

Quasar[®]

HIGH POWER UV & GREEN FOR FAST PRECISION MICROMACHINING

The Quasar Advantage

- >60 W UV (300 μ J) or >45 W UV (225 μ J)
- TimeShift Technology
 - Constant pulse width over wide range of PRF
 - Variable pulse width
 - Pulse shaping
 - Pulse splitting and Burst mode operation
- High PRF from 0–3.5 MHz for fast processing
- Robust and reliable for OEM tools
- Datalog for critical performance monitoring and diagnostics



The breakthrough performance of the Quasar series leads the industry with unprecedented highest UV average power and energy at high rep rate for fast micromachining. Quasar features novel TimeShift™ technology for programmable pulse profiles for the ultimate in process speed, flexibility, and control.

Breakthrough Technology

Quasar combines advanced fiber laser, power amplifier and patented harmonics technologies to achieve breakthrough results. This unique design exploits fiber laser flexibility and robustness to enable TimeShift technology. Adding Spectra-Physics' exclusive power amplifier, Quasar enhances this flexibility at unprecedented high output power levels. Finally, with Spectra-Physics' patented harmonics, known for exceptional stability, Quasar continues to provide an innovative synergy of power, flexibility and control in a reliable 24/7 OEM laser for the most demanding applications.

Breakthrough Performance

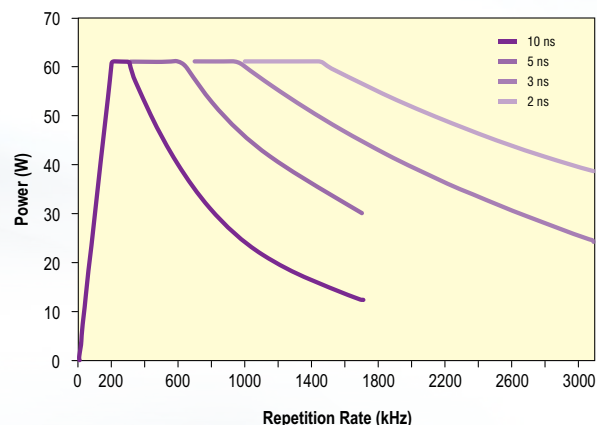
The newest Quasar laser, the Quasar 355-60, produces >60 W of UV output power at 200 kHz and 300 kHz, and >300 μ J pulse energy, complimenting Spectra-Physics' breakthrough Quasar 355-45 laser. The Quasar 355-60 operates over a wide repetition rate range from 0-3.5 MHz, with pulse widths from <2 ns to >100 ns. The Quasar 532 rounds out the Quasar series with >75 W of green output power. The Quasar family of lasers has excellent beam characteristics and very low noise.

Quasar is designed, built, and tested to stringent quality standards for reliable continuous operation in demanding 24/7 manufacturing environments. The built-in ALPS (Active Laser Purification System) helps sustain that performance for long life. And finally, Quasar lasers' automatic data logging software monitors all key laser performance parameters over the life of the laser, providing a powerful service feature and product reliability tool.

Applications

- Glass cutting and drilling
- PCB drilling
- PCB cutting and depaneling
- HDI (high density interconnects)
- Si micromachining
- Si wafer dicing
- Low K dielectric grooving
- Ceramic processing
- LED processing
- Solar cell processing
- ITO patterning
- Photolithography
- CFRP cutting and drilling

Quasar 355-60 Power vs Repetition Rate Performance¹



1. Specified power is >60 W at 200 kHz and 300 kHz. Other points on graph are not a guaranteed or warranted specification.

*Patent pending

TimeShift™ Technology – Expanding and/or Compressing (Controlling) Output in the Time Domain to Enhance Utilization

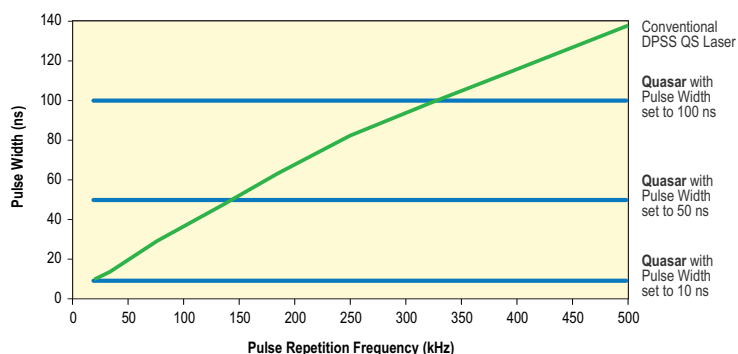
Quasar is the first laser of this class to offer TimeShift technology, which enables pulse energy programmability in the time domain. By controlling the laser pulse (width and shape) in time and repetition rate, material removal and/or modification in micromachining becomes more efficient, thereby increasing process speed and quality. Utilizing TimeShift in conjunction with high UV or green power at a higher repetition rate means Quasar can process more materials faster, and with greater quality. TimeShift enables pulse width variation, as well as pulse splitting and burst mode operation. For the Quasar 355-60 laser, pulse widths from <2 ns to >100 ns can be created at a constant PRF or conversely, maintain constant pulse width with varying repetition rate from 0 to 3.5 MHz.

TimeShift Technology Flexibility and Benefits

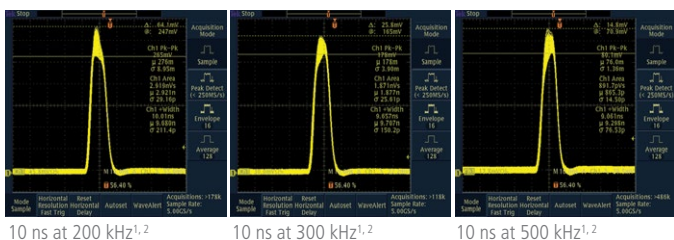
TimeShift Constant Pulse Width vs PRF

Unlike conventional Q-switched lasers, Quasar’s TimeShift technology can maintain constant pulse width over a wide range of PRF. Constant pulse width means the peak power remains more constant allowing for more consistent process results at higher speeds.

Pulse Width vs Repetition Rate¹

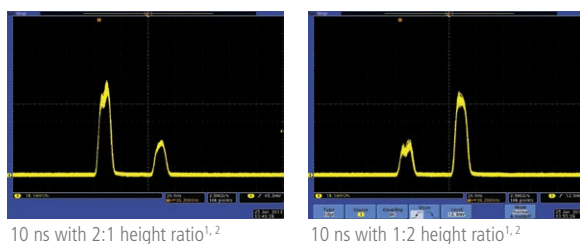
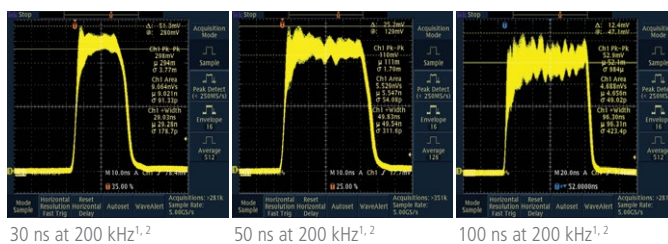


Actual Pulse Traces of Constant Pulse Widths vs PRF



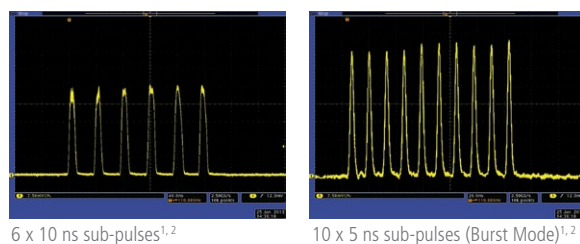
TimeShift Variable Pulse Width and Pulse Shaping

Varying the pulse width for a given PRF can be used to optimize the material interaction. By changing the energy and intensity within a pulse (pulse shaping), the heating or cooling of the material is further optimized.



TimeShift Pulse Splitting and Burst Mode

By splitting the pulses at a given PRF, the material is allowed to dissipate the heat or plasma such that more efficient material removal is possible. By altering the number, spacing, and relativity intensity of pulses within the burst, the spatial-temporal thermal profile in the work piece can be precisely tailored, increasing process speed and/or quality.



1. Typically measured performance; not a guaranteed or warranted specification.
 2. Vertical range on oscilloscope set so that pulse peak is 75% of window.

Specifications^{1, 2}

| | Quasar 355-60 | Quasar 355-45 | Quasar 532-75 |
|--|--|--|------------------------|
| Output Characteristics | | | |
| Wavelength | 355 nm | 355 nm | 532 nm |
| Output Power | >60 W @ 200 kHz, 10 ns >60 W @ 300 kHz, 10 ns | >45 W @ 200 kHz, 10 ns >45 W @ 250 kHz, 10 ns >41 W @ 300 kHz, 10 ns | >75 W @ 200 kHz, 10 ns |
| Maximum Pulse Energy | >300 µJ | >225 µJ | >375 µJ |
| Repetition Rate Range | 0–3.5 MHz | 0–1.7 MHz | 0–1.7 MHz |
| Optimized TimeShift™ Setting (Nominal setup for beam optimization) | 300 kHz, 10 ns | 300 kHz, 10 ns | 200 kHz, 10 ns |
| Pulse-to-Pulse Stability ³ | <5%, rms 1 σ | | |
| Power Stability (after warm-up) | <2%, rms 1s over 8 hours | | |
| Peak-to-Peak Power Stability (after warm-up) | ±3% over 8 hours | | |
| Polarization | 100:1, vertical | 100:1, vertical | 100:1, horizontal |
| Spatial Mode ³ | TEM ₀₀ (M ² <1.3) | | |
| Beam Divergence, full angle ³ | <0.3 mrad | | <0.45 mrad |
| Pulse Width, FWHM (TimeShift programmable) ⁴ | <2 ns to >100 ns | <5 ns to >100 ns | <5 ns to >100 ns |
| Beam Diameter (D4 σ) ³ | 3.5 ±0.35 mm | | |
| Boresight Tolerance ³ | ±0.5 mm ±5 mrad | | |
| Operating Conditions | | | |
| Warm-up Time, typical | <20 min from standby mode <60 min from cold start | <20 min from standby mode <40 min from cold start | |
| Temperature Range | 20–28°C | | |
| Altitude | 0–3000 m | | |
| Humidity | 10–80% non-condensing | | |
| Non-Operating Conditions | | | |
| Temperature Range | 0–50°C | | |
| Altitude | 0–10,000 m | | |
| Humidity | 10–80% non-condensing | | |
| Electrical and Chiller Requirements | | | |
| Heat Load (at laser head) | <1500 W | | |
| Water Temperature (laser inlet) | 20°C ±1°C | | |
| Water Flow Rate (at laser head) | 9.5 l/min | | |
| Power Input | 190–240 VAC, 50/60 Hz, single phase | | |
| Heat Load (at power supply) | <400 W | | |
| Power Consumption | <1900 W | | |
| Water Temperature Stability | ±0.5°C | | |
| Physical Characteristics | | | |
| Laser Head Dimensions (LxWxH) ⁵ | 39.4 x 14.7 x 9.3 in (1000 x 373 x 235 mm) | | |
| Laser Head Weight | 200 lbs (90 kg) | | |
| Power Supply Dimensions (LxWxH) | 21.1 x 19.0 x 6.9 in (536 x 483 x 175 mm) | | |
| Power Supply Weight | 35 lbs (16 kg) | | |
| Cable Length | 5 m | | |
| Other | | | |
| RoHS Compliant | Yes | | |
| Sacrificial Output Window | Yes | | |
| Optional Safety Shutter | Yes | | |

1. Due to our continuous product improvement program, specifications may change without notice.

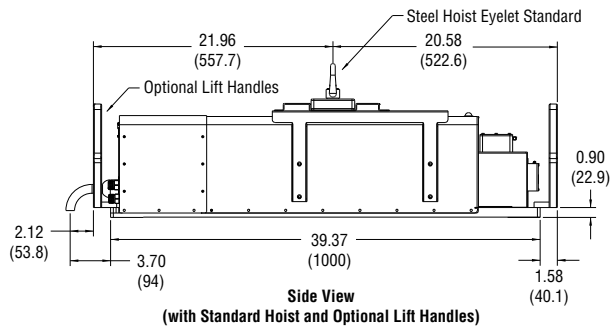
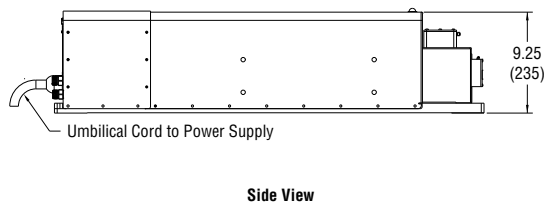
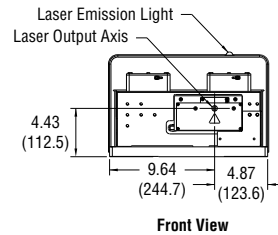
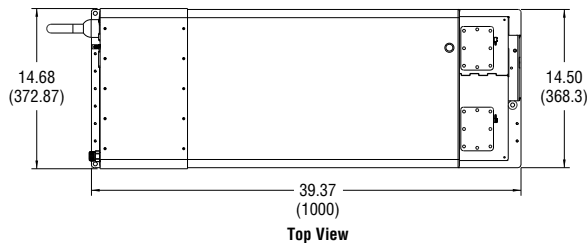
2. All test specs are at 10 ns at 300 kHz with the diode current set to achieve 62 W for the Quasar 355-60, and 42 W for the Quasar 355-45.

3. Applies at 10 ns over the repetition rate range of 250 kHz to 400 kHz, using the appropriate TimeShift setup at the same input current set to achieve 300 kHz for Quasar 355-60, and input current to achieve 42 W 355 nm at 300 kHz for Quasar 355-45. Applies at 10 ns at 200 kHz for 75 W 532 nm version.

4. The nominal pulse width is 10 ns. Alternative/programmable pulse widths using TimeShift will change power and beam parameter performance. Contact Spectra-Physics for more information.

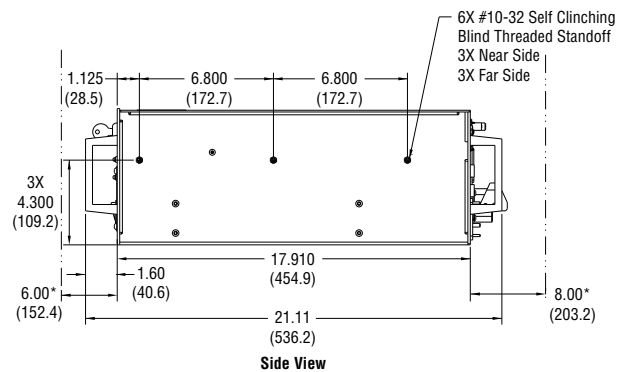
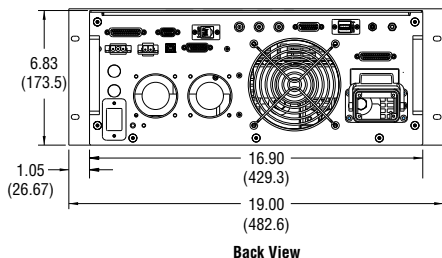
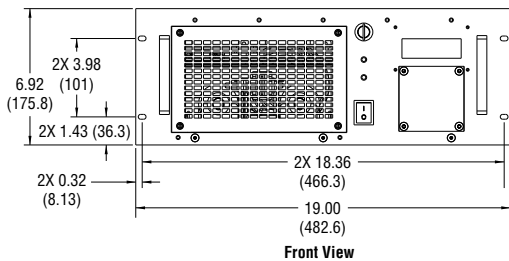
5. Dimensions noted do not include the standard removable lifting hoist exoskeleton or the optional removable lift handles.

Quasar Laser Head Dimensions



Dimensions are in inches (mm)

Quasar Power Supply Dimensions



*Minimum envelope for cable/tubing bending radius and/or proper air flow circulation

Dimensions are in inches (mm)