

# 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 5<sup>th</sup> 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 **2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> or 5<sup>th</sup> 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 <sup>1)</sup>

Model	Q1								
	-B10	-C10	-D10	-B20	-C20	-D20	-50	-A50	-B50
Wavelength	1064 nm / 1053 nm								
Pulse repetition rate <sup>2)</sup>	single-shot to 10 Hz			single-shot to 20 Hz			single-shot to 50 Hz		
Pulse duration <sup>3)</sup>	< 8 ns						< 10 ns	< 9 ns	< 8 ns
Pulse energy <sup>4)</sup>									
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 <sup>5)</sup>									
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 <sup>6)</sup>	± 3.0 %								
Beam profile	bell-shaped, > 75 % fit to Gaussian						nearly TEM <sub>00</sub> , > 75 % fit to Gaussian		
Beam divergence <sup>7)</sup>	< 1.5 mrad	< 1 mrad		< 1.5 mrad	< 1 mrad		< 1.5 mrad		
Beam pointing stability <sup>8)</sup>	< 10 μrad			< 20 μrad					
Polarization	Linear, horizontal								
Typical beam diameter <sup>9)</sup>	1.7 mm	2.5 mm	3.5 mm	1.7 mm	2.0 mm	2.5 mm	1.5 mm		
Jitter <sup>10)</sup>	< 0.5 ns RMS								

Optional attenuator <sup>11)</sup>

Transmission range	0.5 – 95 %			1 – 95 %					
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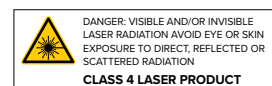
## Operating requirements

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>12)</sup>								
Average power consumption	15 W	25 W	30 W			< 40 W			

## DIMENSIONS

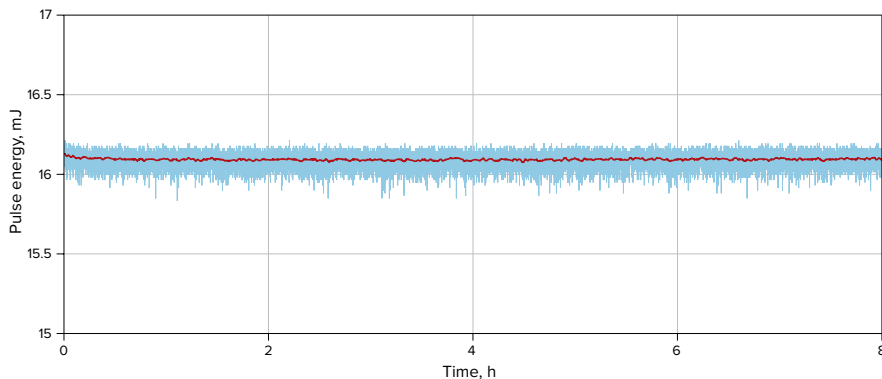
Unit	Dimensions (W×L×H)	Weight
Laser head	110 × 232 × 109 mm <sup>3</sup>	4.5 kg
Controller unit	108 × 172 × 59 mm <sup>3</sup>	0.8 kg
Power adapter <sup>13)</sup>	50 × 125 × 31 mm <sup>3</sup>	0.3 kg
Harmonic generator <sup>14)</sup>	110 × 230 × 109 mm <sup>3</sup>	4.5 kg
BSP1 plate	140 × 630 × 15 mm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

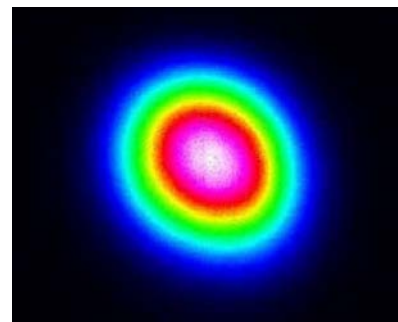


- When pulse energy is presented in xx/yy format, first number is for 1064 nm wavelength version, second – for 1053 nm version. Pulse energies for harmonic wavelengths are maximum possible values available from H1 series harmonic generator module. See datasheets of H1 for details.
- Measured during 30 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.

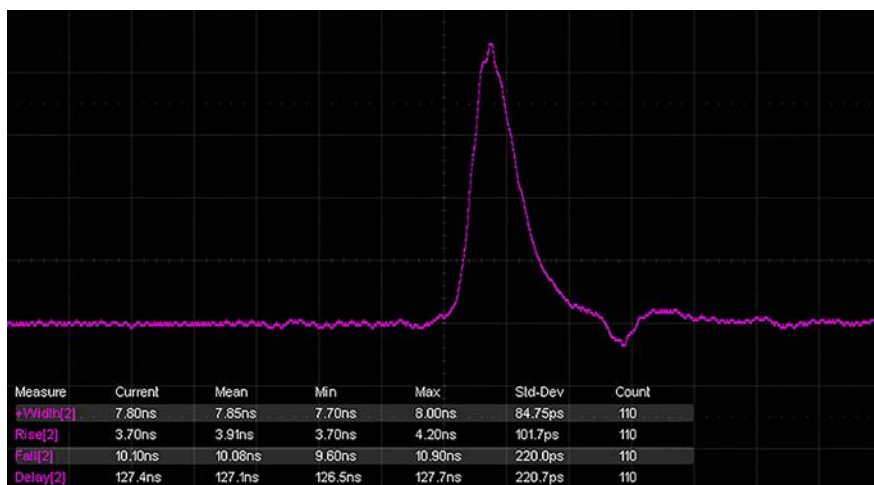
## PERFORMANCE



Long term stability Q1-C10 @ 1064 nm.  
Power drift +0.11 %; -0.12 %



**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

**Q1-D10-1064-AT1**

**Model**

**Pulse energy level**

- no letter → 0.1–4 mJ
- A → 5–9 mJ
- B → 10–19 mJ
- C → 20–34 mJ
- D → 35–40 mJ

**Optional items**

- AT1 → motorized attenuator
- EM1 → pulse energy monitor
- FC/NIR → fiber coupled output

**Laser wavelength**

- 1064 → Nd:YAG; 1064.2 nm
- 1053 → Nd:YLF; 1053.0 nm

**Default pulse repetition rate in Hz**

## 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



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



Fiber coupler FC



Motorized attenuator AT



Pulse energy monitor EM/BB



Laser controller CT



Laser controller CT.  
Front view



Laser controller CT.  
Rear view

OPTIONAL EXTENSIONS



Laser head Q1  
with attached fiber coupler



Laser head Q1 with H1 harmonic  
generator and base plate

DRAWINGS

