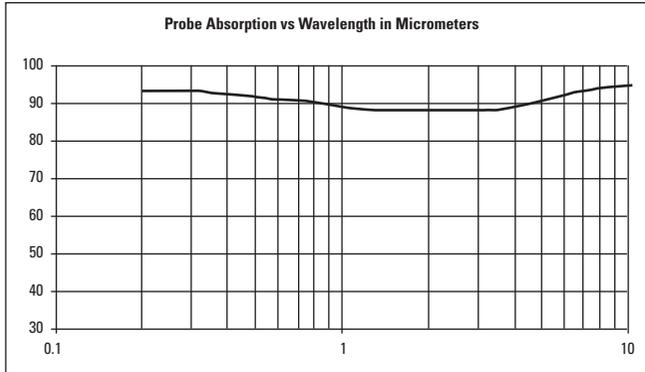


- Now press up or down to change the calibration factor to give a more correct reading. For instance, if your Comet is reading 10% lower than it should and the present setting of the factor is 1.055, then set the factor to $1.10 \times 1.055 = 1.1605$
- Press the menu button. The screen will show SAVE? Press YES. The screen will show SURE? Press YES and the new value will be saved.

6 Spectral Sensitivity Curve

The following curve is the approximate spectral sensitivity of the Comet vs. wavelength in μm . You can use this graph to calculate the approximate power reading of lasers that are different from the calibrated wavelengths.



7 Specifications

Spectral range	See table 1 and the spectral graph							
Power measurement range	Comet 10K & 10K-HD: 200W to 10,000W Comet 1K: 20W to 1,000W							
Absolute calibration accuracy at calibrated wavelengths	±5%							
Repeatability	±1% for same initial temperature							
Linearity with power	Comet 10K & 10K-HD: ±2% from 1KW to 10KW Comet 1K: ±2% ±1W from 20W to 1KW							
Time to reading	Comet 10K: Initial reading 20s after exposure, final reading 40s after exposure Comet 10K-HD: Initial reading 30s after exposure, final reading 70s after exposure Comet 1K: Initial reading 10s after exposure, final reading 20s after exposure							
Maximum Average Power Density kW/cm ²	Power	Comet 1K	Comet 10K	Comet 10K-HD		Safe minimum distance from lens in cm		
		kW/cm ²	kW/cm ²	kW/cm ² for beam dia <40	kW/cm ² for beam dia >40	5" Lens		
					Std.	HD	Std.	HD
	100W	10						
	200W	8						
	300W	6						
	500W	5			17	15	38	36
	1kW	4	3.5	10	7	19	16	40
	2kW		2.8	10	6	21	17	44
	3kW		2.5	8	5	24	18	48
	5kW		1.5	6	3	29	20	56
	10kW		1	4	2	41	25	74
Maximum permitted probe temperature	70degC before measurement, 140degC after measurement.							
Temperature compensation	Temperature compensated to give accurate readings independent of starting probe temperature							
Number of readings before probe must be cooled (for 25degC starting temp.)	Comet 10K, Comet 10K-HD						Comet 1K	
	1KW	4					100W	4
	3KW	3					300W	3
	4KW	2					400W	2
	10KW	1					1kW	1
Display	2x8 character LCD. Character height 5mm							
Operation modes:	AUTO: Automatic measurement with laser set to 10s timed exposure. MANUAL: User places probe in front of beam for 10s							
History	Stores last three readings							
Calibration	Can be recalibrated by user							
Battery	2 x AA. Lifetime in normal use approximately 1 year.							
Electromagnetic compatibility	CE approved							
Dimensions	Comet 10K: Absorber: $\varnothing 100\text{mm}$ dia x 50mm thick. Length: 345mm Comet 10K-HD: Absorber: $\varnothing 55\text{mm}$ dia x 87mm thick. Length: 355mm Comet 1K: Absorber: $\varnothing 50\text{mm}$ dia x 25mm thick. Length: 295mm							
Part number	Comet 10K-V1: P/N 7Z02705, Comet 10K-HD-V2: P/N 7Z02706, Comet 1K: P/N 7Z02702							



COMET

User Manual

1 General Description and Principle of Operation

The Comet family includes the Comet 10K that can measure up to 10KW, the Comet 10K-HD for high power density lasers and the Comet 1K for powers of up to 1KW. See the specification table for details.

The Comet laser power probe is simple to use, economical but also highly accurate. It operates by measuring the heat rise from a 10 second exposure to a laser beam and thereby calculates the laser power. It has a sophisticated algorithm to take into account heat loss at elevated temperatures and thus can give accurate readings even if the Comet is hot before the measurement. This allows you to take several measurements before cooling the probe with water.

Please follow these instructions to get the best use out of your Comet laser power probe:

Safety Note:

Comet power probes can measure high power lasers up to 10KW. In addition, the absorbing surface of the Comet can reflect back up to 10% of the laser light. In the case of a CO₂ laser, this reflected light can be almost specular, coming back at a divergence angle of about 20 degrees. Therefore:

- Keep hands safely away from laser beam at all times. It is preferable to measure in automatic mode with the user safely away from the beam. Do not approach the probe to read the results until the laser is off.
- Wear safety glasses at all times. Do not place the Comet so that reflected light can point in your direction.

Comet User Manual



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2 Setup

2.1 Switching On and Off

Press the “on/ready/off” button. A beep will sound and the display will appear. To turn off, press the “on/ready/off” button and hold it for 3s. The Comet will turn off. Note that if no button on the Comet is pressed for 15 minutes, the Comet will turn off automatically

2.2 Comet 1K Swivel Mount

The Comet 1K absorber can be swiveled +/- 90 degrees vis-a-vis the handle display for ease of use depending on whether the laser beam is coming from above, right or left and if the user is right or left handed. Swivel to the most convenient position. Do not force the handle past +/-90 degrees angle or it will be damaged.

2.3 Initial Setup and Choosing of Wavelengths

The Comet series have several calibration settings, see table 1 below for details of which setting to use for your laser. It also can be operated in automatic or manual mode as follows:

Automatic: the laser is set to a 10s time period and the Comet automatically senses the beam and gives the reading.

Manual: the laser is on constantly and the user places the Comet in front of the beam for 10s then removes it.

Please set up for measurement as follows:

1. Press the “on/ready/off” button. A beep will sound and the display will appear.
2. Press the “menu” button twice and the SETTINGS screen will appear. Press the left soft key to choose “MAN” for manual operation or “AUTO” for automatic operation. For accuracy, ease of use and safety it is recommended to use the AUTO mode. In this mode, the laser shutter is set for a 10 second exposure. Only use the MAN mode if you cannot accurately time the laser exposure.
3. Press the right soft key to choose the correct wavelength depending on the laser you are measuring according to table 1 below.

Comet Model	10K		10K-HD		1K		
	CO ₂	YAG	CO ₂	YAG	CO ₂	YAG	VIS
Wavelength range	10.6µm	800 - 3000nm	10.6µm	800 - 3000nm	10.6µm	800 - 3000nm	400 - 800nm

Table 1

4. Press the menu button twice and your new settings are ready for measurement. Note that when you turn off the Comet, your latest settings will be saved.

3 Measurement

3.1 AUTO Mode

1. Place the Comet 10K on a flat non-metal surface in a position that is centered beneath the laser beam. Note that the rear surface of the Comet is recessed so the Comet will only touch the surface at the edges and will not lose heat to the surface it is resting on. This helps the Comet to give highly accurate readings.
2. Place the Comet 1K so the head is in no direct contact with any other objects.
3. It is recommended that for an accurate measurement the Comet will not be subjected to direct strong airflow.
4. Press the “on/ready/off” button once to turn the Comet on. Press the button again, the display will say “READY” and will show the probe temperature.

Note: The Comet has a sophisticated algorithm to compensate for the probe temperature and give accurate readings even if the probe is hot at the beginning of the measurement. However, the probe is limited so that it will not measure if the probe temperature exceeds 70degC. If so, the probe will say “WAIT...” showing the probe temperature. Once the temperature drops beneath 70degC, the Comet will allow new measurements. If the probe temperature exceeds 140degC “WARNING TOO HOT” will appear on the screen and an alarm buzz will be heard. If that is the case, cool down the probe by placing it in water before measuring. Also, do not measure more than 5KW using Comet 10K or 500W using Comet 1K if the probe temperature is above 30degC.

5. Set the laser shutter timer to give an exposure of exactly 10 seconds. Make sure the laser beam is large enough that you do not exceed the maximum power density of the Comet and cause damage to the surface. It is best to use a beam as large as practical but not larger than ø45mm for Comet 10K and ø30mm for Comet 1K. Fire the laser.
6. When the Comet senses a rise in temperature it will say “MEASURE”. About 10s after the exposure a reading will appear on the display. After 30s for the Comet 10K and 25s for the Comet 1K, the final and most accurate reading will appear and a beep will sound. For centered beams, the initial reading will be within about 2% of the final reading so for many purposes you do not have to wait for the final reading.
7. If you want to make another measurement, Press the “on/ready/off” button again and you are ready for another measurement.

3.2 MANUAL Mode

Use this mode when you cannot give an accurately timed exposure from the laser.

1. Press the “on/ready/off” button once to turn the Comet on. A beep will sound and the display will appear.

Note: The Comet has a sophisticated algorithm to compensate for the probe temperature and give accurate readings even if the probe is hot at the beginning of the measurement. However, the probe is limited so that it will not measure if the probe temperature exceeds 70degC. If so, the probe will say “WAIT...” showing the probe temperature. Once the temperature drops beneath 70degC, the Comet will allow new measurements. If the probe temperature exceeds 140degC “WARNING TOO HOT” will appear on the screen and an alarm buzz will be heard. If that is the case, cool down the probe by placing it in water before measuring.

2. Turn on the laser. Press the “on/off/ready” button. A short beep will sound. The display will say “READY” and will show the probe temperature. After 5 seconds a longer beep will sound. As soon as the second beep sounds, place the center of the probe in front of the laser beam when the Comet senses a rise in temperature it will say “MEASURE”. After 10s another beep will sound. As soon as you hear the beep, remove the probe from the laser beam. Note that the measurement accuracy depends on if the probe is in front of the beam exactly 10 seconds. Assuming your reaction time to the first beep and second beep is the same, this will be so.
3. About 10s after the exposure a reading will appear on the display. After 25 – 30s, the final and most accurate reading will appear. For centered beams, the initial reading will be within about 2% of the final reading so for many purposes you do not have to wait for the final reading.
4. If you want to make another measurement, Press the “on/ready/off” button again and you are ready for another measurement. Do not measure more than 5KW using Comet 10K or 500W using Comet 1K if the probe temperature is above 30degC.

4 History

The Comet can show you your last 3 measurements. To view them, from the main measurement screen press the menu button once, the word HISTORY? with YES under it will appear, press the left soft key to choose YES. The last reading “<0” will appear. Press the left soft key to see the one before the last “<-1” and the one before that “<-2”. Press the menu button again to return to the main screen. Note that these values are lost when the Comet is turned off.

5 Calibration and Accuracy

The absorption of the probe surface varies somewhat from one probe to another as well as with wavelength. Therefore, each Comet is calibrated at several wavelengths.

5.1 Accuracy of Calibration

The Comet has been carefully designed to give readings that are linear with power, and to compensate for the initial temperature of the probe. The mass and material of the probe is known accurately and the absorption of the surface is measured. Since all of the above is known to high accuracy and has also been checked against NIST traceable standards, an absolute accuracy of ± 5% can be specified.

Note: The surface of the Comet can become somewhat mottled and discolored by repeated immersion in water and drying afterwards. This is normal and does not change the calibration by more than ~0.5%. If the surface is actually damaged by the laser beam then recalibration may be necessary. See below.

5.2 Calibration

In time and with use, the surface of the probe can be damaged or otherwise change and it may be necessary to recalibrate the Comet. If you know your laser power from another power meter you may change the Comet calibration as follows:

1. Make sure the Comet is set to the type of laser you are measuring. If not, set to the correct setting (see table1).
2. From the main screen, press the menu button three times. The screen will say CALIB?
3. Press YES.