



Spirit®

Component Selection Guide



The Spirit® laser platform offers flexible, high average power and high repetition rate femtosecond lasers. With superior beam quality, high pulse energy and industry-leading stability, Spirit's innovative and robust architecture offers truly unique performance and value.

The Spirit platform offers impressive versatility to serve the needs of our industrial customers. Starting with one of the most compact and cost efficient, all-in-one lasers available on the market (Spirit One®), to the performance leading Spirit 100 with 100 W average power, 100 μ J pulse energy and up to 10 MHz repetition rate, the Spirit platform offers ideal solutions for a wide variety of applications. Every Spirit laser comes with an industry-standard Ethernet interface and an integrated pulse picker, which offers the possibility to gate the output pulse train, as well as modulate the output power.

An optional, high efficiency Second Harmonic Generation (SHG) stage, available for all Spirit lasers, enables the fabrication of smaller and more precise structures. The Spirit lasers are designed and tested to rigorous quality standards for reliable 24/7 operation. The built-in data logging and analysis capability allows monitoring of all relevant laser parameters over the life time of the system. As such, this represents an indispensable diagnostics tool for service and preventive maintenance which significantly enhances uptime and thus productivity of the tool.

Recommended Optics & Optomechanics

It is critical to choose the right optics and optomechanical components that work best with your Spirit laser. Spirit's high IR and green average output power, and in particular the high peak power of femtosecond pulses necessitate optics that have a high damage threshold. MKS Newport offers a wide selection of the highest quality optics and optical components covering the entire spectrum UV, VIS, NIR and IR wavelengths to help you with your most challenging applications. In addition, for more than 30 years, we have manufactured the world's most comprehensive line of optical mounts and mechanics. Our precision optomechanics help our customers stay at the leading edge. MKS also offers LaserClean™ components for low-contamination applications.

Please use the recommendations below to determine which components best serve your needs. If you need help making a selection or have questions about the tables below, please contact us at tech@newport.com.

Recommended Optics & Optomechanics Continued

Optics					Optomechanics		Spirit	Spirit NOPA	Spirit HE	Spirit OPA	Spirit One	Spirit 1030-100 and 1030-70											
Optics Type	λ	Part Number	LIDT*	Description	Mount P/N	Mount Description	1040-16	1040-16-SHG	NOPA-3H	NOPA-2H	NOPA-IR	NOPA-VISIR	HE 1040-16	HE 1040-16-SHG	HE 1040-30	HE 1040-30-SHG	OPA-8	OPA-30	One 1040-8	One 1040-8-SHG	1030-100	1030-70	1030-100-SHG
Nano-Texture Surface Lenses	500-1100 nm	SPCxxxPAR.L	35 J/cm ² @ 1064 nm, 10 ms, 10 Hz	Plano-Convex Lens, Nano-Textured Fused Silica, 12.7 mm	LP-0.5A	XYZ ØXY Lens Positioner, 0.5 in. Diameter	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	500-1100 nm	SPCxxxPAR.L	35 J/cm ² @ 1064 nm, 10 ms, 10 Hz	Plano-Concave Lens, Nano-Textured Fused Silica, 12.7 mm	LP-0.5A-XYZ	XYZ Lens Positioner, 0.5-in.Diameter	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Beam Samplers	440-700 nm	10Q20NC.1	1 J/cm ² @ 1064 nm, 10 ms, 10 Hz	Broadband Beam Sampler, UVFS, 25.4 mm, $\lambda/10$	9774	Top Actuated Mirror Mount, Ø 1.0 in., 2 Knob Adjustment	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	1010-1550 nm	10Q20NC.3	1 J/cm ² @ 1064 nm, 10 ms, 10 Hz	Broadband Beam Sampler, UVFS, 25.4 mm, $\lambda/10$	HVM-1i-LC	Top Adjust Mirror Mount, LaserClean, Ø 1 in.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Broadband Retroreflector	650-16,000 nm	UBBR1-1I	1 mJ/cm ² @ 1064 nm, 10 ms, 10 Hz	Broadband Hollow Retroreflector, Gold, 1.0 in, 1 arc sec parallelism	PS-T series Posts	1.0 in. Optical Post & Peg System	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	450-10,000 nm	UBBR1-1S	1 mJ/cm ² @ 1064 nm, 10 ms, 10 Hz	Broadband Hollow Retroreflector, Silver, 1.0 in, 1 arc sec parallelism	Q-TMS Series Post Holders	1.0 in. Optical Post Holders	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

* The listed LIDT values are for ns pulses. The nano, pico or femtosecond regimes have different damage mechanisms. Typically, the higher the ns LIDT, the better performance in the ultrafast regime. Please design your beam path so that the beam on the optic has optimum size. If you need assistance, please contact your local MKS sales representative

** Multiple lenses can be mounted with Newport's lens tubes and spacers

*** Additional optics types and sizes are available – please go to <http://www.newport.com> or contact your local MKS sales representative

**** The optics listed in this guide will meet the requirements of most customer applications for the Spirit laser. Not all optics have been tested for all potential Spirit applications, so compatibility with all applications cannot be guaranteed. When selecting optics, please evaluate suitability for requirements of your application. If you need assistance, please contact your local MKS sales representative

Recommended Laser Measurement Sensors*



For optimal application results, it is critical to ensure that the delivered laser power at the sample is precisely controlled. Laser power sensor is a detector that absorbs a laser beam and outputs a signal proportional to the beam's power. MKS Newport offers a wide selection of power sensors to accurately measure the Spirit laser power delivered to the sample. The specific type of sensor depends on the details of the laser beam being measured, including power level, spectral region, beam size, etc.

Spirit Type	Spirit Model	Recommended Sensor	Laser Damage Threshold	Aperture	Power/Energy Measurement Range	Spectral Range	Description
Spirit	1040-16	919P-030-18	20 kW/cm ²	17.5 mm	20mW to 30W; 6mJ to 30J	0.19 to 11 μ m	<ul style="list-style-type: none"> Spectrally flat broadband coating NIST-traceable calibration included Insensitive to beam position Sensitive with low noise & drift
	1040-16-SHG						
Spirit NOPA	NOPA-3H	919P-003-10 for Output Only (919P-030-18 for Pump)	1 kW/cm ²	9.5mm	40 μ W to 3W; 20 μ J to 2J		
	NOPA-2H						
	NOPA-IR						
Spirit HE	NOPA-VISIR	919P-003-10 for Output Only (919P-150-26 for Pump)	1 kW/cm ²	9.5mm	40 μ W to 3W; 20 μ J to 2J		
	HE 1040-16	919P-030-18	20 kW/cm ²	17.5 mm	20mW to 30W; 6mJ to 30J		
	HE 1040-16-SHG						
	HE 1040-30						
HE 1040-30-SHG							
Spirit OPA	OPA-8	919P-030-18	20 kW/cm ²	17.5 mm	20mW to 30W; 6mJ to 30J		
	OPA-30	919P-050-26	12 kW/cm ²	26 mm	40mW to 50W; 20mJ to 30J		
Spirit One	One 1040-8	919P-030-18	20 kW/cm ²	17.5 mm	20mW to 30W; 6mJ to 30J		
	One 1040-8-SHG						
Spirit 1030	1030-100	919P-150-26	12 kW/cm ²	26 mm	50 mW to 150 W; 20 mJ to 100 J		
	1030-70						
	1030-100-SHG						

* Order a 3" optical post holder VPH-3, and a mounting base B-2SA to mount the sensor at beam height. A 2.25" long post is included in the detector model

** Additional options from MKS Ophir are available. Please visit www.ophiropt.com or contact your Ophir sales representative for consultation

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Recommended Power Meter*

1919-R is one of MKS Newport's most feature rich and technologically advanced power meters. It offers a plug-and-play functionality and is compatible with almost any of the wide range of Newport sensors. 1919-R is also the most precisely calibrated unit on the market thus measuring with the highest accuracy. With its versatility, ease of use, and user-friendly interface, the sensor can be used stand-alone or interfaced with LabVIEW or the user's own software.

Power Meter	Part Number	Description
	1919-R	<ul style="list-style-type: none"> Compatible with all standard Newport thermal sensors USB and RS232 interfaces with PMManager PC applications and User Commands document LabVIEW driver and COM Object Interface Select between English, Japanese, Russian, and Chinese interfaces

PC Interface (optional)

A PC interface allows you to connect your laser power sensor directly to the PC. The Model 841-PE-USB is a Power Meter with a USB connection to use a computer as the monitor, allowing the user to access the full computing power of the PC.

PC Interface	Part Number	Description
	841-PE-USB	<ul style="list-style-type: none"> Optical Power and Energy Meter, Virtual, USB Ideal when equipment space is tight or there is a need to control multiple power meter channels Has a USB output and 0-1 V analog output. Application installation is simple & takes care of the USB driver installation

* Other Newport display meters are available – please contact your local MKS sales representative

Recommended Beam Profiler & Attenuators*



In addition to the average or instantaneous Watts or Joules of the laser beam, it is critical to understand how the power is spatially distributed in the cross-section of the beam. A beam profiler can help detect laser performance issues such as beam wander, jitter, divergence and astigmatism. MKS is the market leader with the largest installed base of laser beam profilers. With our unmatched accuracy, customizable layout, cutting edge R&D and global support system, we are ready to help our customers solve their most challenging problems.

Spirit Type	Spirit Model	Recommended Beam Profiler	Recommended Attenuator	Description
Spirit	1040-16 1040-16-SHG	LBP2-HR-VIS2	LBP2-SAM-BB2	<ul style="list-style-type: none"> The LBP2-HR-VIS2 Laser Beam Profiler is a powerful software driven system with comprehensive beam diagnostic measurement features. It features a 1924 x 1448 pixel CCD camera for the wavelength range between 190 and 1100 nm. The easy to use graphical user interface includes all of the accuracy and ISO approved quantitative results The LBP2-HR-IR2 Laser Beam Profiler is a powerful software driven camera with comprehensive beam diagnostic measurement features. It features a 1924 x 1448 pixel CCD camera with phosphor coating for near IR sensitivity between 1440 and 1605 nm. The LBP2-SAM-BB2 beam sampler operates by reflecting the incoming beam from the front surfaces of a pair of wedges through 90 degrees into the camera. Approximately 97% of the beam is transmitted through the beam sampler with 0.25% passed on to the available filter slides where you can add an additional attenuation up to ND6.
Spirit NOPA	NOPA-3H			
	NOPA-2H			
	NOPA-IR			
	NOPA-VISIR			
Spirit HE	HE 1040-16			
	HE 1040-16-SHG			
	HE 1040-30			
	HE 1040-30-SHG			
Spirit OPA	OPA-8	LBP2-HR-VIS2		
	OPA-30			
Spirit One	1040-8			
	1040-8-SHG			
Spirit 1030	1030-100			
	1030-70			
	1030-100-SHG			

* Additional options from MKS Ophir are available. Please visit www.ophiropt.com or contact your Ophir sales representative for consultation



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MKS Instruments, Inc. (NASDAQ: MKSI) is a \$1.9B global provider of instruments, subsystems and process control solutions that measure, control, power, monitor and analyze critical parameters of advanced manufacturing processes to improve process performance and productivity. Our products are derived from our core competencies in pressure measurement and control, materials delivery, gas composition analysis, control and information technology, power and reactive gas generation, vacuum technology, photonics, lasers, optics and motion control.

The laser measurement sensors, power meter & PC interface, beam profilers & attenuators listed in this document are RoHS compliant

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