



Macken Instruments, Inc.

YAG & CO₂ Digital Power Probes



The Macken Instruments, Inc., Digital Power Probe is a completely portable, easy-to-use calorimeter type power meter. The instrument consists of two components: a microprocessor-based digital meter and a probe head. Different probe heads are available to cover various laser types with power ranges from a few watts to over 11 kW. The meter accepts any of the probe heads so it is easy to change power ranges as well as check a reading using a second probe head of the same type.

Like Macken Instruments' highly successful dial type Laser Power Probes, the Digital Power Probe uses timed exposures and is based on the idea that the laser power measurement should be quick and easy. Setup should not require special fixture or time consuming alignment. Ideally, it should be possible to take power measurements at any point in the optical system where losses are likely to occur. Unfortunately, most laser power meters have sacrificed ease of use to gain continuous power readings.

In most laboratory and production situations, however the usual requirement is for quick power spot checks with minimum disruptions.

The Digital Power Probe has several special features:

1. Increased accuracy due to the microprocessor control and a digital readout. The meter automatically compensates for nonlinearities and other sources for error in power measurement.
2. Laser power readings are retained until the meter is reset.
3. Power Probe Heads are inexpensive and easily switched. This permits alternating between two Probe Heads so that readings can be made using one head while the other cools or if the user is checking more than one different laser.
4. The Digital Power Probe measures laser power with full accuracy from 20W to over 11kw using 8 Probe Heads with overlapping ranges.
5. The EEPROM memory chip in the Power Probe Head contains the calibration information which allows the user to utilize the nominal 20 second exposure or the timer on the DM5 Meter for the exact calibration time.

Probe Head selection. Eight different Probe Heads are available for use with the DM5 Digital Meter. The Probe Heads have four different power ranges (designated Models of D1, D2, D3, D4). The Probe Heads are also available with two absorbing coatings designated Y and C. The Y series Probe Heads have a broad spectral absorption coating that is particularly useful for YAG lasers but covers a spectral range from 0.4 to 6 microns. This coating can also be used with CO₂ lasers. If the Probe Head is to be used with only a CO₂ laser, then the C coating is preferred. The C coating does not exhibit damaged until the aluminum substrate is close to melting temperatures. The D2C, D3C and D4C Probe Heads are conical in shape allowing for a higher damage threshold.

Probe Head	D1C & D1Y	D2C & D2Y	D3C & D3Y	D4C & D4Y
Useful Range	20-220 Watts	100-1,000 Watts	200-2,200 Watts	1000-11,000 Watts
Exposure Time	20 Sec	20 Sec	20 Sec	10 Sec
Resolution	0.1 Watt	1 Watts	1 Watt	10 Watts
Head Diameter	1.5" C 0.4" Y	1.9" C 2.5" Y	2.4" C 3" Y	3" C 3.5" Y
Accuracy	+/-5%	+/-5%	+/-5%	+/-5%
Repeatability	+/- 1.5%	+/- 1.5%	+/- 1.5%	+/- 1.5%



The Digital Power Probe is a calorimeter-type power meter that measures laser power by measuring the temperature rise in a known mass of material over a known time interval. The laser power is absorbed for a timed interval to create this temperature rise.

OPERATION

- 1.1 Turning On and Off: To turn on the meter press the button marked "On/Off", the meter will take several seconds to power up. To turn off the meter hold down the "On/Off" button.
- 1.2 Connecting a Probe: The probe connects to the top of the meter, line up the pin pattern, push together, and twist the locking hub.
- 1.3 Selecting an Exposure Time: Select one of three exposure times, 10 seconds, 20 seconds or 40 seconds by pressing the "Exp Time" button to cycle through these options. Choose an exposure time based on the size of the probe and power of the beam, using the follow chart as a rough guide.

	10 sec.	20sec	40 sec.
D1	NA	20-220W	NA
D2	750-2000W	250-750W	50-250W
D3	1500-4000W	500-1500W	100-500W
D4	4000-10KW	2000-4000W	1000-2000W

- 1.4 Resetting or Zeroing the Meter be when the probe is approximately at ambient temperature press the "Reset" button prior to taking a reading.
- 1.5 Using the Timer The timer is for use when your laser does not have a accurately timed shutter. Press the button marked "Timer" when you are placing the probe in the beam. You will hear a long beep when the "Timer" button is first pressed, then a soft beep every second for the length of the selected exposure time, during the final three seconds you will hear two louder beeps and a final long beep, remove the probe from the beam on this final long beep.
- 1.6 Expose Power Probe to Beam Allow the laser beam to strike a conical side of the gray absorbing head for the selected exposure time. To expose the absorbing head of the Power Probe to the laser beam, either physically move the absorbing head into and away from the laser beam, or hold the absorbing head stationary and shutter the laser beam on and off.
- 1.7 Remove Power Probe from Beam and Take a Reading: The Watts value will continue to increase for a few seconds after the end of the exposure. Once the value has stabilized you will hear a beep and "Final" will be displayed this indicates that the reading is complete.
- 1.8 Preparing for Another Reading: Return the temperature of the head of the Power Probe to nearly room temperature before making another measurement. To rapidly cool the probe head, insert the absorbing head into a beaker of water. Thoroughly dry the head and reset the meter before making the next measurement.

2.0 RETRIEVING A READING

- 2.1 Go to Recorded Readings: The meter automatically records the last 10 reading, to retrieve these readings hold down the "Reset" button and press the "Exp Time" button.
- 2.2 Scroll through readings: Let go of and then hold down the "Reset" button and press the "Exp. Time" button again, repeat to scroll through 1 to all 10 readings.
- 2.3 Exit to take a new reading to exit the recorded readings press the "Reset" button

3.0 COATING DAMAGE CAUTION

The coating on the absorbing head can be damaged by exposing the Power Probe to too high a laser power density. NEVER focus the laser beam on the surface of the Power Probe. Move the absorbing head around slightly while taking the reading, this helps to reduce the possibility of damage.

4.0 SAFETY CONSIDERATIONS

ALWAYS observe safety precautions, such as wearing eye protection, when using the laser Power Probe. Take care to prevent the laser beam from reflecting off of the stainless steel stem.

See the DM5 Display & Keypad Diagram Next Page



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DM5 Digital Meter Display & Keypad Diagram

