THE INDUSTRIAL REVOLUTION IN ULTRAFAST SCIENCE

A Superior Way to Design and Build Ultrafast Lasers

COHERENT®

Superior Reliability & Performance

THE INDUSTRIAL REVOLUTION IN ULTRAFAST SCIENCE

A Superior Way to Design and Build Ultrafast Lasers

Rigorous Stress Testing
HALT/HASS testing, utilizing our in-house environmental test chamber, drives reliability and lifetime across product lines.

Vertical Integration
In-house production of diodes, crystals, and critical optics ensures the highest level of performance and quality control.

Industrial Laser Experience
Unmatched industrial laser design and manufacturing expertise lets us deliver high-performance scientific lasers with industrial-grade reliability.

COHERENT.

LASERS IN SCIENTIFIC RESEARCH

Reliability and Performance Enable Your Success

Scientific research is highly demanding and competitive. Obtaining reproducible results is the fastest way to advance your research. A high performance laser with exceptional reliability reduces your cost of data and accelerates your career. With Coherent industrial-grade scientific lasers you can focus on results, publication, and funding.

Join The Industrial Revolution in Ultrafast Science

HALT:

Highly Accelerated Lifetime Testing to Detect and Rectify Failure Modes

HALT testing reveals failure modes during product design phase.

HALT testing exceeds normal operating levels, including simultaneous fast temperature changes and 5-axis randomized vibration.

HALT testing enables faster correction and improved design margins resulting in increased lifetime and reliability.

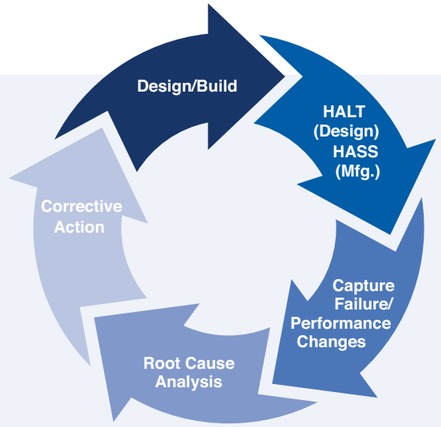
HASS:

Highly Accelerated Stress Screening to Minimize Operational Failure

HASS testing reveals defects during product manufacturing.

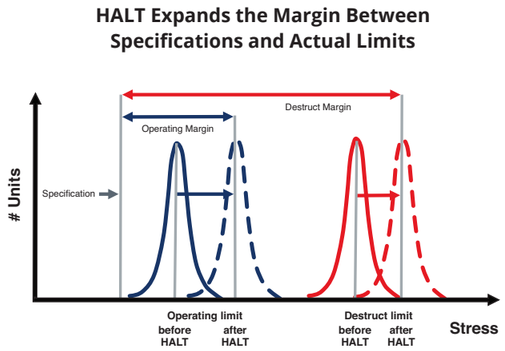
HASS testing is more rigorous than normal operating conditions but well below HALT conditions.

HASS testing is most effective when included in the standard production process.

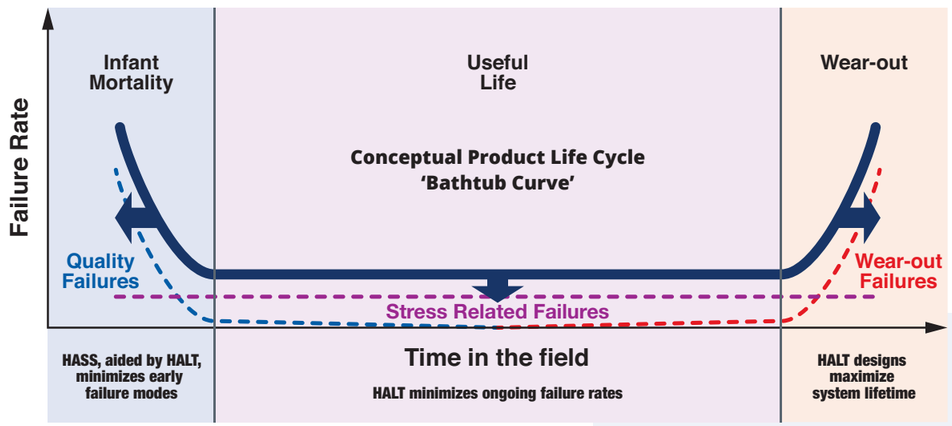


Industrial Design and Testing Cycle

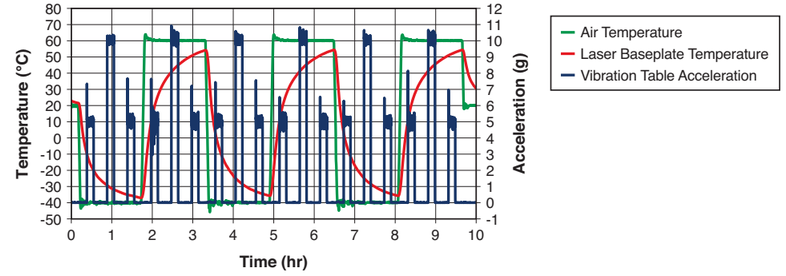
HALT Expands the Margin Between Specifications and Actual Limits



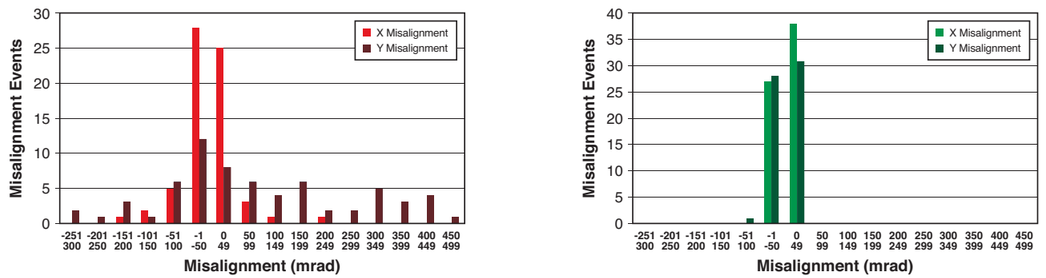
Positive Impact of HALT and HASS on Failure Rate



HASS Test Prototcol for Vitara Oscillator



Benefit of HALT Testing:
X and Y Misalignment of Oscillator Mounts After Temperature and Vibration Stressing



Pre-HALT Design vs. Post-HALT Redesign

In-house HALT/HASS Test Chamber, Santa Clara, CA

HALT/HASS History

In the 1970's, HALT/HASS testing was originally applied to space-related projects including opto-mechanical and electrical systems. It's now widely used in aerospace, automotive, medical, and consumer industries. Coherent uses HALT/HASS to test our industrial lasers as well as to design and build scientific lasers such as Vitara, Astrella, Revolution, and Chameleon.

THE COHERENT ADVANTAGE

Superior Reliability and Performance

Reliable Performance

- World leader in ultrafast laser technology offering the most extensive product portfolio
- Industrial-grade reliability allowing you to focus on results, publication, and funding
- HALT/HASS infrastructure and protocols ensuring reliability and long lifetime

Reliable Support

- Largest and most experienced, factory-trained, global service network for rapid, expert support
- Market-leading, value-based service plans for up to 5 years of complete coverage
- A global logistic network for quick delivery of certified spare parts

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5100 Patrick Henry Drive Santa Clara, CA 95054
p. (800) 527-3786 | (408) 764-4983
f. (408) 764-4646

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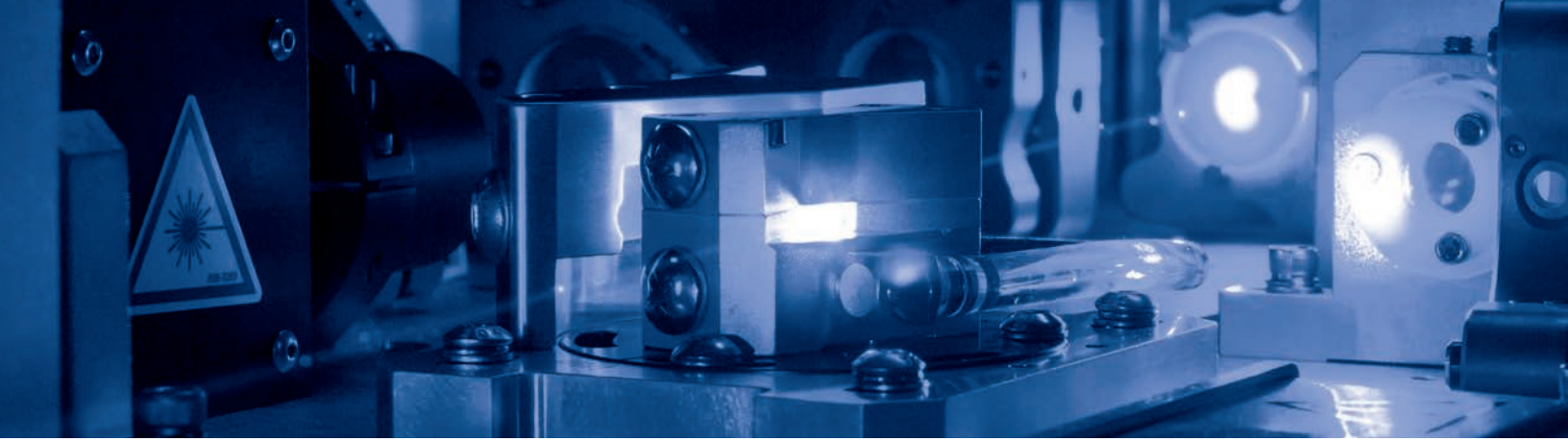


Astrella

Ultrafast Ti:Sapphire Amplifier

Astrella and the new Astrella HE are next-generation, ultrafast, kHz amplifiers that are the first to combine industry-leading performance and industrialized durability. Manufactured to Coherent's rigorous standards using advanced stress-testing techniques, the one-box Astrella system enables a wide range of demanding scientific applications and operating conditions, offering higher productivity and lower data acquisition costs. Delivering high (up to >9 mJ/pulse) energy, either <35 fs or <100 fs pulse widths, and excellent beam quality (M^2 <1.25), Astrella is ideal for ultrafast spectroscopy, THz studies, femtosecond micromachining, etc. With unmatched performance, reliability and affordability, Astrella stands at the forefront of the industrial revolution in ultrafast science.

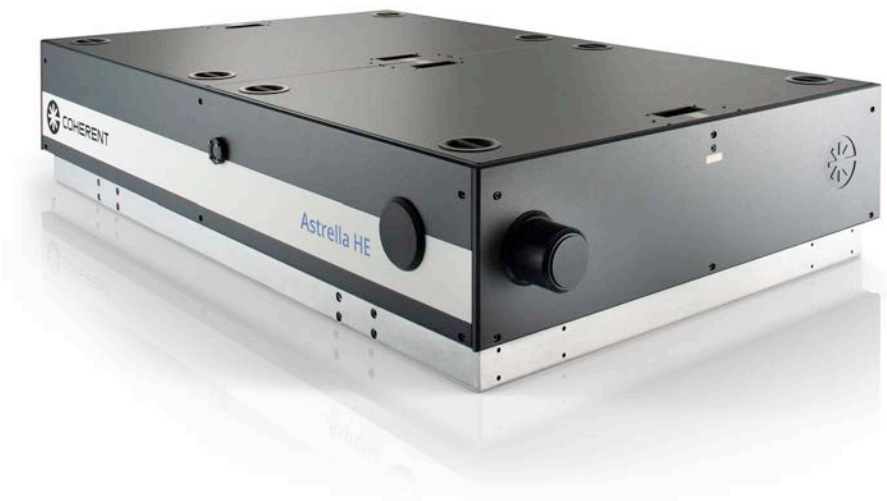
FEATURES & BENEFITS

- One-box, industrialized platform
- HASS* verified for quality and reliability
- >5 mJ, >7 mJ or >9 mJ <35 fs or <100 fs pulses
- High performance STAR regen amplifier (water-only cooling)
- Hands-free Vitara oscillator
- Revolution pump laser for performance overhead
- Sealed stretcher/compressor section with advanced dispersion management for clean, short pulses
- Thermally-stabilized sub-systems for long term stability

APPLICATIONS

- Time-resolved Spectroscopy
- Multidimensional Spectroscopy
- THz Spectroscopy
- fs Micromachining
- Surface SFG/SHG
- Stimulated Raman Scattering

* HASS – Highly Accelerated Stress Screening



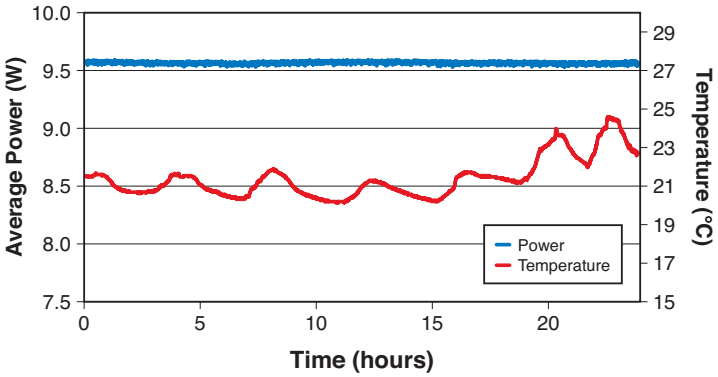
COHERENT®
Superior Reliability & Performance

SPECIFICATIONS[1]	Astrella USP	Astrella F	Astrella HE USP	Astrella HE F
Center Wavelength[2] (nm) (nominal)	795 to 805	780 to 820	795 to 805	780 to 820
Repetition Rate[3] (kHz)	1, 5			
Pulse Duration[3,4] (fs) (FWHM)	<35	<100	<35	<100
Contrast Ratio[5] Pre-Pulse Post-Pulse	 >1000:1 >100:1			
Power Stability[6,7] (rms)	<0.5			
Beam Pointing Stability[6,7] (µrad) (rms)	<10			
Beam Diameter (mm) ($1/e^2$) (nominal) 1 kHz 5 kHz	 11		 13 11	
Spatial Mode	TEM_{00}, M^2 <1.25			
Polarization	linear, horizontal			
Energy per Pulse (mJ) 1 kHz 5 kHz	 >5.0, >7.0 >1.4		 >9.0 >2.0	
Pump Laser	Revolution-50, Revolution-65		Revolution-80	
Seed Laser	Vitara-S, Vitara-T, or Vitara-T-HP			
Each System HASS Verified	Yes			

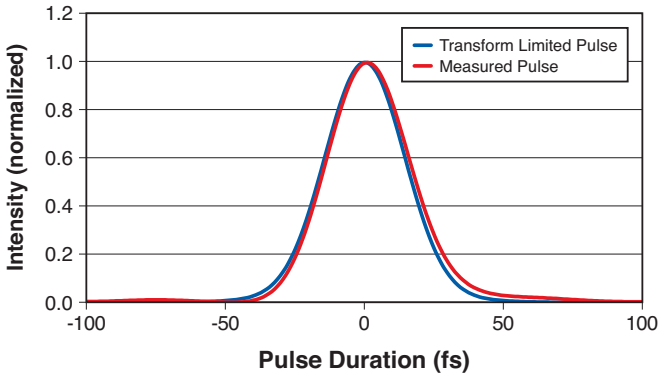
1 Specifications apply at 800 nm.
2 Factory set, must be specified when ordered and will be optimized prior to shipment.
3 Contact factory for other repetition rates and pulse width options.
4 A Gaussian pulse shape de-convolution factor (0.7) is used to determine the pulse width from an autocorrelation signal measured by a Coherent SSA (Single-Shot Autocorrelator).
5 Contrast ratio is defined as the ratio between the peak intensity of the output pulse to the peak intensity of any other pulse that occurs greater than 1 ns before or after the output pulse.
6 Under stable environmental conditions after system warm-up.
7 Over 24 hrs.

TYPICAL PERFORMANCE DATA

Astrella HE 24-Hour Stability



Astrella HE USP Pulse Width



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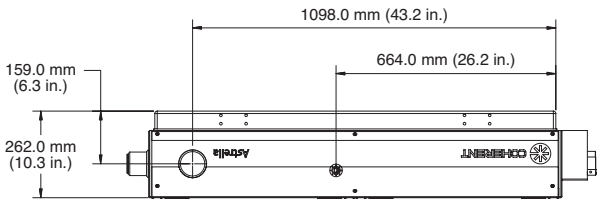
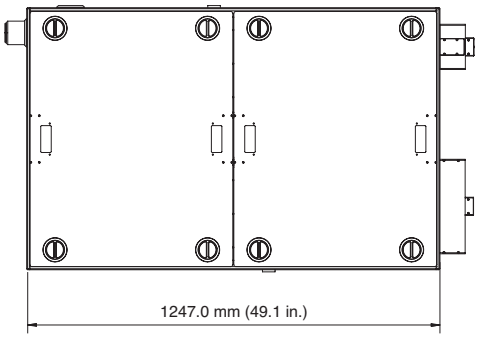
MECHANICAL SPECIFICATIONS

Astrella

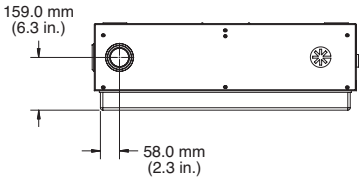
Right Side View



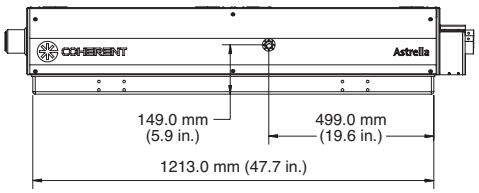
Top View



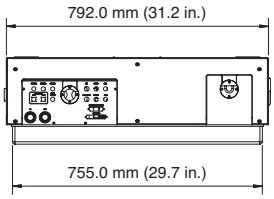
Front View



Left Side View



Rear View



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Coherent, Inc.,
5100 Patrick Henry Drive Santa Clara, CA 95054
p. (800) 527-3786 | (408) 764-4983
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Legend Elite HE+

Ultrafast Ti:Sapphire Amplifier

The Legend Elite series of ultrafast amplifiers offers a market-leading combination of performance, stability and reliability. The Legend Elite HE+ delivers output power up to 8 W from a single regenerative amplifier stage, with pulse widths available at <25 fs, <35 fs, <130 fs and 1 ps.

The Legend Elite series utilizes technology unique to Coherent, e.g. slab Ti:Sapphire rod design for enhanced cooling and optimal beam quality, temperature stabilized baseplate and CEP-grade hardware for superior stability.

Powered by an integrated Revolution pump laser, the Legend Elite HE+ is very compact and when seeded by a Vitara ultrafast oscillator the small foot print of this 2-box, high-performance amplifier system allows sophisticated experimental setups on a single optical table. These subsystems are built to Coherent's exacting manufacturing standards using our advanced HASS verification to ensure the highest level of quality and reliability.

FEATURES & BENEFITS

- High energy, high efficiency design (up to >7.0 mJ)
- Integrated Revolution pump laser
- Thermally stabilized E-2 Engine regenerative amplifier platform
- Unsurpassed stability – energy, pointing, pulse width
- Pulse widths from <25 fs to 1 ps
- Multiple upgrade pathways up to > 20 mJ, >25 W

APPLICATIONS

- Time-resolved Spectroscopy
- Multidimensional Spectroscopy
- THz Spectroscopy
- fs Micromachining
- Surface SFG/SHG
- Stimulated Raman Scattering
- High Harmonic Generation

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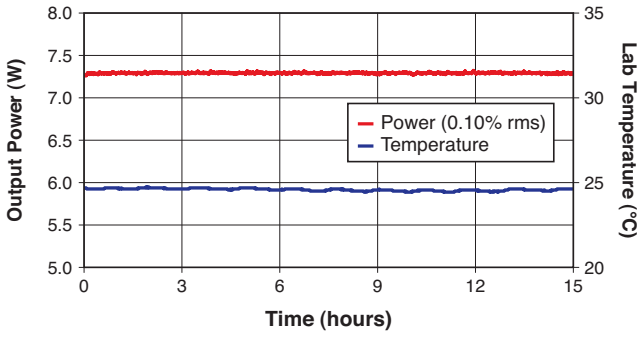
Superior Reliability & Performance

SPECIFICATIONS[1]	Legend Elite HE+			
Center Wavelength[2] (nm)	795 to 805		780 to 820	
Pulse Width Configuration	**USX**	**USP**	**F**	**P**
Pulse Width (fs) (FHWM)	<25[3,4]	<35[5,6]	<110[5]	500 to 1000[4,5]
Repetition Rate[7] (kHz)	1, 5, or 10			
Contrast Ratio[8]				
Pre-pulse	>1000:1			
Post-pulse	>100:1			
Power Stability[9,10] (%) (rms)	<0.5			
Beam Pointing Stabilty[9,10] (µrad) (rms)	<10			
Spatial Mode	TEM_{00}, M^2 <1.3			
Polarization	linear, horizontal			
Pump Configuration	**-I**	**-II**	**-III**	
Pump Laser[11]	REVOLUTION-20	REVOLUTION-50	REVOLUTION-65	
Energy per Pulse (mJ)	>1.5 at 1 kHz >0.3 at 5 kHz >0.15 at 10 kHz	>5.0 at 1 kHz >1.0 at 5 kHz >0.45 at 10 kHz	>7.0 at 1 kHz >1.6 at 5 kHz >0.7 at 10 kHz	

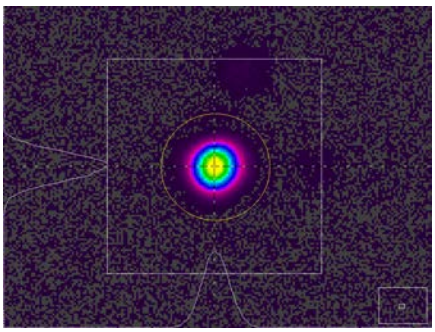
1 Specifications are given at 800 nm unless otherwise mentioned. Please contact factory for specifications at other wavelengths.
2 Factory set, must be specified when ordered and will be optimized prior to shipment.
3 When seeded by Vitara-T. For other seed lasers, please contact factory. An FFT of the pulse spectrum is used to calculate the transform-limited pulse width and a deconvolution factor which is then used to determine the real pulse width from an autocorrelation signal measured by a Coherent SSA (Single-Shot Autocorrelator).
4 Not available in -I configuration, limited to 4 mJ in -II and 5 mJ in -III configurations.
5 When seeded by Vitara. For other seed lasers, please contact factory. A Gaussian pulse shape deconvolution factor (0.7) is used to determine the pulse width from an autocorrelation signal measured by a Coherent SSA (Single-Shot Autocorrelator).
6 Limited to 6 mJ in -III configuration. For longer pulse width, please contact factory.
7 Repetition rate must be specified when ordered and will be optimized prior to shipment. Options for more than one repetition rate available. Please contact factory for other repetition rates.
8 Contrast ratio is defined as the ratio between the peak intensity of the output pulse to the peak intensity of any other pulse that occurs greater than 1 ns before or after the output pulse.
9 Under stable environmental conditions.
10 Over 24 hours.
11 Sold separately.

TYPICAL PERFORMANCE DATA

Legend Elite HE+
Power Stability



Legend Elite HE+
Typical Far Field Beam Quality



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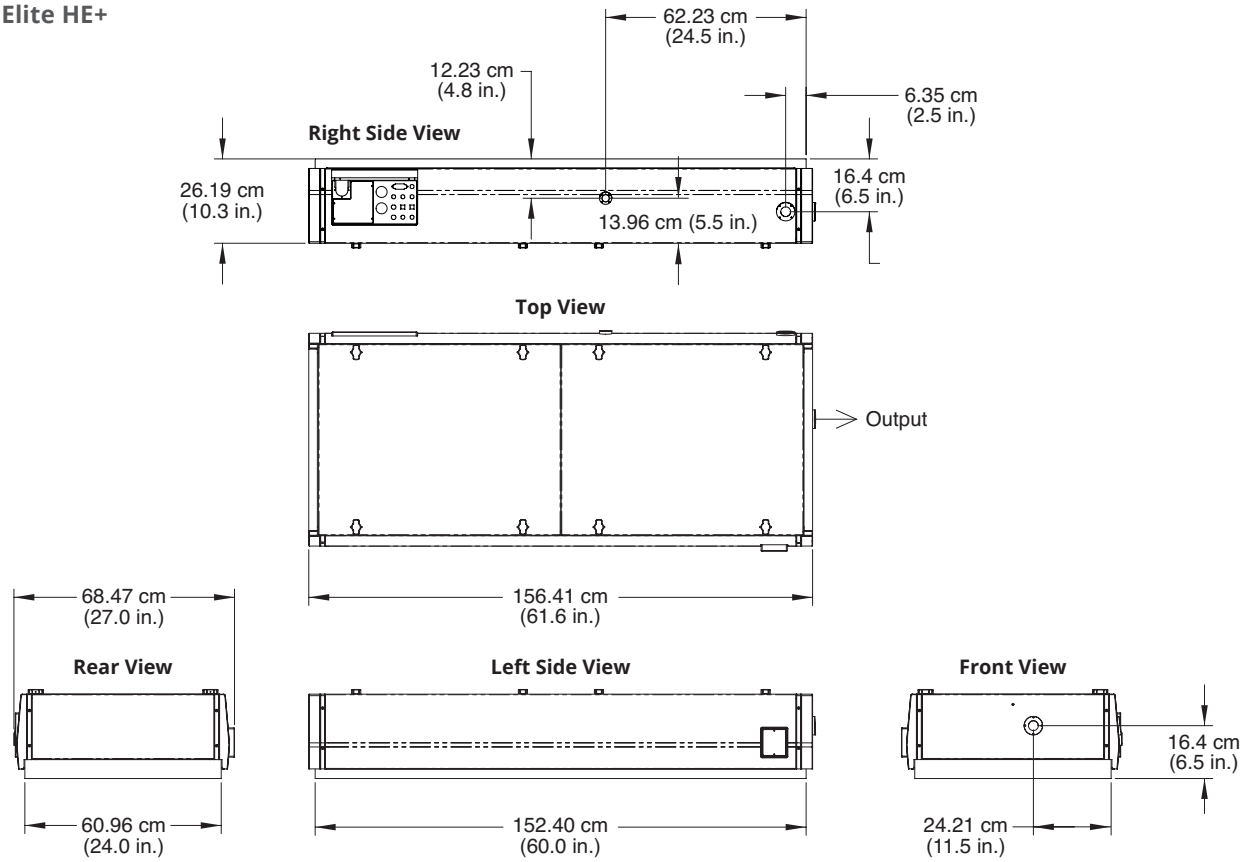
MECHANICAL SPECIFICATIONS

Legend Elite HE+



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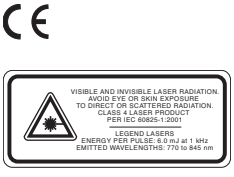
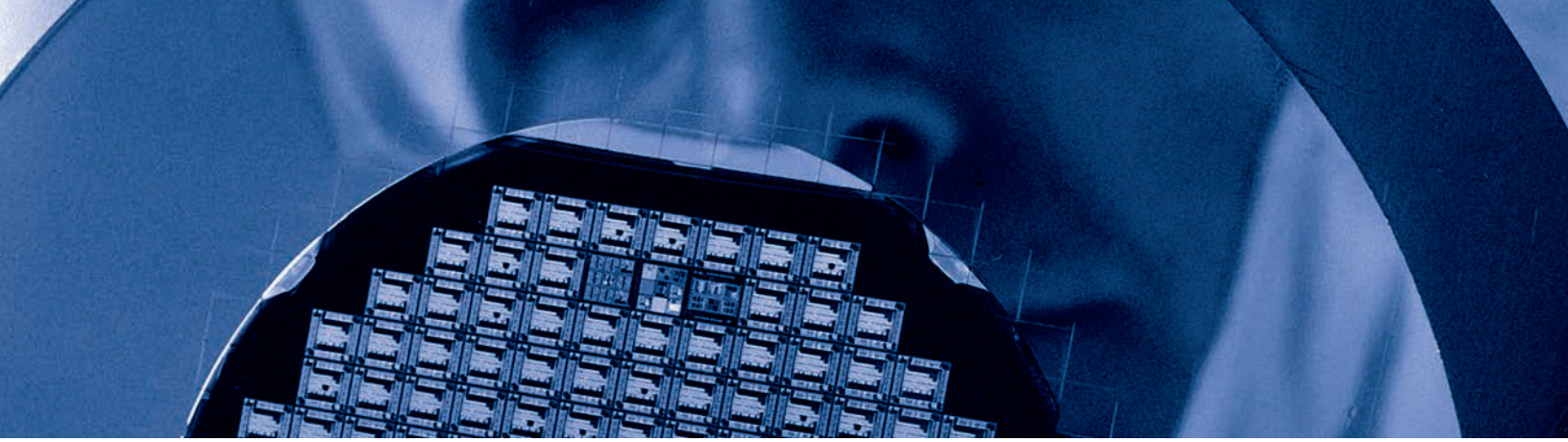




COMPex

Market Leading UV-Technology

COMPex Excimer lasers are highly effective light sources, featuring a compact design and easy installation and operation. They deliver superior results in demanding applications, such as solid sampling systems (LA-ICPMS), material research (PLD) and precise material processing.

Featuring ceramic preionization, the COMPex provides multi-hundred millijoules output, plus unmatched pulse-to-pulse stability. The COMPex also comes with an improved gas processor that extends both gas and optics lifetimes.

FEATURES & BENEFITS

- Selection of 193 nm, 248 nm, 308 nm, and 351 nm wavelengths for full material flexibility
- Superior pulse energy of up to 750 mJ to enable effective ablation at large field size
- Unrivalled pulse stability of 0.75%, rms to ensure high fluence control
- Ultimate pulse control and system parameter logging to deliver smart and reproducible thin films

APPLICATIONS

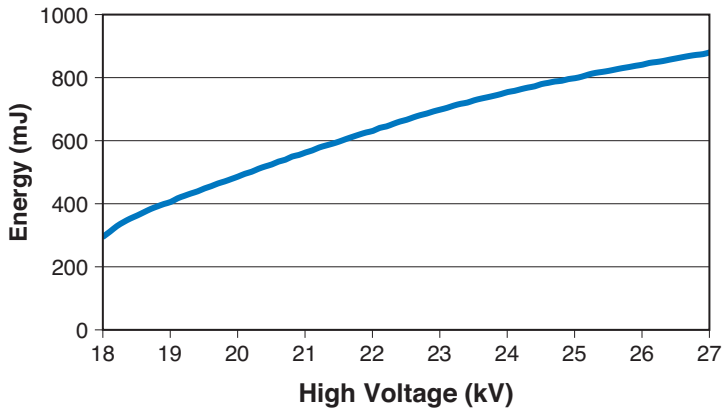
- PLD – Pulsed Laser Deposition
- Thin Wafer Processing
- Laser Lift-Off/Debonding
- LA-ICP-MS

COHERENT®
Superior Reliability & Performance

SPECIFICATIONS		COMPex FBG	COMPex 50	COMPex 102	COMPex 110	COMPex 201	COMPex 205
Wavelength (nm)							
Pulse Energy[1] (mJ)	193	-	100	240	240	400	400
	248	140	150	400	400	750	750
	308	-	-	250	250	500	500
	351	-	-	200	200	300	300
Max. Rep. Rate (Hz)		100	50	20	100	10	50
Average Power[2] (W)	193	-	4	4.8	12	4	15
	248	12	7	8	30	7.5	33
	308	-	-	5	16	5	20
	351	-	-	4	12	3	15
Energy Stability[3] (1 sigma) (%)		≤0.75					
Pulse Duration (FWHM) (ns) (typ.)		20					
Beam Dimensions (V x H, FWHM) (mm^2) (typ.)		12 x 4.5	14 x 5	24 x 10	24 x 10	24 x 10	24 x 10
Beam Divergence[3] (V x H, FWHM) ($mrad^2$)		≤0.3 x 0.2	≤2 x 1	≤3 x 1	≤3 x 1	≤3 x 1	≤3 x 1
Beam Pointing Stability[4] (1 sigma) (µrad)		≤50					
Spatial Coherence (FWHM) (µm) Horizontal (typ.)		800	-	-	-	-	-
Electrical		200 to 240V AC, 16A, 50/60 Hz switchable, 1-phase 100 to 120V AC, 25A, 50/60 Hz switchable, 1-phase					
Water Cooling[5]		2 to 5 l/min. (0.5 to 1.3 gal./min.), 10 to 20°C, connection: 1/2"					
Weight		280 kg (617 lbs.)				325 kg (717 lbs.)	
Dimensions (L x W x H)		1258 x 375 x 813 mm^3 50 x 15 x 32 $in.^3$				1682 x 375 x 813 mm^3 66 x 15 x 32 $in.^3$	

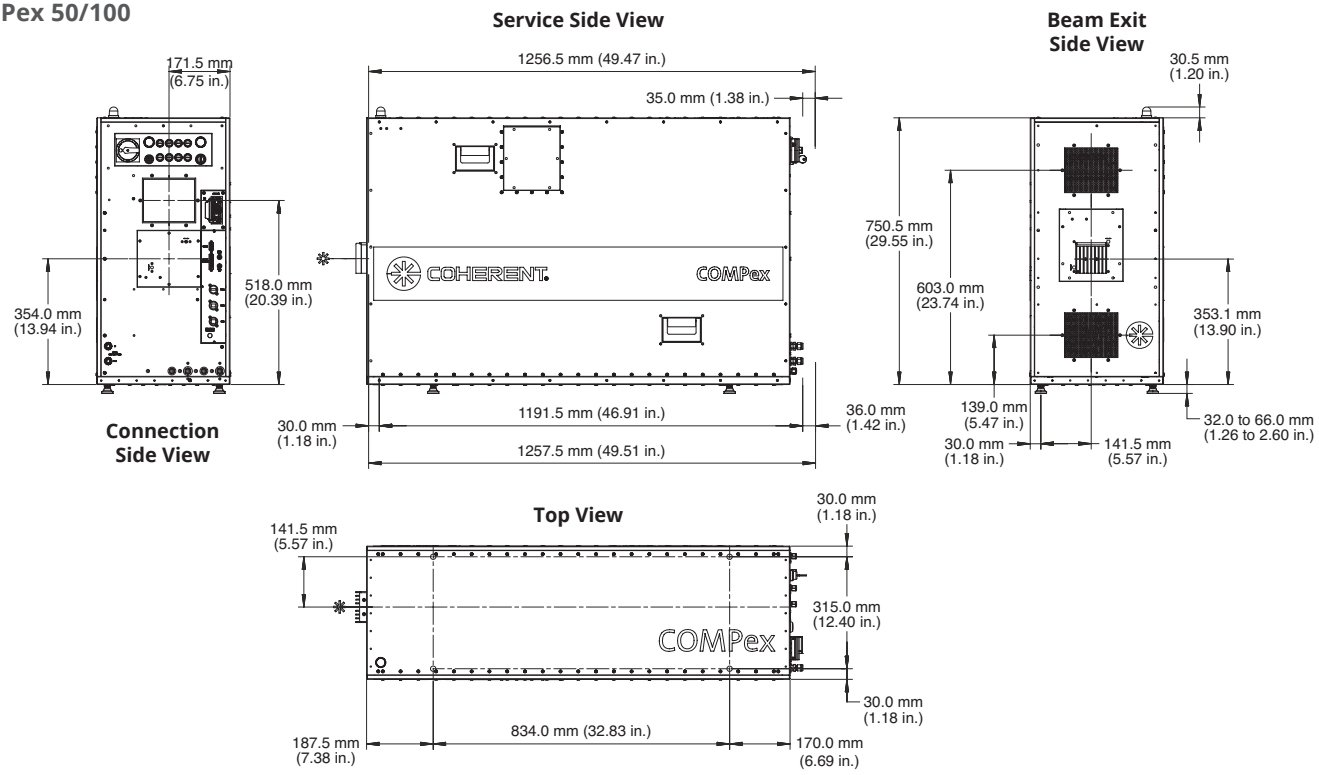
1 Measured at low repetition rate.
2 Measured at maximum repetition rate.
3 Specified at 248 nm.
4 At shutter plane over 2000 pulses.
5 Only required above 20 Hz, delivered as standard.

COMPex 205 Pulse Energy over Dynamic Operating Range

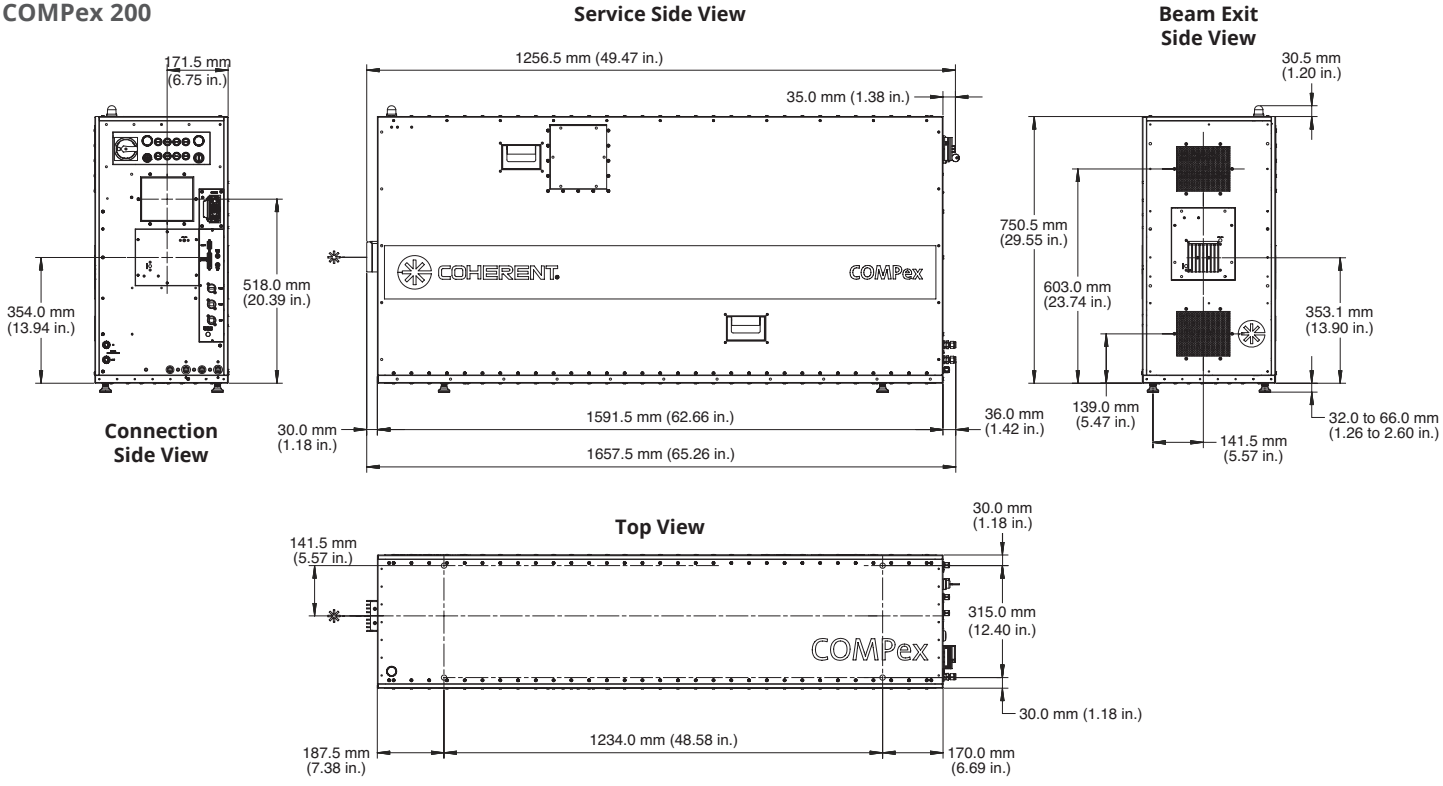


MECHANICAL SPECIFICATIONS

COMPex 50/100



COMPex 200



COMPex: Additional Control Options[1]

HIGH SPEED USB 2.0 STANDARD A
Upload/download data from the Laser

SPEED USB STANDARD B
Virtual Serial Port for input/output of operating modes

ETHERNET NETWORK CONNECTION RJ45
Upload/download data to/from the Laser Controller

1 Laptop not included.

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VISIBLE AND INVISIBLE LASER RADIATION.
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION.
CLASS IV LASER RADIATION PRODUCT
PER EN/IEC 60825-1 (2014)

MAX. OUTPUT POWER: 40 W
MAX. OUTPUT ENERGY: 0.8 mJ/pulse
PULSE DURATION: 10 to 50 ns
WAVELENGTH: 193 to 351 nm