VALO Femtosecond Series

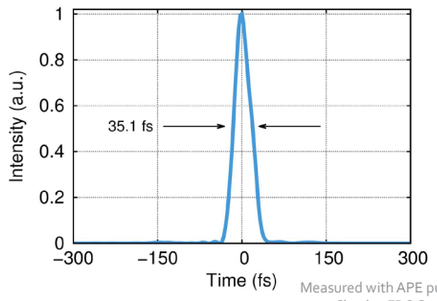
< 50 fs | Ultrafast femtosecond fiber lasers

Applications

Multiphoton Microscopy
Wafer Inspection (SiC)
Nonlinear Optics
Optogenetics
Two-Photon Polymerization
Terahertz Generation
Supercontinuum Generation
Spectroscopy

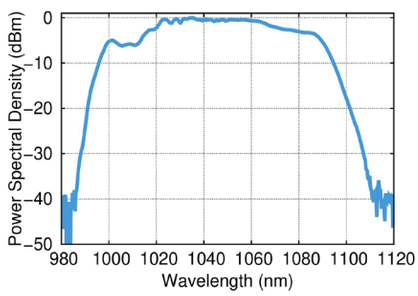
- < 50 fs pulse duration at > 2 W average power
- Integrated dispersion pre-compensation
- Very low noise performance
- Laser head passively cooled (no water & no fan)
- User friendly design - remote controllable

Typical temporal profile

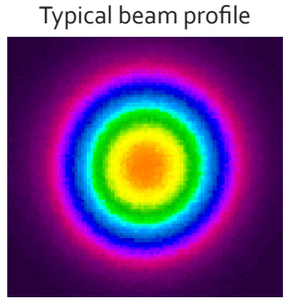


Measured with APE pulse Check + FROG

Typical optical spectrum



Typical beam profile



VALO Tidal

The VALO Femtosecond Series of ultrafast fiber lasers are unique in their design offering amongst the shortest femtosecond pulses and highest peak powers which can be obtained from a compact turn-key solution. Pulse durations of <50 fs are achieved using novel fiber laser based technology, with average output powers of more than 2 W, delivered in a low noise, nearly perfect TEMoo beam. All VALO Femtosecond Series lasers are delivered fully aligned and ready to use.

The VALO Femtosecond Series features integrated group velocity dispersion pre-compensation for peak power optimization at the sample and a simplified touch screen interface to allow for a user-friendly operation. The VALO Aalto and VALO Tidal are passively cooled with no need for external water chillers or fans.

The ultrashort pulse durations combined with computer-controlled group velocity dispersion pre-compensation allow users of the VALO Femtosecond Series fiber lasers to achieve the highest peak power exactly where it's needed, which makes the lasers ideal for use in multiphoton imaging, advanced spectroscopy, supercontinuum generation and many other applications.

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VALO Femtosecond Series

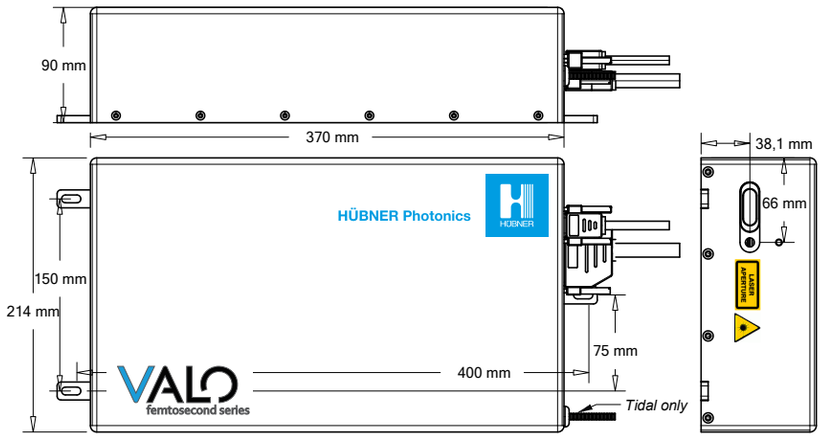
Optical Performance Specifications

	VALO Aalto	VALO Tidal
Pulse duration (FWHM)	< 50 fs (typ. < 40 fs)	
Average power	> 200 mW	> 2.0 W
Repetition rate	30 ± 1 MHz (other repetition rates upon request)	
Pulse energy	> 6.6 nJ	> 66 nJ
Peak power (typical value)	166 kW	1.6 MW
Power stability (RMS, 24 hours, ±3 °C)	< 0.1 %	< 0.5 % (typ. < 0.2 %)
Dispersion compensation range	- 30,000 to + 5,000 fs²	
Center wavelength in air	1055 ± 15 nm	
Spectral bandwidth (at -10 dB)	> 90 nm (typ. > 110 nm)	
Spatial mode (TEM_{00})	M^2 < 1.2	M^2 < 1.3 (typ. < 1.2)
Beam diameter (typical value)	1.8 ± 0.2 mm	1.6 ± 0.2 mm
Beam divergence	< 2 mrad	
Beam astigmatism	< 0.1	
Beam asymmetry	< 1.1	
Polarization	Linear, Vertical	
Polarization extinction ratio (PER)	> 100 : 1	
Electrical power consumption	< 50 W	< 75 W

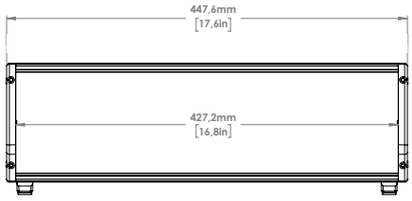
Options

Electrical Trigger Output	Fiber Coupling	Power Control (Modulation Bandwidth up to 1 MHz)	Pulse Picking

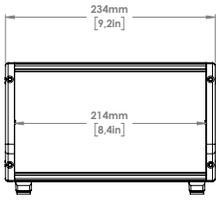
Laser head dimensions



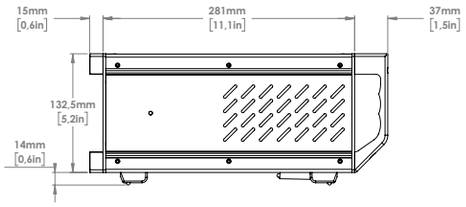
Controller dimensions



Tidal



Aalto



WARNING INVISIBLE LASER RADIATION

VALO Aalto
965 - 1150 nm, > 25 fs, < 10 nJ, $P_{avg.}$ < 350 mW
Avoid exposure to beam
Class 3B Laser Product
Classified by DIN EN 60825-1:2015-07

VALO Tidal
965 - 1150 nm, > 25 fs, < 100 nJ, $P_{avg.}$ < 3 W
Avoid eye or skin exposure to direct
or scattered radiation
Class 4 Laser Product
Classified by DIN EN 60825-1:2015-07

Specifications and technical data are subjects to change without notice due to technical developments.

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VALO Femtosecond Series

Sub 50 femtosecond pulses for multiphoton microscopy

Sub 50 femtosecond lasers are ideal for nonlinear and multiphoton microscopy applications, including simultaneous second and third harmonic imaging, due to their higher pulse peak powers which result in increased signal-to-noise ratio images at much lower average power, reducing photobleaching, and extending cell viability.

The impact of sub 50 femtosecond pulse durations can be seen on the calibration grid images to the right (Ibidi, 50 mm grid size).

a) 4.7 mW, <50 fs; VALO Femtosecond Series.

b) 6 mW with laser spectrum limited to 10 nm bandwidth (~160 fs).

c) Scaled up contrast for the 6 mW laser spectrum limited to 10 nm bandwidth (~160 fs).

a) b) c)

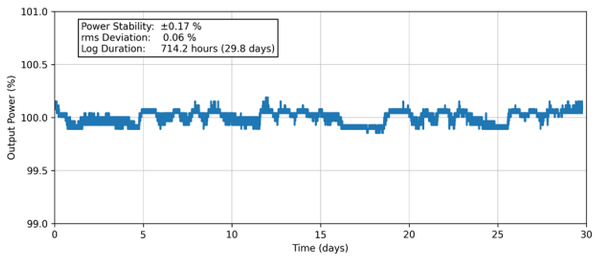
By comparison, for the same peak power a 50 fs pulsed laser requires a quarter of the average power for the same two-photon efficiency (TPEF), thus reducing photobleaching effects, allowing for longer imaging duration and improved cell viability.

Pulse Duration	**Peak Power** (30 MHz)	**Average Power** *For the same TPEF
200 fs	16 kW	100 mW
50 fs	16 kW	25 mW

Long term performance stability

VALO Femtosecond Series lasers are equipped with an optical feedback loop to actively stabilize the average output power by measuring a portion of the final output beam and adjusting the pump to compensate for any fluctuations.

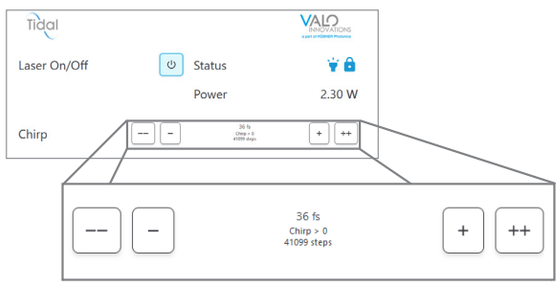
The result is more than 24 hours of uninterrupted performance stability better than 0.1 % for VALO Aalto at 200 mW of average power and better than 0.5 % for VALO Tidal at over 2 W of average power.



Group velocity dispersion pre-compensation

Integrated, and easy to use, group velocity dispersion pre-compensation allows the user to control the pulse duration at the sample.

Using automated dispersion compensation just before the laser aperture the pulse duration is fully characterized and the calibrated values are accessible through the touch screen user interface. The range for the dispersion compensation is - 30,000 to + 5,000 fs².



Read more about sub 50 femtosecond pulse lasers for gentler multiphoton microscopy at:
https://hubner-photonics.com/products/lasers/femtosecond-lasers/valo-series/

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