

High pulse repetition rate wavelength-tunable optical parametric oscillators



Q-TUNE-HR laser head

Q-TUNE-HR is an Optical Parametric Oscillator (OPO) producing tunable wavelengths in the 680–2200 nm range with up to 100 kHz pulse repetition rate. The high pulse repetition rate makes Q-TUNE-HR a suitable coherent light source for photoacoustic microscopy, micromachining and imaging applications.

Several models are available, optimized for pump sources with different wavelengths and pulse energy levels. The G100 and G1K models are pumped by a 1064 nm laser with pulse energies starting from 5 mJ. The G10K and G100K models are pumped by 532 nm lasers with a minimum pump pulse energy of 350 μ J.

By default, the OPO is optimized to produce maximum output in the 800 nm range. As an option, the unit can be optimized for the 1300 nm range.

The OPO is controlled through a single Ethernet port via a built-in web server. There is no need to install control software – any computer or mobile device with a modern web browser can control Q-TUNE-HR. An API is also provided for integration with user devices.

In addition to the tunable output, Q-TUNE-HR provides a bypass port for access to the pump laser beam.



FEATURES

- Up to **100 kHz** pulse repetition rate
- Hands-free automated wavelength tuning from **680 to 2100 nm**
- Up to **4 W** output power in near IR range
- Can be adapted for user-supplied laser with 532 nm or 1064 nm pump wavelength and up to **35 W @ 532 nm** input power
- Microprocessor controlled operation with self-optimization, self-calibration capability
- Optional **air purging** for long lifetime of OPO optics
- Powered from +12 VDC source or AC/DC adapter

OPTIONAL EQUIPMENT

- Air purging for long lifetime of OPO optics
- Compact spectrometer for monitoring of OPO wavelength and linewidth
- Fiber coupled OPO output

APPLICATIONS

- Photo-acoustic microscopy
- Micromachining
- Raman spectroscopy & microscopy
- Infrared spectroscopy

SPECIFICATIONS ¹⁾

Model	Q-TUNE-HR			
	-G100	-G1K	-G10K	-G100K
Wavelength range ²⁾	680 – 2100 nm		750 – 1800 nm	
Pulse repetition rate ³⁾	100 Hz	1 kHz	1 – 10 kHz	10 – 100 kHz
Typical conversion efficiency	> 20 % (signal + idler)			
Output pulse energy	> 6 mJ ⁴⁾	> 1 mJ ⁵⁾	> 100 µJ ⁶⁾	> 40 µJ @ ⁷⁾
Linewidth	20 – 100 cm ⁻¹			
Pulse duration ⁸⁾	5 – 7 ns			
Typical pulse-to-pulse stability ⁹⁾	2 × pump laser			
Typical power drift ¹⁰⁾	2 × pump laser			
Polarization	linear, horizontal			
Typical beam diameter ¹¹⁾	4 mm	3 mm		
Typical beam divergence ¹²⁾	< 5 mrad		< 3 mrad	

Pump laser requirements

Pump wavelength	1064 nm	1064 nm	532 nm	532 nm
Pulse duration	5 – 8 ns FWHM			
Pulse energy	> 20 mJ	> 5 mJ	> 700 µJ	> 350 µJ
Max pump power	< 5 W	< 10 W		< 35 W
M ² factor	< 2		< 1.5	

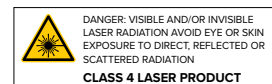
Dimensions

Laser head (W×L×H)	390 × 620 × 135 mm ³
Power adapter (W×L×H)	50 × 125 × 33 mm ³
Air-purging unit (W×L×H)	482 × 460 × 106 mm ³

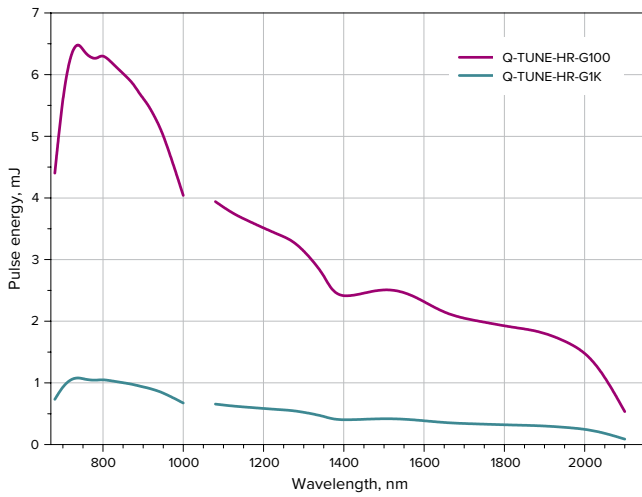
Operating requirements

Ambient temperature	15 – 30 °C
Relative humidity (non-condensing)	10 – 80 %
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz ¹³⁾
Average power consumption	< 50 W

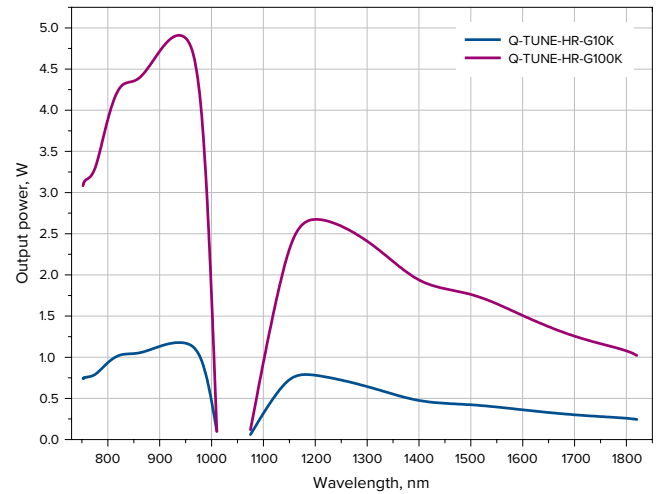
- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at 800 nm and max pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Custom-built devices with wavelength range of 210–4000 nm are available by request. Please inquire for details.
- Determined by pulse repetition rate of pump source. Q-TUNE-G100 can be configured for 200 Hz repetition rate if minimum pump energy requirements are satisfied.
- When pumped by 40 mJ @ 1064 nm @ 100 Hz pulse repetition rate source. See tuning curves for pulse energies at other wavelengths.
- When pumped by 10 mJ @ 1064 nm @ 1 kHz pulse repetition rate source. See tuning curves for pulse energies at other wavelengths.
- When pumped by 8 W @ 532 nm @ 10 kHz pulse repetition rate source. See tuning curves for pulse energies at other wavelengths.
- When pumped by 30 W @ 532 nm @ 100 kHz pulse repetition rate source. See tuning curves for pulse energies at other wavelengths.
- FWHM level at 800 nm, measured with 350 ps rise time photodiode.
- Measured during 30 seconds of operation after warm-up.
- Over 8 hour period after 20 minutes of warm-up, when ambient temperature variation is less than ±2 °C. Power value is calculated once per second.
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- Full angle measured at the 4σ level.
- Laser can be powered from an appropriate 12 or 28 VDC power source, depending on model. Please inquire for details.



PERFORMANCE



Q-TUNE-HR tuning curves (models -G100, -G1K)



Q-TUNE-HR tuning curves (models -G10K, -G100K)

PART NUMBERS

Q-TUNE-HR-G1K-AT/OPO

<p>Model</p> <p>HR → high repetition rate</p> <p>G → OPO pump wavelength 532 nm</p> <p>Pulse repetition rate in Hz or kHz</p> <p>100 → 100 Hz</p> <p>10K → 10 000 Hz</p>	<p>Optional items</p> <p>AT/NIR → attenuator for 700–1100 nm</p> <p>AT/IR → attenuator for 1200–1800 nm</p> <p>EM/BB → attachable pulse energy monitor for 210–2300 nm</p> <p>SPM2 → OPO wavelength monitoring in 480–1000 nm range</p> <p>FC/NIR → fiber coupler for NIR range</p> <p>FC/IR → fiber coupler for IR range</p> <p>APU2 → air-purging unit</p>
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OPTIONAL ITEMS

WF	Stand-alone wireless router for wireless laser control
RS	Stand-alone adapter for laser control via RS-232 port
PC	Laptop computer for laser control
EXP	Stand-alone pulse generator for variable rep. rate
CT19	19" mounted controller with integrated AC/DC power supply
CTA19	19" mounted controller with air-purging unit
CTBR	Front/rear panel with brackets for standard controller
PS19	19" form factor AC/DC power supply
APU2	Stand-alone air-purging unit with integrated AC/DC power supply
CST	Custom model

IMAGES



Fiber coupler FC



Motorized attenuator AT



Pulse energy monitor EM/BB



Front view of Q-TUNE-HR laser head



Rear view of Q-TUNE-HR laser head

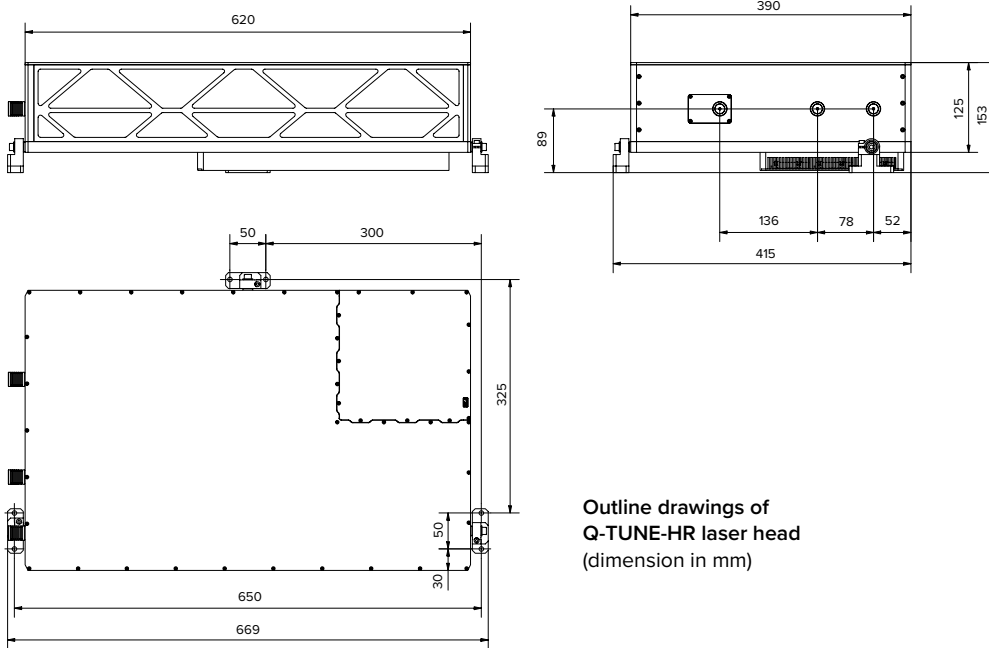


Front view of air-purging unit APU2



Rear view of air-purging unit APU2

DRAWINGS



Outline drawings of Q-TUNE-HR laser head (dimension in mm)