

# PL SERIES

Infrared Lasers



The PL series of continuous wave (CW), grating tuned, infrared gas lasers sets the standard for high power, stable sources for a wide variety of applications from molecular spectroscopy, non-linear optics, LIDAR, interferometry, process control, atmospheric studies, plasma density measurements and much more.

The PL-series of lasers include grating tuned CO<sub>2</sub> lasers with a step tunable wavelength from 9.1  $\mu\text{m}$  – 10.9  $\mu\text{m}$  with single line powers from a few Watts (Model PL2), to 50 W (Model PL5) and even to 180 W (Model PL6); each characterised by excellent amplitude and frequency stability for the most technically challenging tasks.

The higher power PL-series lasers can be used to optically pump polar gases (for example methanol, formic acid, etc) to create Far Infrared (FIR) laser emission. The FIR/TeraHertz region (40  $\mu\text{m}$  – 1.2 mm, 7.5 to 0.25 THz) can be used for temperature measurement of fusion reactor plasma. There are also many applications in homeland security and scanning, scattering density measurements, radar modelling, etc.

## KEY FEATURES

- + Tunable spectral ranges from 5.2 to 10.9  $\mu\text{m}$
- + Single line outputs up to 180 W
- + High stability
- + Polarised output

## PL2-M / PL2-S

The PL2 CO<sub>2</sub> laser is a compact high stability laser featuring a user-replenishable discharge tube, grating/piezo line tuning, and an invar stabilised cavity. A DC power supply is offered as standard. The PL2-M has a minimum rated power of 10 W on the strongest line and the PL2-S has a minimum rated power of 1 W on the strongest line.

A short term amplitude stability of better than 1% is easily achieved and this can be maintained over hour periods with an active Laser Stabiliser.

The laser is operated in sealed off mode. A vacuum valve is fitted to allow user replenishment, with standard or isotopic gas mixtures for ultimate flexibility and ease of operation at lowest cost.

### KEY FEATURES

- + Over 60 CO<sub>2</sub> lines available (9.1 – 11 μm)
- + User replenishable gas mixtures
- + <±1% stability
- + Compact footprint



### KEY FEATURES

- + Unique CO or CO<sub>2</sub> operation
- + Up to 1.0 W CO output (5.1 μm - 6.0 μm)
- + Up to 25 W CO<sub>2</sub> output (9.1 μm - 10.9 μm)

## PL3

The PL3 laser is a versatile step-tuneable infra-red laser system designed to give excellent frequency and amplitude stability. It operates sealed off on low gain CO transitions (5.2 to 6.0 μm) under hazard-free, near room temperature conditions.

As with the PL2-M the PL3 gas is user replenishable. By changing the cavity optics and gas mixture, the PL3 can be converted into a tunable CO<sub>2</sub> laser covering the 9.1 μm to 10.9 μm region. Typical single line powers are 1.0 W CO and 20 W CO<sub>2</sub>.

## PL5

The PL5 is a flowing gas CO<sub>2</sub> laser producing single line powers in excess of 50 W and operating on more than 80 individual lines. The cavity optics consist of two ZnSe Brewster windows, a gold coated diffraction grating and a ZnSe output coupler. The laser head is supplied with all necessary vacuum couplings, valves and a capsule gauge to enable flow operation. A suitable vacuum pump, is available to complete the system

Q-Switched operation of the PL5 can be achieved with the PL5-QS option. This is a six sided polygon scanning mirror assembly which mounts in the intercavity space between the grating and rear Brewster window.

Depending on laser operating conditions, pulses of typically 2 kW peak power and pulse widths of 200 ns are achieved at frequencies up to 1 kHz.

### KEY FEATURES

- + Up to 50 W CO<sub>2</sub> output (9.1  $\mu\text{m}$  - 10.9  $\mu\text{m}$ )
- + Optically switched option (~200 ns pulses)
- + Flowing gas operation
- +  $\leq \pm 1\%$  stability



### KEY FEATURES

- + Up to 180 W CO<sub>2</sub> output
- + Over 90 lines available (9.1  $\mu\text{m}$  - 10.9  $\mu\text{m}$ )
- + 60 lines above 120 W
- + Flowing gas operation

## PL6

The highest power tunable CO<sub>2</sub> laser currently available is the model PL6, offering single line power up to 180 W and more than 90 lines across 9.1  $\mu\text{m}$  to 11  $\mu\text{m}$ . The flowing gas laser head is a single U-folded design with twin discharge tubes. The laser resonator is passively stabilised with a 5 bar invar support frame which is decoupled from the laser base by orthogonal Rose bearings.

Cavity optics comprise of a gold coated diffraction grating and piezo mounted output coupler. Within the cavity, two high reflectivity folding mirrors reflect the beam internally and two ZnSe Brewster windows are used to seal the discharge tubes.



# SPECIFICATIONS

Gas Type	CO <sub>2</sub> (9.1–10.9 μm)					CO (5.1 – 6.2 μm)
	PL2-S	PL2-M	PL3	PL5	PL6	PL3
Model						
Output Power (W) – flowing	–	–	–	50	180	–
Output Power (W) – sealed	1	10	20	–	–	1
Number of lines	50	60	80	80	90	60
M <sup>2</sup>	1.25	1.25	1.35	1.25	1.5	n/a
Beam Divergence – 1/e <sup>2</sup> (mrad)	<7.5	<6.5	3.5	3.5	3.5	3.5
Beam Diameter – 1/e <sup>2</sup> (mm)	4.0	4.8	7.5	7.5	11	5.0
Polarisation	Vertical	Vertical	Horizontal	Vertical	Vertical	Horizontal
Amplitude Stability	<±1%	<±1%	<±1%	<±1%	<±2%	<±1%
Frequency Stability (kHz/sec)	200	200	60	500	500	60
Frequency Stability (MHz/10min) (actively stabilized)	±1	±1	±1	±2	±2	±1
Tuning Mechanism	Piezo-ceramic length tuner and diffraction grating wavelength selection					
Cavity length (cm)	42	77	178	183	388	178
Dimensions (cm) L	65	110	221	220	220	221
Dimensions (cm) W	12	12	52	22	45	52
Dimensions (cm) H	13	13	37	22	32	37
Weight (Kg)	11.8	18	100	36	125	100
Gas Requirements	Sealed/user replenishable	Sealed/user replenishable	Sealed/user replenishable	1.2 lit/min (flowing gas)	9 lit/min	Sealed/user replenishable

## A wide range of accessories are available for the PL Series. These include:

**Laser Stabilisers** – For applications demanding excellent medium and long term stability, an active stabiliser may be required. This will compensate for laser output fluctuations caused by changes in ambient conditions and lock the variation in laser frequency or power to a value close to the passive jitter.

Edinburgh Instruments has designed a family of active stabilisation techniques appropriate to the type of laser and operating conditions.

**Laser Pumping and Refilling Systems** – All flowing gas laser systems are supplied with the necessary valves, gauges and vacuum couplings for simple connection to the system vacuum pump. A range of turbo molecular and dry pumps are available.

**Gas Mixing Stations** – Designed to allow mixing and metering of up to 3 component gases from independent gas cylinders. These comprise of 3 inlet ports with individual flow meters or needle valves for gas mixing or gas flow operation.

The PL5 and PL6 can be used in combination with our FIR optically pumped lasers.



PROTECTIVE GLASSES ARE AVAILABLE FOR THE PL SERIES OF CO<sub>2</sub> LASER.

Customer support is available worldwide.

**edinst.com**