

LightWire Series

Ultrafast Fiber Lasers

FPS200

1064 nm, 200 mW, 50 nJ
9 ps, 20 kHz – 40 MHz

FPS100

1064 nm, 80 mW, 6 ps, 40 MHz

FFS100CHI

1030 nm, 50 mW, 9 nm
4 ps (chirped pulse), 50 MHz



2017

LightWire

SERIES

The LightWire fiber lasers feature turn-key operation, monolithic design and require no maintenance making it a preferred alternative to the solid state counterparts in the industrial settings and multidisciplinary research laboratories. Different versions, featuring femtosecond and picosecond pulse durations are available.

LightWire FPS and **FFS** series fiber lasers are dedicated for seeding solid state (Nd:YAG, Yb:YAG) amplifiers. Compact, cost efficient FPS series models deliver sub-10 ps pulses at 1064 nm wavelength with the average output power up to 200 mW and pulse energy up to 50 nJ. They feature narrow close to bandwidth limited spectrum and low pulse amplitude noise. Wavelength tunability ensures that seed pulses are always spectrally overlapped with the amplification spectrum of your amplifier. FFS series models are specially designed for femtosecond CPA systems. Ekspla offers FFS lasers either with femtosecond pulse duration directly from fiber, or with chirped pulses. Broad up to 12 nm spectral bandwidth

enables amplification of pulses with <300 fs compressed duration. Special feature of FFS200CHI laser is customizable chirp profile to match compressor design of the CPA system. LightWire FP and FF series lasers are dedicated for researchers and OEM integrators, who require small, convenient and maintenance free sources with bandwidth limited picosecond pulses or sub-150 fs femtosecond pulses. Widely tunable pulse repetition rate 20 kHz – 40 MHz makes it an excellent choice for non-linear microscopy, time-resolved spectroscopy, terahertz spectroscopy, ultrafast metrology applications. FP200 model is available with second harmonic (532 nm) option.

SPECIFICATIONS FOR STANDARD LASER CONFIGURATIONS

Not all output specifications may be available simultaneously. Please refer to the catalog page for exact specifications and available options.

Model	Central wavelength	Pulse duration	Output power	Pulse energy	Repetition rate	Page
FPS10	1064 nm tunable ± 0.2 nm	2.3 \pm 0.3 ps	2 mW	50 pJ	40 MHz	3
FPS100	1064 nm tunable ± 0.2 nm	7 \pm 1 ps	80 mW	2 nJ	40 MHz	3
FPS200	1064 nm tunable ± 0.2 nm	9 \pm 1 ps	200 mW	50 nJ	20 kHz–40 MHz	3
FFS10	1030 nm	550 \pm 50 fs	1 mW	20 pJ	50 MHz	5
FFS100CHI	1030 nm	7 \pm 2 ps (linearly chirped)	50 mW	1 nJ	50 MHz	5
FFS200CHI	1030 nm	>50 ps (custom chirp profile)	200 mW	250 nJ	50 MHz	5
FP200	1064 nm	9 \pm 1 ps	200 mW	50 nJ	20 kHz–40 MHz	9
FF200	1064 nm	<130 fs	200 mW	5 nJ	40 MHz	11

TABLE REPRESENTING PULSE CONTROL TECHNOLOGY
 IMPLEMENTED IN VARIOUS FIBER LASER MODELS AND MODIFICATIONS

Model	Oscillator only	Oscillator + pulse picker	Oscillator + frequency divider + amplifier
FPS10	■		
FPS10-AOM		■	
FPS100	■		
FPS100-AOM		■	
FPS200			■
FFS10	■		
FFS10-AOM		■	
FFS100CHI	■		
FFS100CHI-AOM		■	
FFS200CHI			■
FP200			■
FF200	■		
FF200-AOM		■	

LightWire FPS series



LightWire FPS series fiber lasers are dedicated for seeding solid state Nd:YAG amplifiers. Compact, cost efficient FPS series models deliver sub-10 ps pulses at 1064 nm wavelength with the average output power up to 200 mW and pulse

energy up to 50 nJ. They feature narrow close to bandwidth limited spectrum and low pulse amplitude noise. Wavelength tunability ensures that seed pulses are always spectrally overlapped with the amplification spectrum of your amplifier.

Compact Fiber Seeders for Picosecond Lasers

FEATURES

- ▶ Pulse energy >50 nJ at repetition rate <1 MHz
- ▶ Sub-10 ps pulse duration
- ▶ Close to Fourier-transform limited spectral bandwidth
- ▶ Integrated fiber pulse picker for flexible repetition rate control (20 kHz – 40 MHz, burst mode available)

APPLICATIONS

- ▶ Seeding solid state amplifiers

OPTIONS

- ▶ Collimated free space output available as option for FPS10 and FPS100 models [code: FPS10/100-COL]
- ▶ Integrated fiber pulse picker option (repetition rate 20 kHz – 40 MHz) with TTL synchronization interface is available as option for FPS10 and FPS100 models [code: FPS10/100-AOM]

SPECIFICATIONS ¹⁾

Model	FPS10	FPS100	FPS200
Central wavelength	1064 nm, tunable ± 0.2 nm		
Pulse duration	2.3 ± 0.3 ps	7 ± 1 ps	9 ± 1 ps
Spectral bandwidth	0.7 ± 0.2 nm	0.4 ± 0.1 nm	0.25 ± 0.05 nm
Oscillator pulse repetition rate	40 \pm 2 MHz		
Pulse repetition rate with pulse picker ²⁾	20 kHz – 40 MHz (PRR = PRR _{osc} / N, N = 1, 2, 3, ..., 2000)		
Output power (without/with pulse picker)	> 2 mW / > 1 mW	> 80 mW / > 40 mW	> 200 mW at 10 MHz > 40 mW at 1 MHz > 5 mW at 100 kHz
Pulse energy (without/with pulse picker)	> 50 pJ / > 25 pJ	> 2 nJ / > 1 nJ	> 50 nJ at repetition rates < 200 kHz
Polarization	linear, > 100:1 extinction		
Optical output	FC/APC connector or collimator with mounting flange (optional)		collimator & isolator node ³⁾
Umbilical	5 m length armored cable \varnothing 5mm		3 m length armored cable \varnothing 5mm
Collimated beam diameter	0.9 \pm 0.1 mm or 1.9 \pm 0.1 mm		
Beam height	NA		38 mm
Beam quality	$M^2 < 1.1$		
Pulse train monitoring	photodiode output for oscillator train, TTL synch pulse for laser output (when pulse picker included)		
Dimensions of control unit (L x W x H)	315 x 450 x 95 mm (19" rack mountable)		
Dimensions of collimator (D x L)	\varnothing 33 x 11.76 mm		
Weight	< 10 kg		
Control interface	USB, CAN, RS232, LAN, (WLAN option)		
Power supply (AC/DC adapter included)	100–240 V, 50–60 Hz AC		
Power consumption	maximal 230 W (typical 60 W)		
Operating conditions	10–30 °C, humidity – not condensing		



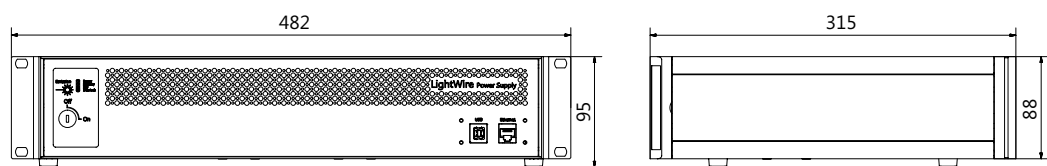
¹⁾ Due to continuous improvement all specifications are subject to change without notice.

²⁾ Pulse picker is an option for FPS10, FPS100 models. It supports external gating. FPS200 includes internal frequency divider, which enables pulse repetition rate reduction but does not support external gating.

³⁾ FPS200 model is provided with collimator & isolator node with dimensions 138x52x67 mm.

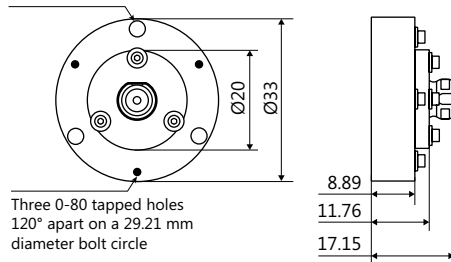
DRAWINGS

All dimensions are in millimetres.

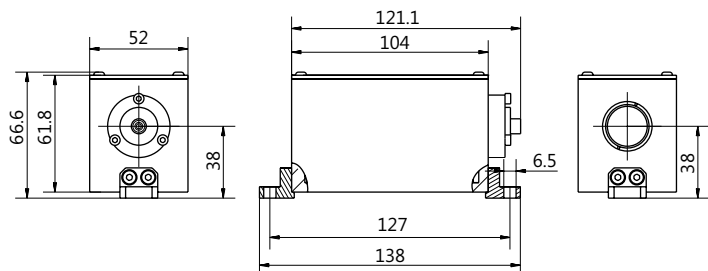


LightWire FPS series control unit outline drawing

Three \varnothing 3.18 mm thru holes
120° apart on a 29.21 mm
diameter bolt circle

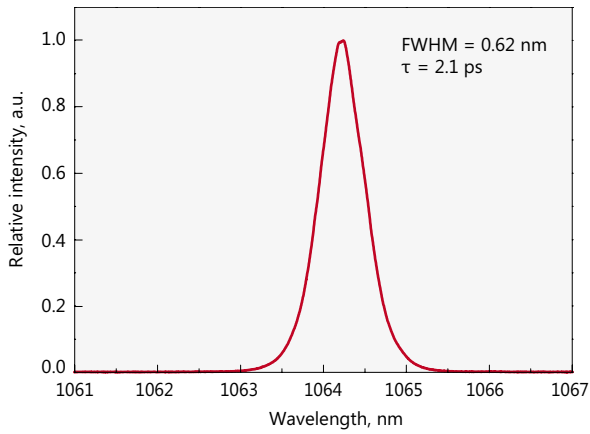


LightWire FPS10/100 laser collimator flange outline drawing

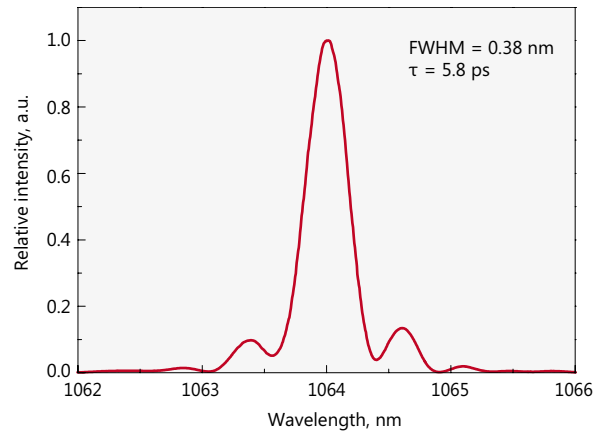


LightWire FPS200 laser isolator & collimator node outline drawing

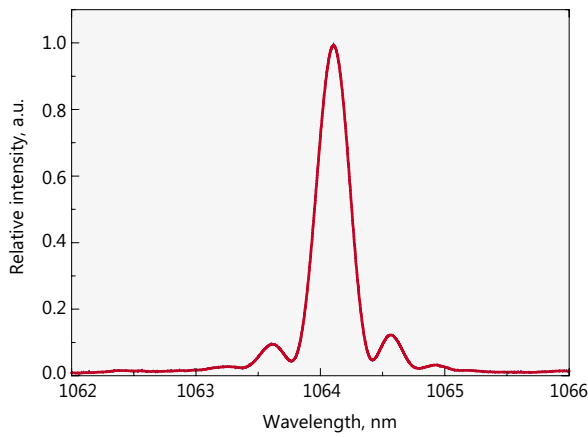
PERFORMANCE



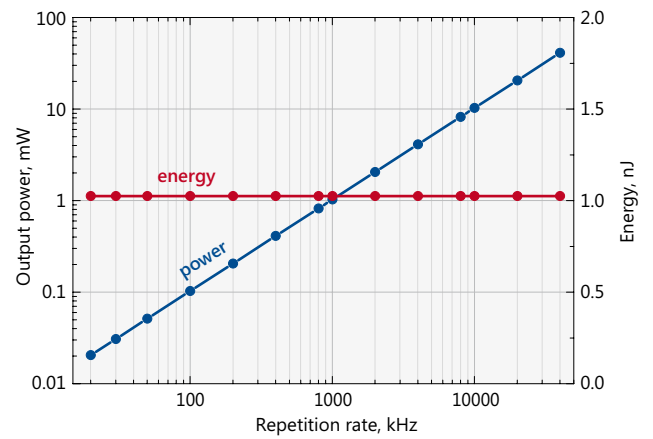
Typical spectrum from FPS10 laser



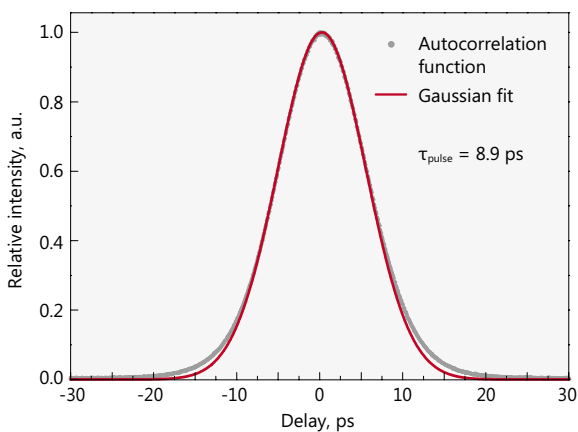
Typical spectrum from FPS100 laser



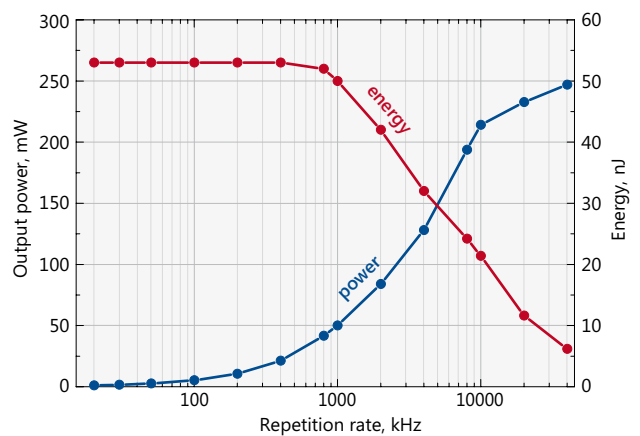
Typical spectrum from FPS200 laser



Typical dependence of average power (blue curve) and pulse energy (red curve) on the repetition rate for FPS100-AOM laser



Typical autocorrelation curve of FPS200 laser



Typical dependence of average power (blue curve) and pulse energy (red curve) on the repetition rate for FPS200 laser

LightWire FFS series



LightWire FFS series fiber lasers are dedicated for seeding solid state femtosecond Yb:YAG based CPA systems. Ekspla offers FFS lasers either with femtosecond pulse duration directly from fiber, or with chirped pulses. Broad up to 12 nm spectral

bandwidth enables amplification of pulses with < 300 fs compressed duration. Special feature of FFS200CHI laser is customizable chirp profile to match compressor design of the CPA system.

**Compact
Fiber Seeders for
Femtosecond Lasers**

FEATURES

- ▶ Pulse energy > 250 nJ at repetition rate < 200 kHz
- ▶ Compressed or chirped broadband pulses
- ▶ Down to 300 fs pulses available after compression

APPLICATIONS

- ▶ Seeding femtosecond CPA systems

OPTIONS

- ▶ Collimated free space output available as option for FFS10 and FFS100 models [code: FFS10/100-COL]
- ▶ Integrated fiber pulse picker option (repetition rate 26 kHz – 52 MHz) with TTL synchronization interface is available for FFS10 and FFS100 models [code: FFS10/100-AOM]

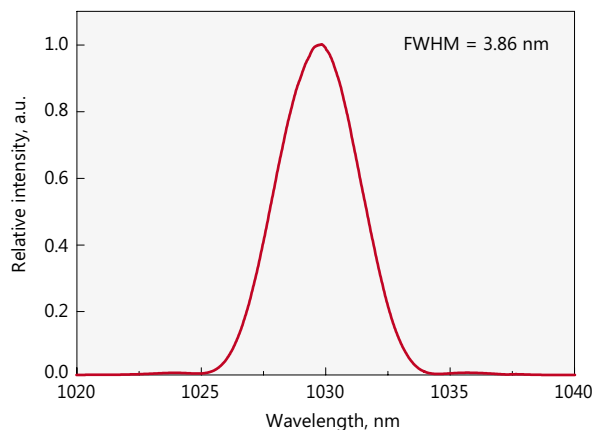
SPECIFICATIONS ¹⁾

Model	FFS10	FFS100CHI	FFS200CHI
Central wavelength	1030 ± 1 nm		
Spectral bandwidth	3.5 ± 0.5 nm	8 ± 1 nm	up to 12 nm
Pulse duration	550 ± 50 fs	7 ± 2 ps (chirped)	> 50 ps (chirped)
Compressed pulse duration	NA	< 300 fs	down to 300 fs
Chirp profile	no chirp	linear	custom ²⁾
Oscillator pulse repetition rate	52 ± 3 MHz		
Pulse repetition rate with pulse picker ³⁾	26 kHz – 52 MHz (PRR = PRR _{osc} / N, N = 1, 2, 3, ..., 2000)		
Output power (without/with pulse picker)	> 1 mW / > 0.5 mW	> 50 mW / > 25 mW	> 200 mW at 10 MHz > 100 mW at 1 MHz > 25 mW at 100 kHz
Pulse energy (without/with pulse picker)	> 20 pJ / > 10 pJ	> 1 nJ / > 0.5 nJ	> 250 nJ at repetition rates < 200 kHz
Polarization	linear, > 100:1 extinction		
Optical output	FC/APC connector or collimator with mounting flange (optional)		collimator & isolator node ⁴⁾
Umbilical	5 m length armored cable Ø5 mm		
Beam diameter	0.9 ± 0.1 mm		
Beam height	NA	38 mm	
Beam quality	M ² < 1.1		
Pulse train monitoring	photodiode output for oscillator train, TTL synch pulse for laser output (when pulse picker included)		
Dimensions of control unit (L × W × H)	315 × 450 × 95 mm (19" rack mountable)		
Dimensions of collimator (D × L)	Ø33.02 × 11.76 mm		
Weight	< 10 kg		
Control interface	USB, CAN, RS232, LAN, (WLAN optional)		
Power supply (AC/DC adapter included)	100–240 V, 50–60 Hz AC		
Power consumption	maximal 230 W (typical 60 W)		
Operating conditions	10–30 °C, humidity – not condensing		

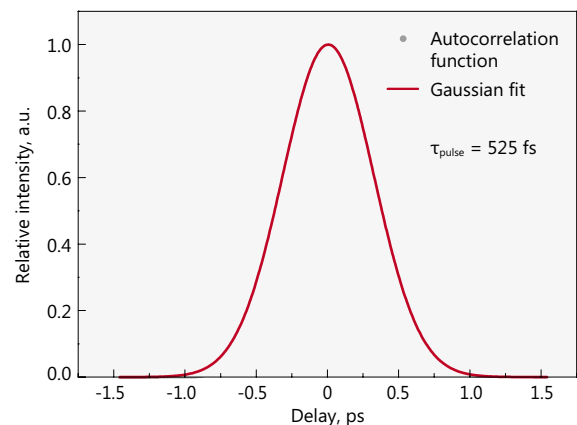


- ¹⁾ Due to continuous improvement all specifications are subject to change without notice.
- ²⁾ Chirp profile will be optimized by Ekspla to match customer compressor design.
- ³⁾ Pulse picker is an option for FFS10, FFS100 models. It supports external gating. FFS200CHI includes internal frequency divider, which enables pulse repetition rate reduction but does not support external gating.
- ⁴⁾ FFS200CHI model is provided with collimator & isolator node with dimensions 104×52×67 mm.

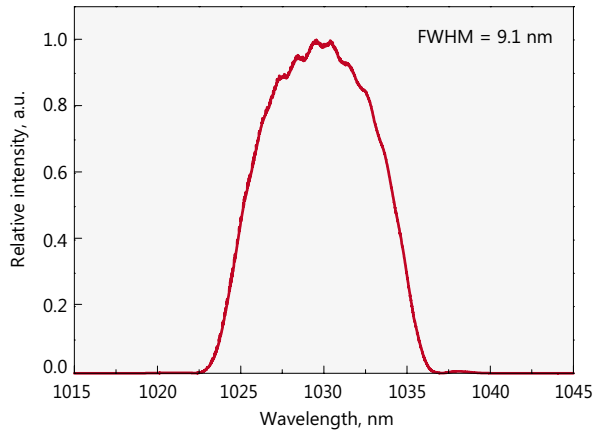
PERFORMANCE



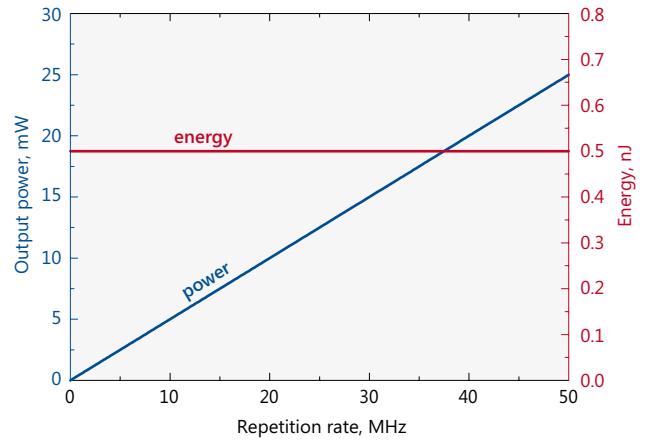
Typical spectrum from FFS10 laser



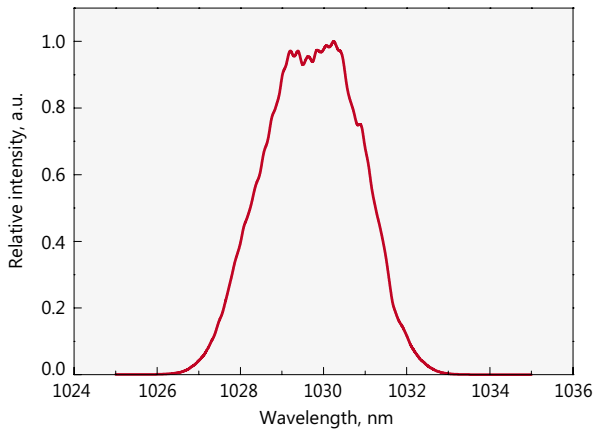
Typical autocorrelation from FFS10 laser



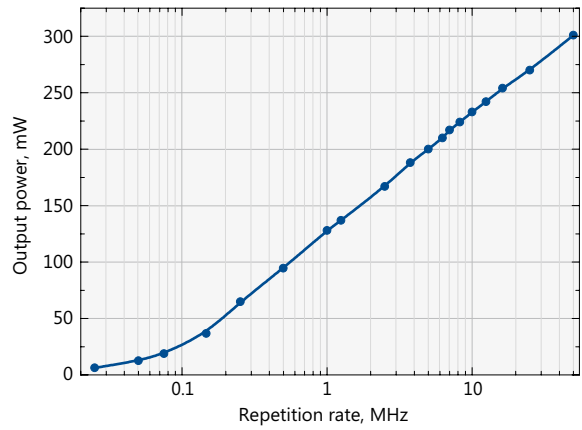
Typical spectrum from FFS100CHI laser



Typical dependence of average power (blue curve) and pulse energy (red curve) on the repetition rate for FFS100CHI-AOM laser



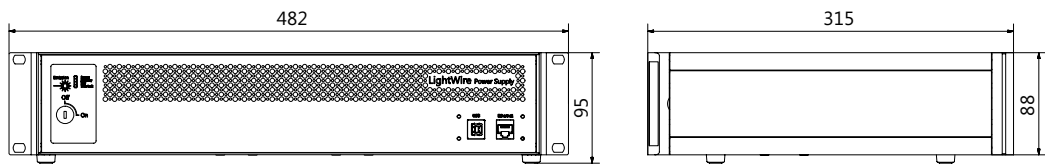
Typical spectrum from FFS200CHI laser



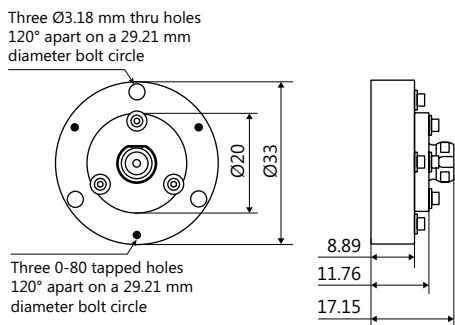
Typical dependence of average power on the repetition rate for FFS200CHI laser

DRAWINGS

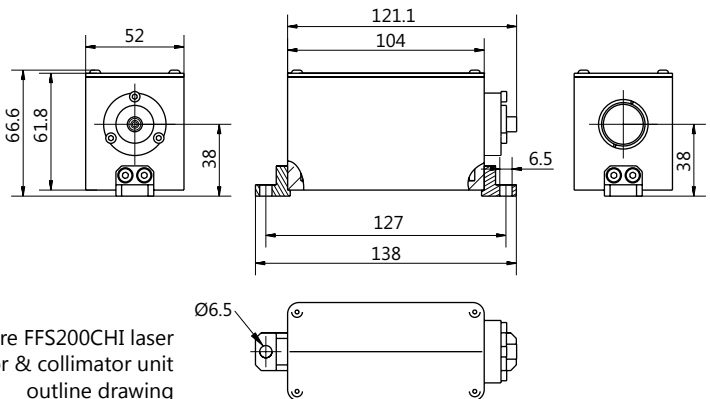
All dimensions are in millimetres.



LightWire FFS series control unit outline drawing



LightWire FFS10/100CHI laser collimator flange outline drawing



LightWire FFS200CHI laser isolator & collimator unit outline drawing

LightWire FP200

Compact
Picosecond
Fiber Laser



FEATURES

- ▶ Pulse energy > 50 nJ at repetition rate < 200 kHz
- ▶ 9 ps pulse duration
- ▶ Close to transform limited pulse duration
- ▶ Integrated fiber pulse picker for flexible repetition rate control (20 kHz – 40 MHz, burst mode available)

APPLICATIONS

- ▶ Ultrafast/nonlinear spectroscopy and microscopy
- ▶ Metrology

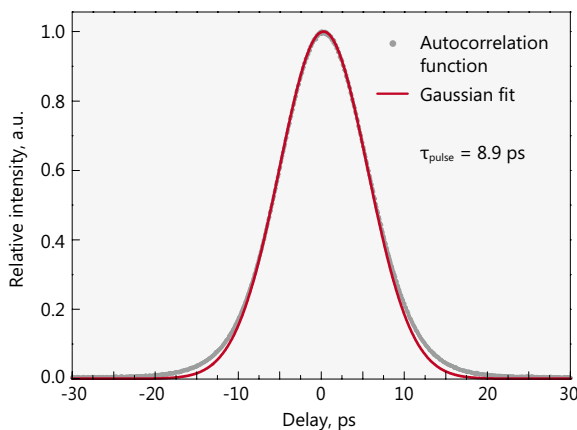
LightWire FP200 laser is dedicated for researchers and OEM integrators, who require small, convenient and maintenance free source with transform limited picosecond pulses. Widely tunable pulse repetition rate 20 kHz – 40 MHz makes it an excellent

choice for non-linear microscopy, time-resolved spectroscopy, terahertz spectroscopy, ultrafast metrology applications. FP200 model is available with second harmonic option (532 nm).

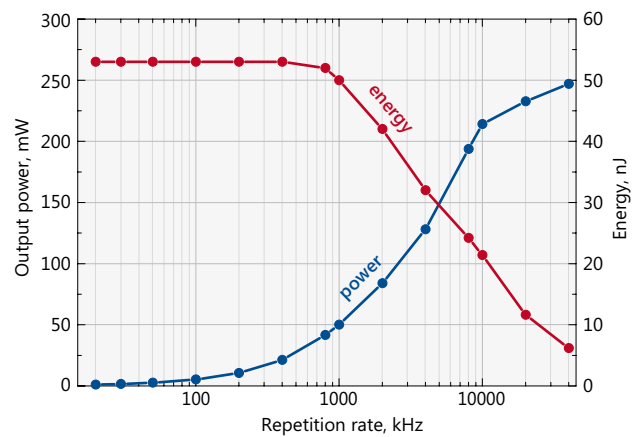
OPTIONS

- ▶ Second harmonic generation module (532 nm). Peak conversion efficiency: 20% for SH [code: FP200-SH].

PERFORMANCE



Typical autocorrelation curve of FP200 laser



Typical dependence of average power (blue curve) and pulse energy (red curve) on the repetition rate for FP200 laser

SPECIFICATIONS ¹⁾

Model	FP200
Central wavelength	1064 nm, tunable ± 0.2 nm
Pulse duration	9 ± 1 ps
Spectral bandwidth	0.25 ± 0.05 nm
Oscillator pulse repetition rate	40 ± 2 MHz
Pulse repetition rate range using frequency divider	20 kHz – 40 MHz ($PRR = PRR_{osc} / N$, $N = 1, 2, 3, \dots, 2000$)
Output power	> 200 mW at 10 MHz > 40 mW at 1 MHz > 5 mW at 100 kHz
Pulse energy	> 50 nJ at repetition rates < 200 kHz
Polarization	linear, vertical, > 100:1 extinction
Optical output	collimator & isolator node ²⁾ (free space output)
Umbilical	3 m length armored cable $\varnothing 5$ mm
Beam diameter	0.9 ± 0.1 mm
Beam height	50 mm
Beam quality	$M^2 < 1.1$
Pulse train monitoring	photodiode output for oscillator train, TTL synch pulse for laser output
Dimensions of control unit (L x W x H)	315 x 450 x 95 mm (19" rack mountable)
Dimensions of collimator & isolator node (L x W x H)	164 x 72 x 73 mm
Weight (with/without pulse picker)	< 10 kg
Control interface	USB, CAN, RS232, LAN, WLAN
Power supply (AC/DC adapter included)	100–240 V, 50–60 Hz AC
Power consumption	maximal 230 W (typical 60 W)
Operating conditions	10–30 °C, humidity – not condensing

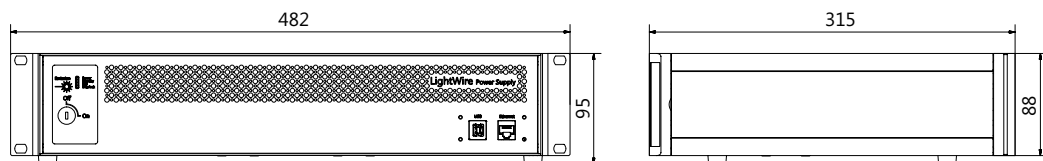


¹⁾ Due to continuous improvement all specifications are subject to change without notice.

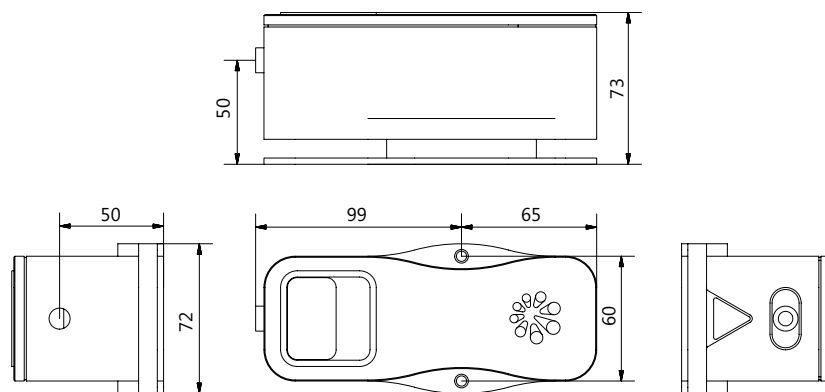
²⁾ FP200 model is provided with specially designed collimator & isolator node, which shouldn't be disconnected from output fiber without Ekspla approval.

DRAWINGS

All dimensions are in millimetres.



LightWire FP200 control unit outline drawing



LightWire FP200 laser isolator & collimator unit outline drawing

LightWire FF200



LightWire FF200 is a cost effective turn-key femtosecond fiber laser with fiber delivery of the pulses all the way to your sample. Based on a well-established MOPA scheme,

LightWire FF200 model laser due to its all-in-fiber construction ensures a reliable hands free operation in very compact package.

Compact Femtosecond Fiber Laser

FEATURES

- ▶ Pulse duration down to 130 fs
- ▶ Up to 200 mW output power
- ▶ Fiber delivery
- ▶ Compact, rugged design
- ▶ Low maintenance

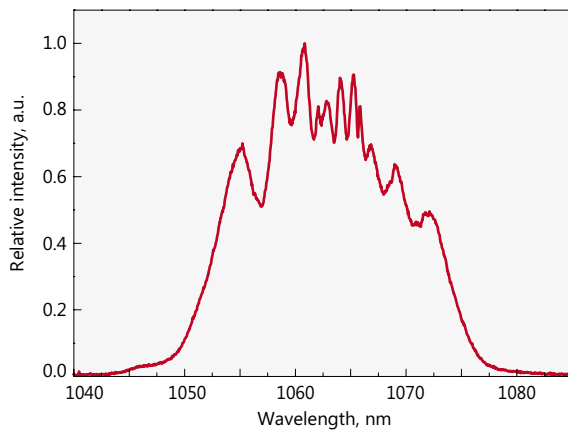
APPLICATIONS

- ▶ Ultrafast spectroscopy
- ▶ Time-domain terahertz spectroscopy

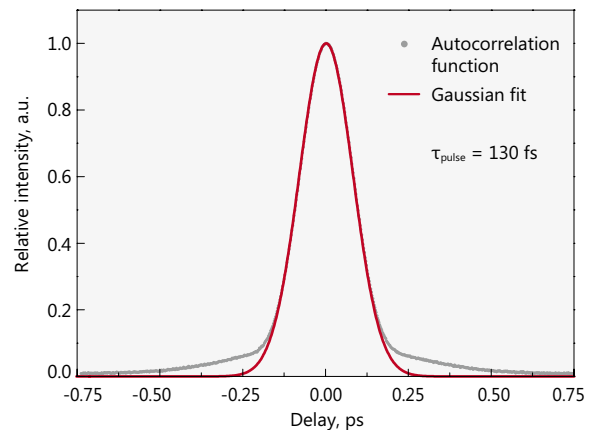
OPTIONS

- ▶ Pulse picker option
[code: FF200-AOM]

PERFORMANCE



Typical spectrum from FF200 laser



Typical autocorrelation from FF200 laser

SPECIFICATIONS ¹⁾

Model	LightWire FF200
Central wavelength	1064 nm
Compressed pulse duration	< 130 fs
Output power	> 200 mW
Oscillator pulse repetition rate	40 ± 2 MHz
Pulse repetition rate with pulse picker	20 kHz – 40 MHz (PRR = PRR _{osc} / N, N = 1, 2, 3, ..., 2000)
Pulse energy (without/with pulse picker)	> 5 nJ / > 2.5 nJ
Bandwidth (typical)	30 nm
Optical output	FC/PC connector ²⁾ or collimated beam (option)
Umbilical	1.5 m length armored cable Ø5 mm
Beam quality	M ² < 1.5
Pulse train monitoring	photodiode output for oscillator train, TTL synch pulse for laser output (with pulse picker option only)
Control interface	USB, CAN, RS232, LAN, (WLAN option)
Dimensions of control unit (L × W × H)	315 × 450 × 95 mm (19" rack mountable)
Dimensions of collimator unit (L × W × H)	164 × 73 × 75 mm
Weight	< 10 kg
Power supply	100–240 V, 50–60 Hz AC
Power consumption	maximal 230 W (typical 60 W)
Operating conditions	10–30 °C, humidity – not condensing

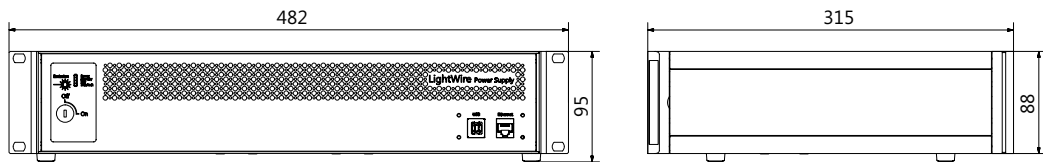


¹⁾ Due to continuous improvement all specifications are subject to change without notice.

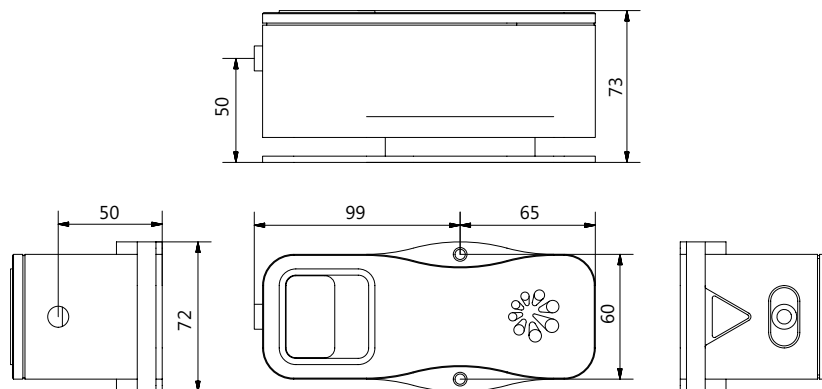
²⁾ The connector is not suitable to connect with single mode fiber.

DRAWINGS

All dimensions are in millimetres.



LightWire FF200 control unit outline drawing



LightWire FF200 laser collimator unit outline drawing



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