



# 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 80  $\mu\text{J}/\text{pulse}$  at 1035 nm, or 30  $\mu\text{J}/\text{pulse}$  at 517 nm. Standard repetition rates to 50 MHz at 40W 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-350 fs pulsewidth. Additionally, the on-the-fly variable pulsewidth 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.

### FEATURES

- 80  $\mu\text{J}/\text{pulse}$  at 1035 nm
- 30  $\mu\text{J}/\text{pulse}$  at 517 nm
- Single-shot to 50 MHz repetition rate
- Variable pulsewidths  $<350$  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

### APPLICATIONS

- Glass Cutting and Drilling
- Thin Film Ablation
- Wafer Scribing
- Ceramics and Polymer Processing
- Precise Metal Marking and Cutting
- Stent Fabrication
- OPA Pumping



SPECIFICATIONS <sup>1</sup>	Monaco 1035-40	Monaco 1035-80	Monaco 517-20	Monaco 517-30
Fundamental Center Wavelength (nm)	1035 ±5	1035 ±5	517 ±5	517 ±5
Output Power (W)	40	40	20	20
Energy (µJ)	40 (at 1 MHz)	80 (at 500 kHz)	20 (at 1 MHz)	30 (at 670 kHz)
Repetition Rate	Single-shot to 1MHz, higher rep rates without AOM pulsepicking: 1 to 50 MHz standard			
Pulsewidth (fs)	<350			
Tuning Range	<350 fs to >10 ps	<350 fs to >10 ps	-	-
Spatial Mode	TEM <sub>00</sub> , M <sup>2</sup> <1.2			
Beam Divergence (mrad, 2θ)	<1			
Beam Diameter at 1m from Output <sup>2</sup> (mm, 1/e <sup>2</sup> )	2.7 ±0.3	2.7 ±0.3	2.0 ±0.2	2.0 ±0.2
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	-20 to +60°C (-4 to 140°F)			
Non-Operation (storage)	5 to 65°C (41 to 149°F)			
Relative Humidity (%)	<90, non-condensing			
SHIPPING SPECIFICATIONS				
Temperature	-20 to +60°C (-4 to 140°F)			

<sup>1</sup> All specifications at full energy and repetition rate.

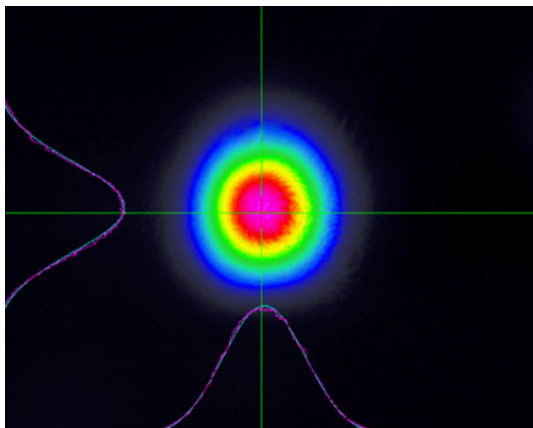
<sup>2</sup> Measured at 1m from laser output window.

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

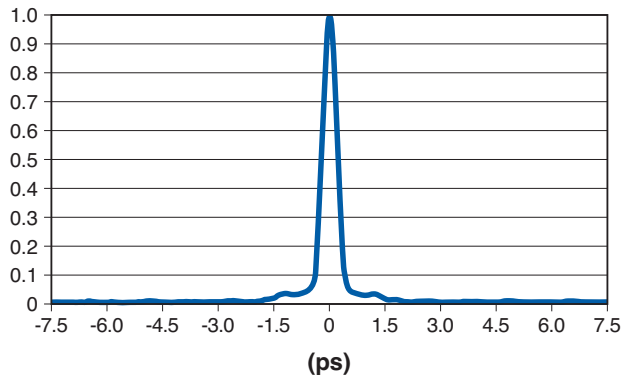
<sup>4</sup> Optional 110-240VAC power supply available.

TYPICAL PERFORMANCE DATA

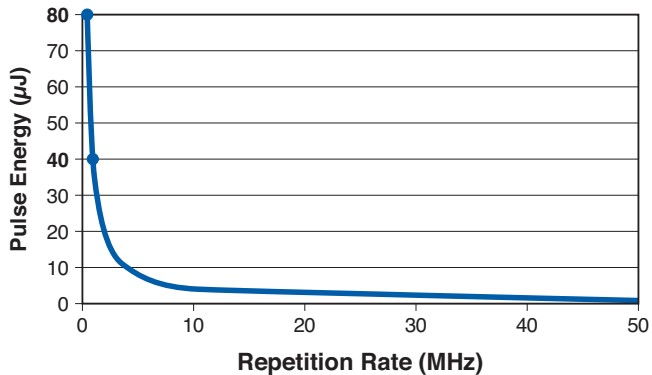
Monaco Sample Spatial Mode at 1 MHz



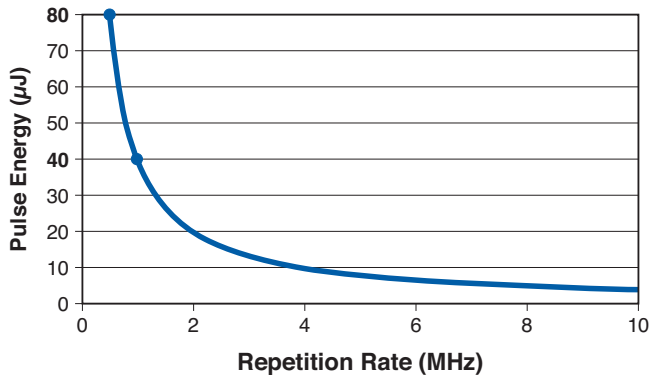
Monaco Sub-350 fs Temporal Profile



IR Output Energy vs. Repetition Rate (to 50 MHz)

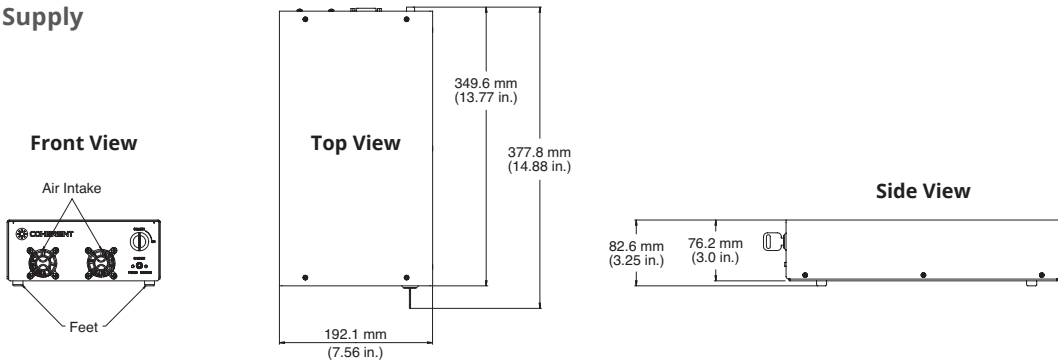


IR Output Energy vs. Repetition Rate (to 10 MHz)



MECHANICAL SPECIFICATIONS

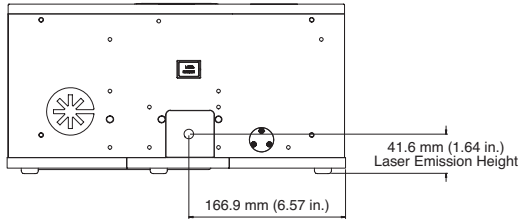
Monaco Power Supply



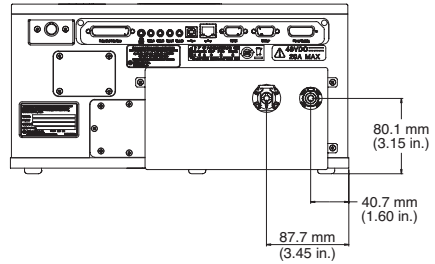
**MECHANICAL SPECIFICATIONS**

Monaco

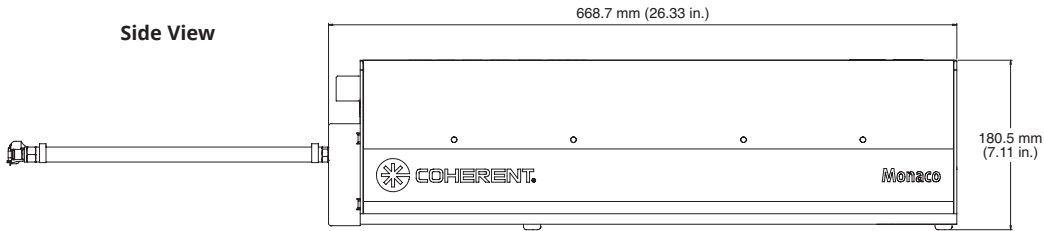
Front View



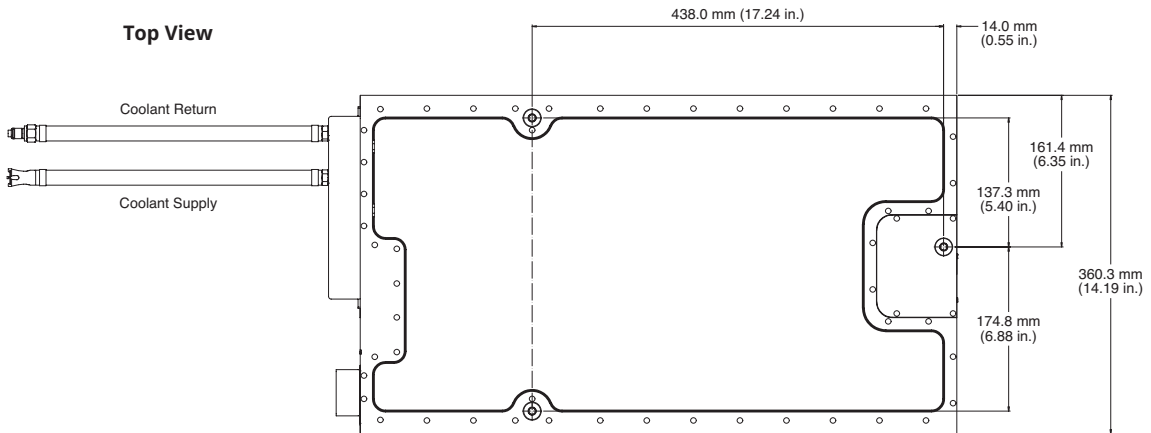
Rear View



Side View



Top View



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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. Printed in the U.S.A. MC-020-15-0M0617Rev.C Copyright ©2017 Coherent, Inc.