Spirit® One™

BREAKTHROUGH COST-PERFORMANCE FEMTOSECOND LASERS

The Spirit One Advantage

- *High average power (up to >8 W) and high pulse energy (40 µJ)*
- *Integrated pulse-picker with analog-in triggering*
- *User adjustable pulse duration between <400 fs and 4 ps (optional)*
- *SHG module with access to 1040 nm and 520 nm (optional)*
- *Laser head comprises electronic drivers (It's in the Box™)*
- *Proven, dependable performance under 24/7 operation*

Spirit One is a compact, industrial femtosecond laser that delivers game-changing cost-performance with average powers up to >8 W. With ultrashort <400 fs pulse width, high pulse energy and average power output, and repetition rate up to 1 MHz, the laser is an It's in the Box™ laser that combines power supply and laser head in a single rugged, compact and lightweight package for ease of integration. Spirit One enables advancements in high precision applications including microsurgery, femtosecond micromachining, medical device manufacturing, optogenetics, and multiphoton microscopy.

With up to >8 W average power, and >40 µJ pulse energy at 1040 nm wavelength, Spirit One provides additional flexibility with a new adjustable pulse duration option, allowing the user to freely choose pulse durations between <400 fs and 4 ps by software in less than 3 seconds. The amplifier is optimized for one factory calibrated repetition rate at either 200 kHz (40 µJ) or 1 MHz (8 µJ) that can be chosen by the customer. Additional or different pre-set repetition rates are optional and can be configured in the factory during assembly on request. The laser includes an integrated pulse picker for fast pulse selection and power control by an analog input signal or via software commands for high process throughput.

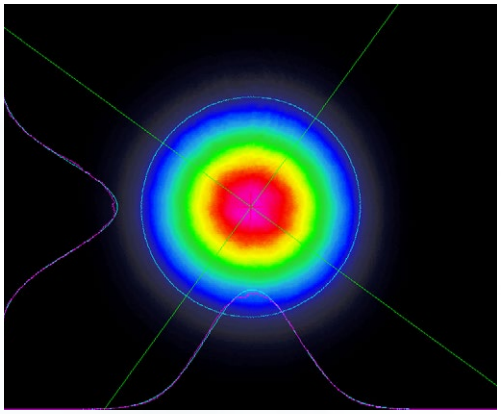
The optional, high efficiency Second Harmonic Generation (SHG) module enables the fabrication of smaller and more accurate structures. The fundamental and SHG output beams are collinear at the laser exit for easy integration and beam delivery. The end user can easily switch between the 1040 nm and 520 nm outputs by software.

Spirit One is based on the proven and widely deployed Spirit industrial femtosecond laser platform and has passed extensive environmental qualification testing to ensure high reliability. Fully automated and computer controlled, Spirit One has exceptional power and beam pointing stability during 24/7 operation, resulting in high precision and reproducibility for demanding applications.

Applications

- *Micro-surgery*
- *Femtosecond micromachining*
- *Medical device manufacturing*
- *Optogenetics*
- *Multiphoton microscopy*

Spirit One Beam Profile[1]



1. Typically measured performance; not a guaranteed or warranted specification.

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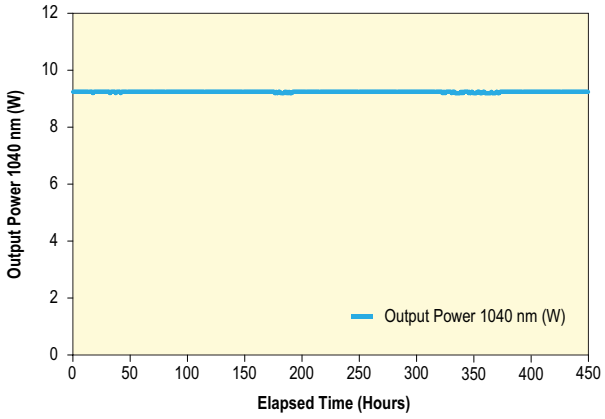
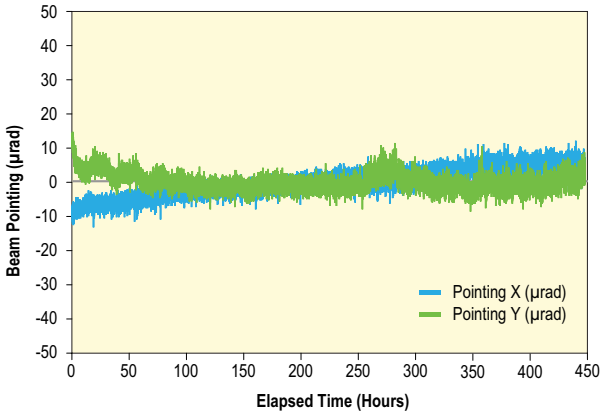
Long-term Performance >100 hours - Spirit One 1040-8[1]

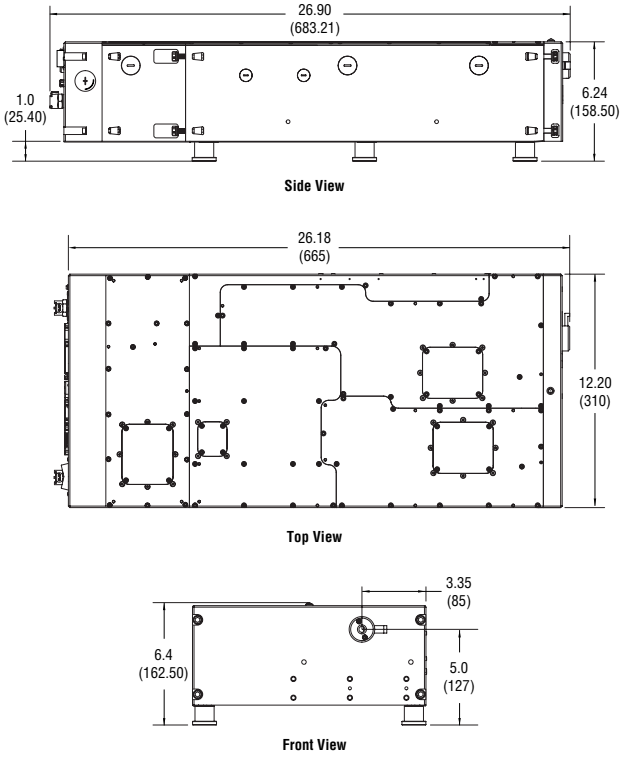


Long-term Beam Pointing Stability >100 hours - Spirit One 1040-8[1]

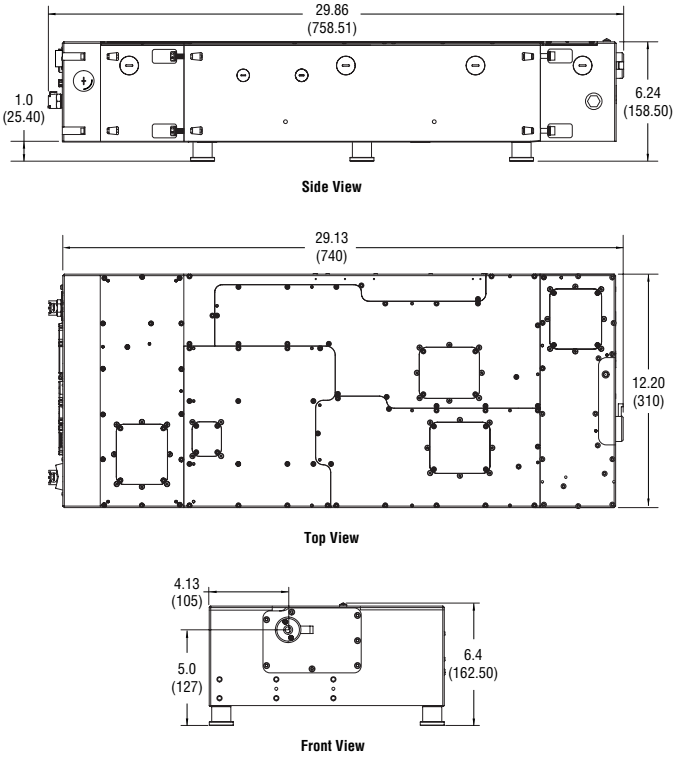


1. Typically measured performance; not a guaranteed or warranted specification.

Spirit One 1040-8 Dimensions



Spirit One 1040-8-SHG Dimensions



Dimensions in inch (mm)

Spirit One

Specifications[1,6]

	Spirit One 1040-8	Spirit One 1040-8-SHG
Output Characteristics		
Wavelength	1040 ± 5 nm	
Output Power	>8 W	
Pulse Energy	>40 µJ at 200 kHz	
Wavelength (SHG)	NA	520 ± 3 nm
Output Power[2] (SHG)	NA	>4 W at 200 kHz
Pulse Energy[2] (SHG)	NA	>20 µJ at 200 kHz
Repetition Rates[3]	200 kHz or 1 MHz	
Pulse Selection	Integrated pulse picker (AOM) for single shot to 1 MHz operation	
Pulse Width	<400 fs	
Pulse Width Tunability[4,5]	400 fs to 4 ps; tunable by software	
Power Stability	<1% rms over 100 hours (for 1040 nm and 520 nm)	
Pulse-to-Pulse Stability	<2% rms	
Spatial Mode	TEM_{00}, M^2 <1.2	
Beam Diameter (at exit)	2.0 mm (1040 nm); 2.0 mm (520 nm)	
Beam Divergence	<1 mrad (1040 nm); <0.5 mrad (520 nm)	
Pre-Pulse Contrast Ratio	>250:1	
Polarization	Linear	
Cold Start Time	<30 min	
Warm Start Time	<15 min	
Environmental Specifications		
Operating Temperature	18–30°C (64–86°F)	
Humidity	<65%, non-condensing	
Cooling Requirements		
Laser Head	Closed-loop chiller, included with shipment	
Utility Requirements		
Voltage	Laser Head: 24 VDC Chiller: 100-240 V, 50/60 Hz	
Current	<15 A	
Laser Head Physical Characteristics		
Dimensions (L x W x H)	26.2 x 12.2 x 5.2 in (665 x 310 x 133 mm)	29.1 x 12.2 x 5.2 in (740 x 310 x 133 mm)
Weight	88 lb (40 kg)	99 lb (45 kg)
Closed Loop Chiller Physical Characteristics		
Dimensions (L x W x H)	19.0 x 15.8 x 10.5 in (484 x 400 x 267 mm)	
Weight	68 lb (31 kg)	

1. Due to our continuous product improvement program, specifications are subject to change without notice.
2. Maximum conversion efficiency of 50% for SHG at 200 kHz; lower efficiency at 1 MHz.
3. Additional, pre-calibrated repetition rates are optional and available upon request; please contact Spectra-Physics.
4. Pulse duration tunability "fs2ps" is optional.
5. Conversion efficiency for SHG module will be lower for longer pulse width. Pulse width tunability at 520 nm output: 400 fs to 2 ps.
6. Spirit One is a Class IV – High-Power Laser, whose beam is, by definition, a safety and fire hazard. Take precautions to prevent exposure to direct and reflected beams. Diffuse as well as specular reflections can cause severe skin or eye damage.

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