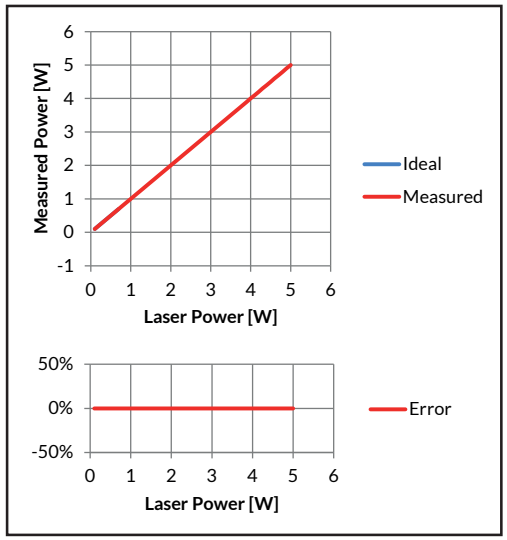
Thermal Management for Thermopile Laser Power Sensors

In order to achieve optimal measurement results with thermopile detectors, the influence of the thermal environment has to be considered. In the following, we describe the common error sources and suggest possible solutions to avoid their interference with the laser power measurement.

Ideal Sensor

Sensor output corresponds to the laser output power.

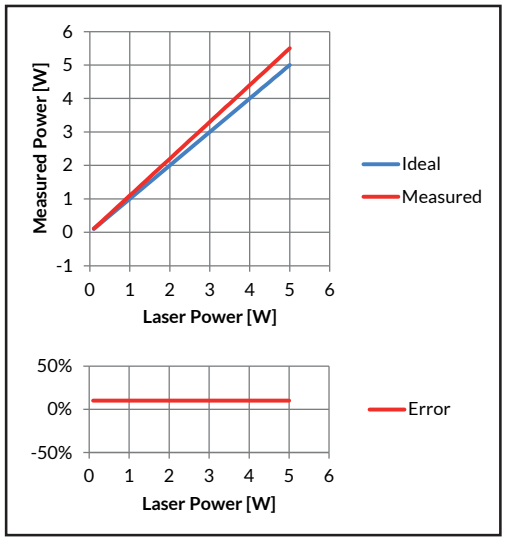


Temperature error

Cause
The sensor sensitivity is only valid for the temperature at which the calibration was done. The sensitivity changes linearly with the sensor temperature.
The magnitude of this error does not depend on the measured laser power.

Correction
The temperature error can be corrected by multiplying the measurement value by a temperature dependent correction factor.

greenTEG Solution
The digital sensor heads have a built-in temperature sensor and microprocessor that automatically applies a temperature correction. The output signal is a fully compensated digital signal.

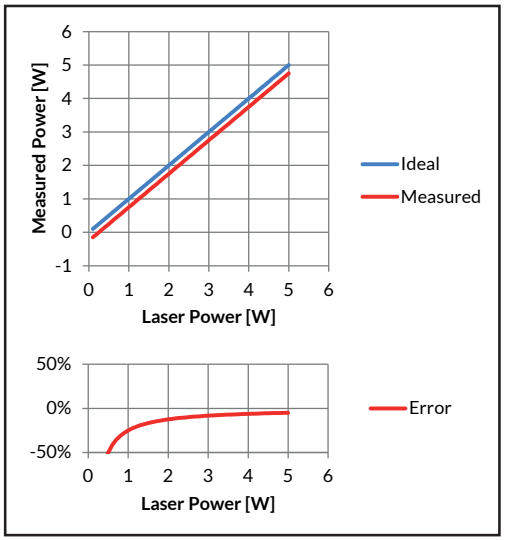


Background error

Cause
Background errors occur if the sensor temperature differs from the surrounding air temperature. This type of error is important especially when measuring low laser powers.

Correction
The background error can be minimized by keeping the sensor at the same temperature as the air and avoiding any air flows. It can also be corrected by subtracting the background signal recorded at zero laser power, or by using a second sensor that only records the background signal.

greenTEG Solution
greenTEG's double sensors (e.g. B05-MC) reduce background errors by up to two orders of magnitude by direct background substracion using a dark sensor



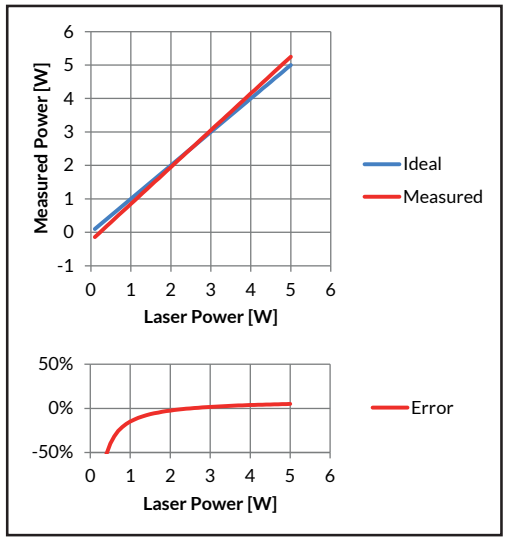
Real life measurement

In most real life measurement setups one will encounter both effects simultaneously. The dominant error depends on your setup, laser power and sensor type. As a rule of thumb one can say the following:

- Background errors are negligible (<1%) for laser powers above 10W.

- The temperature error affects measurements at all laser powers, but is more likely to be important at laser powers above 10W, where bigger temperature deviations might be expected.

greenTEG Solution
Contact us and tell us the details of your setup. We will be happy to help you select the best sensor with the most suitable correction for your application.



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