



Quick and easy, laser power measurement

Laser power measurements should be quick and easy. They should not involve time consuming set-up and alignment problems. Ideally, the measurements should also be able to be made at any point in an optical system where losses are likely to occur.

Unfortunately, most laser power meters have sacrificed ease of use to gain continuous power readings. However, in most laboratory and production situations, the usual requirement is for a quick spot-check of power with a minimum of disruption. Even when tuning up a laser, researchers have found that it is best to tune for a desirable mode pattern using Thermal Image Plates*, then briefly check the laser power.

The Power Probes are calorimeter-type power meters which: measure laser power using a timed exposure. They display average power absorbed on a calibrated readout scale and can be used with continuous or repetitively pulsed lasers ranging from small 20 watt YAG lasers to large 10,000 watt CO₂ lasers.

**Thermal Image Plates and Beam Probes are viewing devices for CO₂, CO, HF and YAG lasers. Data sheets are available from Macken Instruments, Inc.*

Taking Measurements

Each Power Probe is a self-contained unit consisting of an absorbing head, a temperature measuring mechanism, a zeroing knob and a readout dial. In operation, the dial is zeroed. Then the absorbing head on the end of the Power Probe is exposed to the laser beam for a specified time interval. After the Power Probe has been removed from the laser beam, the average laser power can be read out on the dial. The process takes about one minute. If it is necessary to make several power measurements in succession, the absorbing head can be rapidly cooled by immersing it in a beaker, of water between measurements.

Laser Power Probes Specifications



Mack Instruments, Inc.

For CO₂ & YAG Lasers

Select Features

- The absorbing head of a Power Probe is conveniently sized. An absorbing head is large enough to be easily used, yet small enough to be inserted between optical components to measure the laser power without disturbing set-up.
- The hand-held meter requires only about one minute to make a power measurement
- The absorbent coating is very tough, resisting mechanical abrasion and water immersion.
- A zero adjustment mechanism has been incorporated into the design to expedite and simplify the power measurement process.
- An accurate and durable all-metal construction has been used to insure a long life.

A model for every application

The Laser Power Probes have proven to be so popular that Macken Instruments now offers 16 flat and 3 conical style models. The models include 9 different power ranges and 2 different absorbing coatings. The "Y" series Power Probes have a broad spectral absorption coating which can be used from 0.2 to 11 μ . These Power Probes are designed for use the YAG or CO₂ lasers. The "C" series Power Probe can only be used with CO₂ laser wavelengths. The C series is recommended for use with CO₂ lasers because the coating generally has a higher damage limit than the "Y" series.

Model	Power Range (Watts)	Exposure Time	Watts/ Division	Absorbing Head	Overall Length	Weight (gm)	Accuracy % (1)	Repeatability %
P20Y	2-20	20 sec.	0.2	4.06 x 2.54 cm (1.6" x 1")	22	89	+/-5	+/-1.5
P50Y	5-50	20 sec.	0.5	4.24 x 2.54 cm (1.7" x 1")	22	98	+/-5	+/-1.5
P100Y & P100C	10-100	20 sec.	1	5.08 cm 3.175 cm (2" x 1.25")	22	120	+/-5	+/-1.5
P200Y & P200C	20-200	20 sec.	2	5.8 cm dia. (2" x 1.25")	22	157	+/-5	+/-1.5
P500Y & P500C	50-500	20 sec.	5	5.8 cm dia. (2" dia.)	22	183	+/-5	+/-1.5
P1000Y & P1000C	100-1000	20 sec.	10	6.35 cm dia. (2.5" dia.)	22	287	+/-5	+/-1.5
P2000Y & P2000C	200-2000	20 sec.	20	7.62 cm dia. (3" dia.)	22	522	+/-5	+/-1.5
P4000Y & P4000C	400-4000	20 sec.	25	8.89 cm dia. (3.5" dia.)	28	753	+/-5	+/-1.5
P10KY & P10KC	500-5000 1000-10000	20 sec.** 10 sec.**	50** 100**	8.89 cm dia. (3.5" dia.)	28	1144	+/-5	+/-1.5

Alternate power ranges can be obtained by doubling or halving exposures (hand held) For CO₂ lasers the "C" coating is recommended because this coating can withstand higher laser power than the broad band "Y" coating.

The accuracy and repeatability of the Power Probes partly depends on the accuracy of the exposure time. The average accuracy of exposures (hand held) has been found to be 0.2 seconds. This amounts to a 1% error for a 20 second exposure time. Today most lasers are equipped with a shutter that can product an exact time exposure.

*10 second exposure time for 10,000 watts.

**20 second exposure time for 5,000 watts.

Approximate Damage Threshold for Stationary Probes*

Power (watts)	100	200	500	1,000	2,000	5,000	10,000
Time** (seconds)	20	20	20	20	20	20	10
Co ₂ (W/cm ²)	10,000	7,000	4,000	2,500	1,500	1,100	900
YAG Probes (W/cm ²)	3,000	2,500	2,000	1,750	1,200	900	---

*Moving the probe during exposure will increase (up to double) the damage threshold compared to the numbers shown for a stationary probe; To achieve this increase, the head must be moved in a circular motion so that the laser beam does not strike any one area continuously for more than 1.5 seconds.

**Exposure time of the laser beam on a Power Probe head which is rated to accept the indicated power level.