Spirit® HE

HIGH POWER, HIGH PULSE ENERGY INDUSTRIAL FEMTOSECOND LASERS

The Spirit HE Advantage

- *High average power (>30 W) and high pulse energy (>120 µJ)*
- *User adjustable repetition rate (single shot – 1 MHz)*
- *Integrated pulse-picker with analog-in triggering*
- *Integrated SHG module (optional)*
- *User adjustable pulse duration between 400 fs and 10 ps (optional)*
- *Superb beam pointing stability (<20 µrad for 100 hours)*
- *Fully automated and computer controlled*
- *Proven, dependable performance for 24/7 operation*



The Spirit® HE industrial femtosecond laser product line delivers high energy, and high average power for applications requiring reliable and robust 24/7 operation. With direct diode pumped technology developed by Spectra-Physics, Spirit's innovative and simple architecture offers truly unique performance.

The Spirit platform offers impressive versatility to serve the needs of industrial and scientific customers. High average power (>30 W) and high pulse energy (>120 µJ) enable femtosecond micromachining applications with high throughput and excellent cost-performance. Pulse energy and repetition rate adjustability (single shot – 1 MHz) make Spirit HE the ideal source for medical device manufacturing, material ablation and high aspect ratio drilling. The integrated pulse picker available in all models offers full control of the laser output with single pulse selection and fast power control via an analog input signal. This simplifies the integration of the lasers. Optionally, the available burst mode offers higher ablation efficiencies and therefore higher throughput.

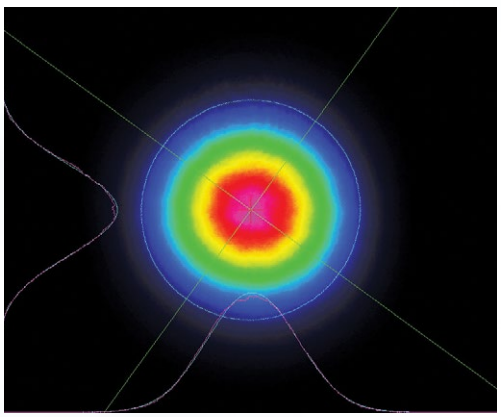
The optional, high efficiency Second Harmonic Generation (SHG) module is integrated in the laser head and enables the fabrication of smaller and more accurate structures. A pulse energy of >60 µJ at 520 nm is available. The fundamental and SHG output beams are collinear at the laser exit for easy integration and beam delivery. The end user can easily switch between the 1040 nm and 520 nm outputs using either the communication interface (TCP/IP) or the user control software.

Fully automated and computer controlled, Spirit is manufactured with high reliability and quality in mind. Spirit's design is optimized for easy integration and for superb power and beam pointing stability (typically <20 µrad for 100 hours) during 24/7 operation, ensuring high precision and reproducibility in every application.

Applications

- *Femtosecond micromachining*
- *Material processing*
- *Medical device fabrication*
- *Time resolved femtosecond spectroscopy*
- *Optical parametric amplifier pumping*

Spirit HE Beam Profile[1]



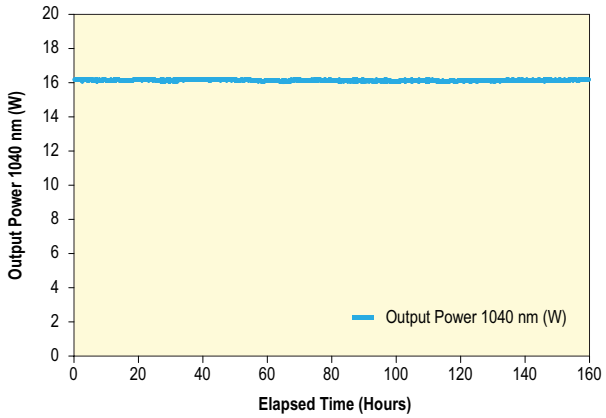
1. Typically measured performance; not a guaranteed or warranted specification.

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Spirit® HE

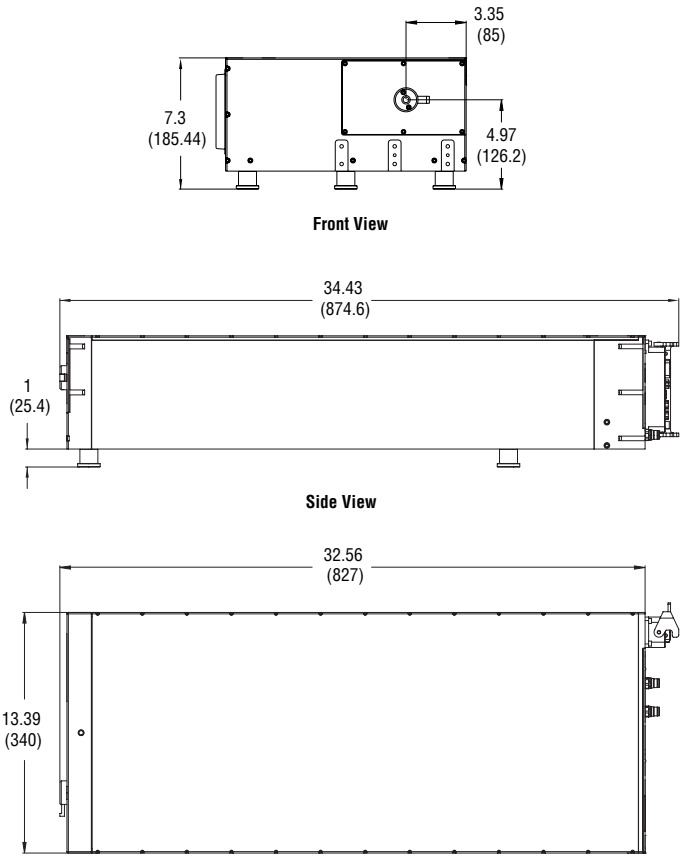
Spirit HE Typical Performance

Long-term Performance >100 hours[1] - Spirit HE 1040-16



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

Spirit HE Dimensions



Dimensions in inch (mm)

Spirit® HE

Specifications[1,6]

	Spirit HE 1040-16	Spirit HE 1040-16-SHG	Spirit HE 1040-30	Spirit HE 1040-30-SHG
Output Characteristics				
Wavelength	1040 ±5 nm			
Output Power	>16 W		>30 W	
Pulse Energy	>120 µJ			
Wavelength (SHG)	NA	520 ±5 nm	NA	520 ±5 nm
Output Power (SHG)[2]	NA	>6 W @ 100 kHz >8 W @ 200 kHz	NA	>12 W at 200 kHz >15 W at 375 kHz
Max Pulse Energy (SHG)[2]	NA	>60 µJ @ 100 kHz >40 µJ @ 200 kHz	NA	>60 µJ at 200 kHz >40 µJ at 375 kHz
Repetition Rate[3]	100 kHz, 200 kHz or 1 MHz		200 kHz, 400 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 10 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	2.5 mm ± 0.5 mm (1040 nm and 520 nm)			
Beam Divergence	<1 mrad (1040 nm); <0.5 mrad (520 nm)			
Pre-Pulse Contrast Ratio	>250:1			
Polarization	Horizontal			
Cold Start Time	<30 min			
Warm Start Time	<15 min			
Environmental Specifications				
Operating Temperature	18–30°C (64–86°F)			
Relative Humidity	<65%, non-condensing			
Cooling Requirements				
Laser Head	Closed-loop chiller included			
Power Supply	Air cooled			
Utility Requirements				
Voltage	100-240 V, 50 Hz / 60 Hz			
Current	<16 A			
Laser Head Physical Characteristics				
Dimensions (L x W x H)	32.5 x 14 x 6.5 in (875 x 340 x 160 mm)			
Weight	155 lb (70 kg)			
Power Supply Physical Characteristics				
Dimensions (L x W x H)	23.6 x 22.0 x 29.4 in (600 x 560 x 746 mm)			
Weight	176 lb (80 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 (16 W) and 375 kHz (30 W); 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 and can be implemented on request.
5. Conversion efficiency for SHG module will be lower for pulse width >400 fs.
6. Spirit HE 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.

Spectra-Physics®
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