

# Helium Cadmium Lasers



56 series

***Melles Griot helium cadmium lasers combine ruggedized, welded Invar resonator construction with internal mirror design to produce reliable operation in any orientation.***

- ▶ Up to 50 mW at 442 nm
- ▶ Up to 20 mW at 325 nm
- ▶ Low optical noise
- ▶ TEM<sub>00</sub> or multimode output
- ▶ Beam axis registered to base plate
- ▶ Diagnostic test points
- ▶ Superior beam pointing stability
- ▶ Maintenance-free internal mirror design
- ▶ Operation in any orientation
- ▶ <400 watt power consumption
- ▶ Colinear beams
- ▶ CE compliant and CDRH certified

**MELLES GRIOT**

Specifications: 56 HeCd series

Common to All Models

**Effective oscillation bandwidth:** 3 GHz

**Mode Spacing (c/2L):** 268 MHz

**Coherence Length (approx):** 10 cm

**Warmup Time from Cold Start:** <15 minutes

**Recovery from Standby:** <5 minutes

**Beam Pointing Stability:**

< 20  $\mu$ rad at ambient constant  $\pm 2^\circ\text{C}$

**Power Stability over 2 hours:**

$\pm 2\%$  at ambient constant  $\pm 2^\circ\text{C}$

Recommended Power Supply

**Model LC-500-XXXXY**

(XXX = 100, 120, 208, 220, 230, 240)

(Y = B for Black, G for Grey)

Environmental Specifications

**Cooling:** Forced air

**Operating Temperature:**  $+10^\circ\text{C}$  to  $40^\circ\text{C}$

**Storage Temperature:**  $-40^\circ\text{C}$  to  $60^\circ\text{C}$

**Relative Humidity, Operating:**

0–90% noncondensing

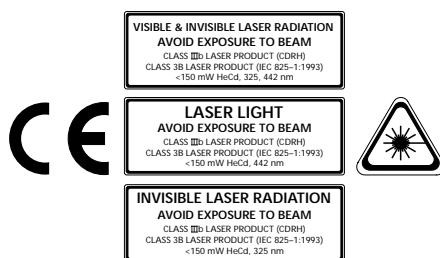
**Shock to shipping container:** 30 g max

**Laser Head Weight:** 17 lbs. (7.7 kg)

**Shipping Weight w/Cable:** 22 lbs. (10.0 kg)

Options

- Remote cooling
- Linear polarization
- Beam delivery interface
- Fiber optic coupling
- Electronic Shutter



Most Melles Griot lasers and instruments are designed, tested, and manufactured for compliance with applicable European electrical and laser safety standards.

Lasers in Holography

The three primary types of cw lasers used in holography are argon-ion, helium cadmium (HeCd), and helium neon (HeNe) lasers. Each has distinct advantages that are related to the holographer's needs. Typically, the recording medium, the size and depth of field of the hologram, and budget considerations determine which laser is best suited for the application.

In embossed holography, photoresist is the primary medium used for recording images. The use of photoresist enables mass-produced holograms. Photoresist chemically etches the holographic image onto a glass plate. The optically engraved glass plate (called a master) is electroplated, producing a shim. The shim is placed on an embossing machine for mass stamping of embossed holograms.

Because photoresist is extremely sensitive to wavelengths between 420 nm and 450 nm. HeCd lasers (which lase at 442 nm) are ideally suited for this application.

Artistic holography is not constrained by the necessity to mass produce. This gives the holographer freedom to choose from a variety of emulsions when producing holograms. In such cases, most holographers prefer to use emulsions that are sensitive to the primary wavelength (514 nm) of an argon-ion laser. These lasers provide an attractive combination of high power and long coherence length, enabling holograms that are both large and visually striking.

In most forms of holography, the coherence length of the laser determines the size of the hologram. Generally, a laser with a 10-cm coherence length can produce holograms that are 10 cm by 10 cm. Seasoned holographers can shoot holograms as large as 15 cm by 15 cm with a laser whose coherence length is 10 cm.

Novice holographers typically cannot justify the expense of an argon-on laser or HeCd laser. For "week-end shooters" on a budget, the HeNe laser provides a cost-effective alternative.

Certain laser parameters are essential to all forms of cw holography. The beam must have a single transverse mode (i.e., a Gaussian TEM<sub>00</sub> mode). A polarized laser beam (at least a 100:1 extinction ratio) is necessary in all forms of holography except dot matrix. The low exposure times of dot-matrix holography, typically five milliseconds

per dot, reduce the need for polarization. The laser cannot generate excessive heat or vibration, two mortal enemies of the holographer.

With the exception of dot-matrix holography, high power is very desirable. The higher the power, the shorter the exposure times, and the less chance that something will go wrong.

### Helium Cadmium (HeCd) Lasers

For manufacturers of dot-matrix holograms, in which the exposure time is trivial, HeCd lasers have always been the laser of choice. They are economical, easy to operate, are easy to use, have low maintenance, and last for a long period of time.

With the development of higher power systems, the HeCd laser has also come to dominate embossed holography. The 442-nm line of a HeCd laser exposes the photoresist used in embossed holography several times more effectively than the 458-nm line of an argon laser. A typical HeCd laser can deliver more than 150 mW TEM<sub>00</sub> and can have coherence lengths as high as 30 cm — more than enough for a 6-in. by 6-in. hologram. The effective exposure on photoresists for HeCd lasers meets or exceeds that of large-frame argon-ion lasers, while saving the average holographer in excess of \$800 per month per laser on electricity and water bills. This improvement has created a profound change in the embossed holography marketplace. Today, nearly 90 percent of the lasers purchased for commercial embossed holography are HeCds.

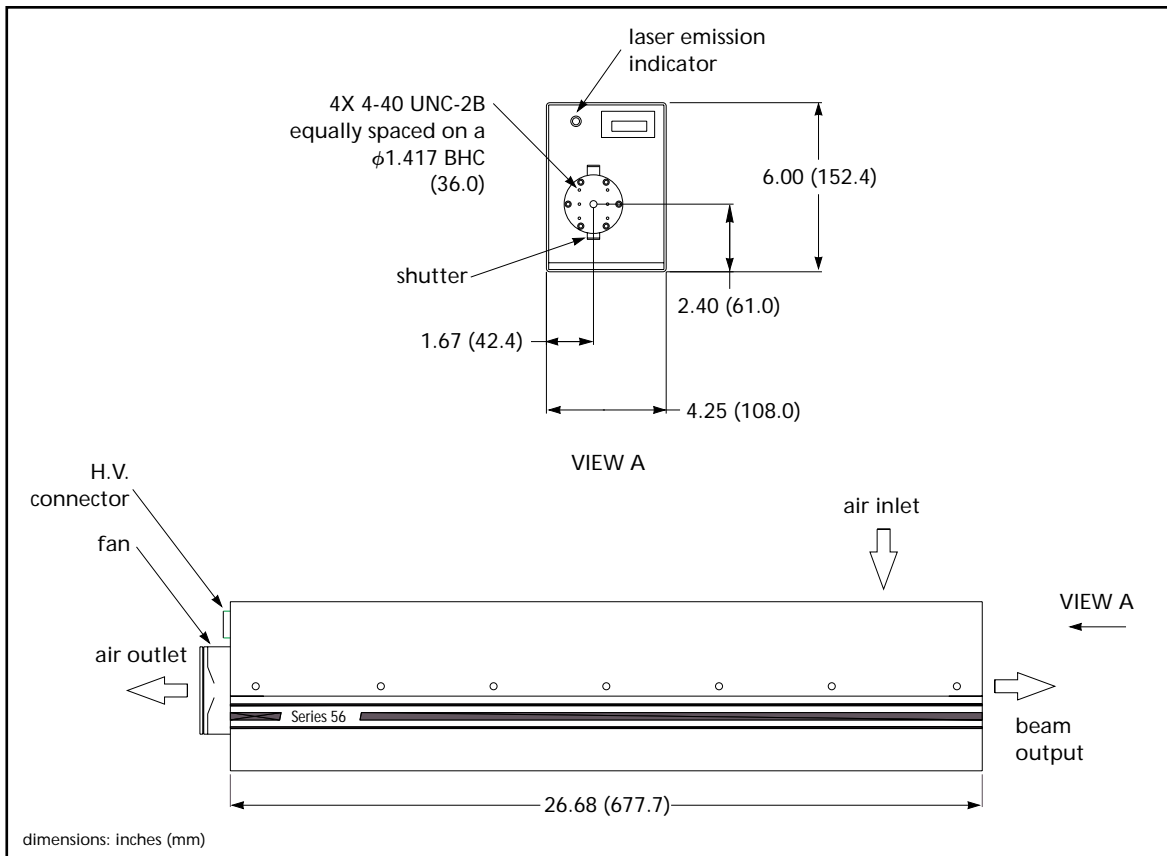
### Specifications for 56 Series Helium Cadmium Laser

Model	Wavelength (nm)	Spec Power Min. (mW)	Warranty Power (mW)	Mode	Beam Diameter <sup>2</sup> (mm)	Beam Divergence <sup>2</sup> (mrad)	M2 <sup>2</sup> (max)	rms Noise <sup>1, 3</sup> DC-2 MHz (%)
2056-S-A01	325/442	2/10	1.4/7.0	TEM <sub>00</sub>	0.29/0.32	1.9/2.2	1.3	1.6/2.0
2056-S-A02	325/442	3/12	2.1/8.4	TEM <sub>00</sub>	0.29/0.32	1.9/2.2	1.3	1.6/2.0
2056-M-A01	325/442	8/25	5.6/17.5	Multi	2.0/1.9	2.9	14/9	2.0
2056-M-A02	325/442	10/30	7/21	Multi	2.0/1.9	2.9	14/9	2.0
2056-M-A03	325/442	15/35	10.5/24.5	Multi	2.0/1.9	2.9	14/9	2.0
2056-M-A04	325/442	20/50	14/35	Multi	2.0/1.9	2.9	14/9	2.0
3056-P-A01	325	2	1.4	TEM <sub>00</sub>	0.28	2.0	1.4	2.0
3056-S-A01	325	2	1.4	TEM <sub>00</sub>	0.28	2.0	1.4	2.0
3056-S-A02	325	4	2.8	TEM <sub>00</sub>	0.28	2.0	1.4	2.0
3056-S-A03	325	5	3.5	TEM <sub>00</sub>	0.28	2.0	1.4	2.0
3056-M-A01	325	10	7.0	Multi	1.10	1.3	3.5	2.0
3056-M-A02	325	15	10.5	Multi	1.10	1.3	3.5	2.0
3056-M-A03	325	18	12.6	Multi	1.10	1.3	3.5	2.0
4056-S-A01	442	15	10.5	TEM <sub>00</sub>	0.32	2.1	1.2	2.0
4056-S-A02	442	20	14.0	TEM <sub>00</sub>	0.32	2.1	1.2	2.0
4056-M-A01	442	30	21	Multi	1.10	2.0	4.0	1.5
4056-M-A02	442	50	35	Multi	1.10	2.0	4.0	1.5

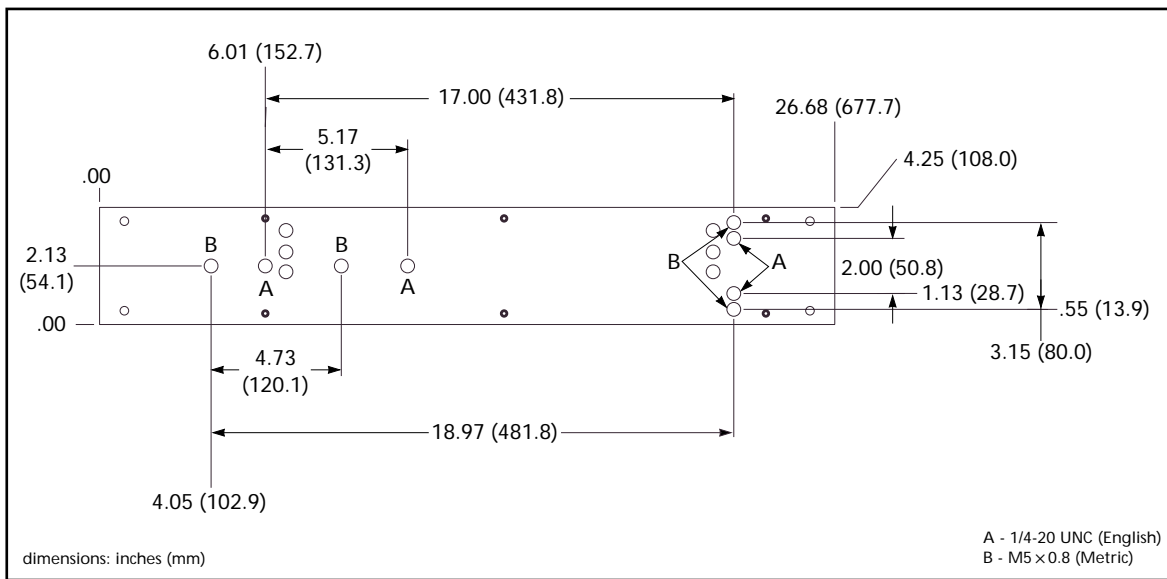
<sup>1</sup> Except resonance occurring in the 240 to 300 kHz range. Lower noise specifications available at reduced power specifications.

<sup>2</sup> Beam diameter defined as twice the separation between the 16% and 84% transmission points of a knife-edge translated across the beam.

<sup>3</sup> Measured using a Hewlett Packard model 403B/001 AC voltmeter and PIN diode detector.



56-series helium cadmium laser outline drawing



56-series helium cadmium laser mounting plate (bottom view)

**MELLES GRIOT**

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