



helixx

Turn-key 250 MHz femtosecond laser



A Novanta Company

- Self-locking and maintaining
- Stable and robust
- True hands-off turn-key system
- Wavelength tuneable
- Integrated pump laser



Overview

The **helixx** is a unique turn-key femtosecond laser with a 250 MHz repetition rate, delivering >2.3 W of average power in pulses <50 fs. Tuneability is offered between 720 nm and 920 nm. Its innovative design combines a compact, hermetically sealed, vibration-resistant laser head that incorporates the Ti:Sapphire oscillator and pump laser, with a full-feature control unit. The control unit houses the field replaceable pump diodes, isolating temperature effects from the **helixx** laser head, and provides intelligent control that both monitors and maintains laser performance. The result is a highly stable and reproducible product with a long lifetime and low cost of ownership.

The **helixx** is particularly ideal for two photon microscopy. The repetition rate of 250 MHz significantly lessens photobleaching and phototoxicity, thus reducing damage to the cells and minimises the emission dead times of typical fluorophores. Its broad and continuous tuning range (see figure 1) improves flexibility in the choice of a suitable marker.

Optional features

Pulse train monitoring

An integrated high bandwidth (>10 GHz) photodiode can be used for repetition rate monitoring and to supply a signal to the **TL-1000** units or external electronics.

Repetition rate control

Control of the repetition rate and active feedback is enabled by cavity mirrors mounted on a fast and slow piezo crystal enabling rapid feedback and drift control simultaneously; this allows for the implementation of precision closed loop stabilisation of the repetition rate, as offered by Laser Quantum's **TL-1000** series of stabilisation electronics.

Active locking of repetition rate and pulse timing

The **TL-1000** is an optional supporting unit that enables tight phase-locking of the repetition rate to an external reference with jitter <100 fs. **TL-1000-ASOPS** enables a repetition rate offset lock between two 250 MHz oscillators of 0.5 kHz to 5 kHz allowing ultrafast time-domain spectroscopy without a mechanical delay stage.

CEPLoQ™ technology

CEPLoQ™ is our patented technology that directly modulates the pump power to maintain phase stabilisation without the use of an AOM. This leads to faster and more stable responses than the traditional method.



The **helixx** is compatible with the Laser Quantum RemoteCom software that allows connection to the Laser Quantum support team for monitoring laser performance and diagnosing opportunities for carrying out laser optimisation.



Pump power modulation

Modulation access to the pump power with a bandwidth of >100 kHz and modulation depth up to $\pm 1\%$ is provided for feedback purposes.

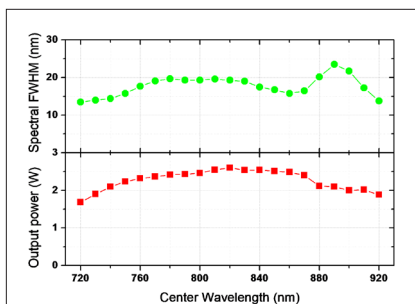


Figure 1: Tuning curve - Typical output power and spectral bandwidth of a **helixx** system



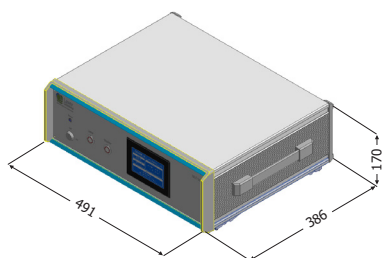
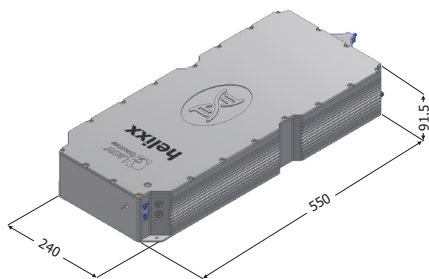
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Dimensions (mm)



Other information

- Umbilical length: 2 m
- Head weight: 20 kgs
- Cooling system included
- Warm-up time: 10 minutes
- Warranty: 2 years/5000 hours



Drawings are for illustrative purposes only. Please contact Laser Quantum for complete engineer's drawings.

Specifications*

	helixx
Average power output ¹	>2.3 W
Central wavelength	720 nm to 920 nm (tuneable)
Pulse duration ²	~50 fs
Spectral FWHM	~15 nm
Repetition rate ³	250 MHz
Pulse energy	>9 nJ
Beam size	2 mm +/- 0.5 mm
Divergence	<2.5 mrad
M-squared	<1.3 (sag plane) <1.6 (tan plane)
Power stability ⁴	<1%
Noise (RMS)	<0.1%
Polarisation ratio	>100:1
Polarisation direction	Horizontal
Operating temperature	21° +/- 5°C

* Laser Quantum operates a continuous improvement programme which can result in specifications being improved without notice.

¹ For the **helixx**, the values stated are at ~820 nm and will vary across the wavelength range.

² Achieved with optional extra cavity dispersion compensation.

³ Repetition rate: accuracy ±1 MHz, higher accuracy available on request.

⁴ Measured over 8 hours after cold start within operating temperature range.

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