Helium Cadmium Lasers

74 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 55 mW at 325 nm
- Up to 130 mW at 442 nm
- Low optical noise
- TEM_{00} 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
- <600 watt power consumption
- Colinear beams
- CE compliant and CDRH certified

MELLES GRIOT

Specifications: 74 HeCd Series

Common to All Models

Effective oscillation bandwidth: 3 GHz*

Mode Spacing (c/2L): 203 MHz

Coherence Length (approx): 10 cm**

Warmup Time from Cold Start: <15 minutes

Recovery from Standby: <5 minutes

Beam Pointing Stability:
< 20 μrad at ambient constant ±2ºC

Power Stability over 2 hours:
±2% at ambient constant±2ºC

Recommended Power Supply

Model LC-500-XXXY
(XXX = 100, 120, 208, 220, 230, 240)
(Y = B for Black, G for Grey)

Environmental Specifications

Cooling: Forced air
Operating Temperature: +10°C to 40°C
Storage Temperature: −40°C to 60°C

Relative Humidity, Operating:
0–90% noncondensing

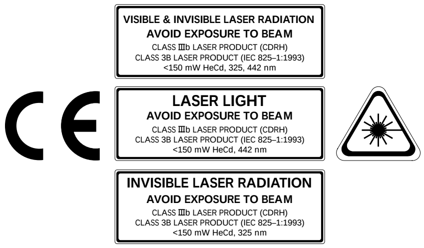
Shock in shipping container: up to 30 g max
Laser Head Weight: 24 lbs. (10.9 kg)

Shipping Weight w/Cable: 30 lbs. (13.6 kg)

**single isotope (16 Hz)*
*** single isotope (30 cm)*

Options

- Remote cooling
- Linear polarization
- Beam delivery interface
- Fiberoptic 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_{00} 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

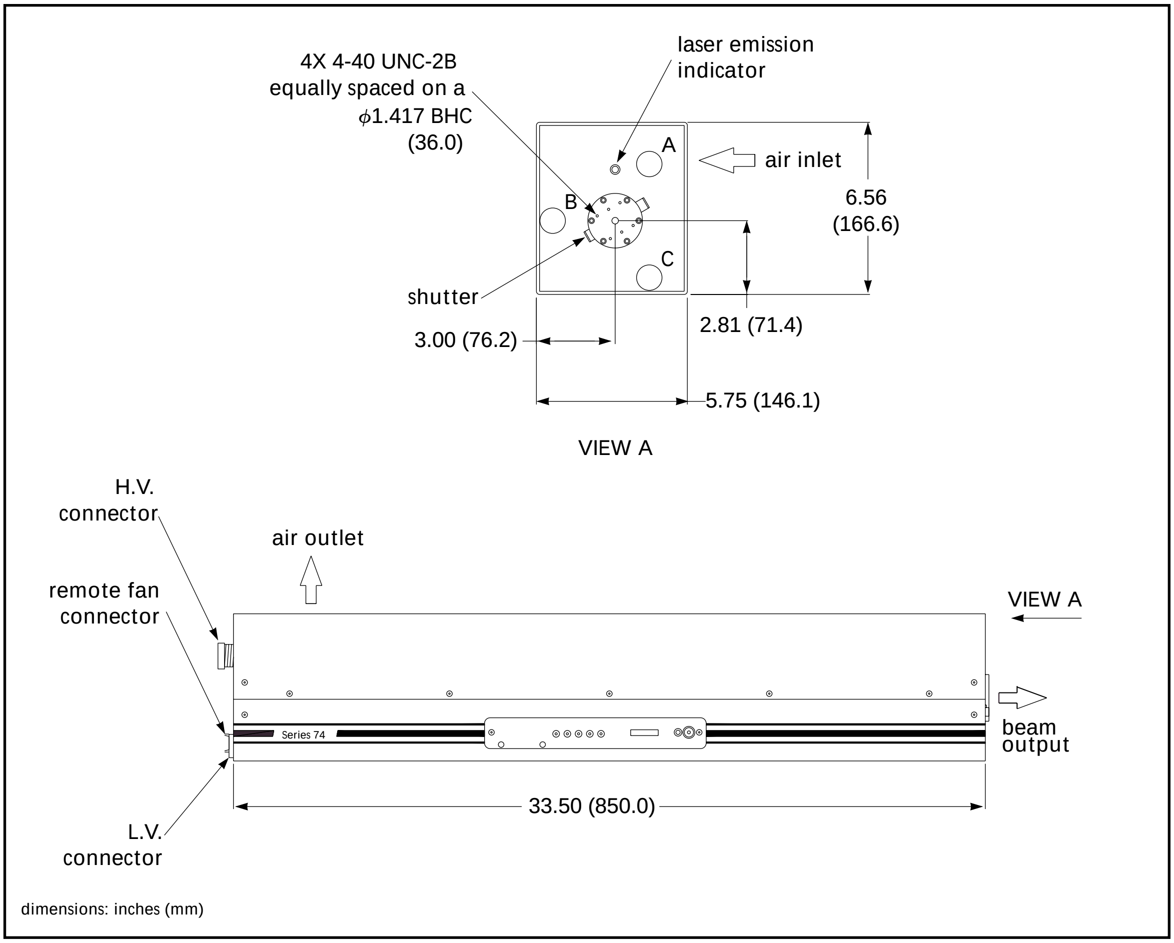
For manufacturers of dot-matrix holograms, in which the exposure time is trivial, HeCd lasers have always been the laser of choice. They are economical, easy to operate, are easy to use, have low maintenance, and last for a long period of time.

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_{00} 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.

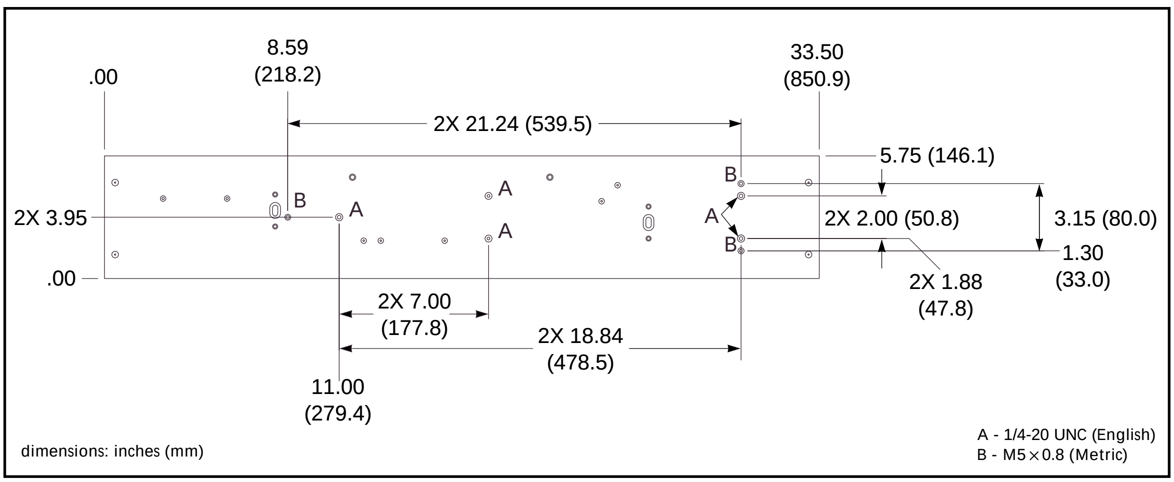
Specifications for 74 Series Helium Cadmium Laser

Model	Wavelength (nm)	Spec Power Min. (mW)	Warranty Power (mW)	Mode	Beam Diameter[2] (mm)	Beam Divergence[2] (mrad)	M2 [2] (max)	rms Noise[1, 3] DC–2 MHz (%)
2074-S-A01	325/422	5/20	3.5/14	TEM_{00}	0.33/0.31	1.50	1.2/1.1	2/2
2074-M-A01	325/442	15/70	10.5/49	Multi	2.1	3.0	15/10	1.5/1.5
2074-M-A02	325/442	25/80	17.5/56	Multi	2.1	3.0	15/10	1.5/1.5
2074-M-A03	325/442	35/100	24.5/70	Multi	2.1	3.0	15/10	1.5/1.5
3074-S-A01	325	6	4.2	TEM_{00}	0.33	1.50	1.2	1.5
3074-S-A02	325	8	5.6	TEM_{00}	0.33	1.50	1.2	1.5
3074-S-X01	325	13	9.1	TEM_{00}	0.33	1.50	1.2	1.5
3074-M-A01	325	20	14.0	Multi	1.40	1.4	5.5	2.0
3074-M-A02	325	30	21.0	Multi	1.40	1.4	5.5	2.0
3074-M-A03	325	40	28.0	Multi	1.40	1.4	5.5	2.0
3074-M-X04	325	55	38.5	Multi	1.50	1.5	5.5	2.0
4074-P-A01	442	30	21.0	TEM_{00}	0.5	1.60	1.2	2.0
4074-P-A03	442	70	49.0	TEM_{00}	1.10	1.65	1.3	2.0
4074-S-A01	442	30	21.0	TEM_{00}	0.5	1.60	1.3	2.0
4074-S-A02	442	40	28.0	TEM_{00}	0.5	1.60	1.3	2.0
4074-S-B03	442	70	49.0	TEM_{00}	1.10	0.65	1.3	2.0
4074-S-A03	442	90	63.0	TEM_{00}	1.10	0.65	1.3	2.0
4074-S-X01	442	90	63.0	TEM_{00}	1.10	0.65	1.3	2.0
4074-M-A01	442	100	70.0	Multi	1.90	3.00	10	2.0
4074-M-A03	442	130	91.0	Multi	1.90	3.00	10	2.0

[1] Except resonance occurring in the 240 to 300 kHz range. Lower noise specifications available at reduced power specifications.
[2] Beam diameter defined as twice the separation between the 16% and 84% transmission points of a knife-edge translated across to the beam.
[3] Measured using a Hewlett Packard model 403B/001 AC voltmeter and PIN diode detector.



74-series medium-frame helium cadmium laser outline drawing



74-series medium-frame helium cadmium laser mounting plate (bottom view)

MELLES GRIOT

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