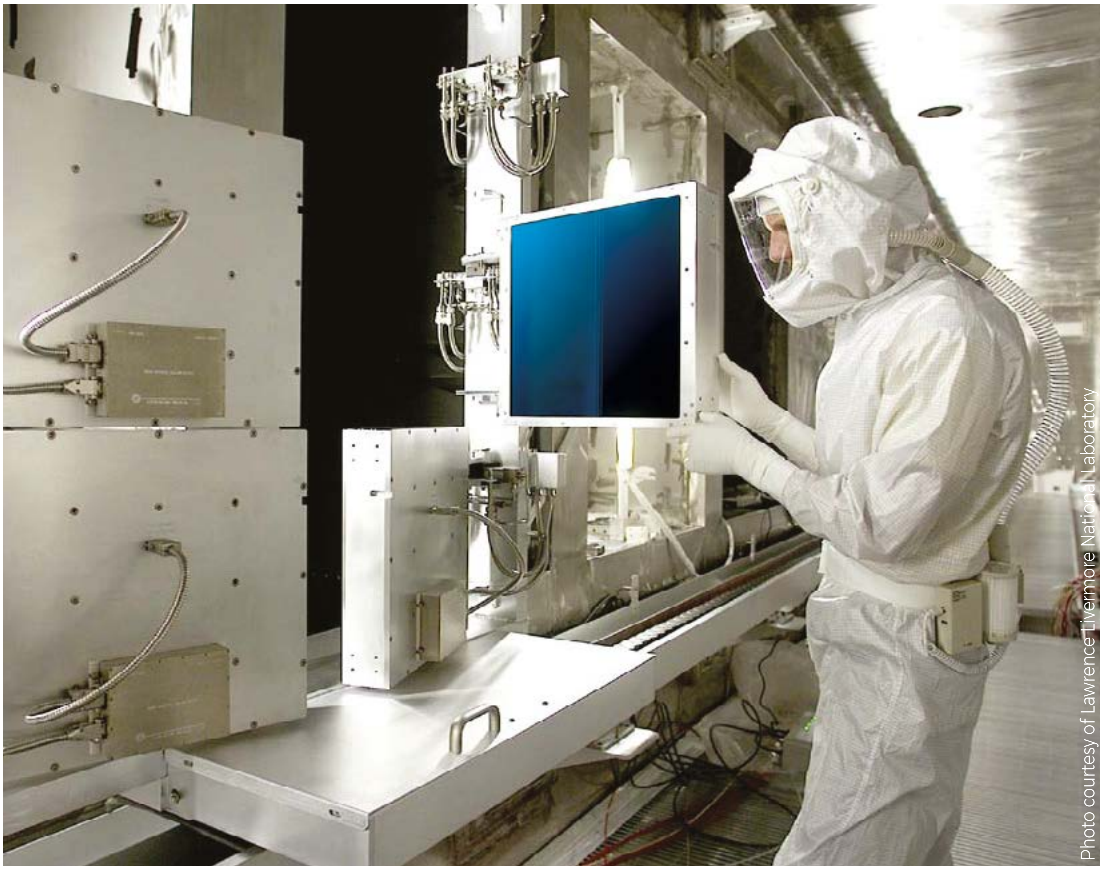
Measurement Devices

CALORIMETERS

Measuring the highest energy laser beams



A Gentec-EO calorimeter is the only reliable solution available for the largest and highest energy laser beams. Through cooperation with several leading research facilities around the world, Gentec-EO has become the expert in manufacturing, calibrating and servicing calorimeters for use in high energy inertial confinement fusion calorimetric measurement.

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STATE-OF -THE-ART

We work with a wide range of materials from surface coatings to the most robust volume absorbers to provide the best solution for your specific application.

- OUTSTANDING SIGNAL-TO-NOISE RATIO
- HIGH SENSITIVITY
- VACUUM COMPATIBILITY
- ATTENTION TO DETAILS AND WORKMANSHIP

With over 50 years of experience in thermal-based energy measurement, Gentec-EO is the ideal choice for all your high energy measurement needs.

ACCURATE

Using NIST traceable sources and proven calibration techniques, your Gentec-EO calorimeter is always the most accurate large aperture measurement device on the market.

With calibration uncertainties of ± 3%, and repeatabilities better than ± 2% even for very large beams, Gentec-EO offers the very best solution for extreme energy measurements.

CUSTOMIZED

We have designed calorimeters for 16 kJ beams with apertures as large as 420 x 427 mm, and able to withstand pulse energy densities of more than 15 J/cm².

We have also provided smaller, highly-sensitive calorimeters for beam energies as low as 50 mJ for the most delicate applications.

Our calorimeters range from 190 nm to 20 microns. Moreover, we are happy to push these limits even further. We work with a wide range of materials from surface coatings to the most robust volume absorbers to provide the best solution for your specific application.

05/22 / V10 / SG-IF / gentec/calorimeters

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CALORIMETERS
Applications

LASER FUSION EXPERIMENTS

Inertial confinement fusion (ICF) is a process where nuclear fusion reactions are initiated by heating and compressing a fuel target, typically in the form of a pellet that most often contains a mixture of deuterium and tritium. To compress and heat the fuel, energy is delivered to the outer layer of the target using high-energy beams of laser light. ICF is said to reproduce the energy generation process taking place in the core of the sun.

Several laser fusion projects are underway around the world right now, their main goal is to produce a clean, reliable and nearly unlimited source of energy. All these laser fusion experiments use very high energy lasers of sereval kJ per pulse for which a Gentec-EO calorimeter is the ONLY reliable measuring device available on the market. Over the years, we have been presented with increasingly large and energetic laser pulses to be measured and we have kept pace with the world's most demanding lasers.

LASER FUSION MECHANISM

Schematic of the stages of inertial confinement fusion using lasers. The blue arrows represent radiation; orange is blowoff; purple is inwardly transported thermal energy.

1.	2.	3.	4.
Laser beams or laser-produced X-rays rapidly heat the surface of the fusion target, forming a surrounding plasma envelope.	Fuel is compressed by the rocket-like blowoff of the hot surface material.	During the final part of the capsule implosion, the fuel core reaches 20 times the density of lead and ignites at 100 000 000 ˚C.	Thermonuclear burn spreads rapidly through the compressed fuel, yielding many times the input energy.

EXTREME PEAK POWER APPLICATIONS

Ultrashort pulsed lasers are developping at a very fast pace. Some lasers now feature peak powers in the petawatts (10^{15} W). Furthermore, the beam sizes can be fairly small, which results in peak power densities too high for a standard detector. Typically, pulse values for these lasers are in the range:

Beam sizes: up to 160 mm Ø

Energy range: 1 J to 100 J

Pulse widths: femtosecond & picosecond

Wavelengths: UV to NIR

For these, a Gentec-EO calorimeter is the only reliable solution. Furthermore, it can sometimes be used in power mode.

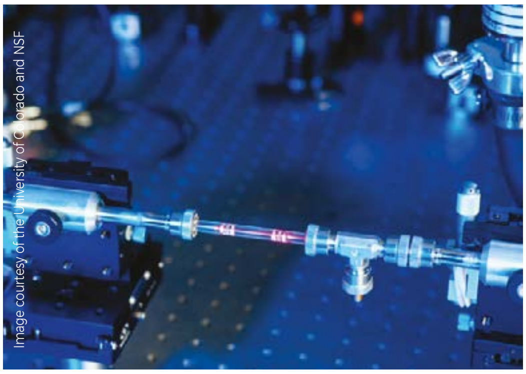

Image courtesy of the University of Colorado and NSF

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LASER COMPONENTS®

CALORIMETERS
Technical aspects

EXAMPLES OF CUSTOM CALORIMETERS

	SPECTRAL RANGE	MINIMUM ENERGY	MAXIMUM ENERGY *
RECTANGULAR APERTURES			
420 x 427 mm	1053 nm	500 J	16 000 J
420 x 427 mm	351/532/1053 nm	200 J	5000 J
110 x 110 mm	351/532/1053 nm	1 J	50 J
400 x 400 mm	351/532/1053 nm	200 J	5000 J
230 x 230 mm	532/1064 nm	100 J	1500 J
ROUND APERTURES			
310 mm Ø	351 nm	20 J	500 J
310 mm Ø	0.35 - 1.1 µm	200 J	1500 J
150 mm Ø	0.3 - 1.1 µm	1 J	500 J
50 mm Ø	0.19 - 10 µm	15 mJ	200 J
19 mm Ø	0.19 - 25 µm	1 mJ	2.3 J

* *Maximum measurable energy depends on pulse width and wavelength.*

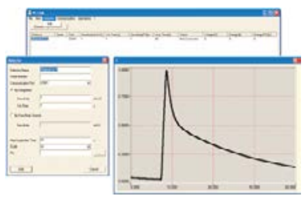
MONITORING

PC INTERFACE

Single-channel power & energy PC interface (USB or RS-232)

The P-LINK is the perfect PC interface to be integrated into your system and used remotely. You have the choice between USB or RS-232 connection. The P-LINK comes with a complete acquisition software (PC-CALO).

ACQUISITION SOFTWARE



Can handle several calorimeters saves data to the PC graphic display

The PC-Calo is a user-friendly PC interface that reads and controls several channels simultaneously. It reads the voltage outputs of the PC interface, saves the data in a spreadsheet, displays the data graphically and analyzes the measured energy. The parameters are entered seperately and the data can be treated individually or simultaneously.

REMOTE SYSTEM DIAGNOSTICS

Validation of the calibration Verification of the signal response

Do the on-site monitoring of your calorimeter using our special diagnostic tool. The verification is done remotely so you can control it from another location. The diagnostic includes the verification of the calorimeter's calibration and of the signal response and data acquisition.

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