

# LightWire Series

Ultrafast Fiber Lasers

## FPS200

1064 nm, 200 mW, 50 nJ  
10 ps, 25 kHz – 50 MHz

## FFS100CHI

1030 nm, 50 mW, 8 nm, 7 ps (chirped pulse)  
50 MHz, compressible down to <300 fs

## FFS200

1064 nm, 200 mW, 5 nJ, <130 fs, 40 MHz



2023

# 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 – 50 MHz makes it an excellent choice for non-linear microscopy, time-resolved spectroscopy, terahertz spectroscopy, ultrafast metrology applications.

### SPECIFICATIONS FOR STANDARD LASER CONFIGURATIONS

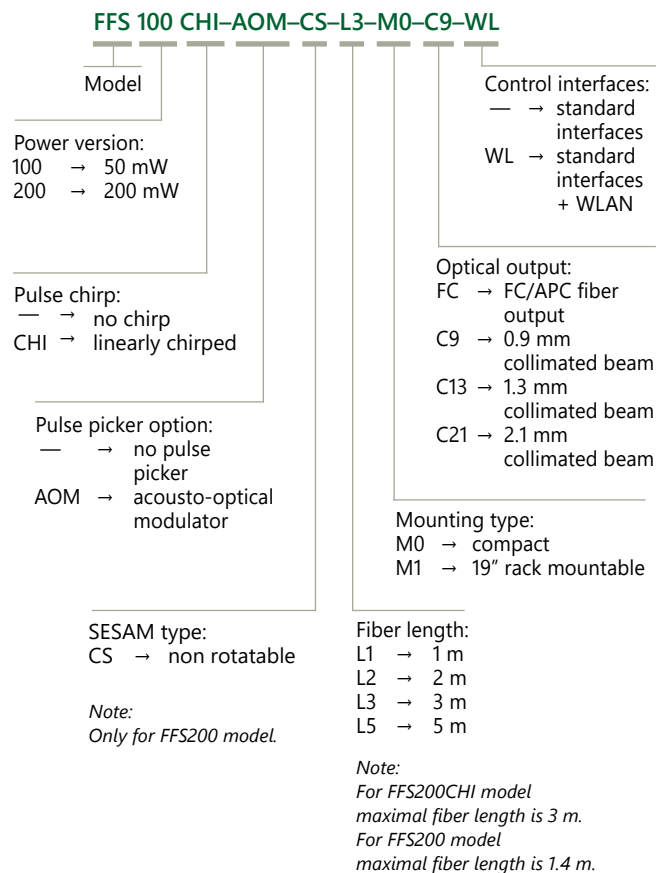
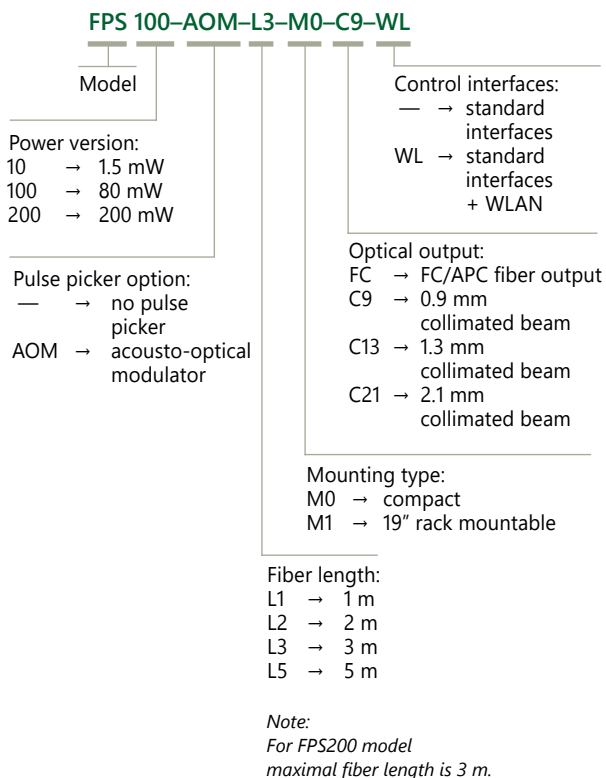
Not all output specifications may be available simultaneously. Please refer to the catalog page for exact specifications and available options.

| Model            | Central wavelength           | Pulse duration                  | Output power | Pulse energy | Repetition rate  | Page |
|------------------|------------------------------|---------------------------------|--------------|--------------|------------------|------|
| <b>FPS10</b>     | 1064 nm tunable $\pm 0.2$ nm | 2.3 $\pm$ 0.3 ps                | 1.5 mW       | 30 pJ        | 50 MHz           | 3    |
| <b>FPS100</b>    | 1064 nm tunable $\pm 0.2$ nm | 7 $\pm$ 1 ps                    | 80 mW        | 1.6 nJ       | 50 MHz           | 3    |
| <b>FPS200</b>    | 1064 nm tunable $\pm 0.2$ nm | 9 $\pm$ 1 ps                    | 200 mW       | 50 nJ        | 25 kHz – 50 MHz  | 3    |
| <b>FFS100CHI</b> | 1030 nm                      | 7 $\pm$ 2 ps (linearly chirped) | 50 mW        | 1 nJ         | 50 MHz           | 6    |
| <b>FFS200CHI</b> | 1030 nm                      | >50 ps (custom chirp profile)   | 200 mW       | 250 nJ       | 200 kHz – 50 MHz | 6    |
| <b>FFS200</b>    | 1064 nm                      | <130 fs                         | 200 mW       | 5 nJ         | 40 MHz           | 6    |

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

| Model         | Oscillator only | Oscillator + frequency divider | Oscillator + frequency divider + amplifier |
|---------------|-----------------|--------------------------------|--|
| FPS10         | ■               |                                |  |
| FPS10-AOM     |                 | ■                              |  |
| FPS100        | ■               |                                |  |
| FPS100-AOM    |                 | ■                              |  |
| FPS200        |                 |                                | ■  |
| FFS100CHI     | ■               |                                |  |
| FFS100CHI-AOM |                 | ■                              |  |
| FFS200CHI     |                 |                                | ■  |
| FFS200        | ■               |                                |  |
| FFS200-AOM    | ■               | ■                              |  |

ORDERING INFORMATION FOR FPS AND FFS SERIES



# LightWire FPS series

Compact  
Fiber Seeders for  
Picosecond Lasers



## FEATURES

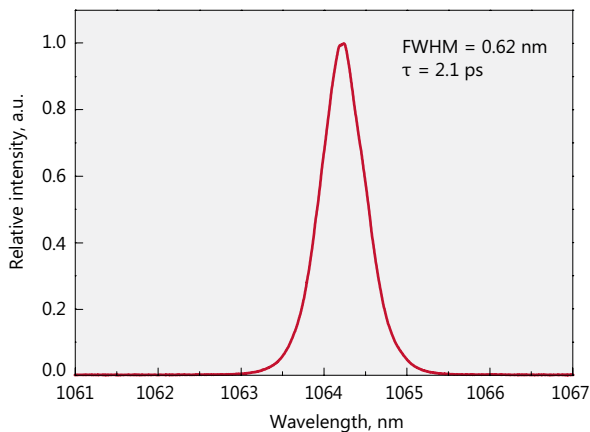
- ▶ Pulse energy >50 nJ at repetition rate <1 MHz
- ▶ Sub-10 ps pulse duration
- ▶ Close to Fourier-transform limited spectral bandwidth
- ▶ Integrated fiber pulse picker for flexible repetition rate control (25 kHz – 50 MHz, burst mode available)

## APPLICATIONS

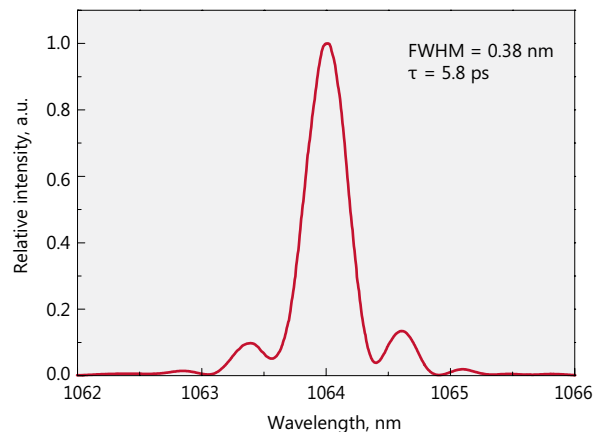
- ▶ Seeding solid state amplifiers

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.



Typical spectrum from FPS10 laser



Typical spectrum from FPS100 laser

**SPECIFICATIONS <sup>1)</sup>**

| Model   | FPS10   | FPS100              | FPS200  |
|---|---|---------------------|---|
| Central wavelength                                    | 1064 nm, tunable $\pm 0.2$ nm   |                     |   |
| Pulse duration  | $2.3 \pm 0.3$ ps  | $7 \pm 1$ ps        | $9 \pm 1$ ps  |
| Spectral bandwidth                                    | $0.7 \pm 0.2$ nm  | $0.4 \pm 0.1$ nm    | $0.25 \pm 0.05$ nm  |
| Oscillator pulse repetition rate                      | $50 \pm 2$ MHz  |                     |   |
| Pulse repetition rate with pulse picker <sup>2)</sup> | 25 kHz – 50 MHz (PRR = PRR <sub>osc</sub> / N, N = 1, 4, 5, ..., 2000)                                |                     |   |
| Output power (without/with pulse picker)              | > 1.5 mW / > 0.7 mW   | > 80 mW / > 40 mW   | > 200 mW at 10 MHz<br>> 40 mW at 1 MHz<br>> 5 mW at 100 kHz |
| Pulse energy (without/with pulse picker)              | > 30 pJ / > 14 pJ   | > 1.6 nJ / > 0.8 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 <sup>3)</sup>                    |
| Output fiber length                                   | up to 5 m   |                     | up to 3 m   |
| Collimated beam diameter                              | $0.9 \pm 0.1$ mm or $1.3 \pm 0.1$ mm or $2.1 \pm 0.2$ mm  |                     | $0.9 \pm 0.1$ 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 collimator (D × L)                      | $\varnothing 33 \times 11.76$ mm  |                     |   |
| 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   |                     |   |

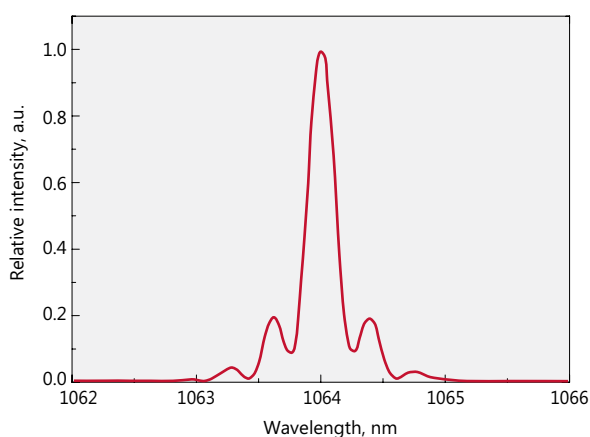
<sup>1)</sup> Due to continuous improvement all specifications are subject to change without notice.

<sup>2)</sup> Pulse picker is an option for FPS10, FPS100 models. It supports external gating. FPS200 includes internal pulse picker.

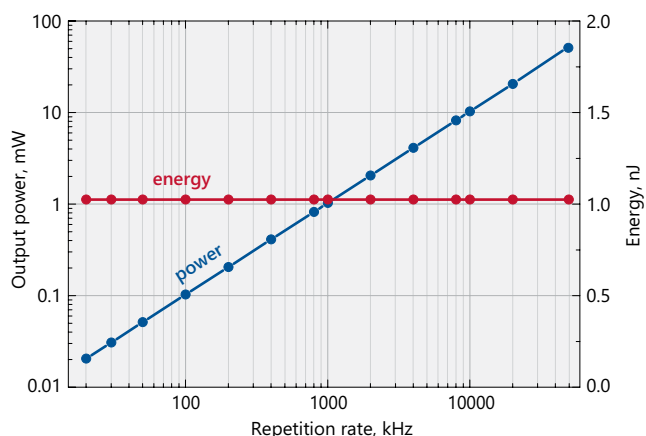
<sup>3)</sup> FPS200 model is provided with collimator & isolator node with dimensions 138×66.6×52 mm.



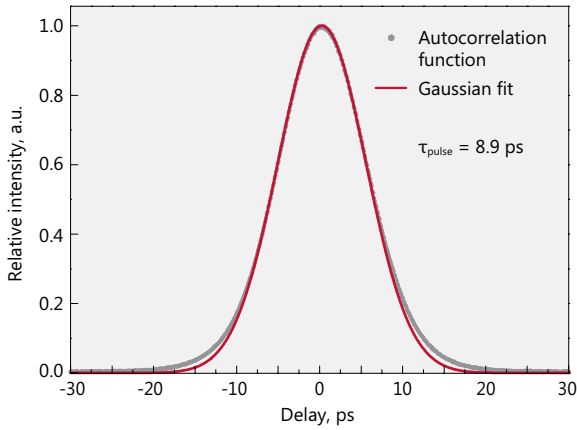
**PERFORMANCE**



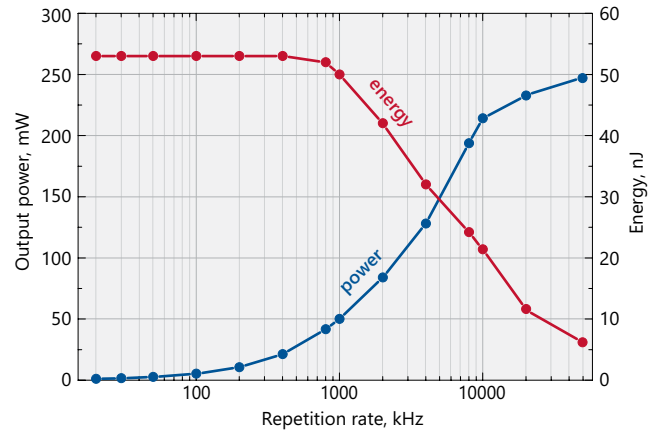
Typical spectrum from FPS200 laser



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

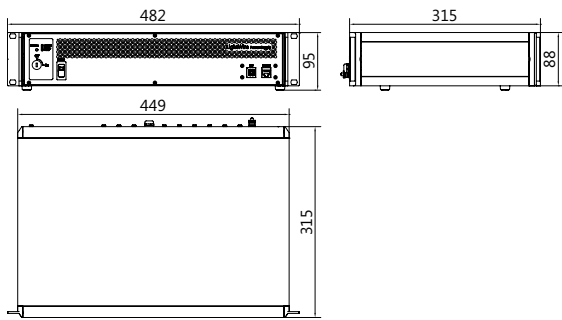


Typical autocorrelation curve of FPS200 laser

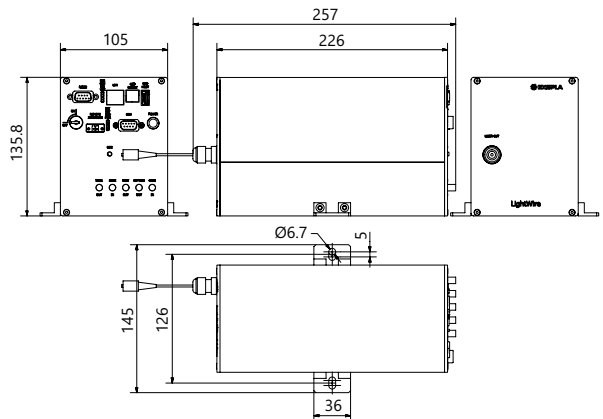


Typical dependence of average power (blue curve) and pulse energy (red curve) on the repetition rate for FPS200 laser

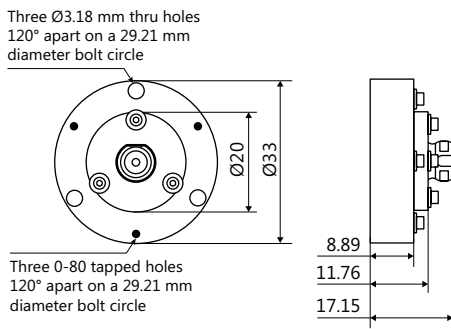
DRAWINGS



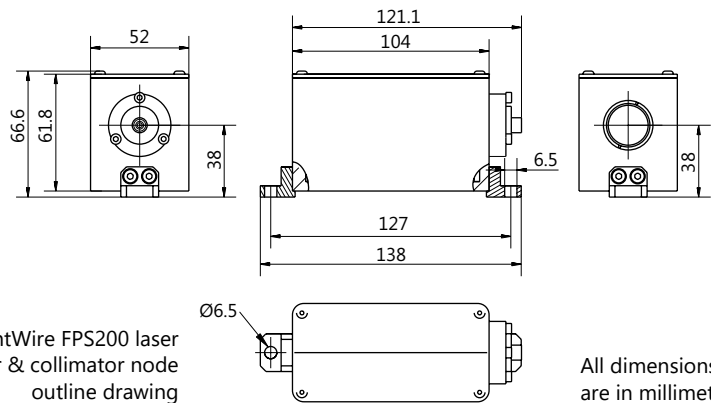
LightWire FPS series control unit outline drawing (19" rack mountable version)



LightWire FPS series "Compact" version drawing. Example only. Actual dimensions depends on a selected laser configuration and options. Please enquire

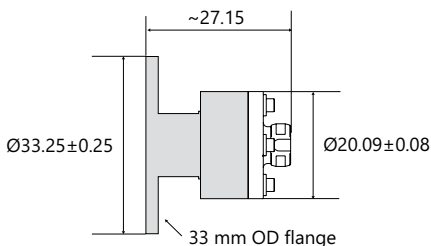


LightWire FPS10/100 laser collimator flange outline drawing for beam diameters 0.9 mm and 1.3 mm



LightWire FPS200 laser isolator & collimator node outline drawing

All dimensions are in millimetres.



LightWire FPS10/100 laser collimator flange outline drawing for beam diameter 2.1 mm

# LightWire FFS series

Compact  
Fiber Seeders for  
Femtosecond Lasers



## FEATURES

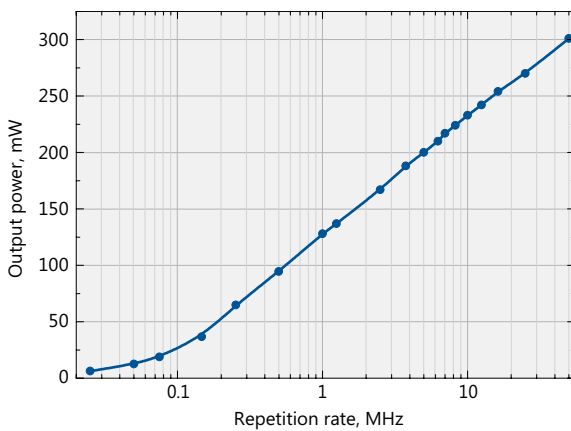
- ▶ Pulse energy > 250 nJ at repetition rate < 200 kHz
- ▶ Compressed or chirped broadband pulses
- ▶ Down to 300 fs pulses available after compression (for FFS100CHI and FFS200CHI)
- ▶ Pulse duration < 130 fs (for FFS200)

## APPLICATIONS

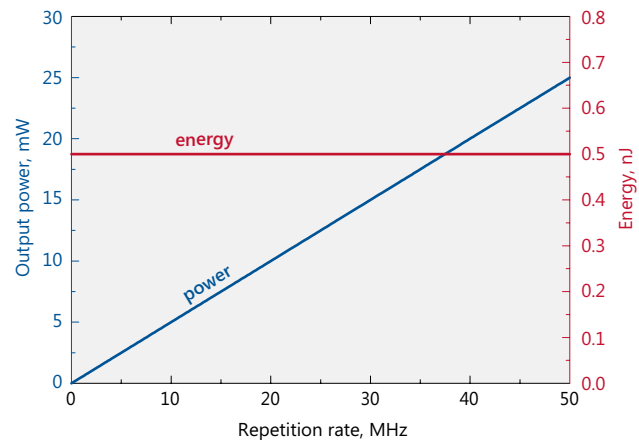
- ▶ Seeding femtosecond CPA systems
- ▶ Ultrafast spectroscopy
- ▶ Time-domain terahertz spectroscopy

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.



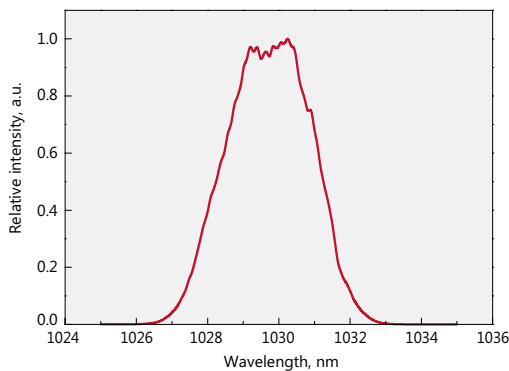
Typical dependence of average power on the repetition rate for FFS200CHI laser



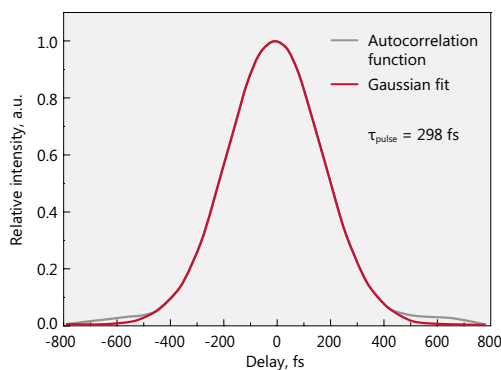
Typical dependence of average power (blue curve) and pulse energy (red curve) on the repetition rate for FFS100CHI-AOM laser

SPECIFICATIONS <sup>1)</sup>

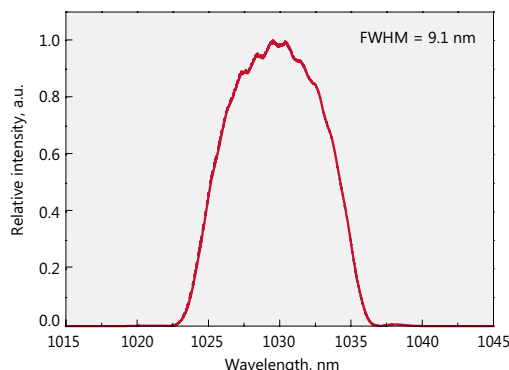
| Model   | FFS100CHI   | FFS200CHI   | FFS200   |
|---|---|---|--|
| Central wavelength                                    | 1030 ± 1 nm   |   | 1064 nm  |
| Spectral bandwidth                                    | 8 ± 1 nm  | up to 12 nm   | 30 nm (typical)  |
| Pulse duration from the laser                         | 7 ± 2 ps (chirped)  | > 50 ps (chirped)   | < 130 fs   |
| Compressed pulse duration                             | < 300 fs  | down to 300 fs  | NA   |
| Chirp profile   | linear  | custom <sup>2)</sup>  | NA   |
| Oscillator pulse repetition rate                      | 50 ± 3 MHz  |   | 40 ± 2 MHz   |
| Pulse repetition rate with pulse picker <sup>3)</sup> | 25 kHz – 50 MHz<br>(PRR = PRR <sub>osc</sub> / N,<br>N = 1, 5, 6, ..., 2000)                          | 200 kHz – 50 MHz<br>(PRR = PRR <sub>osc</sub> / N,<br>N = 1, 5, 6, ..., 2000) | 20 kHz – 40 MHz<br>(PRR = PRR <sub>osc</sub> / N,<br>N = 1, 4, 5, ..., 2000) |
| Output power (without/with pulse picker)              | > 50 mW / > 25 mW   | > 200 mW at 10 MHz<br>> 100 mW at 1 MHz<br>> 25 mW at 100 kHz                 | > 200 mW / > 100 mW  |
| Pulse energy (without/with pulse picker)              | > 1 nJ / > 0.5 nJ   | > 250 nJ at repetition rates<br>< 200 kHz                                     | > 5 nJ / > 2.5 nJ  |
| Polarization  | linear, > 100:1 extinction  |   | linear, > 10:1 extinction  |
| Optical output  | FC/APC connector or collimator with mounting flange (optional)  | collimator & isolator node <sup>4)</sup>                                      | FC/PC connector <sup>5)</sup> or collimated beam (optional)                  |
| Output fiber length                                   | up to 5 m   | up to 3 m   | up to 1.4 m  |
| Beam diameter   | 0.9 ± 0.1 mm or 1.3 ± 0.1 mm or 2.1 ± 0.2 mm  | 0.9 ± 0.1 mm  | 2 ± 0.2 mm   |
| Beam height   | NA  | 38 mm   | NA   |
| Beam quality  | M <sup>2</sup> < 1.1  |   | M <sup>2</sup> < 1.5   |
| Pulse train monitoring                                | photodiode output for oscillator train, TTL synch pulse for laser output (when pulse picker included) |   |  |
| Dimensions of collimator (D × L)                      | Ø33.02 × 11.76 mm   |   |  |
| 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   |   |  |



Typical spectrum from FFS200CHI laser



Typical FFS100CHI compressed pulse autocorrelation

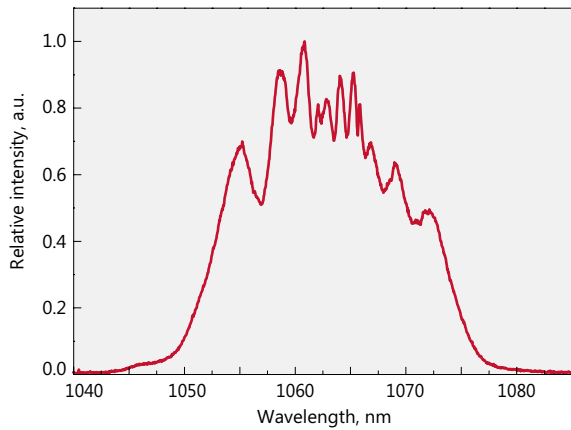


Typical spectrum from FFS100CHI laser

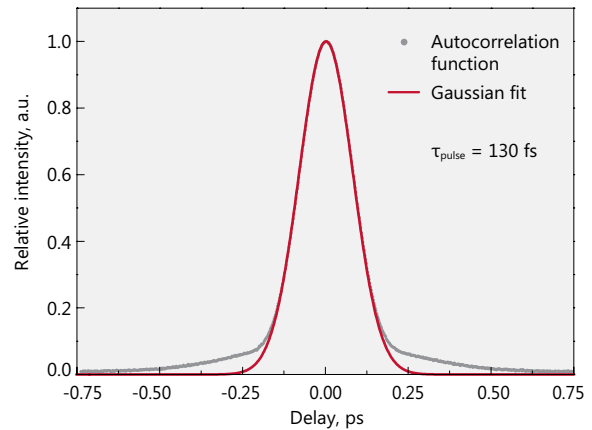
- <sup>1)</sup> Due to continuous improvement all specifications are subject to change without notice.
- <sup>2)</sup> Chirp profile will be optimized by Ekspla to match customer compressor design.
- <sup>3)</sup> Pulse picker is an option for FFS100 and FFS200 models. It supports external gating. FFS200CHI includes internal frequency divider, which enables pulse repetition rate reduction but does not support external gating.
- <sup>4)</sup> FFS200CHI model is provided with collimator & isolator node with dimensions 138×66.6×52 mm.
- <sup>5)</sup> The connector is not suitable to connect with single mode fiber.





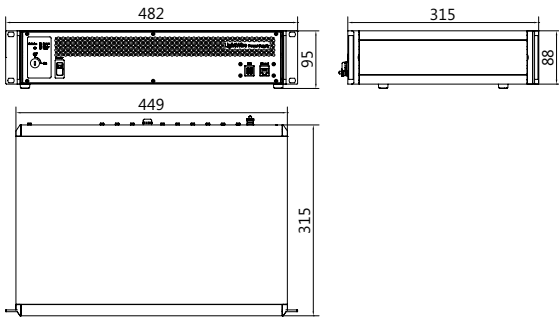


Typical spectrum from FFS200 laser

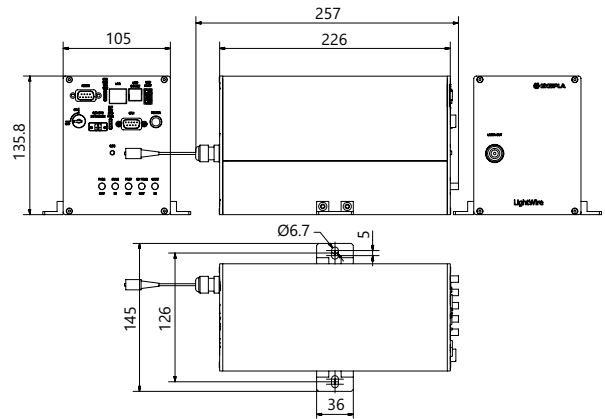


Typical autocorrelation from FFS200 laser

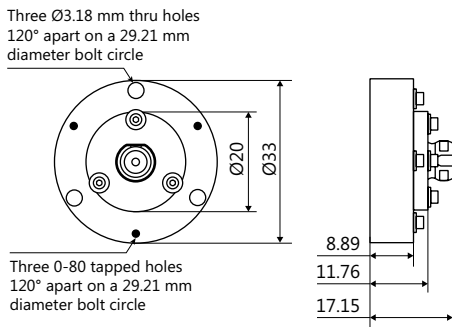
DRAWINGS



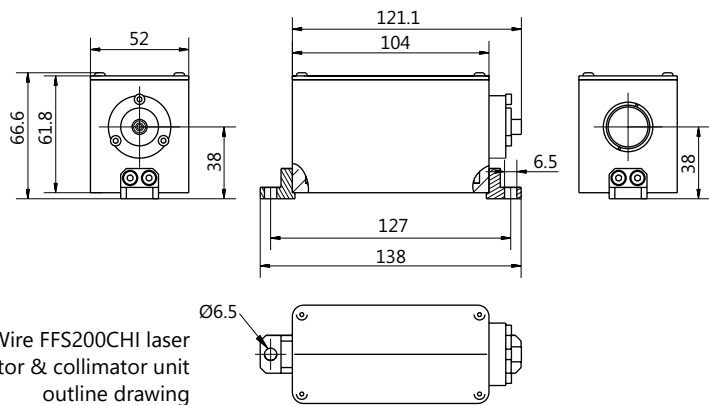
LightWire FFS series control unit outline drawing (19" rack mountable version)



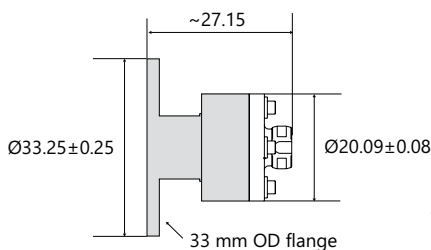
LightWire FFS series "Compact" version drawing. Example only. Actual dimensions depends on a selected laser configuration and options. Please enquire



LightWire FFS100CHI laser collimator flange outline drawing for beam diameters 0.9 mm and 1.3 mm



LightWire FFS200CHI laser isolator & collimator unit outline drawing



LightWire FFS100CHI/200 laser collimator flange outline drawing for beam diameter 2.1/2.0 mm


All dimensions are in millimetres.



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