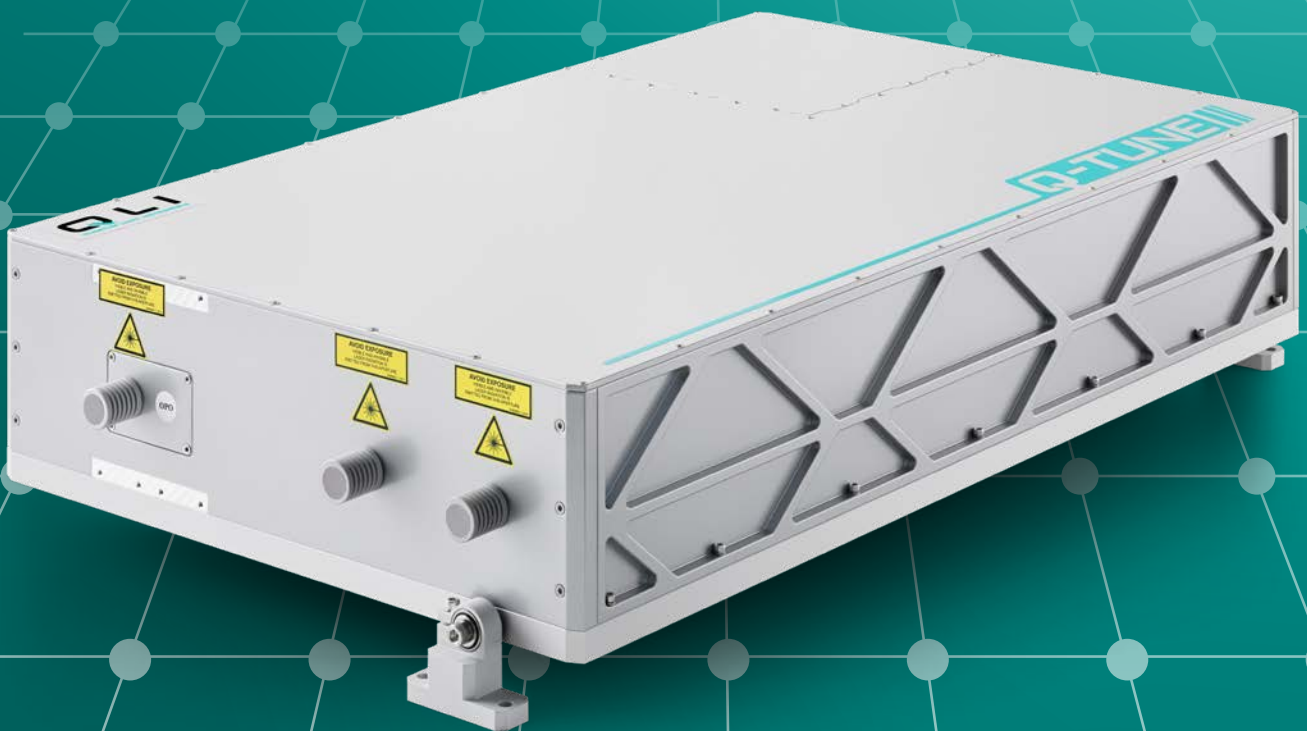


Laser Sources

- ✓ Q-switched
- ✓ Air-cooled
- ✓ Diode-pumped
- ✓ Wavelength-tunable



MEET OUR TEAM



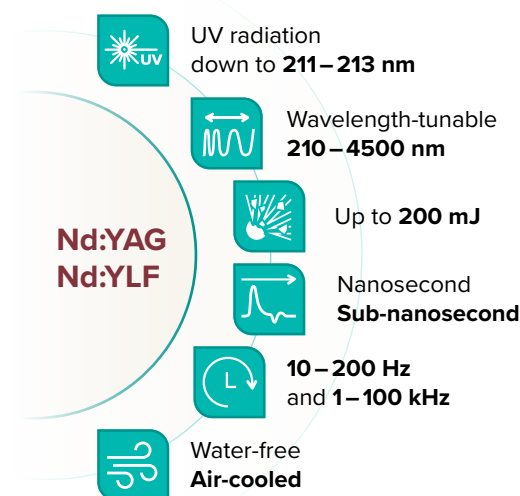
Quantum Light Instruments, Ltd. was founded in 2014 in Vilnius, Lithuania. We design and manufacture DPSS nanosecond pulsed lasers for scientific, industrial, defense and medical applications. Actively or passively Q-switched lasers are available with Nd:YAG and Nd:YLF versions of crystals with end-pumping technology, delivering up to 200 mJ pulse energy at 1–200 Hz or 1–100 kHz repetition rates (model dependent). QLI's fully air-cooled ("water-free") technology eliminates chillers, bulky oversized power supply or external water-cooling and enables compact single-box systems.

Accessories include harmonic generators (up to the 5th harmonic, up to 3 factory-configurable output ports), OPOs, Raman shifters, attenuators, energy monitors, and fiber-coupling modules. Custom modules and system configurations are available on request, and harmonic generation can extend the output into deep-UV down to 211–213 nm.

We believe innovation begins with listening. Every customer request helps us refine and improve our technology. Whether you need a compact DPSS nanosecond laser for laboratory research or a custom high-energy system for industrial integration, our team is ready to tailor solutions that fit your exact needs.

FACTS ABOUT OUR LASERS

Q-SWITCHED DIODE-PUMPED SOLID-STATE Nd:YAG AND Nd:YLF LASERS



CONTENT

Company profile	1
-----------------	---

WAVELENGTH-TUNABLE LASERS

Q-TUNE Wavelength-tunable, air-cooled, diode-pumped, Q-switched laser	2
Q-TUNE-G Wavelength-tunable, air-cooled, diode-pumped, Q-switched laser	6
Q-TUNE-IR Wavelength-tunable, air-cooled, diode-pumped, Q-switched laser for infrared spectroscopy	10
Q-TUNE-HR High pulse repetition rate wavelength-tunable optical parametric oscillators	14

Q-SWITCHED LASERS

Q1 Compact diode-pumped, air-cooled Q-switched laser	18
H1 Stand-alone harmonics generator for Q1	22
Q2 Diode-pumped, air-cooled, Q-switched laser	24
Q2HE High-energy, air-cooled, Q-switched laser	30
SHG Second harmonic generator designed for Q2/Q2HE	33
H-SMART Stand-alone automated harmonics generator for Q2/Q2HE	34
Q-SHIFT Diode-pumped, air-cooled, Q-switched laser with built-in nonlinear wavelength conversion	38
Q-SPARK Air-cooled, short-pulse Q-switched laser	42
Q-DOUBLE Double-pulse, diode-pumped, air-cooled Q-switched lasers	46
ACCESSORIES	
Air-purging unit	48
Motorized attenuator	50
Pulse energy monitors	52
Fiber couplers	53

Wavelength-tunable air-cooled, diode-pumped, Q-switched lasers



Q-TUNE laser head

Q-TUNE is a diode-pumped laser source combined with an Optical Parametric Oscillator (OPO) that generates a tunable wavelength output in the 410 – 2300 nm range with a linewidth narrower than 6 cm^{-1} . An optional second-harmonic generation (SHG) module extends the tuning range into the UV, covering 210 – 410 nm with a linewidth narrower than 12 cm^{-1} .

With a pulse duration of $< 5\text{ ns}$ and a pulse repetition rate of up to 100 Hz, Q-TUNE is a practical laser source for time-resolved spectroscopy, metrology and photo-acoustic imaging. At the core is QLI's water-free laser crystal pumping technology, enabling high beam quality and pulse energies of up to 100 mJ without water cooling infrastructure.

The laser is engineered as a turnkey system: compact, user-friendly and low-maintenance. No chiller or bulky under-table power supplies are required. All electronics are integrated into the Q-TUNE housing. The only external unit is a mains adapter providing 12 or 28 VDC and 50 – 150 W (model dependent), as well as an air-purging unit.

Both the pump laser and the OPO are controlled through a single Ethernet port via a built-in web server. No control software needs to be installed – any computer or mobile device with a modern web browser can operate the Q-TUNE. An API is also available for integration with user systems.

In addition to the tunable output, Q-TUNE provides two additional output ports for access to the pump laser beams.



FEATURES

- Seamless laser and Optical Parametric Oscillator (OPO) integration
- Turnkey performance due to water-free pump laser design
- Microprocessor controlled operation with self-optimisation, self-calibration capability
- Guaranteed **> 2 G shot** pump-diode lifetime
- **Hands-free** automated tuning from **210 to 2300 nm**
- Up to **100 Hz** pulse repetition rate
- Up to **8 mJ** pulse energy in visible range
- **$< 6\text{ cm}^{-1}$** linewidth
- Internal or external triggering modes
- Separate output ports for access to pump laser wavelengths
- Low power consumption – **from 50 to 150 W** depending on model
- Air purging for long lifetime of UV optics

OPTIONAL EQUIPMENT

- Compact spectrometer for monitoring of OPO wavelength and linewidth
- Motorized attenuator for VIS or NIR range
- Broadband OPO pulse energy monitor
- Fiber coupled OPO output

APPLICATIONS

- Temporally resolved laser spectroscopy (for example, Light Induced Fluorescence Spectroscopy (LIFS))
- Nonlinear laser spectroscopy
- Confocal microscopy
- Metrology
- Photo-acoustics imaging

SPECIFICATIONS ¹⁾

Model	Q-TUNE									
	-C10	-C100	-D10	-D20	-D50	-E10	-E20	-E33	-F10	-F20
Wavelength range, nm ²⁾										
OPO	410 – 2300 nm									
SH extension	210 – 410 nm									
Pump laser wavelength	1053 nm	1064 nm	1053 nm	1064 nm		1053 nm		1064 nm	1053 nm	
Pulse repetition rate ³⁾	10 Hz	100 Hz	10 Hz	20 Hz	50 Hz	10 Hz	20 Hz	33 Hz	10 Hz	10 Hz
Pulse energy ⁴⁾	> 1 mJ		> 2 mJ			> 5 mJ			> 8 mJ	
Linewidth	< 6 cm ⁻¹									
Pulse duration ⁵⁾	< 5 ns									
Pulse-to-pulse stability ⁶⁾	< 4.5 % RMS									
Polarization										
Signal	vertical									
Idler	vertical									
Typical beam diameter ⁸⁾	3 mm		4 mm			5 mm			6 mm	
Power drift ⁷⁾	± 3.0 %									
Typical beam divergence ⁹⁾	< 3 mrad		< 4 mrad			< 5 mrad				
Jitter ¹⁰⁾	< 0.5 ns RMS									

Pump laser outputs ¹¹⁾Max pulse energy at ¹²⁾

Fundamental	15 mJ	30 mJ		50 mJ		70 mJ	
2nd harmonic	7 mJ	15 mJ		20 mJ		30 mJ	25 mJ
3rd harmonic	5 mJ	9 mJ		20 mJ		30 mJ	25 mJ

Dimensions

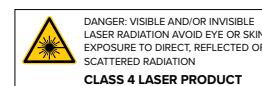
Laser head (W×L×H) ¹³⁾	390 × 620 × 153 mm ³						
Air-purging unit and power adapter (W×L×H) ¹⁴⁾	482 × 460 × 106 mm ³						

Operating requirements

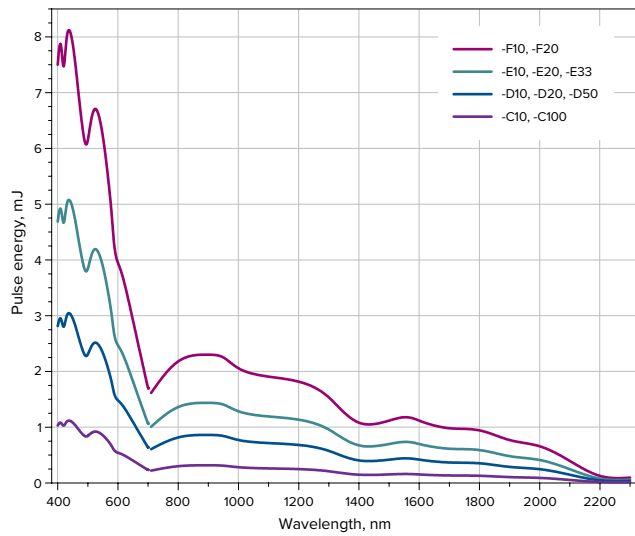
Cooling requirements	air-cooled (water-free)						
Ambient temperature	15 – 25 °C						
Relative humidity (non-condensing)	10 – 80 %						
Mains voltage ¹⁵⁾	90 – 230 VAC, single phase, 47 – 63 Hz						
Average power consumption	< 50 W	< 150 W	< 100 W	< 150 W	< 100 W	< 150 W	

- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at 450 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.
- Optional extension down to 210 nm is available with second harmonic generator.
- Factory-set pulse repetition rate in internal triggering mode. Pulse repetition rate can be divided-down to 1 Hz.
- Measured at 450 nm output. See tuning curves for pulse energies at other wavelengths.
- FWHM level at 450 nm, measured with 350 ps rise time photodiode.
- Measured during 30 seconds 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.

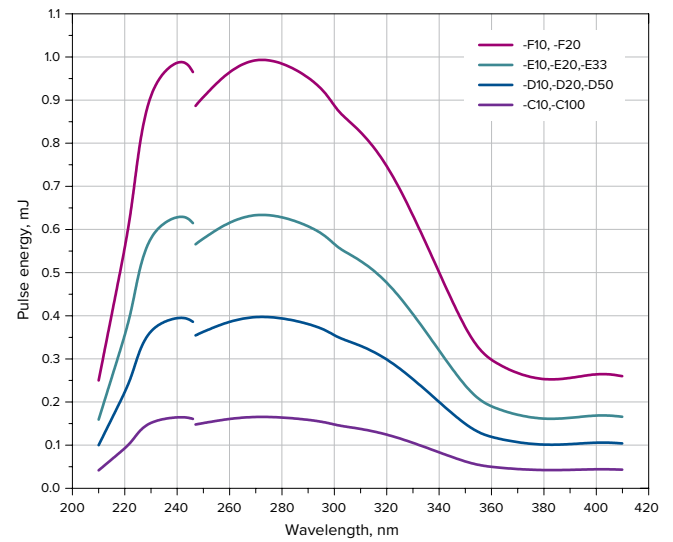
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- Full angle measured at the 4σ level.
- In respect to falling edge of pump-diode triggering pulse.
- Laser pulse energy is optimized for OPO pumping and may differ from stand-alone laser specifications.
- Outputs can be configured for simultaneous or non-simultaneous with OPO operation. Values indicated here are for non-simultaneous operation.
- For model Q-TUNE-C10 housing dimensions – 390 × 620 × 135 mm³.
- Power adapter is integrated with air-purging unit.
- Laser can be powered from an appropriate 12 or 28 VDC power source, depending on model. Please inquire for details.



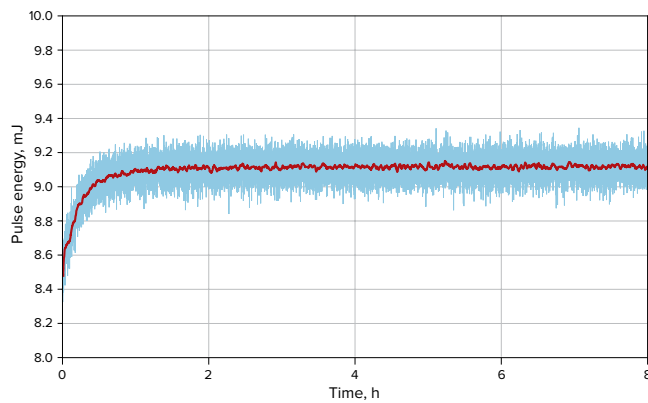
PERFORMANCE



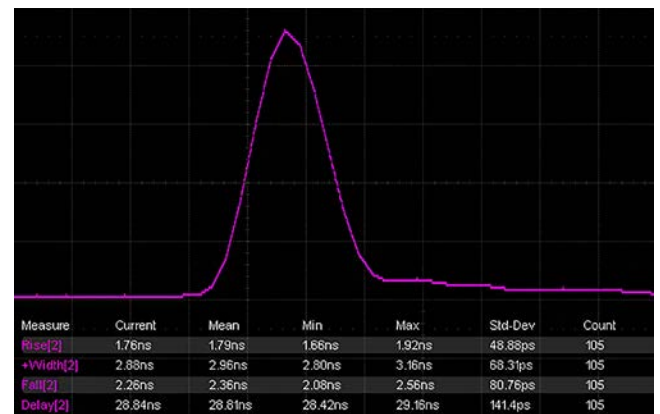
Q-TUNE tuning curves



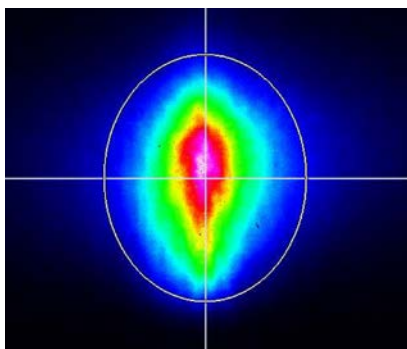
Q-TUNE-SH tuning curves



Long term stability of Q-TUNE-F10 @ 450 nm
Power drift: +0.47 %; -0.96 %



Pulse duration of Q-TUNE-F10 @ 450 nm



Q-TUNE-E10 beam profile
Axis length (X, Y) – (2915.0, 3564.0) μm ,
effective diameter – NA, ellipticity – 81.8 %,
wavelength – 450 nm

PART NUMBERS

Q-TUNE-F10-SH-AT/VIS

Model

Pulse energy @ 450 nm

C → > 1 mJ

D → > 3 mJ

E → > 5 mJ

F → > 8 mJ

Default pulse repetition rate in Hz

Optional tuning range extension

SH → 210–409 nm

BB → broadband output in the 600–900 nm range

Optional items

AT/UV → motorized attenuator for UV range

AT/VIS → motorized attenuator for VIS range

AT/NIR → motorized attenuator for NIR range

AT/IR → motorized attenuator for NIR range

EM/BB → pulse energy monitor for OPO output

SPM1 → OPO wavelength monitoring in VIS range

FC/UV → fiber coupler for UV range

FC/VIS → fiber coupler for VIS range

FC/NIR → fiber coupler for NIR range

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 repetition 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



Front view of Q-TUNE laser head



Rear view of Q-TUNE laser head



Front view of air-purging unit APU2



Rear view of air-purging unit APU2



Fiber coupler FC

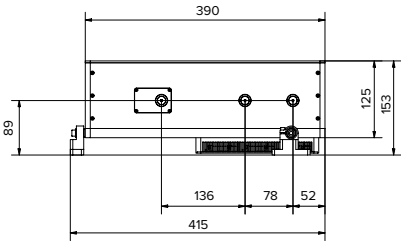
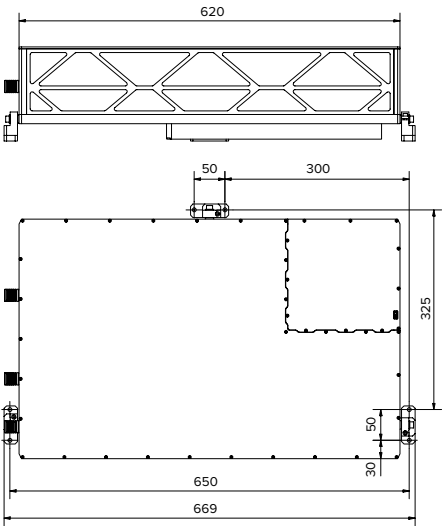


Motorized attenuator AT



Pulse energy monitor EM/BB

DRAWINGS



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

Air-cooled, diode-pumped, wavelength-tunable Q-switched laser



Q-TUNE-G laser head

Q-TUNE-G is an air-cooled, wavelength-tunable laser integrating an Optical Parametric Oscillator (OPO) and its pump source. The pump source is a Q-switched DPSS laser from the Q2 series. A pulse duration of less than 4 ns and a pulse repetition rate of up to 100 Hz make Q-TUNE-G a suitable coherent light source for photoacoustic imaging, nonlinear and time-resolved spectroscopy, and metrology. Q2 series lasers feature water-free laser crystal pumping technology that enables generation of a high-quality laser beam with pulse energies up to 80 mJ. The advanced laser design results in a compact, user-friendly turnkey system requiring minimal maintenance. No external chillers or bulky power supplies are required, as all laser electronics are integrated into the Q-TUNE-G housing. The only external module is a mains adapter providing 12 or 28 VDC, 50–150 W (depending on model).

Both the pump laser and the OPO are 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-G. An API is also provided for integration with user devices. In addition to the tunable output, Q-TUNE-G provides two additional ports for access to the pump laser beams.



FEATURES

- Seamless laser and Optical Parametric Oscillator (OPO) integration
- Turnkey performance due to the water-free pump laser design
- Microprocessor controlled operation with self-optimization, self-calibration capability
- Guaranteed > **2 G shot** pump-diode lifetime
- Hands-free automated tuning from **680 to 2300 nm**
- Up to **100 Hz** pulse repetition rate
- Up to **11 mJ** pulse energy in near-IR range.
- **10–15 cm⁻¹** typical linewidth (broadband version available by request)
- Internal or external triggering modes
- Separate output ports for access to the pump laser wavelengths
- Low power consumption – from 50 to 150 W depending on model

OPTIONAL EQUIPMENT

- Compact spectrometer for monitoring of OPO wavelength and linewidth
- Motorized attenuator for VIS or NIR range
- OPO pulse energy monitor
- Fiber coupled OPO output
- Air-purging unit for long lifetime of optics

APPLICATIONS

- Photo-acoustics imaging
- Photo-acoustics microscopy
- Nonlinear laser spectroscopy
- Metrology

SPECIFICATIONS ¹⁾

Model	Q-TUNE-G								
	-C10	-C100	-D10	-D20	-D50	-E10	-E20	-E33	-F10
Wavelength range	680 – 2300 nm								
Pulse repetition rate ²⁾	10 Hz	100 Hz	10 Hz	20 Hz	50 Hz	10 Hz	20 Hz	33 Hz	10 Hz
Pulse energy ³⁾	> 2 mJ		> 4.5 mJ			> 7 mJ			> 11 mJ
Linewidth ⁴⁾	< 10 cm ⁻¹					< 15 cm ⁻¹			
Pulse duration ⁵⁾	< 4 ns								
Pulse-to-pulse stability ⁶⁾	< 3 % RMS								
Power drift ⁷⁾	± 3.0 %								
Polarization									
Signal	horizontal								
Idler	vertical								
Typical beam diameter ⁸⁾	3 mm		4 mm			5 mm			6 mm
Typical beam divergence ⁹⁾	< 3 mrad					< 5 mrad			
Jitter ¹⁰⁾	< 0.5 ns RMS								

Pump laser outputs ¹¹⁾

Max pulse energy at ¹²⁾				
Fundamental	15 mJ	32 mJ	60 mJ	80 mJ
2nd harmonic	7 mJ	16 mJ	30 mJ	40 mJ

Dimensions

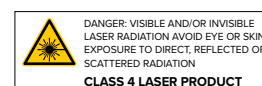
Laser head (W×L×H)	390 × 620 × 153 mm ³
Power adapter (W×L×H) ¹³⁾	192 × 178 × 46 mm ³
Air-purging unit (APU) (W×L×H) ¹⁴⁾	482 × 460 × 106 mm ³

Operating requirements

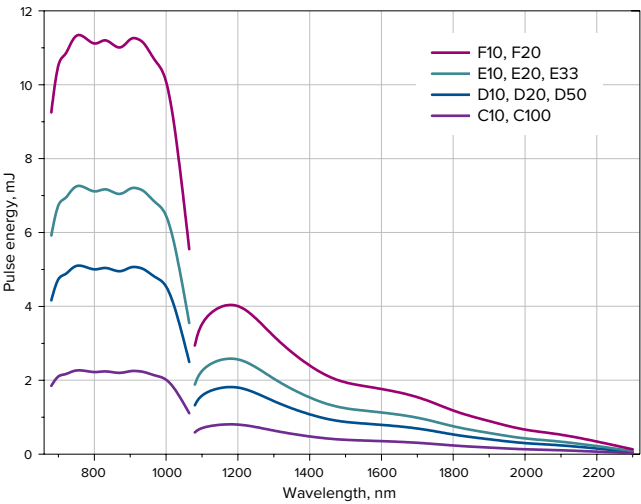
Cooling requirements	air-cooled (water-free)			
Ambient temperature	15–25 °C			
Relative humidity (non-condensing)	10–80 %			
Mains voltage ¹⁵⁾	90–230 VAC, single phase, 47–63 Hz			
Average power consumption	50–150 W	80–150 W	< 100 W	< 150 W

- 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.
- Factory-set pulse repetition rate in internal triggering mode. In internal triggering mode repetition rate can be divided by integer number down to f/2, f/3, f/4, ... 1 Hz.
- Measured at 800 nm output. See tuning curves for pulse energies at other wavelengths. Optical components are optimized for best performance in 700–1000 nm range, when optimized for SWIR pulse energies are 25–40 % higher in 1400–2000 nm range. Inquire for tuning curve for -SWIR option.
- Broadband version is available by request. Linewidth is in 20–200 cm⁻¹ range.
- FWHM level at 800 nm, measured with 350 ps rise time photodiode.
- Measured during 30 seconds operation after warm-up.

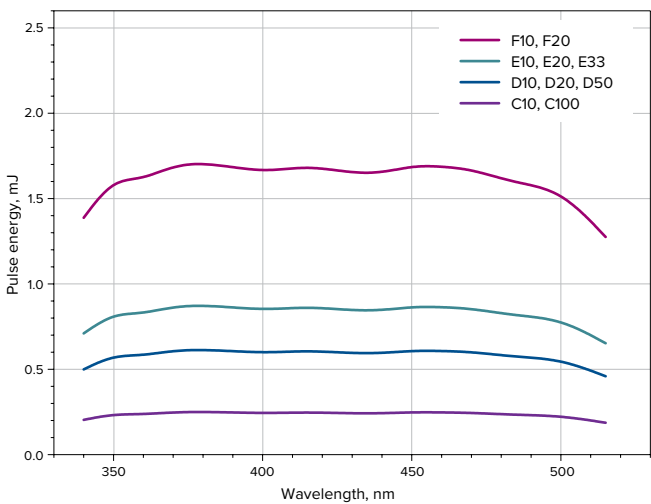
- Over 8 hour period after 20 minutes of warm-up, when ambient temperature variation is less than ± 2 °C. Power value is calculated once per second.
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- Full angle measured at the 4σ level.
- In respect to falling edge of pump-diode triggering pulse.
- Laser pulse energy is optimized for OPO pumping and may differ from stand-alone laser specifications.
- Outputs can be configured for simultaneous or non-simultaneous with OPO operation. Values indicated here are for non-simultaneous operation.
- Power adapter size depends on the model.
- APU is optional. APU provides power for Q-TUNE-G, additional power adapter is not required.
- Laser can be powered from an appropriate 12 or 28 VDC power source, depending on model. Please inquire for details.



PERFORMANCE



Q-TUNE-G tuning curves



Q-TUNE-G-SH tuning curves

PART NUMBERS

Q-TUNE-G-F10-SH-AT/IR

Model

G → OPO pump wavelength 527/532 nm

Pulse energy at 800 nm

- no letter → < 1 mJ
- C → > 1 mJ
- D → > 3 mJ
- E → > 5 mJ
- F → > 8 mJ

Optional items

- EM/BB → pulse energy monitor for OPO output
- AT/NIR → motorized attenuator for 700–1100 nm
- AT/IR → motorized attenuator for 1200–1800 nm
- SPM2 → wavelength monitoring
- FC/NIR → fiber coupler for NIR range
- FC/IR → fiber coupler for IR range
- APU2 → air-purging unit

Optional tuning range extension

- SH → 350–500 nm
- BB → broadband output in 900–1200 nm range

Default pulse repetition rate in Hz



Fiber coupler FC



Motorized attenuator AT



Pulse energy monitor EM/BB

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 repetition 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



Front view of Q-TUNE laser head



Rear view of Q-TUNE laser head

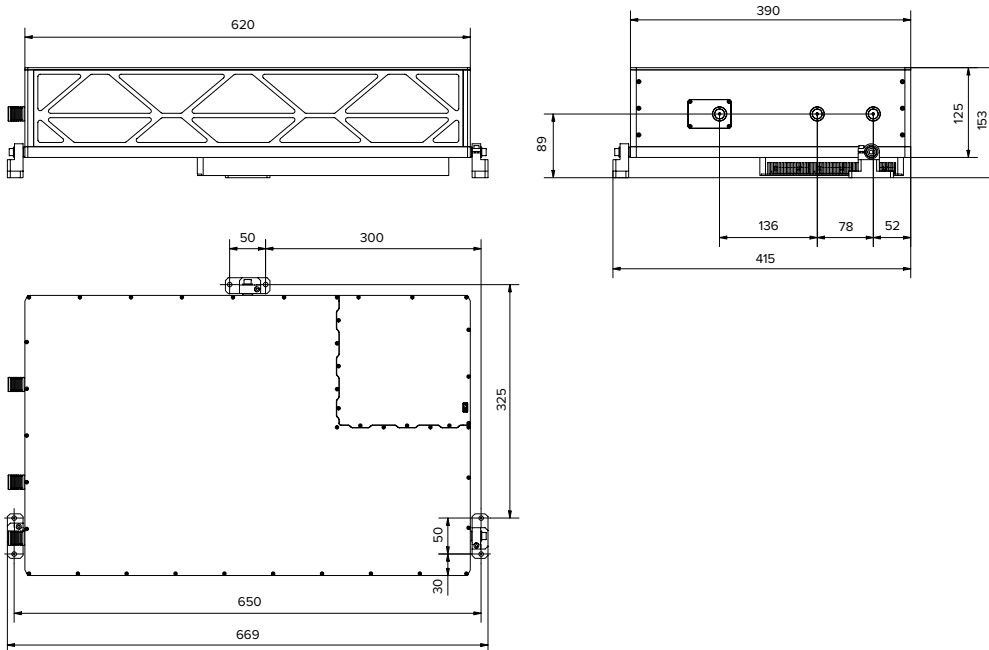


Front view of air-purging unit APU2



Rear view of air-purging unit APU2

DRAWINGS

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

Air-cooled, diode-pumped, wavelength-tunable Q-switched laser for infrared spectroscopy



Q-TUNE-IR laser head

Q-TUNE-IR is a high-peak-power coherent light source designed for infrared spectroscopy, spectrophotometry, metrology, single-molecule vibrational microscopy and remote sensing applications.

The system is based on an Optical Parametric Oscillator (OPO) that generates tunable output across the 1380–4500 nm range with a linewidth below 10 cm^{-1} . A broadband configuration, offering linewidths up to 200 cm^{-1} , is available on request.

Three OPO coating options are available to optimize performance across different spectral regions. The -TC1 option provides the best performance over the full 1.38–4.5 μm range. The -TC2 option is optimized for enhanced output in the 1.45–1.65 μm and 3.5–4 μm regions. The -TC3 option delivers superior performance in the 2.5–3.4 μm range, eliminating the typical gap near 2.87 μm . Refer to the tuning curves (performance pictures) for a detailed comparison.

QLI's advanced air-cooled (water-free) pumping technology delivers a high-quality pump beam with pulse energies up to 100 mJ, eliminating the need for external chillers or bulky power supplies. All electronics are fully integrated into the Q-TUNE-IR housing, with only a compact external power adapter required (12 or 28 VDC, 50–150 W depending on the model).

Both the pump laser and the OPO are controlled via a single Ethernet interface using a built-in web server. No additional software installation is required – any computer or mobile device with a modern web browser can operate the system. An API is also available for seamless integration into user setups.

In addition to the tunable IR output, the system provides an auxiliary port for direct access to the pump laser beam.



FEATURES

- Seamless laser and optical parametric oscillator (OPO) integration
- Remote control via PC
- Turnkey performance due to water-free pump laser design
- Guaranteed > **2 G shot** pump-diode lifetime
- Microprocessor controlled operation with self-optimization, self-calibration capability
- Hands-free automated tuning **from 1380 to 4500 nm**
- > **16 mJ** pulse energy at the peak of tuning curve
- < **10 cm^{-1}** linewidth (broadband **$\sim 200 \text{ cm}^{-1}$** version is available)
- Up to **100 Hz** pulse repetition rate
- Air purging to remove water vapor absorption lines and extend optics lifetime
- Internal or external triggering modes
- Separate output port for access to pump laser beam
- Low power consumption – from 50 to 100 W depending on model
- Can be powered from +12 VDC or +28 VDC source

OPTIONAL EQUIPMENT

- Compact spectrometer for OPO wavelength and linewidth monitoring
- Attachable attenuator for pulse energy control

APPLICATIONS

- Infrared spectrophotometry
- Cavity ring-down spectroscopy
- Gas spectroscopy
- Single molecule vibrational spectroscopy
- Scanning near-field optical microscopy
- Remote sensing

SPECIFICATIONS ¹⁾

Model	Q-TUNE-IR				
	-C10	-C100	-E33	-F10	-F20
Wavelength range, nm ²⁾	1380 – 4500 nm				
Pulse repetition rate ³⁾	10 Hz	100 Hz	33 Hz	10 Hz	20 Hz
Pulse energy ⁴⁾					
-TC1	≥ 1.8 mJ	≥ 0.6 mJ	≥ 2.5 mJ	≥ 4.5 mJ	≥ 4 mJ
-TC2	≥ 1.8 mJ	≥ 0.6 mJ	≥ 2.5 mJ	≥ 4.5 mJ	≥ 4 mJ
-TC3	≥ 2.5 mJ	≥ 0.8 mJ	≥ 3.0 mJ	≥ 5.0 mJ	≥ 4.5 mJ
Linewidth ⁵⁾	< 10 cm ⁻¹				
Pulse duration ⁶⁾	3 – 4 ns typical				
Pulse-to-pulse stability ⁷⁾	< 4.5 % RMS				
Power drift ⁸⁾	± 3.0 %				
Polarization	horizontal, linear				
Typical beam diameter ⁹⁾	3 mm		5 mm	6 mm	
Typical beam divergence ¹⁰⁾	< 7 mrad		< 5 mrad		
Jitter ¹¹⁾	< 0.5 ns RMS				

Pump laser output

Max pulse energy at fundamental wavelength ¹²⁾	30 mJ	15 mJ	50 mJ	70 mJ	60 mJ
---	-------	-------	-------	-------	-------

Dimensions

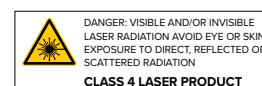
Laser head (W×L×H)	390 × 620 × 153 mm ³				
Power adapter (W×L×H) ^{13) 14)}	192 × 178 × 46 mm ³				
Air-purging unit (W×L×H) ¹⁵⁾	482 × 460 × 106 mm ³				

Operating requirements

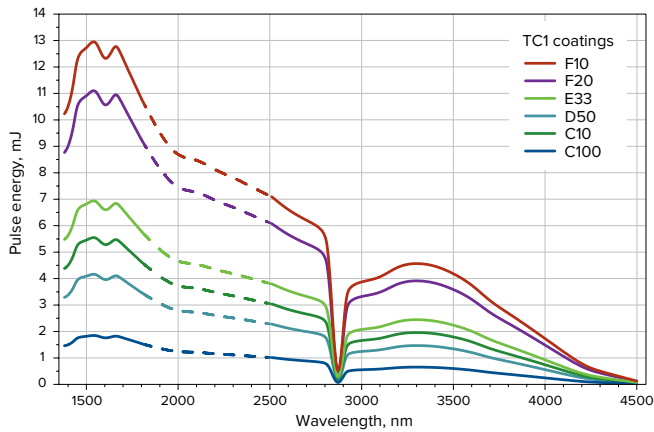
Cooling requirements	air-cooled (water-free)				
Ambient temperature	15 – 30 °C				
Relative humidity (non-condensing)	10 – 80 %				
Mains voltage ¹⁴⁾	90 – 230 VAC, single phase, 47 – 63 Hz				
Average power consumption	< 50 W	< 150 W		< 80 W	< 120 W

- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at 3300 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.
- There are two wavelengths at the exit port in 1800 – 2500 nm range corresponding to signal and idler of OPO. TC3 option has 1430 – 4000 nm tuning range.
- Factory-set pulse repetition rate in internal triggering mode. Pulse repetition rate can be divided-down to 1 Hz.
- Pulse energy at 3300 nm. See tuning curves for typical pulse energies at other wavelengths.
- Broadband version is available, with linewidth up to 200 cm⁻¹. Please inquire for details.
- FWHM level at 1550 nm, measured with 350 ps rise time photodiode.

- Measured during 30 seconds 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 at 1550 nm.
- Full angle measured at 1550 nm at the 4σ level.
- In respect to falling edge of pump-diode triggering pulse.
- Laser pulse energy is optimized for OPO pumping may differ from stand-alone laser specifications indicated here.
- Power adapter is integrated in air-purging unit's housing, both devices fit in the housing.
- Laser can be powered from an appropriate 12 or 28 VDC power source, depending on model. Please inquire for details.
- Air-purging unit is supplied with integrated power adapter.

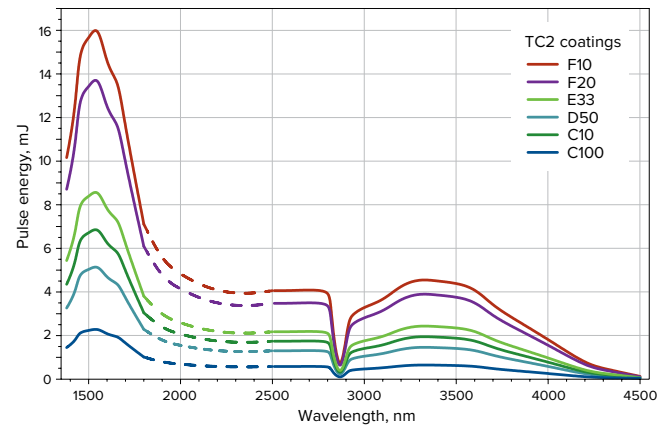


PERFORMANCE



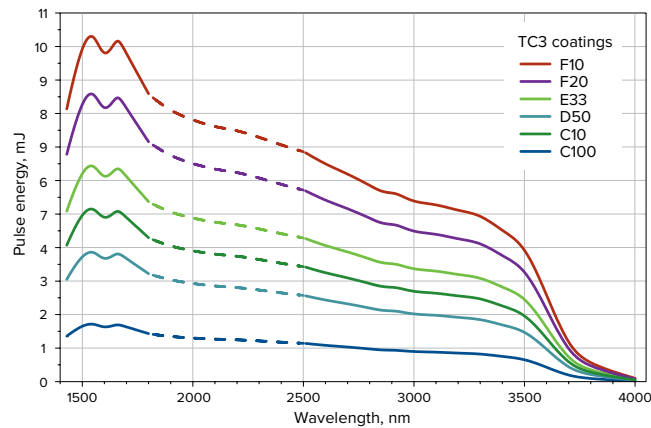
Q-TUNE-IR-TC1 tuning curves

Dashed lines show the range where signal and idler waves are spectrally unseparated.



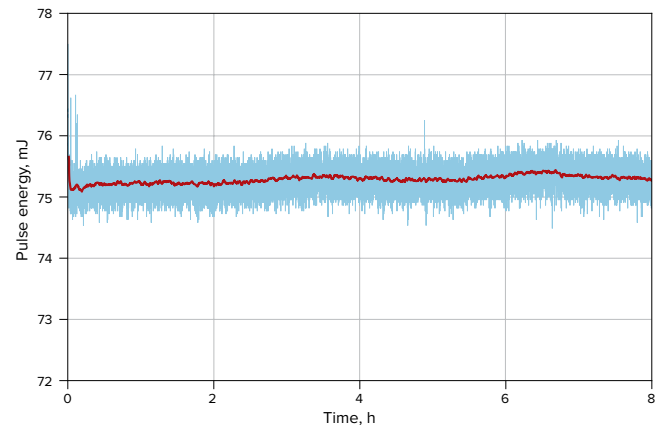
Q-TUNE-IR-TC2 tuning curves

Dashed lines show the range where signal and idler waves are spectrally unseparated.



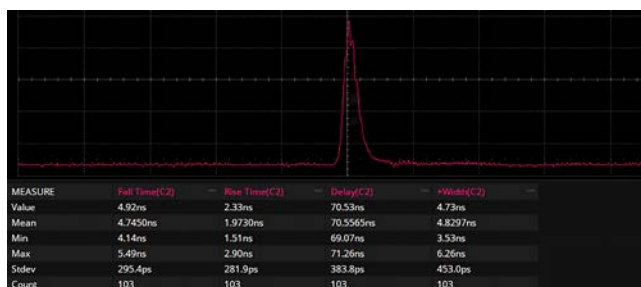
Q-TUNE-IR-TC3 tuning curves

Dashed lines show the range where signal and idler waves are spectrally unseparated.

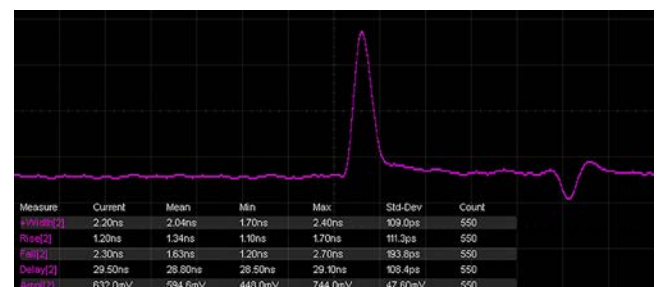


Long term stability Q-TUNE-IR-F20 @ 1st harmonic

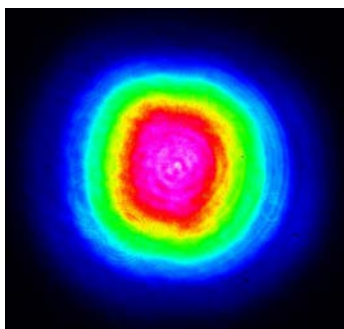
Power drift: +0.2 %; -0.17 %



Pulse duration of Q-TUNE-IR-F20 @ 1st harmonic

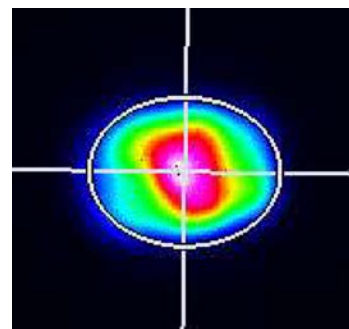


Pulse duration of Q-TUNE-IR-F20 @ 1550 nm



Q-TUNE-IR-F20 1st harmonic beam profile

Axis length (X, Y) – (3583.3, 3471.1) μm ,
effective diameter – 3527.7 μm , ellipticity – 96.9 %



Q-TUNE-IR-F20 beam profile

Axis length (X, Y) – (5152.7, 4016.4) μm ,
effective diameter – 4619.6 μm , ellipticity – 77.9 %, wavelength – 1550 nm

PART NUMBERS

Q-TUNE-IR-F10-TC1-AT/IR

Model

IR → OPO pump wavelength
1053 nm or
1064 nm

Pump laser energy level

C → > 20 mJ
D → > 40 mJ
E → > 60 mJ
F → > 80 mJ

Default pulse repetition rate in Hz

Optional items

AT/IR → motorized attenuator for 1400–1800 nm
FC/IR → fiber coupler for 1400–1800 nm
SPM3 → OPO wavelength monitoring in 700–900 nm range
EM/BB → pulse energy monitor for OPO output
APU2 → air-purging unit

Tuning range optimisation

TC1 → 1400–3300 nm
TC2 → 1550–3400 nm
TC3 → 2800–3200 nm

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 repetition 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



Front view of Q-TUNE-IR laser head



Rear view of Q-TUNE-IR laser head



Front view of air-purging unit APU2



Rear view of air-purging unit APU2



Fiber coupler FC

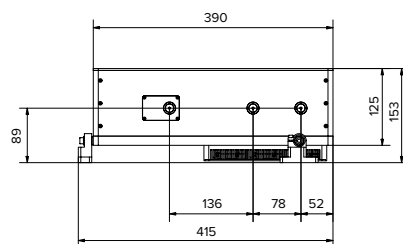
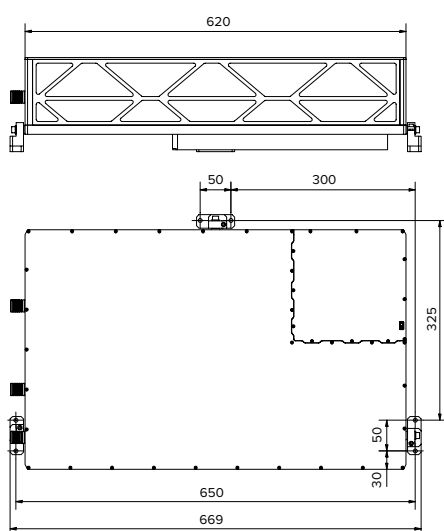


Motorized attenuator AT



Pulse energy monitor EM/BB

DRAWINGS



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

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

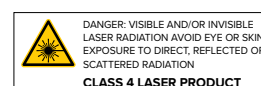
Laser head (W×L×H)	390 × 620 × 135 mm ³
Power adapter (W×L×H)	50 × 125 × 33 mm ³
Air-purging unit (W×L×H)	482 × 460 × 106 mm ³

Operating requirements

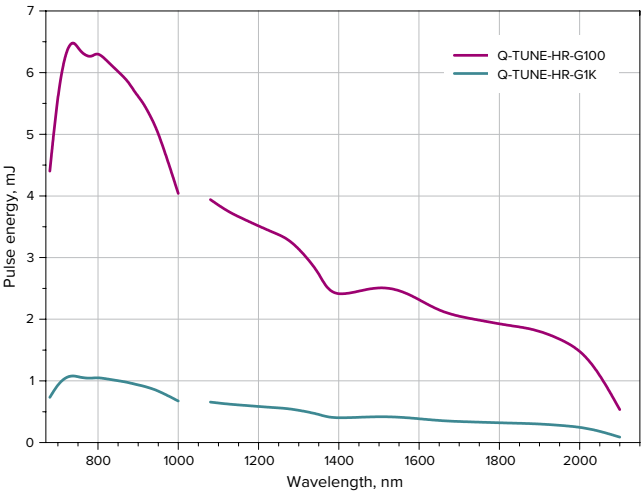
Ambient temperature	15 – 30 °C
Relative humidity (non-condensing)	10 – 80 %
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz ¹³⁾
Average power consumption	< 50 W

- 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.

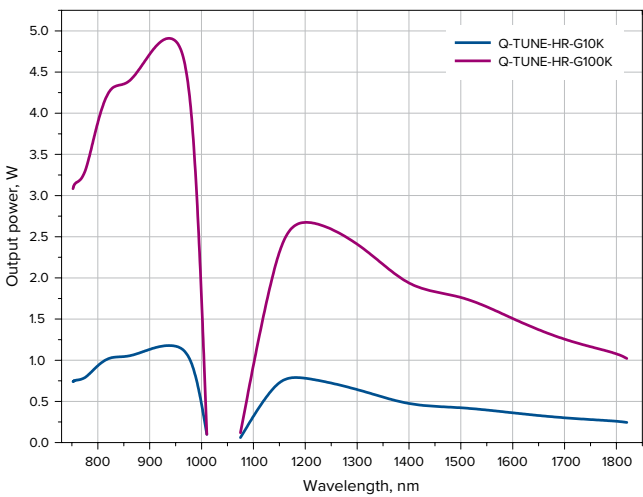
- When pumped by 8 W @ 532 nm @ 10 kHz pulse repetition rate source. See tuning curves for pulse energies at other wavelengths.
- When pumped by 30 W @ 532 nm @ 100 kHz pulse repetition rate source. See tuning curves for pulse energies at other wavelengths.
- FWHM level at 800 nm, measured with 350 ps 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

Model

- HR** → high repetition rate
- G** → OPO pump wavelength 532 nm

Pulse repetition rate in Hz or kHz

- 100 → 100 Hz
- 10K → 10 000 Hz

Optional items

- AT/NIR → attenuator for 700–1100 nm
- AT/IR → attenuator for 1200–1800 nm
- EM/BB → attachable pulse energy monitor for 210–2300 nm
- SPM2 → OPO wavelength monitoring in 480–1000 nm range
- FC/NIR → fiber coupler for NIR range
- FC/IR → fiber coupler for IR range
- APU2 → air-purging unit

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

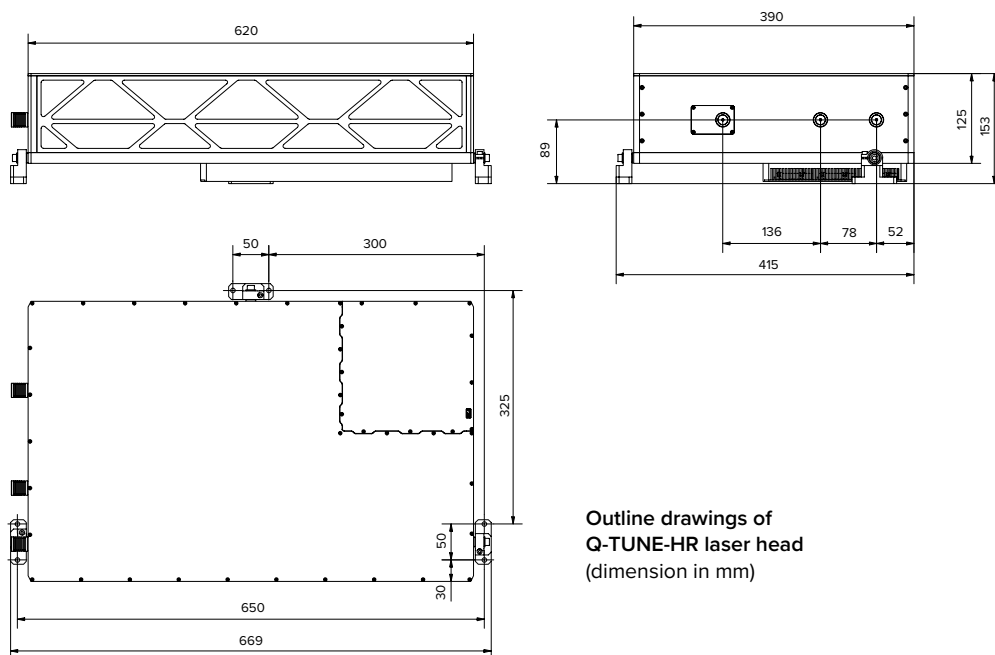


Front view of air-purging unit APU2



Rear view of air-purging unit APU2

DRAWINGS



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

Diode-pumped air-cooled Q-switched laser



Laser head Q1

Q1 is a compact, energy-efficient, diode-pumped, air-cooled Q-switched laser intended for a wide range of applications requiring high peak power pulses. The laser can be monitored and controlled using any computer or mobile device with a modern web browser and an API is available for integration with user systems.

The system can be equipped with an **H1 harmonic generator**, providing up to **two output ports** and supporting harmonic generation **up to the 5th harmonic**, depending on configuration.

All laser electronics are fully integrated within the Q1 housing, eliminating the need for external chillers or bulky power supplies.



Air-purging unit APU2
with integrated AC/DC power supply

Q1

FEATURES

- **1053 nm** or **1064 nm** wavelength from **Nd:YLF** or **Nd:YAG** laser crystals respectively
- Up to **40 mJ** pulse energy, up to **0.5 W** average output power
- Up to **50 Hz** variable pulse repetition rate
- **Air-cooled** (water-free)
- **7–10 ns** pulse duration
- Weight < **6 kg** incl. heatsink, controller & AC/DC adapter
- > **2 G shot** lifetime of pump-diode
- Built-in sync pulse generator for triggering of user equipment
- **Low jitter** triggering pulses **less than 0.5 ns RMS**
- Remote monitoring and control via built-in **Ethernet** interface

OPTIONAL EQUIPMENT

- Stand-alone **2nd, 3rd, 4th or 5th harmonic generators** of H1 series – **down to 211 nm** output
- Attachable PC controlled **motorized attenuator** for fundamental wavelength beam
- Attachable **pulse energy monitor** with analog and/or digital output
- **Fiber coupled** output
- Stand-alone closed-loop **air-purging** unit for long lifetime of UV optics

APPLICATIONS

- Laser Induced Breakdown Spectroscopy (LIBS)
- Laser ablation
- Time-of-Flight Spectroscopy (TOFS)
- Light Induced Fluorescence (LIF) Spectroscopy
- Nonlinear laser spectroscopy
- Flash photolysis
- Photo-acoustics
- Metrology

SPECIFICATIONS ¹⁾

Model	Q1								
	-B10	-C10	-D10	-B20	-C20	-D20	-50	-A50	-B50
Wavelength	1064 nm / 1053 nm								
Pulse repetition rate ²⁾	single-shot to 10 Hz			single-shot to 20 Hz			single-shot to 50 Hz		
Pulse duration ³⁾	< 8 ns						< 10 ns	< 9 ns	< 8 ns
Pulse energy ⁴⁾									
1064/1053 nm	8/10 mJ	16/20 mJ	32/40 mJ	10 mJ	15 mJ	25 mJ	2.5 mJ	5 mJ	10 mJ
532/526.5 nm	4/5 mJ	8/10 mJ	16/20 mJ	4 mJ	7.5 mJ	12.5 mJ	1.2 mJ	2.5 mJ	5 mJ
355/351 nm	2.4/3 mJ	4.5/6 mJ	9/12 mJ	2.5 mJ	5 mJ	7.5 mJ	0.6 mJ	1.5 mJ	3 mJ
266/263 nm	1.2/1.5 mJ	2.4/3 mJ	5/6 mJ	1 mJ	1.8 mJ	3 mJ	0.3 mJ	0.7 mJ	1.5 mJ
213/211 nm	0.5 mJ	1 mJ	2/2.5 mJ	0.4 mJ	0.7 mJ	1.2 mJ	0.1 mJ	0.2 mJ	0.5 mJ
Pulse to pulse energy stability ⁵⁾									
1064/1053 nm	< 0.5 % RMS								
532/526.5 nm	< 2.5 % RMS								
355/351 nm	< 3.5 % RMS								
266/263 nm	< 4 % RMS								
213/211 nm	< 5 % RMS								
Power drift ⁶⁾	± 3.0 %								
Beam profile	bell-shaped, > 75 % fit to Gaussian						nearly TEM ₀₀ , > 75 % fit to Gaussian		
Beam divergence ⁷⁾	< 1.5 mrad	< 1 mrad		< 1.5 mrad	< 1 mrad		< 1.5 mrad		
Beam pointing stability ⁸⁾	< 10 µrad			< 20 µrad					
Polarization	Linear, horizontal								
Typical beam diameter ⁹⁾	1.7 mm	2.5 mm	3.5 mm	1.7 mm	2.0 mm	2.5 mm	1.5 mm		
Jitter ¹⁰⁾	< 0.5 ns RMS								

Optional attenuator ¹¹⁾

Transmission range	0.5 – 95 %	1 – 95 %
--------------------	------------	----------

Operating requirements

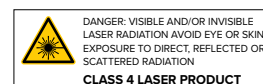
Cooling requirements	air-cooled								
Ambient temperature	15 – 30 °C								
Relative humidity	10 – 80 % (non-condensing)								
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz ¹²⁾								
Average power consumption	15 W	25 W	30 W				< 40 W		

DIMENSIONS

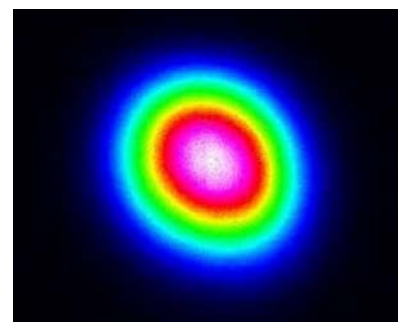
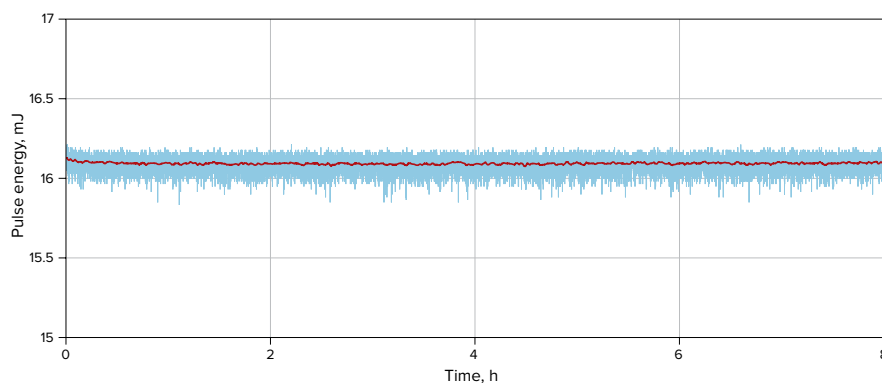
Unit	Dimensions (W×L×H)	Weight
Laser head	110 × 232 × 109 mm ³	4.5 kg
Controller unit	108 × 172 × 59 mm ³	0.8 kg
Power adapter ¹³⁾	50 × 125 × 31 mm ³	0.3 kg
Harmonic generator ¹⁴⁾	110 × 230 × 109 mm ³	4.5 kg
BSP1 plate	140 × 630 × 15 mm ³	3.5 kg

- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Factory-set pulse repetition rate is fixed at max repetition rate shown in the table. Smoothly variable pulse repetition rate is possible when laser is externally triggered. In internal triggering mode repetition rate can be divided by integer number down to f/2, f/3, f/4,... 1 Hz.
- At FWHM level at fundamental wavelength, measured with 350 ps rise time photodiode.

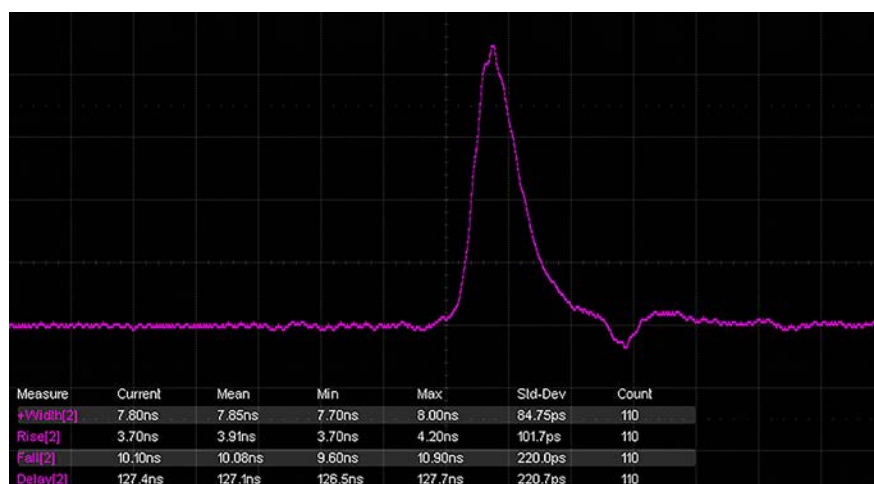
- When pulse energy is presented in xx/yy format, first number is for 1064 nm wavelength version, second – for 1053 nm version. Pulse energies for harmonic wavelengths are maximum possible values available from H1 series harmonic generator module. See datasheets of H1 for details.
- Measured during 30 seconds operation after warm-up.
- Over 8 hour period after 20 minutes of warm-up when ambient temperature variation is less than ±2 °C.
- Full angle measured at the 4σ level.
- Peak to peak value, measured for 30 seconds of operation after laser warm-up.
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- In respect to falling edge of pump-diode triggering pulse.
- Motorized attenuator intended to be attached to the laser housing. Transmission can be changed remotely through laser web-server control interface.
- Laser can be powered from an appropriate 12 VDC power source. Please inquire for details.
- Power adapter dimensions might differ from indicated here, depending on model.
- Q1 laser is compatible all models of stand-alone H1 harmonics generator. Please refer to harmonic generator datasheets for detailed specifications.



PERFORMANCE

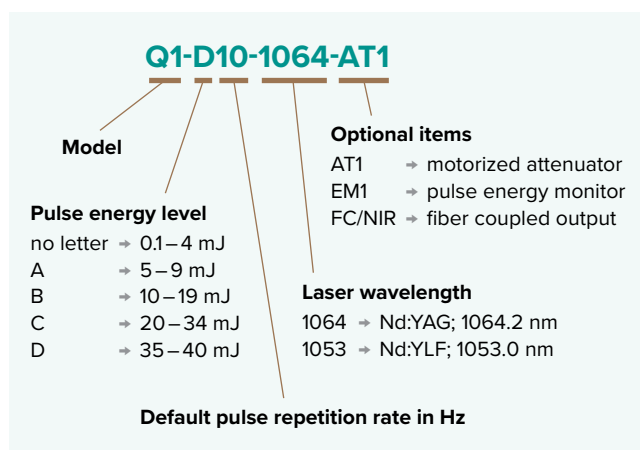


Q1-B10-1053 beam profile
Axis length (X, Y) – (728.8, 807.7) μm ,
effective diameter – 769.3 μm ,
ellipticity – 90.2 %, wavelength – 1053 nm



Pulse duration

PART NUMBERS



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 repetition 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



Laser controller with air-purging unit CTA19



Front view of CTA19



Rear view of CTA19

IMAGES



Laser head Q1.
Front view



Laser head Q1.
Rear view



Laser controller CT



Laser controller CT.
Front view



Laser controller CT.
Rear view



Fiber coupler FC



Motorized attenuator AT



Pulse energy monitor EM/BB

OPTIONAL EXTENSIONS

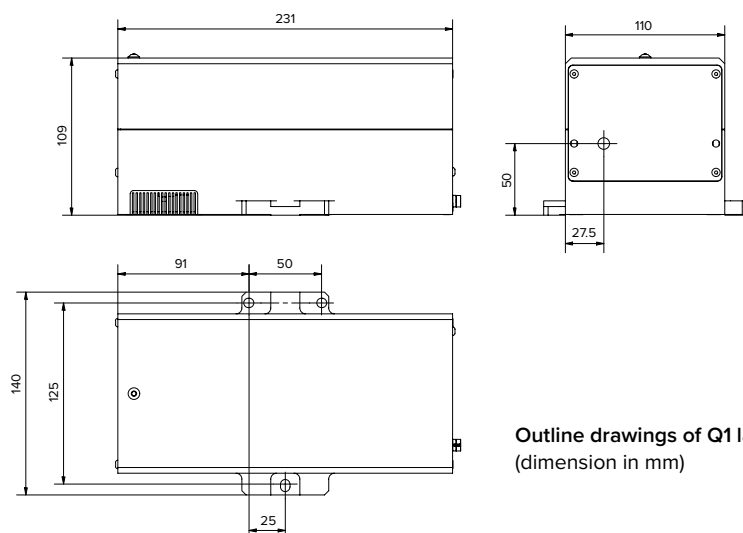


Laser head Q1
with attached fiber coupler



Laser head Q1 with H1 harmonic
generator and base plate

DRAWINGS



Outline drawings of Q1 laser head
(dimension in mm)

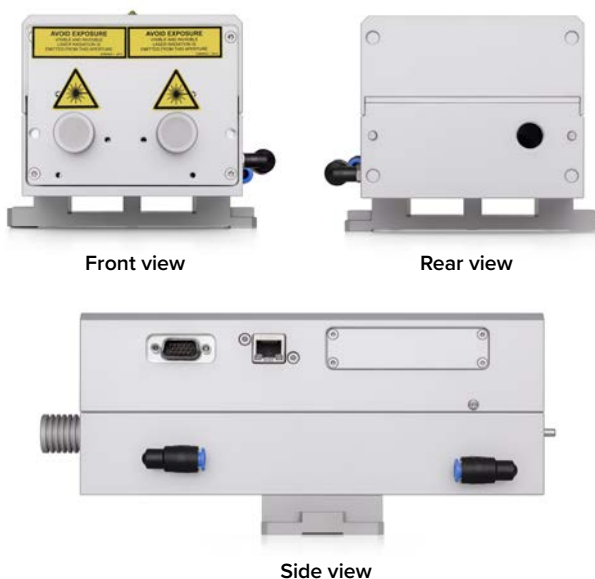
Stand-alone harmonics generator



Harmonics generator H1

H1 is **stand-alone harmonic generator** module is designed to be used with our Q1 series lasers. Module is intended to be mounted side-by-side with Q1 laser on common optical table or breadboard.

Most of high performance birefringent **crystals are hygroscopic**, which might limit their lifetime in humid environment. However, if they are continuously kept at higher than ambient temperatures, the lifetime of crystals can be significantly extended and can be even longer than laser system itself. **To keep crystals dry, H1 module needs to be always connected to the power source.** If power is not available, the module should be stored in dry environment.



H1

FEATURES

- Stand-alone **2nd, 3rd, 4th or 5th** harmonic generator compatible with Q1 series lasers
- Factory-configurable **two exit ports**
- Microprocessor controlled temperature tuned nonlinear crystals
- Remote monitoring and control via common with laser or separate **Ethernet** interface

OPTIONAL EQUIPMENT

- Motorized attenuator for up to 5th harmonic beam
- Pulse energy monitor with analog and/or digital output
- Fiber coupled output

PART NUMBERS

H1-FH-1P-AT4

Model

Output wavelength configuration

- SH → second harmonic
- TH → third harmonic
- TH/SH → third and second harmonics
- FH → fourth harmonic
- FH/SH → fourth and second harmonic
- FiH → fifth harmonic
- FiH/SH → fifth and second harmonics

See datasheet for all available options

Optional items

- AT1/AT2/AT3/AT4/AT5 → motorized attenuator
- EM1/EM2/EM3/EM4/EM5 → pulse energy monitor
- BSP1 → baseplate for mounting with H1
- FC/UV → fiber coupler for UV range
- FC/VIS → fiber coupler for VIS range
- APU2 → air-purging unit

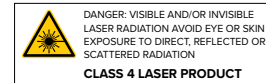
Number of exit ports (optional)

- 1P → single exit port
- 2P → two exit ports
- 3P → three exit ports

SPECIFICATIONS ¹⁾

Model	H1
Conversion efficiency ²⁾	
Fundamental to second harmonic	> 50 %
Fundamental to third harmonic	> 30 %
Fundamental to fourth harmonic	> 15 %
Fundamental to fifth harmonic	> 6 %
Pulse to pulse energy stability ³⁾	
526.5/532 nm	< 2.5 % RMS
351/355 nm	< 3.5 % RMS
263/266 nm	< 4 % RMS
211/213 nm	< 5 % RMS
Spectral purity for Port #1 ⁴⁾	> 99 %
Typical pulse duration	10 – 20 % shorter in each conversion stage
Typical beam diameter	10 – 30 % smaller than pump beam
Beam pointing stability	same as the pump beam
Dimensions	
Harmonic generator (W×L×H)	110 × 230 × 109 mm ³
Operating requirements	
Ambient temperature	15 – 30 °C
Relative humidity	10 – 80 % (non-condensing)
Powering	12 VDC ⁵⁾
Average power consumption	< 10 W

1. Due to continuous improvements all specifications are subject to change. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
2. Conversion efficiency presented here is for Port #1. Conversion efficiency at Port #2 depends on unit configuration and typically are lower than presented here. Please inquire for details.
3. When unit is pumped by our Q1 series laser. Measured during 30 seconds operation after warm-up.
4. Spectral purity at Port #2 could not be specified for two-wavelength output configuration.
5. When supplied with Q1 laser, H1 is powered from laser controller.

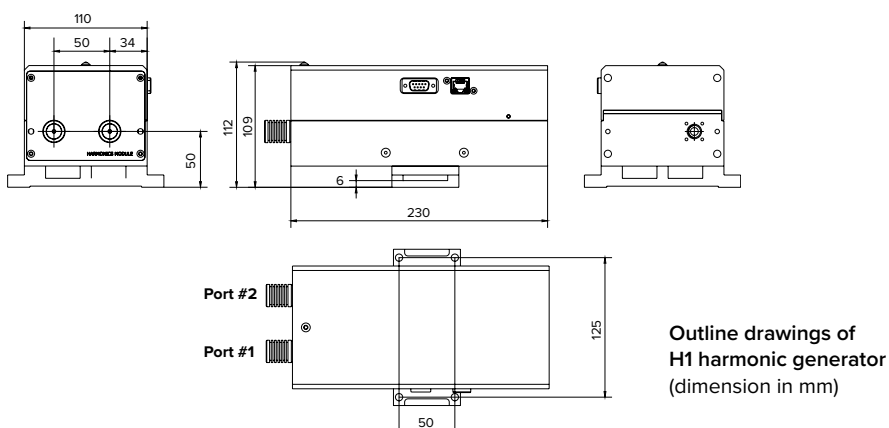


Laser head Q1 with H1 harmonic generator and base plate

CONFIGURATION OPTIONS ¹⁾

H1	Port #1			Port #2
	Wavelength ²⁾	Attenuator (optional) ³⁾	Energy monitor (optional) ⁴⁾	Wavelength
SH	532 nm	-AT2	-EM2	1064 nm ⁵⁾
TH	355 nm	-AT3	-EM3	532+1064 nm ⁶⁾
TH/SH	355 nm	-AT3	-EM3	532 nm ⁵⁾
FH	266 nm	-AT4	-EM4	532+1064 nm ⁶⁾
FH/PB	266 nm ⁷⁾	-AT4	-EM4	N/A
FH/SH	266 nm ⁷⁾	-AT4	-EM4	532 nm
FiH	213 nm ⁷⁾	-AT5	-EM5	N/A
FiH/SH	213 nm ⁷⁾	-AT5	-EM5	532 nm

1. See Figure 1 for port number assignment. Inquire for custom configurations.
2. Wavelength is shown for 1064 nm pump wavelength. For 1053 nm pump wavelength recalculate wavelengths accordingly.
3. Shows compatible attenuator model. This option is available only when H1 is supplied together with Q1 series laser.
4. Shows compatible pulse energy monitor model. This option is available only when H1 is supplied together with Q1 series laser.
5. Spectral purity is >98 %.
6. Both wavelengths exit Port #2, for separation external dichroic mirror is required.
7. Spectral purity for this model is >99.9 %.



Air-cooled diode-pumped Q-switched laser



Laser head Q2

Q2 series diode-pumped, fully air-cooled, Q-switched laser intended for wide range of applications that require high peak power pulses.

Our innovative water-free laser crystal end-pumping technology allows to produce Gaussian-like, low divergence laser beam. At the same time, Q2 is a versatile platform that can be configured in many ways.

When used with the **H-SMART stand-alone harmonic generator**, the system can provide up to **3 separate output ports** with different harmonics, extending the applicability of the Q2 lasers.



H-SMART harmonics generator with fiber coupler FC
Provides up to 5 harmonics, compatible with the Q2 lasers



FEATURES

- **1053 nm or 1064 nm** wavelength from **Nd:YLF** or **Nd:YAG** laser crystals respectively
- Up to **80 mJ** pulse energy and up to **2 W** average power
- Up to **100 Hz** pulse repetition rate
- **Air-cooled** (water-free)
- **5–10 ns** pulse duration
- Optional **< 3 ns** pulse duration at up to **40 mJ** pulse energy (short cavity version)
- Weight **< 9 kg** incl. heatsink, controller & AC/DC adapter
- Guaranteed **> 2 G shot** lifetime of pump-diodes
- **Built-in sync pulse generator** for triggering of user equipment
- **Remote monitoring and control** via built-in **Ethernet** interface

OPTIONAL EQUIPMENT

Stand alone:

- H-SMART series stand-alone **2nd, 3rd, 4th or 5th** harmonic generators
- **Two-channel pulse generator** for triggering
- **Air-purging unit** for long lifetime of UV optics

Attachable:

- **2nd harmonic generator**, model SHG
- **Beam guiding** module
- **Motorized attenuator** for fundamental wavelength beam
- **Pulse energy monitor** with analog and/or digital output

APPLICATIONS

- Light Detection And Ranging (LIDAR) (Metrology, Military, Astronomy and etc.)
- Spectroscopy (Laser Induced Breakdown (LIBS), Light Induced Fluorescence (LIFS), Flash photolysis and etc.)
- Laser ablation (marking, LCD repair, trimming, scribing and etc.)
- Medical (Ophthalmology, Dermatology, Photoacoustic Imaging (PAI) and etc.)
- Pulsed Laser Deposition (PLD)

SPECIFICATIONS at 10 Hz pulse repetition rate ¹⁾

Model	Q2				
	-B10	-C10	-D10	-E10	-F10
Pulse repetition rate ²⁾	10 Hz				
Wavelength, nm	1064/1053 nm				1053 nm
Pulse energy ³⁾	8/10 mJ	16/20 mJ	32/40 mJ	60/65 mJ	80 mJ
Typical pulse duration ⁴⁾	< 8 ns		< 7 ns		< 5 ns
Beam divergence ⁵⁾	< 1.5 mrad		< 1 mrad		
Typical beam diameter ⁶⁾	1.5 mm		3.0 mm		4.0 mm
Pulse energy stability	< 0.5 % RMS				
Power drift	± 3.0 %				
Beam profile	bell-shaped, > 80 % fit to Gaussian				
Jitter	< 0.5 ns RMS				
Polarization	linear, horizontal				

Optional harmonics generator ⁷⁾

Pulse energy ³⁾					
532/526.5 nm	4/5 mJ	8/10 mJ	16/20 mJ	30/32 mJ	40 mJ
355/351 nm	2.4/3 mJ	4.5/6 mJ	9/12 mJ	18/20 mJ	24 mJ
266/263 nm	1.2/1.5 mJ	2.4/3 mJ	5/6 mJ	9/10 mJ	12 mJ
213/211 nm	0.5 mJ	1 mJ	2 mJ	3.5 mJ	5 mJ

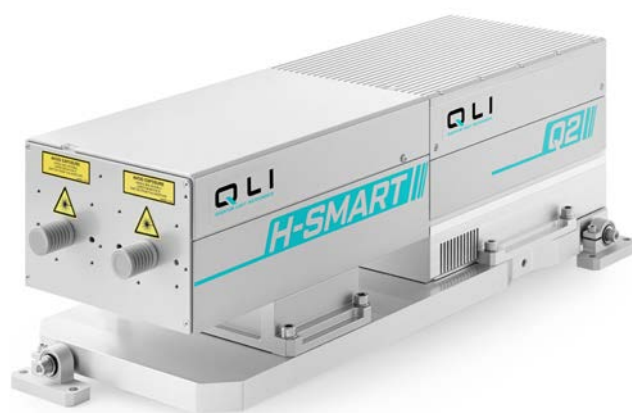
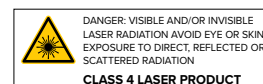
Optional attenuator ⁸⁾

Transmission range	0.5 – 95 %
--------------------	------------

Operating requirements

Cooling requirements	air-cooled (water-free)			
Ambient temperature	15 – 30 °C			
Relative humidity	10 – 80 % (non-condensing)			
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz ⁹⁾			
Average power consumption	30 W	40 W	50 W	60 W

- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Factory-set pulse repetition rate is fixed at max repetition rate shown in the table. In internal triggering mode repetition rate can be divided by integer number down to f/2, f/3, f/4,... 1 Hz.
- When pulse energy is presented in xx/yy format, first number is for 1064 nm wavelength version, second – for 1053 nm version.
- At FWHM level at fundamental wavelength, measured with 350 ps rise time photodiode. Short pulse duration version is available, with pulse duration shorter by approx 50 %. Inquire for detailed specifications.
- Full angle measured at the 4 σ level.
- Beam diameter is measured 20 cm from laser output at the 4 σ level.
- Q2 is compatible with our attachable second harmonic generator (model SHG) and all models of stand-alone H-SMART harmonics generator. Pulse energies presented here are maximum values. Please refer to harmonic generator datasheets for detailed specifications.
- Motorized attenuator intended to be attached to the laser housing. Transmission can be changed remotely through laser web-server control interface.
- Laser can be powered from an appropriate 12 or 28 VDC power source. Please inquire for details.



Laser head Q2 and H-SMART harmonics generator on BSP2 base plate

SPECIFICATIONS at 20 – 33 Hz pulse repetition rate ¹⁾

Model	Q2						
	-B20	-C20	-D20	-E20	-F20	-D33	-E33
Pulse repetition rate ²⁾	20 Hz					33 Hz	
Wavelength, nm	1064/1053 nm				1053 nm	1064/1053 nm	1064 nm
Pulse energy ³⁾	8/10 mJ	16/20 mJ	32/40 mJ	60/65 mJ	70 mJ	40 mJ	60 mJ
Typical pulse duration ⁴⁾	< 7 ns		< 5 ns				
Beam divergence ⁵⁾	< 1.5 mrad		< 1 mrad				
Typical beam diameter ⁶⁾	1.5 mm		3.0 mm	4.0 mm			
Pulse energy stability	< 0.5 % RMS						
Power drift	± 3.0 %						
Beam profile	bell-shaped, > 80 % fit to Gaussian						
Jitter	< 0.5 ns RMS						
Polarization	linear, horizontal						

Optional harmonics generator ⁷⁾

Pulse energy ³⁾							
532/526.5 nm	4/5 mJ	8/10 mJ	16/20 mJ	30/32 mJ	35 mJ	20 mJ	30 mJ
355/351 nm	2.4/3 mJ	4.5/6 mJ	9/12 mJ	18/20 mJ	21 mJ	12 mJ	18 mJ
266/263 nm	1.2/1.5 mJ	2.4/3 mJ	5/6 mJ	9/10 mJ	11 mJ	6 mJ	9 mJ
213/211 nm	0.5 mJ	1 mJ	2 mJ	3.5 mJ	4.2 mJ	2 mJ	2.5 mJ

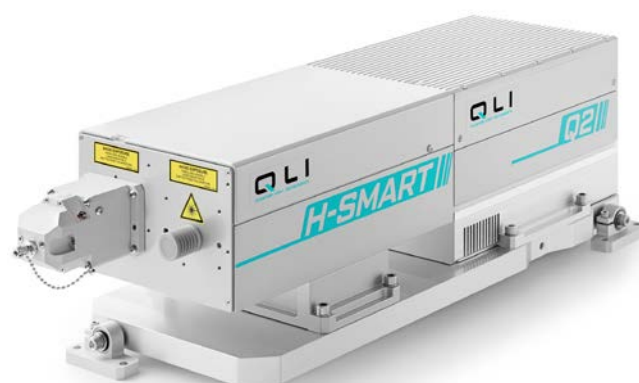
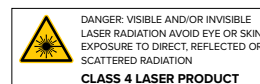
Optional attenuator ⁸⁾

Transmission range	1–95 %
--------------------	--------

Operating requirements

Cooling requirements	air-cooled (water-free)
Ambient temperature	15 – 30 °C
Relative humidity	10 – 80 % (non-condensing)
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz ⁹⁾
Average power consumption	30 W 40 W 70 W 80 W 100 W

- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Factory-set pulse repetition rate is fixed at max repetition rate shown in the table. In internal triggering mode repetition rate can be divided by integer number down to f/2, f/3, f/4,... 1 Hz.
- When pulse energy is presented in xx/yy format, first number is for 1064 nm wavelength version, second – for 1053 nm version.
- At FWHM level at fundamental wavelength, measured with 350 ps rise time photodiode. Short pulse duration version is available, with pulse duration shorter by approx 50 %. Inquire for detailed specifications.
- Full angle measured at the 4 σ level.
- Beam diameter is measured 20 cm from laser output at the 4 σ level.
- Q2 is compatible with our attachable second harmonic generator (model SHG) and all models of stand-alone H-SMART harmonics generator. Pulse energies presented here are maximum values. Please refer to harmonic generator datasheets for detailed specifications.
- Motorized attenuator intended to be attached to the laser housing. Transmission can be changed remotely through laser web-server control interface.
- Laser can be powered from an appropriate 12 or 28 VDC power source. Please inquire for details.



Laser head Q2 and H-SMART harmonics generator
with FC fiber coupler on BSP2 base plate

SPECIFICATIONS at 50 – 200 Hz pulse repetition rate ¹⁾

Model	Q2								
	-A50	-B50	-C50	-D50	-200	-100	-A100	-B100	-C100
Pulse repetition rate ²⁾	50 Hz				200 Hz	100 Hz			
Wavelength	1064/1053 nm		1064 nm						
Pulse energy ³⁾	5 mJ	8/10 mJ	16/20 mJ	40 mJ	1 mJ	2.5 mJ	5 mJ	10 mJ	20 mJ
Typical pulse duration ⁴⁾	< 7 ns		< 6 ns	< 5 ns	< 10 ns		< 8 ns		< 7 ns
Beam divergence ⁵⁾	< 1 mrad	< 1.5 mrad	< 1 mrad		< 2 mrad		< 1.5 mrad		< 1 mrad
Typical beam diameter ⁶⁾	1.5 mm		2.5 mm	3.5 mm	1.5 mm		2.0 mm	2.5 mm	3.5 mm
Pulse energy stability	< 0.5 % RMS								
Power drift	± 3.0 %								
Beam profile	bell-shaped, > 80 % fit to Gaussian								
Jitter	< 0.5 ns RMS								
Polarization	linear, horizontal								

Optional harmonics generator ⁷⁾

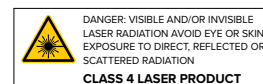
Pulse energy ³⁾									
532/526.5 nm	2.5 mJ	4/5 mJ	8/10 mJ	16/20 mJ	0.5 mJ	1.25 mJ	2.5 mJ	5 mJ	10 mJ
355/351 nm	1.5 mJ	2.4/3 mJ	4.5/6 mJ	9/12 mJ	0.25 mJ	0.7 mJ	1.5 mJ	3 mJ	6 mJ
266/263 nm	0.7 mJ	1.2/1.5 mJ	2.4/3 mJ	5/6 mJ	0.1 mJ	0.3 mJ	0.7 mJ	1.5 mJ	3 mJ
213/211 nm	0.2 mJ	0.5 mJ	1 mJ	2 mJ	0.02 mJ	0.1 mJ	0.25 mJ	0.5 mJ	1 mJ

Optional attenuator ⁸⁾

Transmission range	1 – 95 %								
--------------------	----------	--	--	--	--	--	--	--	--

Operating requirements

Cooling requirements	air-cooled (water-free)								
Ambient temperature	15 – 30 °C								
Relative humidity	10 – 80 % (non-condensing)								
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz ⁹⁾								
Average power consumption	30 W	50 W	80 W	100 W	40 W	50 W	70 W	80 W	100 W



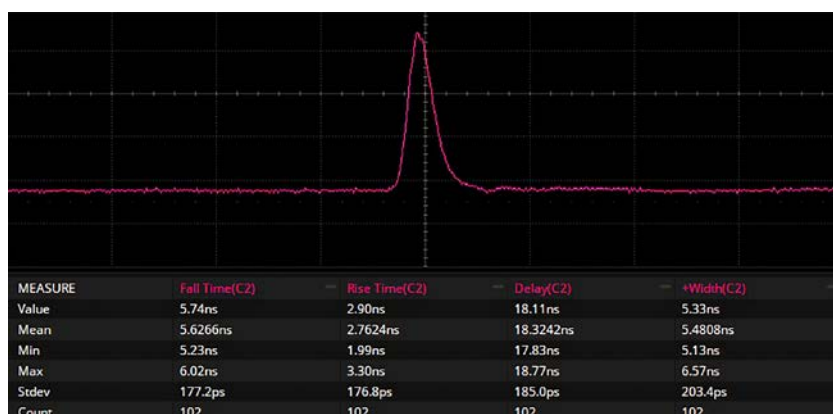
DIMENSIONS

Unit	Dimensions (W×L×H)	Weight
Laser head Q2	160 × 230 × 141 mm ³	4.8 kg
Controller unit	108 × 172 × 59 mm ³	0.8 kg
Power adapter ¹⁾	50 × 125 × 31 mm ³	1.3 kg
Harmonic generator	160 × 242 × 141 mm ³	4 – 6 kg
SHG module	153 × 78 × 65 mm ³	0.7 kg
BSP2 plate	219 × 491 × 32 mm ³	3 kg

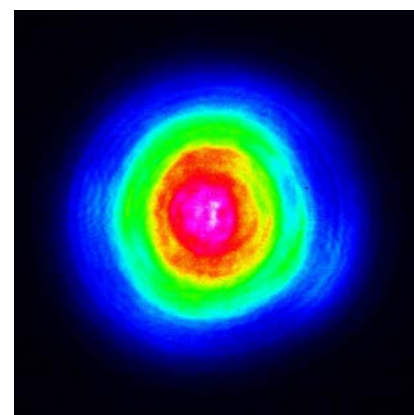
1. Power adapter dimensions might differ from indicated here, depending on model.

- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Factory-set pulse repetition rate is fixed at max repetition rate shown in the table. In internal triggering mode repetition rate can be divided by integer number down to $f/2$, $f/3$, $f/4$,... 1 Hz.
- When pulse energy is presented in xx/yy format, first number is for 1064 nm wavelength version, second – for 1053 nm version.
- At FWHM level at fundamental wavelength, measured with 350 ps rise time photodiode. Short pulse duration version is available, with pulse duration shorter by approx 50 %. Inquire for detailed specifications.
- Full angle measured at the 4σ level.
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- Q2 is compatible with our attachable second harmonic generator (model SHG) and all models of stand-alone H-SMART harmonics generator. Pulse energies presented here are maximum values. Please refer to harmonic generator datasheets for detailed specifications.
- Motorized attenuator intended to be attached to the laser housing. Transmission can be changed remotely through laser web-server control interface.
- Laser can be powered from an appropriate 12 or 28 VDC power source. Please inquire for details.

PERFORMANCE

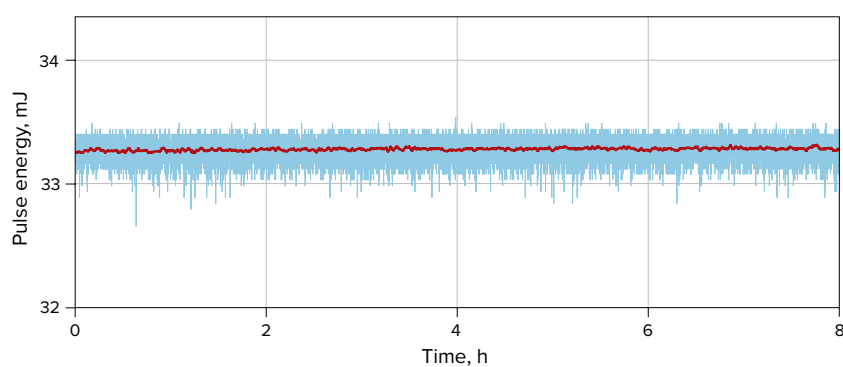


Pulse duration of Q2-D10-1064



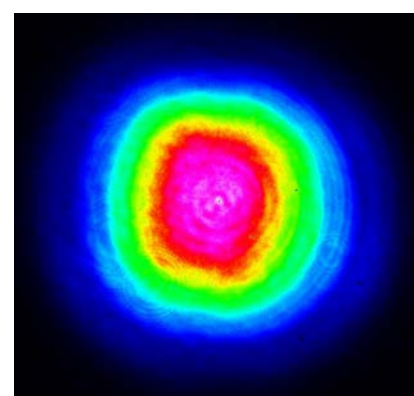
Beam profile of Q2-D10-1064

Axis length (X, Y) – (3.16, 3.18) mm,
effective diameter – 3.17 mm,
ellipticity – 99.2 %



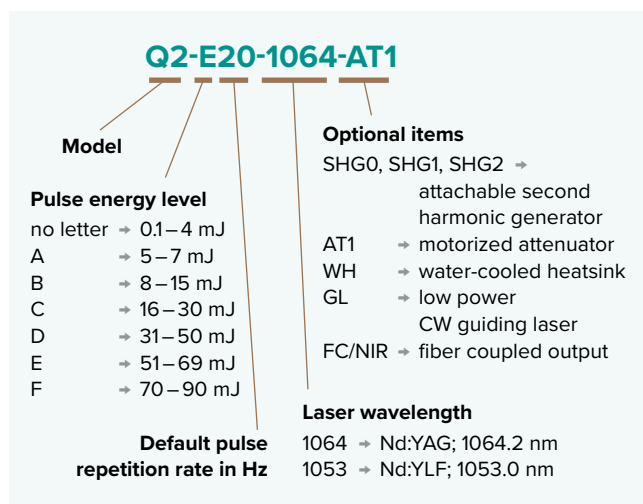
Long term stability of Q2-D10-1064

Power drift: +0.1 %; -0.1 %

Q2-F20-1053 1st harmonic beam profile

Axis length (X, Y) – (3.58, 3.47) mm,
effective diameter – 3.53 mm,
ellipticity – 96.9 %

PART NUMBERS



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 repetition 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



Laser head Q2.
Front view



Laser head Q2.
Rear view



Fiber coupler FC



Motorized attenuator AT



Pulse energy monitor EM/BB



Laser controller CT



Laser controller CT.
Front view



Laser controller CT.
Rear view



Laser controller with air-purging unit CTA19

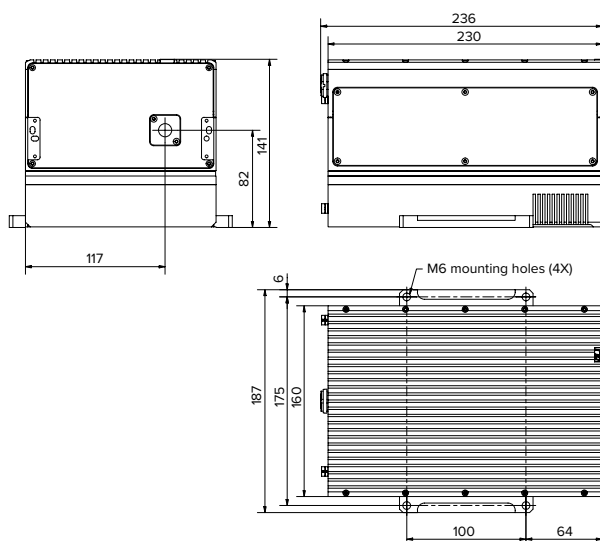


Front view of CTA19

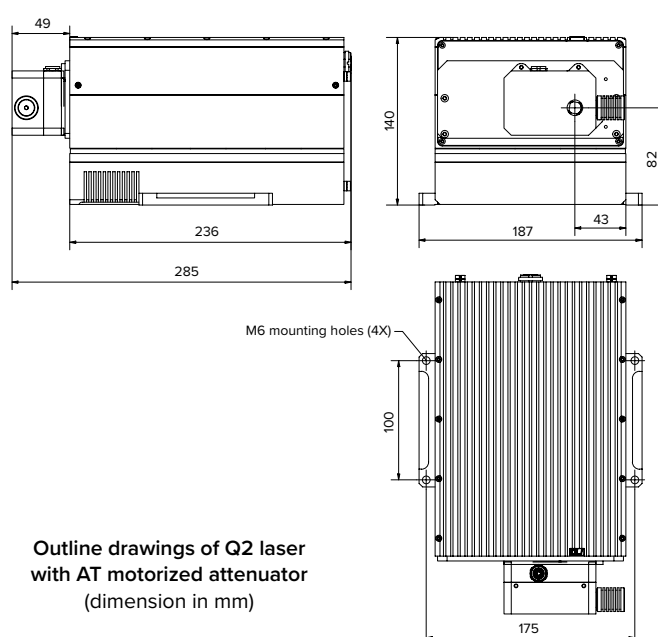


Rear view of CTA19

DRAWINGS



Outline drawings of Q2 laser
(dimension in mm)



Outline drawings of Q2 laser
with AT motorized attenuator
(dimension in mm)

High energy air-cooled Q-switched laser



Laser head Q2HE

Q2HE series high-energy DPSS lasers use water-free crystal cooling technology that provides stable high-energy operation and high-quality laser beams with pulse energies of up to 200 mJ. The system requires no external chillers or large power supplies, as most electronics are integrated into the laser head. Only a controller unit and a 28 VDC mains adapter (50 – 150 W, model dependent) remain external.

With a pulse duration of < 7 ns and low beam divergence, the Q2HE series supports efficient harmonic generation down to 211 nm. The system supports internal low-jitter triggering as well as external triggering via a delay generator. Laser control is available via Ethernet through a built-in web interface, with no software installation required. An API is available for system integration.



H-SMART harmonics generator with fiber coupler FC
Provides up to 5 harmonics, compatible with the Q2HE lasers

Q2HE

FEATURES

- Up to **200 mJ** pulse energy, up to 5 W average output power.
- **1053 or 1064 nm** output wavelength
- **Air-cooled** (water-free)
- Up to **100 Hz** repetition rate
- Smoothly variable pulse repetition rate for 1053 nm output wavelength models
- Guaranteed **> 2 G shot** lifetime of pump-diodes
- Built-in sync pulse generator for triggering of user equipment
- Remote monitoring and control via built-in Ethernet interface

OPTIONAL EQUIPMENT

- H-SMART series stand-alone **up 5th harmonic** generator
- Attachable **2nd harmonic** generator, model SHG
- Attachable **motorized attenuator** for fundamental wavelength beam
- Attachable **pulse energy monitor** with analog and/or digital output
- Attachable **beam guiding module**
- Stand-alone **two-channel pulse generator** for variable pulse repetition rate
- Stand-alone **seeder for SLM** operation
- Stand-alone **air-purging unit** for operation in harsh environments

APPLICATIONS

- Light-induced Breakdown Spectroscopy (LIBS)
- Light Detection And Ranging (LIDAR)
- Remote sensing/designation
- Laser ablation (marking, LCD repair etc.)
- Laser shock wave generation
- Pulsed light deposition (PLD)

SPECIFICATIONS ¹⁾

Model	Q2HE						
	D50	D100	E50	F10	F20	G10	H20
Wavelength	1064 or 1053 nm	1064 nm		1064 or 1053 nm		1053 nm	
Pulse repetition rate ²⁾	50 Hz	100 Hz	50 Hz	10 Hz	20 Hz	10 Hz	20 Hz
Pulse energy ³⁾	40 mJ		70 mJ	100/120 mJ	80/100 mJ	160 mJ	200 mJ
Pulse duration ⁴⁾	< 7 ns			< 6 ns			
Pulse to pulse energy stability ⁵⁾	< 0.5 % RMS						
Power drift ⁶⁾	± 3.0 %						
Beam profile	bell-shaped, >75 % fit to Gaussian						
Beam divergence ⁷⁾	< 1 mrad						
Polarization	linear, horizontal						
Typical beam diameter ⁸⁾	3.0 mm		3.5 mm	4.5 mm		5.5 mm	
Jitter ⁹⁾	< 0.5 ns RMS						

Optional harmonics generator ¹⁰⁾

Pulse energy ³⁾							
532/526.5 nm	20 mJ	35 mJ	50/60 mJ	40/50 mJ	80 mJ	100 mJ	
355/351 nm	12 mJ	20 mJ	30/40 mJ	25/30 mJ	50 mJ	70 mJ	
266/263 nm	5 mJ	10 mJ	15/20 mJ	12/15 mJ	27 mJ	30 mJ	
213/211 nm	1.5 mJ	3 mJ	4/5 mJ	3.5/4 mJ	7 mJ	10 mJ	

Optional attenuator ¹¹⁾

Transmission range	1–95 %
--------------------	--------

Dimensions

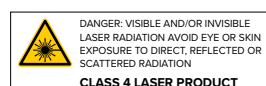
Laser head (W×L×H)	191 × 408 × 155 mm ³	
Controller unit (W×L×H)	482 × 460 × 106 mm ³	108 × 172 × 59 mm ³
AC/DC power adapter, typical (W×L×H)		192 × 178 × 46 mm ³

Operating requirements

Cooling requirements	air-cooled	
Ambient temperature	15–30 °C	
Relative humidity	10–80 % (non-condensing)	
Mains voltage	90–230 VAC, single phase, 47–63 Hz ¹²⁾	
Average power consumption	100 W	150 W
	70 W	120 W

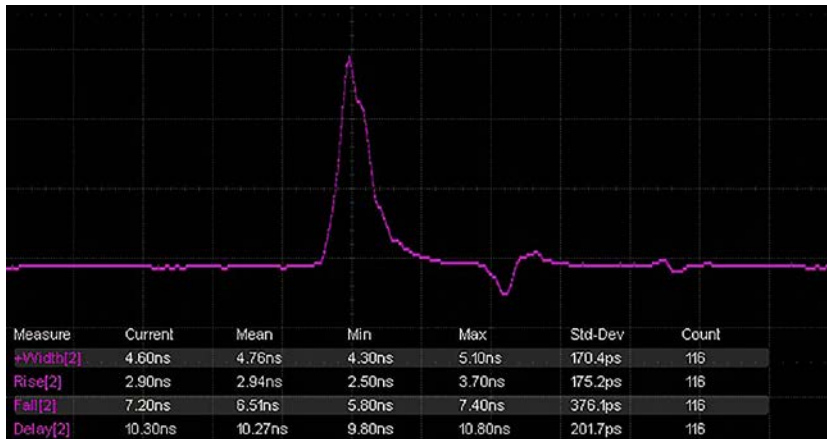
DIMENSIONS

Unit	Dimensions (W×L×H)	Weight
Laser head	191 × 408 × 155 mm ³	16.5–20 kg
Controller unit	108 × 172 × 59 mm ³	0.8 kg
Power adapter	192 × 178 × 46 mm ³	1.3 kg
Controller and power adapter CT19 ¹³⁾	482 × 460 × 106 mm ³	7.5 kg
Air-purging unit APU2		10.5 kg
Harmonic generator	160 × 244 × 141 mm ³	4–6 kg
SHG module	153 × 78 × 65 mm ³	0.7 kg
BSP3 plate	219 × 665 × 32 mm ³	6.7 kg

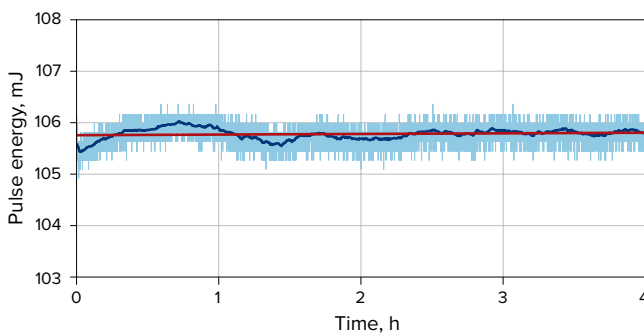
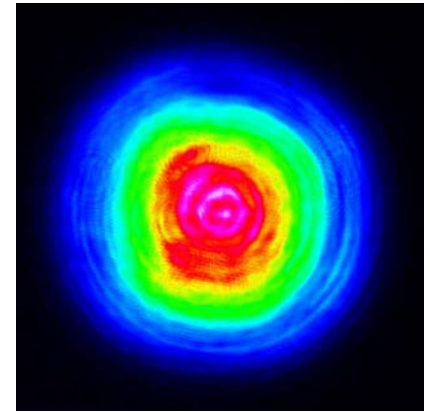


- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Factory-set pulse repetition rate is fixed at max repetition rate shown in the table. In internal triggering mode repetition rate can be divided by integer number down to f/2, f/3, f/4, ... 1 Hz. Pulse repetition rate up to 200 Hz are available by request.
- When pulse energy is presented in xx/yy format, first number is for 1053 nm wavelength version, second – for 1064 nm version.
- At FWHM level at 1064 or 1053 nm, measured with 350 ps rise time photodiode.
- Measured during 30 seconds operation after warm-up.
- Over 8 hour period after 20 minutes of warm-up when ambient temperature variation is less than ± 2 °C.
- Full angle measured at the at the 4σ level.
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- In respect to falling edge of pump-diode triggering pulse.
- Q2HE is compatible with our attachable SHG and stand-alone H-SMART harmonic generators. Pulse energies presented here are maximum values. Please refer to harmonic generator datasheets for detailed specifications.
- Motorized attenuator intended to be attached to the laser housing. Transmission can be changed remotely through laser web-server control interface.
- Laser can be powered from an appropriate 28 VDC power source. Please inquire for details.
- Power adapter dimensions depends on the model.

PERFORMANCE



Pulse duration of Q2HE-F10-1064

Long term stability of Q2HE-F10-1064
Power drift: +0.22 %; -0.23 %Beam profile of Q2HE-F10-1053
Axis length (X, Y) – (4.05, 3.94) mm,
effective diameter – 4.0 mm,
ellipticity – 97.2 %

PART NUMBERS

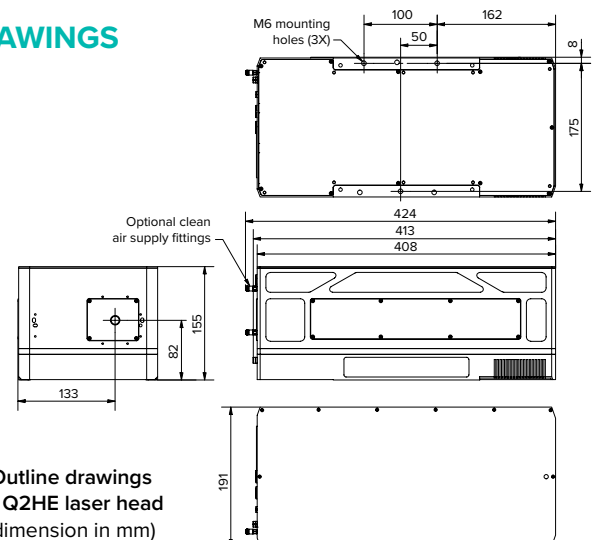
Q2HE-F10-1064-AT1	
Model	Optional items
Pulse energy level	SHG0, SHG1, SHG2 → attachable 2 nd harmonic generator
no letter → 0.1–4 mJ	P15 → long pulse duration (15 ns)
A → 5–9 mJ	AT1 → motorized attenuator
B → 10–19 mJ	EM1 → pulse energy monitor
C → 20–34 mJ	GL → low power CW guiding laser
D → 35–59 mJ	FC/NIR → fiber coupled output
E → 60–79 mJ	WH → water-cooled heatsink
F → 80–120 mJ	APU2 → air-purging unit
G → 121–160 mJ	INJ → injection seeder option for SLM linewidth
H → 161–200 mJ	
Default pulse repetition rate in Hz	
	Laser wavelength (optional)
	1064 → Nd:YAG; 1064.2 nm
	1053 → Nd:YLF; 1053.0 nm

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 repetition 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

Laser head Q2HE.
Front viewLaser head Q2HE.
Rear view

DRAWINGS

Outline drawings
of Q2HE laser head
(dimension in mm)

Attachable compact second harmonics generator



Second harmonic generator SHG attached to Q2

SHG is a compact second-harmonic generator with the Q2 and Q2HE series lasers. It offers two configurable output ports, enabling coaxial or separated delivery of the second harmonic via integrated dichroic mirrors. Connected to the laser system, SHG supports remote monitoring and control. Due to the hygroscopic nature of the nonlinear crystals, the module must remain attached to the controller during operation and be stored in a dry environment when unpowered.

SPECIFICATIONS ¹⁾

Model	SHG
Conversion efficiency ²⁾	> 50 %
Pulse to pulse energy stability ³⁾	< 2.5 % RMS
Spectral purity ⁴⁾	> 99 %
Typical pulse duration	10 – 20 % shorter than fundamental
Typical beam diameter	10 – 20 % smaller than fundamental
Beam pointing stability	same as the pump beam
Polarization at Port #1	vertical
Polarization at Port #2	horizontal

Dimensions

Housing (W×L×H)	153 × 78 × 65 mm ³
Weight	< 0.5 kg

Operating requirements

Ambient temperature	15 – 30 °C
Relative humidity	10 – 80 % (non-condensing)
Powering	from laser controller

CONFIGURATION OPTIONS ⁵⁾

Model	Port #1		Port #2	
	Wavelength ⁶⁾	EM ⁷⁾	Wavelength ⁶⁾	EM ⁷⁾
SHG-0	N/A	N/A	532+1064 nm ⁸⁾	-EM2
SHG-1	1064 nm	-EM1	532 nm	-EM2
SHG-2	532 nm	-EM2	1064 nm	-EM1

SHG

FEATURES

- **Compact** attachable **2nd harmonic** generator compatible with the Q2 and Q2HE series lasers
- Factory-configurable **two exit ports**
- Microprocessor controlled temperature tuned nonlinear crystal
- Remote monitoring and control via common with laser **Ethernet** interface
- Optional attachable pulse energy monitor

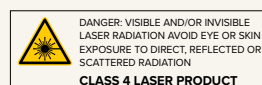
OPTIONAL EQUIPMENT

- Attachable pulse energy monitor with analog and/or digital output

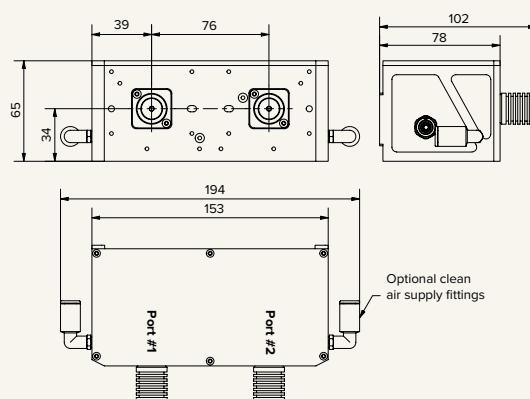
APPLICATIONS

- Laser wavelength conversion

1. Due to continuous improvements all specifications are subject to change. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
2. Fundamental to second harmonic.
3. When unit is pumped by our Q2 or Q2HE series laser. Measured during 30 seconds operation after warm-up.
4. Spectral purity for second harmonic beam.
5. See Drawings for port number assignment.
6. Wavelength is shown for 1064 nm pump wavelength. For 1053 nm pump wavelength recalculate wavelengths accordingly.
7. Shows compatible pulse energy monitor model. This option is available only when SHG is supplied together with Q2 or Q2HE series laser.
8. Both wavelengths exit Port #2, for separation external dichroic mirror is required.



DRAWINGS



Outline drawings of SHG second harmonic generator (dimensions in mm)

Stand-alone automated harmonics generator



Automated harmonics generator H-SMART

H-SMART is a stand-alone, automated harmonic generator module designed for Q2 and Q2HE series lasers. It is mounted alongside the laser on a common optical table and enables hands-free operation using temperature-tuned nonlinear crystals and built-in pulse energy monitors. The system can be remotely monitored and controlled either through the laser's control panel or via the integrated Ethernet interface. H-SMART features up to three factory-configurable output ports supporting harmonic generation up to the 5th order, with custom configurations available upon request.

H-SMART flexible design and microprocessor controlled operation enabled to implement number of advanced features:

Single output port – motorized selection of required wavelength, emitted through the same exit aperture.

Self-tuning – automatic, microprocessor controlled tuning of nonlinear crystal temperatures for maximum pulse energy.

Monitoring – monitoring of pulse energy at fundamental or harmonic wavelength.

Bypass – laser fundamental beam can bypass H-SMART with minimal losses on internal optical components.

Attenuation – ability to attenuate output pulse energies without change of laser pump energy, helping to minimize changes to beam profile and pulse duration.

Enhanced spectral purity – improved to 99.9 % spectral purity of exit wavelengths.

“Advanced Features” table below summarizes features of each model and available extensions.

H-SMART

FEATURES

- Stand-alone **2nd, 3rd, 4th or 5th** harmonic generator compatible with **Q2** and **Q2HE** series lasers
- **Microprocessor controlled** temperature tuned nonlinear crystals
- Factory-configurable up to **three exit ports**
- **Self-tuning** of crystals for maximum pulse energy
- Built-in **bypass** and/or **attenuator** of fundamental beam (for some models)
- **Remote monitoring** and control via common with laser or separate **Ethernet** interface

OPTIONAL EQUIPMENT

- **Enhanced spectral purity** of UV wavelengths
- Built-in or attachable **motorized attenuator** up to 5th harmonic beam
- Built-in or attachable pulse **energy monitor** with analog and/or digital output
- Mounting on common heatsink with Q2 series laser
- **Air-purging unit** for improved lifetime of UV harmonic crystals and optics
- **Fiber coupled** output

APPLICATIONS

- Laser wavelength conversion
- Laser pulse energy control
- Laser pulse energy monitoring

SPECIFICATIONS ¹⁾

Model	H-SMART
Conversion efficiency ²⁾	
Fundamental to second harmonic	> 50 %
Fundamental to third harmonic	> 30 %
Fundamental to fourth harmonic	> 15 %
Fundamental to fifth harmonic	> 6 %
Pulse to pulse energy stability ³⁾	
526.5/532 nm	< 2.5 % RMS
351/355 nm	< 3.5 % RMS
263/266 nm	< 4 % RMS
211/213 nm	< 5 % RMS
Spectral purity for Port #1 ⁴⁾	> 99 %
Typical pulse duration	10–20 % shorter in each conversion stage
Typical beam diameter	10–30 % smaller than pump beam
Beam pointing stability	same as the pump beam

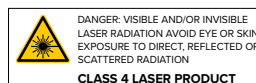
Dimensions

Harmonic generator (W×L×H)	160 × 244 × 141 mm ³
Weight	< 5 kg

Operating requirements

Ambient temperature	15–30 °C
Relative humidity	10–80 % (non-condensing)
Powering	12 VDC ⁵⁾
Average power consumption	< 20 W

1. Due to continuous improvements all specifications are subject to change. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
2. Conversion efficiency presented here is for Port #1. Conversion efficiency at Port #2 or Port #3 depends on unit configuration and typically are lower than those presented here. Please inquire for details.
3. When unit is pumped by our Q2 or Q2HE series laser. Measured during 30 seconds operation after warm-up.
4. Spectral purity at Port #2 or Port #3 could not be specified for two-wavelength output configuration.
5. When supplied with Q2 or Q2HE laser, H-SMART is powered from laser controller.



Most of high performance birefringent crystals are hygroscopic, which might limit their lifetime in a humid environment. However, if they are continuously kept at higher than ambient temperatures, **the lifetime of crystals can be significantly extended** and can be even longer than laser system itself. **To keep crystals dry, H-SMART module needs to always remain connected to the power source. If power is not available, the module should be stored in dry environment.**

ADVANCED FEATURES

H-SMART-	No. of exits	Self-tuning	Monitoring	Bypass	Attenuation
SH	2	optional	optional	-	optional
SH-AT1	2	optional	optional	✓	✓
SH-AT2	2	optional	optional	-	✓
SH/SP	1	✓	✓	✓	optional
TH	2	optional	optional	-	optional
TH-2P	2	✓	✓	-	optional
TH-AT1	2	✓	optional	-	✓
TH-3P	3	✓	optional	✓	✓
TH/SP	1	✓	optional	-	✓
TH/OPO	2	✓	✓	✓	✓
FH	2	optional	optional	-	optional
FH-1P	1	✓	optional	-	optional
FH-2P	2	✓	✓	-	optional
FH-AT1	2	✓	✓	-	✓
FH-3P	3	✓	✓	✓	✓
FH/SP	1	✓	optional	-	✓
SH/TH/FH-3P	3	✓	✓	-	optional
SH/TH/FH-2P	2	✓	✓	-	optional
SH/TH/FH-UN	1	-	-	-	✓
FiH	1	✓	optional	-	optional
FiH/FH	1	✓	optional	-	-

EXIT PORT CONFIGURATION OPTIONS ¹⁾

H-SMART-	Port #1			Port #2	Port #3
	WL ²⁾	AT ³⁾	EM ⁴⁾	WL ²⁾	WL ²⁾
SH	532 nm	-AT2	-EM2	1064 nm ⁵⁾	N/A
SH-AT1	1064 nm	built-in	-EM1	532 nm ⁵⁾	
SH-AT2	532 nm	built-in	-EM2	1064 nm ⁵⁾	
SH/SP	532/1064 nm selectable	-AT	-EM/BB	N/A	
TH	355 nm	-AT3	-EM3	532 & 1064 nm ⁶⁾	
TH-2P	355 nm	-AT3	-EM3	532 & 1064 nm ⁶⁾	
TH-AT1	355 nm	-AT3	-EM3	532 nm ⁵⁾	
TH-3P	1064 nm	built-in	built-in	532 nm ⁵⁾	355 nm ⁵⁾
TH/SP	355/532/1064 nm selectable	built-in	-EM/BB	N/A	N/A
TH/OPO	355/1064 nm selectable	built-in	-EM/BB	532 nm ⁵⁾	
FH	266 nm	-AT4	-EM4	532 & 1064 nm ⁶⁾	
FH-1P	266 nm	-AT4	-EM4	N/A	
FH-2P	266 nm	-AT4	-EM4	532 & 1064 nm ⁶⁾	
FH-AT1	266 nm	-AT4	-EM4	532 nm ⁵⁾	
FH-3P	1064 nm	built-in	built-in	532 nm ⁵⁾	266 nm ⁵⁾
FH/SP	266/532/1064 nm selectable	built-in	-EM/BB	N/A	N/A
SH/TH/FH-3P	355 nm	-AT3	-EM3	532 & 1064 nm ⁶⁾	266 nm
SH/TH/FH-2P	266/355 nm selectable	N/A	-EM/BB	532 & 1064 nm ⁶⁾	N/A
SH/TH/FH-UN	266 & 355 & 532 & 1064 nm	built-in	N/A	N/A	
FiH	213 nm ⁷⁾	-AT5	-EM5		
FiH/FH	213/266 nm selectable ⁷⁾	N/A	-EM/BB		

- See Figure 1 below for port number assignment.
- Wavelength is shown for 1064 nm pump wavelength. For 1053 nm pump wavelength recalculate wavelengths accordingly.
- Shows compatible attenuator model. This option is available only when H-SMART is supplied together with Q2 or Q2HE series laser.
- Shows compatible pulse energy monitor model. This option is available only when H-SMART is supplied together with Q2 or Q2HE series laser.
- Spectral purity is > 98 %.
- Both wavelengths exit Port #2, for separation external dichroic mirror is required.
- Spectral purity for this model is > 99.9 %.

PART NUMBERS

H-SMART-FH-2P-AT4

Model

Output wavelength configuration	Number of exit ports
SH → second harmonic	1P → single exit port
TH → third harmonic	2P → two exit ports
FiH → fifth harmonic	3P → three exit ports
FH → fourth harmonic	
SH/TH/FH → 2 nd , 3 rd and 4 th harmonic	
FiH/FH → 5 th and 4 th harmonics	
UN → unseparated wavelengths	

See datasheet for all available options

Optional items

AT1/AT2/AT3/AT4/AT5	→ motorized attenuator
EM1/EM2/EM3/EM4/EM5	→ pulse energy monitor
BSP2	→ baseplate for mounting with Q2 laser baseplate for mounting with Q2HE laser
FC/UV	→ fiber coupler for UV range
FC/VIS	→ fiber coupler for VIS range
APU2	→ air-purging unit
SP	→ Single port output

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 repetition 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



Harmonics generator H-SMART.
Front view



Harmonics generator H-SMART.
Rear view



Harmonics generator H-SMART.
Side view

OPTIONAL EXTENSIONS



Laser controller with air-purging unit CTA19



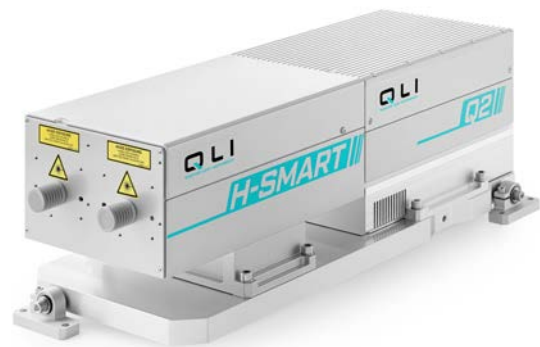
Front view of CTA19



Rear view of CTA19

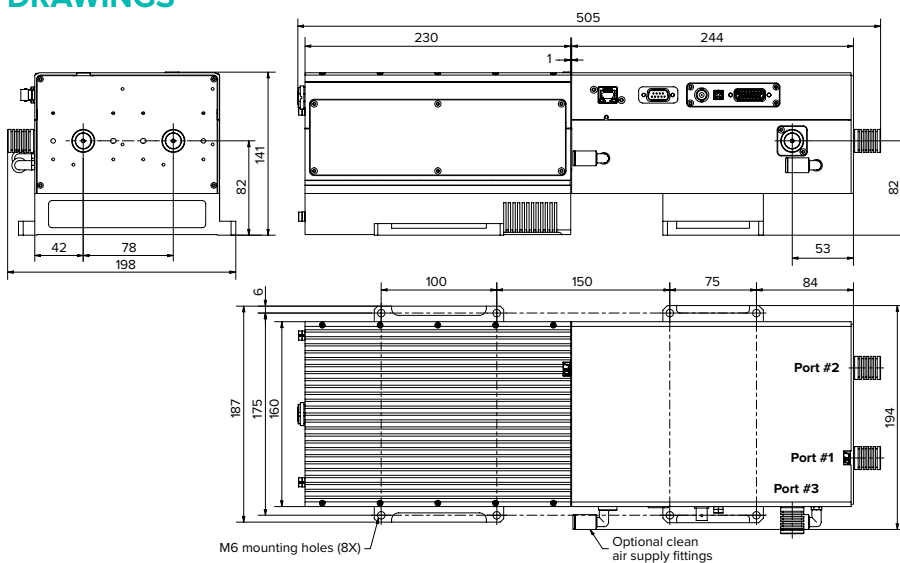


H-SMART harmonics generator with fiber coupler FC



H-SMART harmonics generator attached to Q2 laser
on BSP2 base plate

DRAWINGS



Fiber coupler FC



Attenuator AT1 and pulse
energy monitor EM1

Diode-pumped air-cooled Q-switched laser



Q-SHIFT laser head

Q-SHIFT is a family of Q-switched lasers with built-in nonlinear wavelength conversion stage that allows to produce wavelengths that are not accessible with conventional solid-state lasers. Nd:YAG or Nd:YLF lasers of Q2 or Q2HE series are used as pump sources.

The wavelengths and maximum pulse energies available are shown in the figure below and datasheets in the next pages.

High peak intensity pulses at visible wavelengths (blue, yellow and red) are provided when Q-SHIFT laser is combined with our attachable SHG or stand-alone H-SMART harmonic generator.



Laser head Q-SHIFT
Front view



Laser head Q-SHIFT
Rear view



Second harmonic generator SHG
attached to Q-SHIFT laser head



FEATURES

- Nonlinear conversions to **1169 nm, 1272 nm, 1551 nm** and **1572 nm** wavelengths
- Up to **50 mJ** pulse energy
- Up to **1 W** average power
- Up to **100 Hz** pulse repetition rate
- **Air-cooled** (water-free)
- **2–5 ns** pulse duration
- Guaranteed **> 2 G shot** lifetime of pump-diodes
- Sync pulses for triggering of user equipment
- Remote monitoring and control via built-in **Ethernet** interface

OPTIONAL EQUIPMENT

- Attachable **2nd harmonic generator**, model SHG
- H-SMART series stand-alone **2nd, 3rd or 4th harmonic generators**
- Attachable **motorized attenuator** for fundamental wavelength beam
- Attachable **pulse energy monitor** with analog and/or digital output
- Stand-alone **air-purging unit** for long lifetime of UV optics or operation in harsh environment
- Stand-alone **two-channel pulse generator** for smoothly variable pulse repetition rate, burst, double-pulse and other user-configurable modes of operation

APPLICATIONS

- Eye-safe Light Detection And Ranging (LiDAR)
- Laser micro-machining (LCD repair)
- Laser dermatology (facial renewal, hair removal, acne treatment etc.)
- Semiconductor inspection
- Time-resolved laser spectroscopy

SPECIFICATIONS ¹⁾ at 1159 nm or 1272 nm wavelength

Model ²⁾	Q-SHIFT-W1159			Q-SHIFT-W1272		
	-Bxx	-Dxx	-Fxx	-Bxx	-Dxx	-Fxx
Wavelength ³⁾	1159 nm			1272 nm		
Pulse repetition rate ⁴⁾	up to 100 Hz	up to 50 Hz	up to 20 Hz	up to 100 Hz	up to 50 Hz	up to 20 Hz
Pulse energy	3.5 mJ	14 mJ	25 mJ	2 mJ	8 mJ	14 mJ
Typical pulse duration ⁵⁾	2 – 5 ns					
Pulse energy stability ⁶⁾	< 3 % RMS			< 5 % RMS		
Power drift ⁷⁾	± 3.0 %					
Beam divergence ⁸⁾	< 3.0 mrad					
Typical beam diameter ⁹⁾	3 – 4 mm typical					
Beam profile	bell shaped, > 75 % fit to Gaussian					
Polarization	linear, > 95 %					
Jitter ¹⁰⁾	< 0.5 ns RMS					

Optional harmonics generator ¹¹⁾

Pulse energy ¹²⁾						
579.5 nm / 636 nm	1.2 mJ	5 mJ	9 mJ	0.5 mJ	2 mJ	3.5 mJ
386 nm / 424 nm	0.4 mJ	1.6 mJ	3 mJ	0.16 mJ	0.6 mJ	1.2 mJ
290 nm / 318 nm	0.25 mJ	1 mJ	1.8 mJ	0.1 mJ	0.4 mJ	0.7 mJ

SPECIFICATIONS ¹⁾ at 1551 nm or 1572 nm wavelength

Model ²⁾	Q-SHIFT-W1551 / Q-SHIFT-W1572						
	-Bxx	-Cxx	-Dxx	-Exx	-F20	-F10	-H20
Wavelength ³⁾	1551±1 nm or 1572±1 nm						1551±1 nm
Pulse repetition rate ⁴⁾	up to 100 Hz		up to 50 Hz	up to 33 Hz	up to 20 Hz	10 Hz	20 Hz
Pulse energy	2.5 mJ	5 mJ	10 mJ	16 mJ	18 mJ	22 mJ	50 mJ
Typical pulse duration ⁵⁾	2 – 5 ns						
Pulse energy stability ⁶⁾	< 3.5 % RMS						
Power drift ⁷⁾	± 3.0 %						
Beam divergence ⁸⁾	5.0 mrad typical						< 6 mrad
Typical beam diameter ⁹⁾	3 – 6 mm typical						7 mm
Beam profile	bell shaped, > 75 % fit to Gaussian						
Polarization	linear, > 95 %						
Jitter ¹⁰⁾	< 0.5 ns RMS						

Optional harmonics generator ¹¹⁾

Pulse energy							
775.5/786 nm	0.63 mJ	1.25 mJ	3 mJ	5 mJ	6 mJ	7 mJ	–
517/524 nm	0.3 mJ	0.6 mJ	1.5 mJ	2.5 mJ	3 mJ	3.5 mJ	
388/393 nm	0.13 mJ	0.25 mJ	0.6 mJ	1 mJ	1.2 mJ	1.4 mJ	

1. Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.

2. xx in the model name sets laser repetition rate, for example Q-SHIFT-W1159-B100 laser will have factory-set 100 Hz pulse repetition rate.

3. Depend on pump-laser wavelength.

4. Standard factory-set repetition rates are 10 Hz, 20 Hz, 33 Hz, 50 Hz and 100 Hz. Specify required pulse repetition rate when ordering, for example -D50 would mean laser with 50 Hz pulse repetition rate.

5. At FWHM level at fundamental wavelength, measured with 350 ps rise time photodiode

6. Measured during 30 seconds operation after warm-up.

7. Over 8 hour period after 20 minutes of warm-up when ambient temperature variation is less than ±2 °C.

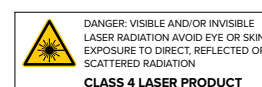
8. Full angle measured at the 4σ level.

9. Beam diameter is measured 20 cm from laser output at the 4σ level.

10. In respect to falling edge of pump-diode triggering pulse.

11. Q-SHIFT is compatible with our attachable second harmonic generator (model SHG) and stand-alone H-SMART harmonics generator. Pulse energies presented here are maximum values. Please refer to harmonic generator datasheet for detailed specifications.

12. Black-labelled pulse energies measured at black-marked wavelength; teal-labelled at teal-marked wavelength.



COMMON SPECIFICATIONS

Operating requirements	
Ambient temperature	15–30 °C
Relative humidity	10–80 % (non-condensing)
Mains voltage ¹⁾	90–230 VAC, single phase, 47–63 Hz
Average power consumption	30–100 W

DIMENSIONS

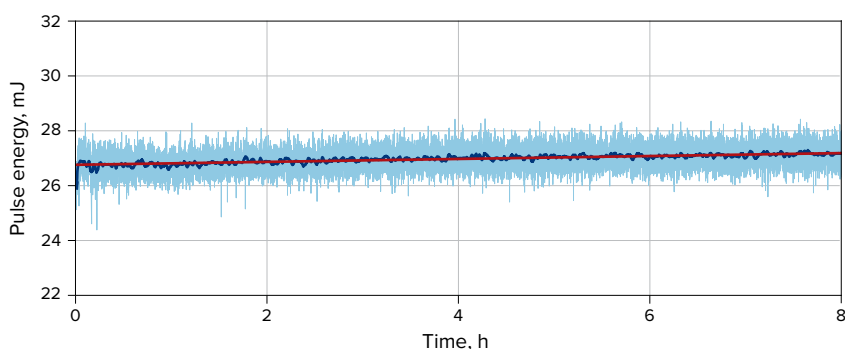
Unit	Dimensions (W×L×H)	Weight
Laser head ²⁾	191 × 408 × 155 mm ³	15–17 kg
Q-SHIFT-H20 laser head	400 × 400 × 200 mm ³	20 kg
Controller CT	108 × 172 × 59 mm ³	0.8 kg
Power adapter	192 × 178 × 46 mm ³	1.6 kg
Controller and power adapter CT19 ³⁾	482 × 460 × 106 mm ³	7.5 kg
Air-purging unit APU2		10.5 kg

OPTIONAL ITEMS

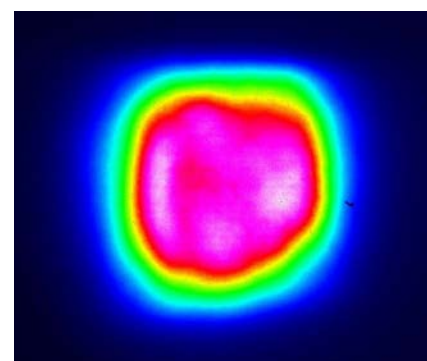
WF	Stand-alone wireless router for wireless laser control
RS	Stand-alone adapter for laser control via RS-232 port
PC	Laptop computer for laser control
EXP	Stand-alone pulse generator for variable repetition rate
CT19	19" mounted controller with integrated AC/DC power supply
CTA19	19" mounted controller 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

1. Laser can be powered from an appropriate 12 or 28 VDC power source. Please inquire for details.
2. Laser housing size depends on average power at output wavelength.
3. Power adapter dimensions depend on the model.

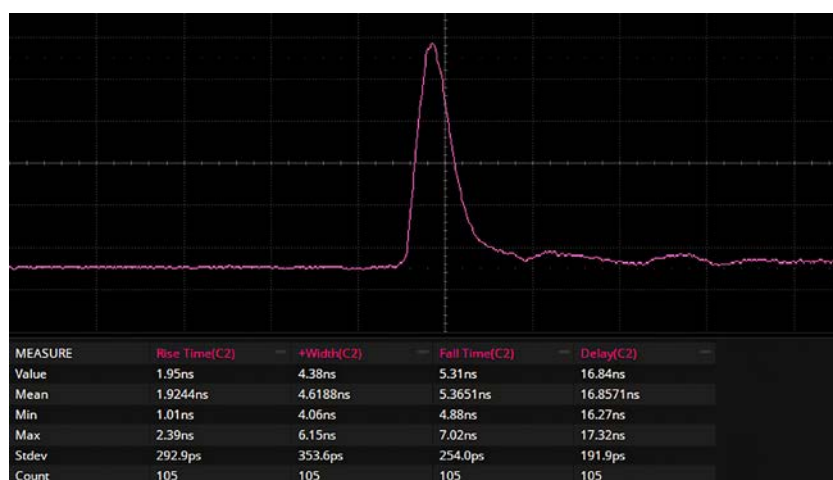
PERFORMANCE



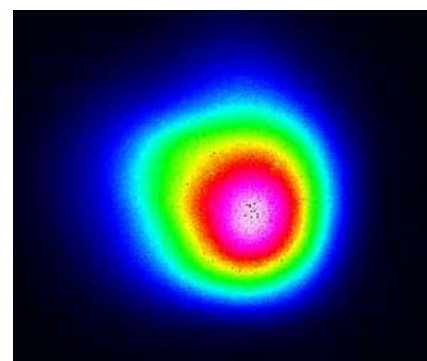
Long term stability of Q-SHIFT-F10-W1551
Power drift: +1.1 %; -1.57 %



Beam profile of Q-SHIFT-W1551-H20
Axis length (X, Y) – (11.8, 11.1) mm,
effective diameter – 11.4 mm,
ellipticity – 94.1 %



Pulse duration of Q-SHIFT-H20 @ 1551 nm



Beam profile of Q-SHIFT-W1551-D10
Axis length (X, Y) – (3.5, 3.3) mm,
effective diameter – 3.4 mm,
ellipticity – 95.6 %

PART NUMBERS

Q-SHIFT-F20-W1551-AT/IR

Model

Pulse energy level

no letter	→	< 1 mJ
A	→	1–2 mJ
B	→	2–4 mJ
C	→	4–8 mJ
D	→	8–16 mJ
E	→	16–22 mJ
F	→	22–32 mJ
G	→	32–50 mJ
H	→	> 50 mJ

Default pulse repetition rate in Hz

W1159	→	1159 nm
W1272	→	1272 nm
W1551	→	1551 nm
W1572	→	1572 nm

Laser wavelength**Optional items**

SHG0, SHG1, SHG2	→	attachable second harmonic generator
AT/IR	→	motorized attenuator for IR range
EM/BB	→	pulse energy monitor
WH	→	water-cooled heatsink
FC/IR	→	fiber coupled output

IMAGES



Front view of CT A19



Rear view of CT A19



Laser controller with air-purging unit CT A19

Laser controller CT.
Front viewLaser controller CT.
Rear view

Laser controller CT



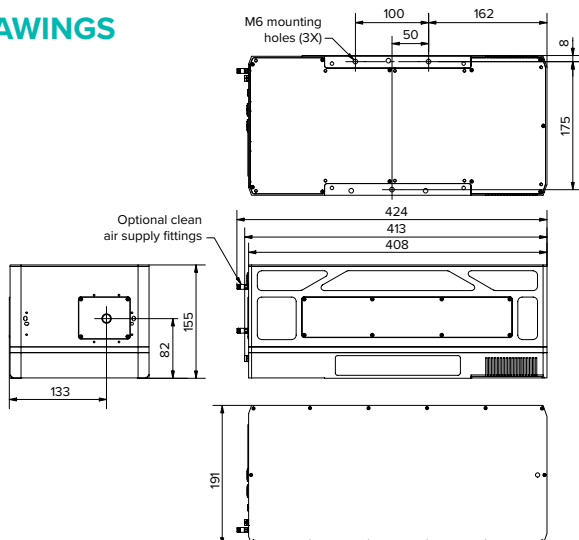
Fiber coupler FC

Attenuator AT1 and pulse
energy monitor EM1

Motorized attenuator AT

H-SMART harmonics generator
with fiber coupler FC

DRAWINGS

Outline drawings of Q-SHIFT laser
(dimension in mm)

Air-cooled short-pulse Q-switched laser



Q-SPARK laser head

Q-SPARK is a diode-pumped, water-free, Q-switched laser designed for applications requiring sub-nanosecond pulse durations. Its optimized water-free end-pumping technology delivers Gaussian-like, low-divergence pulses in the sub-nanosecond or nanosecond range, with peak power up to **20 MW**, all within a compact and energy-efficient platform. The passively Q-switched configuration can provide pulse durations down to **750 ps**.

The laser is monitored and controlled via an Ethernet interface with a built-in web server and an API is available for integration into user systems.



FEATURES

- Short **sub-nanosecond** pulse duration down to **750 ps** and **> 5 mJ** pulse
- Up to **20 mJ** pulse energy at **1064 nm**, up to **20 MW** peak power
- **Air-cooled** (water-free)
- Up to **100 Hz** repetition rate
- **> 2 G shot** lifetime of pump-diodes
- Built-in sync pulse generator for triggering of user equipment
- Remote monitoring and control via built-in **Ethernet** interface

OPTIONAL EQUIPMENT

- Built-in **2nd, 3rd, 4th or 5th harmonic generator**
- Attachable PC controlled **motorized attenuator** with analog and/or digital output
- Attachable **pulse energy monitor**
- **Fiber coupled** output
- Auxiliary **exit port** for residual harmonic generator wavelength access

APPLICATIONS

- Laser Induced Breakdown Spectroscopy (LIBS)
- Light Detection And Ranging (LIDAR)
- Laser ablation/micromachining
- Time-of-Flight Spectroscopy (TOFS)
- Time Resolved Spectroscopy (TRS)
- Raman spectroscopy
- Dermatology (tattoo removal etc.)
- Ophthalmology
- Time domain thermorefectance (TDTR)

SPECIFICATIONS ¹⁾

Model	Q-SPARK-						
	100PS	20PS	A10PS	A100	A50	B20	C10
Wavelength	1064 nm						
Q-Switch type	Passive, Cr:YAG			Active, Pockels cell			
Pulse repetition rate ²⁾	100 Hz	20 Hz	10 Hz	100 Hz	50 Hz	20 Hz	10 Hz
Pulse energy, mJ	1 mJ	2 mJ	5 mJ	2 mJ	5 mJ	10 mJ	20 mJ
Typical pulse duration ³⁾	< 2 ns		< 800 ps	< 2 ns		< 1.5 ns	
Pulse to pulse energy stability ⁴⁾	< 1.5 % RMS			< 1.2 % RMS			
Linewidth	SLM ⁵⁾			< 0.8 cm ⁻¹			
Power drift ⁶⁾	± 3.0 %						
Beam profile	nearly TEM ₀₀ , > 85 % fit to Gaussian						
Beam divergence ⁷⁾	< 1.5 mrad					< 1 mrad	
Polarization	linear, horizontal						
Typical beam diameter ⁸⁾	1.2 mm		2.0 mm				
Jitter ⁹⁾	1 μs RMS			< 0.5 ns RMS			

Optional built-in harmonics generator ¹⁰⁾

Pulse energy							
532 nm	0.5 mJ	1 mJ	2.5 mJ	1 mJ	2.5 mJ	5 mJ	10 mJ
355 nm	0.25 mJ	0.5 mJ	1.6 mJ	0.5 mJ	1.6 mJ	2.5 mJ	5 mJ
266 nm	0.1 mJ	0.2 mJ	0.8 mJ	0.2 mJ	0.8 mJ	1.5 mJ	2.5 mJ

Optional attenuator ¹¹⁾

Transmission range	0.5 – 95 %
--------------------	------------

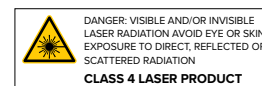
Dimensions

Laser head (W×L×H)	140× 277 × 135 mm ³
Controller unit CT (W×L×H)	108× 172 × 59 mm ³
Power adapter (W×L×H) ¹²⁾	50 × 125 × 32 mm ³ typical (for +12 VDC output)

Operating requirements

Cooling requirements	air-cooled
Ambient temperature	15 – 30 °C
Relative humidity	10 – 80 % (non-condensing)
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz ¹³⁾
Average power consumption	40 W 30 W 50 W 40 W 30 W

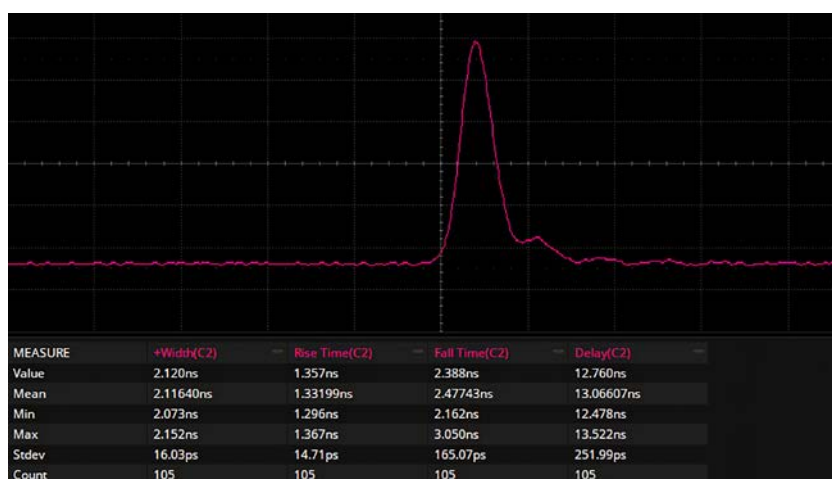
- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Factory-set pulse repetition rate is fixed at max repetition rate shown in the table.
- At FWHM level at fundamental wavelength, measured with 350 ps rise time photodiode.
- Measured during 30 seconds operation after warm-up.
- SLM pulses are produced for > 95 % of operating time.
- Over 8 hour period after 20 minutes of warm-up when ambient temperature variation is less than ±2 °C.
- Full angle measured at the 4σ level.
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- In respect to falling edge of pump-diode triggering pulse.
- Q-SPARK can be configured with built-in harmonics generator and beam separators for selecting single wavelength at the exit port. Two port configuration is available by request.
- Motorized attenuator intended to be attached to the laser housing. Transmission can be changed remotely through laser web-server control interface.
- Power adapter dimensions might differ from indicated here, depending on model.
- Laser can be powered from an appropriate 12 VDC power source. Please inquire for details.



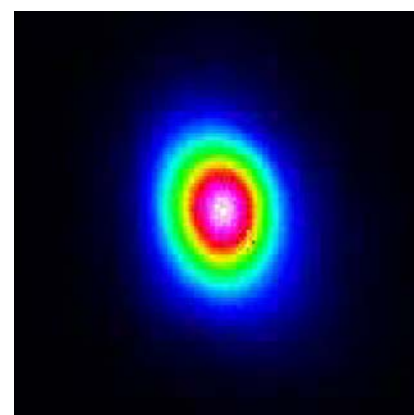
WEIGHT

Unit	Weight
Laser head	6.5 kg
Controller CT	0.8 kg
AC/DC power adapter	0.25 kg
Air-purging unit APU2	7.5 kg

PERFORMANCE

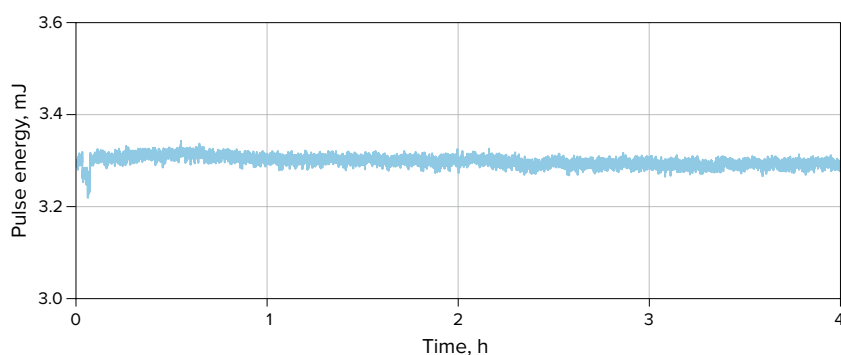


Typical temporal waveform of Q-SPARK-A100 laser



Beam profile of Q-SPARK-A100-1064

Axis length (X, Y) – (1.64, 1.43) mm,
effective diameter – 1.54 mm,
ellipticity – 87.0 %



Long term stability of Q-SPARK-A100

PART NUMBERS

Q-SPARK-A10PS-FH-AT1	
Model	Optional items
Pulse energy level	AT1/AT2/AT3/AT4 → motorized attenuator
no letter → 0.1–4 mJ	EM1/EM2/EM3/EM4 → pulse energy monitor
A → 5–9 mJ	RE → additional output port for residual wavelengths
B → 10–19 mJ	TM → low jitter sync pulse
C → > 20 mJ	APU2 → air-purging unit
Default pulse repetition rate in Hz	Built-in harmonic generator
PS → passive Q-switch	SH → second harmonic
no letter → active Q-switch	TH → third harmonic
	FH → fourth harmonic

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 repetition 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



Q-SPARK laser head
Front view



Q-SPARK laser head
Rear view



Q-SPARK
laser head



Attenuator AT1 and pulse
energy monitor EM1



Fiber coupler FC



Laser controller CT



Laser controller CT.
Front view



Laser controller CT.
Rear view



Laser controller with air-purging unit CTA19

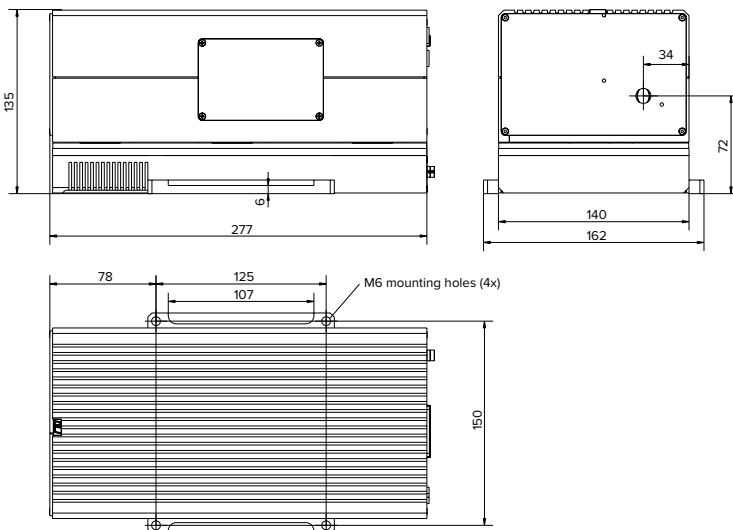


Front view of CTA19



Rear view of CTA19

DRAWINGS



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

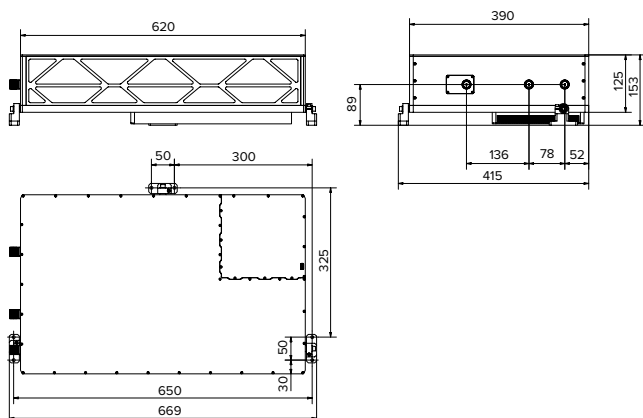
Double-pulse diode-pumped Air-cooled Q-switched laser



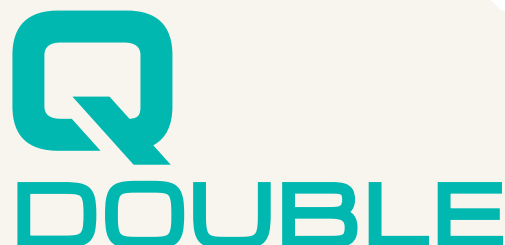
Q-DOUBLE laser head

Q-DOUBLE is a diode-pumped, fully air-cooled (water-free) Q-switched laser designed to generate two pulses with variable temporal separation. The system operates at 1053 nm (Nd:YLF) or 1064 nm (Nd:YAG) and delivers up to 160 mJ total pulse energy at 10 Hz, or up to 40 mJ at 100 Hz.

All electronics are integrated within a compact housing requiring no external chiller; only a 12 or 28 VDC mains adapter (50–200 W, model dependent) is needed. The laser is controlled via a built-in Ethernet web interface and supports both internal low-jitter triggering (up to 450 μ s lead) and external triggering.



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



FEATURES

- Up to **80 mJ** pulse energy and/or up to **2 W** average power (for each channel)
- Up to **100 Hz** pulse repetition rate
- Air-cooled (**water-free**)
- **5–10 ns** pulse duration
- **10 ns – 100 ms** temporal separation
- Stand-alone delay generator for timing adjustment
- Guaranteed **> 2 G shot** lifetime of pump-diodes
- Built-in sync pulse generator for triggering of user equipment
- Remote monitoring and control via built-in **Ethernet** interface

OPTIONAL EXTENSIONS

- Built-in **2nd, 3rd or 4th harmonic** generator
- Built-in attenuators for fundamental wavelength
- Pulse energy monitor for each channel
- **< 3 ns** pulse duration at up to **40 mJ** pulse energy (short cavity version)
- Stand-alone air-purging unit
- Red or green beam guiding module

APPLICATIONS

- Particle Image Velocimetry (PIV)
- Laser-induced Breakdown Spectroscopy (LIBS)
- Laser-induced fluorescence (LIF)
- Planar laser-induced fluorescence (PLIF)
- Laser ablation/cleaning
- Holography
- Electronic Speckle Interferometry (ESPI)

SPECIFICATIONS ¹⁾

Model	Q-DOUBLE				
	-F10	-E20	-E33	-D50	-C100
Wavelength, nm	1053 nm	1053 or 1064 nm	1064 nm		
Pulse repetition rate ²⁾	10 Hz	20 Hz	33 Hz	50 Hz	100 Hz
Pulse energy	80 mJ	60 mJ		40 mJ	20 mJ
Typical pulse duration ³⁾	< 5 ns				<7 ns
Pulse energy stability ⁴⁾	< 0.5 % RMS				
Power drift ⁵⁾	± 3.0 %				
Beam profile	bell-shaped, > 80 % fit to Gaussian				
Beam divergence ⁶⁾	< 1 mrad				
Polarization	linear, horizontal				
Typical beam diameter ⁷⁾	4.0 mm			3.5 mm	
Jitter ⁸⁾	< 0.5 ns RMS				
Average power consumption	120 W	160 W	200 W		

Optional harmonics generator ⁹⁾

Pulse energy					
526.5/532 nm	40 mJ	35 mJ	30 mJ	20 mJ	10 mJ
351/355 nm	24 mJ	20 mJ	18 mJ	12 mJ	6 mJ
263/266 nm	12 mJ	10 mJ	10 mJ	6 mJ	3 mJ

Optional attenuator ¹⁰⁾

Transmission range	0.5–95 %	1–95 %
--------------------	----------	--------

COMMON SPECIFICATIONS

Dimensions

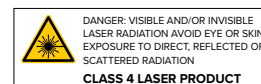
Laser head (W×L×H)	390 × 620 × 153 mm ³
Power adapter (W×L×H) ¹¹⁾	192 × 178 × 46 mm ³ typical

Operating requirements

Cooling requirements	air-cooled
Ambient temperature	15–30 °C
Relative humidity	10–80 % (non-condensing)
Mains voltage ¹²⁾	90–230 VAC, single phase, 47–63 Hz

PART NUMBERS

Q-DOUBLE-E20-SH-AT1	
Model	Optional items:
Pulse energy level (for each laser):	EXP → two channel pulse generator
no letter → 0.1–4 mJ	AT1 → motorized attenuator
A → 5–9 mJ	Optional built-in harmonic generator:
B → 10–19 mJ	SH → second harmonic
C → 20–34 mJ	TH → third harmonic
D → 35–59 mJ	FH → fourth harmonic
E → 60–79 mJ	
F → > 80 mJ	
Default pulse repetition rate in Hz	



- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- Factory-set pulse repetition rate is fixed at max repetition rate shown in the table.
- At FWHM level at fundamental wavelength, measured with 350 ps rise time photodiode. Short pulse duration version is available, with pulse duration shorter by approx 50 %. Inquire for detailed specifications.
- Measured during 30 seconds operation after laser warm-up.
- Over 8 hour period after 20 minutes of warm-up when ambient temperature variation is less than ± 2 °C.
- Full angle measured at the 4σ level.
- Beam diameter is measured 20 cm from laser output at the 4σ level.
- In respect to falling edge of pump-diode triggering pulse.
- Q-DOUBLE is compatible with all models of stand-alone H-SMART harmonics generator. Pulse energies presented here are maximum values. Please refer to H-SMART harmonic generator datasheets for detailed specifications.
- Motorized attenuator is built into the laser housing. Transmission can be changed remotely through laser web-server control interface.
- Power adapter dimensions might differ from indicated here, depending on model.
- Laser can be powered from an appropriate 12 or 28 VDC power source. Please inquire for details.

OPTIONAL ITEMS

RS	Stand-alone adapter for laser control via RS-232 port
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

Air-purging units and laser controllers



Laser controller with air-purging unit CTA19



Air-purging unit APU2 with integrated AC/DC power supply



Laser controller CT

FEATURES

- Designed to remove moisture and particles from the air
- 19" rack form-factor (by customer request)
- Operates in a closed loop configuration
- Cleanroom-grade conditions for several months without service
- Optionally can be configured with AC/DC mains adapter and/or laser controller for powering and remote control

Air-Purging Unit (model **APU2**) is designed to remove water vapor and dust particles by recirculating air from the laser or harmonic generator cavity. Maintaining a clean environment helps extend the lifetime of UV optical components and eliminates water vapor absorption lines present in the near- and mid-IR ranges.

In addition, the APU2 includes an integrated AC/DC converter for powering the laser electronics.

Several versions of the air-purging unit are available with additional functionality. The unit can integrate an AC/DC mains adapter and/or a laser controller.

The laser controller provides interfaces for operating the laser from a personal computer (PC) or directly from a triggering pulse generator. Standard features include an Ethernet port for PC control, BNC sockets for applying trigger pulses to the pump-diodes and Q-switch, a safety key switch and an emergency stop connector.

Our high average power lasers (typically above 2 W) may require a 19" rack-mount AC/DC adapter, model PS19. On request, the PS19 can be upgraded with a built-in controller (CT19) and an air-purging unit (CTA19).

By default, most QLI lasers are supplied with a compact CT-type controller, which is not a 19" rack unit. Due to its small size, the CT controller can be placed close to the laser head for convenient access.

For more information about the default controller, please refer to the datasheet of each laser.

AVAILABLE AIR-PURGING UNIT AND CONTROLLER COMBINATIONS

Model	Controller	AC/DC adapter	Air-purging	19" form-factor (by request)
CT	✓	–	–	–
CT19	✓	✓		✓
PS19	–	✓		✓
APU2	–	✓	✓	✓
CTA19	✓	✓	✓	✓

SPECIFICATIONS ¹⁾

Model	CT	PS19	CT19	APU2	CTA19
Laser head powering	N/A	12 or 28 VDC, depends on laser model			
Air flow	N/A			0.6 to 1 l/min	
Air filters ²⁾				Desiccant & Molecular Sieve	
Operating requirements					
Ambient temperature	15 – 40 °C				
Relative humidity	0 – 95 % (non-condensing)				
Mains voltage	90 – 230 VAC, single phase, 47 – 63 Hz				
Power consumption	30 – 200 W, depending on laser model				
External tube fittings	N/A			FESTO for 1/4" OD tubing	
Dimensions					
Housing (W×L×H) ³⁾	108 × 172 × 59 mm ³	482 × 330 × 106 mm ³	482 × 460 × 106 mm ³		
Weight	0.8 kg	7.5 – 10.5 kg			

1. Due to continuous improvements all specifications are subject to change. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.

2. Moisture trap capacity: 15 g.

3. 19" rack standard compatible, 2U height.

IMAGES



Front view of CTA19



Rear view of CTA19

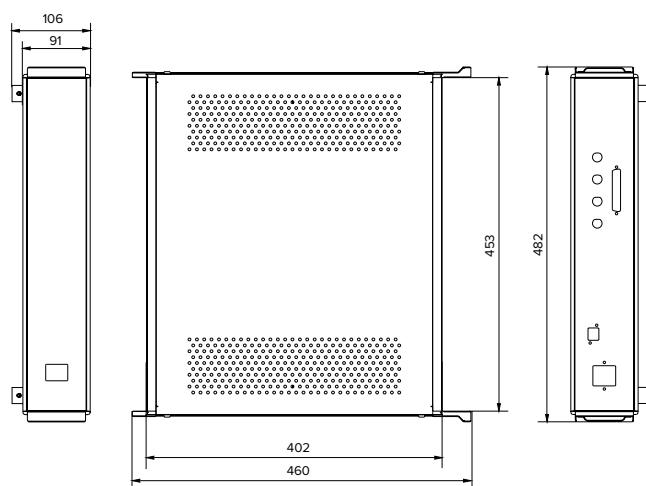


Front view of air-purging unit APU2

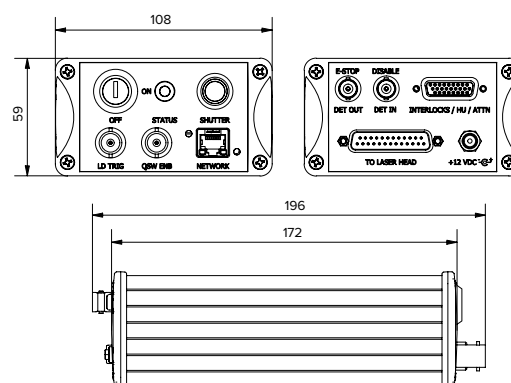


Rear view of air-purging unit APU2

DRAWINGS



Outline drawings of CTA19 (dimensions in mm)

Laser controller CT
Front viewLaser controller CT
Rear view

Outline drawings of controller unit CT (dimensions in mm)

Motorized attenuators



Attachable motorized attenuator AT



Q-SPARK with AT motorized attenuator attached

FEATURES

- Drop-in attachable to the laser body attenuators for **1st, 2nd, 3rd, 4th or 5th** harmonics of Nd:YAG or Nd:YLF lasers
- Up to **98 %** maximum transmission
- Precise transmission control by stepper motor in microstepping mode (25600 steps/rotation)
- Transmission adjustment resolution < 0.15 %
- Remote control via common with laser **Ethernet** interface

OPTIONAL EXTENSIONS

- Stand-alone version for mounting on optical table
- Side port transforms attenuator to variable beam splitter

Pulse energy of our Q-switched lasers can be conveniently lowered from maximum value by reducing current of pump-diode. When less pump light is stored in lasing media, laser emits pulses with lower energy.

Above described method of pulse energy attenuation has its pros and cons. It is cost-effective, simple to implement, however, pulse energy change affects also other important laser beam parameters like pulse-to-pulse stability, beam divergence, pulse duration. For example, pulse-to-pulse energy stability of harmonics wavelengths might be more than 2 times worse at lower than nominal fundamental pulse energy. AT series attenuators allows to attenuate laser pulse energy without changes in beam parameters.

Attenuator consist of polarizer and waveplate. By changing of input beam polarization, transmission of beam can be changed for maximum to minimum value.

Minimum transmission value depends on input beam polarization state and polarizer extinction ratio and typically is approx. 1 %.

Maximum possible transmission is determined by reflection and absorption losses of optical components.

Several attenuators can be used in series if larger dynamic range is required. Attenuator transmission can be controlled through common with laser Ethernet interface. API is provided for integration into user software.

SPECIFICATIONS ¹⁾

Single wavelength

Model	Attenuators				
	AT1	AT2	AT3	AT4	AT5
Design wavelength	1064 nm	532 nm	355 nm	266 nm	213 nm
Typical max transmission ²⁾	98 %	95 %	90 %	75 %	65 %
Typical min transmission ³⁾	1 %			0.5 %	
Input polarization	linear				
Output polarization ⁴⁾	linear, vertical			linear, rotating	
Resolution	< 0.15 %				
Accuracy	± 0.5 %				
Clear aperture	6 mm				
Stepper motor	25600 steps / 360 deg, 4-phase, 1 A				
Dimensions (W×L×H)	54 × 43 × 77 mm ³				
Weight	< 0.4 kg				

Broadband versions

Model	Attenuators			
	AT/UV	AT/VIS	AT/NIR	AT/IR
Design wavelength	250 – 410 nm	410 – 710 nm	700 – 1100 nm	1200 – 1800 nm
Typical max transmission ²⁾	75 %	90 %	90 %	85 %
Typical min transmission ³⁾	1 %			
Input polarization	linear			
Output polarization ⁴⁾	linear, vertical			
Resolution	< 0.15 %			
Accuracy	± 0.5 %			
Clear aperture	8 mm			
Stepper motor	25600 steps / 360 deg, 4-phase, 1 A			
Dimensions (W×L×H)	54 × 43 × 77 mm ³			
Weight	< 0.4 kg			

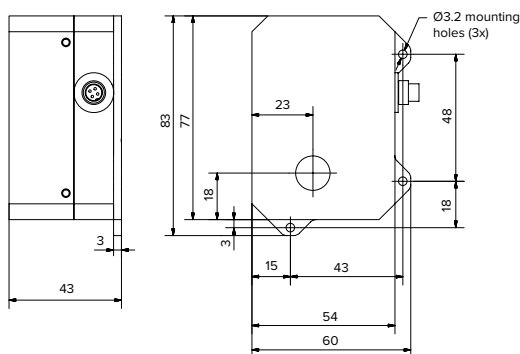
1. Due to continuous improvements all specifications are subject to change. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.

2. At peak wavelength. Might be affected by polarization state of laser.

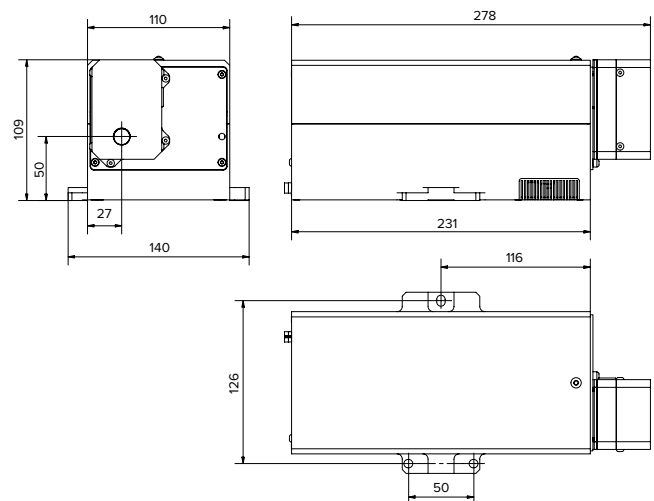
3. Might be affected by polarization state of laser.

4. For some models polarization plane depends on angular position of polarizer.

DRAWINGS



Outline drawings of AT attachable motorized attenuator
(dimensions in mm)

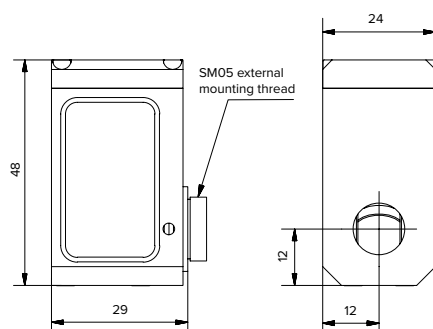


Outline drawings of Q1 laser head
with attached AT attenuator
(dimension in mm)

Pulse energy monitors



Pulse energy monitor EM and attenuator AT



Outline drawings of EM pulse energy monitor (dimensions in mm)

FEATURES

- Drop-in laser pulse energy or power monitoring (up to **100 samples/second**)
- Less than **2 %** insertion losses
- **12-bit** resolution
- Average pulse energy and pulse-to-pulse stability calculation
- Sample&Hold analog output from BNC socket on the rear panel of laser controller
- Digital readout through laser **Ethernet** interface

OPTIONAL EXTENSIONS

- Broadband version for 210 – 2600 nm range

Pulse energy monitors of EM series allows conveniently measure pulse energy of our lasers. Detector can be attached to any component that has internal SM05 thread. Photodetector cable with BNC plug should be connected to the laser controller.

Monitor consist from beam splitter that splits approx 2 % from total pulse energy and photodetector. Colored and/or neutral density filters are used to cut unwanted wavelengths and calibrate photodetector readings.

Measured pulse energy can be presented to the user in digital or analog form. Analog DC voltage, proportional to the last pulse energy is provided from BNC socket on the rear panel of laser controller. Digital value can be retrieved through laser Ethernet interface.

Each monitor is factory calibrated at specified wavelength. Broadband version is available, in this case calibration is performed at 1053 or 1064 nm wavelength.

SPECIFICATIONS ¹⁾

Model	Pulse energy monitor					
	EM1	EM2	EM3	EM4	EM5	EM/BB
Design wavelength	1064 nm	532 nm	355 nm	266 nm	213 nm	210 – 2600 nm
Insertion loss	<2 %					
Detector type	photodiode					pyroelectric
Resolution	12 bit					
Accuracy	±3 %					
Clear aperture	6 mm					
Dimensions (W×L×H)	48 × 29 × 24 mm ³					
Weight	< 0.1 kg					

1. Due to continuous improvements all specifications are subject to change. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.

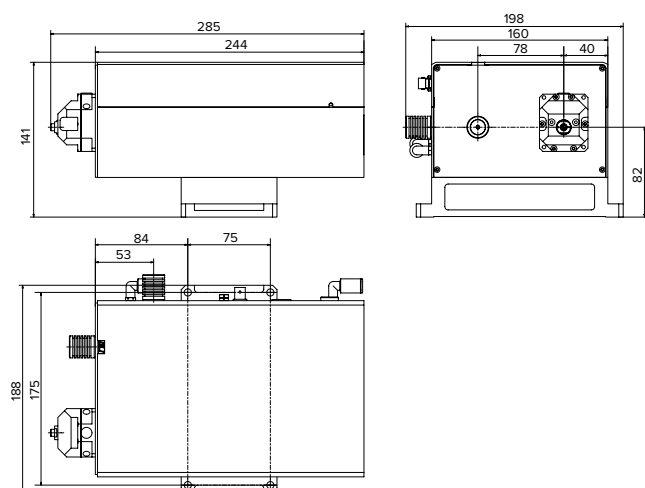


Q-SPARK with AT motorized attenuator and EM pulse energy monitor attached

Fiber couplers



FCHE stand-alone fiber coupler

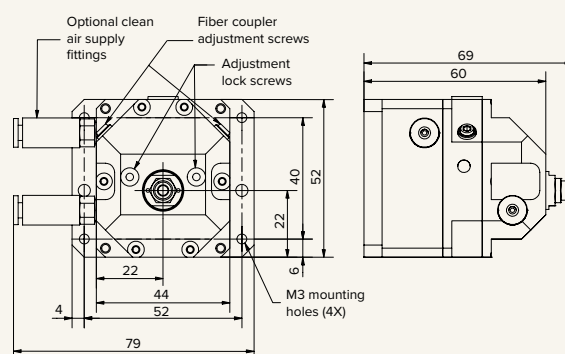


Outline drawings of FCHE fiber coupler
(dimensions in mm)

FEATURES

- Fiber coupling of Nd:YAG, Nd:YLF lasers or OPO's radiation
- Up to **40 mJ** input pulse energy at fundamental laser wavelength
- Wavelength range **260–1700 nm** (210–2100 nm by request)
- Four different sets of optics optimized for **UV, VIS** or **IR** wavelength
- Attachable to laser output panel or stand-alone versions
- Optional built-in motorized attenuator for stand-alone version
- Optional air purging for improved lifetime of fiber coupler optics

Fiber coupling allows the laser beam to be safely guided from the laser output to the desired location, extending the range of possible applications. As with any fiber coupling solution, this approach involves certain trade-offs, including increased system cost, reduced maximum pulse energy and lower beam focusability.



Outline drawings of FC fiber coupler
(dimensions in mm)

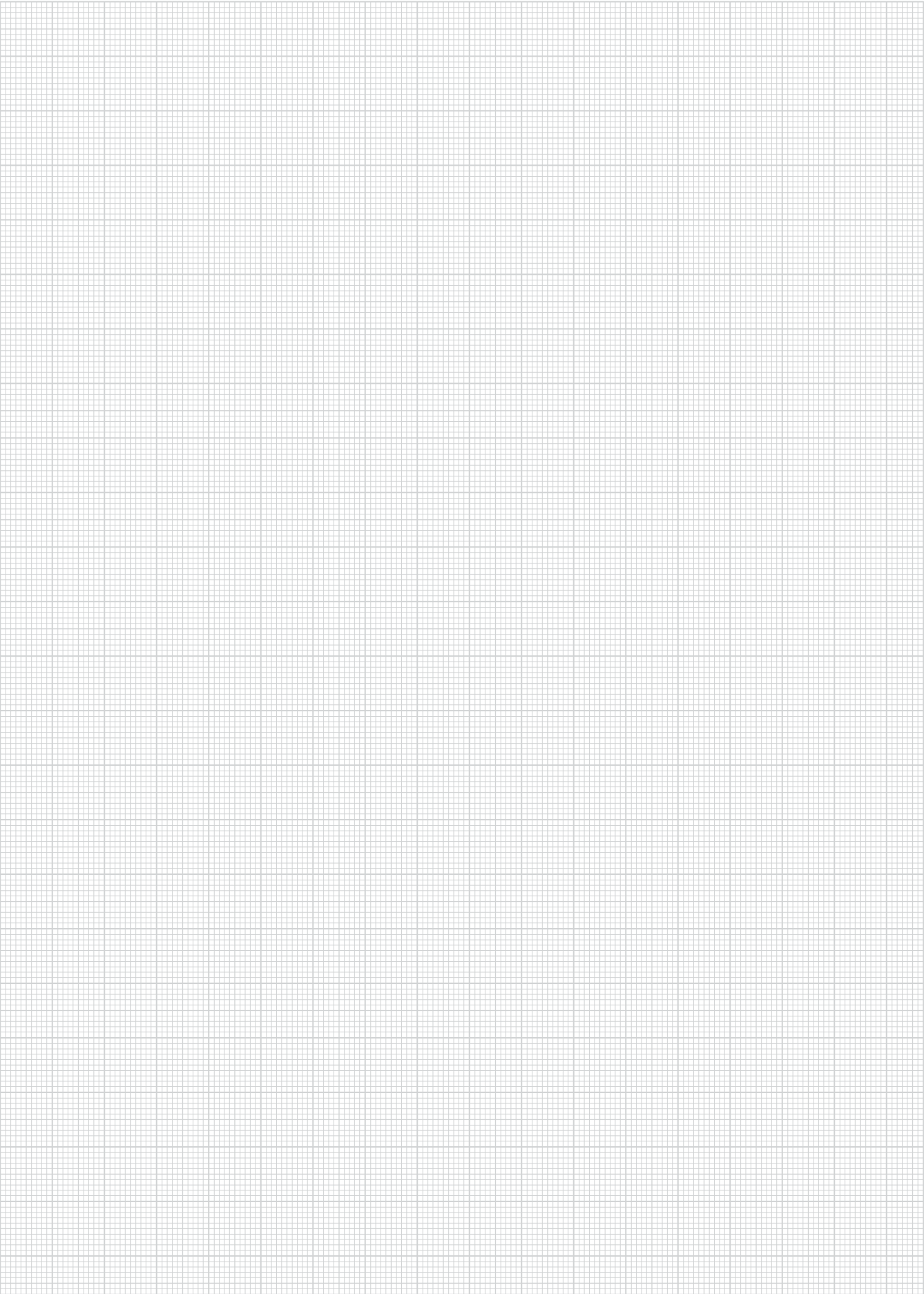
SPECIFICATIONS ¹⁾

Model	Attachable fiber coupler				Stand-alone fiber coupler	
	-FC/UV	-FC/VIS	-FC/NIR	-FC/IR	-FCHE/VIS	-FCHE/NIR
Wavelength range ²⁾	260 – 400 nm	400 – 700 nm	700 – 1100 nm	1100 – 1700 nm	400 – 700 nm	700 – 1100 nm
Pulse energy	up to 3 mJ	up to 5 mJ	up to 10 mJ		20 mJ	40 mJ
Fiber length ³⁾	2 m				2 m	
Fiber numerical aperture	0.22				0.22	
Fiber core diameter ⁴⁾	200, 400, 600 μm	200, 400, 600, 800, 1000 or 1200 μm			800, 1000 or 1200 μm	
Connector port ⁵⁾	SMA / SMA				SMA / SMA	
Fiber core material	UV fused silica				UV fused silica	
Transmission ⁶⁾	>80 % at peak (~70 % typical)				> 75 % at peak (~70 % typical)	
Dimensions (W×L×H)	60 × 69 × 52 mm ³				60 × 41 × 53 mm ³ + 160 × 244 × 141 mm ³	

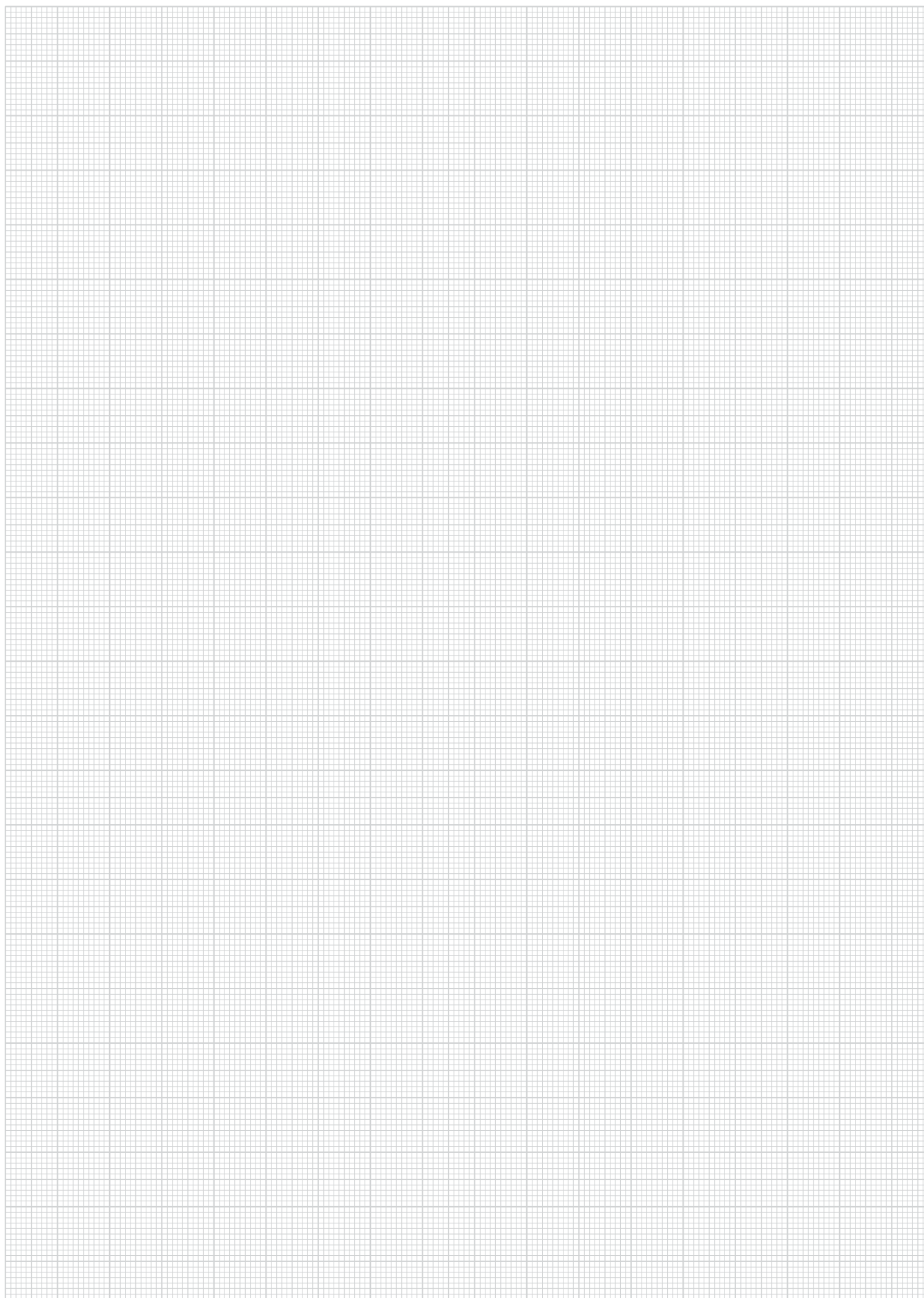
1. Due to continuous improvements all specifications are subject to change. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
2. Customization for 210–2200 nm range is possible. Please inquire for details.
3. Up to 10 m long fiber cables are available, inquire for detailed specifications.

4. Other core diameters by request.
5. Exit beam is uncollimated. Inquire for optional beam collimator.
6. Transmission for wavelengths below 330 nm depends on laser parameters, typically is in 10–60 % range. Please inquire for details. For wavelengths below 330 nm standard fiber length is 1 m.

Notes



Notes





Quantum Light Instruments Ltd.

Mokslininku 6A, LT-08412, Vilnius, Lithuania

Office: +370 5 250 3717

sales@qlinstruments.com

www.qlinstruments.com

Q-SWITCHED AIR-COOLED DIODE-PUMPED SOLID-STATE Nd:YAG & Nd:YLF LASERS

