

# Monaco

## Diode-Pumped Femtosecond Industrial Laser

Monaco is a femtosecond industrial laser with a MOPA architecture. Designed for high-uptime, 24/7 applications, the laser family provides up to 40  $\mu\text{J}/\text{pulse}$  at 1035 nm, or 20  $\mu\text{J}/\text{pulse}$  at 517 nm. The 1 MHz repetition rate enables current and future throughput requirements in materials processing and microelectronics applications. Homogeneous materials such as glass and metals, as well as complex, layered structures for the FPD and mobile markets are readily addressed with Monaco's sub-400 fs pulsewidth. Additionally, a variable pulsewidth option enables tuning out to  $>10$  ps.

Monaco's compact laser head is machined from a single block of stress-relieved aluminum. This monolithic structure ensures an optical alignment that is maintained during the life of the laser. This head encases all of the optical, electrical, and control elements. There are no umbilicals, no outmoded wiring harnesses between power supply boards, nor remotely located pump diodes. Furthermore, the laser head acts as its own cleanroom environment, thanks to the onboard PureFemto™ cleaning engine that is constantly cleaning the interior of the laser.

Finally, Monaco's reliability is assured through the HALT (Highly Accelerated Life Test) and HASS (Highly Accelerated Stress Screen) protocols employed during development and throughout production. Commonly used in the consumer electronics and automotive industries, Coherent has introduced HALT/HASS to the laser industry to bring an unrivaled standard of reliability and quality to laser-based manufacturing applications. Monaco is tested to extremes like no other femtosecond laser.

Monaco – defining femtosecond industrial manufacturing.



**Superior Reliability & Performance**

### Monaco Features:

- 40  $\mu\text{J}/\text{pulse}$  at 1035 nm
- 20  $\mu\text{J}/\text{pulse}$  at 517 nm
- 1 MHz repetition rate
- Variable pulsewidths  $<400$  fs to  $>10$  ps
- Exceptional beam quality  $M^2 <1.2$
- Burst Mode capable
- Single-box solution
- HALT Designed/HASS Certified
- Remote access via ethernet interface

### Monaco Applications:

- Glass Cutting and Drilling
- Thin Film Ablation
- Wafer Scribing
- Complex Layer Processing
- Precise Metal Marking and Cutting
- Stent Fabrication
- Ophthalmic Applications
- OPA Pumping

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### System Specifications<sup>1</sup>

	Monaco 1035-40-1	Monaco 1035-6-1	Monaco 517-20-1
Fundamental Center Wavelength (nm)	1035 ±5	1035 ±5	517 ±5
Output Power (W)	40	6	20
Energy (μJ)	40 (at 1 MHz)	30 (Max.)	20 (at 1 MHz)
Repetition Rate	Single-shot to 1 MHz	Single-shot to 1 MHz	Single-shot to 1 MHz
Pulsewidth (fs)		<400	
Optional Tuning Range	<400 fs to >10 ps	<400 fs to >10 ps	–
Spatial Mode		TEM <sub>00</sub> , M <sup>2</sup> <1.2	
Beam Divergence (mrad, 2θ)		<1	
Beam Diameter at Output <sup>2</sup> (mm, 1/e <sup>2</sup> )	3.0 ±0.3	3.0 ±0.3	2.0 ±0.2
Astigmatism (%)		±25	
Beam Circularity (%)		>85	
Polarization Ratio		>100:1	
Polarization Direction <sup>3</sup>		Vertical ±3°	
Beam Pointing Stability (μrad/°C)		<25	
Pulse Energy Stability (%) (RMS)		<2	
Power Stability (%) (RMS, 2σ)		<2	
Warm-up Time (minutes)			
Cold Start		<45	
Warm Start		<15	
Long-term Pointing Stability at Fixed Rep-rate (μrad)		±25 over 8 hours	
Head Weight		32 kg (70 lbs.)	
External Comms		RS-232, Ethernet, USB	
Power Consumption <sup>4</sup> (typical)		48VDC, <500W	

### Operating Specifications

Temperature (non-condensing)	
Laser Head	+10 to 30°C (50 to 86°F)
Power Supply	+10 to 30°C (50 to 86°F)
Non-Operation (storage)	-20 to +60°C (-4 to 140°F)
Relative Humidity (%)	5 to 65

### Shipping Specifications

Temperature	-20 to +60°C (-4 to 140°F)
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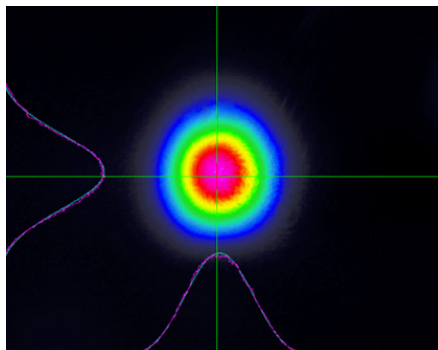
<sup>1</sup> All specifications at full energy and repetition rate.

<sup>2</sup> Measured at 1m from laser output window.

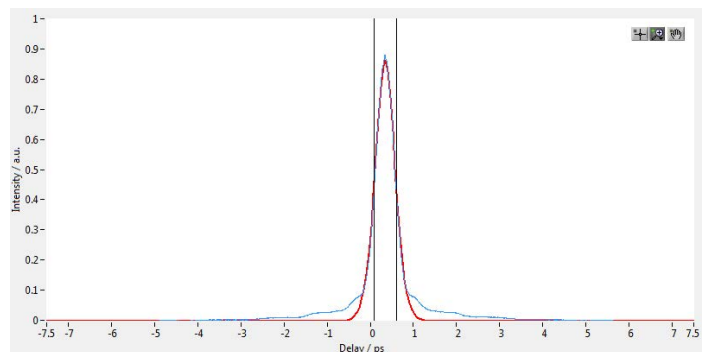
<sup>3</sup> External isolation required depending on application.

<sup>4</sup> Optional 110-240VAC power supply available.

Monaco Sample Spatial Mode at 1 MHz



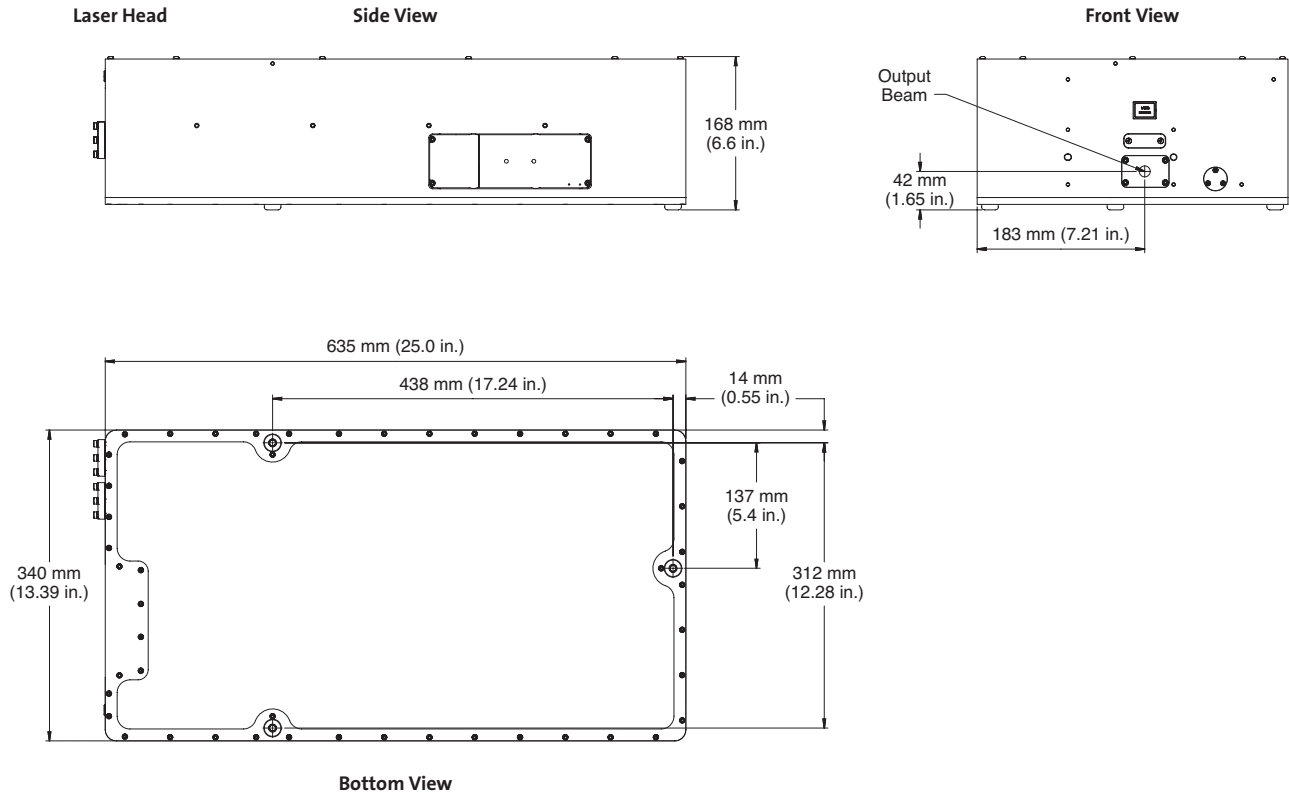
Monaco Sub 400 fs Temporal Profile



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### Mechanical Specifications



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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 Monaco lasers. For full details of this warranty coverage, please refer to the Service section at [www.Coherent.com](http://www.Coherent.com) or contact your local Sales or Service Representative.