Rate <sup>1</sup> (kHz)	100, 200
Pulse Control	Process pulse picker shutter is standard to deliver dynamic pulse control
Pulse Width <sup>2</sup> (fs)	<900
Beam Quality M <sup>2</sup> (x,y)(4σ)	<1.4
Beam Diameter 2w (mm)(x,y)(at 1 m from laser output)	5.0 ±0.5
Beam Divergence (mrad)	<1
Beam Waist Astigmatism	<0.25
Beam Waist Asymmetry	1.00 ±0.15
Polarization Ratio	>100:1
Polarization Direction	Vertical ±3°
Beam Pointing Stability (μrad/°K)	±50
Long-term Pointing Stability (μrad)(over 8 hours)	<±50
Pulse Energy Stability <sup>3</sup> (%) (RMS 1σ) 100 kHz single pulse	<2
Average Power Stability <sup>4</sup> (%) (RMS 2σ)(over 8 hours)	<2
Warm-up Time (minutes)	
Cold Start	<45
Warm Start	<30
Head Weight	49.5 kg (109 lbs.)
External Comms	Ethernet
Supply Voltage (VAC)	100 to 265
Power Consumption (W)(VAC)(typical)	<1500

### 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)

### Shipping Specifications

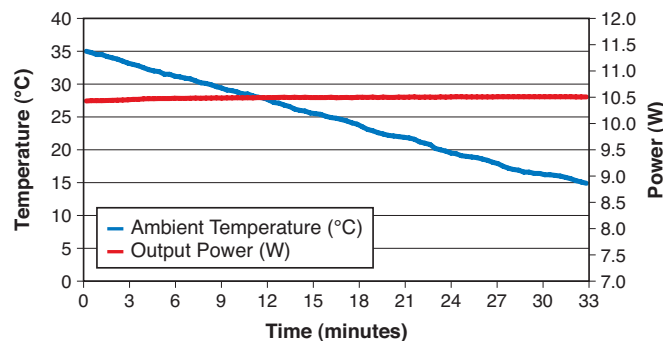
Temperature	-10 to +50°C (-14 to 122°F)
Relative Humidity (%)	5 to 90

<sup>1</sup> Repetition rate set at factory.

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

<sup>3</sup> For 1000 consecutive pulses.

### RAPID-F Thermal Stability



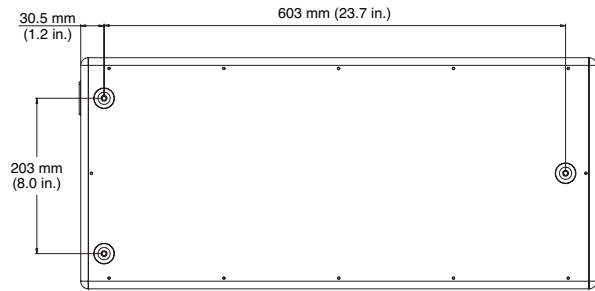
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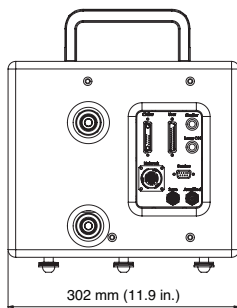
## Mechanical Specifications

Laser Head

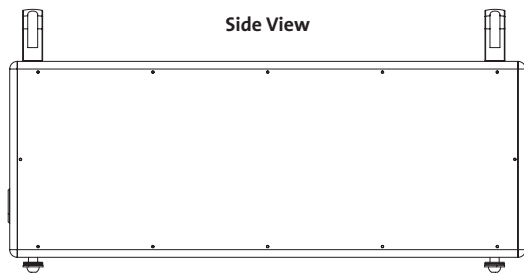
Bottom View



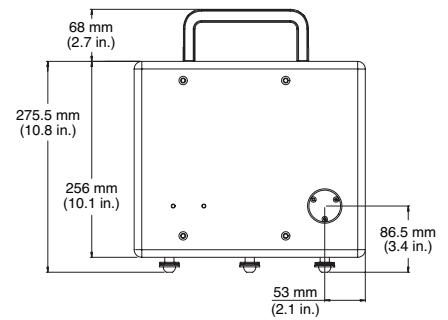
Rear View



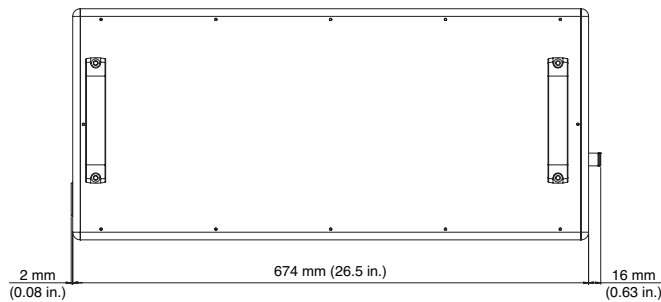
Side View



Front View



Top View



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