## **Product catalog**



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## **High Quality and Reliability**

Amplitude has been for the past decade at the forefront of the diode- pumped ultrafast lasers industrial revolution. Specific developments in the field of mechanical and electrical engineering, extensive vibration testing and temperature cycling during the product development phase ensure a high level of quality and reliability. Today, Amplitude is the only ultrafast laser manufacturing company meeting both the demanding requirement of the ISO 9001 : 2008 and ISO 13485 quality system. The ISO 13485 standard emphasises strict requirement for all steps within the product development, risk analysis and more. An externally certified clean room environment guarantees high quality production. Each single laser undergoes more than 700 individual control points, from tightening torque of individual mounts to final vibration tests. Individual traceability is enforced on all critical components. An extensive Quality Test Report is provided upon laser delivery and provides detailed test results, including long term data and vibration testing results. To guarantee production efficiency, advanced manufacturing techniques have been implemented (lean, 5S, MRP2, etc).A highly trained and motivated personnel is dedicated to system quality.

## 

## **Femtosecond Lasers**

## Nanosecond Lasers

### **Ytterbium products**

Satsuma
Satsuma Display
Satsuma Niji
Tangor 300
Tangor

Tangor UV Tangerine Goji Magma Mikan

### **Ti:Sa products**

Arco

**Pulsar TW** 

Pulsar PW



## Nanosecond Advanced Lasers

Premiumlite Yag	Intrepid
Premiumlite Glass	Agilite
Elite	

### **Nanosecond Standard Lasers**

Surelite 4 Axia Inlite II Inlite III Mesa Mesa HP Mesa PIV Minilite I & II **Minilite PIV** Powerlight DLS Plus

Powerlight DLS 8000 Powerlight DLS 9000 Seeded Surelite Surelite EX Surelite I, II, III Surelite PIV Terra Terra HP **Terra PIV** Titan

### Add-ons

#### **Beam management**

Beam Scan Fiber Glass

#### Metrology

Spin

Sequoia Sequoia HD

#### Pulse management

Compress Synchronization

Mango Surelite OPO Horizon OPO



## **Ytterbium products**



Click on a laser







Satsuma

Satsuma Display

Satsuma Niji



Tangor 300



Tangor



## **Ytterbium products**







Tangor UV



Tangerine



Goji







Mikan





## For every industrial need

## Satsuma

### Versatile, full-featured and compact femtosecond laser

The Satsuma family of femtosecond laser offers versatility in the most compact aircooled laser platform on the market. Satsuma is a cost-efficient solution providing high repetition rate and high energy, up to 150  $\mu$ J.

Versatile and full-featured, Satsuma femtosecond lasers are equipped with: FemtoBurst<sup>™</sup> (choose number of pulses, rhythms, time between each pulse from 25 to 100 ns) and SuperSync Control for getting more precise synchronization with a high speed scanning system. Satsuma femtosecond laser is available with green, UV and deep UV outputs.

With more than 1 500 Satsuma installed around the world, this laser product range is a best-seller. Our customers highly appreciate the ease of integration, and its unsurpassed engraving quality.

Satsuma is part of Amplitude's femtosecond laser range, internationally-recognized as reliable and stable. Their very short pulse widths lead to both the lowest heating effect on the market and the best ablation efficiency, reaching an unparalleled process quality.

Medical:

> Ophthalmology

Manufacturing

> Medical Device



watch a video about this laser



#### Industry:

- > Microelectronics
- > Micromachining
- > Flat Panel Display Repair

#### Science:

- > Multiphoton Imaging
- > Optogenetics
- > Ultrafast Spectroscopy

Key Features

- > Trigger on demand <u>FemtoTrig™</u>
- > Air-cooled up to 20 W
- > FemtoBurst<sup>TM</sup>
- > SuperSync Control
- > Optional green, UV and DUV outputs
- > Industrial design for 24/7 operation



Specifications	Satsuma	Satsuma HP	Satsuma HP <sup>2</sup>	Satsuma HP <sup>3</sup>	
Average Power	> 5 W	> 10 W	> 20 W	> 50 W	Dimensions
Energy Per Pulse	> 10 µJ	> 20 µJ	> 40 µJ ,	/ 150 μJ*	All Models
Pulse Width		< 350 fs	to > 10 ps		Weight
Repetition Rate		From single s	hot to 40 MHz		All Models
Central Wavelength		1030 +	/- 5 nm		Cooling
Beam Quality		M <sup>2</sup>	<1.2		Cooting
Beam Circularity		> 8	7 %		Satsuma, HP, HP
Beam Pointing Stability		<25 μ	rad/°C		Satsuma HP <sup>3</sup>
Long Term Mean Power Stability	< 1 % rms over 100 hours				
Warm-up Time	< 30 min				
*High Energy Option					

Dimensions	
All Models	52 x 33 x 12 cm
Weight	
All Models	23 kg
Cooling	
Satsuma, HP, HP <sup>2</sup>	Air-cooled
Satsuma HP <sup>3</sup>	Water-cooled

## Options



SHG/THG/FHG



Mango

Compress



GLASS



Synchrolock



FIBER



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# Satsuma Display

*Flexibility and experience in a single compact laser* 

Satsuma Display is the most compact air-cooled femtosecond laser on the market, offering 4 individual outputs.

Satsuma Display is based on the well-known Satsuma platform - benefiting from 10 years of product improvements and feedback from installation of 1500 units in the field. The Satsuma platform's reliability and stability are internationally-recognized.

Thanks to the unique features of Satsuma Display, Amplitude enables Display leaders to operate with up to 4 different wavelengths using a single laser. It offers the possibility to optimize the quality of ablation to the highest level for every kind of materials, including metals, p-Si, ITO, isolators and polymers.

In addition, femtosecond pulses provide flexibility to deliver results for the most challenging processes, such as selective ablation, cutting, drilling and carbonization.

Upgrade your nanosecond or picosecond laser repair processes to femtosecond laser to increase your production yield.

Satsuma Display is robust, compact, light and air-cooled, making the integration smooth for gantry system designs.



Applications

#### Industry:

- > OLED and LCD array repair
- > C/F repair
- $> \mu$ LED lift-off and repair

 > 4 wavelengths IR, Green, UV and DUV for processing all kind of materials including metals, p-Si, ITO, isolators and polymers

Key Features

- > Femtosecond pulses for high quality thin layer removal and cutting with low HAZ
- > Air-cooled, compact, lightweight and robust for smooth integration on a gantry system



Specifications	IR	SHG	THG	FHG
Wavelength	1030 nm	515 nm	343 nm	257 nm
Average Power	> 5 W (20 W optional)	> 2 W (8W optional)	> 0.75 W (3W optional)	> 0.5 W (2W optional)
Pulse Energy	> 40 µJ	> 16 µJ	> 6 µJ	> 4 µJ
Repetition Rate		Single sho	t to 2 MHz	
Pulse Duration	< 350 fs to 10 ps			
Wavelength Switching Time	< 2 s			
Long Term Power Stability	< 1 % rms over 100 hours			
Waist Asymmetry	< 13 %			
M <sup>2</sup>	< 1.2			
Beam Pointing Stability	< 25 µrad/°C			
Warm-up Time	< 30 min			
*High Energy Option				

Dimensions	
Laser Head	52 x 33 x 19 cm
Power Supply	2U rackable

#### Weight

Laser Head + HG	< 30 kg
Controller	15 kg

## Options

- Output power monitoring for 4 wavelengths
- Burst mode Pulse train with 25 ns period
- Superior beam astigmatism <10%, waist asymmetry <5%
- High amplifier repetition rate up to 40MHz

## Application Results:

C/F repair – direct method



Array repair – block removal





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# Satsuma Niji

Fully customizable and versatile femtosecond laser

Satsuma Niji is an industrial laser platform offering all possible wavelengths from 257 nm and up to 4000 nm. Satsuma Niji breaks free from the restrictive wavelengths choices available today and offers a whole new parameter space for ultrafast processing optimization. Fully customizable with up to 4 simultaneous outputs, Amplitude takes pride in delivering the most application focused ultrafast laser to date.

The small footprint, squat design offers unmatched long term stability and performances while easing system integration in medical or industrial machinery.

Satsuma Niji represents a major simplification combining multiple lasers into one allowing major breakthroughs in selective and highly demanding medical and industrial applications.

Satsuma Niji is based on the industry leading Satsuma fiber laser. It benefits from 10 years of product improvements from over 2000 units installed in factories, hospitals and research laboratories.



Applications

> Selective ablation

- > Display repair> Silicon processing
- > Medical

Key Features

> Fully customizable

and minimal HAZ

> Up to four simultaneous wavelengths

> Femtosecond pulses for maximum precision





## Specifications

Wavelength	Fully customizable with up to 4 simultaneous outputs from 257 nm to 4000 nm
Average Power	Up to 20 W*
Pulse Energy	Up to 40 μJ*
Repetition Rate	From single shot to 2 MHz
Pulse Duration	50 fs < ΔT < 350 fs
Long term power stability	< 1% rms



\*depends on selected wavelength(s) and repetition rate

## Options

- Output power monitoring for four wavelengths
- Burst mode pulse train with 25 ns period
- Superior beam astigmatism > 90% and waist symmetry > 95%
- Up to 40 MHz repetition rate







## For all industrial and scientific needs

# Tangor 300

### Accelerate your production process & advance your research

Tangor 300 is a powerful femtosecond laser combining high repetition rate, real pulse on demand, high energy, and high beam quality. Coming with a suite of unique features, Tangor 300 enables both new industrial applications such as large area processing, high speed processing, etc., and cutting-edge scientific applications such as high field THz generation, high flux high harmonic generation, and photoemission spectroscopy.

Powerful, versatile and full featured, Tangor 300 femtosecond laser is equipped with:

- > FemtoTrig<sup>TM</sup>: uniquely adapts laser frequency to scan speed by accurately controlling pulse emission (ideal for processing round corners)
- > GHz Burst<sup>™</sup>: uniquely and substantially increases throughput
- > IR output > 300 W / GREEN output > 200 W / UV output > 100 W

Tangor 300 femtosecond laser is the ideal solution for enhancing your production process or advance your research projects. It offers high energy ultrashort pulses in the most reliable, compact, versatile, and cost-effective package.



## Applications

- Industry:
- and Drilling
- > Large Surface Texturing
- > Microelectronics
- > Micromachining

#### Science:

- > High Speed Microcutting > High Intensity and **Energy Physics**
- > Flat Panel Display Cutting > Lifescience and

- **Key Features**
- Imaging > Secondary Light
- Sources
- > Spectroscopy

- > Real Pulse on Demand with FemtoTrig™
- > Higher Throughput with GHz Burst™
- > IR, Green and UV Outputs
- > Industrial Design for 24/7 Operations

BACK TO MENU

Specifications	Tangor 300 IR	Tangor 300 Green	Tangor 300 UV
Central Wavelength	1030 nm	515 nm (preliminary specs)	343 nm (preliminary specs)
Average Power	> 300 W	> 200 W	> 100 W
Maximum Pulse Energy	> 3 mJ	> 1.5 mJ	> 200 µJ*
Pulse Width <sup>1</sup>	< 500 fs to 10 ps	< 500 fs	< 500 fs
Repetition Rate	Single shot to 40 MHz	Single shot to 2 MHz**	Single shot to 2 MHz**
Beam Quality		$M^2 < 1.4$	
Beam Circularity		> 87 %	
Beam Pointing Stability		< 25 µrad/°C	
Power Stability	< 1% RMS over 100 hours	< 2% RMS ov	ver 100 hours
Warm-up Time	< 30 minutes	< 1 ł	nour

<sup>1</sup> For other pulse durations, please contact us.

\*Higher energy available upon request

\*\* Higher repetition rate available upon request

## Options





Synchrolock

Compress





amplitude-laser.com



## For every industrial need

## **Tangor** Powerful, full-featured and versatile femtosecond laser

Tangor is a powerful femtosecond laser combining both high repetition rate (going up to 40 MHz and adjustable according to your needs) and high energy per pulse (going up to 1 mJ that can be splitted in several beams according to your production need).

Versatile and full-featured, Tangor femtosecond laser is equipped with: the customization function FemtoBurst<sup>™</sup> (choose the number of pulses, their rhythms, time between each pulse between 25 to 100 ns, etc.), the trigger on demand for selecting individual pulses, SuperSync Control for getting more precise synchronization with a high speed scanning system. Tangor femtosecond laser is available with UV output going up to 100W.

Tangor femtosecond laser is the ideal solution for both developing your production process and mass producing on several applications. Versatility combined with high energy make the laser a cost-effective investment.

Tangor is part of Amplitude's femtosecond lasers range, internationally recognized as reliable and stable. Their very short pulsewidths lead to both the lowest heating effect on the market and the best ablation efficiency, reaching an unparalleled quality.



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watch a video about this laser

# Applications

#### Industry:

- > Microelectronics> Micromachining
- > Flat Panel Display Cutting

> Medical Device Manufacturing

Medical:

Key Features

#### > FemtoBurst™

- > Trigger on demand FemtoTrig™
- > SuperSync Control
- > Optional green and UV outputs (30 and 100 W)
- > Industrial design for 24/7 operations



Specifications	Tangor 50	Tangor 100	Tangor 300
Average Power	> 50 W	> 100 W	> 300 W
Energy Per Pulse	> 300 µJ	> 500 µJ	3 mJ
Pulse Width		< 500 fs to > 10 ps	
Repetition Rate		From single shot to <b>40 MH</b>	Z
Central Wavelength	1030 +/- 5 nm		
Beam Quality	M <sup>2</sup> <1.3 M <sup>2</sup> <1.5 - typi		M <sup>2</sup> <1.5 - typically M <sup>2</sup> <1.3
Beam Circularity	> 87 %		
Beam Pointing Stability	< 25 µrad/°C		
Long Term Mean Power Stability	< 1 % rms over 100 hours		
Warm-up Time	< 30 min		

Dimensions Please contact us for Tangor 300.	
Tangor 50 / 100	68 x 48 x 16 cm
Cooling	
All Models	Water-cooled
Weight (50 / 100 ve Please contact us for Tangor 300.	ersions)
Laser Heads	75 kg
Power Supply 1	15 kg
Power Supply 2	12 kg





SHG / THG\*



Mango

Compress

.



GLASS

Synchrolock\*





# Tangor UV

### The ultimate laser solution for OLED display processing

Tangor UV is a state-of-the-art high power UV femtosecond laser, up to 30W-500fs. It combines high repetition rate, up to 2MHz and high UV pulse energy, up to 150µJ.

Thanks to the unique performance of Tangor UV, Amplitude enables you to reach the best balance available on the laser market between cutting quality and throughput.

In addition, femtosecond UV pulses guarantee the best processing flexibility and the fastest way to obtain excellent results, irrespective of the type of optical setup used. Upgrade your OLED manufacturing processes to UV femtosecond to achieve the highest yield and productivity.

Tangor UV is compact and lightweight, making the integration smooth for in-line display equipment.





#### Industry:

- > Hole drilling of OLED displays (HIAA)
- > Shape cutting of OLED displays
- > Flex-PCBs cutting and drilling

Key Features

- > UV femtosecond pulses 343nm-500fs for the smallest HAZ and clean ablation quality
- > High power and repetition rate to reach the highest productivity
- > High pulse energy for beam splitting utilization
- > Compact and lightweight for ease of integration
- > FemtoTrig<sup>™</sup> for improving shape cutting quality



#### **Specifications Tangor UV Tangor UV HP** Average Power > 15 W > 30 W Energy Per Pulse Up to 80 µJ Ouput Rep Rate Range From single shot to 2 MHz Pulse Width 500 fs Central Wavelength 343 +/- 5 nm Spectral Bandwidth < 0.5nm $M^2$ < 1.3 Astigmatism < 25 % Waist Assymetry < 10 % Power Stability < 2 % rms Beam Pointing Stability < 100 µrad/°C

#### Dimensions 89 x 48 x 16 cm Laser Power Supply 60 x 55 x 53 cm Weight 85 kg Laser Power Supply 52 kg

## Options

DANGER

LASER

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- Performance Power 50W UV
- FemtoTrig<sup>™</sup> Output pulse control with 25 ns jitter
- Superior Beam astigmatism <10%, waist asymmetry <5%
- 4.0 ready more than 50 sensors integrated

## **Application Results:**

Example: Cutting of Pol-film used for OLED display panels. Optimized results @1600 kHz - Same cutting speed maintained for the comparison.

Type Of Use	On The Fly	Scanner Only
Mark Speed	< 700 mm/s	> 700 mm/s
HAZ	Down to 10 μm	Down to 10 µm
Comparison with UV picosecond (10 ps)	85% HAZ reduction	50% HAZ reduction

- Improved cutting quality and wider process flexibility compared to UV picosecond laser thanks to shorter pulse width
- Improved ablation rate compared to UV picosecond laser thanks to higher peak power





## For every industrial need

# Tangerine

## Femtosecond laser for research & development in micro processing and scientific applications

#### Highest pulse energy

Tangerine is a powerful femtosecond laser combining both high repetition rate (going up to 40 MHz and adjustable according to your needs) and high energy per pulse going up to 250  $\mu$ J.

Versatile and full-featured, Tangerine femtosecond laser is notably equipped with SuperSync Control for getting more precise synchronization with a high speed scanning system, and Short Pulse (< 150 fs pulsewidth).

This laser can also be associated with a large range of add-ons such as industrial frequency conversions down to deep UV, tunable Mango OPA platform and Non-Linear Compression to achieve pulse duration from < 100 fs down to the few cycle regime, ideally suited to generate high flux XUV radiations and attosecond pulses.

The industrial Tangerine femtosecond laser is the ideal solution for research & development in micro processing and scientific applications.

Tangerine is part of Amplitude's femtosecond lasers range, internationally recognized as reliable and stable. Their very short pulse widths lead to both the lowest heating effect on the market and the best ablation efficiency, reaching an unparalleled process quality.



#### Industry:

> Microelectronics

> Micromachining

#### Science:

> Ultrafast Spectroscopy> High Harmonic Generation / Attoscience Key Features



> Frequency conversion from Soft X-ray to THz





Specifications	Tangerine	Tangerine HP	Tangerine HP <sup>2</sup>	Tangerine SP	
Average Power	> 20 W	> 35 W	> 50 W	Up to 50 W	
Energy Per Pulse	> 100 µJ	> 200 µJ	> 250 µJ	Up to 200 μJ	
Pulse Width	< 350 fs to > 10 ps < 150 fs				
Repetition Rate	From single shot to 40 MHz				
Central Wavelength	1030 nm +/- 5 nm				
Beam Quality	TEM00, M <sup>2</sup> <1.3				
Beam Circularity	> 87 %				
Long Term Mean Power Stability	< 1 % rms over 100 hours				
Warm-up Time	< 30 min				

Dimensions	
All models	120 x 42 x 15 cm
Weight	
Laser Head	93 kg
Power Supply 1	15 kg
Power Supply 2	12 kg
Cooling	
All Models	Water-cooled

## Options



SHG / THG



Mango



Compress



GLASS

Synchrolock



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## For every industrial need

## **Goji** High precision, compact femtosecond laser

#### A medical marvel

Goji benefits from more than 15 years of experience in laser surgical applications. It has been specifically engineered and tested to meet the requirements of today's most demanding medical and industrial markets.

Goji ultra-compact platform features an industry-leading short pulse duration together with a high average power and an exceptional beam quality to allow the best-inclass processing quality. It is also ideally suited as a pump source for a tunable optical parametric oscillator and for applications in optogenetics and multi-photon imaging.





Medical: > Laser Surgery

### Science:

> Optogenetics> OPO-Pumping

Key Features

> Automated controls

> Industrial design

> Air-cooled

> Ultra-compact and light



Specifications	Goji	Goji HP		
Average Power	>	5 W	Dimensions	
Energy Per Pulse	> 125 nJ	> 500 nJ	All Models	25 x 25 x 13 cm
Pulse Width	<1	150 fs	Cooling	
Repetition Rate	40 MHz	10 to 40 MHz	All Models	Air-cooled
Central Wavelength	1030	+/- 5 nm		
Beam Quality	M	²<1.2	Weight	
Beam Circularity	>	87%	Laser Head	10 kg
Long Term Mean Power Stability	< 1 % rm	s over 100 h	Power Supply 1	11 kg
Warm-up Time	< 3	30 min		





DANGER

LASER 4



## Magma High energy ultrafast laser

#### A world's first

Magma is the world's first industrial-grade ultrafast laser with up to 500 mJ pulse energy. The system offers high energy, high repetition rate together with high peak power capabilities. The modular platform allows evolutive solutions in compact and reliable customizable configurations to fit your highly demanding application.

This solution is especially suited for secondary sources operating 24/7 to address various cutting edge applications, such as Inverse Compton Scattering, THz generation and filamentation.





### Medical:

> Microprocessing > X-Ray Imaging

#### Science:

- > X-Ray Generation
- > THz Generation
- > Photocathode
- > OPA Pumping

- Key Features
- > High peak power and energy
- > Compact and modular
- > Burst mode RF synchronizable
- > Frequency conversion from DUV to MIR
- > Designed for 24/7 operation



Specifications	Magma 2	Magma 5	Magma 25	Magma 75	Magma 200	Magma 500
Pulse Energy	2 mJ	5 mJ	25 mJ	75 mJ	200 mJ	500 mJ
Pulse Duration			< 50	00 fs		
Peak Power	> 4 GW	> 10 GW	> 50 GW	> 150 GW	> 400 GW	1 TW
Repetition Rate	Single shot to 5 kHz	Single shot to 300 Hz	Single shot	t to 100 Hz	Single to 5	e shot 0 Hz
Central Wavelength	1030 nm					
Beam Quality	M <sup>2</sup> < 1,3 M <sup>2</sup> < 1,5					< 1,5
Energy Stability	< 0,3 % rms			< 1 %	6 rms	
Dimensions	75 x 50 x 22 cm	75 x 50 x 22 cm	120 x 50 x 22 cm	125 x 120 x 22 cm	200 x 120 x 22 cm	320 x 150 x 40 cm
Cooling			Water	cooled		

## Options





Burst



c

Synchronization

Multi

lti



Supervision





## For every industrial need

# Mikan

### Air-cooled high power ultrafast oscillator

An ultrafast oscillator to meet your most demanding needs

Mikan is an ultra-compact, reliable and turn-key femtosecond laser oscillator with high average power. Mikan offers an unique optional fiber output for an easy set-up and coupling to the user's experiments.

Optional green output extends the applications range.





#### Industry: > Metrology

Science: > Ultrafast Science

- > Biology
- > THz Generation

Key Features

> Air-cooled system

> Ultra compact

- > Ideal for biophotonics and imaging applications
- > Optional green output





## Specifications

specifications	Mikan
Average Power	> 1,3 W
Energy Per Pulse	> 24 nJ
Pulse Width	< 250 fs
Repetition Rate	54 MHz
Central Wavelength	1025 +/- 5 nm
Beam Quality	TEM00, M <sup>2</sup> <1.1
Long Term Mean Power Stability	< 0,5 % rms
Warm-up Time	< 30 min



## Options



SHG



Compress

CE



Fiber coupling







Click on a laser





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Pulsar PW







# ARCO

### High energy Ti:Sapphire amplifiers

#### The best of the Ti:Sapphire technology

Arco - the class of ultra-intense fs laser systems designed as the ideal light source for the most demanding applications. Arco amplifiers offer outstanding performance: best-in-class output parameters packaged in robust, reliable and user friendly configurations.

Arco ultrafast Ti:Sapphire lasers are built on a modular and versatile architecture and cover most exhaustive output parameter range on the ultrafast laser market.





#### Science:

- > High harmonic generation
- > Attophysics
- > Spectroscopy
- > Filamentation
- > Laser wakefield acceleration
- > Teraherz
- > Plasma study
- > Electron generation & acceleration

- Key Features
- > Amplitude-made pump lasers> Most versatile and robust architecture

> 10 Hz, 100 Hz, 1 kHz, 10 kHz repetition rates

- > Peak power up to 55 TW
- > Highest performance in class

> Pulse energy from 1 mJ tp 1.1 J

- > Pulse duration down to 20 fs
- > Hybrid systems with dual repetition rate



Specifications are subject to change without prior notice  $\mid$  © 08-2019  $\mid$  Ref. 1219-d

## Specifications

#### ARCO W 10 kHz amplifiers

Repetition Rate <sup>1</sup>	10 kHz				
Energy Per Pulse <sup>2,3</sup>	0,8 mJ @ 10 kHz	1,8 mJ @ 10 kHz	3 mJ @ 10 kHz		
Pulse Width (fwhm) 4		< 100 fs or < 35 fs or < 20 fs			
Central Wavelength (nm) <sup>5</sup>		800 ± 10			
Average Power (W)	8	18	30		
Pump Lasers	Mesa	Mesa Duo	Mesa & Mesa Duo		
Pulse To Pulse Energy Stability (RMS) <sup>6</sup>	1 %	1 %	0,7 %		
Power Stability (RMS) <sup>7</sup>	1 %				
Nanosecond Contrast <sup>8</sup>	< 5.10 <sup>-4</sup>				
Picosecond Contrast 9	< 10 <sup>-6</sup> @ 300 - 50 ps & < 10 <sup>-6</sup> @ 50 - 10 ps & < 10 <sup>-5</sup> @ 1 ps				
Beam Quality M <sup>2</sup>	< 1.3				
Pointing Stability	< 10 µrad RMS				
Polarization	Linear horizontal				
Warm-up Time	< 1 hour				

## Options



- Palitra OPA (230 nm 17 μm)
- SHG, THG, FHG harmonic generators

<sup>1</sup> Please contact factory for specifications at other repetition rates <sup>2</sup> 0.6 mJ / 1.6 mJ / 2.8 mJ @ 10 kHz for pulse duration < 25 fs

<sup>3</sup> Please contact factory for specifications at other energy level

 $^{\rm 4}$  Factory set, must be specified when ordered and will be optimized prior to shipment



Mesa DPSS Nd:YAG pump laser



BIRD for CEP stabilization and measurement



<sup>8</sup> Pre-pulse, regenerative amplifier replicas

<sup>7</sup> Over 8 hours under stable environmental conditions

<sup>5</sup>790 nm +/- 10 nm for 100 fs pulse duration. Other central wavelengths, please contact factory

<18 fs pulse duration

<sup>6</sup> Over 2000 pulses



For < 20 fs duration tunability over 100 nm with Mazzler



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Specifications are subject to change without prior notice  $\mid$  © 08-2019  $\mid$  Ref. 1219-d

## Specifications

#### **ARCO C** (100 Hz) & **ARCO M** (1 kHz)

Repetition Rate <sup>1</sup>	100 Hz for Arco C 1 kHz for Arco M			
Energy Per Pulse <sup>2</sup>	6 mJ @ 100 Hz > 5 mJ @ 1 kHz	12 mJ @ 100 Hz ) 10 mJ @ 1 kHz	25 mJ @ 100 Hz 20 mJ @ 1 kHz	
Pulse Width (fwhm) <sup>3</sup>		< 100 fs or < 35 fs or < 20 fs		
Central Wavelength (nm) <sup>4</sup>		800 ± 10		
Average Power (W)	5	10	20	
Pump Lasers	Terra	Terra Duo	2 Terra Duo	
Pulse To Pulse Energy Stability (RMS)⁵	0,7 %	0,7 %	0,5 %	
Power Stability (RMS) <sup>6</sup>	1 %			
Nanosecond Contrast <sup>7</sup>	< 5.10 <sup>-4</sup>			
Picosecond Contrast <sup>8</sup>	< 5 10 <sup>-7</sup> @ 300 - 50 ps & < 10 <sup>-6</sup> @ 50 - 10 ps & < 10 <sup>-5</sup> @ 1 ps			
Beam Quality M <sup>2</sup>	< 1.3			
Pointing Stability	< 10 µrad RMS			
Polarization	Linear horizontal			
Warm-up Time		< 1 hour		

## Options



<sup>1</sup> Please contact factory for specifications at other repetition rates
<sup>2</sup> 5 mJ / 9 mJ / 20 mJ @ 100 Hz or 4 mJ / 9 mJ / 16 mJ @ 1 kHz for pulse duration < 25 fs</li>
<sup>3</sup>790 nm +/- 10 nm for 100 fs pulse duration. Other central wavelengths, please contact factory
<sup>4</sup> Factory-set, must be specified when ordered and will be optimized prior to shipment

<sup>5</sup> Over 2000 pulses
<sup>6</sup> Over 8 hours under stable environmental conditions
<sup>7</sup> Pre-pulse, regenerative amplifier replicas
<sup>8</sup> Measured with third order cross-correlator (SEQUOIA)



Terra DPSS Nd:YLF pump laser



User friendly laser control software





High power stability

Palitra OPA tunability





## Specifications

#### ARCO X 10 Hz high energy amplifiers

Repetition Rate <sup>1</sup>	10 Hz						
Energy Per Pulse <sup>2</sup>	25 mJ	25 mJ 100 mJ 500 mJ 1,1 J					
Pulse Width (fwhm) <sup>3</sup>		< 100 fs or < 3	35 fs or < 20 fs				
Central Wavelength (nm) <sup>4</sup>		800	± 10				
Peak Power (max)	1,25 TW	5 TW	25 TW	55 TW			
Pump Lasers	Inlite II	Minilite II & Surelite III	Inlite II & Powerlite 2,5 J	Inlite II & Powerlite 2,5 J			
Pulse To Pulse Energy Stability (RMS)⁵	< 1,5 %	< 1,5 %	< 1,5 %	< 1 %			
Power Stability (RMS) <sup>6</sup>	2 % over 8 hours						
Nanosecond Contrast <sup>7</sup>	< 5.10 <sup>-4</sup>						
Picosecond Contrast <sup>8</sup>	< 5 10 <sup>-7</sup> @ 300 - 50 ps & < 10 <sup>-6</sup> @ 50 - 10 ps & < 10 <sup>-5</sup> @ 1 ps						
Beam Quality M <sup>2</sup>	< 1.5						
Pointing Stability <sup>9</sup>	< 10 μrad RMS						
Polarization	Linear horizontal						
Warm-up Time		< 1	hour				

## Options



• Down to 20 fs pulse durations

External synchronization

• User friendly laser control software

### Accessories

Energy attenuator

- Active beam pointing control
  - Palitra OPA (230 nm 17 μm)
- Isolation of experimental reflected beam

<sup>1</sup> Please contact factory for specifications at other repetition rates

<sup>2</sup> Please contact factory for specifications at other energy level

<sup>3</sup> Factory-set, must be specified when ordered and will be optimized prior to shipment. Please contact

factory for specifications at other pulse duration

<sup>4</sup> 790 nm +/- 10 nm for 100 fs pulse duration. Other central wavelengths, please contact factory



Vacuum compressor for high energy



<sup>5</sup> Over 2000 consecutive pulses

<sup>9</sup> Over 2000 consecutive pulses

<sup>6</sup> Over 8 hours under stable environmental conditions

<sup>8</sup>Measured with third order cross-correlator (SEQUOIA)

<sup>7</sup> Pre-pulse, regenerative amplifier replicas



Genpulse: safety and timing control unit







### Specifications

#### ARCO Hybrid Dual 1 kHz and 10 Hz amplifier

Repetition Rate <sup>1</sup>	10 Hz & 1 kHz				
Energy Per Pulse <sup>2</sup>	4 mJ @ 1 kHz & 25 mJ @ 10 Hz	4 mJ @ 1 kHz & 25 mJ @ 10 Hz    4 mJ @ 1 kHz & 100 mJ @ 10 Hz    4 mJ @ 1 kHz & 500 mJ @ 10 Hz			
Pulse Width (fwhm) <sup>3</sup>		< 100 fs or < 35 fs			
Central Wavelength (nm) <sup>4</sup>		800 ± 10			
Peak Power (max)	0,7 TW	0,7 TW 2,8 TW 14 TW			
Pump Lasers	Terra & Inlite II	Terra & Surelite III	Terra & Inlite + Powerlite 2,5 J		
Energy Stability (RMS) ⁵	0,7 % @ 1 kHz & 1,2 % @ 10 Hz	0,7 % @ 1 kHz & 1,5 % @ 10 Hz			
Power Stability (RMS) <sup>6</sup>		2 % over 8 hours			
Nanosecond Contrast 7	< 5.10 <sup>-4</sup> @ 1 kHz & < 1.10 <sup>-6</sup> @ 10 Hz				
Picosecond Contrast <sup>8</sup>	< 5 10 <sup>-7</sup> @ 300 - 50 ps & < 10 <sup>-6</sup> @ 50 - 10 ps				
Beam Quality M <sup>2</sup>	< 1,3 < 1,5 < 1,5				
Pointing Stability <sup>9</sup>	< 10 µrad RMS				
Polarization	Linear horizontal				
Warm-up Time	< 1 hour				

## Options



Palitra OPA (230 nm - 17 μm)

 $^{1}$  1 kHz - 10 Hz when 10 Hz output is activated. Please contact factory for specifications at other repetition rates

<sup>2</sup> Please contact factory for specifications at other energy level

 $^3$  Factory-set, must be specified when ordered and will be optimized prior to shipment  $^4$  790 nm +/- 10 nm for 100 fs pulse duration. Other central wavelengths, please contact factory



Pulse duration < 35 fs



<sup>5</sup> Over 2000 pulses
<sup>6</sup> Over 8 hours under stable environmental conditions
<sup>7</sup> Pre-pulse, regenerative amplifier replicas
<sup>8</sup> Measured with third order cross-correlator (SEQUOIA)
<sup>9</sup> Over 2000 consecutive pulses



Vacuum compressor for high energy



Laser control software with beam profile monitoring for each amplifier and pump



amplitude-laser.com



# **Pulsar PW**

### Ultra intense ultrafast laser

#### State-of-the-art Ultra Intense Ultrafast Lasers

Pulsar PW is the ultimate light source dedicated to high field science, offering the best-in-class performance and bringing industrial-grade reliability to Science. Drawing on our large portfolio of pump lasers and solutions for effective thermal management, the Pulsar PW systems are designed for low (1 shot/min to 0.1 Hz) or high (1-5 Hz) repetition rates. This laser family has been designed to ensure the highest temporal quality at both femtosecond and picosecond timescales with optimized beam quality. Pulsar PW reaches the highest intensities with unsurpassed energy and pointing stabilities.

Pulsar PW comes with an embedded, flexible and user friendly monitoring and control software to further enhance the user experience and long term reliability.

The system versatility is augmented by a large offer of instrumentation and options for user specific needs.



Medical:Science:> X-Ray Imaging> Accelerators> Protontherapy



MIR CHAL

> Up to 25 J
> Highest contrast ratio better than 10<sup>10</sup> : 1
> Up to 5 Hz repetition rate

TITAN

watch a video about this laser

> Op to 5 Hz repetition rate

- > Ultra-short sub-20 fs pulses
- > Advanced Monitoring System



Specifications	Pulsar 500	Pulsar 500 HR	Pulsar 1000	Pulsar 1000 HR	
Repetition Rate (Hz)	1 shot / mn ) 0,1	1 to 5	1 shot / mn 0,1	1	
Peak Power (PW) <sup>1</sup>	>	0,5		>1	
Energy Per Pulse (J)	> 1	12,5		> 25	
Central Wavelength (nm)		800	± 10		
Pulse Width (fs FWHM) <sup>2</sup>		<	25		
Pulse To Pulse Energy Stability (% RMS)	< 1.0				
Nanosecond Contrast	> 10 <sup>8</sup> : 1				
		> 10 <sup>3</sup> :1 b	eyond 1 ps		
Picosecond Contrast		> 10 <sup>6</sup> :1 b	eyond 5 ps		
		> 10 <sup>8</sup> :1 be	eyond 10 ps		
ASE Contrast		> 10 <sup>10</sup> :1 be	yond 100 ps		
Strehl Ratio <sup>3</sup>	> 0.85				
Pointing Stability (µrad RMS)⁴		<	: 5		

#### stem dimensions

Pulsar 500	Pulsar 500 HR	32 m <sup>2</sup>	344 ft <sup>2</sup>
Pulsar 1000	Pulsar 1000	38 m <sup>2</sup>	410 ft <sup>2</sup>

#### thers

Max Total Electrical Power⁵	20 to 40 kW
Max Water Cooling Capacity⁵	12 to 20 kW
Laboratory Temperature Range	18 - 23 °C
Laboratory Temperature Stability	+/-1°C

lculated at 25 fs pulsewidth b- 20 fs Ultra short pulse option available th Deformable mirror (in Option) der stable controlled environment pends on model









Pulsar 500 HR typical Near Field beam profile



Pulsar 1000 HR typical Far Field beam profile



Pulsar 500 HR Sequoia HD contrast measurement



amplitude-laser.com



## **Pulsar TW**

Ultra intense ultrafast laser

#### State-of-the-art Ultra Intense Ultrafast Lasers

Pulsar TW is the state-of-the-art high intensity lasers for high field science. It offers the best-in-class performance with industrial-grade reliability in a compact footprint. This laser family has been designed to ensure the highest temporal quality at both femtosecond and picosecond timescales. The beam quality is unmatched thanks to the optimal coupling between our high energy pump lasers and amplifiers. Pulsar TW reaches the highest intensities with unsurpassed energy and pointing stabilities.

Pulsar TW comes with an embedded, flexible and user friendly monitoring and control software to further enhance the user experience and system long term reliability.

The system versatility is expanded by a large offer of instrumentation and options for user specific needs.



# Applications

**Medical:** > X-Ray Imaging

Science: > Attoscience, High Harmonic Generation, XUV > Accelerators

#### > Up to 6.5 J

**Key Features** 

> Highest contrast ratio better than 10<sup>10</sup> :1

> Up to 10 Hz repetition rate

- > Ultra-short sub-20 fs pulses
- > Readily upgradable
- > Advanced Monitoring System



Specifications	Pulsar 60	Pulsar 140	Pulsar 250
Repetition Rate (Hz) <sup>1,2</sup>		Up to 5	
Peak Power (TW) <sup>3</sup>	> 60	> 140	> 250
Energy Per Pulse (J)	> 1.5	> 3.5	> 6.25
Central Wavelength (nm)		800 ± 10	
Pulse Width (fs FWHM) <sup>4</sup>		< 25	
Pulse To Pulse Energy Stability (% RMS)	< 1.5	< 1.2	< 1.0
Nanosecond Contrast		> 10 <sup>8</sup> : 1	
		> 10 <sup>3</sup> :1 beyond 1 ps	
Picosecond Contrast		> 10 <sup>6</sup> :1 beyond 5 ps	
		> 10 <sup>8</sup> :1 beyond 10 ps	
ASE Contrast		> 10 <sup>10</sup> :1 beyond 100 ps	
Strehl Ratio <sup>5</sup>	> 0.9	> (	0.85
Pointing Stability (µrad RMS) <sup>6</sup>		< 10	

## lities

Dimensic	ons
Pulsar 60	~ 6.5 m² / 70 ft²
Pulsar 140	~ 12 m² / 130 ft²
Pulsar 250	~ 13 m² / 140 ft²

#### rs

Max Total Electrical Power <sup>7</sup>	15 to 33 kW
Max water Cooling Capacity <sup>7</sup>	6 to 20 kW
Laboratory Temperature Range	18 - 23 °C
Laboratory Temperature Stability	+/- 1 °C

t to 5 / N Hz (N = 1..5) eration option available d at 25 fs Ultra short pulse option available ormable mirror (in Option) ble controlled environment on model



Pulsar 500 HR Sequoia contrast measurement



Pulsar 250 typical Wizzler pulse width measurement



Pulsar 60 typical Near Field beam profile at full energy





## Nanosecond Advanced Lasers





Premiumlite Yag

Click on a laser



Elite





Contraction of the second seco

Agilite


## **Premiumlite-YAG**

*Flashlamp-pumped lasers* 

#### Kw-class Laser

The Premiumlite product line is based upon a Pseudo Active Mirror Disk Amplifier Module (PAMDAM). Unprecedented high energy and high average power are available on the market for the first time. In a single box, a single beam and a single pulse with up to 750 W average power at 10 Hz can be proposed. Noble materials such as stainless steel, gold and ceramic have been selected to ensure long-term reliable operation. The high homogeneity of the gain deposition in the PAMDAM results in a smooth top-hat beam profile.

The modular approach of the design permits easy upgrade of your laser in a short time schedule:

- any additional PAMDAM might increase your average power for higher throughput
- a set of options is available to match your special requirements.



#### Industry:

 > Laser peening and Laser forming (aircraft, automotive industry...)
 > Nuclear decontamination
 > Laser bond inspection (composite materials)

#### Science:

> Ti:Sapphire pumping for PW and multi-PW Laser systems Key Features

- > Greater than 75 J at 1064 nm
  > Greater than 55 J at 532 nm
- > Up to 10 Hz repetition rate
- > Ns and sub-ns pulsewidth
- > Unique offer by a commercial company





### Specifications

#### Premiumlite 30 Premiumlite 40 Premiumlite 50 Premiumlite 60 Dimensions

Beam Profile	Round, Supergaussian order ≥ 20								
Beam Diameter @ 1/e <sup>2</sup>	44 mn	n ± 2.5	55 mm ± 2.5						
Disk Amplifier Modules (DAM)	3	4	5	6					
Divergence		≤ 500 µrad							
Energy Per Pulse at 1064 nm	> 35 J	> 50 J	> 65 J	> 75 J					
Energy Per Pulse at 532 nm	> 25 J	> 35 J	> 45 J	> 55 J					
Long Term Mean Energy Stability	≤ 3% P-V over 8H (after warm-up time)								
Pulse To Pulse Energy Stability	< 1 % RMS at 1064 nm and < 1.5 % RMS at 532 nm								
Pulsewidth FWHM	6 ns ± 2								
Jitter RMS	≤ 1 ns RMS								
Polarization	Linear or circular								
Pointing Stability		≤ 50 µrad (at fixed rep-rate)							
Repetition Rate		Up to	0 10 Hz						

Optical Table LxW		4.8 x 1.5 m		15.8 x 4.9 ft
Table Thickness		30.5 cm		1 ft
Cabinet For Each DAM (HxLxW)		200 x 62 x 71 cm		6.6 x 2.1 x 2.4 ft
Cabinet For Front-end (HxLxW)		67 x 62 x 71 cm		2.2 x 2.1 x 2.3 ft
Weight				
Table Weight		2500 kg		5512 lb
Others				
Frequency		Up	to 10	Hz
Water Flow		1 x 10l/m per pa	nin + air of	25l/min DAM
Pressure		4 b	ars m	ах
Temperature		8	- 12 °	С
	1	(three phases	+ ne	utral + ground,

1 (single phase + ground + neutral, 32 A), and 2 (single phase + ground, 16 A)





Horizontal beam profile and vertical beam profile at 1064 nm





Image relay telescopes: high level of standardization

Electrical Plugs

amplitude-laser.com

R X /\* LASER AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION



## **Premiumlite-Glass**

#### Flashlamp-pumped lasers

#### High repetition rate glass laser

The Premiumlite product line is based upon a Pseudo Active Mirror Disk Amplifier Module (PAMDAM). Unprecedented high energy together with a high repetition rate are available on the market for the first time. In a single box, a single beam and a single pulse with up to > 250 J at 0.1 Hz can be proposed. Noble materials such as stainless steel, gold and ceramic have been selected to ensure long-term reliable operation. The high homogeneity of the gain deposition in the PAMDAM results in a smooth top-hat beam profile.

For the first time, the Premiumlite in Glass version makes it possible to upgrade TW- and PW-class Lasers to multi-PW level while keeping advantage of 0.1 Hz operation.

The modular approach of the design permits easy upgrade of your laser in a short time schedule:

- any additional PAMDAM might increase your energy.
- a set of options is available to match your special requirements.



#### Science:

> Ti:Sapphire pumping for PW and multi-PW Laser systems> Laser driven shock applications



- > Greater than 250 J at 1053 nm
- > Greater than 200 J at 527 nm
- > Up to 0.1 Hz repetition rate
- > Ns pulsewidth

Key Features

> Unprecedented repetition for a high energy glass Laser



### Specifications

#### Premiumlite 75 Premiumlite 120 Premiumlite 150 Premiumlite 200

Beam Profile	Round, Supergaussian order ≥ 20									
Beam Diameter @ 1/e <sup>2</sup>	80 mm ± 2.5									
Disk Amplifier Modules (DAM)	3	4	5	6						
Divergence	≤ 500 μrad									
Energy Per Pulse at 1053 nm	> 100 J	> 150 J	> 200 J	> 260 J						
Energy Per Pulse at 527 nm	> 75 J	> 120 J	> 150 J	> 200 J						
Long Term Mean Energy Stability	≤ 5 % P-V over 8H (after warm-up time)									
Pulse To Pulse Energy Stability	< 1.5 % RMS at 1053 nm and < 2.0 % RMS at 527 nm									
Pulse Width FWHM	20 ns ± 5									
Jitter RMS	≤ 1 ns RMS									
Polarization	Linear or circular									
Pointing Stability		≤ 50 µrad (at	fixed rep-rate)							
Repetition Rate		Up to	0.1 Hz							

Optical Table LxW	6.4 x 1.5 m	21.0 x 4.9 ft					
Table Thickness	30.5 cm	1 ft					
Cabinet For Each DAM (HxLxW)	200 x 62 x 71 cm	6.6 x 2.1 x 2.4 ft					
Cabinet For Front-end (HxLxW)	200 x 62 x 71 cm	6.6 x 2.1 x 2.4 ft					
Weight							
Table Weight	2 x 1700 kg	2 x 3748 lb					
Others							
Frequency	Up to	0.1 Hz					
Water Flow	1 x 10l/min + 10l/n	nin per pair of DAM					
Pressure	4 bars max						
Temperature	15 - 2	20 °C					
	1 (single phase +	neutral + ground,					

Electrical Plugs

Dimensions







Horizontal beam profile and vertical beam profiles at 1053 nm



Image relay telescopes: high level of standardization



General view of the laser





### Innovation, Performance & Best Value

## Elite

#### The new standard in high energy nanosecond lasers

Elite is the ideal solution for demanding applications such as PW-class amplifier pumping and Shock experiments.

Reliability & ease of use with best-in-class performance: Each & every shot

- > Highest spatial & temporal beam quality for best conversion efficiency and long lasting performance.
- > Unique pre-shot control for reliable and repeatable pulses avoid downstream damage, increase uptime & focus on your experiment.
- > Low energy operation mode integrated for fast & easy alignment of your experimental set-up.
- > Latest generation computer control with embedded diagnostics offers you accurate & remote shot-to-shot operation.
- > Compact, flexible and easy to integrate with low cost of ownership.

*Elite is your modern* & *ergonomic laser delivering state-of-the-art performance in the smallest footprint per Joule.* 





> Pumping of PW-class laser systems
 > Laser Dynamic Shock Compression
 > LIDT metrology (IR, green)
 > High energy frontier science

Key Features

- > Single or multiple beams for pumping applications> Online & real time diagnostics, embedded attenuator
- > Pre-shot flashlamps readiness control

> Superior Top-Hat beam quality

> Up to 100J at 1053 nm & 75J at 527 nm

> Extensive & accurate pulse shaping – optional.

<b>BACK TO MENU</b>

Specifications	Elite	Elite HE						
Repetition Rate	Up to 0.1 Hz	Up to 0.017 Hz						
Wavelength	1053 nm / 527 nm							
Pulse Energy	44J @ 1053 nm (2 pulses) 35 J @ 527 nm (2 pulses)	100 J @ 1053 nm (in 1 pulse) 75 J @ 527 nm (in 1 pulse)						
Energy Stability	≤1.2 % RMS @ 1053 r	nm / ≤1.5 % RMS @ 527 nm						
Energy Drift	≤ 3 %	over 8 hours						
Beam Profile	Roun	id, Top-Hat						
Number of Beams	1 or 2 on demand	1						
Beam(s) Diameter	~ 22 mm	~ 45 mm						
Divergence	≤ 2 mrad	≤ 1 mrad						
Pulsewidth	2 pulses of ~ 12 ns FWHM ~ 15 ns FWHM							
Timing Jitter	≤ 0.6 ns RMS							
Polarization		Linear						
Pointing Stability	≤ 20	µrad RMS						
Laser Head L x W	2500	x 950 mm						
Cabinet #1 H x L x W	192 x 56 x 80 cm	214 x 56 x 80 cm						
Cabinet* #2 H x L x W	90 x 56 x 80 cm	172 x 56 x 80 cm						
Electrical Power	4	kW max						
Electrical Plugs	single pha	ase - 50 / 60Hz						
Voltage	190	) V-250 V						
Water Flow	≤1.	5 l / min						
Water Pressure	3 - 5	bars max						
Water Temperature	10	- 20 °C						

. Typical beam profile of Elite HE at 527 nm



Intermediate and final amplifiers

\* Cooling unit included

1





### **Intrepid** High Energy Nd:YAG

#### Pulse Shaping

Intrepid is a high energy pulsed laser system specifically tailored for pumping OPCPA amplifiers. The output of the laser is shaped to be spatially and temporally flat, uniformly amplifying the input chirped pulse across the entire waveform.

The Intrepid pulse can also be preferentially stressed to adjust for distortions on the seed pulse: Linear ramp, t<sup>3</sup>, multipulses pattern can be generated.

Intrepid is offered in a variety of output energies from mJ to hundreds of joules.

Pulse duration from 100s ps to 100 ns can be proposed.







#### Science:

> Laser peening > OPCPA pumping

- > Laser Driven Dynamic Compression
- > Laser fusion

- > Programmable pulsewidths on a standard platform specifically designed for OPCPA pumping
- > Intelligent control architecture for comprehensive system management
- > Intuitive Graphical User Interface

**Key Features** 

- > Scalable architecture for the most demanding applications
- > Nd:glass versions up to 250 J @ 0.1 Hz @1053 nm and 200 J @ 527 nm are available.





Specifications (Nd:YAG version)	Intrepid 0	Intrepid I Intrepid II-A		Intrepid II-B Intrepid II-C		Intrepid HE	
Beam Profile	Round, Sup	pergaussian with $\leq 1$	5% RMS modulatior	ns in the central 80%	of beam diameter n	neasured at FWHM	
Beam Diameter @ 1/e <sup>2</sup>	~ 6 mm	~ 12 mm ~ 20 mm		~ 26 mm ~ 26 mm		75 mm ± 2.5 @ 1064 nm 55 mm ± 2.5 @ 532 nm	
Divergence	0.6 mrad			≤ 0.5 mrac	1		
Energy Per Pulse at 1064 nm	≥ 10 mJ	≥ 800 mJ	≥ 3000 mJ	≥ 5000 mJ	≥ 6000 mJ	Up to 70J for > 1.5 ns pulsewidth	
Energy Per Pulse at 532 nm	≥ 5 mJ	≥ 550 mJ ≥ 2000 mJ		≥ 3200 mJ	≥ 4000 mJ	Up to 50J for > 1.5 ns pulsewidth)	
Long Term Mean Energy Stability	≤ 5% P-V over 8H		≤ 3%	6 P-V over 8H (after	warm-up time)		
Pulse To Pulse Energy Stability @ 1064 nm	≤ 2% RMS		≤ 1.5%	6 RMS		≤ 1% RMS	
Pulse To Pulse Energy Stability @ 532 nm	≤ 2.5% RMS		≤ 2%	RMS		≤ 1.5% RMS	
Pulsewidth FWHM		1 - 8 ns (200	ps to 100 ns on optic	on; Max energy depe	nds on pulse duration	n)	
Temporal Profile		Flat-top wit	h ≤ 5% RMS modula	ation over central 80	% of the pulsewidth		
Rise / Fall Time			≤ 300 ps 20-8	0% (~ 50 ps on optic	on)		
Jitter RMS			$\leq$	30 ps RMS			
Polarization				Linear			
Pointing Stability			5	≤ 50 µrad			
Repetition Rate		Up to 10 Hz		Up to	5 Hz	Up to 10 Hz	





Temporal 4 ns pulse







Intrepid HE: Intreprid I as a seeder on the top of and up to 6 PAMDAM on the table.







### System Requirements

#### Dimensions

Optical Head (L x W x H)1	Intrepid I : 2,438 mm x 610 mm x 508 mm (96"x 24" x 20") Intrepid II : 2,438 mm x 1,219 mm x 508 mm (96"x 48" x 20")
Power Supply (LxWxH) <sup>2</sup>	Intrepid I : 622 mm x 711 mm x 1,435 mm (24.5" x 28" x 56.5"), total of 1 Intrepid II : 622 mm x 711 mm x 1,435 mm (24.5" x 28" x 56.5"), total of 2
Water	
Service	1-3 GPM (gallons/minute) at 10 - 40 PSI pressure drop
Temperature	closed loop water to water heat exchanger: external cooling water required, temperature <25° C
Others	
Electrical Service	200 - 240 VAC, single ø, 50/60 Hz
Room Temperature	18 to 30° C / 65 to 87° F; temp stability ±1° C/8hr

1.5 m (5 ft)

Umbilical Length

Notes:

 $^{\rm 12}$  The size of optical head and power supplies may vary depending on system requirements.









#### Variable Pulseshape

Agilite is a high-energy pulsed laser with selectable output pulsewidths. The system comprises an innovative laser design with programmable pulse shaping, a distributed intelligence control system and an intuitive Graphical User Interface (GUI).

The Agilite Nd:YAG laser is offered with high energy per pulse, outputs from 50 ns to 50 µsec, and repetition rates to 20 Hz. Harmonic generators tailored to specific pulsewidths and pulseshapes are available. This unique laser architecture opens new parameter space for diverse applications such as Doppler LIDAR, High brightness Laser Doppler Velocimetry, and Ballistic Imaging.

Agilite can also be used as a seeder of our liquid-cooled Disks Amplifiers (see Premiumlite) in order to deliver tens of Joules keeping the full advantage of pulseshaping.



# Applications

#### Industry:

CombustioncharacterizationAnnealing

#### Science:

> LIDAR > Imaging

> Velocimetry

- > Programmable pulsewidths on a standard platform
- > Intelligent control architecture for comprehensive system management
- > Intuitive Graphical User Interface

the .

Features

Contin

- > Single source to support diverse applications
- > YLF, glass phosphate versions at 1053 nm also available





Specifications	Agilite 560	Agilite 569	Agilite 6912
Energy Per Pulse	Ret	e	
Repetition Rate	1-20 Hz av	vailable	1-10 Hz
Wavelength		1064 nm / 532 nm	
Pulse Width FWHM	50 ns - 10 μs	50 ns – 10 μs	
SLM Oscillator		Yes	
Temporal Profile <sup>2</sup>		user selectable	
Beam Diameter @ 1/e <sup>2</sup>	≤ 6 mm	≤ 9 mm	≤ 12 mm
Beam Quality		M <sup>2</sup> <1.7	
Pointing Stability		± 50 μrad	
Long Term Mean Energy Stability		< 5 % over 8 hr	
Linewidth (cm <sup>-1</sup> ) <sup>3</sup>		< 2x transform limit	
Beam Divergence		≤ 0.5 mrad	
Pulse To Pulse Energy Stability at 1064 nm		< 2.5 % RMS	
Jitter <sup>4</sup> RMS		< 2 ns RMS	

Dimensions	of Agilite	560 & 569	
------------	------------	-----------	--

Optical Head* (LxWxH)	24" x 72" x 14.5"
Power Supply* (L x W x H)	24" x 28" x 60" (560), 24" x 28" x 70" (569)
	* Size may vary depending on system requirement
Water	
Service	1-3 GPM (gallons / minute) at 10 - 40 PSI pressure drop
Temperature	<22° C / 70° F (higher flow rate for higher temperature)
Other information	
Electrical Service	200-240 VAC, single phase, 50/60 Hz
Room Temperature	18 to 30° C / 65 to 87° F
Umbilical length	3.80 m (12.5 ft)

 $^1$  Two configurations (modulator 1 and modulator 2) are available.  $^2$  System is configured with one factory set waveform. Additional waveforms are available.

<sup>3</sup> Measured with detection floor of 170 MHz

<sup>4</sup> Measured at 1/2 max leading edge with respect to external modulator trigger. All specifications at 1064 nm unless otherwise noted.





Agilite 560 system output pulse shape

The Agilite 560 GUI screens

The Agilite 560 system block diagram





	Agilite 560			Agilite 569			Agilite 6912 Ag			gilite HE		
Repetition Rate	10	Hz	20	Hz	10	Hz	20	Hz	10	Hz	10	Hz
Wavelength (nm)	1064	532	1064	532	1064	532	1064	532	1064	532	1064	532
	Energ	gy mJ	Ener	gy mJ	Ener	gy mJ	Energ	gy mJ	Energ	gy mJ	Ener	gy mJ
Modulator 1												
50 ns	90	30	30	8	1100	525	630	275	2600	1650	Up	Up
100 ns	130	35	50	15	1200	550	810	350	2800	1750	to 65 J	to 30 J
200 ns	180	55	80	25	1275	590	900	370	3000	1900	Agilite HE: conta	ct us for more information
500 ns	250	85	130	40	1360	600	1180	440	3200	1900		
1 µs	310	100	180	60	1450	575	1170	450	3400	1850		
2 µs	360	120	240	80	1530	625	1260	460	3600	2000		
5 µs	440	145	310	100	1530	560	1350	440	3600	1800		
10 µs	500	150	360	85	1600	460	1440	360	3800	1450		
Modulator 2												
5 μs	440	145	310	100	1800	630	1500	495				
10 µs	500	150	360	85	1900	520	1600	405				
20 µs	550	110	420	70	2000	350	1600	270				
50 μs	620	65	490	40	2000	180	1700	140				





Agilite HE: Agilite 569 as front-end on the top and up to 6 PAMDAM on the table



Pseudo Active Mirror Disk Amplifier Module (PAM-DAM) in Agilite HE





Click on a laser











Click on a laser











Click on a laser



Powerlite DLS 8000



Powerlite DLS 9000







Click on a laser



Surelite PIV











## Surelite 4

*The New Reference in High Energy DPSS Nanosecond Laser* 

The new Surelite 4 high energy 100 Hz diode pumped laser platform draws upon 40 years of positive experience in quality laser design based on the "Energy through Efficiency" thesis – the best high energy laser beams are obtained when excess heat is minimized in the gain media.

Named after the most successful pulsed Nd:YAG laser (> 20,000 installations), the Surelite 4 will proudly carry the mantle held by its revered predecessor.

Surelite 4 is a true hands-off laser platform designed for high output configurability and proven by the most strenuous testing procedures to date. Controlled via an intuitive Graphical User Interface and integrating onboard sensors, this state-of-the art laser brings you out of the box performance and reliability – first day & every day.

Excellent beam quality & unsurpassed output energies in a compact and flexible package make Surelite 4 the ideal choice for pumping OPOs, dye or Ti:sapphire lasers.



> Pumping Ti:Sapphire> Rayleigh Scattering> Thomson Scattering

- > OPO Pumping
- > LIDAR



- > Compact, modular & mobile DPSS laser
- > Reliable performance first day & every day
- > Optional: internal doubling , 1 or 2 pump heads
- > Multimode or gaussian operation
- > Excellent pointing stability
- > 100 Hz standard, other configurations available





### **Specifications**

-	
Wavelength (nm)	532
Repetition Rate (Hz)	100
Energy (mJ)	125
Pulsewidth (ns)	<10
Divergence (mrad)	<2
Beam Pointing <sup>1</sup> (+/- urad)	7.5
Beam Diameter <sup>2</sup> (mm)	5
Jitter <sup>3</sup> (+/- ns)	<0.35
Energy Stability <sup>4</sup> (+/-%)	0.5
Power Drift <sup>5</sup> (+/- %)	<2

Laser Head Size and w	veight
Size inch (mm)	18" x 7" x 8" (457 x 178 x 203)
Weight lbs (kg)	40 (18.2)
Others	
Water	closed loop water-to-air chiller, included
Electrical Service	110-240 V, single phase, 10 A, 50/60 Hz
Room Temperature	65 to 82° F / 18 to 28°C

1. RMS over 1000 shots ; 2. 500mm from exit port ; 3. RMS WRT single external trigger ; 4. RMS of 10,000 shots ; 5. Within operating range and  $\Delta$ T room < 2° C /Hour

### Surelite 4 Physical Layout



2-532-MM







## Axia<sup>™</sup> OPO

#### Compact, Mobile, Fiber Delivery OPO

Specifically designed for deployment into pre-clinical environments, AXIA is a fiber coupled OPO that provides broadband tunability, ease of operation, and efficiency in a compact, mobile package. With beam quality that is the hallmark of Amplitude products, AXIA offers a clear advantage in the marketplace.

Fully automated for precision scanning, AXIA comes with a GUI for hands-free operation and features built-in safety interlocks for smooth and safe operation in every environment.







#### Science:

> Photoacoustic Imaging

> Biological Sample Excitation> Spectroscopy

- Key Features
- > Fully automated for precision scanning> GUI for hands free operation
- > Built-in safety interlocks for smooth and safe operation in every lab
- > Optional energy monitoring for easy diagnostics
- > Optional fiber delivery

mobile system

> Frequency shifting at 20Hz with linewidth accuracy.



Specifications	AXIA
OPO Peak Energy at 750 nm (mJ)	100
Signal Energy (680-970)	70
Idler Energy (1200-2000) nm	15
Repetition Rate (Hz)	20
Tuning Range	680-970 nm signal / 1200-2000 nm idler
Pulsewidth (ns)	3-8
Beam Diameter (mm)	~ 6

Size and weight	
Size	11.6" x 22.15" x 31.3" (294.6 x 562.6 x 795.1 mm)
Weight	175 lbs
Others	
Others	
Water	closed loop water to air heat exchanger
Electrical Service	110-240 V, single phase, 10 A, 50/60 Hz
Room Temperature	18 to 28°C / 65 to 82° F

### Axia Physical Layout









# Inlite<sup>™</sup> II

High Energy Nd:YAG

The Inlite series of pulsed Q-switched laser systems provides high levels of performance and reliability for Industrial and OEM applications.

The Inlite is designed for new and existing users of pulsed lasers allowing easy integration, simple external control and ease of service in a compact package. The cast aluminum body structure is designed to minimize misalignment due to changes in temperature or vibration. The optics cavity is sealed to prevent contamination. Both lamp electrodes are accessible during lamp changes, eliminating problems with corrosion and broken lamps.

Options and accessories can be added to tailor the laser performance parameters to your application. Inlite series are used for remote sensing, sample testing, mass spectroscopy, LIF, LIBS and LIDAR.



#### Industry:

- Material sorting (recycling)Weld inspection
- > Cleaning

#### > LIBS Science:

- > LIDAR
- > Thomson Se
- > Thomson Scattering> Laser Thermal Annealing
- > Pump Source
- > LIF, PLIF, LIBS

#### Medical:

> Skin Surfacing
 > Tattoo Removal
 > Pump Source
 > Medical device
 manufacturing

Key Features

- > Hardened design for reliable operation in industrial environments
- > Modular power supply in both rack mount and tower configurations
- > Easy flashlamp replacement without realignment of the laser oscillator
- > Cast aluminum resonator structure for a long-term thermal and mechanical stability
- > Options and accessories available to simplify integration







#### Specifications

#### Inlite II - 20

Inlite II - 30

All specifications at 1064 nm unless otherwise noted.

-			
Repetition Rate (Hz)	20		30
Energy (mJ) 1064 nm 532 nm 355 nm 266 nm	250 125 40 20		200 100 35 15
Pulsewidth <sup>1</sup> (ns) 1064 nm 532 nm 355 nm 266 nm	6 - 8 5 - 7 5 - 7 5 - 7		7 - 9 6 - 8 6 - 8 6 - 8
Linewidth (cm <sup>-1</sup> )		1	
Divergence <sup>2</sup> (mrad)		< 0.75	
Beam Diameter <sup>3</sup> (mm)		6	
Jitter <sup>4</sup> (±ns)		0.5	
Energy Stability <sup>5</sup> (±%) 1064 nm 532 nm 355 nm 266 nm		2.0 ; 0.6 4.0 ; 1.3 6.0 ; 2.0 8.0 ; 2.6	
Polarization 1064 nm 532 nm 355 nm 266 nm		Horizontal Vertical Horizontal Horizontal	

<sup>1</sup> Full width half max

<sup>2</sup> Full angle for 86% (1/e<sup>2</sup>) of energy

<sup>3</sup> At the output coupler

<sup>4</sup> With respect to external trigger

 $^5$  The first value represents shot-to-shot for 3  $\sigma$  of pulses, the second value represents RMS;

Dimensions	
Optical Head (LxWxH)	323 x 84 x 94 mm (12.7 x 3.3 x 3.7 in)
Power Supply - Tower (LxWxH)	572 x 254 x 432 mm ( 22.5 x 10 x 17 in. )
Power Supply - Rack (LxWxH)	559 x 432 x 267 mm ( 22 x 17 x 10.5 in. )
Weight	

Optical Head	4.5 kg (10 lbs)
Power Supply	30 kg (66 lbs)

#### Water

Closed loop water to air heat exchanger (2 l. deionized water): Closed loop water to external cooling water available.

#### Others

Electrical Service	200 - 240 V (6 A), 50/60 Hz
Room Temperature	18.3 to 29.4° C (60 to 85° F)
Umbilical Length	3.0 m (9 ft 10 in)

#### Accessories

- Harmonics modules for 532, 355, or 266 nm output
- Dichroic beam separation module
- Internal pyro-electric power detectors for IR, harmonics
- External pyro-electric power detector for system loop
- Automated continuously variable attenuator, optical losses reduce energy specifications by 10%





### Inlite II Physical Layout

Top View Tower Supply



Top View Rack Mount Power Supply



#### Front View



Note: Faceplate is 10.5" in height. Body of supply is 10.0" to height, centered on faceplate.





Note 1: 3/32" location pin (2x) Note 2: Clearance Slots for M4 Allen head screws (3x)





# Inlite<sup>™</sup> III

*High Energy Nd*:YAG

The Inlite series of pulsed Q-switched laser systems provides high levels of performance and reliability for Industrial and OEM applications.

The Inlite is designed for new and existing users of pulsed lasers allowing easy integration, simple external control and ease of service in a compact package. The cast aluminum body structure is designed to minimize misalignment due to changes in temperature or vibration. The optics cavity is sealed to prevent contamination. Both lamp electrodes are accessible during lamp changes, eliminating problems with corrosion and broken lamps.

Options and accessories can be added to tailor the laser performance parameters to your application. Inlites are used for remote sensing, sample testing, mass spectroscopy, LIF and LIBS.





#### Industry:

- > Material sorting (recycling)
- > Weld inspection
- > Cleaning
- > LIBS

#### Science:

- > LIDAR
- > Thomson Scattering
- > Laser Thermal Annealing
- > Pump Source
- > LIF, PLIF, LIBS

#### > Skin Surfacing

**Key Features** 

> Tattoo Removal

Medical:

- > Pump Source
- > Medical device manufacturing

- Hardened design for reliable operation in industrial environments
- > Modular power supply in both rack mount and tower configurations
- > Easy flashlamp replacement without realignment of the laser oscillator
- > Cast aluminum resonator structure for a long-term thermal and mechanical stability
- > Options and accessories available to simplify integration

BACK TO MENU

Specifications	Inlite III - 10	Inlite III - 20	Inlite III - 30
Repetition Rate (Hz)	10	20	30
Energy (mJ) 1064 nm 532 nm 355 nm 266 nm	45 20 6 4	50 00 5 5	400 180 55 35
Pulsewidth <sup>1</sup> (ns) 1064 nm 532 nm 355 nm 266 nm		6 - 8 6 - 8 5 - 7 5 - 7	
Linewidth (cm-1)		1	
Divergence <sup>2</sup> (mrad)		< 1.5	
Beam Diameter <sup>3</sup> (mm)		7	
Jitter <sup>4</sup> (±ns)		< 1	
Energy Stability⁵ (±%) 1064 nm 532 nm 355 nm 266 nm		2.0 ; 0.6 4.0 ; 1.3 6.0 ; 2.0 8.0 ; 2.7	
Polarization 1064 nm 532 nm 355 nm 266 nm		Horizontal Vertical Horizontal Horizontal	

<sup>1</sup> Full width half max

 $^{\rm 2}$  Full angle for 86% (1/e²) of energy

<sup>3</sup> At the output coupler

<sup>4</sup> With respect to external trigger

 $^5$  The first value represents shot-to-shot for 3  $\sigma$  of pulses, the second value represents RMS;

Dimensions	
Optical Head (LxWxH)	323 x 84 x 94 mm (12.7 x 3.3 x 3.7 in)
Power Supply - Tower (LxWxH)	572 x 254 x 432 mm ( 22.5 x 10 x 17 in. )
Power Supply - Rack (LxWxH)	559 x 432 x 267 mm ( 22 x 17 x 10.5 in. )

#### Weight

Optical Head	4.5 kg (10 lbs)
Power Supply	30 kg (66 lbs)

#### Water

Closed loop water to air heat exchanger (2 l. deionized water): Closed loop water to external cooling water available.

#### Others

All specifications at 1064 nm unless otherwise noted.

Electrical Service	200 - 240 V (6 A), 50/60 Hz
Room Temperature	18.3 to 29.4° C (60 to 85° F)
Umbilical Length	3.0 m (9 ft 10 in)

#### Accessories

- Harmonics modules for 532, 355, or 266 nm output
- Dichroic beam separation module
- Internal pyro-electric power detectors for IR, harmonics
- External pyro-electric power detector for system loop
- Automated continuously variable attenuator, optical losses reduce energy specifications by 15%, except the 30 Hz model, which is 25%.





Specifications are subject to change without prior notice  $\mid$  @ 02-2021  $\mid$  Ref. 1265-c

### Inlite III Physical Layout

Top View Tower Supply



Top View Rack Mount Power Supply



Front View



Note: Faceplate is 10.5" in height. Body of supply is 10.0" to height, centered on faceplate.





Note 1: 3/32" location pin (2x) Note 2: Clearance Slots for M4 Allen head screws (3x)





## Mesa™

#### Diode pumped Nd:YAG laser

Our Mesa Series of lasers is ideally suited for a broad range of scientific and industrial applications, including micromachining, where small kerf width and excellent edge quality are the most important process requirements. This series of lasers is optimized with astigmatism-free circular beams and superior stability to ensure the highest process quality.

Our pumping technology and stable optical resonator design produce a laser beam with uniform energy distribution and high output power. The harmonic output at 532 nm is ideal for processing materials such as semiconductor wafers, solar cells, copper, polyamide, printed circuit boards, and plastics.





#### Industry:

- > Stent/Glass/PCB/Fine Metal
- Applications Cutting > LCD/Solar Edge Deletion
  - > Marking
  - > Wafer Trimming
  - > Micro-hole Drilling
  - > Ceramics Scribing
  - > Fine Wire Stripping
  - > Diamond/Gemstone Processing

#### Science:

- > Ti:Sapphire pumping
- > Particle Image Velocimetry (PIV)
- Combustion Analysis
- > Laser Induced Fluorescence
- > LIDAR
- > Resonance Raman Spectroscopy
- > Chemical Analysis of Macromolecules

#### > Laser Microprobe Analysis

#### > 1064 and 532 nm operation

**Key Features** 

- > Smooth and symmetrical beam profile
- > Highly efficient wavelength conversion
- > Consistent output over wide power range
- > Compact & rugged package designed for 24/7 operation
- > Record 3 min. diode module replacement with no realignment necessary
- Proprietary optical cavity design for optimal beam quality







Specifications	1064- 100-M	1064- 50-M	1064- 25-М	1064- 25-0	1064- 20-0-Р	532- 60-M	532- 40-L	532- 40-M	532- 20-0	532- 16-0	532- 10-0
Wavelength			1064					53	32		
Power CW (W)	100	50		25	20			n,	'a		
Power at 10 kHz (W)	75	37	18	20	14	60	4	0	20	16	10
Power at 6 kHz (W)	60	30	14	17	10	55	4	0	18	16	9
Repetition Rate (kHz)		1-40				1-30					
Pulse-to-Pulse Stability (% RMS) <sup>1</sup>	<	2	< 3		< 2		< 3	< 2		< 3	
Pulsewidth (ns)	< 160	< 200	< 220	<	140	< 1	50	< 170	<	: 110	< 130
Beam Pointing Stability (µrad RMS)	< 20	<	30	<	: 15		< 20			< 15	
Beam Diameter (mm) <sup>2</sup> , <sup>3</sup>		6		1.1	1.0	3.5	2.2	4.0		0.9	0.8
Beam Divergence (mrad) <sup>2</sup>	9.5	7	7		3	7	5	7		2.3	1.7
Beam Quality (M <sup>2</sup> )	< 20	<	12	<	1.2	< 25	< 12	< 25		< 1.2	
Polarization <sup>4</sup>		Ran	dom					V 100:1			

<sup>1</sup> All specifications at 6 kHz unless otherwise noted

<sup>2</sup> Typical measurement (±10%)

<sup>3</sup> Measured at 13.5% level at output window <sup>4</sup> V=Vertical. Factory default (can be changed upon request)



Mesa Output Profile: M<sup>2</sup> <1.2 at 6kHz





Laser System Output Characteristics: Mesa 532-20-0





### Mesa Physical Layout

Side View





Side View Chiller







Front View



#### Dimensions

Optical Head (LxWxH)	686 x 171 x 145 mm (27.0 x 6.8 x 5.7 in)
Power Supply (LxWxH)	509 x 483 x 177 mm (20.0 x 19.0 x 7 in)
Chiller (LxWxH)	699 x 483 x 411 mm (27.5 x 19.0 x 16.2 in)
Weight	
Optical Head	20.4 kg (45 lbs)
Power Supply	17.7 kg (39 lbs)
Chiller	55 kg (122 lbs)

#### **Electrical Service**

Power Supply	Single-phase: 200-240 VAC, 50/60 Hz operating current: 5A, max current: 10A
Chiller	Single-phase: 230 $\pm$ 10% VAC, 50/60 Hz operating current: 10A, max current: 15A

#### Temperature & Humidity

Operating Temperature	15 to 35° C
Storage Temperature	-20C to 50° C
Relative Humidity	8-80%, non-condensing

#### Control Interface

User Interface	Full featured front panel control
Serial Interface	RS-232
Rear Connections	External beam enable, external trigger
Control Software	MS Windows-based Laser Commander™

#### Umbilical Length

3.65 m (12.0 ft)

Cooling

Side View

Air-water; water-water cooling option available







## Mesa<sup>™</sup> HP

#### Diode pumped Nd:YAG laser

The Mesa HP Nd:YAG laser is designed to accomplish demanding tasks for a broad range of industrial and OEM applications. Our pumping technology and stable optical resonator design produce a laser beam with uniform energy distribution and high output power.

The high-quality profile, combined with high pulse energy and repetition rates, provide an ideal laser beam for micromachining applications.



### Appl<u>ications</u>

#### Industry:

- > Stent/Glass/PCB/Fine Metal Cut-
- ting
  - > LCD/Solar Edge Deletion
  - > Marking
  - > Wafer Trimming
  - > Micro-hole Drilling
  - > Ceramics Scribing
  - > Fine Wire Stripping
  - > Diamond/Gemstone Processing

#### Science:

- > Ti:Sapphire pumping
- > Particle Image Velocimetry
- > Combustion Analysis
- > Laser Induced Fluorescence
- > LIDAR
- > Resonance Raman Spectroscopy
- > Chemical Analysis of Macromolecules

**Key Features** 

> Laser Microprobe Analysis

#### > 1064, 532, 355 nm operation

- > Smooth and symmetrical beam profile
- > Highly efficient wavelength conversion
- > Fist-pulse supression for consistent material processing
- > Compact & rugged package designed for 24/7 operation
- > Record 3 min. diode module replacement with no realignment necessary
- > Proprietary optical cavity design for optimal beam quality





Specifications <sup>1</sup>	1064- 220-M	1064- 180-L	1064- 150-M	532- 150-M	532- 120-L	532- 100-M	355- 40-M
Wavelength		1064			532		355
Power CW (W)	220	180	150		n	/a	
Power at 10 kHz (W)	180	150	120	150	120	100	32
Power at 6 kHz (W)	150	120	100	120	100	80	40
Repetition Rate (kHz)		1-40			1-30		1-20
Pulse-to-Pulse Stability (% RMS) <sup>1</sup>	< 2	< 3	<	2	< 3	<	2
Pulsewidth (ns)	< 130	< 150	< 170	< 120	< '	130	< 170
Beam Pointing Stability (µrad RMS)				< 25			
Beam Diameter (mm) <sup>2</sup> , <sup>3</sup>		2.5			2	2.6	
Beam Divergence (mrad) <sup>2</sup>	11	9	11	9	8	9	6
Beam Quality (M²)	< 25	< 12	< 25	< 30	< 15	< 30	< 35
Polarization <sup>4</sup>		Random			V 1	00:1	



Mesa HP, 1064-220-M



Mesa HP, 532-150-M



Mesa HP, 355-40-M



Mesa HP 1064-220-M Performance Curves

<sup>1</sup> All specifications at 6 kHz unless otherwise noted.
 <sup>2</sup> Typical measurement (±10%)
 <sup>3</sup> Measured at 1/e <sup>2</sup> points of Gaussian fit to beam profile
 <sup>4</sup> V=Vertical. Factory default (can be changed upon request)





Mesa HP 355-40-M Performance Curves





### Mesa HP Physical Layout









2757(70)

Side View Chiller

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

CE



#### Dimensions

Optical Head (LxWxH)	812 x 254 x 145 mm (31.9 x 10.0 x 5.6 in)
Power Supply (LxWxH)	509 x 483 x 221 mm (20.0 x 19.0 x 8.7 in)
Chiller (LxWxH)	699 x 483 x 492 mm (27.5 x 19.0 x 19.4 in)
Weight	
Optical Head	31.5 kg (70 lbs)
Power Supply	27 kg (60 lbs)
Chiller	65 kg (144 lbs)

#### **Electrical Service**

Power Supply	Single-phase: 200-240 VAC, 50/60 Hz operating current: 10A, max current: 20A
Chiller	Single-phase: 230 ±10% VAC, 50/60 Hz operating current: 12A, max current: 20A

#### Temperature & Humidity

Operating Temperature	15 to 35° C
Storage Temperature	-20C to 50° C
Relative Humidity	8-80%, non-condensing

#### Control Interface

User Interface	Full featured front panel control
Serial Interface	RS-232, ethernet
Rear Connections	External beam enable, external trigger, analog current control, analog RF attenuation control, digital alert output
Control Software	MS Windows-based Laser Commander™
Others	
Umbilical Length	3.65 m (12.0 ft); longer available upon request
Cooling	Air-water; water-water cooling option available

amplitude-laser.com

notice | © 02-2021 | Ref. 1264-c prior without





## Mesa<sup>™</sup> PIV

High Power Diode Pumped Nd: YAG Laser

Mesa PIV is a dual oscillator/single head, high repetition rate, diodepumped Nd:YAG laser. It offers ultimate flexibility for PIV and other dual output applications.

The combination of two oscillators allows complete control of pulse separation and pulse energy. Both oscillators in the Mesa PIV are identical in optical design giving temporally and spatially matched pulses for the highest degree of cross-correlation. Each oscillator can be independently triggered via TTL inputs. As an option, a compact, external combination box can be directly attached to the laser to make access to the beam combination optics easier and safer for the rest of the laser system.



#### Industry:

**Applications** 

- > Stent/Glass/PCB/Fine Metal
- Cutting > LCD/Solar Edge Deletion
- > Marking
- > Wafer Trimming
- > Micro-hole Drilling
- > Ceramics Scribing
- > Fine Wire Stripping
- > Diamond/Gemstone Processing

#### Science:

- > Ti:Sapphire pumping
- > Particle Image
- Velocimetry (PIV)
- > Combustion Analysis
- > Laser Induced Fluorescence
- > LIDAR
- > Resonance Raman Spectroscopy
- > Chemical Analysis of Macromolecules

**Key Features** 

> Laser Microprobe Analysis

- > 18 mJ total energy at 1-6 kHz
- > 120 W average power at 10 kHz
- > Ideal for Particle Image Velocimetry
- > Independent external trigger for each oscillator
- > Compact & rugged package designed for 24/7 operation
- > Record 3 min. diode module replacement with no realignment necessary
- Proprietary optical cavity design for optimal beam quality



Specifications <sup>1</sup>	532- 120-M	532- 80-M	532- 80-L	532- 60-M
Wavelength		53	32	
Power (W) @ 10 kHz	120	8	0	60
Energy per Osc (mJ) at 1- 6 kHz	9	6	.5	5
Total Pulse Energy (mJ) at 1-6kHz	18	1	3	10
Repetition Rate (kHz) <sup>1</sup>		1-3	30	
Pulse-to-Pulse Stability (% RMS)	< 7	2	< 3	< 2
Pulsewidth (ns)	< 150	< 170	< 150	< 190
Beam Pointing Stability (µrad RMS)		< 2	20	
Beam Diameter (mm) <sup>3</sup>	5		3	5
Beam Divergence (mrad) <sup>4</sup>	7		5	7
Beam Quality (M <sup>2</sup> )	< 2	5	< 15	< 25
Polarization <sup>5</sup>		Circ	ular	

All specifications at 6 kHz unless otherwise noted
 Single shot to 1 kHz available with external trigger.
 Measured at 13.5% level at output window
 Typical measurement (±10%).

<sup>5</sup> Cross-polarization available as option.



Mesa PIV 532-120-M Beam Profile

Dimensions	
Optical Head (LxWxH)	812 x 254 x 145 mm (31.9 x 10.0 x 5.6 in)
Power Supply (LxWxH)	509 x 483 x 221 mm (20.0 x 19.0 x 8.7 in)
Chiller (LxWxH)	699 x 483 x 492 mm (27.5 x 19.0 x 19.4 in)
Weight	
Optical Head	31.5 kg (70 lbs)
Power Supply	27 kg (60 lbs)
Chiller	65 kg (144 lbs)
Electrical Service	
Power Supply	Single-phase: 200-240 VAC, 50/60 Hz operating current: 10A, max current: 20A
Chiller	Single-phase: 230 ±10% VAC, 50/60 Hz

#### Temperature & Humidity

Operating Temperature	15 to 35° C
Storage Temperature	-20C to 50° C
Relative Humidity	8-80%, non-condensing

operating current: 12A, max current: 20A

#### Control Interface

User Interface	Full featured front panel control
Serial Interface	RS-232
Rear Connections	External beam enable, external trigger
Control Software	MS Windows-based Laser Commander™

#### Others

Umbilical Length	3.65 m (12.0 ft); longer available upon request
Cooling	Air-water; water-water cooling option available





2.75

(70)



Advantages Generation of Pulse Pairs



**Generation of Pulse Pairs** Flexible time delay adjustment



Two laser output synchronized to double the pulse energy and peak power, a) one laser output, b) a second laser output, and c) combined output.



Two laser output combined with an adjustable delay to double the repetition rate of the pulse. a) one laser output, b) a second laser output with delay, and c) combined laser output.

X /\* LASER AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

CE



## Minilite<sup>™</sup> I & II

High Energy Nd:YAG

The Minilite Series is the Amplitude entry level Q-switched Nd:YAG laser platform. It is designed for new and existing users of pulsed lasers allowing easy operation, simple external control and compact size. It provides high levels of performance while maintaining a very reasonable price point.

The Minilite platforms offer users accessible harmonic generators, integrated energy attenuator and simple operation.

Both the Minilite I and II lasers, use a single YAG rod/flashlamp pump chamber, invar resonator, and a stable resonator design which offers maximum energy extraction and excellent beam quality.

Minlite series lasers are used for remote sensing, sample testing, mass spectroscopy, LIF and laser flash photolysis.





#### Industry:

Medical:

> LCD repair > Sample setup > Resistor trimming > Metal Sorting > PIV

#### Science:

> LIF, PLIF, LIBS > MALDI > PIV

> Dimple Tray Illumination > Mass spec source

**Key Features** 

> Operated locally or remotely via TTL interface

- > System entirely self-contained, no external water hook-up needed
- > Easy flashlamp replacement without realignment of the laser oscillator
- > Invar resonator structure ensures long-term thermal and mechanical stability
- > Variable attenuator included




### Specifications

Specifications	Minilite I	Minilite II
Repetition Rate (Hz)		1-15
Energy (mJ) 1064 nm 532 nm 355 nm 266 nm	28 12 4 2	50 25 8 4
Pulsewidth <sup>1</sup> (ns) 1064 nm 532 nm 355 nm 266 nm		5 - 7 3 - 5 3 - 5 3 - 5
Linewidth (cm-1)		1
Divergence <sup>2</sup> (mrad)		< 3
Beam Diameter (mm)		3
Jitter <sup>3</sup> (±ns)		0.5
Energy Stability <sup>4</sup> (±%) 1064 nm 532 nm 355 nm 266 nm	2. 3. 4. 8.	0 ; 0.6 0 ; 1.0 0 ; 1.3 0 ; 2.6
Polarization 1064 nm 532 nm 355 nm 266 nm	Hoi Ve Hoi Hoi	rizontal ertical rizontal rizontal

<sup>1</sup> Full width half max

<sup>2</sup> Full angle for 86% (1/e<sup>2</sup>) of energy

<sup>3</sup> With respect to external trigger

<sup>4</sup> The first value represents shot-to-shot for 99.9% of pulses,

the second value represents RMS

Dimensions	
Optical Head (LxWxH)	267 x 172 x 63.5 mm (10.5 x 6.75 x 2.5 in)
Power Supply (LxWxH)	381 x 197 x 365 mm (15 x 7.75 x 14 in)
Weight	
Optical Head	3.6 kg (8 lbs)

#### Water

Power Supply

Closed loop water to air heat exchanger: external cooling water not required (10 oz. deionized water per PS)

14.5 kg (32 lbs)

#### Others

Electrical Service	Option 1: 110 V (4 A) OR Option 2: 220 V (2A), 50/60 Hz
Room Temperature	18 to 30° C (65 to 87° F)
Umbilical Length	3.18 m (10.4 ft)



Minilite interior layout

All specifications at 1064 nm unless otherwise noted.





## Minilite Physical Layout



Note 1: Clamps optional Note 2: Base is drilled & tapped in 4 places with 1/4-20 Note 3: Variable Attenuator (VA).





Power Supply







# Minilite<sup>™</sup> PIV

High Energy Nd:YAG

The Minilite PIV system is based on the Amplitude proven Q-switch Nd:YAG technology. The system is a miniaturized Surelite package providing 10's of mJ in each pulse at 532 nm.

The system offers excellent beam quality, long term stability and increased overall reliability. The ease of operation and safety features, as well as long lifetime, make the Continuum PIV system an excellent choice for your dual pulse application.





#### Industry:

> LCD repair> Resistor trimming

> Resistor trimming > Dimple Tray Illumination > Metal Sorting > Mass spec source

Medical:

> Sample setup

- Science:
- > LIF, PLIF, LIBS
- > MALDI
- > PIV

> PIV

- > Safety Interlocks to ensure correct water flow, level, and temperature
- > System entirely self-contained, no external water hook-up needed
- > A built-in TTL interface for convenient external control
- > A decoupled kinematic mounted resonator structure ensures long-term thermal and mechanical stability
- > Very compact package

**Key Features** 





#### Specifications **ML PIV** Repetition Rate (Hz) 1-15 Energy (mJ) 1064 nm 50 532 nm 25 Pulsewidth<sup>1</sup> (nsec) 1064 nm 4 - 6 532 nm 3 -5 Divergence<sup>2</sup> (mrad) < 3 Rod Diameter (mm) 3 Energy Stability<sup>4</sup> (±%) 1064 nm 2.0; 0.7 532 nm 3.0; 1.0 Beam Spatial Profile (fit to Gaussian)<sup>5</sup> Near Field (<1M) 0.70 Far Field (∞) 0.95

<sup>1</sup> Full width half max

 $^2$  Full angle for 86% (1/e²) of energy

<sup>3</sup> With respect to external trigger

<sup>4</sup> The first value represents shot-to-shot for 99.9% of pulses,

the second value represents RMS

<sup>5</sup> A least squares fit to Gaussian profile A perfect fit would have a coefficient of 1

A perfect fit would have a coefficient of 1

All specifications at 1064 nm unless otherwise noted.

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D	I	n	٦	e	n	١S	I	0	n	S

Optical Head (LxWxH)	431.8 x 203.4 x 63.5 mm (17" x 8" x 2.5")
Power Supply (LxWxH)	380 x 197 x 365 mm (15" x 7.75" x 14") each of 2

#### Weight

Optical Head	3.6 kg (8 lbs)
Power Supply (2)	14.5 kg (32 lbs) each of two

#### Water

Closed loop water to air heat exchanger: external cooling water not required (10 oz. deionized water per PS)

#### Others

Electrical Service	Option 1: 110 V (4 A) for each power supply OR Option 2: 220 V (2A), 50/60 Hz for each power supply
Room Temperature	18 to 30° C (65 to 87° F)
Umbilical Length	3.18 m (10.4 ft)





365 (14)

## Minilite Physical Layout

Power Supply







Specifications are subject to change without prior notice  $\mid$  © 02-2021  $\mid$  Ref. 1194-c



# **Powerlite<sup>™</sup> DLS Plus**

### High Energy Nd:YAG

The Powerlite DLS Plus Series is an ideal solution when higher levels of green energy are required for the pumping of Ti:Sapphire laser systems.

High energy, high repetition rate Ti:Sapphire systems are using multiplexed standard lasers as the amplifier pump source. When more energy is required, more lasers are needed.

At 2 J and 2.5 J at 532 nm, the Powerlite DLS Plus Series is the industry leader in terms of energy and beam quality.

For dollars per Joule, the Powerlite DLS Plus Series lasers make economic sense.





#### Industry:

- > Material sorting (recycling)
- > Weld inspection
- > Cleaning > LIBS
- > Medical device manufacturing

Medical:

> Skin Surfacing

> Pump Source

> Tattoo Removal

#### Science:

- > LIDAR, LIF, LIBS, PLIF
- > Thomson Scattering
- > Laser Thermal Annealing
- > Pump Source

**Key Features** 



- > Distributed intelligence power supply architecture.
- > Rack mounted and modular components for easier maintenance and service
- > New cooling group with active digital control for acurate temperature monitoring and improved thermal management
- > LabView drivers available



BACK TO MENU		

Specifications	Plus	Plus 2 J	Plus 2.5 J
Repetition Rate (Hz)		10	
Energy (mJ) 1064 nm 532 <sup>1</sup> nm 355 <sup>2</sup> nm 266 nm	3000 1500 800 160	2000 NA NA	- 2500 NA NA
Pulsewidth <sup>3</sup> (ns) 1064 nm 532 nm 355 nm 266 nm	6-9 5-8 4-7 4-6	- 5-8 NA NA	- 6-8 NA NA
Linewidth <sup>4</sup> (cm-1) Standard Injection Seeded, SLM		1 0.003	
Divergence⁵ (mrad)		0.45	
Beam Pointing Stability <sup>6</sup> (±µrad)		30	
Beam Diameter (mm)		12	
Jitter <sup>7</sup> (±ns) Unseeded Seeded		0.5 1.0	
Energy Stability <sup>8</sup> (±%) 1064 nm 532 nm 355 nm 266 nm	2.5;0.8 3.0;1.0 4.0;1.3 8.0;2.6	3.0 N N	;1.0  A  A
Power Drift <sup>9</sup> (±%) 1064 nm 532 nm 355 nm 266 nm	3.0 6.0 6.0 8.0	6 N N	- .0  A

Dimensions	
Optical Head (L x W x H)	1189.2 x 457.2 x 298.4 mm (46.82" x 18" x 11.75")
Power Supply (L x W x H)	714.5 x 621 x 679.4 mm (28.13" x 24.46" x 26.75")
Water	
Service	1-2 GPM (gallons/minute) at 10 - 40 PSI pressure drop
Temperature	<22° C / 70° F (higher flow rate for higher temperature)

#### Others

Electrical Service	200 - 240 VAC, single $\Phi$ , 50/60 Hz
Room Temperature	18 to 30° C / 65 to 87° F
Umbilical Length	5 m (16.4 ft)





Powerlite DLS Plus 2J Beam Quality -2 J at 532 nm

All specifications at 1064 nm unless otherwise noted.

Powerlite DLS Plus 2.5 J Beam Quality -2.5 J at 532 nm

 $^6~$  99.9% shots will be <±30 µrads with  $\Delta T_{_{room}}$  <±3°C  $^7~$  With respect to external trigger <sup>1</sup> Using Type II doubler

<sup>2</sup> Using Type I doubler <sup>3</sup> FWHM full width half max

<sup>8</sup> The first value represents shot-to-shot for 99.9% of pulses, the second value represents RMS

<sup>4</sup> FWHM (1cm<sup>-1</sup> = 30 GHz)

<sup>5</sup> Full angle for 86% (1/e<sup>2</sup>)  $^{9}$  Average for 8 hours with  $\Delta T\pm 3^{\circ}C$ 





Specifications	Plus	Plus 2 J	Plus 2.5 J
Beam Spatial Profile (Fit to Gaussian)¹º Horizontal Near Field (<1m) Far Field (∞)		0.7 0.95	
Max Deviation from fitted Gaussian <sup>11</sup> (±%) Near Field (<1m)		40	
Service Requirements 208-240 VAC, single Φ Water GPM at 10-40 PSI	21A 1-2		30A 1-2
Polarization 1064 nm 532 nm 355 nm 266 nm		Horizontal Vertical Horizontal Horizontal	

<sup>10</sup> A least squares fit to a Gaussian profile. A perfect fit would have a coeffficient of 1. <sup>11</sup> Within FWHM points near field at 1 meter.

CE

### Powerlite DLS Plus Physical Layout







# Powerlite<sup>™</sup> DLS 8000

### High Energy Nd:YAG

The Powerlite Series of high energy YAG lasers is known for its beam quality, reliability, and ease of use. The New DLS (Digital Laser Source) Series remains consistent with the Amplitude approach to laser design, keeping the features that have made it so popular, and adding new capabilities to enhance its performance and utility.

The DLS power supply is compact and quiet, taking up half the space of the one it replaces. The components are modular and rack mounted to simplify maintenance and service. It uses distributed intelligence, with microprocessors in both the laser head and power supply.

A new cooling group has been added for more accurate monitoring. The complete control of all functionality is made possible through a digital interface, thus eliminating the need for knobs or switches.

A powerful Windows®-based Graphical User Interface is standard for all Powerlite DLS systems. An optional touch screen remote control is available, as are LabView drivers.





#### Industry:

- > Material sorting (recycling)
- > Weld inspection> Cleaning
- > LIBS
- > LIDS

#### Science:

- > LIDAR, LIF, LIBS, PLIF
- > Thomson Scattering
- > Laser Thermal Annealing
- > Pump Source

#### Medical: > Skin Surfacing

**Key Features** 

- > Tattoo Removal
- > Pump Source
- > Medical device manufacturing

- > Distributed intelligence power supply architecture.
  - > Rack mounted and modular components for easier maintenance and service
  - > New cooling group with active digital control for acurate temperature monitoring and improved thermal management
  - > LabView drivers available
  - > HEO for maximum 532 nm output





Specifications	8000	8010	8020	8030	8050
Repetition Rate (Hz)	1	0	20	30	50
Energy (mJ) 1064 nm 532 <sup>1</sup> nm 532 HEO 355 <sup>2</sup> nm 266 nm	1200 600 800 310 120	1650 800 1100 450 150	1200 550 780 300 80	650 300 420 150 50	550 210 360 95 30
Pulsewidth <sup>3</sup> (ns) 1064 nm 532 nm 355 nm 266 nm		6-8 5-7 5-7 5-7			7-9 5-8 5-8 5-8
Linewidth⁴ (cm-1) Standard Injection Seeded, SLM			1 0.003		
Divergence⁵ (mrad)		0.45			0.5
Beam Pointing Stability <sup>6</sup> (±µrad)			30		
Beam Diameter (mm)		9			7
Jitter <sup>7</sup> (±ns) Unseeded Seeded			0.5 1.0		
Energy Stability <sup>8</sup> (±%) 1064 nm 532 nm 355 nm 266 nm		2.5;0.8 3.5;1.2 4.0;1.3 10;3.3		3. 4. 5. 10	0;1.0 5;1.5 0;1.7 );3.3
Power Drift <sup>9</sup> (±%) 1064 nm 532 nm 355 nm 266 nm		3.0 5.0 5.0 8.0		5.0 6.0 6.0 8.0	5.0 7.0 8.0 8.0

Dimensions	
Optical Head (LxWxH)	1189.2 x 457.2 x 298.4 mm (46.82" x 18" x 11.75")
Power Supply (LxWxH)	714.5 x 621 x 546.1 mm (28.13" x 24.46" x 21.5")
Water	
Service	1-2 GPM (gallons/minute) at 10 - 40 PSI pressure drop
Temperature	<22° C / 70° F (higher flow rate for higher temperature)
Others	
Electrical Service	200 - 240 VAC, single $\Phi$ , 50/60 Hz
Room Temperature	18 to 30° C / 65 to 87° F
Umbilical Length	5 m (16.4 ft)

<sup>1</sup> Using Type II doubler
 <sup>2</sup> Using Type I doubler
 <sup>3</sup> FWHM full width half max

 $^6$  99.9% shots will be <±30 µrads with  $\Delta T_{mom}$  <±3°C

<sup>7</sup> With respect to external trigger <sup>8</sup> The first value represents shot-to-shot for 99.9% of pulses,

<sup>4</sup> FWHM (1cm<sup>-1</sup> = 30 GHz) the second value represents RMS

<sup>5</sup> Full angle for 86% (1/e<sup>2</sup>)  $^{\rm 9}$  Average for 8 hours with  $\Delta T\pm 3^{\circ}C$ 

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All specifications at 1064 nm unless otherwise noted.



Specifications are subject to change without prior notice  $\mid \odot$  02-2021  $\mid$  Ref. 1266-e

Specifications	8000	8010	8020	8030	8050
Beam Spatial Profile (Fit to Gaussian) <sup>10</sup> Horizontal Near Field (<1m) Far Field (∞)			0.7 0.95		
Max Deviation from fitted Gaussian <sup>11</sup> (±%) Near Field (<1m)			40		
Service Requirements 208-240 VAC, single Φ Water GPM at 10-40 PSI	10A 1-2	11A 1-2	16 1-	A 2	17A 1-2
Polarization 1064 nm 532 nm 355 nm 266 nm			Horizontal Vertical Horizontal Horizontal		

 $^{\rm 10}$  A least squares fit to a Gaussian profile. A perfect fit would have a coeffficient of 1.  $^{\rm 11}$  Within FWHM points near field at 1 meter.

"Within FWHM points near field at Timeter.

### Powerlite DLS 8000 Physical Layout







# Powerlite<sup>™</sup> DLS 9000

### High Energy Nd:YAG

The Powerlite Series of high energy YAG lasers is known for its beam quality, reliability, and ease of use. The New DLS (Digital Laser Source) Series remains consistent with the Amplitude approach to laser design, keeping the features that have made it so popular, and adding new capabilities to enhance its performance and utility.

The DLS power supply is compact and quiet, taking up half the space of the one it replaces. The components are modular and rack mounted to simplify maintenance and service. It uses distributed intelligence, with microprocessors in both the laser head and power supply.

A new cooling group with active digital control has been added. The complete control of all functionality is made possible through a digital interface, thus eliminating the need for knobs or switches.

A powerful Windows<sup>®</sup>-based Graphical User Interface is standard for all Powerlite DLS systems. An optional touch screen remote control is available, as are LabView drivers.





#### Industry:

Material sorting (recycling)
 Weld inspection
 Cleaning
 LIBS

#### Science:

- > LIDAR, LIF, LIBS, PLIF
- > Thomson Scattering
- > Laser Thermal Annealing
- > Pump Source

#### Medical: > Skin Surfacing

- > Tattoo Removal
- > Pump Source
- > Medical device manufacturing
- Key Features > Ra
- > Distributed intelligence power supply architecture.
- > Rack mounted and modular components for easier maintenance and service
  - > New cooling group with active digital control for acurate temperature monitoring and improved thermal management
  - > LabView drivers available
  - > HEO for maximum 532 nm output



Specifications	9010	9020	9030	9050
Repetition Rate (Hz)	10	20	30	50
Energy (mJ) 1064 nm 532 <sup>1</sup> nm 532 HEO 355 <sup>2</sup> nm 266 nm	2000 1000 1400 550 160	1800 900 1200 475 110	1600 800 1100 400 90	1200 600 800 350 75
Pulsewidth <sup>3</sup> (ns) 1064 nm 532 nm 355 nm 266 nm		6 5 2 4	5-9 5-8 1-7	
Linewidth <sup>4</sup> (cm-1) Standard Injection Seeded, SLM		0.	1 003	
Divergence⁵ (mrad)	0.4	45		0.5
Beam Pointing Stability <sup>6</sup> (±µrad)		3	30	
Beam Diameter (mm)			9	
Jitter <sup>7</sup> (±ns) Unseeded Seeded		0.5 1.0		0.6 1.0
Energy Stability <sup>8</sup> (±%) 1064 nm 532 nm 355 nm 266 nm	2.5; 3.0 4.0 8.0;	0.8 ;1.0 ;1.3 ;2.6	2.5;0.8 3.0;1.0 4.0;1.3 9.0;3.0	3.0;1.0 4.0;1.3 6.0;2.0 9.0;3.0
Power Drift <sup>9</sup> (±%) 1064 nm 532 nm 355 nm 266 nm		3 6 6 8	3.0 5.0 3.0	
<sup>1</sup> Using Type II doubler <sup>6</sup> 99.9% shots will be <±30	µrads with ΔT <sub>room</sub> <±3°C igger shot-to-shot for 99.9% of pu	lses,	All specifications at 10	064 nm unless otherwise noted.

Dimensions	
Optical Head (LxWxH)	1189.2 x 457.2 x 298.4 mm (46.82" x 18" x 11.75")
Power Supply (L x W x H)	714.5 x 621 x 546.1 mm (28.13" x 24.46" x 21.5") PL 9050: 714.5 x 621 x 679.4 mm (28.13" x 24.46" x 26.75")
Water	
Service	1-2 GPM (gallons/minute) at 10 - 40 PSI pressure drop
Temperature	<22° C / 70° F (higher flow rate for higher temperature)
Others	
Electrical Service	200 - 240 VAC, single $\Phi$ , 50/60 Hz
	10 to 200 C / CE to 070 E

Room Temperature 18 to 30° C / 65 to 87° F 5 m (16.4 ft) Umbilical Length



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<sup>4</sup> FWHM (1cm<sup>-1</sup> = 30 GHz)

<sup>5</sup> Full angle for 86% (1/e<sup>2</sup>)

the second value represents RMS

 $^{9}$  Average for 8 hours with  $\Delta T\pm 3^{\circ}C$ 



Specifications	9010	9020	9030	9050
Beam Spatial Profile (Fit to Gaussian) <sup>10</sup> Horizontal Near Field (<1m) Far Field (∞)		0.7 0.95		0.65 0.90
Max Deviation from fitted Gaussian <sup>11</sup> (±%) Near Field (<1m)		4	0	
Service Requirements 208-240 VAC, single $\Phi$ Water GPM at 10-40 PSI	14A 1-2	21A 1-2	24A 2-3	35A 2-3
Polarization 1064 nm 532 nm 355 nm 266 nm		Horiz Vert Horiz Horiz	ontal ical ontal ontal	

 $^{10}$  A least squares fit to a Gaussian profile. A perfect fit would have a coeffficient of 1.  $^{11}$  Within FWHM points near field at 1 meter.

### Powerlite DLS 9000 Physical Layout









# Seeded Surelite<sup>™</sup>

The injection seeder system for the Surelite Family produces ultra-narrow single longitudinal mode (SLM) outputs with a smooth temporal profile.

Seeding is accomplished by injecting a seed beam from a single mode cw diode pumped fiber laser into the Surelite oscillator. Amplitude pioneered the commercial introduction of this technique and holds the patent on its use with radially variable reflectivity resonator optics<sup>\*</sup>.

Important applications that require narrow linewidth include pumping narrow linewidth tunable systems, holography, and Doppler LIDAR.

The Surelite has been updated with the new Surelite Remote Harmonic operation for first and second stage harmonic automation. Controlled from a simple intuitive GUI, the option allows for hands free adjustment of the Surelite harmonics.

\* U.S. Patent # 4,918,704





#### Industry:

- Material sorting (recycling)Weld inspection
- > Cleaning
  - > LIBS
  - Science:
  - > LIDAR
  - > Thomson Scattering
- > Laser Thermal Annealing
- > Pump Source
- > LIF, PLIF, LIBS

#### > Skin Surfacing

> Tattoo Removal

Medical:

Pump Source
 Medical device
 manufacturing

Features

> RS-232 or TTL interface for remote or local operation
 > Water to air heat exchanger eliminates the need for

- > Water to air heat exchanger eliminates the need for external water cooling
- > Gaussian optics incorporated to provide low divergence and high spatial uniformity in beam
- > Graphite resonator structure ensures long-term thermal and mechanical stability
- > Optional motorized harmonics





Specifications	SL I-10	SL I-20	SL II-10	SL EX
Repetition Rate (Hz)	10	20		10
Energy <sup>1</sup> (mJ) 1064 nm 532 nm 355 nm 266 nm	360 160 <sup>2</sup> 50/80 <sup>3</sup> 48	335 125 <sup>2</sup> 48/80 <sup>3</sup> 35	520 240 <sup>2</sup> 80/125 <sup>3</sup> 65	625 300 <sup>2</sup> 120/180 <sup>3</sup> 70
Pulsewidth⁴ (ns) 1064 nm 532 nm 355 nm 266 nm		4 - 7 4 - 6 4 - 6 4 - 6		4 - 6 3 - 5 3 - 5 3 - 5 3 - 5
Linewidth (cm-1) Standard Injection Seeded		0.0	1 )05	
Divergence <sup>5</sup> (mrad)		0	.5	
Beam Pointing Stability (±µrad)	30	50	30	50
Beam Diameter (mm)	e	5	7	9.5
Jitter <sup>6</sup> (±ns)			1	
Energy Stability <sup>7</sup> (±%) 1064 nm 532 nm 355 nm 266 nm		2.5 3.5 4.0 7.0	; 0.8 ; 1.2 ; 1.3 ; 2.3	
Power Drift <sup>®</sup> (±%) 1064 nm 532 nm 355 nm 266 nm	3. 5. 5. 8.	0 0 0 0		3.0 6.0 6.0 8.0

#### Dimensions

Optical Head (LxWxH)	775 x 178 x 190 mm (30.5 x 7.0 x 7.5")
Power Supply (LxWxH)	622 x 282 x 508 mm (24.5" x 11.2" x 20.0")
Seeder Supply (LxWxH)	257 x 421 x 41 mm (10.1" x 16.6" x 1.6")

#### Weight

Optical Head	24 kg (52 lbs)
Power Supply	44 kg (96 lbs)
Seeder Supply	4.5 kg (10 lbs)

#### Water

Closed loop water to air heat exchanger: external cooling water not required (1 gallon deionized water).

#### Others

Electrical Service	200 - 240 VAC, singleΦ, 10 A, 50/60 Hz
Room Temperature	18 to 30° C / 65 to 87° F
Umbilical Length	3.18 m (10.4 ft)



Temporal Profile -Seeded vs Unseeded

All specifications at 1064 nm unless otherwise noted.



Injection Seeder Configuration



The new Surelite Remote Harmonic Operation option

<sup>1</sup> Energy is in seeded mode only <sup>2</sup> With Type II doubler <sup>7</sup> The first value represents shot-to-shot for 99.9% of pulses, the second value represents RMS

oubler <sup>8</sup> Average for 8 hours with  $\Delta T_{room} <\pm 3^{\circ}C$ 

<sup>3</sup> High Energy UV option with Type I doubler <sup>4</sup> Full width, half maximum

<sup>5</sup> Full angle for 86% of energy

<sup>6</sup> With respect to external trigger





### Specifications

Beam Spatial Profile⁰ Near Field (<1m) Far Field (∞)	0.70 0.95
Deviation from fitted Gaussian <sup>10</sup> (±%) Near Field (<1m)	30

168 (6.6)

 $\odot$   $\odot$   $\odot$ 

Output

В

A=42 (1.65) B=40 (1.55)

129+/-12

(51+/-0.5)

<sup>9</sup> A least squares fit to a Gaussian profile. A perfect fit would have a coefficient of 1. <sup>10</sup> Maximum deviation at beam center (±%)

### Seeded Surelite Physical Layout

All dimensions are in mm (inches)



Surelite Separation Package



Input





Surelite Power Supply





# Surelite<sup>™</sup> EX

High Energy Nd:YAG

Surelite EX is designed to be the ultimate pump source for OPOs and Ti:Sapphire systems.

With an optimized laser cavity, Surelite EX provides a uniform distribution of energy across the beam profile while minimizing hot spots and modulation. This optimal beam quality allows for maximum energy conversion in OPOs and Ti:Sapphire systems making Surelite EX the ideal choice for these applications.

To satisfy the most stringent requriements, Amplitude offers a seeded version of the Surelite EX producing smoother repeatable temporal pulse shape and much narrower linewidth for better conversion efficiency in OPOs.

The Surelite has been updated with the new Surelite Remote Harmonic operation for first and second stage harmonic automation. Controlled from a simple intuitive GUI, the option allows for hands free adjustment of the Surelite harmonics.



#### Industry:

Material sorting (recycling)
 Weld inspection
 Cleaning
 LIBS

#### Science:

- > LIDAR
- > Thomson Scattering
- > Laser Thermal Annealing
- > Pump Source
- > LIF, PLIF, LIBS

#### Medical:

- > Skin Surfacing
- > Tattoo Removal
- Pump Source
   Medical device
   manufacturing





### > RS-232 or TTL interface for remote or local operation > Water to air heat exchanger eliminates the need for

- **Key Features**
- > Water to air heat exchanger eliminates the need for external water cooling
- > Gaussian optics incorporated to provide low divergence and high spatial uniformity in beam
- > Graphite resonator structure ensures long-term thermal and mechanical stability
- > 213 nm option available
- > HEO for maximum 532 nm output
- > Optional motorized harmonics.



### Specifications

Specifications	Surelite Seeded	Surelite unseeded
Repetition Rate (Hz)		10
Energy (mJ) 1064 nm 532 <sup>1</sup> nm 532 HEO 355 <sup>2</sup> nm 266 nm	625 300 425 120/180 70	700 375 475 125/220 90
Pulsewidth <sup>3</sup> (ns) 1064 nm 532 nm 355 nm 266 nm		4 - 6 3 - 5 3 - 5 3 - 5
Linewidth (cm-1)	0.005	1
Divergence⁴ (mrad)		0.5
Beam Pointing Stability (±µrad)		50
Beam Diameter (mm)		9.5
Jitter <sup>5</sup> (±ns)	1	0.5
Energy Stability <sup>6</sup> (±%) 1064 nm 532 nm 355 nm 266 nm	2 3. 4. 7.	5 ; 0.8 5 ; 1.2 0 ; 1.3 ) ; 2.3
Power Drift <sup>7</sup> (±%) 1064 nm 532 nm 355 nm 266 nm	3.0 6.0 6.0 8.0	3.0 5.0 5.0 8.0

<sup>1</sup> Using Type II doubler <sup>2</sup> First # with Type II doubler Second # with Type I doubler <sup>3</sup> FWHM full width half max <sup>4</sup> Full angle for 86% (1/e<sup>2</sup>)

<sup>5</sup> With respect to external trigger <sup>6</sup> The first value represents shot-to-shot for 99.9% of pulses, the second value represents RMS

<sup>7</sup> Average for 8 hours with ∆T±3°C

All specifications at 1064 nm unless otherwise noted.

#### Dimensions

Optical Head (LxWxH)	775 x 178 x 190 mm (30.5 x 7.0 x 7.5")
Power Supply (LxWxH)	622 x 282 x 508 mm (24.5" x 11.2" x 20.0")
Seeder Supply (LxWxH)	257 x 421 x 41 mm (10.1" x 16.6" x 1.6")

#### Weight

Optical Head	24 kg (52 lbs)
Power Supply	44 kg (96 lbs)
Seeder Supply	4.5 kg (10 lbs)

#### Water

Closed loop water to air heat exchanger (1 gallon deionized water); external cooling water not required.

#### Others

Electrical Service	200 - 240 VAC, single $\Phi$ , 10 A, 50/60 Hz
Room Temperature	18 to 30° C / 65 to 87° F
Umbilical Length	3.18 m (10.4 ft)





Beam Profile - Seeded Surelite EX

Beam Profile - Unseeded Surelite EX





## Surelite EX Physical Layout





Surelite Power Supply



Surelite Separation Package





Temporal Profile -Seeded vs Unseeded



Injection Seeder Configuration

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The new Surelite Remote Harmonic Operation option









# Surelite<sup>™</sup> I, II, III

*High Energy Nd*:YAG

Surelite is the most imitated Nd:YAG laser design in the industry. Surelite lasers provide proven high performance and reliability at a very reasonable price. Over 5,000 Surelites are in operation throughout the world today in Scientific, Industrial and Medical applications.

Surelites are being used for remote sensing, spectroscopic analysis, Particle Image Velocimetry (PIV), machining, marking, and biological investigations. Excellent beam quality and unsurpassed output energies make Surelite the perfect choice for pumping OPOs, dye lasers and Ti:sapphire lasers.

The Surelite I, II and III all feature a simple and efficient single rod oscillator design. The Gaussian mirror-coupled resonator is optimally mode filled for maximum energy extraction. A unique rod design, proprietary Q-switch technology and Amplitude's diffuse reflector technology all contribute to the Surelite's efficiency and high performance.

The Surelite has been updated with the new Surelite Remote Harmonic operation for first and second stage harmonic automation. Controlled from a simple intuitive GUI, the option allows for hands free adjustment of the Surelite harmonics.



#### Industry:

- > Material sorting (recycling)
- > Weld inspection
  - > Cleaning > LIBS

#### Science:

- > LIDAR
- Thomson Se
- Thomson ScatteringLaser Thermal Annealing
- > Laser mermat Anne
- > Pump Source
- > LIF, PLIF, LIBS

#### Medical:

> Skin Surfacing> Tattoo Removal> Pump Source

 Medical device manufacturing

vice ring

> RS-232 or TTL interface for remote or local operation
 > Water to air heat exchanger eliminates the need for
 > water read water cooling

- external water cooling
- > Gaussian optics incorporated to provide low divergence and high spatial uniformity in beam
- > Graphite resonator structure ensures long-term thermal and mechanical stability
- > 213 nm option available
- > HEO for maximum 532 nm output
- > Optional motorized harmonics.







BACK TO MENU		

Specifications	SL I-10	SL I-20	SL I-30	SL II-10	SL II-20	SL III-10
Repetition Rate (Hz)	10	20	30	10	20	10
Energy (mJ) 1064 nm 532 <sup>1</sup> nm 532 HEO 355 nm 266 nm	450 200 / 65/100 <sup>2</sup> 60	420 160 / 60/100 <sup>2</sup> 45	380 130 / 25/70 <sup>2</sup> 30	650 300 / 100/160 <sup>2</sup> 80	550 250 / 70/160 <sup>2</sup> 60	850 425 550 165/225 <sup>2</sup> 100
Pulsewidth³ (ns) 1064 nm 532 nm 355 nm 266 nm			4 - 7 4 - 6 4 - 6 4 - 6			4 - 6 3 - 5 3 - 5 3 - 5 3 - 5
Linewidth (cm-1) - Standard				1		
Divergence⁴ (mrad)			0	.5		
Beam Pointing Stability ( $\pm\mu$ rad)	30	50	70	30	5	0
Beam Diameter (mm)		6			7	9.5
Jitter⁵ (±ns)			0	.5		
Energy Stability <sup>6</sup> (±%) 1064 nm 532 nm 355 nm 266 nm			2.5 3.5 4.0 7.0	; 0.8 ; 1.2 ; 1.3 ; 2.3		
Power Drift <sup>7</sup> (±%) 1064 nm 532 nm 355 nm 266 nm		3.0 5.0 5.0 8.0		3 6 6 8	8.0 5.0 5.0 8.0	3.0 5.0 5.0 8.0
<sup>1</sup> Using Type II doubler	<sup>6</sup> The first value represe	nts shot-to-shot for 99.9	9% of pulses,	All s	pecifications at 1064 nm	unless otherwise noted.

Dimensions

Optical Head (LxWxH)	775 x 178 x 190 mm (30.5 x 7.0 x 7.5")
Power Supply (LxWxH)	622 x 282 x 508 mm (24.5" x 11.2" x 20.0")
Veight	
Optical Head	24 kg (52 lbs)
Power Supply	44 kg (96 lbs)

#### Water

Closed loop water to air heat exchanger: external cooling water not required (1 gallon deionized water).

#### Others

Electrical Service	200 - 240 VAC, single Φ, 10 A, 50/60 Hz
Room Temperature	18 to 30° C / 65 to 87° F
Umbilical Length	3.18 m (10.4 ft)



The new Surelite Remote Harmonic Operation option



<sup>2</sup> High Energy UV option with Type I doubler

<sup>3</sup> Full width, half max

<sup>4</sup> Full angle for 86% of energy <sup>5</sup> With respect to external trigger

<sup>6</sup> The first value represents shot-to-shot for 99.9% of pulses, the second value represents RMS  $^7$  Average for 8 hours with  $\Delta T_{_{room}} < \pm 3^{\circ} C$ 

All specifications at 1064 nm unless otherwise noted. As a part of our continuous improvement program, all specifications are subject to change without notice.



### Specifications

Beam Spatial Profile <sup>®</sup> Near Field (<1m) Far Field (∞)	0.70 0.95	0.65 0.90	0.70 0.95	0.65 0.90	0.70 0.95
Deviation from fitted Gaussian <sup>9</sup> (±%) Near Field (<1m)	30	35	30	35	30
Polarization 1064 nm 532 nm 355 nm 266 nm		Horiz Vert Horiz Horiz	ontal ical ontal ontal		

<sup>8</sup> A least squares fit to a Gaussian profile. A perfect fit would have a coefficient of 1.

 $^{9}$  Maximum deviation at beam center (±%)

## Surelite Physical Layout All dimensions are in mmn (inches)



Surelite Power Supply



 $(\mathbf{N})$ LASER AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

CE





# Surelite<sup>™</sup> PIV

High Energy Nd:YAG

The Surelite PIV system is based on our proven Q-switch Nd:YAG technology. The system features a compact turn-key design providing 100's of mJ in each pulse at 532 nm.

The system offers excellent beam quality, long term stability and increased overall reliability. The ease of operation and safety features, as well as long lifetime, make the Amplitude PIV system an excellent choice for your dual pulse application.

Two lasers are built on a single compact platform, providing symmetrical output beam at 532 nm, that consists of two pulses with equivalent energy, beam uniformity and polarization. Temporal separation can be varied from <10 nsec to >100  $\mu$ sec to measure most flow distributions.





#### Industry:

- > Material sorting (recycling)
- > Weld inspection
- > Cleaning > LIBS

#### Science:

- > LIDAR
- > Thomson Scattering
- > Laser Thermal Annealing
- > Pump Source
- > LIF, PLIF, LIBS

> Skin Surfacing > Tattoo Removal

Medical:

- > Pump Source> Medical device
- manufacturing

#### Features



- > Safety Interlocks to ensure correct water flow, level, and temperature
- > No need for an external water hook-up, the system is completely self-contained
- > A built-in TTL interface for convenient external control
- > A decoupled kinematic mounted resonator structure ensures long-term thermal and mechanical stability





Specifications	<b>SL I PIV</b>	SL II PIV	SL III PIV
Repetition Rate (Hz)	10/15		10
Energy <sup>1</sup> (per oscillator, mJ) 1064 nm 532 nm	450/400 200	650 270	825 380
Pulsewidth² (nsec) 1064 nm 532 nm	4	- 7 - 6	4 - 6 3 - 5
Linewidth (cm-1)		1	
Divergence <sup>3</sup> (mrad)		0.5	
Beam Pointing Stability (±µrad)		100	
Beam Diameter (mm)	6	7	9.5
Jitter <sup>4</sup> (±ns)		0.5	
Energy Stability⁵ (±%) 1064 nm 532 nm		2.5;0.8 3.5;1.2	
Power Drift <sup>6</sup> (±%) 1064 nm 532 nm		3.0 5.0	
Beam Spatial Profile (fit to Gaussian) <sup>7</sup> Near Field (<1M) Far Field (∞)		0.7 0.95	
Max. deviation from Gaussian <sup>®</sup> (±%) Near Field (<1M)		30	

 Optical Head (LxWxH)
 996.9 x 457 x 298.4 mm (39.25 x 18 x 11.75")

 Power Supply (LxWxH)
 622 x 282 x 521 mm (24.5" x 11.2" x 20.5")

 Weight
 78.2 kg (172 lbs)

Power SupplY (2) 44 kg (96 lbs) each of two

#### Water

Dimensions

Closed loop water to air heat exchanger: external cooling water not requred (10 oz. deionized water per PS)

#### Others

Electrical Service	200 - 240 VAC, single $\Phi$ , 10 A; 50/60 Hz for each power supply
Room Temperature	18 to 30° C / 65 to 87° F
Umbilical Length	3.18 m (10.4 ft)



<sup>6</sup> Average for 8 hours
 <sup>7</sup> A least squares fit to Gaussian profile
 A perfect fit would have a coefficient of 1
 <sup>8</sup> At beam center

All specifications at 1064 nm unless otherwise noted.





Specifications are subject to change without prior notice  $\mid$  © 02-20221  $\mid$  Ref. 1272-c

## Surelite PIV Physical Layout

#### Surelite PIV Power Supply (one of two)

System includes two power supplies











# Terra™

Diode pumped Nd:YLF laser

The Terra Nd:YLF laser is the smallest laser in its class. It produces high average power (>50 W) at kilohertz repetition rates. Our proprietary intracavity frequency doubling results in high conversion efficiency, without resorting to the tight focusing in the doubling crystal, which is normally necessary in an extracavity design and leads to possible optical damage. Our propriatery pump chamber design further increases the system's overall efficiency.

High pulse energy, smallest M<sup>2</sup>, and small jitter are all available in this extremely compact and highly ruggedized package, optimized for pumping Ti:Sapphire amplifiers



# **Applications**

#### Industry:

- > Stent/Glass/PCB/Fine Metal
- - > LCD/Solar Edge Deletion
  - > Marking

Cutting

- > Wafer Trimming
- > Micro-hole Drilling
- > Ceramics Scribing
- > Fine Wire Stripping
- > Diamond/Gemstone Processing

#### Science:

- > Ti:Sapphire pumping
- > Particle Image
- Velocimetry (PIV)
- > Combustion Analysis
- > Laser Induced Fluorescence
- > LIDAR
- > Resonance Raman Spectroscopy
- > Chemical Analysis of Macromolecules

**Key Features** 

> Laser Microprobe Analysis

- > >30 mJ pulse energy at 1kHz
- > Average power >50 W @ 3 kHz
- > Repetition rates up to 10 kHz
- > Exceptional beam pointing and power stability
- > Compact, rugged & hermetically sealed laser head
- > Quick & easy diode module replacement (3min)
- > Proprietary pump chamber design for optimal beam quality
- > Optimized for ultrafast amplifier pumping



Specifications <sup>1</sup>	527- 50-M	527- 40-M	527- 30-M	527- 20-M
Transverse Mode		٢	1M	
Pulse Energy at 0.1-1 kHz (mJ)	30	25	20	15
Pulse Repetition Rate (kHz) <sup>2</sup>	0.1-10			
Average Power @ 3 kHz (W)	50	40	30	20
Pulsewidth (ns)	< 140	< 150	< 160	< 170
Energy Stability (% rms)	< 0.5			
Beam Pointing Stability (µrad)	< 25			
Beam Diameter at Output (mm) <sup>3, 4</sup>	2.5			
Beam Quality (M <sup>2</sup> )	< 12			
Beam Divergence (mrad) <sup>3</sup>	8			
Time Jitter (ns rms)	< 3			
Polarization (Vertical/Horizontal)		Horiz	zontal	

<sup>1</sup> All specifications at 1kHz unless otherwise noted.
 <sup>2</sup> Single shot to 0.1 kHz available with external trigger
 <sup>3</sup> Typical measurement (±10%)
 <sup>4</sup> Measured at 13.5% level at output window



Terra Energy Stability - Terra-527-40-M output energy stability measurement



Terra Beam Profile - Uniform Spatial Profile is optimized for Ti:Sapphire pumping





Laser System Output Characteristics Terra 527-50-M Performance Curves

60



600



### Terra Physical Layout

All dimensions are in inches [mm].

Side View







Side View





Front View Chiller



19.0 (483) 17.5 (445)

Side View

#### Dimensions

A) 551 x 102 x 127 mm (21.7 x 4.0 x 5.0 in) mm models; B) 627 x 102 x 127 mm (24.7 x 4.0 x 5.0 in) TEM <sup>°°</sup> mode
509 x 483 x 177 mm (20.0 x 19.0 x 7.0 in)
699 x 483 x 411 mm (27.5 x 19.0 x 16.2 in)
A) 9 kg (20 lbs) / B) 10.5 kg (23 lbs)
17.7 kg (39 lbs)
55 kg (122 lbs)

Power Supply	Single-phase: 200-240 VAC, 50/60 Hz operating current: 5A, max current: 10A
Chiller	Single-phase: 230 $\pm$ 10% VAC, 50/60 Hz operating current: 10A, max current: 15A

#### Temperature & Humidity

Operating Temperature	15 to 259 C
Operating remperature	15 LO 55 ° C
Storage Temperature	-20C to 50° C
Relative Humidity	8-80%, non-condensing
Control Interface	

Serial Interface	RS-232
Rear Connections	External beam enable, external trigger
Control Software	MS Windows-based Laser Commander

#### Umbilical Length

Cooling

3.65 m (12.0 ft)

Air-water; water-water cooling option available







# Terra<sup>™</sup> HP

Diode pumped Nd:YLF laser

The Terra Nd:YLF laser is the smallest laser in its class. It produces high average power (>75 W) at kilohertz repetition rates.

Our proprietary intracavity frequency doubling results in high conversion efficiency, without resorting to the tight focusing in the doubling crystal, which is normally necessary in an extracavity design and leads to possible optical damage.

Our propriatery pump chamber design further increases the system's overall efficiency. High pulse energy, and small jitter are all available in this extremely compact and highly ruggedized package, optimized for pumping Ti:Sapphire amplifiers.





#### Industry:

- > Stent/Glass/PCB/Fine Metal Cutting
- > LCD/Solar Edge Deletion
- > Marking
- > Wafer Trimming
- > Micro-hole Drilling
- > Ceramics Scribing
- > Fine Wire Stripping
- > Diamond/Gemstone Processing

#### Science:

- > Ti:Sapphire pumping
- > Particle Image
- Velocimetry (PIV)
- > Combustion Analysis
- > Laser Induced Fluorescence
- > LIDAR
- > Resonance Raman Spectroscopy
- > Chemical Analysis of Macromolecules

**Key Features** 

> Laser Microprobe Analysis

- > Average power >75 W @ 3 kHz
- > Repetition rates up to 10 kHz
- > Exceptional beam pointing and power stability
- > Compact, rugged & hermetically sealed laser head
- > Quick & easy diode module replacement (3min)
- > Proprietary pump chamber design for optimal beam quality
- > Optimized for ultrafast amplifier pumping



Specifications <sup>1</sup>	527-100-M
Wavelength (nm)	527
Pulse Energy at 3 kHz (mJ)	25
Pulse Repetition Rate (kHz) <sup>2</sup>	0.1 - 10
Average Power @ 3 kHz (W)	75
Pulsewidth (ns)	190 ± 35
Energy Stability (% RMS)	< 0.5
Beam Pointing Stability (µrad)	< 25
Beam Diameter at Output (mm) <sup>3</sup> , <sup>4</sup>	3.0
Beam Quality (M <sup>2</sup> )	> 20
Beam Divergence (mrad) <sup>3</sup>	< 10
Time Jitter (ns RMS)	< 3
Polarization (Vertical/Horizontal)	Horizontal

<sup>1</sup> All specifications at 3 kHz unless otherwise noted <sup>2</sup> Single shot to 0.1 kHz available with external trigger <sup>3</sup> Typical measurement (±10%) <sup>4</sup> Measured at 13.5% level at output window



Terra Beam Profile Uniform Spatial Profile is optimized for Ti:Sapphire pumping

Dimensions	
Optical Head (LxWxH)	812 x 254 x 145 mm (31.9 x 10.0 x 5.6 in)
Power Supply (LxWxH)	509 x 483 x 221 mm (20.0 x 19.0 x 8.7 in)
Chiller (LxWxH)	699 x 483 x 492 mm (27.5 x 19.0 x 19.4 in)
Weight	
Optical Head	31.5 kg (70 lbs)
Power Supply	27 kg (60 lbs)
Chiller	65 kg (144 lbs)
Electrical Service	
Power Supply	Single-phase: 200-240 VAC, 50/60 Hz operating current: 10A, max current: 20A
Chiller	Single-phase: 230 ±10% VAC, 20A, 50/60 Hz operating current: 12A, max current: 20A

#### Temperature & Humidity

Operating Temperature	15 to 35° C
Storage Temperature	-20C to 50° C
Relative Humidity	8-80%, non-condensing

#### **Control Interface**

Serial Interface	RS-232
Rear Connections	External beam enable, external trigger
Control Software	MS Windows-based Laser Commander

#### Others

Umbilical Length	3.65 m (12.0 ft); longer available upon request
Cooling	Air-water; water-water cooling option available



## Terra HP Physical Layout



Front View Chiller

16.74 (425)

19.38 (492)

2.75

(70)



specifications are subject to change without prior notice  $\mid$   $\otimes$  02-2021  $\mid$  Ref. 1262-c







# Terra<sup>™</sup> PIV

Diode pumped Nd:YLF laser

Terra PIV is a dual oscillator/single head, high repetition rate, diode-pumped Nd:YLF laser. The Terra PIV offers the ultimate in flexibility for PIV and other dual output applications.

The combination of two independent oscillators allows complete control of pulse separation and pulse energy. Both oscillators in the Terra PIV system are identical in optical design giving temporally and spatially matched pulses for the highest degree of cross-correlation. Each oscillator can be independently triggered via TTL inputs. As an option, a compact, external combination box can be directly attached to the laser to provide for an easy and safe access to the beam combination optics.

The Terra PIV uses our proprietary intracavity frequency doubling to achieve high energy 527 nm outputs without resorting to the tight focusing (which can result in optical damage) necessary for extra-cavity doubling. Our proprietary pump chamber design increases the overall efficiency allowing for high pulse energy, excellent beam quality and long component lifetimes from a compact and robust diode-pumped package.



## Applications

#### Industry:

- > Stent/Glass/PCB/Fine Metal
- Cutting
  - > LCD/Solar Edge Deletion
  - > Marking
  - > Wafer Trimming
  - > Micro-hole Drilling
  - > Ceramics Scribing
  - > Fine Wire Stripping
  - > Diamond/Gemstone Processing

#### Science:

> Ti:Sapphire pumping

**Key Features** 

- > Particle Image
- Velocimetry (PIV)
- > Combustion Analysis
- > Laser Induced Fluorescence
- > LIDAR
- > Resonance Raman Spectroscopy
- > Chemical Analysis of Macromolecules
- > Laser Microprobe Analysis

#### > >60 mJ total energy at 1 kHz

- > Average power >100 W @ 3 kHz
- > Ideal for Particle Image Velocimetry
- > Independent external trigger for each oscillator
- > External and internal triggering
- > Built-in optics for beam combination
- > Record 3 min. diode module replacement
- > Proprietary optical cavity design for optimal laser performance
- > Flexible time delay and energy adjustment

•
BACK TO MENU

Specifications <sup>1</sup>	527- 100-M	527- 80-M	527- 60-M	527- 40-M
Wavelength (nm)		52	27	
Energy per Oscillator at 0.1-1 kHz (mJ)	30	25	20	15
Total Pulse Energy at 0.1-1 kHz (mJ)	60	50	40	30
Pulse Repetition Rate (kHz) <sup>2</sup>		0.1-	-10	
Average Power @ 3 kHz (W)	100	80	60	40
Pulsewidth (ns)	< 210	< 230	< 250	< 270
Pulse-to-Pulse Stability (% RMS)		< (	).5	
Beam Pointing Stability (µrad)		< 2	25	
Beam Diameter at Output (mm) <sup>3</sup> , <sup>4</sup>		3.	0	
Beam Quality (M²)		< 2	25	
Beam Divergence (mrad)⁴		8	3	
Time Jitter (ns RMS)		<	3	
Polarization <sup>5</sup>		Circ	ular	

<sup>1</sup> All specifications at 1kHz unless otherwise noted.

<sup>2</sup> Single shot to 0.1 kHz available with external trigger

<sup>3</sup> Typical measurement (±10%)

<sup>4</sup> Measured at 13.5% level at output window

<sup>5</sup> Cross-polarization available as option



Terra PIV Output Profile Smooth beam profile, ideal for PIV applications.

Dimensions	
Optical Head (LxWxH)	812 x 254 x 145 mm (31.9 x 10.0 x 5.6 in)
Power Supply (LxWxH)	509 x 483 x 221 mm (20.0 x 19.0 x 8.7 in)
Chiller (LyWyH)	699 x 483 x 492 mm (27 5 x 19 0 x 19 4 in)
Weight	
Weight Optical Head	31.5 kg (70 lbs)
Optical Head Power Supply	31.5 kg (70 lbs) 27 kg (60 lbs)

#### **Electrical Service**

Power Supply	Single-phase: 200-240 VAC, 50/60 Hz operating current: 10A, max current: 20A
Chiller	Single-phase: 230 ±10% VAC, 20A, 50/60 Hz operating current: 12A, max current: 20A

#### Temperature & Humidity

Operating Temperature	15 to 35° C
Storage Temperature	-20C to 50° C
Relative Humidity	8-80%, non-condensing

#### Control Interface

Serial Interface	RS-232
Rear Connections	External beam enable, external trigger
Control Software	MS Windows-based Laser Commander

#### Others

Umbilical Length	3.65 m (12.0 ft); longer available upon request
Cooling	Air-water; water-water cooling option available





## Terra PIV Physical Layout

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

CE



Advantages Generation of Pulse Pairs



Generation of Pulse Pairs Flexible time delay adjustment



Two laser output synchronized to double the pulse energy and peak power, a) one laser output, b) a second laser output, and c) combined output.



Two laser output combined with an adjustable delay to double the repetition rate of the pulse. a) one laser output, b) a second laser output with delay, and c) combined laser output.





# Titan

### Ultra-compact high energy pulsed Nd:YAG laser

#### High Energy YAG laser

The Titan serie is the family of High Energy and compact Nd:YAG lasers manufactured by Amplitude.

Thanks to our efficient pumping chambers, the Titan serie provides the highest ratio Joule per  $m^2$  on the market.

It is a laser of choice for compact table-top applications and also for integration in small Laser peening set-up.

Their minimum footprint makes the Titan serie an ideal candidate to pump large 100s TW and PW Ti:Sa lasers up to 5 Hz while preserving space in your laboratory or facility. Tens of Titans have been successfully installed through the world in space-constrained environment.

Moreover, Titans deliver top-hat beam profile and stable output energy to ensure homogeneous and repeatable illumination of your application. For the most demanding applications we can also propose the implementation of a Diffractive Optical Element (DOE) to reach a perfect top-hat beam profile.

Industry:

> Laser peening



# Applications

#### Science:

> Ti:Sapphire pumping
 for TW and PW Laser
 Systems
 > LIDT test

Key Features

- > Output energy up to 10 J at 532 nm / 5 Hz
- > Ultra-compact footprint: highest ratio Joule per m<sup>2</sup> of the market
- > Embedded CCD camera to real-time monitor the laser beam
- > Ergonomic design, dedicated for ultra-intense lasers pumping
- > Reduced cost of ownership




1		
Repetition Rate	1 Hz or 5 Hz	
Wavelength	532 nm model / 1064 nm model	
Pulse Energy	5 J at 532 nm / 8 J at 1064 nm 10 J at 532 nm / 16 J at 1064 nm	
Energy Stability	1.2 % RMS on 1000 shots 1.0 % RMS on 1000 shots	
Energy Drift	5 % over 8 h	
Beam Profile	quasi top-hat	
Beam Quality	Mono-mode	
Beam Diameter	~ 21 mm	
Pulse Duration	12 ns FWHM two pulses of 12 ns FWHM	
Timing Jitter	0.5 ns rms	
Divergence	0.5 mrad	
Polarization	Vertical at 532 nmVertical at 532 nm, 50 % Horizontal,Horizontal at 1064 nm50 % Vertical at 1064 nm	

Titan

### Dimensions

### Titan

**Titan HE** 

Laser head1186 x 429 x 208 mmElectronic cabinet600 x 550 x 835 mmTitan HELaser head1186 x 764 x 212 mmElectronic cabinet600 x 550 x 1240 mm



Beam profile at 532 nm







## Beam management



Click on a laser



Spin



Scan





# **SPIN**

### Precession module

SPIN is a "plug & play" module located in the optical path between a laser head and a SCAN module.

SPIN induces a precession movement of the laser beam, allowing cutting and drilling at high speed with an adjustable cutting or drilling angle. The SPIN module enables deeper drilling with controlled taper.



# Applications

### Industry:

> Microelectronics> Micromachining

#### Medical:

> Medical Device Manufacturing

Key Features

> Ideal for cutting and drilling

> Easy to align

- > Wide field up to 20 mm x 20 mm
- > Patent pending technology



Specifications		SPIN	
Focal Length	50 mm		100 mm
Min Kerf Size (M²= 1,1, 1.030 nm, Scan 20)	40 µm		60 µm
Scanning Field	7 x 7 mm <sup>2</sup>		25 x 25 mm <sup>2</sup>
Conicity Compensation (attack angle)	4 to 8°		2 to 4°
Appropriate Material Thicknesses Without Refocusing	100 to 300 µm		200 to 600 µm
Working Distance	60 mm		110 mm
Hole or Trench Minimum	90 µm	60 µm	40 µm
Hole or Trench Maximum	1000 µm	500 μm	200 µm
Rotation		30,000 rpm	
Available Wavelengths	343 nm (upor	n request) - 515	5 nm - 1030 nm

Utilities	
Dimensions	37,6 x 29,3 x 17,5 cm
Power Supply	24 V – 2 A (5 A peak)
Interface	Ethernet - GigE RJ45

These specifications can change depending on the scan used with this module.

## Compatibility



Satsuma

Tangor



Yuja



amplitude-laser.com



# SCAN

### Micromachining scan head

### The next step in 3D material processing

Designed to fulfill the need for accuracy and speed required in ultrafast material micro-processing, SCAN is a machining head using a sophisticated moving mirror/lens technology for three dimensional material processing.

SCAN is available with various focal lenses and apertures. Very low power consumption and heat generation improves thermal drift, while reduced motor weight enables acceleration ramps 20% higher than traditional solutions.





#### Industry:

> Microelectronics> Micromachining

### Medical:

> Medical Device Manufacturing

Key Features

watch a video about this add-on

- > Designed for ultrafast laser
- > High repeatability
- > Low thermal drift
- > High tracking accuracy



Specifications	SCAN 10	SCAN 15	SCAN 20
Scanner Aperture	10 mm	15 mm	20 mm
Angular Excursion		640 mrad	
Wavelengths Available	343 nm - 355 nm -	515/532 + 1.030/1.0	64 nm - 10.600 nm
Minimum Scanning Tracking Error	80 µs	110 µs	160 µs
Maximum Scanning Speed	64 rad/s		
Z Scan	Optional		
Z Scan Excursion	600 mm x focal length		
Focal Length <sup>1</sup>	50 mm 60 m	m 100 mm 16	60 mm 🔷 255 mm
Minimum Spot Size (M²= 1.1, 1030 nm, Scan 20)	10 μm 12 μr	n 16 μm 2	22 μm 35 μm
Field Scanner	12 x 9 mm <sup>2</sup> 23 x 1 mm <sup>2</sup>	3 70 x 50 12 mm <sup>2</sup> 70	20 x 70 200 x 165 mm <sup>2</sup> mm <sup>2</sup>
Z Field (with Z module option)	0,8 mm 1 mn	n 3 mm 7	7 mm 20 mm

Utilities

Dimensions	12,6 x 12,1 x 14,4 cm
Interface	Ethernet - GigE RJ45
Power Supply	100-240 VAC / 0,4 A

<sup>1</sup> Telecentric F-Theta and F-Theta lenses. Cutting nozzles available upon request.

## Compatibility



Satsuma



Tangor



Yuja





# GLASS

### Transparent material cutting module

### The ultimate solution for glass and sapphire cutting

Compact and easy to use, GLASS module is the ultimate solution for industrial transparent and brittle material cutting. Based on Amplitude's patented FemtoGlass<sup>™</sup>, GLASS uses a non-ablative femtosecond process providing the best cutting quality and speed available on the market.

Optimized for Amplitude ultrafast industrial lasers, GLASS module takes advantage of femtosecond pulses to achieve low roughness and preserve material strength. The innovative technology allows for processing of a large range of materials and shapes.





### Industry:

> Microelectronics> Micromachining

### Medical:

Medical Device
Manufacturing

> Tempered, non-tempered,

- multilayer glass and sapphire processing
- > No chipping and low Ra
- > High speed cutting

- > Control crack orientation for curve-cutting
- > Patented technology
- > Easy to integrate, control and align



Material	Tempered glass, non-tempered glass, sapphire, quartz, multi-layer material	
Shapes	Line, curve, closed shapes	
Cutting Speed*	Up to 5 m/s	
Average Roughness (Ra)*	Down to 0,2 μm	
Material Thickness*	Power diagnosis during the process	
Power Measurement	From 0 to 50 W	

\* Depends on material and laser - other specifications upon request

### GLASS

Utilities

Dimensions 29,5 x 24,9 x 8,6 cm

## Compatibility





Satsuma

Tangor



Yuja

amplitude-laser.com



# **BEAM**

### Laser beam management system

### Motorized beam expander

Intended to simplify optical beam delivery in micromachining stations, BEAM module is installed between the laser and the scanning head. It integrates a motorized beam expander, a power meter, and an attenuator in a single box.





### Industry:

> Microelectronics > Micromachining

### Medical:

> Medical Device Manufacturing

> Beam expander > Attenuator Key Features

> Power meter

> Easy to integrate, control and align



-		
Motorized Shutter	Closed safety position	
Beam Expander	Fixed or motorized from x1 to x5	
Polarization Converter	Circular or linear polarization fixed or motorized	
Motorized Attenuator	From 2% to 98%	
Power Sampling	Power diagnosis during the process	
Power Measurement	From 0 to 100 W	

Beam

Utilities	
Dimensions	39,7 x 21 x 13 cm
Weight	9 kg
Interface	Ethernet - GigE RJ45
Power Supply	24 V - 2A

## Compatibility



Satsuma



Tangor



Yuja





# **FIBER**

### Femtosecond fiber delivery module

Using hollow-core fiber technology, FIBER module delivers ultrashort laser pulses without the negative effects of dispersion and non-linearity.

FIBER module integrates a complete beam launching system, a fiber, a collimation module and an adapted flange to connect your fiber directly to your scanning system.

FIBER module is fully integrated within the laser design and does not require any alignment. Ultrafast laser integration in your micromachining station is as simple as connecting a fiber.





watch a video about this add-on



#### Industry:

> Microelectronics> Micromachining

### Medical:

Medical Device
Manufacturing

> Ease of integration

- > High mechanical stability
- > Optional collimation output





Fiber Length	1,2,5 m (other length upon request)	
Wavelength	1030 nm	
Transmission	> 85 %	
Collimation	Upon request	

Fiber

## Compatibility





Satsuma

Tangor







Click on an add-on



O Sequoia HD Amproce

Sequoia

Sequoia HD



# Sequoia

## *Reference device for temporal contrast measurement*

Sequoia offers state-of-the-art measurement of the temporal contrast of ultrafast laser pulses. As the leading producer of high peak power laser system, Amplitude has developed this unique metrology tool in collaboration with the French CEA. This makes it ideal for operations that require strict control of the laser pulse contour, such as femtosecond laser systems used in high-field physics applications.

High quality system engineering means that precise measurements can be performed easily and reliably. On a daily basis, its high dynamic range allows characterization of high peak power systems, making Sequoia the best third-order cross-correlator commercially available today. The performance level of the Sequoia is such, that it has been adopted as the reference tool to define and optimize virtually any laser system, making it paramount for operations related notably to plasma physics, or laser metrology. Sequoia Sequoia

Science: > Instrumentation

**Applications** 

Key Features

> State-of-the-art technology to measure laser pulse temporal contrast

- > Robust standardized tool for daily use
- > High dynamic range (> 10<sup>9</sup>)

> Developed by Amplitude under CEA license Reference tool to define and optimize

> A wide range of laser systems

## **BACK TO MENU**

### Specifications

Specifications	Sequoia	
Center Wavelength	800 ± 15 nm	1050 ± 15 nm
Spectral Bandwidth	750 - 850 nm	1000 - 1150 nm
Input Pulse Width	20 - 200	) fs (FTL)
Input Energy	Down to 500 μJ for 30 fs pulses	
Input Beam Diameter	< 4 mm at 1/e <sup>2</sup>	
Input Polarization	Linear, horizontal	
Input Repetition Rate	< 1 kHz	
Dynamic Range	> 109	
Total Scanning Range	570 ps	
Temporal Scan Resolution	< 20 fs	
Optical Temporal Resolution	< 120 fs	

### Dimensions

All Models 45 x 25 x 10 cm

### Compatibility



Segu

STOP

Seguei

10 -00 10 -01 sure Utilities Mode Window He 10 -02 Seguoia 10 -03 Intensity (a.u.) Pre-pulse Post-pulse 10 -04 Continuous On/Off 10 -05 <u> Compressor </u>misalignment 10 -06 ASE 10 -07 Sequoin 10 -08 -1 10 -09 10 -10 Out of -20 00 Delay (ps) +20 +40 . 🔵 Data -80 -60 -40 +60 +80

Typical Sequoia trace measurements

Iconic Sequoia user interface

amplitude-laser.com



# Sequoia<sup>HD</sup>

### Ultra high dynamic range

### Temporal contrast measurement

Amplitude is extending the capabilities of the Sequoia 3<sup>rd</sup> order cross-correlator. The worldwide reference for ultrashort laser pulse contrast characterization is improved and reaches unprecedented measurement dynamic range.

With its ability to inspect spontaneous emission up to 13 orders of magnitude and parasitic pulses on several nanoseconds timescale, the Sequoia<sup>HD</sup> is the most powerful tool available today to investigate precise temporal laser pulse profile. The latter is of a crucial importance for high intensity lasers commonly used in high field physics.

The high level of optical and mechanical engineering allows easy and reliable operation. The system includes an enriched user-friendly interface for efficient data collection and analysis.



Science: > Instrumentation

**Applications** 

- > Reference tool for contrast characterization
- > Ultrahigh dynamic range up to 13 orders
- > Extended scanning range up to 5.2 ns
- > Robust optical and mechanical design
- > User-friendly interface



Specifications	Sequoia <sup>HD</sup>
Center Wavelength	800 ± 15 nm
Spectral Bandwidth	750-850 nm
Input Pulse Width	20 - 200 fs (FTL)
Input Energy	Down to 150 μJ
Input Beam Diameter	7 mm at 1/e <sup>2</sup>
Input Polarization	Linear, horizontal
Input Repetition Rate	< 1 kHz
Dynamic Range	> 10 <sup>13</sup>
Total Scanning Range	5.2 ns
	2600 ps to + 600 ps
Adjustable Zero Delay With Temporal Ranges	1600 ps to + 1600 ps
	600 ps to + 2600 ps
Temporal Scan Resolution	< 16 fs
Optical Temporal Resolution	< 100 fs

### Dimensions



### Compatibility



ARCO

MAGMA

**PULSAR TW** 

notice | © 08-2019 | Ref. 1212-c specifications are subject to change without prior

**PULSAR PW** 



Typical contrast measurement curve with Sequoia

User interface



amplitude-laser.com



## Pulse management



Click on an add-on



Compress



Synchronization / Sync



Synchronization / Amplock



# COMPRESS

### Industrial pulse compression extension

The result of several years of intensive research and development efforts, Amplitude's Compress pulse shortening extensions reduce pulse durations well below <100 fs beyond the intrinsic capabilities of all other laser systems on the market.

The patented design of Compress delivers ultrashort pulse duration down to few cycle with the highest throughput efficiency, preserves exceptional beam quality, and provides pristine short and long term stabilities.

Compatible with our entire product range, Compress enables users to apply novel and unique approaches to material processing as well as explore ultrafast phenomena at unprecedented repetition rates and uptime with few-cycle time resolution.





watch a video about this module



### Industry:

> Micromachining

#### Science:

> Ultrafast Spectroscopy

- > High harmonic generation
- > Attoscience

- > Few-cycle pulses
- > Ultra-high efficiency
- > 1030 nm and 515 nm operation
- > Industrial design for 24/7 operation



Specifications	Compress 10	Compress 50	
Input Average Power	Up to 30	Up to 300 W	
Input Energy	Up to 3	3 mJ	
Input Pulse Duration	< 150 fs t	< 150 fs to 1 ps	
Operation Wavelength	1030 nm an	1030 nm and 515 nm	
Repetition Rate	from single shot	from single shot up to 40 MHz	
Throughput	up to > 80%	up to > 50 %	
Compression Ratio	up to > 10	up to > 50	
Output Pulse Compression	down to < 20 fs	down to few cycle	
Long Term Stability	< 1% rms over 100 hours		



Sub-two cycle pulse generation with COMPRESS 50

## Compatibility



Satsuma



Yuja

Tangerine



Tangor



Tangor 300







Specifications are subject to change without prior notice  $\mid$  © 11-2020  $\mid$  Ref. 1247-c



# **SYNCHRONIZATION**

Sync & Amplock are state-of-the-art synchronization add-ons compatible with all Amplitude ultrafast laser portfolio. This versatile solution is designed for highest accuracy synchronization of the laser system to either a radio frequency or an optical reference.

#### Sync

Sync ensures an excellent synchronization of the ultrafast amplified pulses on the fast time scales. It consists in an active stabilization of the seed oscillator cavity to an external reference. Furthermore, the user can adjust remotely and precisely the time of arrival of the pulses.

#### Amplock

Placed at the output of the laser, Amplock compensates for long-term drifts induced by the environmental conditions on the laser and the experimental setup.

These two add-ons, by offering both accuracy and reliability for long-term synchronization, are a must-have for demanding applications such as ultrafast pump-probe experiments, or integrated into secondary sources such as FELs, ICS and OPAs



Amplock



watch a video about these add-ons

> Synchronization with RF> Remote Delay & Scanning> Amplifier drift compensation

## Applications

### Science: > Photocatode

- > Inverse Compton Scattering
- > Time-resolved Experiments
- > Terahertz Spectroscopy
- > Picosecond Acoustics



### Synchronization offer



### **Functionalities**

CE





amplitude-laser.com

**Jitter Measurement** 



# Wavelength







Mango



Surelite OPO Plus





# Mango

## *Industrial tunable optical parametric amplifier*

The key to wavelength agility

Mango is a unique platform of optical parametric amplifier built to conform to the highest quality standards.

This system can deliver any wavelength from 210 nm to 11,000 nm from the same output port with the same polarization for ultimate ease of use.

Mango SP offers shorter pulses and complete dispersion management for applications requiring more peak intensity, such as 3P-imaging, or better temporal resolution.

Mango HE operates at much higher pump energies to drive processes requiring higher intensities while preserving broadband tuning.





### Science:

> 3-Photon Imaging
> Time-resolved Spectroscopy
> THz Generation

- Features
- > Dispersion compensation
- > Tunable from deep UV to mid-IR
- > Repetition rate up to 2 MHz
- > Fully automated and sealed against dust
- > Air-cooled



Specifications	Mango	Mango SP	
Input Power / Energy	50 W / 8 to 200 μJ	50 W / 8 to 200 μJ	
Output Pulse / Energy	12% at the peak	10% at the peak	
Pulse Duration	< 200 fs	< 70 fs	
Repetition Rate	Up to 2 MHz	Up to 2 MHz	
Wavelength	210 to 11,000 nm	325 to 2,500 nm	
Bandwidth	70 to 100 cm <sup>-1</sup>	170 to 300 cm <sup>-1</sup>	
Control	Fully automated computer controlled		
Performance Monitoring	Integrated 24/7 monitoring and data logging of both pump laser		
Additional options	SHG Output and pump laser bypass		



## Compatibility



Satsuma



Tangerine

Yuja



Tangor





s-Pulse



Magma







# Surelite<sup>™</sup> OPO Plus

Versatile Tunable Systems

The ultimate design goal for the Surelite OPO Plus system was to provide broad solid state tunability, ease of operation, and efficiency. Having all of that combined with good beam quality, is what sets the Amplitude Surelite OPO apart.

Our extensive OPO experience has given Amplitude a unique advantage in understanding the pump beam characteristics required for successful OPO performance. The SLOPO Plus can be pumped with our standard Surelite lasers, but more recently Amplitude introduced the Surelite EX - a designated OPO pump source.

This Type I BBO broadband OPO boasts several unique features. A double pass optical cavity design takes advantage of the pump polarization and resonant wave for efficient optical parametric oscillation, and a fully hermetically sealed oscillator ensures crystal longevity. One inclusive mirror set gives complete access to the signal and idler tuning range and optional computer control means truly hands free operation.





### Science:

> Photoacoustic Imaging

- > Biological Sample Excitation
- > Spectroscopy
- > Diode Laser Simulation
- > Two-color Particle Image Velocimetry

- > Designated OPO pump lasers to enhance performance and offer a complete system solution
- > Single resonant cavity for excellent beam quality
- > Hermetically sealed oscillator to ensure crystal longevity
- > IRO option for simultaneous access to residual frequencies to allow for secondary experiments, and built-in safety Interlocks for smooth and safe operation in every lab
- > OPO in 532 nm or 355 nm configuration to provide wavelength of interest



532 nm Pump Source	SL I-10	SL I-20	SL II-10	SL III-10	<b>SL EX</b>
Pump Energy (mJ)	200	160	300	400	375
Energy at Peak (mJ)	65	50	95	120	135
Repetition Rate (Hz)	10	20	10		
Tuning Range (nm)	680 - 2500				
Signal & Idler Pulsewidth (nsec)	3-5				
355 nm Pump Source	SL I-10	SL I-	20 SL	II-10	SL III-10
Pump Energy (mJ)		100		160	200
Pump Energy (mJ) Energy at Peak (mJ)		100 35		160 55	200 70
Pump Energy (mJ) Energy at Peak (mJ) Repetition Rate (Hz)	10	100 35 20		160 55 10	200 70
Pump Energy (mJ) Energy at Peak (mJ) Repetition Rate (Hz) Tuning Range (nm)	10	100 35 20	410-2500	160 55 10	200 70



Surelite OPO Plus Sealed Oscillator



Surelite OPO Plus - Linewidth Curve Pump: SLII-10, 300 mJ at 532 nm, 160 mJ at 355 nm



Surelite OPO Plus - Typical Data Pump: SL EX, 375 mJ at 532 nm & SL II-10,160 mJ at 355 nm





### Surelite OPO Plus Physical Layout

All dimensions are in mm (inches).

Input View



Side View

114

(4.50)

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317 (12.46)

286 (11.25)

442 (17.38)

Output View



amplitude-laser.com

## PC Control Option





The PC Control option gives full control of all scanning features via a simple Windows® platform.

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458 (18.04)

Input your wavelength and scan range of choice, select the scan speed and the SLOPO computer control will ensure optimal performance every time. This option also provides a link between both laser and lab instrumentation - an essential feature for system automation and/or data collection.

The standard SLOPO comes with a micrometer for manual control giving easy access to the broad OPO tuning range.





# Horizon<sup>™</sup>

### Fully Integrated OPO

The Horizon mid-band OPO offers unmatched performance. Its intelligently integrated optical design delivers the highest output powers available over an extensive tuning range (192-2750nm). Fully automated with precision scanning for true hands-free operation, Horizon is a robust system delivering optimal performance – all day, every day.

With the highest conversion efficiency available from any mid-band OPO, Horizon gives you unprecedented advantages: outstanding beam quality, excellent beam pointing stability and the option for wavelength access extended into the vacuum ultraviolet. Ease of use and convenience are also key notions for this OPO as it is an all encompassing optical design integrated into a single monolithic platform.

With crystals and Pellin Broca prisms mounted directly to ultra-high resolution stepper motors, Horizon has been engineered for optimal stability and tuning reproducibility at all wavelengths.





Science: > Spectroscopy and Imaging Medical: > Photoacoustic imaging

- > Extended tunability from 192 nm to 2750 nm
- > The highest conversion efficiency in its class
- > Linewidths down to < 3 cm<sup>-1</sup>
- > Optional residual 532 nm access, with excellent beam quality and low divergence in both axes
- > Fully automated for precision scanning
- > Coated and temperature stabilized crystals enclosed in a secure housing for optimal lifetime and reliability



### SL I, II, EX SL I-20 PL 8000 PL 9010 PL 9020 PL 9030

Repetition Rate (Hz)	10	20	10	20	30
Pulsewidth (nsec)		3-5		3-7	
Pointing Stability (µrad)	<±100				
Linewidth (cm- <sup>1</sup> )					
Signal		3-7		3-9	
UV/Doubling/Mixing <sup>1</sup>		< 10		< 13	
Energy Stability (%, 99% of shots) <sup>2</sup>	<±10				
Divergence (mrad, FWHM)	<> <2 (both axes)>				
Beam Diameter (mm, near field)		4-7		4-9	
Beam Roundness (%, near field) <sup>2</sup>	> 85				
Polarization (%)					
Signal Horizontal			> 99		
Idler Horizontal			> 99		
<sup>1</sup> Theoretical value based on signal linewidth				All specifications are for the sig	gnal unless otherwise noted.

<sup>1</sup>Theoretical value based on signal linewidth <sup>2</sup>Specified at signal wavelength (425 nm)



Horizon Signal beam quality, near field 430 nm at 1.5 m



As a part of our continuous improvement program, all specifications are subject to change without notice.

Horizon linewidth scan

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Size	660.4 x 381 x 346.7 mm (26 x 15 x 13.65") H ±12 mm/0.5"
Weight	30.8 kg (68 lbs)

### Horizon performance with PL 8000 Pump



Typical UV output



Typical Signal and Idler





## Horizon Physical Layout

All dimensions are in mm (inches).



### Top View



CE

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION



## Horizon Energy Specifications

Tuning Range (nm)		400-2750	192-400	
Pump Laser		Energy at Peak (mJ)	Energy at Peak (mJ)	
Pump Model	OPO Pump Energy (mJ) at 355 nm			
Horizon I pumped with 200mJ or less				
SL I-10	100	30	6	
SL I-20	100	20	3	
SL II-10	160	50	10	
Horizon II pumped with 200mJ or more				
SL EX	220	80	15	
PL 8000	290	110	20	
PL 9010	375	135	27	
Horizon III				
PL 9020	385	110	18	
PL 9030	320	95	15	



## We are Amplitude

Created in 2001 by two visionary experts in lasers, Amplitude manufactures and commercializes ultrafast lasers for scientific, medical and industrial applications. Leading the international market since its beginning, Amplitude offers a large range of products: diode-pumped ultrafast solid-state lasers, ultra-high energy Ti:Sapphire ultrafast lasers and a full line of high energy solid state laser products. Always at the cutting edge of technology, Amplitude equips its customers with reliable lasers with the purpose to support them up to the accomplishment of their projects. The group consists of three manufacturing locations (Bordeaux and Paris in France, and Milpitas, CA., U.S.A.) and several commercial offices in Europe, Asia and North America, Amplitude and its 400 employees are committed to create and develop innovative lasers, manufactured compliantly with the highest quality procedures such as ISO 9001 and ISO 13485 certification standards.

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## Product catalog



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