

Hidra

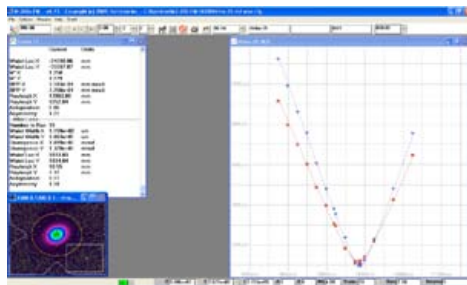
High Energy Ultrafast Ti:Sapphire Amplifier

The Hidra is a multi-stage, chirped pulse amplifier system providing up to 100 mJ at a 10 Hz repetition rate. The complete system consists of a grating-based stretcher, a regenerative amplifier for first-stage amplification, a multipass power amplifier stage, followed by a grating based compressor.

Two standard pumping configurations are available, 10 Hz-only pump or hybrid, 1 kHz and 10 Hz pumping with an available 1 kHz output channel. In 10 Hz-only pumping the entire amplifier (regenerative plus multipass) is pumped by a single 10 Hz lamp-pump Nd:YAG laser. In hybrid pumping, the regenerative amplifier is pumped by a diode-pumped kHz Nd:YLF Evolution laser, and the multipass stage is pumped by a lamp-pumped 10 Hz Nd:YAG.

The pulse compressor for the 25, and 50 mJ Hidra systems is contained within the Hidra enclosure. For the 100 mJ Hidra, the pulse compressor is a separate unit. This external compressor is available with vacuum-compatible hardware, allowing users to mount the entire compressor in their own vacuum enclosure to simplify the delivery of the terawatt pulse to the experiment.

M² data and Far-Field Beam Profile from Hidra-25-USP



Hidra Features:

- **Two-stage, high efficiency design: regenerative amplifier plus multipass amplifier**
- **25, 50 or 100 mJ pulse energy versions**
- **40 fs (USP) or 130 fs (F)**
- **<3% rms stability**
- **TEM₀₀ beam quality**
- **Seeded by Vitara, Verdi/Mira, or Vitesse oscillators**
- **Optional Pulse Slicer for increased nanosecond contrast ratio**
- **1 kHz output available with Hybrid option (requires Evolution pump laser)**

Hidra Applications:

- **High Energy Physics**
- **Filamentation**

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System Specifications¹

	Hidra-25	Hidra-50	Hidra-100
Center Wavelength ² (nm)		795 to 805	
Repetition Rate ³ (Hz)		10	
Energy per Pulse (mJ)	>25	>50	>100
Pulse Duration ⁴ (fs)(FWHM)			
USP version		<40	
F version		<130	
Energy Stability ⁵ (rms)			
10 Hz pump version		<3.5	
1 kHz + 10 Hz pump version		<3.0	
Contrast Ratio ^{6,7}		>1000:1 pre-pulse, >100:1 post-pulse	
Beam Diameter (mm)(1/e ²)(nominal)	12.5	20	35
Spatial Mode ⁸		TEM ₀₀ , M ² <1.5	
Polarization		linear, horizontal	
Seed Source ⁴		Vitara, Mira-F, or Vitesse	
Green Pump Energy Required ⁹ (mJ)	275	400	600
Pulse Compressor ¹⁰		Air-compatible	

Hybrid (1 kHz output) Option¹⁰

Center Wavelength ² (nm)		795 to 805
Repetition Rate ¹¹ (kHz)	1 kHz (minus 10 Hz pulses picked to seed Hidra Amplifier)	
Energy Stability ¹² (% rms)	0.50	
Pulse Duration ⁴ (fs)(FWHM)		
USP version	<35	
F version	<130	
Pulse Energy ¹³ (mJ)	>1, >3.2, >4	
Spatial Mode	TEM ₀₀ , M ² <1.3	
Contrast Ratio ^{6,11}	>1000:1 pre-pulse, >100:1 post-pulse	
Polarization	linear, horizontal	

¹ Specifications apply at 800 nm.

² Factory set, must be specified when ordered and will be optimized prior to shipment.

³ First stage (regenerative amplifier) can be pumped with optional Evolution kHz green pump laser to improve overall stability and/or provide separate kHz repetition rate Ti:S output.

⁴ USP pulse width specification assumes seeding with Vitara-T or Vitara-S. F pulse width specifications assume seeding with Vitara-T, Vitara-S, Mira-F or Vitesse. 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 with a Coherent Model SSA Single Shot Autocorrelator. For other pulse width specifications please contact the factory.

⁵ Measured over 1000 shots under stable environmental conditions, after system warm-up. See also note 1.

⁶ Contrast ratio (nanosecond) is defined as the ratio between the peak intensity of the output pulse to the peak intensity of any other pulse that occurs more than 2 ns before or after the output pulse.

⁷ Contrast ratio (nanosecond) with optional Pulse Slicer increases to >106:1 pre-pulse. Pulse energy specification must be decreased by 20% when optional Pulse slicer is added.

⁸ M² deviation is less than 0.2 between X to Y after compression.

⁹ Pump laser must be qualified for compatibility with Hidra requirements by Coherent. Contact the factory for further information.

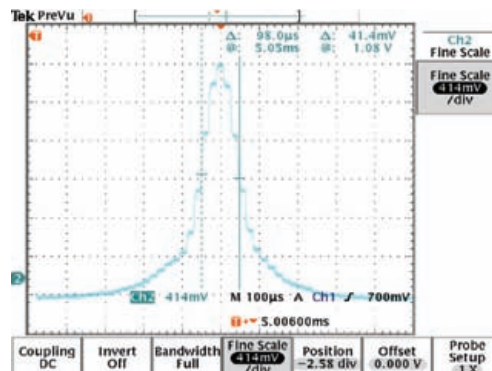
¹⁰ The Pulse Compressors for the Hidra-25 and -50 are contained within the main Hidra enclosure. The Hidra-100 is supplied with an external pulse compressor. Please contact the factory for specific details about this external compressor. As an option, the Hidra-100 compressor can be supplied with vacuum-compatible parts in a separate, non-vacuum enclosure. In this specific case the end-user must supply their own vacuum enclosure and pumps for the compressor.

¹¹ Hybrid option requires the regenerative amplifier to be pumped by an Evolution pump laser. The Pulse Slicer option is included in the hybrid 1 kHz output package to pick pulses to seed Hidra (high contrast not available on 1 kHz output).

¹² Over 8 hours, under stable environmental conditions after system warm-up.

¹³ Pulse energy >1 mJ with Evolution-15, >3.2 mJ with Evolution-30, >4 mJ with Evolution-45.

Typical Pulse Width ~36 fs (taken on Hidra-50-USP)



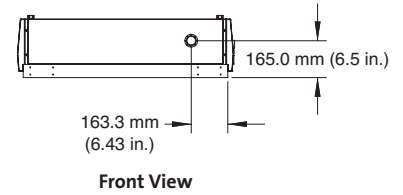
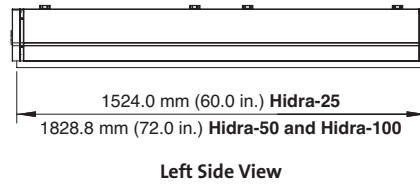
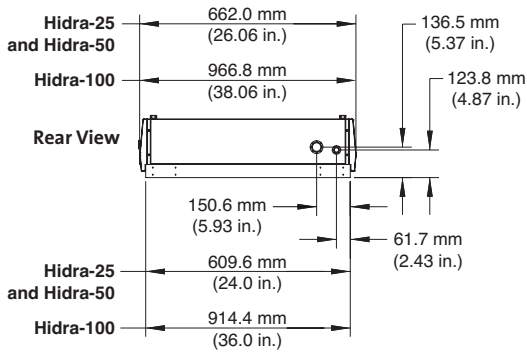
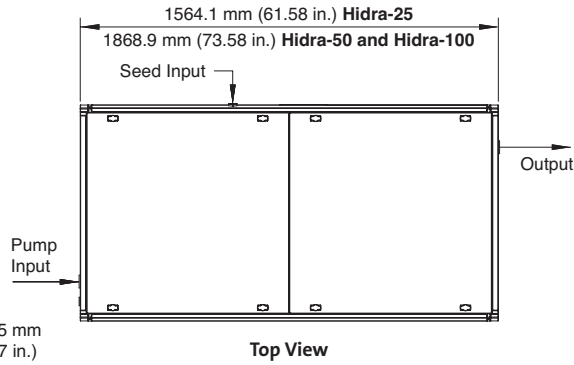
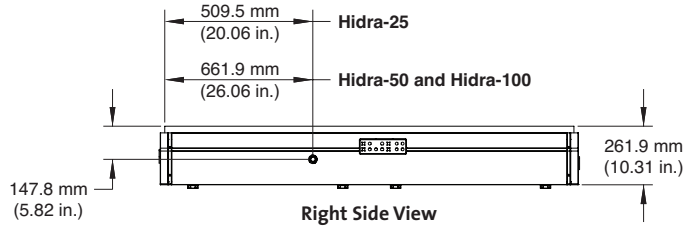
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Mechanical Specifications

Approximate Dimensions:

Hidra-25: 2' x 5'
 Hidra-50: 2' x 6'
 Hidra-100: 3' x 6'



www.Coherent.com

Coherent, Inc.,
 5100 Patrick Henry Drive
 Santa Clara, CA 95054
 phone (800) 527-3786
 (408) 764-4983
 fax (408) 764-4646
 e-mail tech.sales@Coherent.com

Benelux +31 (30) 280 6060
 China +86 (10) 8215 3600
 France +33 (0)1 8038 1000
 Germany/Austria/
 Switzerland +49 (6071) 968 333
 Italy +39 (02) 31 03 951
 Japan +81 (3) 5635 8700
 Korea +82 (2) 460 7900
 Taiwan +886 (3) 505 2900
 UK/Ireland +44 (1353) 658 833

Coherent follows a policy of continuous product improvement. Specifications are subject to change without notice.

Coherent's scientific and industrial lasers are certified to comply with the Federal Regulations (21 CFR Subchapter J) as administered by the Center for Devices and Radiological Health on all systems ordered for shipment after August 2, 1976.

Coherent offers a limited warranty for all Hidra amplifiers. For full details of this warranty coverage, please refer to the Service section at www.Coherent.com or contact your local Sales or Service Representative.