How to choose the right thermal sensor to accurately measure your laser

Power and Energy measurements are the simplest way to gain an understanding of your laser and to control the laser process.
A full Power and Energy measurement system consists of a sensor that converts the laser power and energy in an electrical signal.

Thermal sensors use thermal methods of measuring power and energy where radiant energy is absorbed and converted into heat which generates a temperature rise in the absorbing active area of the sensor (the absorber). The absorbed energy is then measured from the temperature gradient between the hot area (where the laser strikes) and a cool area (where the generate heat is dissipated). This measurement can be done by means of thermocouples arrays (the thermopile) which convert the generated temperature gradient into a voltage using Seebeck effect shown in material junctions built with specific thermoelectric materials. The temperature difference will generate a voltage at the end of each single thermocouple and, if the array is duly distributed over the sensor's surface, the resulting total voltage will be proportional to the incident power or energy. Laser Point thermal sensors based on thermopiles technology perform this electrical conversion with the highest level of linearity and accuracy.
The generated electrical signal is then read using a specific Sensor Meter and the Power and Energy measured values are displayed on the sensor meter itself or on your PC using a PC interface.

- Choosing a Meter

Refer to LaserPoint Technical Note: "SELECTING METERS FOR YOUR LASER APPLICATION" available on LaserPoint Website.

- Choosing a Sensor

Finding the right sensor for the measurement implies a good level of knowledge of your Laser. Every Sensor has its own set of specifications that must fit the laser specifications in order to obtain an accurate measurement and to allow the sensor to survive the potentially destructive laser action.

- EXPLORER: Laser Point Sensor and meter finder.

Laser Point provides an "easy to use" software tool, EXPLORER, to automatically select the right sensor starting from the main Laser technical characteristics. EXPLORER is friendly to use software: you just have to enter the requested laser parameters and our software will select all the sensors available in our product portfolio to safely and accurately measure your laser.
EXPLORER software is available at Laser Point website: https://lpexplorer.laserpoint.it/
Each selected available sensor is provided with "% of Damage Threshold for a gaussian laser beam".
Alternatively, you can directly contact LaserPoint and we are always glad to help you in selecting the right sensor and meter for your laser application. Contact us!

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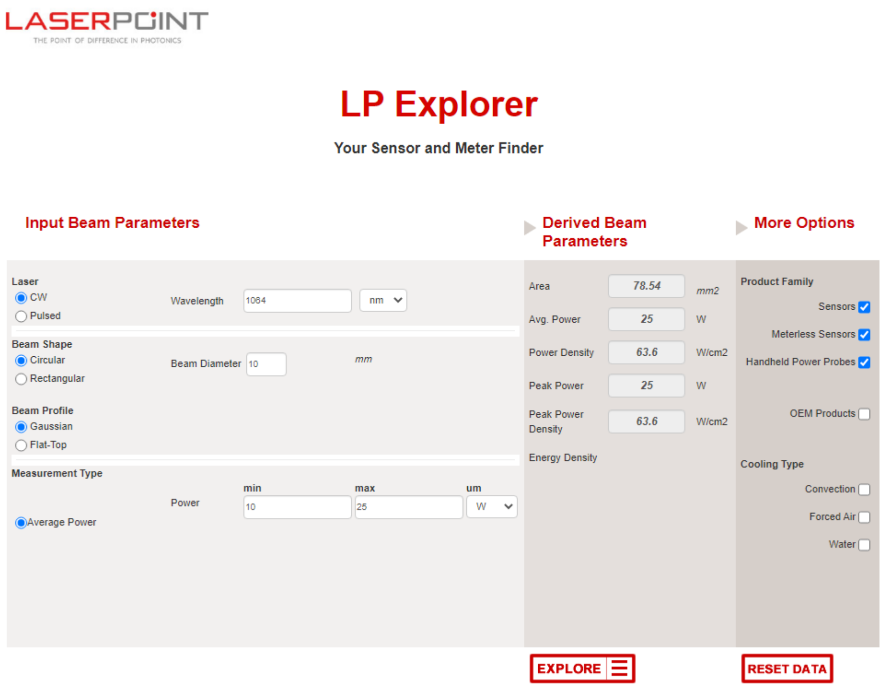
THE POINT OF DIFFERENCE IN PHOTONICS

EXPLORER mask to insert the parameters of your laser



EXPLORER list of Sensor codes and compatible Meters for your laser application.

Sensor Code	Short Description/note	% of Damage Threshold for a Gaussian beam	Compatible Meter PC-Link	Compatible Meter USB/RS Meterless	Compatible Meter PLUS 2.0
A-30-D25-HPB		<1 %	✓	✓	✓
A-40-D25-HPB		<1 %	✓	✓	✓
A-40-D40-HPB		<1 %	✓	✓	✓
A-40/200-D25-HPB	Up to 200W for max. 2 minutes	<1 %	✓	✓	✓
A-40/200-D40-HPB	Up to 200W for max. 2 minutes	<1 %	✓	✓	✓

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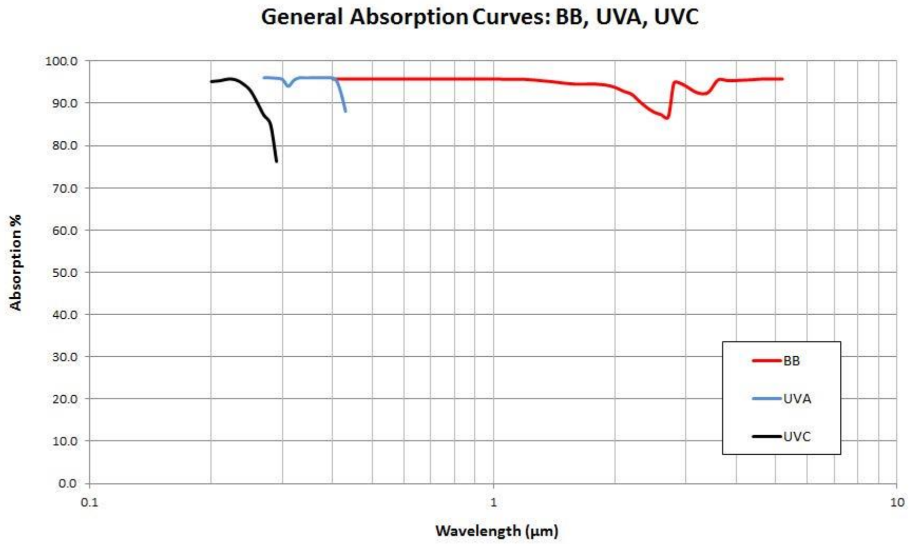
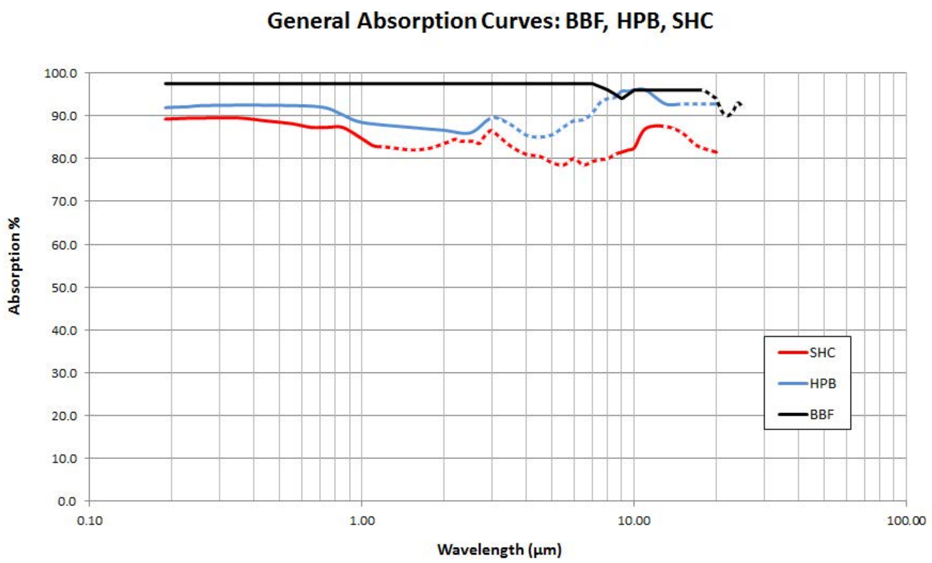
- Which Laser Parameters have to be considered to select the right thermal sensor?

The following 4 main technical points have to be considered to search the right sensor for your Laser application.

1) Laser Wavelength spectral range:

LaserPoint coatings (BBF, HPB, SHC; BB; UVA; UVC) used as laser beam absorber of thermal sensors have been specifically designed to strongly absorb the laser radiation in a broadband part of the wavelength spectrum (typically from 200nm up to 10m).
This is the big advantage of thermal sensor respect to photodiodes which have limited working wavelength spectrum, strongly dependent absorption response with wavelength and temperature.
Select the Absorber spectral range where the coating of the sensor is able to efficiently absorb the laser radiation:





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Check on LaserPoint website, the “Calibration Spectral Range”, which is the wavelength range where sensor can be calibrated and which the certificate of calibration is emitted for. It may be limited respect to the absorber spectral range.

2) Laser Power and Energy

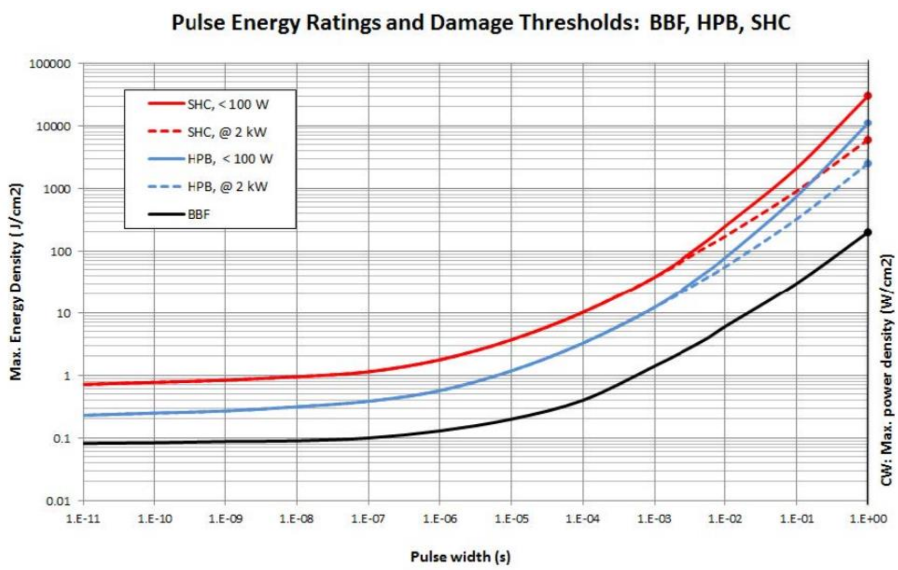
Select the Maximum allowed measured Power which depends on the ability of each sensor to dissipate heat using its convection, forced air or water-cooling system.
Check the Minimum detectable Power and Energy (determined by the sensitivity of the sensor) and the Power and Energy Resolution (minimum displayed power variation) according with your laser application.
Blink series can measure Pulse Energy of a continuously pulsed laser; all other thermal sensors are suitable only for Single Shot Pulse Energy measurement.

3) Useful Aperture

If the Laser beam diameter is too big a percentage of its power will be lost because it doesn't fit into the useful aperture of the sensor.
Choose the sensor considering that the Laser beam area should be contained in the central 50% of the Useful Aperture of the sensor for best accuracy.

4) Damage Threshold

The damage threshold is the power density or energy density (W/cm2 or J/cm2) at which damage to the absorber could occur, meaning when a permanent variation of +-1% of the measured Power or Energy occurs; these specifications must not be exceeded in the brightest region of the beam. The Damage Threshold is strongly dependent from the laser Pulse width. Choose the right coating according to the following figures showing Damage Threshold under different laser pulses conditions up to CW.



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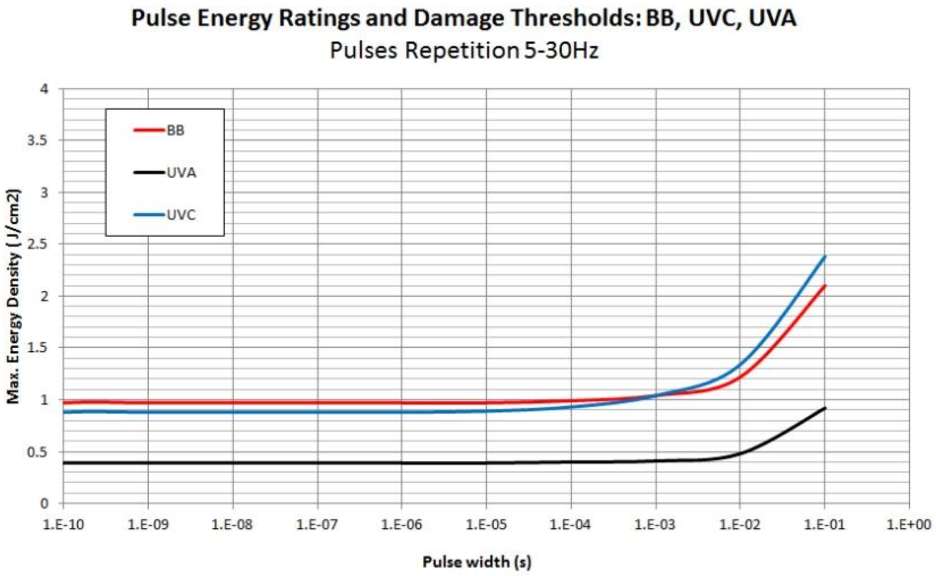
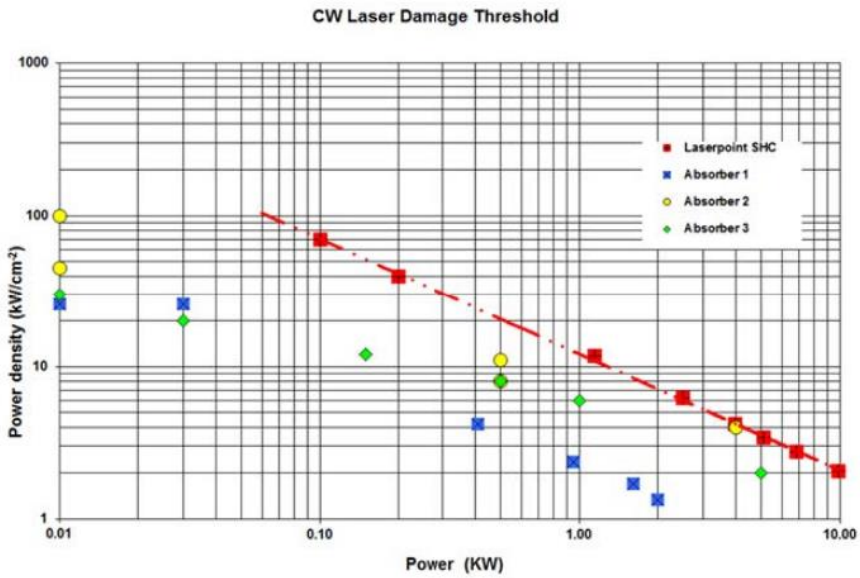


LaserPoint coatings (BBF, HPB, SHC; BB; UVA; UVC) have different maximum power density for damage threshold.
Select the Sensor coating (BBF, HPB, SHC; BB; UVA; UVC) according to the maximum power density of your Laser.
Super Hard Coating (SHC) has been specifically designed for very high level of Laser power density typically reached by high brightness Laser.



SHC coating Damage Threshold compared against similar competitor sensors

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