



# 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.

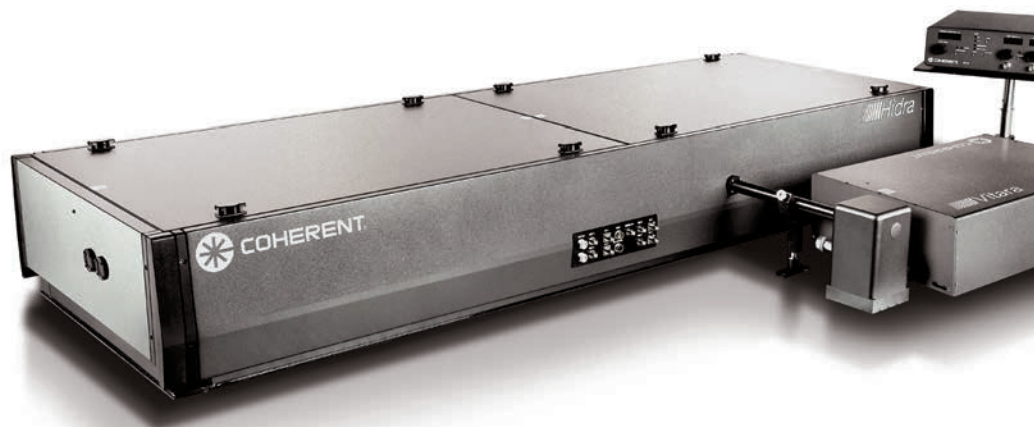
The pulse compressor for the 25, and 50 mJ Hidra systems is contained within the Hidra enclosure. For the 100 mJ Hidra, the pulse compressor is a separate unit. This external compressor is available with vacuum-compatible hardware, allowing users to mount the entire compressor in their own vacuum enclosure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

### 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
- TEM<sub>00</sub> 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)

### APPLICATIONS

- High Energy Physics
- Filamentation



SPECIFICATIONS	Hidra-25	Hidra-50	Hidra-100
Center Wavelength <sup>2</sup> (nm)		795 to 805	
Repetition Rate <sup>3</sup> (Hz)		10	
Energy per Pulse (mJ)	>25	>50	>100
Pulse Duration <sup>4</sup> (fs) (FWHM)			
USP version		<40	
F version		<130	
Energy Stability <sup>5</sup> (rms)			
10 Hz pump version		<3.5	
1 kHz + 10 Hz pump version		<3.0	
Contrast Ratio <sup>6,7</sup>		>1000:1 pre-pulse, >100:1 post-pulse	
Beam Size Diameter (mm) (1/e <sup>2</sup> ) (nominal)	12	18	25
Spatial Mode <sup>8</sup>		TEM <sub>00</sub> , M <sup>2</sup> <1.5	
Polarization		linear, horizontal	
Seed Source <sup>4</sup>		Vitara, Mira-F, or Vitesse	
Green Pump Energy Required <sup>9</sup> (mJ)	275	400	600
Pulse Compressor <sup>10</sup>		Air-compatible	
HYBRID (1 KHZ OUTPUT) OPTION <sup>10</sup>			
Penter Wavelength <sup>2</sup> (nm)		795 to 805	
Repetition Rate <sup>11</sup> (kHz)		1 kHz (minus 10 Hz pulses picked to seed Hidra Amplifier)	
Energy Stability <sup>12</sup> (% rms)		0.50	
Pulse Duration <sup>4</sup> (fs) (FWHM)			
USP version		<35	
F version		<130	
Pulse Energy <sup>13</sup> (mJ)		>1, >3.2, >4	
Spatial Mode		TEM <sub>00</sub> , M <sup>2</sup> <1.3	
Contrast Ratio <sup>6,11</sup>		>1000:1 pre-pulse, >100:1 post-pulse	
Polarization		linear, horizontal	

<sup>1</sup> Specifications apply at 800 nm.

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

<sup>3</sup> 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.

<sup>4</sup> 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.

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

<sup>6</sup> 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.

<sup>7</sup> 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.

<sup>8</sup> M<sup>2</sup> deviation is less than 0.2 between X to Y after compression.

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

<sup>10</sup> 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.

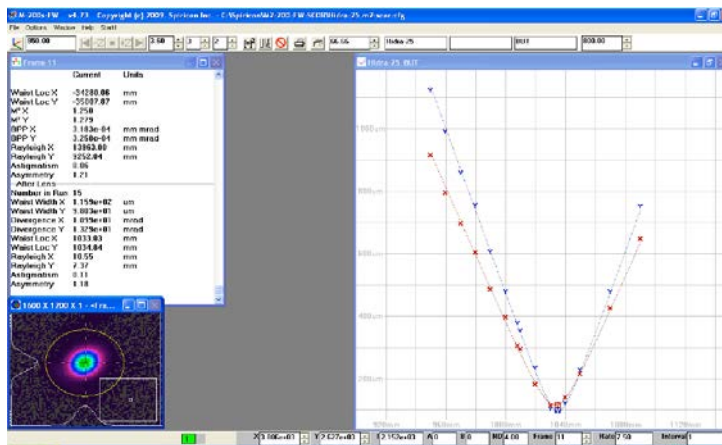
<sup>11</sup> Hybrid option requires the regenerative amplifier to be pumped by an Evolution pump laser. The Pulse Slicer option is included in the hybrid 1 kHz output package to pick pulses to seed Hidra (high contrast not available on 1 kHz output).

<sup>12</sup> Over 8 hours, under stable environmental conditions after system warm-up.

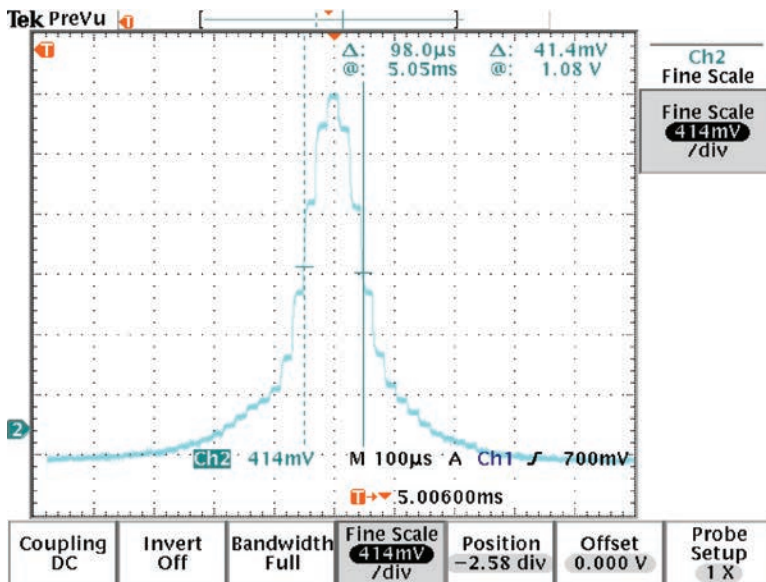
<sup>13</sup> Pulse energy >1 mJ with Evolution-15, >3.2 mJ with Evolution-30, >4 mJ with Evolution-45.

TYPICAL PERFORMANCE DATA

M<sup>2</sup> data and Far-Field Beam Profile from Hidra-25-USP



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

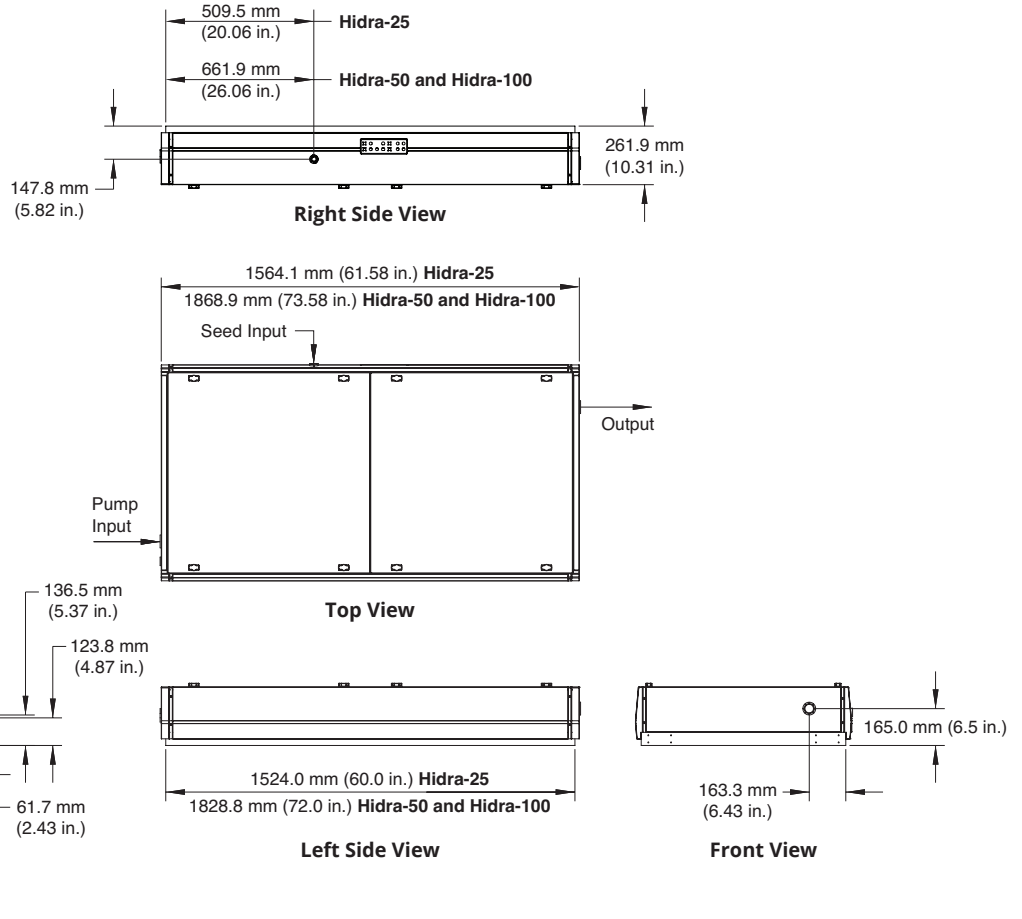


**MECHANICAL SPECIFICATIONS**

**Hidra**

**Approximate Dimensions:**

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



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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](http://www.Coherent.com) or contact your local Sales or Service Representative. Printed in the U.S.A. MC-146-04-0M0317Rev.F Copyright ©2017 Coherent, Inc.