

# 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 **2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> or 5<sup>th</sup> 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 thermoreflectance (TDTR)

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

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 <sup>2)</sup>	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 <sup>3)</sup>	< 2 ns		< 800 ps	< 2 ns		< 1.5 ns	
Pulse to pulse energy stability <sup>4)</sup>	< 1.5 % RMS			< 1.2 % RMS			
Linewidth	SLM <sup>5)</sup>			< 0.8 cm <sup>-1</sup>			
Power drift <sup>6)</sup>	± 3.0 %						
Beam profile	nearly TEM <sub>00</sub> , > 85 % fit to Gaussian						
Beam divergence <sup>7)</sup>	< 1.5 mrad					< 1 mrad	
Polarization	linear, horizontal						
Typical beam diameter <sup>8)</sup>	1.2 mm		2.0 mm				
Jitter <sup>9)</sup>	1 μs RMS			< 0.5 ns RMS			

**Optional built-in harmonics generator <sup>10)</sup>**

Pulse energy	100PS	20PS	A10PS	A100	A50	B20	C10
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 <sup>11)</sup>**

Transmission range	0.5 – 95 %						
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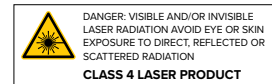
**Dimensions**

Laser head ( W×L×H)	140× 277 × 135 mm <sup>3</sup>						
Controller unit CT (W×L×H)	108× 172 × 59 mm <sup>3</sup>						
Power adapter (W×L×H) <sup>12)</sup>	50 × 125 × 32 mm <sup>3</sup> 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 <sup>13)</sup>						
Average power consumption	40 W	30 W	50 W	40 W	30 W		

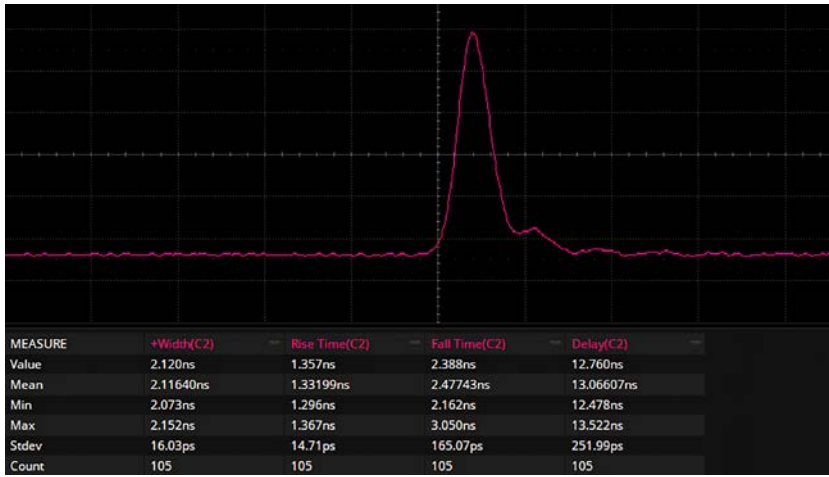
- Due to continuous improvements all specifications are subject to change. Unless stated otherwise all specifications are measured at fundamental wavelength and maximum pulse repetition rate. The parameters marked typical are not specifications. They are indications of typical performance and will vary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



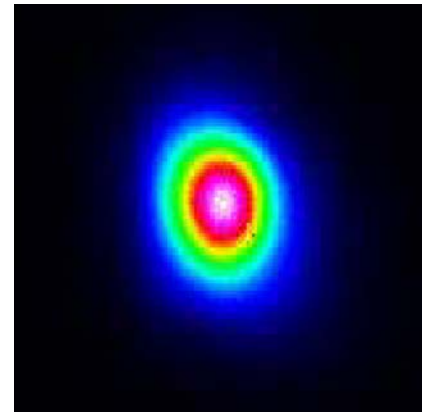
**WEIGHT**

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

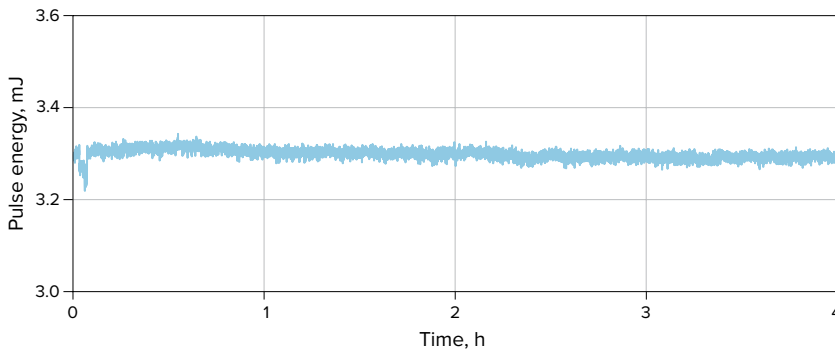
## PERFORMANCE



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**

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

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

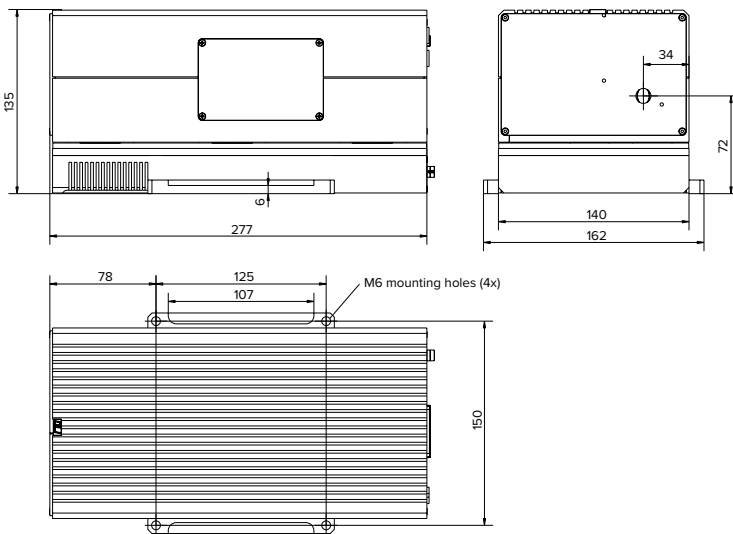


Front view of CTA19



Rear view of CTA19

DRAWINGS



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