

POWERGAUGE V1

USER MANUAL



For use only by trained professionals, always be aware of your surroundings and the relevant risks and dangers involved in the use, operation and maintenance of high power laser equipment.

If you are ever unsure or doubtful about your safety at any time please consult a qualified laser engineer.

POWERGAUGE V1 OPERATING INSTRUCTION

Safety Notice

Laser safety must be taken seriously, high laser output power and an invisible beam coupled with high voltage power supply's sometimes in excess of 50,000v DC, make the dangers and possibility of injury or damage from direct or reflected beams or electrical shock a serious possibility.

Always perform measurements in accordance to the manufactures usage instructions, never bypass / override safety lockout switches and systems.

Never open machine doors / guarding or hatches whist the laser is live or operational.

Never place hands arms or any other limbs inside the machine or beam path whist live or operational.

This device is intended to be used with a magnetic clock stand, allowing for the test equipment to be placed in the beam path before starting the test.



Figure 1 Magnetic base clock stand

High voltage or RF lasers power supplies are high in voltage and often current as well, please be aware of the inherent dangers associated when working around such equipment. Always consult a trained professional before attempting maintenance or laser power measurements.

Water cooling, often lasers tubes are cooled with recirculating water though a water jacket inside the tube, this is in close proximity to many thousands of volts, extra precaution is required.

Reflected or scattered beams can be just as dangerous as direct beams, never operate or test laser equipment with guarding open.

Always wear approved safety goggles suitable for use with CO2 laser beam wavelength (10.6 um)

Usage



The laser power gauge has been designed with ease of use in mind.

Featuring a single button and automatic power down function to power up the meter simply press the button once.

After a brief moment the power meter will enter the calibration process, this must be carried out each time the unit is power cycled. This calibration cycle allows the high accuracy 12 bit analog to digital converters to stabilise before applying our error reduction algorithm. On average this process takes around 5 seconds to complete.

Once calibration is complete the home page splash screen will be displayed. To the top right of the screen is a battery gauge, when this gauge becomes depleted the unit can be recharged using a standard 5v usb charger and micro usb cable. The circuitry has been designed with efficiency in mind. Boasting a 30 + Year standby battery life, and 30 hours continuous operation life time before charging is required. On average it takes around 1 minute from power up to obtain a measurement, based on this you should expect upwards of 5000 measurements before a charge is required. Usb recharging takes around 15-30 minutes to complete.

To the bottom right of the screen the current idle temperature can be seen, by default this is set to degrees Celsius, please be aware of this temperature as the device must be allowed to cool down to ambient temperature before each subsequent measurement.

Setting Test Length Time

The power meter is suitable for measuring CO2 lasers from 10W to 200W of output power.
3 types of test are available



100W+ Suitable for lasers 100+ Watts in output power (15 second test)

50 – 100W Suitable for lasers 50 – 100 Watts in output power (30 second test)

10 – 50W Suitable for lasers between 10 - 50 Watts in output power (60 second test)

If required you can switch test length at any time.

- To change the test length simply hold down the button and count to 4.
- Release the button to be greeted by the TEST LENGTH menu.
- Simply cycle the menu by clicking the button.
- Once your desired test length is highlighted hold the button down for 4 seconds and release.

The chosen test length is saved to memory and does not need to be selected each time the device is used.

The selected test length can be verified on the idle screen.



TM 15 = 15 SEC 100W+

TM 30 = 30 SEC 50-100W

TM 60 = 60 SEC 10-50W

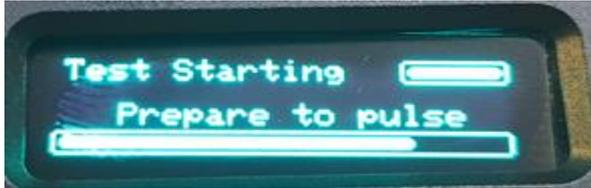
The unit is shipped without a default test type this must be selected on first use.

Taking Your First Measurement

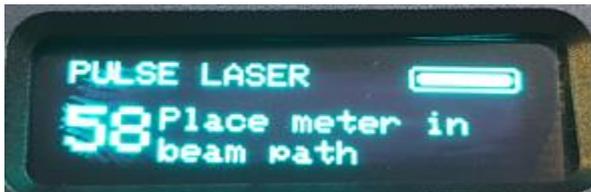
- Simply hold the button and count past 2, when the below option is displayed release the button.



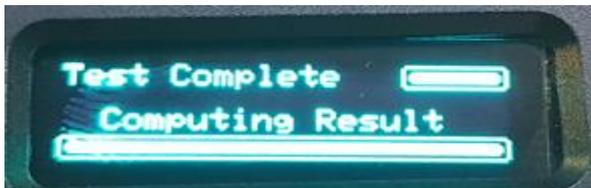
- On release of the button a screen will be displayed with test starting prepare to pulse.



- Place the Test surface in the beam path; ensure the beam hits central on this test surface.
- The progress bar graph will begin to fill, once this bar has filled the test will begin, prepare to fire the laser.
- The screen will change to Pulse Laser, hold the fire / pulse button on your machine for the length of this test, a countdown will begin, once this reaches 0 stop pulsing the laser.



- The accuracy of the test is dependent on the tester's ability to fire the laser at the precise moment this screen changes and stop the moment the countdown reaches 0. After a few tries it will become second nature.
- A screen with the text TEST COMPLETE is now displayed with another bar graph displayed underneath, a few seconds is required for the MCU to calculate the 1000 + collected data points, this data is then processed and filtered by a linier quadratic estimation algorithm.

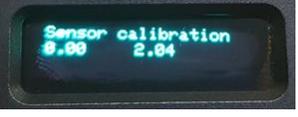
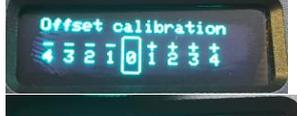
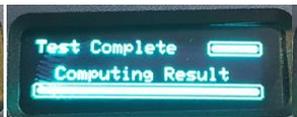


- Once this bar has filled the screen will change to display the tested output power displayed in Watts (W)



- The last recorded test measurement will be saved to the idle display screen next to LT

Menu Structure



Recharging the Power Meter

3 scenarios can occur to that will require the internal battery's to be charged.

1. The battery gauge is getting low and the user decides to charge the unit.
2. A display message prompts the user to charge the device.
3. The low voltage protection is enabled and the device refuses to power up.

To charge the unit simply plug in a micro usb cable into the port and connect to a 5v USB power outlet.

The unit will automatically cut off once charging is complete, but we recommend the user disconnects after 30 minutes charge.

Never leave any device charging unattended.



| SPECIFICATIONS | |
|---------------------------------|--|
| MAX POWER | 400W |
| MAX MEASUREMENT POWER | 200W |
| POWER SENSOR APERTURE | 40mm |
| MEASUREMENT CAPABILITY | |
| WAVELENGTH | 2.5 μm – 10.6 μm |
| CALIBRATED WAVELENGTH | 10.6 μm |
| MINIMUM POWER | 1W |
| EXPOSURE TIME | 15 s, 30 s, 60 s |
| MEASUREMENT ACCURACY | $\pm 1 \%$ |
| COOLDOWN PERIOD | 60 s |
| DAMAGE THRESHOLD | |
| MAXIMUM POWER DENSITY | 15KW/cm ² (10.6 μm) |
| FOCUSED BEAM MEASUREMENT | NO |
| MAX DEVICE TEMPERATURE | 80 °C |
| MAX EXPOSURE TIME | 60 s |
| GENERAL SPECIFICATION | |
| DISPLAY TYPE | HIGH CONTRAST OLED |
| DISPLAY SIZE | 128X32 px |
| BACKLIGHT | YES |
| USB FIRMWARE UPDATE | NO |
| BATTERY TYPE | LITHIUM POLYMER |
| BATTERY SIZE | 380mAh |
| BATTERY LIFE | 30 HOURS (5,000 MEASUREMENTS) |
| BATTERY STANDBY | 30 YEARS |
| CHARGING | MICRO USB (30 MIN FULL CHARGE) |
| OPERATING HUMIDITY | 80% RH |
| PHYSICAL SPECIFICATION | |
| DIMENSIONS | 112mm x 45mm x 15mm |
| WEIGHT | 180g |
| POWER SENSOR APERTURE | 40mm |