Photonics Industries
International, Inc.

FS Series Femtosecond Lasers

www.photonix.com

With tens of thousands of lasers shipped worldwide, Photonics Industries introduces its FS Series of femtosecond (fs) lasers. With true fs pulse widths, ~400 fs, it delivers the smallest heat affected zone (HAZ) compared to other "sub ps" (e.g., ~800 fs) lasers also marketed as femtosecond lasers. Furthermore, the FS Series lasers, with its new revolutionary packaging has smaller form factor and higher performance compared to other fs laser competitors.

The FS provides from 5W to 100W of IR (GRN, UV and DUV outputs also available) on the simplest, most compact AIO (All-in-One) platform with up to 40MHz PRF output for processing at highest throughput with polygon scanners.

The user-friendly control interface allows Total Pulse Control and Burst Mode operation, where a user selectable number of pulses with adjustable incremental separation and programable amplitude can be released in an envelope, further enabling ablation rate increases on many materials. With adjustable repetition rate, the user can change the operating PRF and change the operating power or pulse energy through PEC (Power or Pulse Energy Control) function on the fly to maximize process flexibility.

Applications

- Ultrafast high precision cutting, drilling, welding, scribing, marking, intra-marking, patterning, de-paneling, repair
- Flat Panel Display Repair, LCD/LED/OLED Repair
- Hydrophobic Material Manufacturing, Hydrophilic Material Manufacturing, Ultrafast Laser Assisted Etching (ULAE) Systems, Complex 3D Surface Micro-structuring
- Terahertz (THz) Generation, High Harmonic Generation (HHG), X-Ray Generation, OPO Amplifier Systems
- Laser Particle Accelerator Systems
- Angle/Time-resolved Photoemission Spectroscopy Systems, Femtosecond-stimulated Raman Spectroscopy (FSRS) Systems, Multi-photon Fluorescence Microscopy Systems

Features

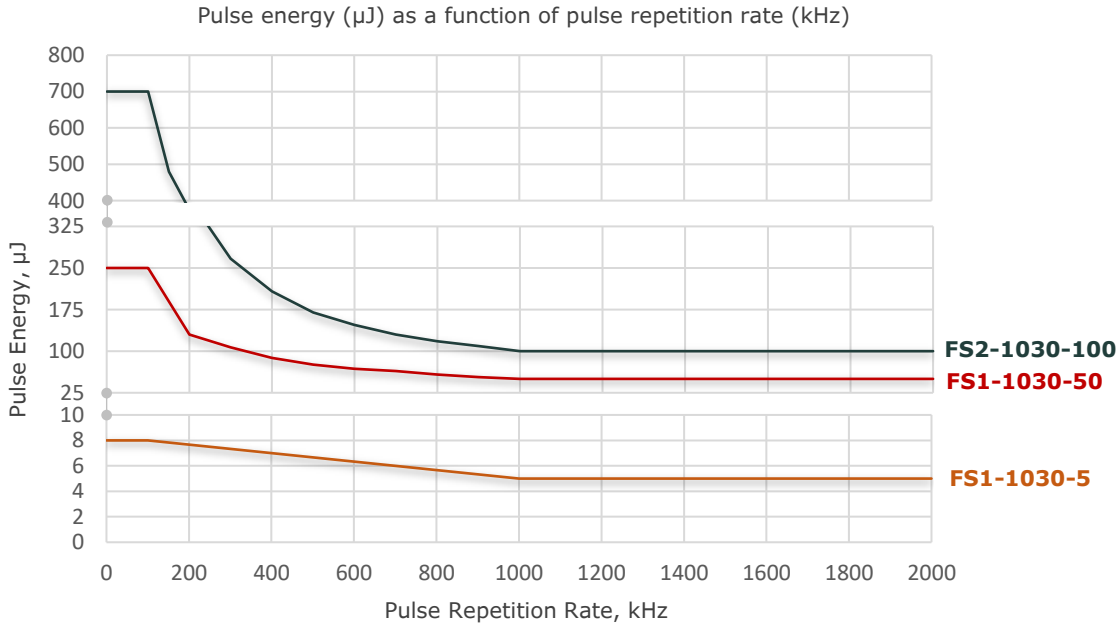
- High power laser (up to 100 W in IR) with ultra-short pulse (~400 fs)
- Specifiable pulse width
- Wide range of wavelengths: 1030 nm, 515 nm, 343 nm, and 257 nm available upon request.
- The most compact, rugged, all-in-one fs laser
- Pulse repetition rates up to 40MHz
- Excellent TEM00 beam with typical M^2 ~1.3
- Exceptional Beam Pointing Stability < 25 µrad
- PEC (Power or Pulse Energy Control)
- PSO (Position Synchronized Output) support for external triggering to any arbitrary PRF while maintaining a constant, stable pulse energy with low jitter.
- Burst Mode for individually controllable bursts of pulses with variable separations.
- POD (Pulse-On-Demand), where a burst of pulses with separation equal to the PRF, can be triggered internally, externally, or continuously, while maintaining constant pulse energy.
- Air-cooled option available

	FS1-1030-5	FS1-1030-50	FS2-1030-100
Beam and output specifications			
Wavelength⊕	1030 ± 5 nm		
Average power	5 W at 1 MHz	50 W at 1 MHz	100 W at 1 MHz
Pulse energy	5 µJ at 1 MHz 8 µJ at 100 kHz	50 µJ at 1 MHz 250 µJ at 100 kHz	100 µJ at 1 MHz 700 µJ at 100 kHz
Pulse width[1]	< 450 fs to 5 ps		
Pulse repetition rate[2,⊕]	Single shot to 2 MHz		
Pulse-to-pulse stability at 1 MHz	~1% rms		
Long term power stability, 8h ± 1°C	≤ 1% rms		
Beam spatial mode	TEM_{00} M^2 < 1.3		
Beam pointing stability	< 25 µrad		
Operational specifications and system characteristics			
Interface	RS232, Ethernet, Software GUI, External TTL Triggering		
Warm-up time	< 30 minutes		
Electrical requirement	100-240 V AC; or 60 V DC, 15 A		
Line frequency	50-60 Hz		
Climate	Ambient 15°C to 30°C (59°F to 86°F) Operating Range, Relative Humidity 90% Maximum, non-condensing		
Power consumption	< 600 W		< 900 W
Dimensions (LxWxH)	25 x 10 x 4.25 in.		27.5 x 10 x 4.25 in.
Weight	~75 lbs		~85 lbs
Vibration	Up to 3g		
Cooling system[3]	Closed-loop chiller		

⊕ See options in below table.

[1.] Specifiable pulse width. [2.] Lower repetition rates, down to single shot, achieved by utilizing PSO or POD features. [3.] Air-cooled option available for low power FS Series models. Please contact us for more information.

Options	Designation
Pulse repetition rate up to 8 MHz, High pulse repetition rate option	-8M e.g., FS1-1030-50-8M
Fixed pulse repetition rate ~40 MHz, High pulse repetition rate option	-40M e.g., FS1-1030-50-40M
Multi-wavelength blended or selectable output option	-MWB, or -MWS e.g., FS1-1030-50-MWB



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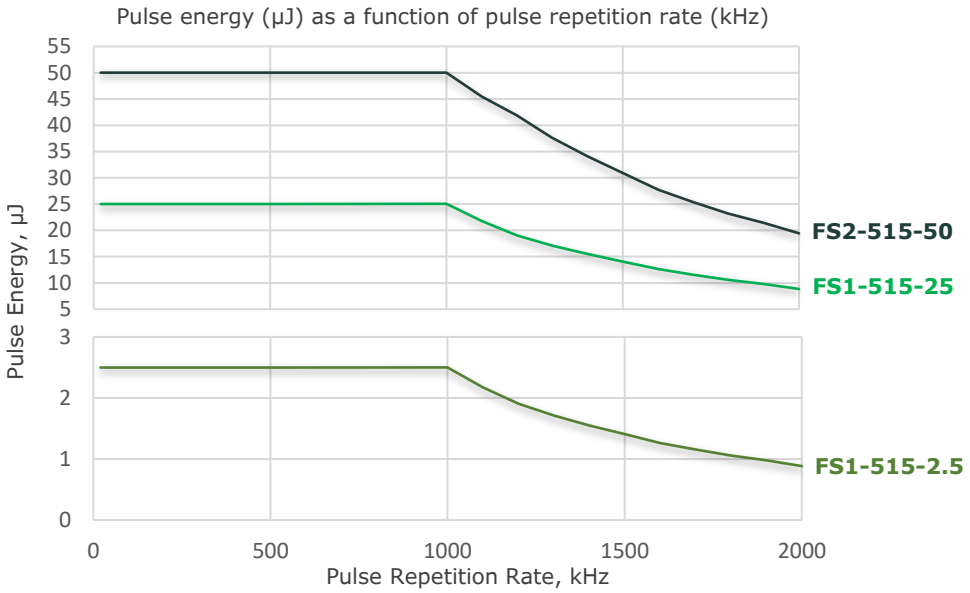
	FS1-515-2.5	FS1-515-25	FS2-515-50
Beam and output specifications			
Wavelength⊕	515 ± 3 nm		
Average power	2.5 W at 1 MHz	25 W at 1 MHz	50 W at 1 MHz
Pulse energy	2.5 µJ at 1 MHz	25 µJ at 1 MHz	50 µJ at 1 MHz
Pulse width[1]	< 400 fs to 5 ps		
Pulse repetition rate[2,⊕]	Single shot to 2 MHz		
Pulse-to-pulse stability at 1 MHz	< 2% rms		
Long term power stability, 8h ± 1°C	≤ 1% rms		
Beam spatial mode	TEM_{00} M^2 ≤ 1.3		
Beam pointing stability	≤ 25 µrad		
Operational specifications and system characteristics			
Interface	RS232, Ethernet, Software GUI, External TTL Triggering		
Warm-up time	< 30 minutes		
Electrical requirement	100-240 V AC; or 60 V DC, 15 A		
Line frequency	50-60 Hz		
Climate	Ambient 15°C to 30°C (59°F to 86°F) Operating Range, Relative Humidity 90% Maximum, non-condensing		
Power consumption	< 600 W		< 900 W
Dimensions (LxWxH)	25 x 10 x 4.25 in.		27.5 x 10 x 4.25 in.
Weight	~75 lbs		~85 lbs
Vibration	Up to 3g		
Cooling system[3]	Closed-loop chiller		

⊕ See options in below table.
[1.] Specifiable pulse width. [2.] Lower repetition rates, down to single shot, achieved by utilizing PSO or POD features. [3.] Air-cooled option available for low power FS Series models. Please contact us for more information.

Options	Designation
30 W at 1 MHz High average power option	FS1-515-30
Pulse repetition rate up to 8 MHz, High pulse repetition rate option	-8M e.g., FS1-515-25-8M
Fixed pulse repetition rate ~40 MHz, High pulse repetition rate option	-40M e.g., FS1-515-2.5-40M
Multi-wavelength blended or selectable output option	-MWB, or -MWS e.g., FS1-1030-50-MWB



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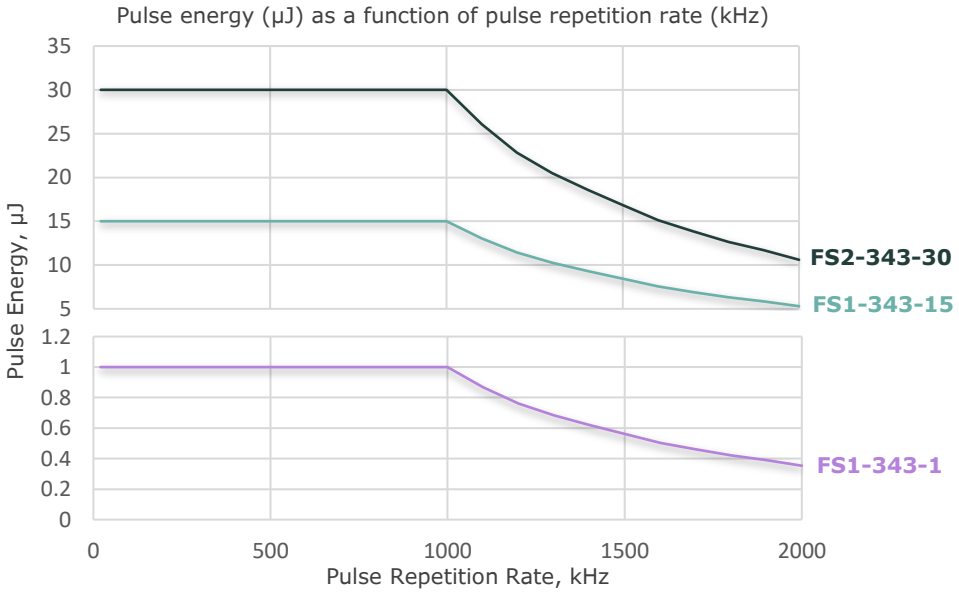
	FS1-343-1	FS1-343-15	FS2-343-30
Beam and output specifications			
Wavelength⊕	343 ± 2 nm		
Average power	1 W at 1 MHz	15 W at 1 MHz	30 W at 1 MHz
Maximum pulse energy	1 µJ at 1 MHz	15 µJ at 1 MHz	30 µJ at 1 MHz
Pulse width[1]	< 400 fs to 5 ps		
Pulse repetition rate[2,⊕]	Single shot to 2 MHz		
Pulse-to-pulse stability at 1 MHz	~2% rms		
Beam spatial mode	TEM_{00} M^2 < 1.3		
Beam pointing stability	≤ 30 µrad		
Operational specifications and system characteristics			
Interface	RS232, Ethernet, Software GUI, External TTL Triggering		
Warm-up time	< 30 minutes		
Electrical requirement	100-240 V AC; or 60 V DC, 15 A		
Line frequency	50-60 Hz		
Climate	Ambient 15°C to 30°C (59°F to 86°F) Operating Range, Relative Humidity 90% Maximum, non-condensing		
Power consumption	< 600 W		< 900 W
Dimensions (LxWxH)	25 x 10 x 4.25 in.		29.5 x 10 x 4.25 in.
Weight	~75 lbs		~85 lbs
Vibration	Up to 3g		
Cooling system[3]	Closed-loop chiller		

⊕ See options in below table.

[1.] Specifiable pulse width. [2.] Lower repetition rates, down to single shot, achieved by utilizing PSO or POD features. [3.] Air-cooled option available for low power FS Series models. Please contact us for more information.

Options	Designation
Pulse repetition rate up to 8 MHz, High pulse repetition rate option	-8M e.g., FS1-343-15-8M
Fixed pulse repetition rate ~40 MHz, High pulse repetition rate option	-40M e.g., FS1-343-1-40M
Multi-wavelength blended or selectable output option	-MWB, or -MWS e.g., FS1-1030-50-MWB



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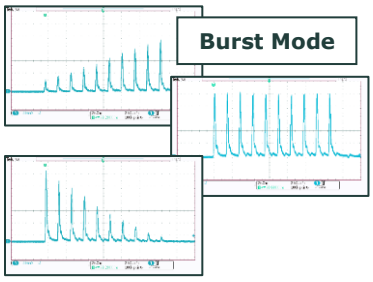
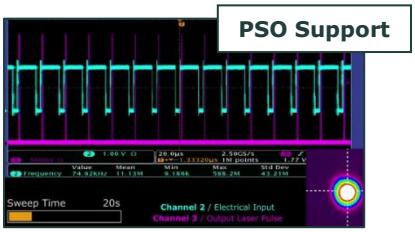
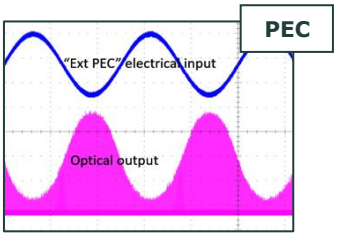
Features

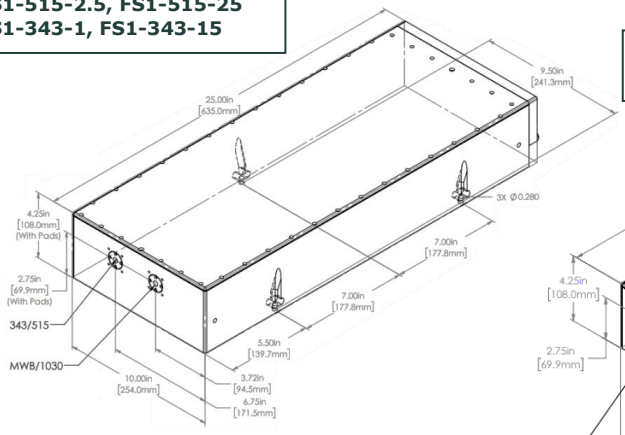




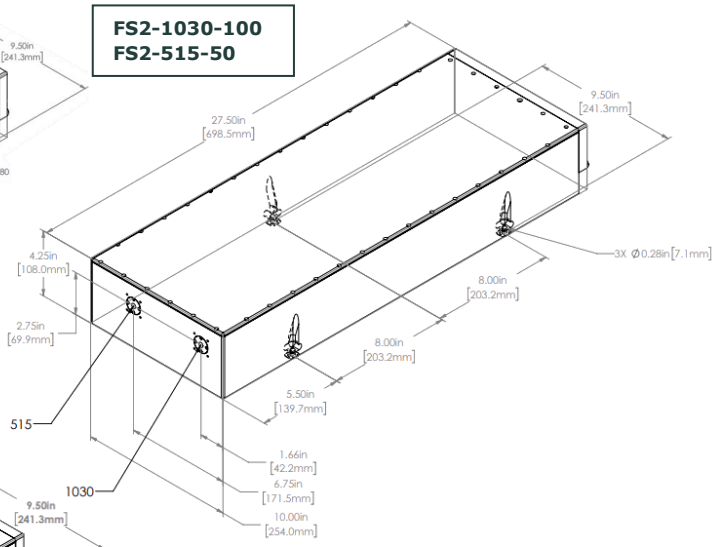


Dimensional Drawings

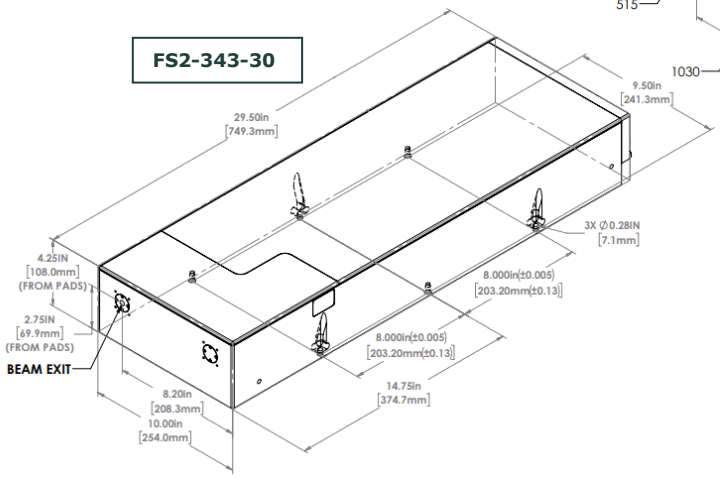
FS1-1030-5, FS1-1030-50
FS1-515-2.5, FS1-515-25
FS1-343-1, FS1-343-15



FS2-1030-100
FS2-515-50



FS2-343-30



Photonics Industries FS Series femtosecond lasers are **all-in-one (AIO)** and do not require a separate controller or utility module. All connections for operation and control of the laser can be found on the

Due to Photonics Industries' commitment to continuous product improvement, specifications and drawings are subject to change without notice.

Photonics Industries conforms to provisions of US 21 CFR 1040.10 & 1040.11 and is made under one or more US patents listed below: 9,531,147, 8,817,831, 7,869,471, 7,346,092, 7,082,149, 7,079,557, 6,999,483, 6,980,574, 6,961,355, 6,842,293, 6,762,405, 6,690,692, 6,587,487, 6,584,134, 6,366,596, 6,356,578, 6,327,281, 6,246,707, 6,229,829, 6,108,356, 6,061,370, 6,028,620, 5,936,983, 5,898,717 and Pending Patents

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Photonics Industries International is the pioneer of intracavity harmonic lasers and is at the forefront of developing, manufacturing and marketing a wide range of nanosecond, sub-nanosecond, picosecond and femtosecond lasers for industrial, scientific, defense, and medical industries. Check out our products and see how we can help you apply our lasers to your needs.

LASER RADIATION

Photonics Industries International, Inc.