



# LASER BEAM MEASUREMENT & BEAM PROFILING

**PRODUCT GUIDE 2024** 

POWER ENERGY PROFILING TERAHERTZ

# NEW RELEASES



# **PRONTO-250-FLEX**

The popular PRONTO-250 is now available with FLEXible calibration options, so you only pay for the features you need.

- > THE BASIC MODEL INCLUDES A BROADBAND CALIBRATION:
  - Default calibration "Y": for visible to NIR wavelengths (248 nm to 2.5  $\mu\text{m})$
- > OPTIONAL CALIBRATIONS YOU CAN ADD:
  - Additional calibration "C": for CO<sub>2</sub> lasers (10.6 μm)
  - Additional calibration "E": for energy measurements with  $\pm$  5 % accuracy
- PORTABLE & EASY TO USE

# **QE195: THE LARGEST ENERGY DETECTORS**

Custom-built to your specifications, contact us with your laser measurement needs

- > TWO SIZES AVAILABLE, FOR EXTRA-LARGE BEAMS:
  - 145 mm Ø
  - 195 mm Ø

> MEASURE HIGH ENERGY: UP TO 700 J PER PULSE, DEPENDING ON PULSE DURATION

THE LARGEST PYROELECTRIC DETECTORS ON THE MARKET

# **IS50: ENERGY METER FOR HIGH AVERAGE POWER**

Custom-built to your specifications, contact us with your laser measurement needs

- > DESIGNED FOR HIGH ENERGY MEASUREMENTS AT HIGH REPETITION RATES
- CAN HANDLE UP TO 1000 W AVERAGE POWER
- > OUR PROPRIETARY COATING OFFERS DAMAGE THRESHOLDS THAT ARE ORDERS OF MAGNITUDE
  - HIGHER THAN ANY OTHER "WHITE" COATING ON THE MARKET.
- PULSE-TO-PULSE ENERGY AT UP TO 1 KW AVERAGE POWER

# HP100A-50KW: SMALL BEAM, EXTREMELY HIGH POWER

With its gold reflector cone and back-reflection reducing geometry, the HP100A-50KW-GD traps > 97 % of the incident light and can handle up to 50 kW of continuous laser power. The very low back-reflections of the detector ensure a safer working environment with high-power lasers. This detector can also handle the high intensities of small beams.

HIGH POWER, LOW BACK-REFLECTIONS





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# **ABOUT GENTEC-EO** Partners for accuracy



Located in the heart of the Quebec Optical Hub, in beautiful Quebec City, Canada, Gentec Electro-Optics (Gentec-EO) has a long history in the laser measurement field. With a track record of over 50 years of innovation and providing quality solutions for laser power and energy measurement applications from the factory to the hospital and laboratory, Gentec-EO stands ready to serve you now and in the future.



# **MILESTONES**

The first laser energy meter in the world has been initially developed for internal use as Gentec Inc. were putting the first high repetition rate TEA CO<sub>2</sub> lasers on the market in 1970. Gentec, Inc. introduced the first pyroelectric joulemeters shortly after that. They were also the first to manufacture both thermopile wattmeters and pyroelectric joulemeters. In the mid 1990's, Gentec introduced the WB series with an average power density damage threshold of 100 kW/cm<sup>2</sup> that is still unrivalled today. In 2000, Gentec Electro-Optics, Inc. was formed from Gentec, Inc. so that the focus was entirely on laser measurement. And in 2010, the acquisition of Spectrum Detector Inc. allowed Gentec-EO to cover new markets, like THz detectors, ultrafast pyroelectric detectors and highly sensitive photodetectors, to name a few.

# **OUR ESSENCE**

**Gentec-E** PARTNERS for ACCURACY The decision of adopting "PARTNERS for ACCURACY" as our branding slogan is the result of a long evolution that spanned over more than 50 years. It came to us naturally since it represents our very essence. We have always aspired to be more than a simple supplier of state-of-the-art laser measurement technologies. We truly believe that developing a very close partnership with our customers is essential and beneficial for every party. By definition, " partnership " means " aiming at the same goal " and " working together". This is what is driving us. As for " accuracy", it does not solely refer to the precise measurements we are able to provide, but also to the complete understanding of our customers' needs and expectations. Finally, the key to our success is to focus all our energy into " rigor ". No matter what the situation, Gentec-EO is always proud to offer its customers the most accurate laser measurements as well as the most personalized help for the development of custom products and solutions.

Let us be your **PARTNERS for ACCURACY**.



# WORLDWIDE PRESENCE

Gentec-EO has an evergrowing presence everywhere around the world. We currently have partners in over 40 countries, and each year, we keep adding new partners. We also have a strong presence in most of the European and Asian countries and we now have offices in USA and in Japan. When you send a unit to us for repair or recalibration, you are entitled to expect your unit back in as short a time as possible.

With calibration centers on 3 continents, and offices in Canada, USA and Japan, Gentec-EO has a solid presence and fast turnaround times, just what you need to keep pace with today's rapid market.

# HIGHEST CALIBRATION STANDARDS



At Gentec-EO, we understand that the essence of our business since over 50 years has been delivering accuracy. There are no half measures : it either measures accurately or it doesn't. This is why one of our company's values is rigor, because our customers expect nothing less.

# THE GENTEC-EO ADVANTAGE



We use only **GOLD Calibration Standards**, guaranteeing our customers the lowest calibration uncertainty possible

For each detector that we calibrate, 50 Parameters are collected and logged in our ISO-certified quality system



The calibration reference is checked 2 to 3 Times during EACH calibration process Our uncertainty values are based on Proven Statistical Calculation Processes

Our Personnal Wavelength CorrectionTM (PWC) data offers you NIST and/or NRC Traceability over the entire range of the detector

Each of these steps contributes to the **TOTAL ACCURACY** of your detector







# THE TERMS

#### ACCURACY UNCERTAINTY ERROR The error on a measurement The accuracy of a measurement Uncertainty is a measure of the is defined as the closeness of the "goodness" of a result. The definition is the difference between the agreement between the result of a and concept of uncertainty is a measurement result and the true measurement and the true value. quantitative attribute to the final value. result of measurement, considering all systematic and random components of all known input quantities. REPRODUCIBILITY REPEATABILITY PRECISION The repeatability is the closeness The reproducibility is the The precision of a measurement of the agreement between the closeness of the agreement is defined as the closeness of results of successive measurements between the results of successive agreement between independent under the same conditions of measurements under changed test results obtained under stipulated conditions of measurements. This conditions. measurements.

is also defined as "precision under reproducibility conditions".

HIGHEST CALIBRATION STANDARDS Measuring with Gentec-EO accuracy

# THE CALIBRATION PROCESS



# THE TECHNIQUE

By definition, calibration is a comparison between measurements, one of a known magnitude or correctness, which is typically called a "gold standard", and another measurement comparable to the first one. In the calibration process, there are four critical aspects that need to be controlled precisely:





# HIGHEST CALIBRATION STANDARDS

ELECTRICAL INSTRUMENTS

All of our electrical instruments are calibrated by certified calibration suppliers. They certify that, at the time of calibration, the instruments used for calibration meet or exceed all published specifications and have been calibrated using standards whose calibrations are traceable to the NIST and/or other recognized international standards. The electrical and physical properties of their laboratories meet the highest requirements for ambient temperature, relative humidity and cleanliness. Their equipment is maintained by procedures that meet the requirements of ISO 9001:2015 and ISO/IEC 17025:2017.

# THE FACTS

# HOW GENTEC-EO CALIBRATES YOUR DETECTOR

Every detector is individually calibrated to the best possible accuracy traceable to NIST standards. Stable laser sources at various wavelengths are used in our calibration process.

# UNCERTAINTY

One very common misconception is the absolute value of calibration uncertainty. Be aware that this value is made using a complex statistical method that takes in account ALL the sources of uncertainty that are present in the process. The figure below shows these steps and their respective contribution to the value of uncertainty. As you can see, the manufacturer itself is only one of these sources.



# CALIBRATION WAVELENGTHS

Another misconception is that any wavelength can be NIST calibrated. The NIST only supplies references for distinct wavelengths contained between 157 nm ( $F_2$  excimer lasers) and 10.6  $\mu$ m (CO<sub>2</sub> lasers). Every other wavelength within this range or out of this range is subject to an additional error.

For more information about NIST's calibration wavelengths, please visit their website at: <u>https://www.nist.gov/calibrations</u>

# PERSONAL WAVELENGTH CORRECTION™ CERTIFICATE

To fill the gaps between the NIST references, Gentec-EO offers you the only NIST traceable calibration in nm steps, from 250 nm to 2.5 µm. We achieve this using our proprietary setup that is based on a NIST traceable spectrophotometer. This way, instead of supplying you with typical values, we offer you a NIST traceable calibration. What you get is an overall accuracy that is not more than ±1% away from the original calibration accuracy, in the calibrated spectral range.

Each Gentec-EO detector comes with a Personal wavelength correction™ Certificate. The correction factors are based on measurements that were made with YOUR detector. They are not based on the general curve of the absorbing material or the general response of equivalent products. This means you get the best wavelength correction tool available on the market. This data is stored in the smart interface of your Gentec-EO detector, you just have to select the wavelength in your display device or PC interface to get the most precise laser measurements on the market.



For more info, see Application Note 202184 - Understanding your Calibration Certificate.

# POWER DETECTORS

Available with

# Integra PH: PHOTODETECTORS

- Photodetectors for measurements up to 750 mW
- Available from UV to IR
- Silicon, UV-silicon and germanium sensors
- OD.3/OD1/OD2 attenuators available
- FAST RESPONSE POWER DETECTORS

# **PRONTO-SI: ALL-IN-ONE PHOTODETECTOR + METER**

- Compact laser power meter up to 800 mW
- 10 x 10 mm aperture
- Integrated ODI slide-in attenuator
- Color touchscreen display
- PORTABLE & EASY TO USE



# **UM: BROADBAND PYROELECTRIC DETECTORS**

Our pyroelectric power detectors have the noise level of a photodetector, but with the large bandwidth of a pyroelectric sensor. They have everything you need to accurately measure extremely low powers from the DUV to the FIR.

- 9 mm Ø aperture
- Broadband, flat spectral response
- Very low noise, down to 5 nW
- MEASURE LOW POWER AT ANY WAVELENGTH



# XLP12: LOW-POWER THERMOPILES

- Low noise level: only ±0.5 μW
- IR filter available
- Available with volume absorber for short pulses
- THERMAL POWER DETECTORS WITH LOW NOISE

# **COMPARISON TABLE - LOW POWER MEASUREMENT**

Available with

integra



gentec-eo.com/laser-power-meter

# **POWER DETECTORS** General use power detectors

Available with integra



# **UP-H: BROADBAND THERMAL DETECTORS**

Our standard absorber offers high damage thresholds and a flat spectral response, making this series of power detectors a versatile solution that can cover most of your laser power measurement needs.

• Available in 6 sizes:

10 mm Ø	12 mm Ø
17 mm Ø	19 mm Ø
25 mm Ø	55 mm Ø

- Available with 5 cooling modules:
  - Convection (S) Small heatsink (H) Large heatsink (L) Fan (F) Water (W)

■ THE WIDEST RANGE OF LASER MEASUREMENTS



# **PRONTO-250-FLEX**

- Compact laser power meter up to 250 W
- Three measurement modes :
  - Single-Shot Power (SSP): up to 250 W Continuous Power (CWP): up to 8 W Single Shot Energy (SSE): up to 25 J
- The FLEXibility to pick only the calibrations you need:
  - Default calibration "Y": for visible to NIR wavelengths (248 nm to 2.5  $\mu$ m) Additional calibration "C": for CO<sub>2</sub> lasers (10.6  $\mu$ m) Additional calibration "E": for energy measurements with ± 5 % accuracy
- PORTABLE & EASY TO USE

# **COMPARISON TABLE - GENERAL USE POWER DETECTORS**



# POWER DETECTORS

High performance power detectors

# Available with integra

# UP-W



Our "W" absorber can handle tightly focused beams thanks to its extremely high damage threshold for average power density. It can be used to measure up to 50 W, from the UV to IR.

- Available in 2 sizes: 19 mm or 50 mm Ø aperture
- High damage threshold absorber (100 kW/cm<sup>2</sup>)
- Our highest maximum average power density
- IDEAL FOR UV LASERS & TIGHTLY FOCUSED BEAMS



# UP-QED

The UP-QED series are power detectors for lasers with extreme power and energy density, such as laser micromachining systems. Thanks to a proprietary absorber that diffuses the measured beam and absorbs it in a larger volume, these detectors have the highest damage thresholds on the market.

- Available in 2 sizes: 16 mm or 52 mm Ø aperture
- Our highest maximum average power density
- Our highest maximum energy density
- Not suitable for UV lasers
- THE HIGHEST DAMAGE THRESHOLDS ON THE MARKET!



# **IS: INTEGRATING SPHERE POWER METER**

Get the best of both worlds with our new integrating sphere power meters. This technology offers the fast risetime of photodetectors with the high average power of thermal detectors.

- Fast risetime: 0-95 % in less than 0.2 seconds
- Measures up to 1000 W of continuous power
- Available in 2 sizes: 12 mm or 50 mm Ø aperture
- Integrated signal processing with USB or RS-232 output
- FAST AND ROBUST POWER MEASUREMENT

# **COMPARISON TABLE - HIGH PERFORMANCE POWER DETECTORS**



# POWER DETECTORS High power measurement

Available with



# HP60: HIGH POWER, LOW BACK-REFLECTIONS

The gold reflector cone of the HP60 series is specifically designed to handle the high intensities of very small beams. By reflecting the incident light on the sides of the aperture, the cone effectively spreads the intensity on a larger area, thus raising the damage threshold to 10 kW/cm<sup>2</sup> at the full power (15 kW).

FOR SMALL BEAMS UP TO 15 KW

Available with



# HP100/125: LARGE APERTURE, COMPACT DEVICE

The HP100A and HP125A are the smallest in our HP series of high-power detectors. They are versatile high-power detectors that measure up to 15 kW of continuous power with a noise level of only a few watts. These models feature a very large aperture of 100 or 125 mm Ø.

CONTINUOUS POWER MEASUREMENT UP TO 15 KW



# SUPER HP: CUSTOM, HIGH-POWER MEASUREMENT

Our unique high-power design allows for infinite customization capabilities. Do not hesitate to contact us with your specific needs. Our Super HP models feature a USB output for direct measurements on a PC as well as our standard DB15 connector. Wireless output is also available.

CUSTOM SOLUTIONS FOR UP TO 150 KW

# **PRONTO: PORTABLE HIGH-POWER PROBES**

When you are on the go and water cooling is not easily accessible, the PRONTO high-power probes are the best solution. These all-in-one power meters with touchscreen controls come in 4 models: 500 W, 3 kW, 6 kW and 10 kW. Their integrated display is encased in a rugged metallic casing to withstand the harshest of environments.

UP TO 10 KW WITHOUT WATER COOLING

# **COMPARISON TABLE - HIGH POWER MEASUREMENT**



# 10 pW to 750 mW, Si and Ge sensors



## **KEY FEATURES**

LARGE APERTURES 10 mm Ø for the silicon sensors

#### > 3 VERSIONS

- Silicon: 350 1080 nm, up to 750 mW
- Silicon-UV: 210 1080 nm, up to 38 mW
- Germanium: 800 1650 nm, up to 500 mW

#### CHOICE OF ATTENUATORS

- OD0.3: 50 % transmission (for PH100-SIUV only)
- OD1: 10 % transmission
- OD2:1% transmission

#### HIGH ACCURACY

The PH100-SI-HA presents the lowest calibration uncertainty to date

> PRECISE CALIBRATION

Wavelength selection in 1 nm steps

## **OD ATTENUATORS**

OD attenuators sold in option. When bought together, the detector is calibrated with and without the attenuator.



PH series detector with OD attenuator

## **OUTPUT OPTIONS**

SMART DB15 CONNECTOR Contains all the calibration data

 integra ALL-IN-ONE-METER Connects directly to a PC Two models available:

 USB output (-INT)

RS-232 output (-IDR)

# **COMPATIBLE DISPLAYS & PC INTERFACES**







TUNER

MIRO ALTITUDE

MAESTRO

1

UNO

U-LINK and P-LINK

M-LINK

# ACCESSORIES



Stand with delrin post









Fiber adaptors & connectors (FC, SC, ST and SMA)



OD attenuators

Pelican carrying case

Isolation tube





	PH100-SI-HA-D0	PH100-SIUV-D0	PH20-GE-D0
MAX AVERAGE POWER* (ALONE / WITH MAX ATTENUATION)	36 mW / 750 mW	4 mW / 38 mW	30 mW / 500 mW
EFFECTIVE APERTURE	10 mm Ø	10 mm Ø	5 mm Ø
MEASUREMENT CAPABILITY			
Calibrated spectral range	350 - 1080 nm	210 - 1080 nm	800 - 1650 nm
With OD0.3		210 - 1080 nm	
With OD1	400 - 1080 nm	400 - 1080 nm	900 - 1650 nm
With OD2	630 - 1080 nm		950 - 1650 nm
Maximum measurable power*	36 mW at 1064 nm	4 mW at 532 nm	30 mW at 1064 nm
With OD0.3		16 mW at 300 nm	
With OD1	300 mW at 1064 nm	38 mW at 532 nm	300 mW at 1064 nm
With OD2	750 mW at 1064 nm		500 mW at 1064 nm
Noise equivalent power <sup>a</sup>	10 pW at 980 nm	10 pW at 850 nm	60 pW at 1550 nm
Rise time (nominal)	0.2 s	0.2 s	0.2 s
Calibration uncertainty	± 5.0 % (350 - 399 nm)	± 18 % (210 - 229 nm)	± 5.0 % (800 - 1049 nm)
	± 2.0 % (400 - 449 nm)	± 8.0 % (230 - 254 nm)	± 3.5% (1050 - 1559 nm)
	± 1.5% (450 - 809 nm)	± 6.5% (255 - 399 nm)	± 7.0% (1560 - 1629 nm)
	± 2.0% (810 - 899 nm)	± 2.5% (400 - 899 nm)	± 10% (1630 - 1650 nm)
	± 4.0% (900 - 1009 nm)	± 4.0% (900 - 1009 nm)	
	± 7.5% (1010 - 1080 nm)	± 7.5% (1010 - 1080 nm)	
Calibration uncertainty (with OD filters)	± 5.0% (400 - 419 nm)	Same as without attenuator	± 5.0% (900 - 1559 nm)
	± 4.0% (420 - 899 nm)		± 7.0% (1560 - 1629 nm)
	± 5.0% (900 - 1009 nm)		± 10% (1630 - 1650 nm)
	± 7.5% (1010 - 1080 nm)		
Minimum repetition rate	155 kHz	155 kHz	155 kHz
DAMAGE THRESHOLDS			
Maximum average power density	100 W/cm <sup>2</sup>	100 W/cm <sup>2</sup>	100 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS			
Effective aperture	10 mm Ø	10 mm Ø	5 mm Ø
Distance to sensor face	13.7 mm	13.7 mm	10.5 mm
Sensor	Silicon	UV-Silicon	Germanium
Dimensions	38.1Ø x 27.4D mm	38.1Ø x 27.4D mm	38.1Ø x 27.4D mm
Weight (head only)	130 g	130 g	130 g
ORDERING INFORMATION			
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-233 or STAND-D-233-M	STAND-D-233 or STAND-D-233-M	STAND-D-233 or STAND-D-233-M
Product page			

\* See curves (p. 62-64) for maximum power at other wavelengths

a. Nominal value. Depends on environmental electromagnetic interference and wavelength.

# RONTO-SI 0.3 nW - 800 mW power probe with touchscreen controls



## **KEY FEATURES**

#### > POCKET-SIZE

This low power laser probe is so compact it fits in your pocket!

#### > SLIM PROFILE

The sensor part is only 6 mm thick, allowing it to fit into tight spaces

#### > EASY TO USE

The color LCD touchscreen allows for a friendly user interface. You can make a measurement with just the touch of a button!

#### > VERY LOW POWER MEASUREMENTS

Thanks to its very low noise level of only 10 pW, the PRONTO-Si measures powers as low as 0.3 nW

#### > SLIDE-IN ATTENUATOR

Just slide the ODI integrated filter to the ON position and you can measure up to 800 mW of continuous power at 532 nm (maximum power varies with wavelength)

#### > DATA LOGGING

Save your data to the internal memory and then transfer them to your PC over the USB connection

#### > **OPTIONAL FIBER OPTICS ADAPTOR**

The fiber optics adaptor is held securely in place with a set screw and is compatible with OD attenuators

#### > SERIAL COMMANDS

Serial commands are available to let you take full control of your PRONTO from your PC.

# **USER INTERFACE**



Displays the measured value with large digits so you can see them from a distance



1064 nm Att ON



# DATA TRANSFER TO PC



# **ACCESSORIES**





Fiber adaptors

Threaded adaptor for PRONTO-Si

**3 Displays for the measurements** 

Bargraph display 1064 nm 4tt 0 1.357<sup>mw</sup>

Adds a bargraph below the measured value, for an intuitive understanding of the trend of your laser

> Adjust the wavelength





In addition to the real

Min/Max display

1.357 mw 1 142 mW

Set the brightness and orientation







# **PRONTO-SI** Specifications



-			
Y	-		
		2	
			h

	PRONTO-SI	ER D
MAX AVERAGE POWER*		)ETE
(ATTENUATOR OFF / ATTENUATOR ON)	88 mW / 800 mW	сто
EFFECTIVE APERTURE	10 x 10 mm	RS
INTERFACE	Touchscreen color LCD display	
MEASUREMENT CAPABILITY		
Calibrated spectral range		므
Attenuator OFF	320 - 1100 nm	VERO
Attenuator ON	400 - 1100 nm	
Power range*		DETE
Attenuator OFF	0.3 nW - 88 mW at 532 nm	CTC
Attenuator ON	3 nW - 800 mW at 532 nm	PRS
Noise equivalent power	10 pW at 980 nm	
Response time	0.2 s	
Measurement accuracy	From $\pm$ 1.5% to $\pm$ 7.5% (wavelength-dependent )	
Display resolution	1pW	BEA
DAMAGE THRESHOLDS		 Í Í
Maximum average power density	100 W/cm <sup>2</sup>	ROF
Maximum average power	800 mW (with attenuator ON)	ILIN
USER INTERFACE		 0
Displays	Real-time, bar graph and min/max	
Measurement controls	Zero offset, wavelength selection and reset data	
Data acquisition and transfer	Yes	TEP
GENERAL SPECIFICATIONS		RAH
Display type	Touchscreen Color LCD	ERT
Display size	28.0 x 35.0 mm (128 x 160 pixels)	ZDE
Data storage	50 000 pts	TEC
Battery type	Rechargeable Li-ion	TOP
Battery life	17 hours (with brightness set at 25%)	S
Battery recharge via	USB port	_
PHYSICAL CHARACTERISTICS		DISP
Effective aperture	10 x 10 mm	LAY
Sensor	Silicon	% %
Attenuator	Integrated slide-in OD1 attenuator	PC
Mounting hole (for post)	1 x 8-32	NTE
Dimensions (Open)	41W x 216.2L x 15.8D mm (Sensor part is only 6.0D mm)	RFA
Dimensions (Closed)	41W x 136L x 22.1D mm	CES
Weight	150 g	
ORDERING INFORMATION		CUS
Compatible stand	STAND-S-233	TON
Product page		/ OEM PRODU

\* See curves (page 65) for maximum power at other wavelengths



#### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data Included in UM9B-BL-D0 model only
- > ANALOG OUTPUT When used with APM (D) analog power supply

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MAESTRO



U-LINK



APM (D) analog power supply (for UM9B-BL-L-D0)

#### **KEY FEATURES**

- VERY LOW NOISE LEVEL Noise levels of a photodetector, but with the large bandwidth of a pyroelectric:
  - Down to 5 nW when using the analog power module (APM)
- VERY HIGH RESPONSIVITY Up to 20 000 V/W when using the analog power module (APM)
- VERY LARGE BANDWIDTH From DUV to FIR thanks to pyroelectric technology
- INCLUDES AN ISOLATING TUBE TO BLOCK UNDESIRED NOISE FROM THE ENVIRONMENT.

## ACCESSORIES



Stand with delrin post



Fiber adaptors & connectors (FC, ST and SMA)



SDC-500 digital optical chopper



Pelican carrying case



Extra isolation tube









	UM9B-BL-L-DO	UM9B-BL-DO
MAX AVERAGE POWER	200 µW	20 mW (MAESTRO), 25 mW (U-LINK)
EFFECTIVE APERTURE	9 mm Ø	9 mm Ø
COMPATIBLE DISPLAYS & PC INTERFACES	APM (D)	MAESTRO and U-LINK
MEASUREMENT CAPABILITY		
Spectral range	0.1 - 20 μm	0.1 - 20 μm
Calibrated spectral range	633 nm <sup>b</sup>	0.248 - 2.1 μmª
Maximum measurable power	200 µW	20 mW (MAESTRO), 25 mW (U-LINK)
Noise equivalent power (RMS)	5 nW	300 nW
Rise time (0-100%)	≤ 0.2 s	≤ 0.2 s
Calibration uncertainty	± 4% at 1064 nm	± 4% at 1064 nm
Chopper frequency	5 ± 1 Hz	10 ± 1 Hz
DAMAGE THRESHOLDS		
Maximum average power density (1064 nm)	50 mW/cm <sup>2</sup>	50 mW/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	9 mm Ø	9 mm Ø
Sensor	Pyroelectric	Pyroelectric
Absorber	BL	BL
Dimensions	38.1Ø X 79D mm	38.1Ø X 79D mm
Weight	91 g	91 g
ORDERING INFORMATION		
Available output options	DB15 only	DB15 only
Compatible stand	STAND-D-233 or STAND-D-233-M	STAND-D-233 or STAND-D-233-M
Product page		

a. Calibrations at 2.1 to 2.5  $\mu m$  and 10.6  $\mu m$  are available on special request. b. Typical wavelength correction factors are provided for 0.19 to 2.1  $\mu m$ .



#### **OUTPUT OPTIONS**

SMART DB15 CONNECTOR Contains all the calibration data



RS-232 output (-IDR)

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO



TUNER



UNO



U-LINK and P-LINK



S-LINK and M-LINK

#### **KEY FEATURES**

- LOW POWER THERMOPILE Noise level of a photodetector with the large bandwidth and high power capacity of a thermal device
- MINIMAL THERMAL DRIFT Only 6 μW/°C (with the IR filter)
- HIGH SENSITIVITY
- SPECIAL MODEL FOR ULTRASHORT PULSES VP (volume absorber) version is perfect for low power lasers with ultrashort pulses (ps and fs)
- > IR FILTER (XLPF12 MODEL) Removes unwanted IR interference
- > ISOLATION TUBE Eliminates power fluctuations created by air turbulence

## ACCESSORIES



Stand with steel post



Fiber adaptors & connectors (FC, ST and SMA)



Extension cables (4, 15, 20 or 25 m)



Pelican carrying case



IR filter (Mounted)



Extra isolation tube





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	XLP12-3S-H2-D0	XLPF12-3S-H2-D0	XLP12-3S-VP-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	3 W / 3 W Broadband absorber	3 W / 3 W Broadband absorber, with IR filter	3 W / 3 W Volume absorber
EFFECTIVE APERTURE	12 mm Ø	12 mm Ø	12 mm Ø
COOLING METHOD	Convection	Convection	Convection
MEASUREMENT CAPABILITY			
Spectral range	0.19 - 20 µm	0.28 - 2.1 µm	0.248 - 20 μm
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 μm	0.308 - 2.1 µm	0.248 - 2.1 μm
Noise equivalent power <sup>b</sup>	0.5 μW	0.5 μW	0.5 µW
Thermal drift °	12 μW/°C	6 μW/°C	12 μW/°C
Rise time (nominal) <sup>d</sup>	2.5 s	2.5 s	3 s
Calibration uncertainty °	± 2.5%	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%	±0.5%
Energy mode			
Maximum measurable energy <sup>f</sup>	5 J	5 J	
Noise equivalent energy <sup>b</sup>	12 µJ	12 µJ	
Minimum repetition period	16 s	16 s	
Maximum pulse width	300 ms	300 ms	
Accuracy with energy calibration option	± 5%	± 5%	
DAMAGE THRESHOLDS			
Maximum average power density <sup>9</sup>	1 kW/cm <sup>2</sup>	1 kW/cm <sup>2</sup>	30 W/cm² at 1064 nm 8 W/cm² at 532 nm 4 W/cm² at 355 nm
Maximum energy density			
1064 nm, 360 µs, 5 Hz	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>	
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	4 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	3 J/cm <sup>2</sup>
355 nm, 7 ns, 10 Hz			1 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	
PHYSICAL CHARACTERISTICS			
Effective aperture	12 mm Ø	12 mm Ø	12 mm Ø
Absorber (high damage threshold)	H2	H2	VP (Volume absorber)
Dimensions	73H x 73W x 20D mm (72D mm with tube)	73H x 73W x 20D mm (80D mm with tube)	73H x 73W x 20D mm (72D mm with tube)
Weight (head only)	0.31 kg	0.32 kg	0.32 kg
ORDERING INFORMATION			
Available output options	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth
Compatible stand	STAND-S-233	STAND-S-233	STAND-S-233
Product page			

a. b.

Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request. Nominal value, actual value depends on electrical noise in the measurement system. With Gentec-EO MAESTRO.

c. d. With anticipation.

e. Including linearity with power.
 f. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
 g. At 1064 nm, 1 W CW.

Specifications are subject to change without notice T 418.651.8003 | info@gentec-eo.com

# 10-H $\square$ $10^{\circ}$ mm Ø, 0.1 mW - 2 W, fast & low power thermopile



#### **OUTPUT OPTIONS**

> **SMART DB15 CONNECTOR** Contains all the calibration data



• RS-232 output (-IDR)

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO



TUNER



UNO



U-LINK and P-LINK



S-LINK and M-LINK

## **KEY FEATURES**

- LOW POWER THERMOPILE Noise level of a photodetector with the large bandwidth and high power capacity of a thermal device
- > HIGH PERFORMANCE Fast rise time (1.4 s) High damage threshold (36 kW/cm<sup>2</sup>)
- > COMPACT DESIGN Only 13 mm thick (UP10P model)
- > ENERGY MODE Measure single shot energy up to 3 J

# ACCESSORIES



Stand with steel post



Isolation tube



Extension Cables (4, 15, 20 or 25 m)



Fiber adaptors & connectors



IR Filter (Mounted)



Pelican carrying case



# **UP10-H** Specifications







	UP10P-2S-H5-L-D0	UP10K-2S-H5-L-D0
MAX AVERAGE POWER	2 W	2 W
EFFECTIVE APERTURE	10 mm Ø	10 mm Ø
COOLING METHOD	Convection	Convection
MEASUREMENT CAPABILITY		
Spectral range	0.19 - 20 μm	0.19 - 20 μm
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 μm	0.248 - 2.1 µm
Noise equivalent power <sup>b</sup>	100 μW without anticipation 30 μW with anticipation and 2 s moving average	100 $\mu W$ without anticipation 30 $\mu W$ with anticipation and 2 s moving average
Rise time (nominal) <sup>c</sup>	1.4 s	1.1 s
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%
Energy mode		
Maximum measurable energy <sup>e</sup>	3 J	3 J
Noise equivalent energy <sup>b</sup>	5 mJ	5 mJ
Minimum repetition period	2 s	2 s
Maximum pulse width	63 ms	63 ms
Accuracy with energy calibration option	±5%	± 5%
DAMAGE THRESHOLDS		
Maximum average power density <sup>f</sup>	36 kW/cm <sup>2</sup>	36 kW/cm <sup>2</sup>
Maximum energy density		
1064 nm, 360 µs, 5 Hz	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	10 mm Ø	10 mm Ø
Absorber (high damage threshold)	Н5	H5
Dimensions	46H x 46W x 13D mm	50H x 50W x 21.5D mm
Weight (head only)	0.13 kg	0.19 kg
ORDERING INFORMATION		
Available output options	DB15, USB or RS-232	DB15, USB, RS-232
Compatible stand	STAND-S-233	STAND-S-233
Product page		

a. Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request.b. Nominal value, actual value depends on electrical noise in the measurement system.

With anticipation. C.

d. Including linearity with power.

For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns). At 1064 nm, 10 W CW. e. f.





#### **OUTPUT OPTIONS**

> **SMART DB15 CONNECTOR** Contains all the calibration data



- RS-232 output (-IDR)

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO



TUNER



UNO



U-LINK and P-LINK



S-LINK and M-LINK

## **KEY FEATURES**

- MODULAR CONCEPT Increase the power capability of your detector: 3 different cooling modules
- > HIGH PERFORMANCE Fast rise time (0.3 s) High damage threshold (36 kW/cm<sup>2</sup>)
- COMPACT DESIGN Only 14 mm thick (10S model)
- > ENERGY MODE Measure single shot energy up to 5 J

# ACCESSORIES



Stand with steel post



Extension cables (4, 15, 20 or 25 m)



Replacement cover for fiber adaptors



Pelican carrying Case













	UP12E-10S-H5-D0	UP12E-20H-H5-D0	UP12E-70W-H5-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	10 W / 20 W	20 W / 40 W	70 W <sup>f</sup> / 110 W <sup>f</sup>
EFFECTIVE APERTURE	12 mm Ø	12 mm Ø	12 mm Ø
COOLING METHOD	Convection	Heatsink	Water-cooled
MEASUREMENT CAPABILITY			
Spectral range	0.19 - 20 µm	0.19 - 20 µm	0.19 - 20 µm
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 µm	0.248 - 2.1 µm	0.248 - 2.1 µm
Noise equivalent power <sup>b</sup>	1 mW	1 mW	lmW
Rise time (nominal) <sup>c</sup>	0.3 s	0.3 s	0.3 s
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%	±0.5%
Energy mode			
Maximum measurable energy <sup>e</sup>	5 J	5 J	5 J
Noise equivalent energy <sup>b</sup>	0.02 J	0.02 J	0.02 J
Minimum repetition period	1.5 s	1.5 s	1.5 s
Maximum pulse width	50 ms	50 ms	50 ms
Accuracy with energy calibration option	± 5%	± 5%	± 5%
DAMAGE THRESHOLDS			
Maximum average power density <sup>g</sup>	36 kW/cm <sup>2</sup>	36 kW/cm <sup>2</sup>	36 kW/cm <sup>2</sup>
Maximum energy density			
1064 nm, 360 µs, 5 Hz	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS			
Effective aperture	12 mm Ø	12 mm Ø	12 mm Ø
Absorber (high damage threshold)	Н5	H5	Н5
Dimensions	38H x 38W x 14D mm	38H x 38W x 45D mm	38H x 38W x 32D mm
Weight (head only)	0.13 kg	0.15 kg	0.19 kg
ORDERING INFORMATION			
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-S-233	STAND-S-233	STAND-S-233
Product page			

a. Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request.

b. Nominal value, actual value depends on electrical noise in the measurement system.

c. With anticipation.

d. Including linearity with power.

- e. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
- f. Minimum cooling flow 0.5 liters/min, water temperature < 22°C, 1/8 NPT compression fittings for 1/4 inch semi-rigid tube. Contact Gentec-EO for clean deionized water cooling module option.

g. At 1064 nm, 10 W CW.

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ENERGY DETECTORS

**BEAM PROFILING** 

TERAHERTZ DETECTORS

DISPLAYS & PC INTERFACES

# **|**/-17 mm Ø, 1 mW - 7 W, ultra thin casing



#### **OUTPUT OPTIONS**

SMART DB15 CONNECTOR Contains all the calibration data



• RS-232 output (-IDR)

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO







UNO



U-LINK and P-LINK



S-LINK and M-LINK

# **KEY FEATURES**

- > ULTRA THIN CASING Only 10.7 mm thick!
- > **CHOICE BETWEEN 2 ABSORBERS** 
  - H5: 36 kW/cm<sup>2</sup>
  - W5: unequalled 100 kW/cm<sup>2</sup>
- > HIGH POWER TO SIZE RATIO 6 W continuous reading

# > ENERGY MODE

Measure single shot energy up to 200 J (with the W5 version)

## ACCESSORIES



Stand with steel post



Extension cables (4, 15, 20 or 25 m)



Pelican carrying case









	UP17P-6S-H5-D0	UP17P-6S-W5-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	6 W / 7 W	6 W / 7 W
EFFECTIVE APERTURE	17 mm Ø	17 mm Ø
COOLING METHOD	Convection	Convection
MEASUREMENT CAPABILITY		
Spectral range	0.19 - 20 μm	0.19 - 10.0 μm
Calibrated spectral range	0.248 - 2.1 μm °	0.248 - 2.1 μm <sup>b</sup>
Noise equivalent power °	1 mW	1 mW
Rise time (nominal) <sup>d</sup>	0.8 s	1.4 s
Calibration uncertainty °	± 2.5%	±2.5%
Repeatability	±0.5%	±0.5%
Energy mode		
Maximum measurable energy <sup>f</sup>	15 J	200 J
Noise equivalent energy <sup>c</sup>	0.02 J	0.02 J
Minimum repetition period	4 s	5 s
Maximum pulse width	88 ms	133 ms
Accuracy with energy calibration option	± 5%	±5%
DAMAGE THRESHOLDS		
Maximum average power density <sup>9</sup>	36 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>
Maximum energy density		
1064 nm, 360 µs, 5 Hz	5 J/cm <sup>2</sup>	100 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.7 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	17 mm Ø	17 mm Ø
Absorber (high damage threshold)	H5	W5
Dimensions	46H x 46W x 10.7D mm	46H x 46W x 10.7D mm
Weight (head only)	0.1 kg	0.1 kg
ORDERING INFORMATION		
Available output options	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-S-233	STAND-S-233
Product page		

a. Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request.

b. Calibration at 2.1 to 2.5 µm is available on special request.

C. Nominal value, actual value depends on electrical noise in the measurement system.

d. With anticipation.

e. Including linearity with power.
f. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
g. At 1064 nm, 10 W CW.

PRODUCT GUIDE 2024

ENERGY DETECTORS

BEAM PROFILING

Specifications are subject to change without notice

# 19 - -19 mm Ø, 1 mW - 200 W



#### **OUTPUT OPTIONS**

- > **SMART DB15 CONNECTOR** Contains all the calibration data
- 3 > integra ALL-IN-ONE-METER Connects directly to a PC
  - Two models available: • USB output (-INT)
    - RS-232 output (-IDR)
- BLU WIRELESS METER 🛜 > Connects via Bluetooth® to a smartphone, tablet or PC

## **COMPATIBLE DISPLAYS & PC INTERFACES**







TUNER



UNO

MIRO ALTITUDE



U-LINK and P-LINK



S-LINK and M-LINK

# ACCESSORIES



Stand with steel post



Fiber adaptors and connectors (FC, SC or SMA)



Extension cables (4, 15, 20 or 25 m)



12V power supply



Isolation tube



Pelican carrying case

## **KEY FEATURES**

- > MODULAR CONCEPT Increase the power capability of your detector: 5 different cooling modules
- > HIGH PERFORMANCE Fast Rise Time (0.6 s) High damage threshold (45 kW/cm<sup>2</sup>)
- > COMPACT DESIGN Only 20.6 mm thick (15S model)
- > ENERGY MODE Measure single shot energy up to 25 J





	UP19K-15S-H5-D0	UP19K-30H-H5-D0	UP19K-50L-H5-D0	UP19K-110F-H9-D0	UP19K-200W-H9-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	15 W / 30 W	30 W/ 60 W	50 W / 90 W	110 W / 150 W	200 W <sup>f</sup> / 200 W <sup>f</sup>
EFFECTIVE APERTURE	19 mm Ø	19 mm Ø	19 mm Ø	19 mm Ø	19 mm Ø
COOLING METHOD	Convection	Heatsink	Large heatsink	Fan-cooled	Water-cooled
MEASUREMENT CAPABILITY					
Spectral range	0.19 - 20 µm	0.19 - 20 µm	0.19 - 20 µm	0.19 - 20 µm	0.19 - 20 µm
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 µm	0.248 - 2.1 µm	0.248 - 2.1 µm	0.248 - 2.1 µm	0.248 - 2.1 µm
Noise equivalent power <sup>b</sup>	1 mW	1 mW	1 mW	3 mW	3 mW
Rise time (nominal) °	0.6 s	0.6 s	0.6 s	1.5 s	1.5 s
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
Energy mode					
Maximum measurable energy °	15 J	15 J	15 J	25 J	25 J
Noise equivalent energy <sup>b</sup>	0.02 J	0.02 J	0.02 J	0.06 J	0.06 J
Minimum repetition period	4 s	4 s	4 s	4 s	4 s
Maximum pulse width	88 ms	88 ms	88 ms	88 ms	88 ms
Accuracy with energy calibration optio	<b>n</b> ± 5%	± 5%	±5%	±5%	± 5%
DAMAGE THRESHOLDS					
Maximum average power density <sup>9</sup>	36 kW/cm <sup>2</sup>	36 kW/cm <sup>2</sup>	36 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>
Maximum energy density					
1064 nm, 360 µs, 5 Hz	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS					
Effective aperture	19 mm Ø	19 mm Ø	19 mm Ø	19 mm Ø	19 mm Ø
Absorber (high damage threshold)	H5	H5	H5	Н9	Н9
Dimensions	50H x 50W x 20.6D mm	50H x 50W x 56.3D mm	76.2H x 76.2W x 73.6D mm	50H x 50W x 63D mm	50H x 50W x 33D mm
Weight (head only)	0.16 kg	0.21 kg	0.48 kg	0.25 kg	0.24 kg
ORDERING INFORMATION					
Available output options	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth	DB15, USB or RS-232	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth
Compatible stand	STAND-S-233	STAND-S-233	STAND-S-233	STAND-S-233	STAND-S-233
Product page					

Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request. a.

b. Nominal value, actual value depends on electrical noise in the measurement system.

C. With anticipation.

d. Including linearity with power.

- For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
   Minimum cooling flow 0.5 liters/min, water temperature ≤ 22°C, 1/8 NPT compression fittings for 1/4 inch semi-rigid tube. Contact Gentec-EO for clean deionized water cooling module option.

g. At 1064 nm, 10 W CW.

# **PRONTO** 95 W - 250 W power probes with touchscreen controls



## **KEY FEATURES**

#### > POCKET-SIZE

This mid to high power laser probe is so compact it fits in your pocket!

#### > EASY TO USE

The color LCD touchscreen allows for a friendly user interface. You can make a measurement with just the touch of a button!

#### DATA LOGGING

Save your data to the internal memory and then transfer them to your PC over the USB connection.

#### FROM LOW TO HIGH POWERS

Thanks to a low noise level and high damage threshold, the PRONTO can measure powers from 0.5 W to 250 W.

#### THE FLEXIBILITY TO PICK THE CALIBRATIONS YOU NEED

The PRONTO-250-FLEX offers three calibration options so you only pay for what you need:

- Default calibration "Y": for visible to NIR wavelengths (248 nm to 2.5 µm)
- Additional calibration "C": for CO<sub>2</sub> lasers (10.6 μm)
- Additional calibration "E": for energy measurements with ± 5 % accuracy

#### > HANDS-FREE OPERATION

Place it on a flat surface or use one of the 2 threaded holes for safe use with optical stands.

#### SERIAL COMMANDS

Serial commands are available to let you take full control of your PRONTO from your PC.

# **USER INTERFACES (SSP MODE)**



\* Device may get hot, it is not recommended for handheld use when making a measurement

#### 2 MODELS FOR ALL YOUR MEASUREMENT NEEDS

#### PRONTO-250-FLEX

PRONTO-250-FLEX comes with 3 measurement modes and can be used in a variety of applications:

- Single shot power (SSP): up to 250 W
- Continuous power (CWP): up to 8 W
- Single shot energy (SSE): up to 25 J

#### > PRONTO-50-W5

This model has our proprietary absorber with extremely high damage thresholds to handle tightly focused beams without damaging the absorber.

• Single shot power (SSP): up to 50 W

# CONNECTIVITY



HANDS-FREE

DATA TRANSFER TO PC









	PRONTO-250-FLEX			PRONTO-50-W5	
	SSP Mode Measures in 5 s	CWP Mode Measures power continuously	SSE Mode Measures single-shot energy		
MAX AVERAGE POWER/ENERGY	250 W	8 W	25 J (up to 150 J for pulses >1 ms)	50 W	
EFFECTIVE APERTURE	19 mm Ø			19 mm Ø	
INTERFACE	Touchscreen color LCD disp	ay		Touchscreen color LCD display	
MEASUREMENT CAPABILITY					
Spectral range	0.19 - 20 µm			0.19 - 10 μm	
Calibrated spectral range	0.248 - 2.5 µm (default) 10.6	µm available with calibration	0.248 - 2.5 μm		
Noise equivalent power/energy	10 mW	10 mW	60 mJ	4 mW	
Minimum measurable power/energy	0.5 W	0.2 W	N/A	0.5 W	
Exposure time	5 s	1.5 s response time	0.26 s	5 s	
Measurement accuracy	±3%	± 2.5%	± 5 % with additional calibration "E" Typical value as default	± 3%	
Min repetition period (Max pulse width)	N/A	N/A	4 s (88 ms)	N/A	
Display resolution	1 mW	1 mW	10 mJ	1 mW	
DAMAGE THRESHOLDS					
Maximum average power density <sup>a</sup>	45 kW/cm² (at 1064 nm, 10 W, 14 kW/cm² (at 10.6 μm, 10 W, C	CW) N)		$100 \text{ kW/cm}^2$ (at 1064 nm, 10 W, CW)	
Maximum exposure time <sup>b</sup>	6 s	N/A	N/A	6 s	
Maximum device temperature <sup>b</sup>	65°C	40°C	40°C	65°C	
USER INTERFACE					
Measurement controls	Wavelength selection and user calibration			Wavelength selection and user calibration	
Measurement modes	Single Shot Power (SSP), Continuous Power (CWP) and Single Shot Energy (SSE)			Single Shot Power (SSP)	
Data acquisition and transfer	Yes			Yes	
GENERAL SPECIFICATIONS					
Display type	Touchscreen color LCD			Touchscreen color LCD	
Display size	28.0 x 35.0 mm (128 x 160 pixels)			28.0 x 35.0 mm (128 x 160 pixels)	
Data storage	50 000 pts			50 000 pts	
Battery type	Rechargeable Li-ion		Rechargeable Li-ion		
Battery life	17 hours or 4 200 measurem (with brightness set at 25%)	ents	17 hours or 4 200 measurements (with brightness set at 25%)		
Battery recharge via PHYSICAL CHARACTERISTICS	USB port		USB port		
Effective aperture	19 mm Ø			19 mm Ø	
Absorber	Н9			W5	
Mounting holes (for post)	2 x 8-32			2 x 8-32	
Dimensions	59W x 181.4L x 17D			59W x 181.4L x 17D	
Weight	210 g			210 g	
ORDERING INFORMATION					
Compatible stand	STAND-S-233			STAND-S-233	
Product page					

a. To get all the damage thresholds, see User Manual.

b. At maximum power.



CUSTOM / OEM PRODUCTS

ENERGY DETECTORS

BEAM PROFILING

TERAHERTZ DETECTORS

DISPLAYS & PC INTERFACES

# P25-H 25 mm,Ø, 3 mW - 350 W



### **OUTPUT OPTIONS**

- > SMART DB15 CONNECTOR Contains all the calibration data
- 2 > integra ALL-IN-ONE-METER Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
- BLU WIRELESS METER 🛜 > Connects via Bluetooth® to a smartphone, tablet or PC

## **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE





TUNER



UNO



U-LINK and P-LINK



S-LINK and M-LINK

## **KEY FEATURES**

- MODULAR CONCEPT Increase the power capability of your detector: 4 different cooling modules
- > HIGH PERFORMANCE Fast rise time (1.3 s) High damage threshold (45 kW/cm<sup>2</sup>)
- > ENERGY MODE Measure single shot energy up to 40 J





Stand with steel post



Extension cables (4, 15, 20 or 25 m)



Pelican carrying case



Fiber adaptors and connectors (FC, SC or SMA)



12V power supply





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	UP25N-40S-H9-D0	UP25N-100H-H9-D0	UP25N-250F-H12-D0	UP25M-350W-H12-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	40 W / 80 W	100 W / 200 W	250 W / 300 W	350 W <sup>f</sup> / 350 W <sup>f</sup>
EFFECTIVE APERTURE	25 mm Ø	25 mm Ø	25 mm Ø	25 mm Ø
COOLING METHOD	Convection	Heatsink	Fan-cooled	Water-cooled
MEASUREMENT CAPABILITY				
Spectral range	0.19 - 20 µm			
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 µm			
Noise equivalent power <sup>b</sup>	3 mW	3 mW	10 mW	10 mW
Rise time (nominal) <sup>c</sup>	1.3 s	1.3 s	1.3 s	1.3 s
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%	±0.5%	±0.5%
Energy mode				
Maximum measurable energy °	40 J	40 J	40 J	40 J
Noise equivalent energy <sup>b</sup>	0.2 J	0.2 J	0.2 J	0.2 J
Minimum repetition period	4.6 s	4.6 s	11.5 s	11.5 s
Maximum pulse width	123 ms	123 ms	390 ms	390 ms
Accuracy with energy calibration option	± 5%	± 5%	± 5%	± 5%
DAMAGE THRESHOLDS				
Maximum average power density				
1064 nm, 10 W, CW	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>
10.6 µm, 10 W, CW	14 kW/cm <sup>2</sup>	14 kW/cm <sup>2</sup>	14 kW/cm <sup>2</sup>	14 kW/cm <sup>2</sup>
Maximum energy density				
1064 nm, 360 µs, 5 Hz	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS				
Effective aperture	25 mm Ø	25 mm Ø	25 mm Ø	25 mm Ø
Absorber (high damage threshold)	Н9	Н9	H12	H12
Dimensions	89H x 89W x 32D mm	89H x 89W x 106D mm	92H x 92W x 117D mm	89H x 89W x 40D mm
Weight (head only)	0.68 kg	0.99 kg	1.44 kg	0.87 kg
ORDERING INFORMATION				
Available output options	DB15, USB, RS-232 or Bluetooth			
Compatible stand	STAND-S-443	STAND-S-443	STAND-S-443	STAND-S-443
Product page				

a. Calibrations at 2.1 to 2.5  $\mu m$  and 10.6  $\mu m$  are available on special request.

b. Nominal value, actual value depends on electrical noise in the measurement system.

c. With anticipation.

d. Including linearity with power.

e. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).

f. Minimum cooling flow 1.5 liters/min, water temperature ≤ 22°C, 1/8 NPT compression fittings for 1/4 inch semi-rigid tube. Contact Gentec-EO for clean deionized water cooling module option. **DETECTORS** 

# **UP55-H** 55 mm Ø, 5 mW - 500 W



### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- Integra ALL-IN-ONE-METER Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
- > BLU WIRELESS METER Connects via Bluetooth® to a smartphone, tablet or PC

## **COMPATIBLE DISPLAYS & PC INTERFACES**







TUNER

MIRO ALTITUDE

MAESTRO



UNO



U-LINK and P-LINK



S-LINK and M-LINK

## **KEY FEATURES**

- MODULAR CONCEPT Increase the power capability of your detector: 4 different cooling modules
- HIGH PERFORMANCE Fast rise time (2 s) High damage threshold (45 kW/cm<sup>2</sup>)
- > COMPACT DESIGN Only 32 mm thick (40S model)
- > ENERGY MODE Measure single shot energy up to 200 J





Stand with steel post



3-Port fiber cylinder with adaptors and plug



Extension cables (4, 15, 20 or 25 m)



12V power supply



Fiber adaptors and connectors (FC, SC or SMA)



Pelican carrying case




	UP55N-40S-H9-D0	UP55N-100H-H9-D0	UP55N-300F-H12-D0	UP55M-500W-H12-D0	
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	40 W / 80 W	100 W / 200 W	300 W / 300 W	500 W <sup>f</sup> / 500 W <sup>f</sup>	
EFFECTIVE APERTURE	55 mm Ø	55 mm Ø	55 mm Ø	55 mm Ø	
COOLING METHOD	Convection	Heatsink	Fan-cooled	Water-cooled	
MEASUREMENT CAPABILITY					
Spectral range	0.19 - 20 µm				
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 µm				
Noise equivalent power <sup>b</sup>	5 mW	5 mW	15 mW	15 mW	
Rise time (nominal) <sup>c</sup>	2 s	2 s	2 s	2 s	
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%	± 2.5%	
Repeatability	±0.5%	±0.5%	±0.5%	±0.5%	
Energy mode					
Maximum measurable energy <sup>e</sup>	200 J	200 J	200 J	200 J	
Noise equivalent energy <sup>b</sup>	0.25 J	0.25 J	0.25 J	0.25 J	
Minimum repetition period	11.1 s	11.1 s	12 s	12 s	
Maximum pulse width	433 ms	433 ms	430 ms	430 ms	
Accuracy with energy calibration option	± 5%	± 5%	± 5%	± 5%	
DAMAGE THRESHOLDS					
Maximum average power density					
1064 nm, 10 W, CW	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	
10.6 µm, 10 W, CW	14 kW/cm <sup>2</sup>	14 kW/cm <sup>2</sup>	14 kW/cm <sup>2</sup>	14 kW/cm <sup>2</sup>	
Maximum energy density					
1064 nm, 360 µs, 5 Hz	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	
PHYSICAL CHARACTERISTICS					
Effective aperture	55 mm Ø	55 mm Ø	55 mm Ø	55 mm Ø	
Absorber (high damage threshold)	Н9	Н9	H12	H12	
Dimensions	89H x 89W x 32D mm	89H x 89W x 106D mm	92H x 92W x 117D mm	89H x 89W x 40D mm	
Weight (head only)	0.62 kg	0.93 kg	1.41 kg	0.81 kg	
ORDERING INFORMATION					
Available output options	DB15, USB, RS-232 or Bluetooth				
Compatible stand	STAND-S-443	STAND-S-443	STAND-S-443	STAND-S-443	
Product page					

a. Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request.

b. Nominal value, actual value depends on electrical noise in the measurement system.

b. Normal rates 21.
 c. With anticipation.
 d. Including linearity with power.
 e. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
 f. Minimum cooling flow 1.5 liters/min, water temperature ≤ 22°C, 1/8 NPT compression fittings for 1/4 inch semi-rigid tube. Contact Gentec-EO for clean deionized water cooling module option.

## **UP55-HD** 55 mm Ø, 45 mW - 2500 W



#### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- integra ALL-IN-ONE-METER Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
- > BLU WIRELESS METER < Connects via Bluetooth® to a smartphone, tablet or PC

#### **COMPATIBLE DISPLAYS & PC INTERFACES**





MAESTRO



TUNER



UNO

MIRO ALTITUDE



U-LINK and P-LINK



S-LINK and M-LINK

#### **KEY FEATURES**

#### HIGH DENSITY ABSORBER

The HD absorber is the strongest on the market for use at high powers, presenting both high average power handling and high power density capabilities

#### UP55G-600F-HD - NO NEED FOR WATER COOLING

Unique on the market, measure 600 W of continuous power WITHOUT THE NEED FOR WATER COOLINC. Just plug the fan and you are ready to go!

UP55M-700W-HD - FAST AND COMPACT A very compact detector that measures up to 700 W of continuous power.

#### UP55C-2.5KW-HD - PERFORMANCE AND SPEED AT A LOW PRICE

Measures both very low and very high powers (up to 2500W) with a fast response time. A compact and versatile detector that is more affordable than any other high power solution on the market.





Stand with steel post



3-Port fiber cylinder with adaptors and plug



Extension cables (4, 15, 20 or 25 m)



12V power supply



Fiber adaptors and connectors (FC, SC or SMA)



Pelican carrying case











	UP55C-600F-HD-D0	UP55M-700W-HD-D0	UP55C-2.5KW-HD-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	600 W / 600 W	700 W <sup>f</sup> / 700 W <sup>f</sup>	2500 W <sup>f</sup> / 2500 W <sup>f</sup>
EFFECTIVE APERTURE	55 mm Ø	55 mm Ø	55 mm Ø
COOLING METHOD	Fan-cooled	Water-cooled	Water-cooled
MEASUREMENT CAPABILITY			
Spectral range	0.19 - 20 µm	0.19 - 20 μm	0.19 - 20 μm
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 μm	0.248 - 2.1 μm	0.248 - 2.1 µm
Noise equivalent power <sup>b</sup>	45 mW	45 mW	200 mW
Rise time (nominal) <sup>c</sup>	2,8 s	2.8 s	3.5 s
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%	±0.5%
Energy mode			
Maximum measurable energy <sup>d</sup>	200 J	200 J	
Noise equivalent energy <sup>b</sup>	0.25 J	0.25 J	
Minimum repetition period	12 s	12 s	
Maximum pulse width	430 ms	430 ms	
Accuracy with energy calibration option	+ 5%	+ 5%	
	- 376	- 576	
DAMAGE THRESHOLDS			
1064 pm 10 W CW	45 kW/cm <sup>2</sup>	$45 \text{ kW/cm}^2$	$45 \text{ k/M/cm}^2$
1064 nm, 10 W, CW	8 kW/cm <sup>2</sup>	8 kW/cm <sup>2</sup>	$9 \mathrm{kW/cm^2}$
1064 nm, 2500 W, CW			6 kW/cm <sup>2</sup>
10.6 µm 500 W CW			4.5 kW/cm <sup>2</sup>
10.6 µm, 500 W, CW			$3.5 \text{ kW/cm}^2$
10.6 µm, 2500 W. CW			3.0 kW/cm <sup>2</sup>
Maximum energy density			
1064 nm. 360 us. 5 Hz	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS			
Effective aperture	55 mm Ø	55 mm Ø	55 mm Ø
Absorber (high damage threshold)	HD	HD	HD
Dimensions	120H x 120W x 135D mm	89H x 89W x 40D mm	116H x 116W x 37D mm
Weight (head only)	2.75 kg	0.90 kg	3.3 kg
ORDERING INFORMATION			
Available output options	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth
Compatible stand	STAND-S-443-C	STAND-S-443-C	STAND-S-443-C
Product page			

a. Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request.

b. Nominal value, actual value depends on electrical noise in the measurement system.

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c. With anticipation.
d. Including linearity with power.
e. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
f. Minimum cooling flow 1.5 l/m (UP55M-700W-HD) or 3 l/m (UP55C-2.5KW-HD), water temperature ≤22°C, 1/8 NPT compression fittings for 1/4 inch semi-rigid tube. Contact Gentec-EO for clean deionized water cooling module option.

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Specifications are subject to change without notice T 418.651.8003 | info@gentec-eo.com



## **UP19-W** 19 mm Ø, 1 mW - 85 W, 100 kW/cm<sup>2</sup>



#### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- integra ALL-IN-ONE-METER Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
- BLU WIRELESS METER Connects via Bluetooth® to a smartphone, tablet or PC

#### **COMPATIBLE DISPLAYS & PC INTERFACES**







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U-LINK and P-LINK



S-LINK and M-LINK

#### **KEY FEATURES**

- MODULAR CONCEPT Increase the power capability of your detector: 4 different cooling modules
- VERY HIGH DAMAGE THRESHOLD 100 kW/cm<sup>2</sup> in average power density
- > COMPACT DESIGN Only 21 mm thick (155 model)
- ENERGY MODE Measure single shot energy up to 200 J





Stand with steel post



Pelican carrying case



Extension cables (4, 15, 20 or 25 m)



Isolation tube



12V power supply



Fiber adaptors & connectors (FC, ST and SMA)





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	UP19K-15S-W5-D0	UP19K-30H-W5-D0	UP19K-50L-W5-D0	UP19K-50F-W5-D0	
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	15 W / 30 W	30 W / 60 W	50 W / 85 W	50 W / 85 W	
EFFECTIVE APERTURE	19 mm Ø	19 mm Ø	19 mm Ø	19 mm Ø	
COOLING METHOD	Convection	Heatsink	Large heatsink	Fan-cooled	
MEASUREMENT CAPABILITY					
Spectral range	0.19 - 10.0 µm	0.19 - 10.0 µm	0.19 - 10.0 µm	0.19 - 10.0 µm	
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 µm	0.248 - 2.1 µm	0.248 - 2.1 µm	0.248 - 2.1 µm	
Noise equivalent power <sup>b</sup>	1 mW	1 mW	1 mW	1 mW	
Rise time (nominal) <sup>c</sup>	1.4 s	1.4 s	1.4 s	1.4 s	
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%	± 2.5%	
Repeatability	±0.5%	±0.5%	±0.5%	±0.5%	
Energy mode					
Maximum measurable energy °	200 J	200 J	200 J	200 J	
Noise equivalent energy <sup>b</sup>	0.02 J	0.02 J	0.02 J	0.02 J	
Minimum repetition period	5 s	5 s	5 s	5 s	
Maximum pulse width	133 ms	133 ms	133 ms	133 ms	
Accuracy with energy calibration option	±5%	± 5%	±5%	± 5%	
DAMAGE THRESHOLDS					
Maximum average power density <sup>f</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>	
Maximum energy density					
1064 nm, 150 µs, 10 Hz	100 J/cm <sup>2</sup>	100 J/cm <sup>2</sup>	100 J/cm <sup>2</sup>	100 J/cm <sup>2</sup>	
1064 nm, 7 ns, 10 Hz	1.1 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>	
532 nm, 7 ns, 10 Hz	1.1 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>	
248 nm, 26 ns, 10 Hz	0.7 J/cm <sup>2</sup>	0.7 J/cm <sup>2</sup>	0.7 J/cm <sup>2</sup>	0.7 J/cm <sup>2</sup>	
PHYSICAL CHARACTERISTICS					
Effective aperture	19 mm Ø	19 mm Ø	19 mm Ø	19 mm Ø	
Absorber (high damage threshold)	W5	W5	W5	W5	
Dimensions	50H x 50W x 20.6D mm	50H x 50W x 56.3D mm	76.2H x 76.2W x 73.6D mm	50H x 50W x 63D mm	
Weight (head only)	0.16 kg	0.21 kg	0.48 kg	0.25 kg	
ORDERING INFORMATION					
Available output options	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth	DB15, USB or RS-232	DB15, USB, RS-232 or Bluetooth	
Compatible stand	STAND-S-233	STAND-S-233	STAND-S-233	STAND-S-233	
Product page					

a. Calibration at 2.1 to 2.5 µm is available on special request.
b. Nominal value, actual value depends on electrical noise in the measurement system.

b. Nominal value, actual value depends on electrical noise in the measurement system.
c. With anticipation.
d. Including linearity with power.
e. For 150 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
f. At 1064 nm, 10 W CW.

PRODUCT GUIDE 2024

ENERGY DETECTORS

## $\square$ 50 mm Ø, 5 mW - 85 W, 100 kW/cm<sup>2</sup>



#### **OUTPUT OPTIONS**

- > **SMART DB15 CONNECTOR** Contains all the calibration data
- 2 > integra ALL-IN-ONE-METER Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
- BLU WIRELESS METER 🛜 > Connects via Bluetooth® to a smartphone, tablet or PC

#### **COMPATIBLE DISPLAYS & PC INTERFACES**











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S-LINK and M-LINK

#### **KEY FEATURES**

- > MODULAR CONCEPT Increase the power capability of your detector: 3 different cooling modules
- > VERY HIGH DAMAGE THRESHOLD 100 kW/cm<sup>2</sup> in average power density
- > VERY LARGE APERTURE 50 mm Ø effective aperture, perfect for large beams
- > HIGHEST ENERGY READINGS IN THE SERIES Measure single shot energy up to 500 J





Stand with steel post



3-Port fiber cylinder with adaptors and plug



Extension cables (4, 15, 20 or 25 m)



12V power supply



Fiber adaptors and connectors (FC, SC or SMA)



Pelican carrying case







Weight (head only) ORDERING INFORMATION Available output options Compatible stand Product page



STAND-S-443

DB15, USB, RS-232 or Bluetooth

0.62 kg



STAND-S-443

DB15, USB, RS-232 or Bluetooth

0.93 kg



1.38 kg



DB15, USB, RS-232 or Bluetooth

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a. Calibration at 2.1 to 2.5 µm is available on special request.

b. Nominal value, actual value depends on electrical noise in the measurement system.

c. With anticipation.

d. Including linearity with power.

e. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).

f. At 1064 nm, 10 W CW.

PRODUCT GUIDE 2024

## UP16-QED 16 mm Ø, 4 mW - 100 W, volume absorber



#### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- Integra ALL-IN-ONE-METER Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)

## > BLU WIRELESS METER <br/> Connects via Bluetooth® to a smartphone, tablet or PC

#### **COMPATIBLE DISPLAYS & PC INTERFACES**







TUNER



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S-LINK and M-LINK

#### **KEY FEATURES**

- MODULAR CONCEPT Increase the power capability of your detector: 3 different cooling modules
- > HIGH PEAK POWER VOLUME ABSORBER Perfect for pulsed beams with high energy density
- > COMPACT DESIGN Only 24 mm thick (15S model)
- > ENERGY MODE Measure single shot energy up to 500 J

#### ACCESSORIES



Stand with steel post



U-LINK and P-LINK

Extension cables (4, 15, 20 or 25 m)



Pelican carrying case

# UP16-QE Specifications









	UP16K-15S-QED-D0	UP16K-30H-QED-D0	UP16K-100W-QED-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	15 W / 20 W	30 W / 35 W	100 W / 100 W
EFFECTIVE APERTURE	16 mm Ø	16 mm Ø	16 mm Ø
COOLING METHOD	Convection	Heatsink	Water-cooled
MEASUREMENT CAPABILITY			
Spectral range	0.266 - 2.5 μm	0.266 - 2.5 μm	0.266 - 2.5 μm
Calibrated spectral range <sup>a</sup>	0.532 - 2.1 μm	0.532 - 2.1 μm	0.532 - 2.1 µm
Noise equivalent power <sup>b</sup>	4 mW	4 mW	4 mW
Rise time (nominal) <sup>c</sup>	2.5 s	2.5 s	2.5 s
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%	±0.5%
Energy mode			
Maximum measurable energy <sup>e</sup>	500 J	500J	500 J
Noise equivalent energy <sup>b</sup>	60 mJ	60 mJ	60 mJ
Minimum repetition period	4 s	4 s	4 s
Maximum pulse width	61 ms	61 ms	61 ms
Accuracy with energy calibration option	± 5%	± 5%	± 5%
DAMAGE THRESHOLDS			
Maximum average power density <sup>f</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>
Maximum energy density			
1064 nm, 360 μs, 5 Hz	300 J/cm <sup>2</sup>	300 J/cm <sup>2</sup>	300 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	8 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS			
Effective aperture	16 mm Ø	16 mm Ø	16 mm Ø
Absorber (volume absorber)	QED	QED	QED
Dimensions	50H x 50W x 23.6D mm	50H x 50W x 59D mm	50H x 50W x 38D
Weight (head only)	0.16 kg	0.21 kg	0.24 kg
ORDERING INFORMATION			
Available output options	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth	DB15, USB, RS-232 or Bluetooth
Compatible stand	STAND-S-233	STAND-S-233	STAND-S-233
Product page			

a. Calibration at 2.1 to 2.5 µm is available on special request.b. Nominal value, actual value depends on electrical noise in the measurement system.

c. With anticipation.

d. Including linearity with power.

e. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).
 f. At 1064 nm, 10 W CW.

## 52-OE 52 mm Ø, 15 mW - 300 W, volume absorber



#### **OUTPUT OPTIONS**

- > **SMART DB15 CONNECTOR** Contains all the calibration data
- 2 > integra ALL-IN-ONE-METER Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
- BLU WIRELESS METER 🛜 > Connects via Bluetooth® to a smartphone, tablet or PC

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO



TUNER



UNO



U-LINK and P-LINK



S-LINK and M-LINK

#### **KEY FEATURES**

- > MODULAR CONCEPT Increase the power capability of your detector: 4 different cooling modules
- > HIGH PEAK POWER VOLUME ABSORBER Perfect for pulsed beams with high energy density
- > LARGE APERTURE 52 mm Ø aperture accomodates large beams
- > HIGH AVERAGE POWER Up to 300 W of continuous power with the water-cooled unit
- > ENERGY MODE Measure single shot energy up to 1000 J





Stand with steel post



Extension cables (4, 15, 20 or 25 m)



12V power supply



Pelican carrying case







	UP52N-50S-QED-D0	UP52N-100H-QED-D0	UP52N-150F-QED-D0	UP52M-300W-QED-D0
MAX AVERAGE POWER (CONTINUOUS / 1 MINUTE)	50 W / 50 W	100 W / 100 W	150 W / 150 W	300 W <sup>f</sup> / 300 W <sup>f</sup>
EFFECTIVE APERTURE	52 mm Ø	52 mm Ø	52 mm Ø	52 mm Ø
COOLING METHOD	Convection	Heatsink	Fan-cooled	Water-cooled
MEASUREMENT CAPABILITY				
Spectral range	0.266 - 2.5 µm	0.266 - 2.5 μm	0.266 - 2.5 µm	0.266 - 2.5 μm
Calibrated spectral range <sup>a</sup>	0.300 - 2.1 µm			
Noise equivalent power <sup>b</sup>	15 mW	15 mW	15 mW	15 mW
Rise time (nominal) <sup>c</sup>	4 s	4 s	4 s	4 s
Calibration uncertainty <sup>d</sup>	± 2.5%	± 2.5%	± 2.5%	± 2.5%
Repeatability	±0.5%	±0.5%	±0.5%	±0.5%
Energy mode				
Maximum measurable energy <sup>e</sup>	1000 J	1000 J	1000 J	1000 J
Noise equivalent energy <sup>b</sup>	250 mJ	250 mJ	250 mJ	250 mJ
Minimum repetition period	9 s	9 s	9 s	9 s
Maximum pulse width	371 ms	371 ms	371 ms	371 ms
Accuracy with energy calibration option	± 5%	± 5%	± 5%	± 5%
DAMAGE THRESHOLDS				
Maximum average power density <sup>9</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>
Maximum energy density				
1064 nm, 360 μs, 5 Hz	300 J/cm <sup>2</sup>	300 J/cm <sup>2</sup>	300 J/cm <sup>2</sup>	300 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	8 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS				
Effective aperture	52 mm Ø	52 mm Ø	52 mm Ø	52 mm Ø
Absorber (volume absorber)	QED	QED	QED	QED
Dimensions	89H x 89W x 32D mm	89H x 89W x 106D mm	89H x 89W x 116D mm	89H x 89W x 43D mm
Weight (head only)	0.62 kg	0.93 kg	1.41 kg	0.84 kg
ORDERING INFORMATION				
Available output options	DB15, USB, RS-232 or Bluetooth			
Compatible stand	STAND-S-443	STAND-S-443	STAND-S-443	STAND-S-443
Product page				

a. Calibrations at 2.1 to 2.5  $\mu m$  and 10.6  $\mu m$  are available on special request.

b. Nominal value, actual value depends on electrical noise in the measurement system.

C. With anticipation.

d. Including linearity with power.

For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns). Minimum cooling flow 1 liters/min, water temperature ≤ 22°C, 1/8 NPT compression fittings for 1/4 inch semi-rigid tube. Contact Gentec-EO for clean deionized water cooling module option. e. f.

g. At 1064 nm, 10 W CW.

PRODUCT GUIDE 2024

**BEAM PROFILING** 

ENERGY DETECTORS

#### Integrating sphere detector for laser power measurement up to 1 kW



#### **OUTPUT OPTIONS**

- integra ALL-IN-ONE-METER Connects directly to a PC Two models available:

   USB output (-INT)
  - RS-232 output (-IDR)

#### **COMPATIBLE PC INTERFACES**



INTEGRA

#### **KEY FEATURES**

- FASTEST RESPONSE With its silicon sensor, the integrating sphere is as fast as a photodiode.
- WIDE POWER RANGE Very low noise level = wide power range with just one device
- HIGH AVERAGE POWER Measure up to 1000 W of continuous power.

#### RESISTANT COATING

Our proprietary coating is designed to be strong. Its damage thresholds are orders of magnitude higher than any other "white" coatings on the market.

#### PRECISE CALIBRATION

The IS detectors have a NIST-traceable calibration for the entire calibrated spectral range.

#### ACCESSORIES



Stand with delrin post



Fiber adaptors & connectors (for IS12L only)



Pelican carrying case



Isolation tube (for IS12L only)



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	IS12L-9S-RSI-INT-D0	IS50A-1KW-RSI-INT-D0
MAXIMUM AVERAGE POWER	9 W	1000 W
EFFECTIVE APERTURE	12 mm Ø	50 mm Ø
COOLING METHOD	Convection	Water
MEASUREMENT CAPABILITY		
Spectral range	340 - 1100 nm	340 - 1100 nm
Calibrated spectral range	400 - 1070 nm	400 - 1070 nm
Maximum average power	9 W C	1000 W
Noise equivalent power <sup>a</sup>	1 μW at 1070 nm	10 µW at 1070 nm
Maximum divergence	10° (half-angle)	10° (half-angle)
Maximum incidence angle	± 10°	± 25° for beam diameter < Ø 12mm ± 5° for beam diameter > Ø 12mm
Typical rise time	< 0.2 s	< 0.2 s
Sampling rate	15 Hz	15 Hz
Calibration uncertainty	± 5.0% (400 - 499 nm) ± 3.5% (500 - 1069 nm) ± 2.5% (1070 nm)	± 5.0% (400 - 499 nm) ± 3.5% (500 - 1069 nm) ± 2.5% (1070 nm)
Back reflections <sup>b</sup>	6%	12%
Linearity with power	±1%	± 1%
DAMAGE THRESHOLDS		
Maximum average power density <sup>c</sup>	2 kW/cm <sup>2</sup>	5 kW/cm <sup>2</sup>
Maximum energy density <sup>d</sup>	400 mJ/cm <sup>2</sup>	400 mJ/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	12 mm Ø	50 mm Ø
Mounting thread	SM1	SM2
Sphere inner diameter	50 mm Ø	100 mm Ø
Sensor	Silicon	Silicon
Dimensions	66H x 78W x 66D mm	127H x 140W x 115D mm
Weight	0.75 kg	4 kg
ORDERING INFORMATION		
Available output options	USB or RS-232	USB or RS-232
Compatible stand	STAND-S-443	STAND-S-443-C
Product page		

 a. Nominal value. Actual value depends on environmental electromagnetic interference and wavelength.
 b. The backscattered power (also known as back reflections) is concentrated in a cone with an apex located at the back of the sphere. For IS12, the cone has a 7.5-degree half-angle. For IS50, the cone has a 15-degree half-angle.

c. At 1064 - 1070 nm, CW.

d. At 1064 - 1070 nm, 7 ns.

## HP60 60 mm Ø with cone reflector, 300 W - 15 000 W



## 2020 LaserFocusWorld

#### OUTPUT OPTIONS

- SMART DB15 CONNECTOR Contains all the calibration data
- > USB PORT

• Connects directly to a PC

- Included in all HP models
- > BLU WIRELESS METER <br/>
  Connects via Bluetooth to a PC

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO



TUNER



UNO

#### **KEY FEATURES**

#### HIGH POWER HANDLING

Handles up to 15 kW of continuous power. Custom models available for higher powers. The new HP60A-15KW-GD-QBH is designed for use with QB/QBH high power fibers.

#### LOW BACK REFLECTIONS

The cone reflector traps most of the incident laser power inside the detector head. With its TUBE extension, the HP60A-15KW-GD-TUBE has the lowest back reflection rating: under 2 %.

AVAILABLE WITH YAG AND CO<sub>2</sub> CALIBRATIONS All HP models can be calibrated at YAG and CO<sub>2</sub> wavelengths with a calibration uncertainty of ± 5%

#### DIRECT USB CONNECTION TO A PC

Each head comes with both a DB15 connector (for use with a Gentec-EO display device) and a USB output for direct connection to a PC

#### > TRACK WATER PARAMETERS

Water flow and temperature are monitored in real time and displayed continuously

#### ACCESSORIES



Stand with steel post



Water filter (Metric: 202984, Imperial: 202990)



Extension cables (4, 15, 20 or 25 m)\*



Pelican carrying case



5 m USB cable (Included)















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	HP60A-10KW-GD	HP60A-15KW-GD	HP60A-15KW-GD-TUBE	HP60A-15KW-GD-QBH	
MAX AVERAGE POWER	10 kW	15 kW	15 kW	15 kW	
EFFECTIVE APERTURE	60 mm Ø	60 mm Ø	70 mm Ø	QB/QBH fiber adaptor	
COOLING METHOD	Water-cooled	Water-cooled	Water-cooled	Water-cooled	
MEASUREMENT CAPABILITY					
Spectral range	0.8 - 12 µm	0.8 - 12 µm	0.8 - 12 µm	0.8 - 12 μm	
Calibrated spectral range <sup>a</sup>	0.8 - 2.1 µm	0.8 - 2.1 µm 0.8 - 2.1 µm		0.8 - 2.1 µm	
Noise equivalent power <sup>b</sup>	10 W	15 W	15 W	15 W	
Minimum average power °	300 W	500 W	500 W	500 W	
Rise time (nominal)	12 s	15 s	15 s	15 s	
Back reflections	10 %	5 - 10 %	1 - 2%	1 - 2%	
Calibration uncertainty	± 5% at 1064 nm & 1070 nm	± 5% at 1064 nm & 1070 nm	± 5% at 1064 nm & 1070 nm	± 5% at 1064 nm & 1070 nm	
Repeatability	± 2%	±2%	±2%	± 2%	
Linearity with power	± 2%	±2%	±2%	± 2%	
Linearity with beam diameter	± 2.0%	± 2.5%	± 2.5%	± 2.5%	
Linearity with beam position <sup>d</sup>	± 3.0 %	±4.0%	±4.0%	± 4.0 %	
DAMAGE THRESHOLDS					
Maximum average power density <sup>e</sup>					
1 kW	70 kW/cm <sup>2</sup>	70 kW/cm <sup>2</sup>	kW/cm <sup>2</sup> 70 kW/cm <sup>2</sup>		
5 kW	35 kW/cm <sup>2</sup>	35 kW/cm <sup>2</sup>	35 kW/cm <sup>2</sup>	35 kW/cm <sup>2</sup>	
10 kW	20 kW/cm <sup>2</sup>	20 kW/cm <sup>2</sup>	20 kW/cm <sup>2</sup>	20 kW/cm <sup>2</sup>	
15 kW		10 kW/cm <sup>2</sup>	10 kW/cm <sup>2</sup>	10 kW/cm <sup>2</sup>	
PHYSICAL CHARACTERISTICS					
Effective aperture	60 mm Ø	60 mm Ø	70 mm Ø tube aperture	QB/QBH fiber adaptor	
Absorber	GD (cone reflector)	GD (cone reflector)	GD (cone reflector)	GD (cone reflector)	
Cooling water					
Required cooling flow <sup>f</sup>	(6 - 8) LPM < ±1 LPM/min	(8 - 10) LPM < ± 1 LPM/min	(8 - 10) LPM < ± 1 LPM/min	(8 - 10) LPM < ± 1 LPM/min	
Temperature range	15 - 25 °C	15 - 25 °C	15 - 25 °C	15 - 25 °C	
Rate of temperature change	< ± 3°C/min	< ± 3°C/min	< ± 3°C/min	< ± 3°C/min	
Maximum water pressure (input)	413 kPa (60 psi)	413 kPa (60 psi)	413 kPa (60 psi)	413 kPa (60 psi)	
Dimensions	127H x 127W x 95D mm	153H x 153W x 97D mm	153H x 153W x 302D mm	153H x 153W x 302D mm	
Weight	6 kg	10 kg	15 kg	15 kg	
ORDERING INFORMATION					
Available output options	DB15 & USB or Bluetooth & USB	DB15 & USB or Bluetooth & USB	DB15 & USB or Bluetooth & USB	DB15 & USB or Bluetooth & USB	
Compatible stand	STAND-S-443-C	2x STAND-S-443-C	3x STAND-S-443-C	3x STAND-S-443-C	
Product page					

a. Calibrations at 2.1 to 2.5  $\mu m$  and 10.6  $\mu m$  are available on special request.

b. Nominal value, actual value depends on electrical noise in the measurement system.
c. For lower powers, call your Centec-EO representative.
d. For a beam size of 20 % of the aperture area, moved across 80 % of the aperture area.

At 1064 nm, 1.07-1.08 µm and 10.6 µm, for beams < 50 mm Ø.</li>
 f. >1 min. contact Gentec-EO for deionized water cooling module option.

ENERGY DETECTORS

# Up to 125 x 125 mm, 100 W - 15 kW



#### **OUTPUT OPTIONS**

> **SMART DB15 CONNECTOR** Contains all the calibration data

#### > USB PORT

• Connects directly to a PC

- Included in all HP models
- BLU WIRELESS METER > Connects via Bluetooth to a PC

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO



TUNER



#### ACCESSORIES





Water filter (Metric: 202984, Imperial: 202990)



Extension cables (4, 15, 20 or 25 m)\*



Pelican carrying case

\*A USB power adaptor will be necessary if the HP is used with a DB15 extension cable.



5 m USB cable (Included)









> TRACK WATER PARAMETERS Water flow and temperature are monitored in real time

and displayed continuously

output for direct connection to a PC

DIRECT USB CONNECTION TO A PC Each head comes with both a DB15 connector

**KEY FEATURES** 

**HIGH POWER HANDLING** 

powers (See SUPER HP)

request (See SUPER HP)

LARGE APERTURE

Handles up to 15 kW of continuous power with our standard models. Custom models available for higher

Our standard HP models have very large effectives apertures to accomodate large laser beams. Larger

apertures with various shapes are available upon

> AVAILABLE WITH YAG AND CO, CALIBRATIONS All HP Models can be calibrated at YAG and CO, wavelengths with a calibration uncertainty of  $\pm 5\%$ 

(for use with a Gentec-EO display device) and a USB

>

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	HP100A-4KW-HE	HP100A-4KW-	HP100A-12KW-HD	HP100A-12KW-	HP125A-15KW-HD	HP125A-15KW-
MAX AVERAGE POWER	4000 W	4000 W	12 000 W	12 000 W	15 000 W	15 000 W
EFFECTIVE APERTURE	100 mm Ø	70 mm Ø	100 mm Ø	70 mm Ø	125 x 125 mm	70 mm Ø
COOLING METHOD	Water-cooled	Water-cooled	Water-cooled	Water-cooled	Water-cooled	Water-cooled
MEASUREMENT CAPABILITY						
Spectral range	0.19 - 20 µm					
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 µm					
Noise equivalent power <sup>b</sup>	±3W	± 3 W	±10 W	±10 W	± 15 W	± 15 W
Minimum average power <sup>c</sup>	100 W	100 W	300 W	300 W	500 W	500 W
Rise time (nominal)	7 s	7 s	9 s	9 s	15 s	15 s
Back reflections	10-15%	< 4 %	10 - 15%	< 4%	10 - 15%	2 - 4%
Calibration uncertainty <sup>d</sup>	± 5	± 5%	±5%	± 5%	±5%	± 5%
Repeatability	± 2%	± 2%	± 2%	± 2%	± 2%	± 2%
Linearity with power	± 1.5%	± 1.5%	± 1.5%	± 1.5%	± 2%	± 2%
Linearity vs beam diameter	±1%	±1%	±1%	±1%	±1%	±1%
Linearity vs beam position $^\circ$	± 1.7%	±1.7%	± 1.7%	± 1.7%	±1.0%	± 1.0 %
DAMAGE THRESHOLDS						
Maximum average power density	f					
500 W	10 kW/cm <sup>2</sup>	10 kW/cm <sup>2</sup>	16 kW/cm <sup>2</sup>	16 kW/cm <sup>2</sup>	16 kW/cm <sup>2</sup>	16 kW/cm <sup>2</sup>
4 kW	4 kW/cm <sup>2</sup>	4 kW/cm <sup>2</sup>				
5 kW			6.5 kW/cm <sup>2</sup>	6.5 kW/cm <sup>2</sup>	6.5 kW/cm <sup>2</sup>	6.5 kW/cm <sup>2</sup>
10 kW			3.5 kW/cm <sup>2</sup>	3.5 kW/cm <sup>2</sup>	3.5 kW/cm <sup>2</sup>	3.5 kW/cm <sup>2</sup>
15 kW					1.5 kW/cm <sup>2</sup>	1.5 kW/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS						
Effective aperture	100 mm Ø	70 mm Ø	100 mm Ø	70 mm Ø	125 x 125 mm	70 mm
Absorber (high damage threshold)	HE	HE	HD	HD	HD	HD
Cooling water						
Required cooling flow <sup>g</sup>	(4 - 6) LPM < ± 1 LPM/min	(4 - 6) LPM < ± 1 LPM/min	(6 - 10) LPM < ± 1 LPM/min	(6 - 10) LPM < ± 1 LPM/min	(8 - 10) LPM < ± 1 LPM/min	(8 - 10) LPM < ± 1 LPM/min
Temperature range	15 - 25 °C					
Rate of temperature change	< ± 3°C/min					
Maximum water pressure (input	) 413 kPa (60 psi)	413 kPa (60 psi)	413 kPa (60 psi)	413 kPa (60 psi)	413 kPa (60 psi)	413 kPa (60 psi)
Dimensions	127H x 127W x 74D mm	127H x 127W x 234D mm	127H x 127W x 70D mm	127H x 127W x 230D mm	153H x 153W x 70D mm	153H x 153W x 272D mm
Weight (head only)	1.8 kg	6.0 kg	3.3 kg	7.5 kg	5 kg	10 kg
ORDERING INFORMATION						
Available output options	DB15 & USB or Bluetooth & USB					
Compatible stand	STAND-S-443-C	2x STAND-S-443-C	STAND-S-443-C	2x STAND-S-443-C	2x STAND-S-443-C	3x STAND-S-443-C
Product page						

a. Calibrations at 2.1 to 2.5 µm and 10.6 µm are available on special request.
b. Nominal value, actual value depends on electrical noise in the measurement system.
c. For lower powers, call your Gentec-EO representative.
d. At 1064 nm and 1070 nm
e. For a beam size of 20% of the aperture area, moved across 80% of the aperture area.
f. At 1064 nm, 1.07-1.08 µm and 10.6 µm.
a. Contact Contex EO reducing divator cooling module option

g. >1 min. Contact Gentec-EO for deionized water cooling module option.



CUSTOM / OEM PRODUCTS

## SUPER HP Custom sizes and shapes, up to 120 000 W upon request



#### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- USB PORT
  - Connects directly to a PC
  - Included in all HP models

#### **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



MAESTRO



TUNER

#### **KEY FEATURES**

THE HIGHEST POWER HANDLING Custom models handle up to 120 000 W of continuous power

#### INFINITE CUSTOMIZATION CAPABILITIES

- 1. Choose YOUR size
- 2. Choose YOUR maximum power
- 3. We will customize one just for you!

#### COMPACT AND LIGHT WEIGHT

Lighter and more compact than any other high power detector on the market, thanks to our unique design

- AVAILABLE WITH YAC AND CO<sub>2</sub> CALIBRATIONS All HP models can be calibrated at YAC and CO<sub>2</sub> wavelengths with a calibration uncertainty of ± 5%
- DIRECT USB CONNECTION TO A PC Each head comes with both a DB15 connector (for use with a Gentec-EO display device) and a USB2.0 output
- for direct connection to a PC. Other connectors available upon request
   TRACK WATER PARAMETERS
  - Water flow and temperature are monitored in real time and displayed continuously
- HIGH POWER NIST-TRACEABLE CALIBRATION WITH A 5 KW FIBER LASER



UNO

#### ACCESSORIES



Stand with steel post For 30 kW model



Pelican carrying case



Extension cables (4, 15, 20 or 25 m)



5 m USB cable (Included)





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	HP280A-30KW-HD		CUSTOMIZATION CAPABILITIES
MAX AVERAGE POWER	30 000 W	50 000 W	Up to 120 000 W
EFFECTIVE APERTURE	280 x 280 mm	100 mm Ø	Up to 500 x 500 mm
COOLING METHOD	Water-cooled	Water-cooled	Water-cooled
MEASUREMENT CAPABILITY			
Spectral range	0.19 - 20 µm	0.8 – 12 µm	0.19 - 20 µm
Calibrated spectral range <sup>a</sup>	1.064 - 1.070 µm	1.030 - 1.080 µm	1.064 - 1.070 µm
Noise equivalent power <sup>b</sup>	± 30 W	± 200 W	Adapted to maximum power
Minimum average power °	1000 W	1000 W	Adapted to maximum power
Rise time (nominal)	25 s	80 s	≤ 45 s
Back reflections	10-15%	< 2.5 %	Depends on the design
Calibration uncertainty <sup>d</sup>	± 5%	± 5 %	± 5%
Repeatability	± 2%	± 2 %	± 2%
Linearity with power	± 2%	± 2 %	± 2%
DAMAGE THRESHOLDS			
Maximum average power density °			
10 kW	2.5 kW/cm <sup>2</sup>	25 kW/cm <sup>2</sup>	2.5 kW/cm <sup>2</sup>
30 kW	0.2 kW/cm <sup>2</sup>	11 kW/cm <sup>2</sup>	0.2 kW/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS			
Effective aperture	280 x 280 mm	100 mm Ø	Square apertures up to 400 x 400 mm Rectangular and round apertures also available
Absorber (high damage threshold)	HD	GD	HD
Cooling water			
Required cooling flow	0-30 kW: (15 - 18) LPM < ± 1 LPM/min <sup>f</sup> 0-10 kW: (12-15) LPM < ± 1 LPM/min <sup>f</sup>	(18 - 25) LPM < ± 1 LPM/min	Adapted to maximum power
Temperature range	15 - 25 °C	15 - 25 °C	15 - 25 °C
Rate of temperature change	<±3°C/min	< ± 1°C/min	<±3°C/min
Dimensions	314H x 324W x 89D mm	305H x 324W x 197D mm	
Weight (head only)	20 kg	60 kg	
ORDERING INFORMATION			
Available output options	DB15 & USB	DB15 & USB	DB15 & USB
Compatible stand	STAND HP280A-30KW-HD	Ask	Ask
Product page			

\* These products are custom-built. Contact us with your requirements for a version tailored to your needs.

a. Calibrations at 0.248 to 2.5 µm and 10.6 µm are available on special request.
b. Nominal value, actual value depends on electrical noise in the measurement system.
c. For lower powers, call your Gentec-EO representative.
d. At 1064 nm and 1070 nm.
e. At 1064 nm, 1.07-1.08 µm and 10.6 µm.
f. > 1min

CUSTOM / OEM PRODUCTS

ENERGY DETECTORS

BEAM PROFILING

TERAHERTZ DETECTORS

DISPLAYS & PC INTERFACES

# HIGH-POWER PRONTO

High damage threshold broadband absorber 5' soft cable for easy positionning Rugged casing Removable handle compact size with 1/4-20 mounting hole for post 8-32 mounting hole for post Color LCD display with USB connector for: touch screen controls Battery charging On/Off Data transfer to PC Internet upgrades and main menu

#### **KEY FEATURES**

#### > WIDE POWER RANGE

Very low noise level = wide power range with just one device

CONTINUOUS READINGS AT LOW POWERS The PRONTO-500 includes a continuous power mode (CWP) for measurements up to 40 W.

#### > NO-WAIT MEASUREMENTS

5 seconds measurements allow for very short cooling time (all models except PRONTO-3K)

#### > EASY TO USE

The color LCD touchscreen allows for a friendly user interface. You can make a measurement with just the touch of a button!

#### > DATA LOGGING

Save your data to the internal memory and then transfer them to your PC over the USB connection.

#### > LARGE APERTURE

55 mm Ø aperture to accommodate large beams

#### RUGGED

- All-metal body
- High damage thresholds

#### > SERIAL COMMANDS

Serial commands are available to let you take full control of your PRONTO from your PC.

#### **USER INTERFACES (SSP MODE)**



#### ACCESSORIES





Stand with steel post

Pelican carrying case

# HIGH-POWER PRONTO Specifications

CE	NIST*	
	Traceable	COMPLIAN
*Also	traceable to NRC-	-CNR(

			1.		100		12.	
	PRONTO-5	600	PRONTO-	3K	PRONTO-	6K	PRONTO	-10K
MAX AVERAGE POWER								
	E00 W/		7000 W/		6000 W		10.000 W/	
CMD Marker (Measures Power in 5 s)	500 W		5000 W					
CWP MODE (Measures Power continuously)	40 W		N/A		N/A		N/A	
EFFECTIVE APERTURE	55 mm Ø		55 mm Ø		55 mm Ø		55 mm Ø	
COOLING METHOD	Convection		Convection		Convection		Convection	
MEASUREMENT CAPABILITY								
Spectral range	0.19 - 20 µm		0.19 - 20 µm		0.19 - 20 µm		0.19 - 20 µm	
Calibrated spectral range <sup>a</sup>	0.248 - 2.5 µm		0.248 - 2.5 µm	1	0.248 - 2.5 µm	1	0.248 - 2.5 µı	m
Noise equivalent power	0.1 W		5 W		20 W		30 W	
Exposure time	5 s <sup>b</sup>		10 s		5 s		5 s	
Calibration uncertainty	± 3% (± 2.5% in	CWP mode)	±5%		±5%		±5%	
Number of readings before cooling <sup>c</sup>	100 W	25 (200 s)	0.5 kW	6 (72 s)	1 kW	6 (36 s)	1 kW	10 (60 s)
(Maximum exposure time before cooling)	200 W	12 (100 s)	1 kW	3 (36 s)	2 kW	3 (18 s)	2 kW	5 (30 s)
	300 W	8 (60 s)	1.5 kW	2 (24 s)	3 kW	2 (12 s)	5 kW	2 (12 s)
	500 W	5 (40 s)	3 kW	1 (12 s)	6 kW	1 (6 s)	10 kW	1 (6 s)
DAMAGE THRESHOLDS								
Maximum average power density								
1064 nm, 100 W, CW	25 kW/cm <sup>2</sup>							
1064 nm, 500 W, CW	5 kW/cm <sup>2</sup>		7 kW/cm <sup>2</sup>					
1064 nm, 3000 W, CW			5 kW/cm <sup>2</sup>		8 kW/cm <sup>2</sup>			
1064 nm, 6000 W, CW					7 kW/cm <sup>2</sup>		7 kW/cm <sup>2</sup>	
1064 nm, 10 000 W, CW					-		5.5 kW/cm <sup>2</sup>	
Maximum allowable casing temperature	65 °C		65 °C		75 °C		75 °C	
GENERAL SPECIFICATIONS								
Display type	Touchscreen c	olor LCD	Touchscreen o	color LCD	Touchscreen	color LCD	Touchscreen	color LCD
Display size	28.0 x 35.0 mn	n (128 x 160 pixels)	28.0 x 35.0 mm (128 x 160 pixels)		28.0 x 35.0 mm (128 x 160 pixels)		28.0 x 35.0 mm (128 x 160 pixels)	
Data storage	50 000 pts		50 000 pts		50 000 pts		50 000 pts	
Battery type	Rechargeable	Li-ion	Rechargeable	e Li-ion	Rechargeable Li-ion		Rechargeable Li-ion	
Battery life	With brightnes	00 measurements ss set at 25%)	With brightne	200 measurements ess set at 25%)	17 hours or 4 200 measurements (with brightness set at 25%)		(with brightness set at 25%)	
Battery recharge via	USB port		USB port		USB port		USB port	
PHYSICAL CHARACTERISTICS								
Effective aperture	55 mm Ø		55 mm Ø		55 mm Ø		55 mm Ø	
Dimensions (sensor head)	88W x 88L x	32D mm	88W x 88L x	( 43D mm	88W x 88L x 36D mm		88W x 88L	x 46D mm
Dimensions (monitor)	41W x 140L x 16	D mm	41W x 140L x 1	6D mm	41W x 140L x 1	6D mm	41W x 140L x	16D mm
Weight	930 g		1240 g		1520 g		2150 g	
ORDERING INFORMATION								
Compatible stand	STAND-S-443		STAND-S-443		STAND-S-443		STAND-S-44	3
Product page	回激制			( <u>)</u>			回線影	迴
	2.00	ē.	<u> </u>		18. E B	2		<b>.</b>
			12766	<u> </u>	教授会	2		
		23	0646	HS	回添佛	晟	回頭管	18 18

a. b.

For calibration at 10.6  $\mu$ m, add CO2-CAL-UP-2 to the order Response time in CWP mode is 2 s. Assuming an exposure time of 8 seconds and for 25°C starting temperature. C.

57

ENERGY DETECTORS

**BEAM PROFILING** 

TERAHERTZ DETECTORS

DISPLAYS & PC INTERFACES



#### **REDUCE BACK-REFLECTIONS**

All BD models can be fitted with a water-cooled absorbing TUBE to reduce the back-reflections below 4 %. The TUBE extension is backward-compatible so it can be added to your current BD unit.



#### **KEY FEATURES**

> EASY TO USE Just plug the water-cooling and you're done!

#### 2 MODELS TO CHOOSE FROM

- 4 kW : BD-4KW-HE
- 12 kW : BD-12KW-HD
- VERY LARGE APERTURE The round aperture of 100 mm in diameter
- HIGH DAMAGE THRESHOLDS Up to 16 kW/cm<sup>2</sup> (at 500 W)
- ISOLATION TUBE IN OPTION It is possible to add an isolation tube to reduce back reflections

accommodates even the largest beams

#### ACCESSORIES







Pelican carrying case



Water filter (Metric: 202984, Imperial: 202990)









	BD-4KW-HE	BD-12KW-HD	ER D
MAX AVERAGE POWER (CONTINUOUS / 2 MINUTES)	4000 W / 4500 W	12 000 W / 12 000 W	ETECT
EFFECTIVE APERTURE	100 mm Ø	100 mm Ø	ORS
COOLING METHOD	Water-cooled	Water-cooled	
DAMAGE THRESHOLDS			
Maximum average power density <sup>a</sup>			п
500 W	10 kW/cm <sup>2</sup>	16 kW/cm <sup>2</sup>	Z
4 kW	4 kW/cm <sup>2</sup>		GYI
5 kW		6.5 kW/cm <sup>2</sup>	DETI
10 kW		3.5 kW/cm <sup>2</sup>	ECTO
PHYSICAL CHARACTERISTICS			ORS
Effective aperture	100 mm Ø	100 mm Ø	
Absorber (high damage threshold)	HE	HD	
Cooling water			
Required cooling flow	(4 - 6) LPM	(6 - 10) LPM	BEA
Temperature range	(15 - 25) °C	(15 - 25) °C	M PF
Dimensions	127H x 127W x 74D mm	127H x 127W x 70D mm	ROFI
Weight (head only)	1.8 kg	3.3 kg	LINO
ORDERING INFORMATION			٢,
Compatible stand	STAND-S-443-C	STAND-S-443-C	
Product page	国教授权国 法述法律教师		TE



a. At 1064 nm, 1.07-1.08  $\mu m$  and 10.6  $\mu m.$ 

### H, HD AND HE ABSORBERS



### **VP ABSORBER**



**WABSORBER** 



61

20%

10%

0% 0.1

1 Wavelength (µm)

### PH100-SI-HA maximum power



### PH100-SIUV maximum power



### PH20-GE maximum power



### **PRONTO-SI** maximum power



# ENERGY DETECTOR



## **PE: PHOTODETECTORS**



- Available in 3 sizes:
  - 3 mm Ø
  - 5 mm Ø
  - 10 mm Ø
- 3 choices of absorber for different wavelength ranges: Silicon
  - Germanium
  - InGaAs
- Extremely low noise: as low as 8 fJ
- LOWEST NOISE LEVEL OF ALL ENERGY DETECTORS



## QE-B: HIGH-SENSITIVITY PYROELECTRIC DETECTORS

Our pyroelectric energy detectors have very low noise levels combined with a large bandwidth. They have everything you need to accurately measure extremely low energy from the DUV to the FIR.

- 8 mm Ø aperture
- 2 choices of absorber:

MT: Fast response and high sensitivity BL: Flat spectral response

- Broadband, from the DUV to the FIR
- Very low noise: as low as 50 nJ
- MEASURE LOW ENERGY AT ANY WAVELENGTH



## MACH 6: MEASURE ALL PULSES UP TO 200 KHZ

- High-speed digital joulemeter: Measures EVERY PULSE at 200 kHz
- Capture and store up to 4 million pulses at the maximum repetition rate
- Track missing pulses and pulses below threshold
- Wide energy range: measure from pJ to mJ
- 200 kHz ENERGY METER

# ENERGY DETECTORS

integra

General use energy detectors

New Prod

### Available with **QE-MB**

Pyroelectric energy meters cover a very wide range, going from nanojoules to several tens of joules per pulse. Our standard absorber offers high damage thresholds and a spectrally flat response, making this series of energy detectors a versatile solution that can cover most of your energy measurement needs.

- Broadband absorber with high damage thresholds
- Available in 7 sizes:
  - 12 x 12 mm
     95 mm Ø

     25 x 25 mm
     NEW 145 mm Ø

     50 x 50 mm
     NEW 195 mm Ø

     65 x 65 mm
     NEW 195 mm Ø
- Available with 2 cooling modules:

Convection (S) Heatsink (H)

THE WIDEST RANGE OF LASER ENERGY MEASUREMENT



Designed for pulsed lasers with high repetition rates, these energy detectors feature an improved temporal response to accurately measure pulse-to-pulse energy at high repetition rates up to 10 kHz.

- Fast response, broadband absorber
- Available in 3 sizes:
  - 12 x 12 mm 25 x 25 mm 50 x 50 mm
- Available with 2 cooling modules: Convection (S) Heatsink (H)
- UP TO 10 KHZ REPETITION RATE



### **COMPARISON TABLE - ENERGY MEASUREMENT**



\* QED models are represented by dashed area and have a limited spectral range: 0.3 - 2.1 µm

# ENERGY DETECTORS

The QED attenuators increase the maximum energy, energy density, average power and average power density that the QE series detectors can handle. They are engineered to typically transmit 30-50 % (at 1064 nm) of the incident radiation to the detector in a near Lambertian pattern (very wide diffusion pattern). Their slide-in casing make them easy to install and remove and they are held securely in place with the use of simple set screws. Since they become part of the detector, it is important to understand how they will affect the calibration.

### **CALIBRATION OPTIONS**

Depending on how you plan to use a QE detector and QED attenuator, different purchasing and calibration options are available.

#### QE detector with QED attenuator included



Product name contains "-QED" Ex: QE25LP-S-MB-**QED**-D0

This product is calibrated with the QED attenuator in place. You may remove the attenuator, but your measurements will not be calibrated with this configuration.

#### QE detector and QED attenuator purchased separately





Product name does not contain "-QED" Ex: QE25LP-S-MB-D0 and QED-25

Three calibration options are available when you purchase the QE detector and the QED attenuator separately.

	FULL CALIBRATION The detector is fully	PARTIAL CALIBRATION The detector is fully	NO EXTRA CALIBRATION The QE detector is fully
	calibrated both with and without attenuator. This configuration comes with a DB15 adaptor. • QED-CAL-3	calibrated without attenuator, and is calibrated at a single wavelength with the attenuator. • QED-CAL-1	calibrated without attenuator only. You may add the attenuator, but your measurements will not be calibrated with this configuration.
Detector alone	Fully calibrated	Fully calibrated	Fully calibrated
Detector with attenuator	Fully calibrated when using the DB15 adaptor	Calibrated at 1064 nm only	Not calibrated

### **SPECIFICATIONS**

PHYSICAL CHARACTERISTICS	QED-12	QED-25	QED-50	QED-65	QED-95
Spectral range	266 - 2100 nm	266 - 2100 nm	266 - 2100 nm	266 - 2100 nm	266 - 2100 nm
Calibrated spectral range	532 - 2100 nm	308 - 2100 nm	308 - 2100 nm	308 - 2100 nm	308 - 2100 nm
Effective aperture	9 x 9 mm	22 x 22 mm	47 x 47 mm	62 x 62 mm	90 mm Ø
Dimensions	30.5H x 41W x 12.5D mm	44H x 55W x 12.5D mm	69H x 80W x 12.5D mm	85H x 97W x 12.5D mm	115H x 127W x 12.5D mm
For use with	QE12	QE25	QE50	QE65	QE95

## ENERGY DETECTORS High energy detectors



### **IS50: ENERGY METER FOR HIGH AVERAGE POWER**

Custom-built to your specifications, contact us with your laser measurement needs

- Designed for high energy measurements at high repetition rates
- Can handle up to 1000 W average power
- Our proprietary coating offers damage thresholds that are orders of magnitude higher than any other "white" coating on the market.
- IDEAL FOR IPL SOURCES: UP TO 350 J



Available with

## THERMOPILES IN SINGLE-SHOT ENERGY MODE

MEASURE ENERGY WITH A POWER DETECTOR

The single-shot energy mode, available with all our thermal power detectors, allows you to measure the energy of single pulses or pulse trains.

SEE "ENERGY MODE" IN THE POWER DETECTOR SPECIFICATIONS



### PRONTO-500-IPL

- Compact energy meter for up to 350 J
- 55 mm Ø aperture
- Color touchscreen display
- Rugged device: all-metal body and protective window
- IDEAL FOR IPL SOURCES: UP TO 350 J



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

## CUSTOM CALORIMETERS

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 ratios .
- High sensitivity .
- Vacuum compatibility
- Attention to detail 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. CUSTOM / OEM PRODUCTS

## 8/1 - 150 nJ, our lowest energy measurements



#### **OUTPUT OPTIONS**

- > SMART INTERFACE Containing all the calibration data
- > ANALOG OUTPUT When used with APM (D) analog power supply

> integra ALL-IN-ONE-METER Connects directly to a PC

Three models available:

- USB output (-INT)
- RS-232 output (-IDR)
- USB with external trigger (-INE)

#### **COMPATIBLE DISPLAYS & PC INTERFACES**





U-LINK



M-LINK



S-LINK

**KEY FEATURES** 

#### > VERY LOW NOISE LEVEL

Take measurements with a noise level as low as 8 fJ (model PE3B-Si only) with the M-LINK, MAESTRO and S-LINK

#### > 3 SENSORS AVAILABLE

- PE-B-SI family: 3 and 10 mm Ø silicon sensors for 0.21 to 1.08 µm
- PE5B-GE: 5 mm Ø, germanium sensor for 0.8 to 1.65 µm
- PE3B-IN: 3 mm Ø, InGaAs sensor for 0.9 to 1.7  $\mu m$

#### ACCESSORIES



Stand with delrin post



Fiber adaptors & connectors (FC, ST or SMA)



Pelican carrying case



Isolation tube



APM (D) analog power supply



	PE3B-SI-D0	PE10B-SI-D0	PE5B-GE-D0	PE3B-IN-D0
MAX MEASURABLE ENERGY*	24 pJ	81 nJ	2.4 nJ	245 pJ
EFFECTIVE APERTURE	3 mm Ø	10 mm Ø	5 mm Ø	3 mm Ø
MEASUREMENT CAPABILITY				
Calibrated spectral range	210 - 1080 nm	210 - 1080 nm	800 - 1650 nm	900 - 1700 nm
Maximum measurable energy*				
With M-LINK	22 pJ at 634 nm	75 nJ at 634 nm	2.2 nJ at 1310 nm	223 pJ at 1310 nm
With S-LINK	24 pJ at 634 nm	81 nJ at 634 nm	2.4 nJ at 1310 nm	245 pJ at 1310 nm
With MAESTRO	20 pJ at 634 nm	69 nJ at 634 nm	2.0 nJ at 1310 nm	200 pJ at 1310 nm
With INTEGRA	24 pJ at 634 nm	81 nJ at 634 nm	2.4 nJ at 1310 nm	245 pJ at 1310 nm
Noise equivalent energy <sup>a</sup>	8 fJ at 634 nm	1.5 pJ at 634 nm	1 pJ at 1310 nm	30 fJ at 1310 nm
Rise time (0-100%)	15 µs	30 µs	25 µs	12 µs
Max repetition rate	1000 Hz	1000 Hz	1000 Hz	1000 Hz
Max pulse width	10 µs	10 µs	10 µs	10 µs
Calibration uncertainty <sup>b</sup>	±4% °	± 18% (210 - 229 nm)	± 5% (800 - 1049 nm)	± 4% <sup>d</sup>
		± 8.0% (230 - 254 nm)	± 3.5% (1050 - 1559 nm)	
		± 6.5% (255 - 399 nm)	± 7% (1560 - 1629 nm)	
		± 2.5% (400 - 899 nm)	± 10% (1630 - 1650 nm)	
		± 4.0% (900 - 1009 nm)		
		± 7.5% (1010 - 1080 nm)		
DAMAGE THRESHOLDS				
Max energy density	N/A	5 μJ/cm²	5 µJ/cm <sup>2</sup>	N/A
Max average power density	N/A	65 mW/cm <sup>2</sup> at 532 nm	320 mW/cm <sup>2</sup> at 1064 nm	N/A
PHYSICAL CHARACTERISTICS				
Effective aperture	3 mm Ø	10 mm Ø	5 mm Ø	3 mm Ø
Distance to sensor face	13.7 mm	13.7 mm	10.5 mm	N/A
Sensor	UV-silicon	UV-silicon	Germanium	InGaAs
Dimensions	38.1Ø x 27.4D mm	38.1Ø x 27.4D mm	38.1Ø x 27.4D mm	38.1Ø x 27.4D mm
Weight	91 g	91 g	91 g	91 g
ORDERING INFORMATION				
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-233 or STAND-D-233-M	STAND-D-233 or STAND-D-233-M	STAND-D-233 or STAND-D-233-M	STAND-D-233 or STAND-D-233-M
Product page				

\* See curves (p. 102-103) for maximum energy at other wavelengths

a. Nominal value. Depends on environmental electromagnetic interference and wavelength.
b. With Gentec-EO display or PC interface.
c. This detector is NIST Traceable at the calibration wavelength of 634 nm. Typical values are used at other wavelengths.
d. This detector is NIST Traceable at the calibration wavelength of 1310 nm. Typical values are used at other wavelengths.



#### **OUTPUT OPTIONS**

- > SMART INTERFACE Containing all the calibration data
- > ANALOG OUTPUT When used with APM (D) analog power supply

integra ALL-IN-ONE-METER Connects directly to a PC

- USB output (-INT)
- RS-232 output (-IDR)
- USB with external trigger (-INE)

#### **COMPATIBLE DISPLAYS & PC INTERFACES**







#### **KEY FEATURES**

#### > VERY LOW NOISE LEVELS

Noise levels of a photodetector, but with the high energies of a pyroelectric:

- 50 nJ with the MT coating
- 100 nJ with the BL coating

#### 2 COATINGS AVAILABLE

- BL: Black coating, sensitivity of 900 V/J, readings up to 400 Hz
- MT: Metallic coating, sensitivity of 2400 V/J, readings up to 1000 Hz

#### ACCESSORIES



Stand with delrin post



Pelican carrying case





Fiber adaptors & connectors APM (D) analog power supply





>





Isolation tube









	QE8SP-B-BL	QE8SP-B-MT	
MAX MEASURABLE ENERGY	3.6 mJ	1.3 mJ	
MAX REPETITION FREQUENCY	400 Hz	1000 Hz	
EFFECTIVE APERTURE	7.8 X 7.8 mm	7.8 X 7.8 mm	
MEASUREMENT CAPABILITY			
Spectral range	0.19 - 20 µm	0.19 - 20 μm	
Calibrated spectral range <sup>a</sup>	0.248 - 2.1 µm	0.248 - 2.1 µm	
Max measurable energy			
With U-LINK	3.6 mJ	1.3 mJ	
With S-LINK	2.9 mJ	1.1 mJ	
With MAESTRO	2.5 mJ	0.93 mJ	
Noise equivalent energy			
With U-LINK	150 nJ	80 nJ	
With S-LINK	100 nJ	50 nJ	
With MAESTRO	150 nJ	80 nJ	
Max repetition frequency	400 Hz	1000 Hz	
Max pulse width	10 µs	10 µs	
Risetime (0-100%)	30 µs	30 µs	
Calibration uncertainty	± 4.0%	±4.0%	
Repeatability	< 0.5%	< 0.5%	
DAMAGE THRESHOLDS			
Maximum average power	0.5 W	0.5 W	
Maximum everage power density			
1064 nm, 7 ns, 10 Hz	1 W/cm <sup>2</sup>	1 W/cm <sup>2</sup>	
Maximum energy density			
1064 nm, 7 ns, 10 Hz	50 mJ/cm <sup>2</sup>	50 mJ/cm <sup>2</sup>	
PHYSICAL CHARACTERISTICS			
Effective aperture	7.8 x 7.8 mm	7.8 x 7.8 mm	
Absorber	Organic black	Metallic	
Dimensions	38.1 Ø X 27.4D mm	38.1 Ø X 27.4D mm	
Weight	91 g	91 g	
ORDERING INFORMATION			
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	
Compatible stand	STAND-D-233 or STAND-D-233-M	STAND-D-233 or STAND-D-233-M	
Product page			

a. Calibration at 2.1 to 2.5  $\mu m$  is available on special request.

# 200 kHz energy meter



#### **COMPATIBLE DISPLAYS & PC INTERFACES**





MACH 6

APM

#### **KEY FEATURES**

- > UP TO 200 kHz PULSE-TO-PULSE Measure EVERY pulse, with no sampling, at high rep rates, up to 200 kHz
- > **CAPTURE AND STORE UP TO 4 MILLION PULSES** Store 40 seconds of data at 100 kHz
- > TRACK MISSING PULSES AND PULSES BELOW THRESHOLD

Know how many pulses were missed or that didn't make the energy threshold with this unique pulse feature

- > SEVERAL HEADS TO CHOOSE FROM Silicon, InGaAs and pyroelectric heads for a broad wavelength and energy range
- > ANALOG MODULE AVAILABLE Use our fast M6 detectors with the APM and an oscilloscope for fast analog energy measurements
- > **FULL-SPEED USB 2.0 CONNECTION** Ensures high data rate transfer and fast operation

#### > USER-FRIENDLY SOFTWARE WITH MANY **DIAGNOSTIC FEATURES**

- Live mode, strip chart, histogram and statistics displays
- FFT display of pulse energy data for temporal diagnostics
- Life test mode to automate laser testing

gentec-eo.com/laser-energy-meter



ACCESSORIES





Stand with delrin post

Additional 9V power supply









M6-UV-QED Relative measurements in UV



Pelican carrying case






	M6-6-SI	M6-6-SI-L	M6-6-IN	M6-6-IN-L	M6-6-PY	M6-12.5-PY
MAX ENERGY <sup>a</sup>	200 µJ	2 µJ	200 µJ	2 µJ	2 mJ	20 mJ
MAX AVERAGE POWER	5 W	5 W	5 W	5 W	5 W	25 W
MAX REP RATE	200 000 Hz	200 000 Hz	200 000 Hz	200 000 Hz	200 000 Hz	200 000 Hz
EFFECTIVE APERTURE	6 mm Ø	6 mm Ø	6 mm Ø	6 mm Ø	6 mm Ø	12.5 mm Ø
MEASUREMENT CAPABILITY						
Spectral range	0.35 - 1.1 µm	0.35 - 1.1 μm	0.9 - 1.6 µm	0.9 - 1.6 µm	0.35 - 2.5 µm	0.35 - 2.5 µm
Max measurable energy <sup>a</sup>	200 µJ	2 µJ	200 µJ	2 µJ	2 mJ	20 mJ
Noise equivalent energy	2 nJ	20 pJ	2 nJ	20 pJ	0.2 µJ	0.2 µJ
Rise time (0-100%)	150 ns	150 ns	150 ns	150 ns	150 ns	150 ns
Max repetition rate	200 000 Hz	200 000 Hz	200 000 Hz	200 000 Hz	200 000 Hz	200 000 Hz
Max pulse width	100 ns	100 ns	100 ns	100 ns	100 ns	100 ns
Calibration uncertainty	± 4%	±4%	±4%	±4%	±4%	±4%
Repeatability	±1%	±1%	±1%	±1%	±1%	±1%
DAMAGE THRESHOLDS						
Max average power (60 seconds)	5 W	5 W	5 W	5 W	5 W	25 W
Max energy (at 1064 nm)	200 µJ	2 µJ	200 µJ	2 µJ	20 mJ	20 mJ
PHYSICAL CHARACTERISTICS						
Effective aperture	6 mm Ø	6 mm Ø	6 mm Ø	6 mm Ø	6 mm Ø	12.5 mm Ø
Sensor	Silicon	Silicon	InGaAs	InGaAs	Pyroelectric	Pyroelectric
Dimensions	38.1 Ø x 58.4D mm	38.1 Ø x 58.4D mm	38.1 Ø x 58.4D mm	38.1 Ø x 58.4D mm	38.1 Ø x 58.4D mm	76H x 111W x 76D
Weight (head only)	150 g	150 g	150 g	150 g	150 g	N/A
COMPATIBLE METERS						
PC-based	Mach 6: see detailed s	specifications on next pa	ge			
Analog power supply	APM: see detailed spe	ecifications on next page	(requires adaptor when	used with M6 heads)		
ORDERING INFORMATION						
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233
Product page						

a. Maximum pulse energy reading will vary with wavelength and probe voltage responsivity (Rv). For more details, please read Application Note 121D-201932 and contact us at info@gentec-eo.com

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# **MACH 6 JOULEMETER**

Measure every pulse at up to 200 kHz with MACH 6. Measure with 12-bit digital accuracy and capture up to 4 million pulses in real time. Our MACH 6 joulemeter is the only instrument in the world that performs at this speed, and with this precision. It is designed to support our full complement of fast energy probes that include silicon, InGaAs and pyroelectric detectors. Measure from pJ to mJ and from 0.35 to 2.5  $\mu$ m. Using the M6-Si detector and the M6-UV-QED accessory, you can make relative measurements at 266 nm.

# **SPECIFICATIONS & FEATURES**

MACUC	0	
(rear view)	Bentrac-ten MACH 6 Constraint Constrain	
APM analog power supply (front view)		

# Name Statistical Statistical

	MACH 6	APM
Compatible detector heads	M6	M6 (with adaptor: P/N C201949), UM-B, QE8, THZ9D and PE detectors
Maximum repetition rate	200 000 Hz	Limited by oscilloscope and detector
Analog output	0 - 3 V	± 4.88 V, BNC
External trigger (TTL)	Optically coupled	None
Internal trigger	2 - 20%	None
Trigger delay	38 - 3825 ns (user-settable)	None
Digital output	USB 2.0	None
Power supply	External, 100/240 VAC 50 - 60 Hz	External, 100/240 VAC 50 - 60 Hz, and 9 V battery (both included)
Product number	202090	201848

# **INSTRUMENT CONTROL SCREEN**

Our powerful LabVIEW application software includes many unique control and diagnostic features. The instrument control screen, shown on the left, is used to set up the operation of the MACH 6, including range, trigger, wavelength, and more. In addition, it is used to set a pulse batch size and to arm the instrument, which starts the data collection. It also gives you access to features like "Autoset", "Call Live Mode", "Run Life Test", "Save Instrument Setup" and the like. These features can be accessed by clicking directly on the feature or pushing the associated function key.

Pulse Data Sampled at 10 Hz Rate	Auto Socie (FI) Tamp Comp (F2) Cal Temp Compositions Confliction Control Factor Factor Control Factor Control Factor Control Factor Control Factor Control Factor Control Factor	NCE+3 (+300
Clear Per (7) 36 Apply Duple, Averaging CIT	1.200 5- 1.200 5-	
totto) tonget) 1.232E-5	Example And Anna Maria Anna Anna	A, l
Temperature (C) 24.0		M
31802	Linen o'ano zelo zelo zelo zelo zelo zelo zelo zel	ie sits site site
max min  1266-5  1248-5	Recyc (N) Toppe Level (N) Nopped Live Enabled Out of Rec 20 al - 4	CurrTemp
man standard deviation	Trapper Service (FP)         Trapper S	Attenuation Factor
VEA resource (In)	Deta File	

# LIVE MODE DISPLAY

The live mode can be accessed from the instrument control screen, or by simply pressing the "F4" function key on your PC. This mode of operation is intended to act like your typical slower digital joulemeter, as it samples the laser pulses at a 10 Hz rate. It provides you with an energy strip chart, live energy reading, statistics and repetition rate. It is a very useful mode when setting up the Mach 6 with your laser. You can select "Auto Set", where the instrument runs through the ranges and trigger levels until it finds the correct range, or set them manually. When setup is complete, you will exit this screen and return to the "Control" screen where you will select a batch size, arm the instrument and start taking pulse energy data.







# **STRIP CHART**

The strip chart display provides a quick graphical look at the pulse data batch just collected. The data can be displayed in full scale or in auto scale mode. You can also zoom-in on a portion of the data, like shown in the screen on the left. An NDO.3 filter has been dropped through the beam and you can see the effects on the pulse data collected. You can fit trend and min/max lines to the data. Just below the chart, you will find a complete set of statistics for the batch. At the top of this screen you will see tabs that will take you to the Histogram, Statistics, and FFT (Fast Fourier Transform) displays.

nationment Context   Do	ta Strip Chart Data Hist	nyura Statacica   //	T Public	Bange 🏧 Overs	mp 📰 160	e Con On 📲	Temp Cent. On
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### HISTOGRAM

Interested in viewing the statistical distribution of the pulse energy data set? The Histogram screen does this for you and fits a "best Gaussian curve" to the data. It displays complete statistical calculations along the bottom of the graph, along with pulse frequency. Just below the statistics, you will find instrument controls, like range and trigger. You are also given the ability to adjust trigger delay and hold off as needed.

9.766E-7 8.643E-1 1.223E-5 Joule w Veter Restored To 2015 1.222E+0 12 w Note the Institute 1.241E-5 4.236E-7 147					
Inc         Value         Page Mare Translati           1.216E-5         1.022E+0         12           Inc         Basedia forders 15 gard         Austa Mare Translati           1.341E-5         4.236E-7         147	les	Joules	1.223E-5	8.643E-1	9.766E-7
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29938 1.217E-5 4.898E-3	taj Joverage er er	Dapiaj hen Pores El CEU	4.898E-3	1.217E-5	29938

# STATISTICS

The statistics display offers a very complete set of useful energy readings and calculated statistics. These include: minimum, maximum, average (mean), standard deviation, spread and variation. Some other very handy features include: windows displaying, average frequency, pulse jitter, pulses below trigger and pulses below threshold (a level set by you). In the screen on the left, you can see that there were 12 pulses below an energy threshold of 3  $\mu$ W, and 147 missing pulses (or pulses below trigger).

EA resource (In)	Test Status
A DELETION DECEMPTOR OF A DELETION DECEMPTOR OF A DELETION DECEMPTOR OF A DELETION DE LA DELETION DELE	The average first of 1991. The Strends of 2005 2012 (FM 14.2017) LL average first of 1991. The Strends of 2005 2012 (FM 14.2017) LL average first of 2005 2014 (FM 14.2017) LL average first of 2005. The Strends of 2005 2014 (FM 14.2017) LL 2007 First of 2007 (FM 14.2017) LL 200
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City Construction and a construction of the co	era File C/U/Jew/Ldfdooleg/Deaktop). don Weitest 4.tot

# LIFE TEST MODE

Would you like to run a life test on your high repetition rate pulsed laser? How about a periodic test vs. an environmental change like temperature? We have included a great feature to accomplish this. In the life test screen, we give you the ability to select the statistics you want, a start time and date, a stop time and date, the number of pulses and a test interval. You simply identify a file, a place to put the data, and then click on start and walk away! When you come back, you have a data set that tracked the performance of your laser over time, temperature, shock, vibration or anything you chose.





# **OUTPUT OPTIONS**

> SMART INTERFACE Containing all the calibration data



- integra ALL-IN-ONE-METER > Connects directly to a PC
  - Three models available:
    - USB output (-INT)
    - RS-232 output (-IDR)
    - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**





U-LINK



- > MODULAR CONCEPT Increase the power capability of your detector: 2 different cooling modules
- > LOW NOISE LEVEL
- > **QED ATTENUATOR AVAILABLE** 
  - Measure up to 5X higher energies
  - Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength

#### > HIGH REPETITION RATE OPTIONS

- QE12LP: 300 Hz
- QE12HR: 1000 Hz
- > TEST TARGET INCLUDED

ACCESSORIES

M-LINK



Stand with delrin post



S-LINK



DB15 to BNC adaptor

QED-12 attenuator



Pelican carrying case





POWER DETECTORS

**BEAM PROFILING** 

TERAHERTZ DETECTORS

|--|--|--|

	QE12LP-S-MB	QE12LP-S-MB- QED	QE12LP-H-MB	QE12LP-H-MB- QED	QE12HR-H-MB	QE12HR-H-MB- QED
MAX MEASURABLE ENERCY a	3.9 J	3.9 J	3.9 J	3.9 J	0.85 J	3.9 J
MAX REPETITION FREQUENCY <sup>b</sup>	300 Hz	300 Hz	300 Hz	300 Hz	1 kHz	1 kHz
EFFECTIVE APERTURE	12 x 12 mm	9 x 9 mm	12 x 12 mm	9 x 9 mm	12 x 12 mm	9 x 9 mm
MEASUREMENT CAPABILITY						
Spectral range	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm	0.3 - 2.1 µm
Calibrated spectral range <sup>c</sup>	0.248 - 2.1 µm	0.532 - 2.1 µm	0.248 - 2.1 µm	0.532 - 2.1 µm	0.248 - 2.1 µm	0.532 - 2.1 µm
Maximum measurable energy a						
1064 nm, 7 ns	0.85 J	3.9 J	0.85 J	3.9 J	0.85 J	3.9 J
266 nm, 7 ns	0.70 J	0.81 J	0.70 J	0.81 J	0.70 J	0.81 J
Noise equivalent energy <sup>d</sup>	0.7 µJ	1.4 µJ	0.7 µJ	1.4 µJ	1.4 µJ	2.8 µJ
Max repetition frequency <sup>b</sup>	300 Hz	300 Hz	300 Hz	300 Hz	1 kHz	1 kHz
Maximum pulse width (typical) °	400 µs	400 µs	400 µs	400 µs	40 µs	40 µs
Calibration uncertainty <sup>f</sup>	± 3%	± 3%	± 3%	±3%	±3%	±3%
Repeatability	< 0.5%	< 0.5%	< 0.5%	< 0.5%	< 0.5%	< 0.5%
DAMAGE THRESHOLDS						
Maximum average power	3 W	7.5 W	5 W	12.5 W	5 W	12.5 W
Maximum energy density						
1064 nm, 7 ns, single shot	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
Maximum average power density <sup>9</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2 j</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS						
Effective aperture (with attenuator)	12 x 12 mm	9 x 9 mm	12 x 12 mm	9 x 9 mm	12 x 12 mm	9 x 9 mm
Absorber	MB	QED	MB	QED	MB	QED
Dimensions	36H x 36W x 14D mm	39H x 41W x 19D mm	36H x 36W x 33D mm	39H x 41W x 38D mm	36H x 36W x 33D mm	39H x 41W x 38D mm
Weight	87 g	87 g	117 g	117 g	117 g	117 g
ORDERING INFORMATION						
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233
Product page						

Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications. a.

b. With the IDR version, measured values are sampled when the repetition rate is > 200 Hz.

Calibration at 2.1 to 2.5  $\mu m$  is available on special request. C.

d. Nominal value, actual value depends on electrical noise in the measurement system.

e. Also available on special order: ELP (extra-long pulse) version.

f. Excludes non-linearities.

g. At maximum power.

DISPLAYS & PC INTERFACES CUSTOM / OEM PRODUCTS

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### **OUTPUT OPTIONS**

> SMART INTERFACE Containing all the calibration data



>

- integra ALL-IN-ONE-METER Connects directly to a PC
- Three models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
  - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**







U-LINK



M-LINK





MAESTRO



S-LINK

# **KEY FEATURES**

> MODULAR CONCEPT

Increase the power capability of your detector: 2 different cooling modules

#### > LOW NOISE LEVEL

#### > **QED ATTENUATOR AVAILABLE**

- Measure up to 5X higher energies
- Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength

#### > HIGH REPETITION RATE OPTIONS

- QE25LP: 300 Hz
- QE25HR: 1000 Hz
- > TEST TARGET INCLUDED





Stand with delrin post





DB15 to BNC adaptor

QED-25 attenuator



Pelican carrying case







	QE25LP-S-MB	QE25LP-S-MB- QED	QE25LP-H-MB	QE25LP-H-MB- QED	QE25HR-H-MB	QE25HR-H-MB- QED
MAX MEASURABLE ENERGY a	3.8 J	23 J	3.8 J	23 J	3.8 J	23 J
MAX REPETITION FREQUENCY <sup>b</sup>	300 Hz	300 Hz	300 Hz	300 Hz	1 kHz	1 kHz
EFFECTIVE APERTURE	25 x 25 mm	22 x 22 mm	25 x 25 mm	22 x 22 mm	25 x 25 mm	22 x 22 mm
MEASUREMENT CAPABILITY						
Spectral range	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm	0.3 - 2.1 µm
Calibrated spectral range <sup>c</sup>	0.248 - 2.1 µm	0.308 - 2.1 µm	0.248 - 2.1 µm	0.308 - 2.1 µm	0.248 - 2.1 µm	0.308 - 2.1 µm
Maximum measurable energy <sup>a</sup>						
1064 nm, 7 ns	3.8 J	23 J	3.8 J	23 J	3.8 J	23 J
266 nm, 7 ns	3.1 J	4.8 J	3.1 J	4.8 J	3.1 J	4.8 J
Noise equivalent energy <sup>d</sup>	4 µJ	8 µJ	4 µJ	8 µJ	10 µJ	20 µJ
Max repetition frequency <sup>b</sup>	300 Hz	300 Hz	300 Hz	300 Hz	1 kHz	1 kHz
Maximum pulse width (typical) °	400 µs	400 µs	400 µs	400 µs	40 µs	40 µs
Calibration uncertainty <sup>f</sup>	± 3 %	± 3%	± 3%	± 3%	± 3%	± 3%
Repeatability	< 0.5 %	< 0.5%	< 0.5%	< 0.5 %	< 0.5%	< 0.5%
DAMAGE THRESHOLDS						
Maximum average power	5 W	15 W	10 W	30 W	10 W	30 W
Maximum energy density						
1064 nm, 7 ns, single shot	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>	1 J/cm²	0.5 J/cm <sup>2</sup>	1 J/cm²
Maximum average power density <sup>g</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS						
Effective aperture	25 X 25 mm	22 X 22 mm	25 X 25 mm	22 X 22 mm	25 X 25 mm	22 X 22 mm
Absorber	MB	QED	MB	QED	MB	QED
Dimensions	50H x 50W x 14D mm	53H x 55W x 19D mm	50H x 50W x 53D mm	53H x 55W x 58D mm	50H x 50W x 53D mm	53H x 55W x 58D mm
Weight	120 g	120 g	193 g	193 g	193 g	193 g
ORDERING INFORMATION						
Available output options	DB15, USB or RS-232					
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233
Product page						

a. Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. b. With the IDR version, measured values are sampled when the repetition rate is > 200 Hz.
c. Calibration at 2.1 to 2.5 μm is available on special request.

d. Nominal value, actual value depends on electrical noise in the measurement system.
 e. Also available on special order: ELP (extra-long pulse) version

e. f.

Excludes non-linearities.

g. At maximum power.

POWER DETECTORS





### **OUTPUT OPTIONS**

SMART INTERFACE Containing all the calibration data



>

- Integra ALL-IN-ONE-METER Connects directly to a PC
- Three models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
  - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**





MAESTRO

S-LINK



U-LINK



M-LINK



**KEY FEATURES** 

- MODULAR CONCEPT Increase the power capability of your detector: 2 different cooling modules
- > LOW NOISE LEVEL
- > QED ATTENUATOR AVAILABLE
  - Measure up to 5X higher energies
  - Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength
- > TEST TARGET INCLUDED









Stand with delrin post

DB15 to BNC adaptor

Cadaptor (





Pelican carrying case





	QE50LP-S-MB	QE50LP-S-MB-QED	QE50LP-H-MB	QE50LP-H-MB-QED
MAX MEASURABLE ENERGY *	15 J	85 J	15 J	85 J
MAX REPETITION FREQUENCY	200 Hz	200 Hz	200 Hz	200 Hz
EFFECTIVE APERTURE	50 x 50 mm	47 x 47 mm	50 x 50 mm	47 x 47 mm
MEASUREMENT CAPABILITY				
Spectral range	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm	0.3 - 2.1 µm
Calibrated spectral range <sup>b</sup>	0.248 - 2.1 μm	0.308 - 2.1 µm	0.248 - 2.1 µm	0.308 - 2.1 μm
Maximum measurable energy a				
1064 nm, 7 ns	15 J	85 J	15 J	85 J
266 nm, 7 ns	12.5 J	22 J	12.5 J	22 J
Noise equivalent energy °	10 µJ	20 µJ	10 µJ	20 µJ
Max repetition frequency	200 Hz	200 Hz	200 Hz	200 Hz
Maximum pulse width (typical) <sup>d</sup>	675 µs	675 µs	675 µs	675 µs
Calibration uncertainty <sup>e</sup>	± 3%	± 3%	± 3%	± 3%
Repeatability	< 0.5%	< 0.5%	< 0.5%	< 0.5%
DAMAGE THRESHOLDS				
Maximum average power	10 W	25 W	20 W	45 W
Maximum energy density				
1064 nm, 7 ns, single shot	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
Maximum average power density <sup>f</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS				
Effective aperture	50 x 50 mm	47 x 47 mm	50 x 50 mm	47 x 47 mm
Absorber	MB	QED	MB	QED
Dimensions	75H x 75W x 15D mm	78H x 80W x 20D mm	75H x 75W x 44D mm	78H x 80W x 49D mm
Weight	209 g	209 g	338 g	338 g
ORDERING INFORMATION				
Available output options	DBI5, USB of RS-232			
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233
Product page				

a. Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications.
b. Calibration at 2.1 to 2.5 µm is available on special request.
c. Nominal value, actual value depends on electrical noise in the measurement system.
d. Also available on special order: ELP (extra-long pulse) version.
e. Evelve and the provide p

Excludes non-linearities.

e. Excludes non-mos. f. At maximum power.

# **OE65-MB** 65 x 65 mm, 10 µJ - 200 J



### **OUTPUT OPTIONS**

> SMART INTERFACE Containing all the calibration data



>

- integra ALL-IN-ONE-METER Connects directly to a PC
- Three models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
  - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**







U-LINK









S-LINK



# ACCESSORIES

M-LINK



Stand with delrin post (200428, For -S model)



QED-65 attenuator



Stand with delrin post

(201284, For -H model)

Pelican carrying case

DB15 to BNC adaptor

> QED ATTENUATOR AVAILABLE

Effective aperture of 65 x 65 mm

MODULAR CONCEPT

LARGE APERTURE

2 different cooling modules

- Measure up to 5X higher energies
- Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength

Increase the power capability of your detector:

LOW NOISE LEVEL 10  $\mu$ J for the MB coating

**KEY FEATURES** 

>

>

> **TEST TARGET INCLUDED** With the MB models





	QE65LP-S-MB	QE65LP-S-MB-QED	QE65LP-H-MB	QE65LP-H-MB-QEI	QE65ELP-H-MB
MAX MEASURABLE ENERGY <sup>a</sup>	25 J	200 J	25 J	200 J	50 J
MAX REPETITION FREQUENCY	100 Hz	100 Hz	100 Hz	100 Hz	20 Hz
EFFECTIVE APERTURE	65 x 65 mm	62 x 62 mm	65 x 65 mm	62 x 62 mm	65 x 65 mm
MEASUREMENT CAPABILITY					
Spectral range	0.19 - 20 µm	0.3 - 2.1 μm	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm
Calibrated spectral range <sup>b</sup>	0.248 - 2.1 µm	0.308 - 2.1 µm	0.248 - 2.1 µm	0.308 - 2.1 µm	0.248 - 2.1 µm
Maximum measurable energy <sup>a</sup>					
1064 nm, 150 µs	25 J	200 J	25 J	200 J	50 J
1064 nm, 7 ns	25 J	125 J	25 J	125 J	25 J
266 nm, 7 ns	20 J	35 J	20 J	35 J	20 J
Noise equivalent energy °	10 µJ	20 µJ	10 µJ	20 µJ	20 µJ
Max repetition frequency	100 Hz	100 Hz	100 Hz	100 Hz	20 Hz
Maximum pulse width (typical) <sup>d</sup>	0.7 ms	0.7 ms	0.7 ms	0.7 ms	5 ms
Calibration uncertainty °	± 3%	± 3%	±3%	± 3%	± 3%
Repeatability	< 0.5%	< 0.5%	< 0.5%	< 0.5%	< 0.5%
DAMAGE THRESHOLDS					
Maximum average power	12 W	30 W	40 W	90 W	40 W
Maximum energy density					
1064 nm, 150 µs, 10 Hz	1.2 J/cm <sup>2</sup>	14 J/cm <sup>2</sup>	1.2 J/cm <sup>2</sup>	14 J/cm <sup>2</sup>	1.2 J/cm <sup>2</sup>
1064 nm, 7 ns, single shot	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>
Maximum average power density <sup>f</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2 h</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS					
Effective aperture	65 x 65 mm	62 x 62 mm	65 x 65 mm	62 x 62 mm	65 x 65 mm
Absorber	MB	QED	MB	QED	MB
Dimensions	92H x 92W x 20D mm	95H x 97W x 25D mm	92H x 92W x 99D mm	95H x 97W x 104D mm	92H x 92W x 99D mm
Weight	440 g	440 g	900 g	900 g	900 g
ORDERING INFORMATION					
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-443	STAND-D-443	STAND-D-443
Product page					

Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications. a.

b. Calibration at 2.1 to 2.5 µm is available on special request.

C. Nominal value, actual value depends on electrical noise in the measurement system.

d. Also available on special order: ELP (extra-long pulse) version.

Excludes non-linearities. e. f.

At maximum power.

POWER DETECTORS





### **OUTPUT OPTIONS**

> SMART INTERFACE Containing all the calibration data



- > integra ALL-IN-ONE-METER Connects directly to a PC
  - Three models available:
    - USB output (-INT)
    - RS-232 output (-IDR)
    - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**



MIRO ALTITUDE



3 0





S-LINK



U-LINK

# **KEY FEATURES**

- > MODULAR CONCEPT Increase the power capability of your detector: 2 different cooling modules
- > EXTRA LARGE APERTURE Effective aperture of 95 mm Ø

#### > **QED ATTENUATOR AVAILABLE**

- Measure up to 5X higher energies
- Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength
- > LOW NOISE LEVEL
- > **TEST TARGET INCLUDED**



ACCESSORIES

M-LINK



Stand with delrin post (200428, For -S model)



QED-95 attenuator



Stand with delrin post (201284, For -H model)



Pelican carrying case



DB15 to BNC adaptor





	QE95LP-S-MB	QE95LP-S-MB-QE	D QE95LP-H-MB	QE95LP-H-MB-QE	D QE95ELP-H-MB
MAX MEASURABLE ENERGY a	35 J	250 J	35 J	250 J	70 J
MAX REPETITION FREQUENCY	40 Hz	40 Hz	40 Hz	40 Hz	10 Hz
EFFECTIVE APERTURE	95 mm Ø	90 mm Ø	95 mm Ø	90 mm Ø	95 mm Ø
MEASUREMENT CAPABILITY					
Spectral range	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm	0.3 - 2.1 µm	0.19 - 20 µm
Calibrated spectral range <sup>b</sup>	0.248 - 2.1 µm	0.308 - 2.1 µm	0.248 - 2.1 µm	0.308 - 2.1 µm	0.248 - 2.1 µm
Maximum measurable energy <sup>a</sup>					
1064 nm, 150 µs	35 J	250 J	35 J	250 J	70 J
1064 nm, 7 ns	35 J	150 J	35 J	150 J	35 J
266 nm, 7 ns	30 J	50 J	30 J	50 J	30 J
Noise equivalent energy <sup>c</sup>	15 µJ	30 µJ	15 µJ	30 µJ	30 µJ
Max repetition frequency	40 Hz	40 Hz	40 Hz	40 Hz	10 Hz
Maximum pulse width (typical) <sup>d</sup>	1.5 ms	1.5 ms	1.5 ms	1.5 ms	5 ms
Calibration uncertainty <sup>e</sup>	± 3%	± 3%	±3%	±3%	± 3%
Repeatability	< 0.5%	< 0.5 %	< 0.5%	< 0.5%	< 0.5%
DAMAGE THRESHOLDS					
Maximum average power	20 W	45 W	40 W	90 W	40 W
Maximum energy density					
1064 nm, 150 µs, 10 Hz	1.2 J/cm <sup>2</sup>	14 J/cm <sup>2</sup>	1.2 J/cm <sup>2</sup>	14 J/cm <sup>2</sup>	1.2 J/cm <sup>2</sup>
1064 nm, 7 ns, single shot	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>	0.5 J/cm <sup>2</sup>
Maximum average power density <sup>f</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2 h</sup>	600 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS					
Effective aperture	95 mm Ø	90 mm Ø	95 mm Ø	90 mm Ø	95 mm Ø
Absorber	MB	QED	MB	QED	MB
Dimensions	122H x 122W x 20D mm	125H x 127W x 25D mm	122H x 122W x 99D mm	125H x 127W x 104D mm	122H x 122W x 99D mm
Weight	0.78 kg	0.78 kg	1.2 kg	1.2 kg	1.2 kg
ORDERING INFORMATION					
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-443	STAND-D-443	STAND-D-443
Product page					

a. Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications.
b. Calibration at 2.1 to 2.5 µm is available on special request.
c. Nominal value, actual value depends on electrical noise in the measurement system.
d. Also available on special order: ELP (extra-long pulse) version.

Excludes non-linearities.

e. f. At maximum power.

# É145-MB Extra-large pyroelectric energy detector



# **OUTPUT OPTIONS**

> SMART INTERFACE Containing all the calibration data



- > integra ALL-IN-ONE-METER Connects directly to a PC
  - Three models available:
    - USB output (-INT)
    - RS-232 output (-IDR)
    - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**









U-LINK







MAESTRO

M-LINK

S-LINK

# **KEY FEATURES**

#### > CUSTOM-BUILT

Contact us with your requirements for a version tailored to your needs

#### > MODULAR CONCEPT Increase the power capability of your detector: 2 different cooling modules

> **EXTRA LARGE APERTURE** Effective aperture of 145 mm Ø

#### > **QED ATTENUATOR AVAILABLE**

- Measure up to 5X higher energies
- Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength
- > LOW NOISE LEVEL
- > **TEST TARGET INCLUDED**

# ACCESSORIES



Stand with delrin post





DB15 to BNC adaptor

Pelican carrying case





POWER DETECTORS

**BEAM PROFILING** 

TERAHERTZ DETECTORS





	QE145, CUSTOM CAPABILITIES	QE145-QED, CUSTOM CAPABILITIES
MAX MEASURABLE ENERGY a	Up to 135 J	Up to 385 J
MAX REPETITION FREQUENCY	Up to 200 Hz	Up to 200 Hz
EFFECTIVE APERTURE	145 mm Ø	135 mm Ø
MEASUREMENT CAPABILITY		
Spectral range	0.19 - 20 μm	0.3 - 2.1 µm
Calibrated spectral range <sup>b</sup>	0.248 - 2.1 µm	0.308 - 2.1 μm
Maximum measurable energy <sup>a</sup>		
1064 nm, 150 µs	Up to 135 J	Up to 385 J
1064 nm, 7 ns	Up to 70 J	Up to 220 J
Noise equivalent energy <sup>c</sup>	As low as 100 µJ	As low as 200 µJ
Max repetition frequency	Up to 200 Hz	Up to 200 Hz
Maximum pulse width (typical)	Up to 5 ms	Up to 5 ms
Calibration uncertainty °	± 3 %	± 3 %
Repeatability	< ± 0.5 %	< ± 0.5 %
DAMAGE THRESHOLDS		
Maximum average power	Up to 75 W	Up to 190 W
Maximum energy density		
1064 nm, 150 μs, 10 Hz	1.2 J/cm <sup>2</sup>	14 J/cm <sup>2</sup>
1064 nm, 7 ns, single shot	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
Maximum average power density <sup>f</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	145 mm Ø	135 mm Ø
Absorber	MB or MT	QED
Dimensions	180H x 180W x 24D mm (thicker with heatsink)	180H x 180W x 27D mm (thicker with heatsink)
Weight	1.9 – 2.5 kg	2.3 – 2.8 kg
Cooling	Convection or heatsink	Convection or heatsink
ORDERING INFORMATION		
Available output options	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-443	STAND-D-443
Product page		

\* These products are custom-built. Contact us with your requirements for a version tailored to your needs.

a. Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications.
b. Calibration at 2.1 to 2.5 µm is available on special request.
c. Nominal value, actual value depends on electrical noise in the measurement system.

- c. Nominal value, actual va d. Excludes non-linearities.

e. At 12 W.

# E195-MB The largest pyroelectric energy detector on the market



# **OUTPUT OPTIONS**

> SMART INTERFACE Containing all the calibration data



- > integra ALL-IN-ONE-METER Connects directly to a PC
  - Three models available:
    - USB output (-INT)
    - RS-232 output (-IDR)
    - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**





MIRO ALTITUDE

M-LINK



MAESTRO

S-LINK



U-LINK



> CUSTOM-BUILT

Contact us with your requirements for a version tailored to your needs

#### > MODULAR CONCEPT Increase the power capability of your detector: 2 different cooling modules

> **EXTRA LARGE APERTURE** Effective aperture of 195 mm Ø

#### > **QED ATTENUATOR AVAILABLE**

- Measure up to 5X higher energies
- Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength
- > LOW NOISE LEVEL
- > **TEST TARGET INCLUDED**

ACCESSORIES







Stand with delrin post

DB15 to BNC adaptor

Pelican carrying case







	QE195, CUSTOM CAPABILITIES	QE195-QED, CUSTOM CAPABILITIES
MAX MEASURABLE ENERGY <sup>a</sup>	Up to 250 J	Up to 700 J
MAX REPETITION FREQUENCY	Up to 200 Hz	Up to 200 Hz
EFFECTIVE APERTURE	195 mm Ø	185 mm Ø
MEASUREMENT CAPABILITY		
Spectral range	0.19 - 20 µm	0.3 – 2.1 µm
Calibrated spectral range <sup>b</sup>	0.248 - 2.1 µm	0.308 - 2.1 µm
Maximum measurable energy <sup>a</sup>		
1064 nm, 150 µs	Up to 250 J	Up to 700 J
1064 nm, 7 ns	Up to 125 J	Up to 400 J
Noise equivalent energy <sup>c</sup>	As low as 100 µJ	As low as 200 µJ
Max repetition frequency	Up to 200 Hz	Up to 200 Hz
Maximum pulse width (typical) <sup>d</sup>	Up to 5 ms	Up to 5 ms
Calibration uncertainty <sup>e</sup>	± 3 %	± 3 %
Repeatability	< ± 0.5 %	< ± 0.5 %
DAMAGE THRESHOLDS		
Maximum average power	Up to 150 W	Up to 350 W
Maximum energy density		
1064 nm, 150 µs, 10 Hz	1.2 J/cm <sup>2</sup>	14 J/cm <sup>2</sup>
1064 nm, 7 ns, single shot	0.6 J/cm <sup>2</sup>	16 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	8 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.5 J/cm <sup>2</sup>	1 J/cm <sup>2</sup>
Maximum average power density <sup>f</sup>	10 W/cm <sup>2</sup>	600 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	195 mm Ø	185 mm Ø
Absorber	MB or MT	QED
Dimensions	229H x 229W x 24D mm (thicker with heatsink)	229H x 229W x 27D mm (thicker with heatsink)
Weight	3 - 5 kg	3 - 6 kg
Cooling	Convection or heatsink	Convection or heatsink
ORDERING INFORMATION		
Available output options	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-443	STAND-D-443
Product page		

\* These products are custom-built. Contact us with your requirements for a version tailored to your needs.

a. Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications.
b. Calibration at 2.1 to 2.5 µm is available on special request.
c. Nominal value, actual value depends on electrical noise in the measurement system.
d. Evulvator are divergent in the measurement system.

- d. Excludes non-linearities.

e. At 12 W.

# QE12-MT 12 x 12 mm, 0.7 μJ - 3.9 J, tuned for high repetition rates



# **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- > integra ALL-IN-ONE-METER
  - Connects directly to a PC
  - Three models available:
    - USB output (-INT)
    - RS-232 output (-IDR)
    - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**



### S-LINK

# **KEY FEATURES**

- MODULAR CONCEPT
   Increase the power capability of your detector:
   2 different cooling modules
- > LOW NOISE LEVEL
- > NEW MODELS FOR HIGH REPETITION RATES The QE12HR models are tuned for short pulses with high repetition rates (up to 10 kHz)

# ACCESSORIES

M-LINK







Stand with delrin post

DB15 to BNC adaptor

QED-12 attenuator



Pelican carrying case





POWER DETECTORS

**BEAM PROFILING** 

TERAHERTZ DETECTORS

DISPLAYS & PC INTERFACES

	QE12SP-S-MT-D0	QE12SP-H-MT-D0	QE12HR-H-MT-D0
MAX MEASURABLE ENERGY <sup>a</sup>	0.70 J	0.70 J	0.70 J
MAX REPETITION FREQUENCY b, c	6 kHz	6 kHz	10 kHz
APERTURE	12 x 12 mm	12 x 12 mm	12 x 12 mm
MEASUREMENT CAPABILITY			
Spectral range	0.19 - 20 µm	0.19 - 20 µm	0.19 - 20 µm
Calibrated spectral range <sup>d</sup>	0.248 - 2.1 µm	0.248 - 2.1 μm	0.248 - 2.1 µm
Maximum measurable energy <sup>a</sup>			
1064 nm, 7 ns	0.70 J	0.70 J	0.70 J
266 nm, 7 ns	0.10 J	0.10 J	0.10 J
Noise equivalent energy <sup>e</sup>	0.8 µJ	0.8 μJ	lμJ
Max repetition frequency <sup>b, c</sup>	6 kHz	6 kHz	10 kHz
Maximum pulse width (typical)	10 µs	10 µs	4 µs
Calibration uncertainty <sup>f</sup>	± 3%	±3%	± 3%
Repeatability	< 0.5%	< 0.5%	< 0.5%
DAMAGE THRESHOLDS			
Maximum average power	3 W	5 W	5W
Maximum energy density			
1064 nm, 7 ns, single shot	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>
532 nm, 7 ns, 10 Hz	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>
Maximum average power density <sup>9</sup>	10 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS			
Effective aperture	12 x 12 mm	12 x 12 mm	12 x 12 mm
Absorber	MT	MT	MT
Dimensions	36H x 36W x 14D mm	36H x 36W x 33D mm	36H x 36W x 33D mm
Weight	87 g	117 g	117 g
ORDERING INFORMATION			
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233
Product page			

Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications. a.

b. With the IDR version, measured values are sampled when the repetition rate is > 200 Hz.

c. Maximum 5.2 kHz with INT version. d. Calibration at 2.1 to 2.5  $\mu$ m is available on special request.

Nominal value, actual value depends on electrical noise in the measurement system. e.

f. Excludes non-linearities.

g. At maximum power.

# E25-MT 25 mm, 2 $\mu$ J - 23 J, tuned for high repetition rates



# **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- 3 > integra ALL-IN-ONE-METER Connects directly to a PC
  - Three models available:
    - USB output (-INT)
    - RS-232 output (-IDR)
    - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**



# **KEY FEATURES**

- MODULAR CONCEPT Increase the power capability of your detector: 2 different cooling modules
- > LOW NOISE LEVEL
- > NEW MODELS FOR HIGH REPETITION RATES The QE25HR models are tuned for short pulses with high repetition rates (up to 10 kHz)









Stand with delrin post

DB15 to BNC adaptor

QED-25 attenuator



Pelican carrying case







				POV
	QE25SP-S-MT-D0	QE25SP-H-MT-D0	QE25HR-H-MT-D0	VER D
MAX MEASURABLE ENERGY <sup>a</sup>	3.0 J	3.0 J	3.0 J	ETE
MAX REPETITION FREQUENCY b, c	6 kHz	6 kHz	10 kHz	СТО
EFFECTIVE APERTURE	25 x 25 mm	25 x 25 mm	25 x 25 mm	S
MEASUREMENT CAPABILITY				
Spectral range	0.19 - 20 µm	0.19 - 20 µm	0.19 - 20 μm	
Calibrated spectral range <sup>d</sup>	0.248 - 2.1 µm	0.248 - 2.1 µm	0.248 - 2.1 µm	m
Maximum measurable energy <sup>a</sup>				ERO
1064 nm, 7 ns	3.0 J	3.0 J	3.0 J	
266 nm, 7 ns	0.44 J	0.44 J	0.44 J	ETEC
Noise equivalent energy °	2 µJ	2 µJ	3 μJ	СТОР
Max repetition frequency <sup>b, c</sup>	6 kHz	6 kHz	10 kHz	S
Maximum pulse width (typical)	10 µs	10 µs	4 µs	
Calibration uncertainty <sup>f</sup>	± 3%	± 3%	±3%	
Repeatability	< 0.5%	< 0.5%	< 0.5%	
DAMAGE THRESHOLDS				EAN
Maximum average power	5 W	10 W	10W	PR
Maximum energy density				OFI
1064 nm, 7 ns, single shot	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>	
1064 nm, 7 ns, 10 Hz	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>	2,
532 nm, 7 ns, 10 Hz	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>	
266 nm, 7 ns, 10 Hz	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>	
Maximum average power density <sup>9</sup>	10 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>	TER/
PHYSICAL CHARACTERISTICS				
Effective aperture	25 x 25 mm	25 x 25 mm	25 x 25 mm	RTZ
Absorber	MT	MT	MT	DET
Dimensions	50H x 50W x 14D mm	50H x 50W x 53D mm	50H x 50W x 53D mm	ECT
Weight	193 g	193 g	193 g	ORS
ORDERING INFORMATION				
Available output options	DB15, USB or RS-232	DB15, USB or RS-232	DB15, USB or RS-232	D
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233	SPL
Product page				AYS & PC INTERF

a. Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications.

b. With the IDR version, measured values are sampled when the repetition rate is > 200 Hz.

C. Maximum 5.2 kHz with INT version.

d. Calibration at 2.1 to 2.5  $\mu m$  is available on special request.

e. Nominal value, actual value depends on electrical noise in the measurement system.

f. Excludes non-linearities.

g. At maximum power.

PRODUCT GUIDE 2024





# **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- > integra ALL-IN-ONE-METER
  - Connects directly to a PC Three models available:
    - USB output (-INT)
    - RS-232 output (-IDR)
    - USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**



### S-LINK

# ACCESSORIES

M-LINK







QED-50 attenuator

Stand with delrin post





Pelican carrying case

# **KEY FEATURES**

- MODULAR CONCEPT Increase the power capability of your detector: 2 different cooling modules
- > LOW NOISE LEVEL
- QED ATTENUATOR AVAILABLE Measure up to 5X higher energies Available with optional calibration, all wavelengths between 532 & 1064 nm, or single wavelength
- HIGH REPETITION RATE Measure each pulse at up to 4000 Hz









	QE50SP-S-MT-D0	QE50SP-H-MT-D0
MAX MEASURABLE ENERCY a	13 J	13 J
MAX REPETITION FREQUENCY <sup>b, c</sup>	4000 Hz	4000 Hz
EFFECTIVE APERTURE	50 x 50 mm	50 x 50 mm
MEASUREMENT CAPABILITY		
Spectral range	0.19 - 20 μm	0.19 - 20 µm
Calibrated spectral range <sup>d</sup>	0.248 - 2.1 µm	0.248 - 2.1 μm
Maximum measurable energy <sup>a</sup>		
1064 nm, 7 ns	13 J	13 J
266 nm, 7 ns	1.8 J	1.8 J
Noise equivalent energy <sup>e</sup>	10 μJ	10 µJ
Max repetition frequency <sup>b, c</sup>	4000 Hz	4000 Hz
Maximum pulse width (typical)	10 µs	10 µs
Calibration uncertainty <sup>f</sup>	± 3%	± 3%
Repeatability	< 0.5%	< 0.5%
DAMAGE THRESHOLDS		
Maximum average power	10W	20W
Maximum energy density		
1064 nm, 7 ns, single shot	0.50 J/cm <sup>2</sup>	0.50 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	0.50 J/cm <sup>2</sup>	0.50 J/cm2
532 nm, 7 ns, 10 Hz	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.07 J/cm <sup>2</sup>	0.07 J/cm <sup>2</sup>
Maximum average power density <sup>g</sup>	10 W/cm <sup>2</sup>	10 W/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	50 x 50 mm	50 x 50 mm
Absorber	MB	MB
Dimensions	75H x 75W x 15D mm	75H x 75W x 44D mm
Weight	209 g	338 g
ORDERING INFORMATION		
Available output options	DB15, USB or RS-232	DB15, USB or RS-232
Compatible stand	STAND-D-233	STAND-D-233
Product page		

Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy. The maximum measurable energy depends on the display or PC interface used. If your laser is close to the maximum, contact us to check your specifications. а.

b. With the IDR version, measured values are sampled when the repetition rate is > 200 Hz.

Maximum 5.2 kHz with INT version. C.

d. Calibration at 2.1 to 2.5 µm is available on special request.

Nominal value, actual value depends on electrical noise in the measurement system. e. f.

Excludes non-linearities.

g. At maximum power.



### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- > ANALOG OUTPUT When used with APM (D) analog power supply

> integra ALL-IN-ONE-METER Connects directly to a PC Three models available:

- USB output (-INT)
- RS-232 output (-IDR)
- USB with external trigger (-INE)

# **COMPATIBLE DISPLAYS & PC INTERFACES**







M-LINK



#### > CUSTOM-BUILT

Contact us with your requirements for a version tailored to your needs

#### > WIDE ENERGY RANGE

Very low noise level = wide energy range with just one device

#### > HIGH AVERAGE POWER

The water-cooled joulemeters can handle high average powers, up to 1000 W.

#### > **RESISTANT COATING**

Our proprietary coating is designed to be strong. Its damage thresholds are orders of magnitude higher than any other "white" coatings on the market.

#### > PRECISE CALIBRATION

The IS detectors have a NIST-traceable calibration for the entire calibrated spectral range.



# ACCESSORIES









DB15 to BNC adaptor

APM (D) analog power supply

Pelican carrying case











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1

		POW
	IS50A-1KW-RMT	/ER D
MAX MEASURABLE ENERGY <sup>a</sup>	1 J, can be higher for low repetition rates	ETE
MAX REPETITION FREQUENCY	1000 Hz	СТОР
EFFECTIVE APERTURE	50 mm Ø	S
COOLING METHOD	Water	
MEASUREMENT CAPABILITY		
Spectral range	0.19 – 2.5 μm	E
Calibrated spectral range	532 nm, 1064 nm, and 1070 nm, other wavelengths available on request	ERC
Maximum measurable energy 1064 nm, 7 ns	1 J, can be higher for low repetition rates	/ DETEC
Noise equivalent energy <sup>b</sup>	<lmj< th=""><th>CTOF</th></lmj<>	CTOF
Max repetition frequency	1000 Hz	S
Maximum pulse width (typical)	10 µs	
Maximum divergence	10° (half-angle)	
Maximum incidence angle	$\pm$ 25° for beam diameter < Ø 12mm $\pm$ 5° for beam diameter > Ø 12mm	BEAN
Calibration uncertainty <sup>c</sup>	±4%	1 PR
Back reflections	12 %, concentrated in a cone with 15 degrees half-angle	OFIL
Repeatability	< ± 0.5 %	INC
DAMAGE THRESHOLDS		
Maximum average power	1000 W	
Maximum energy density 532 nm and 1064 nm, 7 ns	400 mJ/cm <sup>2</sup>	TER/
Maximum average power density <sup>d</sup>	400 mJ/cm <sup>2</sup>	HEF
PHYSICAL CHARACTERISTICS		RTZ
Effective aperture	50 mm Ø	DETE
Mounting thread	SM2	ECTO
Sphere inner diameter	100 mm Ø	ORS
Sensor	Pyroelectric	
Dimensions	127H x 140W x 115D mm	DIS
Weight	4 kg	PLA
ORDERING INFORMATION		∞ S∕
Available output options	DB15, USB or RS-232	PC
Compatible stand	STAND-D-443	ZTE
Product page		RFACES
		SU0

\* These products are custom-built. Contact us with your requirements for a version tailored to your needs.

a. Not exceeding maximum average power. Increasing pulse width increases the maximum measurable energy.

b. Nominal value, actual value depends on electrical noise in the measurement system.
 c. Excludes non-linearities.
 d. At 1064 nm.

PRODUCT GUIDE 2024

# NTO-500-IPl Portable laser probe for IPL sources, 2 - 350 J per pulse



# **USER INTERFACE (SSE MODE)**



Automatically starts when

exposed to a laser beam



The value is displayed until the next measurement

# for a laser beam Adjust the wavelength and calibration

The device waits



Calibration W

Device may get hot, it is not recommended for handheld use when making a measurement

Warns you when the device is too hot\*



Set the brightness

**KEY FEATURES** 

> HIGH ENERGY PER PULSE Accurate readings up to 350 J/pulse!

#### > EASY TO USE

The touchscreen color LCD allows for a friendly user interface. You can make a measurement with just the touch of a button!

> DATA LOGGING

> Save your data to the internal memory and then transfer them to your PC over the USB connection.

#### > LARGE APERTURE

55 mm Ø aperture to accommodate large beams

#### > RUGGED

- All-metal body
- High damage thresholds

# PROTECTIVE WINDOW

- For measurements with gel-coupled IPL heads.
- Protects the absorber, easy to clean

#### > SERIAL COMMANDS

Serial commands are available to let you take full control of your PRONTO from your PC.

# ACCESSORIES





Stand with steel post

Pelican carrying case

# **PRONTO-500-IPL**

Specifications





		POW
	PRONTO-500-IPL	VER D
MAX PULSE ENERGY (SINGLE SHOT)	350 J	DETECT
EFFECTIVE APERTURE	55 mm Ø	ORS
APERTURE TYPE	Full aperture with protective window	
MEASUREMENT CAPABILITY		
Spectral range	0.19 - 2.5 µm	Ē
Calibrated spectral range	1064 nm	NER
Energy range	2 - 350 J	CY [
Noise equivalent energy	500 mJ	DETE
Minimum repetition period	15 s (= time between measurements)	CTC
Maximum pulse width	433 ms	PRS
Accuracy	±5%	
DAMAGE THRESHOLDS		
Maximum average power density	45 kW/cm² (1064 nm, 10 W, CW)	-
Pulsed laser damage threshold	175 J/cm² (10 ms pulses)	BEAN
Maximum allowable absorber temperatur	re 65 °C	≤ PF
GENERAL SPECIFICATIONS		ÔFI
Display type	Touchscreen color LCD	LINO
Display size	28.0 x 35.0 mm (128 x 160 pixels)	2,
Data storage	50 000 pts	
Battery type	Rechargeable Li-ion	_
Battery life	17 hours or 4 200 measurements (with brightness set at 25%)	ERA
Battery recharge via	USB port	Ú H E F
PHYSICAL CHARACTERISTICS		TZ [
Effective aperture	55 mm Ø	DETE
Dimensions (sensor head)	88W x 88L x 32D mm (194L with handle)	CTC
Dimensions (monitor)	41W x 136L x 16D mm	RS
Weight	930 g	
ORDERING INFORMATION		DIS
Compatible stand	STAND-S-443	PLA
Product page		YS & PC INTERFACES



# 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.



# **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  $\pm$  3 %, and repeatabilities better than  $\pm$  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  $420 \times 427 \text{ mm}$ , and able to withstand pulse energy densities of more than 15 J/cm<sup>2</sup>.

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.

# 

# 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.



Laser beams or laserproduced X-rays rapidly heat the surface of the fusion target, forming a surrounding plasma envelope.

1.



Fuel is compressed by the rocket-like blowoff of the hot surface material.

2



3

During the final part of

the capsule implosion.

the fuel core reaches

20 times the density of

lead and ignites at

Thermonuclear burn spreads rapidly through the compressed fuel, yielding many times the input energy.

4

# EXTREME PEAK POWER APPLICATIONS

Ultrashort pulsed lasers are developping at a very fast pace. Some lasers now feature peak powers in the petawatts (10<sup>15</sup>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.



# CALORIMETERS Technical aspects

# **EXAMPLES OF CUSTOM CALORIMETERS**

	SPECTRAL RANGE	PULSE WIDTH	MINIMUM ENERCY	MAXIMUM ENERGY*
RECTANGULAR APERTURES				
427 mm x 420 mm	355 nm to 1064 nm	fs to ms	~100 J	~5000 J
230 mm x 230 mm	355 nm to 1064 nm	fs to ms	~30 J	~1500 J
160 mm x 160 mm	355 nm to 1064 nm	fs to ms	~10 J	~750 J
120 mm x 120 mm	355 nm to 1064 nm	fs to ms	~5 J	~400 J
110 mm x 110 mm	355 nm to 1064 nm	fs to ms	~5 J	~350 J
CIRCULAR APERTURES				
310 mm Ø	355 nm to 1064 nm	fs to ms	~40 J	~2000 J
150 mm Ø	355 nm to 1064 nm	fs to ms	~5 J	~500 J

\* For nanosecond pulses at 1064 nm. Maximum measurable energy depends on pulse width and wavelength. It generally decreases for shorter wavelengths and/or shorter pulse widths.

# MONITORING



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.

# **ABSORPTION CURVES**

# QE-MT & QE-MB



# PE maximum energy



# **ABSORPTION CURVES**

# **QED** attenuators







# **BEAM PROFILING** Overview of the different models



# **BEAM PROFILING CAMERAS**

Profiling a laser beam is a convenient complement to the measurement of its power or energy because it provides very useful additional information, like spatial energy or intensity distribution, beam widths, centroid, ellipticity and orientation, that may help you determine if your laser-based systems are operating optimally.

The Beamage is the most cost-effective USB3.0 Beam Profiling Camera on the market. It is available for UV to IR wavelengths and in 2 sizes. It comes with an intuitive and complete software that features an array of useful tools and functions. Its calculations are ISO compliant.

# MAIN SPECIFICATIONS

	BEAMAGE-4M	BEAMAGE-4M-IR	BEAMAGE-4M-FOCUS
Wavelength range			
Camera only	350 - 1150 nm	1495 - 1595 nm	350 - 1150 nm
With UG11-UV filter	250 - 370 nm		
With B3-IR-Filter	1250 - 1350 nm		
Pixel count	4.2 MPixels	4.2 MPixels	4.2 MPixels
HxV	2048 x 2048	2048 x 2048	2048 x 2048
Sensor size	11.3 x 11.3 mm	11.3 x 11.3 mm	20.5 x 20.5 mm



# **BEAM QUALITY MEASUREMENT**

The performance of a laser in practical applications is critical in the design of optical systems and focusing applications, and it can be quantified by measuring M2, the laser beam quality factor, which indicates how close a laser is to being an ideal Gaussian beam.

The Beamage-M2 acquires a sequence of beam profile measurements to automatically perform beam quality measurements within a few seconds. It is equipped with the largest optics on the market for easy alignment and fast measurements that you can trust. Its software is both intuitive and ISO compliant.





# IF YOUR LASER SPECIFICATIONS EXCEED THE LIMITS IN TERMS OF

- > WAVELENGTH
- > BEAM SIZE
- > LASER POWER

YOU CAN MANAGE THEM WITH THE ACCESSORIES PRESENTED BELOW

# MANAGE THE WAVELENGTH

Since CMOS sensors are not sensitive to every frequency of the electromagnetic spectrum, we offer several wavelength management solutions to enhance the capabilities of the Beamage beam profiling cameras.



#### Senterco V V V V V V V V So nm V-Rays Beamage + UV Converter

# MANAGE THE BEAM SIZE

A simple solution is offered to those who need to profile beams that are larger than the CMOS sensor (> 11.3 mm x 11.3 mm). This solution is a beam reducing optical component called camera lens. It works either by indirectly imaging the transmission of the beam after it has passed through a diffusing element or by directly imaging the beam that is incident on a Gentec-EO detector or beam dump.



# MANAGE THE LASER POWER

CMOS sensors have low saturation levels as well as low damage thresholds. It is thus very important that you control your laser power to get the best measurement possible and avoid damaging the Beamage camera.

- For laser power under 1 W, you can attenuate the beam with ND filters
- For laser power up to 1000 W, you can sample a small fraction of the beam with a BA optical sampler







# INTUITIVE SOFTWARE INTERFACE

Easy to navigate interface, with many displays and control features:

- 2D, 3D and XY Displays
- Background Subtraction Function
- Unique "Animate" Function
- Gaussian Fit
- Semi-Log Graph

### **KEY FEATURES**

> **USB 3.0 FOR THE FASTEST TRANSFER RATES** Up to 10X faster than regular USB 2.0 connections

#### > HIGH RESOLUTION

4.2 Mpixels resolution gives accurate profile measurements of very small beams

# > LARGE APERTURES

- 11.3 x 11.3 mm for the Beamage-4M
- 20.5 x 20.5 mm for the Beamage-4M-FOCUS

### > AVAILABLE WITH IR COATING

Beamage 4M-IR cameras have a special phosphor coating for IR wavelengths (1495-1595 nm)

#### > ISO COMPLIANT

D4odefinition of diameter, centroid, ellipticity and orientation are ISO 11146:2004 and 11146:2005 compliant

#### > EXTERNAL TRIGGER

To synchronize the camera with a pulsed laser







BA series optical attenuators





Pelican carrying case







USB-A to USB-C adaptor



Stackable ND filters (0.5, 1.0, 2.0, 3.0, 4.0 & 5.0)



Fiber adaptors & connectors (FC, ST and SMA)



UV and IR filters






POWER
DETECTORS

	gentec-(-)	gentec-co		
	BEAMAGE-4M	BEAMACE-4M-IR	BEAMAGE-4M-FOCUS	
SENSOR TECHNOLOGY	СМОЅ	CMOS (with phosphor coating)	CMOS (with fiber optic taper)	
EFFECTIVE APERTURE	11.3 x11.3 mm	11.3 x 11.3 mm	20.5 X 20.5 mm °	
MEASUREMENT CAPABILITY				
Wavelength range				
Camera only	350 - 1150 nm	1495 - 1595 nm	350 - 1150 nm	
With UG11-UV filter	250 - 370 nm			
With B3-IR-filter	1250 - 1350 nm			
Pixel count	4.2 MPixels	4.2 MPixels	4.2 MPixels	
HxV	2048 x 2048	2048 x 2048	2048 x 2048	
Minimum measurable beam	55 µm	70 µm	120 µm	
RMS noise	1000:1 (60 dB)	1000:1 (60 dB)	1000:1 (60 dB)	
DAMAGE THRESHOLDS				
Maximum average power	1 W with ND filter	1 W with ND filter	1 W with ND filter	
Maximum density (1064 nm)	10 W/cm <sup>2</sup> 0.1 J/cm <sup>2</sup>	10 W/cm² 0.1 J/cm²	10 W/cm² 0.1 J/cm²	
SOFTWARE				
Displays	2D, 3D, XY and Beam Tracking			
Display Features	2D: Print Screen, Reset View, Show/Hide Beam Diameter 3D: Print Screen, Reset View, Top View XY: Save Data, Zoom, Gaussian Fit, Semi-Log, Show/Hide Cursor, Show/Hide FWHM, Show/Hide 1/e² Beam Tracking: Save Data, Print Screen, Reset View, Zoom			
Beam Diameter Definitions		D4σ (ISO compliant), 1/e² along crosshairs (13.5%) FWHM along crosshairs (50%) Custom (%)		
		Custom (70)		
Buffer Controls	0	pen File, Save Current Data, Save All Data, Previous/Nex	t Image, Clear Buffer, Animate	
Buffer Controls Printing and Reports	С	pen File, Save Current Data, Save All Data, Previous/Nev Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D ar	rt Image, Clear Buffer, Animate easures, Parameters) nd 3D)	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS	С	pen File, Save Current Data, Save All Data, Previous/Nex Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D au	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D)	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size	C 11.3 x 11.3 mm	pen File, Save Current Data, Save All Data, Previous/Nex Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D ar 11.3 x 11.3 mm	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size Sensor area	C 11.3 x 11.3 mm 1.28 cm <sup>2</sup>	pen File, Save Current Data, Save All Data, Previous/Nex Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D a 11.3 x 11.3 mm 1.28 cm <sup>2</sup>	rt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm 1.28 cm²	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size Sensor area Effective aperture	C 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor	Dipen File, Save Current Data, Save All Data, Previous/Nex Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D a) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> 20.5 x 20.5 mm	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size Sensor area Effective aperture Dimensions (not including filter)	C 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm	Dipen File, Save Current Data, Save All Data, Previous/Nev Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D at 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> 20.5 x 20.5 mm 61H x 81.1W x 46.5D mm	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size Sensor area Effective aperture Dimensions (not including filter) Weight (head only)	C 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g	Dipen File, Save Current Data, Save All Data, Previous/Nev Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D a) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> 20.5 x 20.5 mm 61H x 81.1W x 46.5D mm 235 g	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size Sensor area Effective aperture Dimensions (not including filter) Weight (head only) ORDERING INFORMATION	C 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g	bpen File, Save Current Data, Save All Data, Previous/Nev Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D a) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> 20.5 x 20.5 mm 61H x 81.1W x 46.5D mm 235 g	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size Sensor area Effective aperture Dimensions (not including filter) Weight (head only) ORDERING INFORMATION Compatible stand	C 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g STAND-D-233	Deen File, Save Current Data, Save All Data, Previous/Nev Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D a) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g STAND-D-233	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> 20.5 x 20.5 mm 61H x 81.1W x 46.5D mm 235 g STAND-D-233	
Buffer Controls Printing and Reports PHYSICAL CHARACTERISTICS Sensor size Sensor area Effective aperture Dimensions (not including filter) Weight (head only) ORDERING INFORMATION Compatible stand Product page	C 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g STAND-D-233 STAND-D-233	Dipen File, Save Current Data, Save All Data, Previous/Nev Full Report in Print Ready Format (2D, 3D, XY, M Print Screen in BMP format (2D a) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> Same as sensor 61H x 81.1W x 19.7D mm 138 g STAND-D-233	tt Image, Clear Buffer, Animate easures, Parameters) nd 3D) 11.3 x 11.3 mm 1.28 cm <sup>2</sup> 20.5 x 20.5 mm 61H x 81.1W x 46.5D mm 235 g STAND-D-233	







# MAIN CONTROLS

The upper part of the software includes all the main controls in a ribbon format. These controls are grouped by family: Capture Controls, File Controls, Buffer Controls, M2 Controls and Data Computations. The last includes very useful filters and a normalization function.

# DISPLAYS

3

The left-hand side of the software is the display panel. Four displays are available: 3D, 2D, XY (cross-sectional graphs along the crosshairs) and Beam Tracking. The desired display is selected by clicking on the corresponding icon at the bottom of the panel. Print screen controls are available for the 3D, 2D and Beam Tracking displays. They allow the user to save an image of the current view in BMP format.

# HOME AND SETUP TABS

The right-hand side of the software contains the Home, Setup and Data Acquisition tabs. The Home tab allows the user to select the main controls for his measurements (Beam Diameter Definition, Crosshair Center and Orientation) and displays the resulting measurements below. The Setup tab allows the user to set the measurement parameters (Exposure Time, Image Orientation and Averaging, Active Area, etc.) and the Data Acquisition tab allows the user to save measurements with or without full images, to enter the Sampling Rates and a Total Duration for the Acquisition. More tabs with advanced controls are available when clicking on the Show/Hide Options button in the Computations panel.





## **3D DISPLAY**

The 3D display shows the actual shape of the beam. It is possible to easily zoom, pan and rotate the image. The Reset button puts the data back in its original configuration. This display also features a Print Screen button to save the latest image in BMP format.



format.

Select

1

**2D DISPLAY** 



💿 Top View

The 2D display features the crosshairs (set to the major and minor axis or along a specific angle) and the measured diameters of the beam. These diameters vary with the chosen definition (4-sigma, FWHM, 1/e2, etc.) and the display can be turned ON or OFF. The Print Screen button allows to save a picture of the current screen in BMP

 $\bigcirc$ 

Toggle to

grayscale



Crosshairs



# **XY DISPLAY**

Active Area

The XY display plots cross-sectional graphs of the beam along the crosshairs. This display features many useful tools like zoom, cursor, and FWHM and 1/e2 level bars. It is also possible to display the graphs in semi-log format to enhance the details in the low intensity parts of the beam.

**Reset View** 

Show/Hide

Diameter

0



# **BEAM TRACKING DISPLAY**

----

Screen

The Beam Tracking Display allows the user to visualize the variation of the beam's centroid position on the sensor. This display shows the latest calculated position as well as the previous ones, until the user resets the view. The display also shows the mean position of all computed values and gives information regarding position stability for both X and Y axes. This tool is great to monitor the beam pointing stability over time.





# BEAMAGE-M2 Automated M<sup>2</sup> measurement system



#### **AUTOMATED MEASUREMENTS**



Inside the BEAMAGE-M2, a computer-controlled motorized rail allows precise positioning of two mirrors, which in turn allow a 400 mm beam path difference. At each position of the translation stage, a beam profile is acquired and the beam diameter is measured. The automation of the translation stage allowed by the software is the key to a fast measurement.

#### **KEY FEATURES**

#### > LARGE APERTURES

The only  $M^2$  system on the market equipped with a complete set of 50mm (2") optics. Also, the sensor is 11.3 x 11.3mm

#### SIMPLE ALIGNMENT

Two beam-steering mirrors are included for quick and easy alignment of your laser into the system.

COMPACT

The low-profile ingenious mechanics make it easy to fit the device on any optical table

#### ISO COMPLIANT

The calculations are fully compliant to the ISO 11146 and 13694 standards

#### FAST ACQUISITION

Make a complete, ISO-compliant measurement in only 20 seconds with the ROI feature and in less than a minute with full-frame acquisition

#### FLEXIBLE & INTUITIVE SOFTWARE

#### PRACTICAL ALIGNMENT TOOL



Each BEAMAGE-M2 system includes an alignment tube that helps you set up the system faster. Simply use the two alignment mirrors to center your laser beam onto both irises, and you will be ready to start measuring in no time!

The fluorescent material around the pinholes also helps to align beams that are in the NIR range without having to use an IR viewer.

# BEAMAGE-M2 Specifications



	BEAMAGE-M2	
SENSOR TECHNOLOGY	Beamage-4M included	
EFFECTIVE APERTURE	Ø 48 mm optics - 11.3 x 11.3 mm sensor	
MEASUREMENT CAPABILITY		
System wavelength range	350 - 1100 nm	
Attenuation range	3 Flip-mount attenuators for 8 levels of attenuation: no attenuation, ND0.5, ND1, ND2, ND1.5, ND2.5, ND3, ND3.5	
Beam diameter range <sup>a</sup>	55 µm to 11.3/3 mm	
Translation stage		6
Mechanical travel range	200 mm	
Effective optical path range	400 mm	( -
Lens focal length	5 AR-coated lenses included: 200 mm, 250 mm, 300 mm, 400 mm and 500 mm	
Typical M <sup>2</sup> accuracy <sup>b</sup>	± 5%	
Typical M <sup>2</sup> repeatability <sup>b</sup>	±2%	
Applicable light sources	CW and quasi-CW	
Typical measurement time	45 s with full-frame acquisition	
DAMAGE THRESHOLDS °		
Maximum average power	1 W with ND filter	
Maximum density (1064 nm)	CW: 10 W/cm <sup>2</sup> ; Pulsed: 0.1 J/cm <sup>2</sup>	
PHYSICAL CHARACTERISTICS		
Dimensions		
Main enclosure	357 mm (L) x 165 mm (W) x 135 mm (H)	
Total (including external mirrors)	602 mm (L) x 193 mm (W) x 172 mm (H)	Ē
Optical axis height	86 mm	
Weight	6.6 kg	
Power supply	48 VDC, 1.25A out	1
SOFTWARE		
Displays	2D, 3D, XY, Beam Tracking and M <sup>2</sup>	
Beam diameter definitions	D4ơ 1/e² along crosshairs (13.5%) FWHM along crosshairs (50%) Custom (%)	
Beam quality definitions	Laser beam quality M <sup>2</sup> : M <sup>2</sup> <sub>x</sub> , M <sup>2</sup> <sub>y</sub> (ISO compliant) Beam Propagation Factor: BPP <sub>x</sub> , BPP <sub>y</sub> Width at waist: W <sub>x</sub> , W <sub>y</sub> Waist location and offset: Z <sub>x</sub> , Z <sub>y</sub> , $\Delta$ Z Divergence angle: $\theta_x$ , $\theta_y$ Rayleigh length: Z <sub>Rx</sub> , Z <sub>Ry</sub> Astigmatism	
Printing and reports	Full report in print-ready format	
ORDERING INFORMATION		
Product page		

Specifications in the table above are for the use with a Beamage-4M beam profiler (included in the Beamage-M2 kit)

a. At the Beamage sensor

b. Depending on the beam quality and optical configuration

c. With ND4 filter at the Beamage



CE

# BEAMAGE-M2 Software features

Select which set of Rayleigh range boundaries



M2 Results tab:

View and understand all the measured parameters

quickly, for both the initial laser beam and the

gentec-eo.com/laser-beam-diagnostics

RUNM'SETUP



ISO COMPLIANCE MADE SIMPLE

With the "RUN M2 SETUP" button, the software automatically defines new parameters for a more precise  $M^2$  measurement. The "ISO SCAN" data set complies with the ISO-11146  $M^2$  measurement standard, being spread between  $-3Z_p$  and  $+3Z_p$ .

The automatic settings are updated after each calculation, considering the values of  $\rm Z_{_0}$  and  $\rm Z_{_p}$  from the latest measurement.

By default, the results graph always shows the calculated positions of the first three Rayleigh distances on each side of the waist.

	🔍	Des Acquistio	M <sup>2</sup>	2 Roots
M <sup>2</sup> Flood	Values			
Laser Wave	iongth 1064		scal Length (Lens)	300 mm
Automatic	Settings			
Х В.	NMPSETUP	D STARTE	0 SC/W	8109
User-Defin	ed Scan-		fanual Frames	
۲	SETTINGS		Enter Distance	586.63 mm
			(Late to series)	
	wir E	2106	< +	Add 🕨
Data				
CALO		leiste Sot	Clear All	
Index	Distance	X Diameter	Y Diameter	Exposure Time ^
1	271.0	702.8	689.7	10.55
2	280.6	659.3	646.1	9.16
3	290.3	612.6	600.5	7.96
4	300.0	567.8	556.0	6.93
5	309.7	523.3	512.7	5.87
6	319.3	480.3	471.4	5.00
7	329.0	435.6	428.3	4.22
	338.7	394.5	388.3	3.47
	348.4	353.4	348.5	2.73

# FULL CONTROL ON YOUR DATA

During an M<sup>2</sup> scan, each of the measured profiles is saved and the flexible software gives you complete control on your acquired data.

- View each acquired profile in 2D display or 3D display.
- Add measurement points to a data set at the position of your choice with the "ADD" button.
- Remove unwanted profiles from your data set & recalculate the measurements.



# **FAST ATTENUATION**

Add or remove attenuation with the flick of a finger. The software adjusts the exposure time at each frame during an acquisition, and advises the user on the required attenuation.



#### **COMPATIBLE PRODUCTS**







BEAMAGE-4M

BEAMAGE-4M-FOCUS

PH series

#### **KEY FEATURES**

#### > FOR ALL BEAMAGE MODELS

We offer various SM1-threaded absorptive ND filters that can be fixed directly on the aperture of the Beamage camera via a SM1 to C-mount adaptor. We also offer SM2-threaded filters that can be fixed on the Beamage-4M-FOCUS via a SM2 to T-Mount adaptor.

#### > HIGH-QUALITY OPTICS

These filters reduce the intensity of all wavelengths without affecting the wavefront of the beam or distorting the image.

#### > STACKABLE ATTENUATION

Subsequent filters can be stacked directly on each other. Sets of 3 filters or 6 filters as well as individual filters are available.

#### **OVERVIEW OF THE MODELS**

MODEL NAM	E	EQUIVALENT ATTENUATION	TRANSMITTANCE AT 633 NM
SM1 FILTERS	SM2 FILTERS		
ND0.5	ND0.5-FOCUS	(1/3.16)	~32%
ND1.0	ND1.0-FOCUS	(1/10)	~10%
ND2.0	ND2.0-FOCUS	(1/100)	~1%
ND3.0	ND3.0-FOCUS	(1/1000)	~0.1%
ND4.0	ND4.0-FOCUS	(1/10 000)	~0.01%
ND5.0	ND5.0-FOCUS	(1/100 000)	~0.001%
NDSET-6 (Set of 6 f	ilters)		
NDSET-3 (Set of 3 fil	lters: ND1, ND2, ND3)		

ND-H (ND filter holder)







	ND0.5 TO ND5.0
Spectral range	400 nm² - 1595 nm
Filter diameter	25 mm Ø
Clear aperture	22.5 mm $\phi$ (90% of diameter)
Dimensional tolerance	+0.0/-0.25 mm
Optical density tolerance	±5%
Parallelism	< 10 arcsec
Transmitted wavefront error	< λ/10 at 633 nm
Surface flatness	< \/4
Surface quality	40 - 20 Scratch-Dig
Maximum power	1 W
Damage thresholds	100 W/cm <sup>2</sup> or 3 J/cm <sup>2</sup>
Product page	

\* Data specified at 633 nm

a. For ND4.0 filter, lower limit with other models.

# SPECTRAL TRANSMISSION OF ALL FILTERS



# Optical attenuators - up to 1 kW



#### **MULTIPLES USES**

- Monitor power and beam profile simultaneously
- Polarization insensitive beam-splitter with no back-reflections
- > Optical pick-off for use with our energy or power detectors
- > Attenuator for our high sensitivity detectors like M6 series and PH series

#### **COMPATIBLE PRODUCTS**





BEAMAGE-4M



PH series

BEAMAGE-4M-FOCUS





M6 series



UP55N-40S-H9 (for BA32-1KW only)

#### **KEY FEATURES**

#### > MANAGE THE LASER POWER

CMOS sensors have low saturation levels as well as low damage thresholds. It is thus very important that you control your laser power to get the best measurement possible and avoid damaging the BEAMAGE camera.

#### SAMPLE YOUR LASER BEAM

The BA series optical attenuators use Fresnel reflections on two orthogonal wedges to pick off a small fraction of the input beam. The incoming beam polarization state and irradiance are preserved.

#### IMPROVED MECHANICS

The BA16 models are now compatible with 30-mm cage systems and also include SM1 threads on the input face



**ACCESSORIES** 



## BA32 mounting kit for BEAMAGE-4M-FOCUS



BA32 mounting kit for UP55N-40S-H9



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	* partition *			<u> </u>
	BA16-60S	BA16K-150S-H5-D0	BA16K-500F-H9-D0	BA32-1KW
MAXIMUM POWER	60 W	150 W	500 W	1000 W
EFFECTIVE APERTURE	16 mm Ø	16 mm Ø	16 mm Ø	32 mm Ø
COOLING METHOD	Convection	Convection	Fan	Water
MEASUREMENT CAPABILITY				
Spectral range	200 - 2100 nm			
Integrated power detector	N/A	UP19K-15S-H5-D0	UP19K-110F-H5-D0	Compatible with UP55 series (not included)
Fan input voltage	N/A	N/A	12 VDC	N/A
Equivalent attenuation	1/1700 @ 1064 nm	1/1700 @ 1064 nm	1/1700 @ 1064 nm	1/1900 @ 1064 nm
Optical wedges material	UV fused silica (uncoated)			
Residual beam deviation	5.6°	5.6°	5.6°	3.6° @ 1064 nm
Polarization correction	Yes (pair of orthogonal wedges)			
DAMAGE THRESHOLDS				
Maximum power	60 W	150 W	500 W	1000 W
Maximum average power density	10 MW/cm <sup>2</sup>	10 MW/cm <sup>2</sup>	10 MW/cm <sup>2</sup>	10 MW/cm <sup>2</sup>
Maximum energy density	10 J/cm <sup>2</sup>	10 J/cm <sup>2</sup>	10 J/cm <sup>2</sup>	10 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS				
Aperture diameter	16 mm Ø	16 mm Ø	16 mm Ø	32 mm Ø
Dimensions	45H x 47W x 81D mm	54H x 50W x 91D mm	54H x 54H x 126D mm	145H x 250W x 132D mm
Weight	0.26 kg	0.37 kg	0.46 kg	5.5 kg
Mounting thread	SM1	SM1	SM1	SM2
Included adaptor	SM1 external threaded tube	SM1 external threaded tube	SM1 external threaded tube	N/A

#### **ORDERING INFORMATION**

Compatible Stand

Product Page







STAND-S-233



2x STAND-S-443-C-M

TERAHERTZ DETECTORS

POWER DETECTORS

ENERGY DETECTORS

# UV CONVERTERS Wavelength management



#### **SPECIFICATIONS**

	BSF23C11.3N	BSF23P11.3N	BSF23R11.3N	BSF23G11.3N
Input Aperture Ø	23 mm	23 mm	23 mm	23 mm
Overall Length (OAL)	97 mm	97 mm	97 mm	97 mm
Magnification	1.4	1.4	1.4	1.4
Crystal Type	С	Р	R	G
Wavelength range	110 - 225 nm	10 - 350 nm	110 - 532 nm	X-ray - 400 nm
Saturation level 193 nm 248 nm 308 nm	400 mJ/cm² N/A N/A	30 mJ/cm² 30 mJ/cm² 50 mJ/cm²	50 mJ/cm² 400 mJ/cm² 400 mJ/cm²	10 mJ/cm² 10 mJ/cm² 50 mJ/cm²
Decay time	3 - 5 µs	5 µs	4000 µs	0.1 µs
Max repetition rate	20 - 30 kHz	20 kHz	25 Hz	20 kHz
Product page				

A complete procedure on how to choose the appropriate UV Converter (UV Converter Application Note) is available on our website at **<u>www.gentec-eo.com</u>**.

UV Converters take advantage of a phenomenon called fluorescence to extend the performance range of the Beamage beam profiling camera to ultraviolet wavelengths. A fluorescent crystal located at the entrance of the converter absorbs UV wavelengths and reemits longer wavelengths (in the visible spectrum), which are less energetic and detected by the CMOS sensor.

#### MAIN CHARACTERISTICS

- Transforms wavelengths contained between X-rays and 400 nm to visible and near-IR wavelengths.
- Images larger beams due to the magnification properties of the optics.
- Built with an iris at the output port for a control of the exposure on the CMOS sensor.
- Removable extension tube that is easily fixed onto the entrance port of the Beamage camera.
- Ready to use within minutes

# IR ADAPTOR Wavelength management



Typically, a CMOS silicon sensor is operating at its full potential when imaging lasers with wavelengths between 350 nm and 1150 nm. If you want to extend the performance range of your Beamage beam profiling camera to the near-IR telecom wavelengths band, you can use the IR Adaptor. This ideal solution takes advantage of a multi-photon absorption process to extend the sensitivity range of the camera sensor to a portion of the near-IR spectrum (1495 nm - 1595 nm).

#### MAIN CHARACTERISTICS

- Converts wavelengths between 1495 nm and 1595 nm to shorter wavelengths between 950 nm and 1075 nm.
- Images larger beams due to the convergent properties of the optics (3.29X).
- Built with a high quality coated anti-reflection input window that allows wavelength conversion with low distortion and maximum image resolution.
- Removable and easily C-mounted onto the entrance port of the camera.
- > Ready to use within minutes.

### SPECIFICATIONS

	IR ADAPTOR
Active area	27.5 mm Ø
IR spectral range	1495 nm - 1595 nm
Peak IR sensitivity	1510 nm and 1540 nm
Converted wavelengths	950 nm - 1075 nm
<b>Pixel Multiplication Factor</b>	3.29
Minimum beam size	230 µm
Maximum beam size	19 mm
Maximum resolution	12 lp/mm over active area 40 lp/mm at sensor focal plane
Distortion	-1.0% barrel distortion (inverted image)
Linearity	Non-Linear, IR converted output ~ IR input intensity 141
Spectral transmission	360 nm - 2000 nm at F30.8
Damage threshold	1 W/cm <sup>2</sup>
Dimensions	46 mm Ø x 97 mm L
Operating temperature	-10°C to +40°C
Weight	210 g
Product page	



# EXCITATION SPECTRUM





CE

POWER DETECTORS

TERAHERTZ DETECTORS



# **UV BANDPASS FILTER**

We also offer a color glass filter specially designed for the UV spectrum. Depending on the wavelength, the UG11-UV filter transmits 20% to 70% of the input beam power. It is particularly useful for applications with wavelengths contained between 250 nm and 370 nm. Other wavelengths are blocked by the filter.

#### **SPECIFICATIONS**

MODEL	UC11-UV
Spectral range	250 nm - 370 nm
Diameter	25 mm Ø
Clear aperture	80% of area
Dimensional tolerance	+0.0 / -0.2 mm
Thickness	3 mm
Thickness tolerance	+0.0 / -0.2 mm
Parallelism	< 3 arcmin
Surface flatness	< \//4
Maximum power	1 W
Surface quality	40 - 20 Scratch-Dig
Damage threshold	30 W/cm² (typical)
Product page	

SPECTRAL TRANSMISSION



\* Data specified at 633 nm

# **IR FILTER**

The B3-IR-FILTER is a color glass filter specifically designed for IR applications. Acting as a longpass filter, the B3-IR-FILTER cuts all the wavelengths below 1250 nm and only lets the IR wavelengths pass. It transmits approximately 70% of the incident light.

#### **SPECIFICATIONS**

MODEL	B3-IR-FILTER
Spectral range	1250 - 1350 nm
Diameter	25 mm Ø
Clear aperture	80% of area
Dimensional tolerance	+0.0/-0.2 mm
Thickness	6.3 mm max
Parallelism	< 3 arcmin
Surface flatness	< \/4
Maximum power	1 W
Surface quality	80-50 Scratch-Dig
Damage threshold	30 W/cm² (Typical)
Product page	
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#### SPECTRAL TRANSMISSION



# **CAMERA LENSES**

Camera lenses work by indirectly imaging on the sensor the reflection or the transmission of a beam that previously went through a diffusing material such as glass (see diagrams below).

It is necessary to use a camera lens to image beams that are larger than the CMOS sensor (11.3 mm X 11.3 mm) of the Beamage beam profiling camera. A camera lens can be directly C-mounted onto the aperture of the Beamage camera.



#### SPECIFICATIONS

	CL-25	CL-50
Focal length	25 mm	50 mm
Horizontal FOV	14°	7°
FOV at 1m	245 mm	120 mm
Minimum working distance	0.5 m	lm
Maximum beam size	2000 mm X 2000 mm (not a limiting factor)	2000 mm X 2000 mm (not a limiting factor)
Maximum measurable intensity / energ	y Very high because of indirect mechanism	Very high because of indirect mechanism
Inverted image	Yes	Yes
Beam distortion	Setup, lens aberration and speckles from diffusing glass	Setup, lens aberration and speckles from diffusing glass
Diffusing material needed	Yes	Yes
Magnification calibration needed	Yes	Yes
Possibility of wavelength conversion	Yes	Yes
Optical filter needed	Rarely to never	Rarely to never
Removable	Yes	Yes
Product page		





#### IMAGING A TRANSMITTED BEAM



#### **IMAGING A REFLECTED BEAM**



CE

### **BSORPTION CURVES** Specifications

# Beamage relative response





# ABSORPTION CURVES

# Beamage operating range



# **TERAHERTZ DETECTORS**

Overview of the different models

# WHAT IS TERAHERTZ RADIATION?

The THz portion of the electromagnetic spectrum fills the gap between the far infrared and the microwaves. More precisely, it is nestled between the high-frequency edge of the microwave band, 300 GHz ( $3\times10^{11}$  Hz), and the long-wavelength edge of far-infrared light, 3000 GHz ( $3\times10^{12}$  Hz or 3 THz). In wavelengths, this range corresponds to 0.1 mm (or 100 µm) infrared to 1.0 mm microwave. The THz band is set in the region where electromagnetic physics can best be described by its wave-like characteristics (microwave) and its particle-like characteristics (infrared).



# WHAT IS IT USED FOR?

THz radiation is interesting because of the way it interacts with matter:

- It can penetrate things like wood, plastics, clothing, and other materials.
- It is also absorbed by water, or a material that contains water, like human skin.
- It is non-ionizing and therefore not harmful to humans like X-rays can be.

One of the first uses is the "full body scan" used at airports. It also has uses in medical applications for early detection of cancer cells.

# HOW IS IT MEASURED?

THz sources range in power from nW to mW and in energy from nJ to mJ. Like most electromagnetic sources, they must be characterized for performance and/or control.

Older THz detection methods include:

- Golay cells
- Microbolometers
- Electronic antennas

Newer THz detection methods include:

- Pyroelectric detectors
- Schottky diode detectors
- Photoacoustic detectors

# WHY ARE GENTEC-EO PRODUCTS BETTER?

Golay cells are large, fragile, costly and have a limited measurement range.

Pyroelectric detectors (like the ones used in our THZ detectors) are small, sensitive, durable and less costly. Some of their advantages are:

- High performance in a small package
- Broad spectral response (from 0.25 to 3000  $\mu m)$
- Wide dynamic range (from nW to mW)
- Rugged and durable
- Very cost-effective

# TERAHERTZ DETECTORS

Overview of the different models

We have designed a unique line of thermal sensors and meters for measurements in the THz region. These products are used to measure power (radiant flux or irradiance) and energy of CW, pulsed and quasi-CW THz sources from 30 THz to 0.1 THz. Our product line includes the QS series of miniature pyroelectric detector hybrids that include an operational amplifier and can be easily integrated into THz instrumentation.









# THZ-B DETECTORS, WITH T-RAD RADIOMETERS

- Large area: 5 mm and 9 mm Ø
- Wide dynamic range: 10 nW to 20 mW
- Broad spectral response with BL coating: 0.1 μm to 3000 μm
- Two output options:
  - "DZ" models used with our digital T-RAD lock-in radiometer, for USB output to PC. Includes a powerful standalone LabVIEW software.
  - "DA" models used with our T-RAD-ANALOG power supply, for analog BNC output to your oscilloscope or lock-in amplifier.
- CHOICE OF ANALOG OR DIGITAL OUTPUT

# THZ5I-BNC: ANALOG RADIOMETER & JOULEMETER

- Very sensitive pyroelectric radiometer and joulemeter
- 5 mm Ø detector with BL broadband absorber
- Wide dynamic range: 10 nW to 63  $\mu\text{W}$  and 10 nJ to 2  $\mu\text{J}$
- Analog BNC output to your oscilloscope or lock-in amplifier
- CAN BE USED BOTH FOR POWER AND ENERGY MEASUREMENTS

# THZ-D: POWER DETECTORS FOR USE WITH GENTEC-EO METERS

- THZ12D-3S-VP:
  - Large area: 12 mm Ø
  - Wide dynamic range: 0.1 mW to 3 W
  - Spectrally flat (± 5%) from 30 THz to 0.7 THz
- THZ9D-20mS-BL:
  - Large area: 9 mm Ø
  - High sensitivity: 500 nW to 20 mW
  - Spectral correction factors provided from 0.25  $\mu m$  to 3000  $\mu m$
- COMPATIBLE WITH OUR STANDARD DISPLAYS & PC INTERFACES

# QS-THZ: MINIATURE HYBRID PYROELECTRIC DETECTORS

- Standard sizes: 5 and 9 mm Ø active area (other sizes available)
- Wide dynamic range: nW to mW and nJ to mJ
- Broad spectral response with BL coating: 0.1  $\mu m$  to 3000  $\mu m$
- Small packages: TO5 & TO8
- Includes integrated operational amplifier
- TRY THEM WITH OUR EVALUATION TEST BOX QS-I-TEST

# THZ-B JHz-B detectors and T-Rad modules



#### **KEY FEATURES**

- COVERS THE ENTIRE THZ SPECTRUM Get the best precision across the entire wavelength range and relative measurements from 30 THz to 0.1 THz.
- > ROOM TEMPERATURE OPERATION Easier to use and less expensive than a Golay cell.
- MEASURE POWER FROM nW TO mW With state of the art pyroelectric sensors, measure down to 10 nW with 1 nW NEP
- USE WITH T-RAD THZ MODULE OR T-RAD-ANALOG POWER MODULE

Each head can be connected to an oscilloscope using the analog power module (T-Rad-Analog) or directly to a PC with the digital power module (T-Rad)

SEVERAL SENSOR SIZES AVAILABLE Choice of 5 mm and 9 mm diameter

#### CALIBRATED AT 0.63 μm

All THz detectors are calibrated at a single wavelength (0.63  $\mu$ m) and include a typical wavelength correction data from 0.25 to 440  $\mu$ m. They are used for relative measurements outside that range.

#### SDC-500 OPTICAL CHOPPER

All THZ-B detectors require the use of an optical chopper, like our SDC-500, to sync the signal at either 5 Hz (DA models) or 25 Hz (DZ models)

#### **OUTPUT OPTIONS**

SMART DB15 CONNECTOR Contains all the calibration data

#### > TWO DETECTOR TYPES AVAILABLE:

- "DZ": digital output, used with T-RAD digital power module
- "DA": analog output, used with T-RAD-ANALOG analog power module

#### **COMPATIBLE DISPLAYS & PC INTERFACES**





T-RAD (for "-DZ" models only)

T-RAD-ANALOG (for "-DA" models only)

#### ACCESSORIES



Stand with delrin post

Winston cone



Removable IR windows (Various types available)



Pelican carrying case



SDC-500 digital optical chopper





	THZ5B-BL-DZ	THZ5B-BL-DA	THZ9B-BL-DZ	THZ9B-BL-DA
MAX AVERAGE POWER	20 mW	25 μW	20 mW	125 μW
EFFECTIVE APERTURE	5 mm Ø	5 mm Ø	9 mm Ø	9 mm Ø
COMPATIBLE MODULES	T-Rad	T-RAD-ANALOG	T-Rad	T-RAD-ANALOG
MEASUREMENT CAPABILITY				
Spectral range <sup>a</sup>				
Frequency	0.1 - 30 THz			
Wavelength	3000 - 10 µm	3000 - 10 μm	3000 - 10 μm	3000 - 10 µm
Max measurable power	20 mW	25 μW	20 mW	125 µW
Noise equivalent power (NEP)	5 nW	1 nW	50 nW	3 nW
Rise time (0-95%)	≤ 0.2s	≤ 0.2s	≤ 0.2s	≤ 0.2s
Sensitivity (Typical)	N/A	140 kV/W	N/A	20 kV/W
Chopping frequency <sup>b</sup>	25 Hz	5 Hz	25 Hz	5 Hz
DAMAGE THRESHOLDS				
Max average power density (at 1064 nm)	10 mW/cm <sup>2</sup>	10 mW/cm <sup>2</sup>	10 mW/cm <sup>2</sup>	10 mW/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS				
Effective aperture	5 mm Ø	5 mm Ø	9 mm Ø	9 mm Ø
Sensor	Pyroelectric	Pyroelectric	Pyroelectric	Pyroelectric
Absorber	BL	BL	BL	BL
Dimensions	66.0Ø x 46.5D mm			
Weight	227 g	227 g	227 g	227 g
ORDERING INFORMATION				
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233
Product page				

PRODUCT GUIDE 2024

a. Projected spectral range.
From 10 to 440 µm, spectrometer measurement.
From 440 to 3000 µm, relative measurement only.
This spectral range is subject to change.
b. SDC-500 digital optical chopper sold separately.



T-Rad (rear view)

T-Rad-Analog (front view)



### T-Rad

The T-Rad is a microprocessor-based digital radiometer that includes a 12-bit ADC and unique DSP Lock-In Software. It is powered by a USB connection, which also acts as a Virtual COM port. When a THZ-B Terahertz Pyroelectric detector is plugged into the T-Rad module, the module reads the content of the head's EEPROM, which identifies the detector and provides calibration and wavelength correction data. The LabVIEW Software supplied with the device makes it very easy to set up the radiometer, measure a THz or broadband source and record data. The software is compatible with Windows 7.8 & 10.

## **SPECIFICATIONS & FEATURES**

	T-RAD	T-RAD-ANALOG
Compatible detector heads	THZ-B-DZ	THZ-B-DA
Full scale ranges	200 nW - 200 mW*	N/A
Power on light	Green	Green
Analog output	0 to 3.6V, BNC	± 4.88 V, BNC
PC connection	USB 2.0	None
Trigger input (TTL)	BNC connector	None
Power supply	USB 2.0	External, 100/240 VAC 50 - 60 Hz, and 9V battery (both included)
Product number	201849	202306

Actual ranges vary based on the THZ-B detector selected



# INSTRUMENT CONTROL AND STRIP CHART

Instrument controls and the radiant power measurement are always visible, making it easy to change the radiometer settings, no matter which display tab is selected. Instrument controls include: Range, Filter Tau, Batch Size, Data Collection Mode, Reset Options, and a Null button for background cancellation. In addition, there are more set up and operation status indicators including: detector Rv, Wavelength, Frequency (actual), Locked and Frequency in Range lights. The Strip Chart displays the Radiant Power measurement in Watts, either continuously or by the batch. Select full scale, auto scale or use our manual scaling option.



# INSTRUMENT CONTROL AND TUNING NEEDLE

The "TUNE" tab selects the very useful "Tuning Needle" display. This is a simulated analog meter whose speed is determined by the "filter tau" setting. It is expected to be used during the set-up of a radiometer with a source. The "tau" value is usually set to a small value when aligning the probe to the source (i.e. when peaking the reading). There is a button control to select "full scale", "min-max" or "reset". In the "min-max" mode, the indicators are "blue" for the minimum power and "red" for the maximum power.



	Sea Duet Bullets Taray Seta 🖉 Bala G	dection Active 100 Carmint Sample
1 305	Min	Std. Dev.
	1.277E+0	4.078E+0
		Display as %
Rampe         Filter Tau         Fulled Passer           2xW         1         1.000         368         96-2	Max	Mean
Botch Size () 40 First Strength Collection Place () 40 Strengt Ante Record	1.469E+0	1.357E+0
Proof.         Warehough (on)         Locked           16+5         (533         Image: Control of the second sec	Riter Rescheidth (%) 1.592E-1	
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# INSTRUMENT CONTROL AND STATISTICS

In the "Statistics" tab there are 4 large windows that contain the statistics for the selected batch, including: Minimum, Maximum, Standard Deviation and Mean, expressed in Engineering Notation. Standard Deviation can be displayed in Watts or as a % that is user-selectable. There is also a window that shows the bandwidth of the Digital Band Pass Filter based on the user selected "Filter Tau" (0.100 to 100 seconds). A lower time constant is helpful when setting up, and a longer one when making measurements, especially on the lower ranges of the instrument.



# THZ-B-DA DETECTOR AND OSCILLOSCOPE

Here is a basic analog set up that would be useful if the optical power of the source was about 5  $\mu$ W or greater. The output of the THZ5B-BL-DA detector would be approximately 600 mV at 5 Hz chopping frequency, giving plenty of signal for an oscilloscope. Simply read the voltage output and divide by the Rv factor (V/W) of the detector to measure the intensity of the source in Watts. Also consider applying a wavelength correction factor under certain circumstances.



# THZ-B-DA DETECTOR AND LOCK-IN AMPLIFIER

This is another analog set-up option that we recommend if you have to measure very low power levels (i.e. less than 5  $\mu$ W) where the signal may be buried in the broadband noise. The voltage output of the analog THZ-B-DA detector, powered by our T-Rad-Analog, is routed to the Lock-In Amplifier input, and the Sync Output of our SDC-500 Chopper is connected to the reference input. The Lock-In Amplifier will lock on the chopping frequency and you can dial in a long integrating time and measure a very low RMS voltage. The voltage divided by our Voltage Responsivity (V/W) equals the power of the source.



# THZ-B-DZ DETECTOR AND T-Rad MODULE

Although analog solutions are available, for simplicity, convenience and sensitivity, we recommend you choose our THZ-B-DZ detectors and the T-Rad Digital Radiometer. Our unique DSP Lock-In Amplifier software provides a function much like the Analog Lock-In, but is so much easier to use. It also addresses thermal drift of the sensor and allows you to display the power measurement and complete statistics directly in digital and graphic formats. Set the range, null the background, set the filter tau (bandwidth) and make the measurement. It's that easy!



#### **OUTPUT OPTIONS**

> ANALOG OUTPUT

> Plug the device directly into your oscilloscope or lock-in amplifier with the BNC output

#### **KEY FEATURES**

- > COVERS THE ENTIRE THZ SPECTRUM Measure accurately from 0.25 to 15  $\mu m$  and from 30 THz to 0.1 THz in relative terms
- > MEASURE POWER FROM nW TO uW Make low-level measurements with an NEP of 1.0 nW
- MEASURE ENERGY FROM nJ TO µJ Can be used with low repetition rate pulsed THz sources to measure pulse energy up to 40 Hz
- INTEGRATED ANALOG MODULE Plug the device directly into your oscilloscope or Lock-In Amplifier
- > BATTERY OR EXTERNAL POWER Includes 9V battery and an external power supply

#### CALIBRATED AT 0.63 μm

All THz detectors are calibrated at a single wavelength (0.63 µm) and include typical wavelength correction data from 0.25 to 440  $\mu$ m. They are used for relative measurements outside that range.

#### > SDC-500 OPTICAL CHOPPER The THZ-I-BNC models require the use of an optical chopper, like our SDC-500, running at 5 Hz.

#### ACCESSORIES





Stand with delrin post



Removable IR Windows (Various types available)



SDC-500 digital optical chopper



Pelican carrying case





	THZ5I-BL-BNC
MAX AVERAGE POWER	62.5 µW
EFFECTIVE APERTURE	5 mm Ø
INTEGRATED MODULE	Analog (BNC)
MEASUREMENT CAPABILITY	
Spectral range <sup>a</sup>	
Frequency	0.1 - 30 THz
Wavelength	3000 - 10 μm
Max measurable power	62.5 μW
Noise equivalent power <sup>b</sup>	1.0 nW
Rise time (0-100%)	≤ 0.2s
Sensitivity (Typical)	140 kV/W
Chopping frequency	5 Hz (Required)
Calibration uncertainty	Contact us
Energy mode	
Maximum measurable energy	2 µJ
Noise equivalent energy	1.0 nJ
Minimum pulse width	1.0 µs
Maximum repetition rate	40 Hz
DAMAGE THRESHOLDS	
Maximum average power density (1064 nm)	50 mW/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS	
Effective aperture	5 mm Ø
Sensor	Pyroelectric
Absorber	BL
Analog output	0-10 V
Dimensions	81.3Ø X 99.3D mm
Weight	500 g
ORDERING INFORMATION	
Compatible stand	STAND-D-233
Product page	

a. Projected spectral range.

From 10 to 440  $\mu$ m, spectrometer measurement. From 440 to 3000  $\mu$ m, relative measurement only. This spectral range is subject to change. b. At 632 nm and a chopping frequency of 5Hz.



#### **KEY FEATURES**

- COVERS THE ENTIRE THZ SPECTRUM Get the best precision across the entire wavelength range and relative measurements from 30 THz to 0.1 THz.
- ROOM TEMPERATURE OPERATION Easier to use and less expensive than a Golay cell.

#### CALIBRATED AT 10.6 μm

THZ-D detectors are calibrated at a single wavelength 10.6 um (30 THz) and at 10 Hz chopping frequency for the THZ9D. Both include typical wavelength correction data from 10.6 to 440  $\mu$ m. They are used for relative measurements outside that range.

#### LARGE AREA

Models range from 9 mm Ø for the THZ9D and 12 mm Ø for the THZ12D.

#### WIDE RANGE OF MEASUREMENTS

Measure from 100 uW to 3 W of continuous power with the THZ12D model, the highest in our terahertz range of products, and down to 5 uW to 25 mW with the THZ9D model.

#### USE WITH A UNIVERSAL DISPLAYS & PC INTERFACE

No need for an exclusive monitor. These unique THz detectors work with our display & PC interface.

#### > SDC-500 OPTICAL CHOPPER

The THZ9D model requires the use of an optical chopper, like our SDC-500, running at 10 Hz.

#### **OUTPUT OPTIONS**

- SMART DB15 CONNECTOR Contains all the calibration data
- > ANALOG OUTPUT When used with APM (D) analog power supply module
- integra ALL-IN-ONE-METER (for THZ12D only) Connects directly to a PC Two models available:
  - USB output (-INT)
  - RS-232 output (-IDR)

#### **COMPATIBLE DISPLAYS & PC INTERFACES**







MAESTRO

U-LINK

M-LINK (for THZ12D)



APM (D) analog power module (for THZ9D)

#### ACCESSORIES



Stand with steel post (for THZ12D)



Pelican carrying case



Fiber adaptors & connectors (FC, ST and SMA)



Stand with delrin (for THZ9D)



Extension cables (4, 15, 20 or 25 m)



SDC-500 digital optical chopper



Extra isolation tube

gentec-eo.com/terahertz-power-meter





	THZ9D-20mS-BL	THZ12D-3S-VP	РО
MAX AVERAGE POWER	25 mW	3 W	WER
EFFECTIVE APERTURE	9 mm Ø	12 mm Ø	
COMPATIBLE DISPLAYS & PC INTERFACES	MAESTRO, U-LINK & APM (D)	MAESTRO, U-LINK & M-LINK	TECT
MEASUREMENT CAPABILITY			ORS
Spectral range <sup>a</sup>			
Frequency	0.1 - 30 THz	0.1 - 30 THz	
Wavelength	3000 - 10 μm	3000 - 10 µm	
Maximum average power			
with MAESTRO	20 mW	3 W	QCY
with U-LINK	25 mW	3 W	DET
Noise equivalent power <sup>b</sup>	300 nW	0.5 µW	ECT
Minimum measurable power <sup>c</sup>	N/A	50 - 100 µW	ORS
Thermal drift	N/A	12 μW/°C	
Rise time (nominal) <sup>d</sup>	< 0.2 s	3 s	
Minimum repetition rate <sup>f</sup>	1000 Hz	7 Hz	
Chopping frequency	10 Hz (required)	N/A	BEA
Calibration uncertainty <sup>9</sup>	± 5.0% at 10.6 μm; ± 15% at 10.6 - 440 μm °	± 3.0% at 10.6 μm ± 8.0% at 10.6 – 300 μm ± 15% at 300 – 440 μm	M PROFIL
Repeatability	±0.5%	±0.5%	.INC
DAMAGE THRESHOLDS			
Maximum average power density <sup>h</sup>	50 mW/cm <sup>2</sup>	30 W/cm <sup>2</sup>	
Maximum energy density	< 0.1 J/cm <sup>2</sup>	<1 J/cm <sup>2</sup>	I
PHYSICAL CHARACTERISTICS			ERAH
Effective aperture	9 mm Ø	12 mm Ø	HER.
Absorber	BL (Black Absorber)	VP (Volume Absorber)	TZ D
Dimensions	38.1Ø x 79 mm	73H x 73W x 20D mm (72D mm with tube)	ETECT
Weight (head only)	91 g	320 g	ORS
ORDERING INFORMATION			
Compatible stand	STAND-D-233 or STAND-D-233-M	STAND-D-233	
Product page			SPLA



a. From 10 to 440  $\mu\text{m}$  spectrometer measurement with multiple laser references validation. From 440 to 600  $\mu$ m, spectrometer measurement only. From 600 to 3000  $\mu$ m, relative measurement only. This spectral range is subject to change.

b. Nominal value, actual value depends on electrical noise in the measurement system.

c. Actual value depends on ambient conditions and the measurement system.

d. With anticipation

- e. Maximum output voltage = sensitivity x maximum power.
- f. Minimum repetition rate for stable average power measurements.
- g. Including linearity with power.h. At 1064 nm, 1 W CW.







#### PERMANENT IR WINDOW OPTIONS

Every model can be fitted with a permanent IR window to narrow the wavelength range:

- S5/8: sapphire (0.3 4.5 and 100 1000 μm)
- Q5/8: quartz (0.25 3.0 and 50 1000 μm)
- Si5/8: silicon (1.2 8.0 and 50 1000 μm)

\* Pictures for indicative purposes only

#### **KEY FEATURES**

RELATIVE MEASUREMENTS FROM 0.1 TO 30 THZ

Broadband, room temperature operation, easier to use and less expensive than a Golay cell

- EASY TO INTEGRATE FORMAT TO5 and TO8 packages make the QS-THZ detectors small and easy to integrate in an existing system
- SEVERAL SENSOR SIZES AVAILABLE Choice of 5 and 9 mm Ø

#### CALIBRATED AT 0.63 μm

All THz detectors are calibrated at a single wavelength (0.63  $\mu$ m) and include a typical wavelength correction data from 0.25 to 440  $\mu$ m. They are used for relative measurements outside that range.

#### > TEST BOX AVAILABLE

Can be used with our QS-I-TEST test box which provides mounting and power supply

#### ACCESSORIES



QS-I-Test evaluation test box



Permanent IR Windows (Various types available)



SDC-500 digital optical chopper



Pelican carrying case





	QS5-THZ-BL	QS9-THZ-BL
VOLTAGE RESPONSIVITY	120 kV/W	30 kV/W
EFFECTIVE APERTURE	5 mm Ø	9 mm Ø
PACKAGE	ТО5	TOB
MEASUREMENT CAPABILITY		
Spectral range <sup>a</sup>		
Frequency	0.1 - 30 THz	0.1 - 30 THz
Wavelength	3000 - 10 μm	3000 - 10 µm
Max power density	50 mW/cm <sup>2</sup>	50 mW/cm <sup>2</sup>
Noise equivalent power	1 nW	3 nW
Detectivity <sup>b</sup>	4.10 <sup>8</sup> cm(Hz) <sup>½</sup> ∕W	2.7.10 <sup>8</sup> cm(Hz) <sup>½</sup> /W
Voltage responsivity <sup>b</sup>	120 kV/W	30 kV/W
PHYSICAL CHARACTERISTICS		
Effective aperture	5 mm Ø	9 mm Ø
Package	TO5	TO8
Sensor	Pyroelectric	Pyroelectric
Absorber	BL	BL
Dimensions (excluding pins)	9.1Ø x 6.4D mm	15.2Ø x 6.4D mm
Weight	45 g	45 g
ORDERING INFORMATION		
Product page		

a. Projected Spectral Range.
 From 10 to 440 μm, spectrometer measurement.
 From 440 to 3000 μm, relative measurement only.
 This spectral range is subject to change.
 b. 630 nm, 5 Hz



# **QS-I-TEST EVALUATION TEST BOX**

	QS-I-TEST
Batteries	+9V/-9V
R <sub>r</sub> resistors	105 - 1010 Ω
C, compensating	YES
Package	101.6H x 127W x 58.4D
Optical mount	<sup>1</sup> /-20 threaded
Front bezel	SM1 (1.035-40)
Product number	201693

\* For details, contact your Gentec-EO representative

POWER DETECTORS

# ABSORPTION CURVES

**VP ABSORBER** 



# THZ-BL, THZ-I-BL & QS-THZ-BL



# **DISPLAYS & PC INTERFACES**

Overview of the display modules

We offer four models of meters with display: MIRO ALTITUDE and MAESTRO for both power and energy measurements, as well as TUNER and UNO for power readings. Connect one of these display devices to your detector and you have a complete laser power or energy measurement system



## **MIRO ALTITUDE**

MIRO ALTITUDE is Gentec-EO's flagship product for reading laser power and energy. It was designed to help engineers and service technicians increase their productivity thanks to numerous innovative features in both hardware and software. Enter modern times of laser beam measurement with MIRO ALTITUDE.

Supercharge your productivity with an intuitive user interface, an extra large screen, tons of connectivity possibilities, 3 convenient display modes, a built-in dataviewer and a built-in file manager.

PROFESSIONAL LASER POWER & ENERGY METER



### MAESTRO

The MAESTRO power & energy meter is our top of the line display device with an extra-large 5.6 in color LCD display and fully touchscreen controls. With its unique user interface and faster electronics, it will do more, in less time, and with less effort than any other meter on the market!

LASER POWER & ENERGY METER



### TUNER

The TUNER power meter display presents both a large LCD display and an ultrafast needle. It also features min and max holds for both displays, comet tail needle and bar graph function. The TUNER comes in Gentec-EO's ergonomic design, with a large LCD display and easy to use direct access keys.

ULTRA-FAST TUNING NEEDLE



### UNO

The UNO is a simple power meter display, with large contrast fields and direct access buttons. Its extremely low power consumption allows it to work on standard alkaline batteries, making it the display of choice for service technicians working in the field. With the lowest price for a display meter, the UNO is the perfect choice when looking for a reliable, entry-level power meter.

ECONOMICAL POWER METER

# DISPLAYS & PC INTERFACES

The Gentec-EO PC interfaces come in various sizes and types to cover all applications. We offer models for power or energy measurement, or both. Most of our PC interfaces are single-channel, and we also offer models with either 2 channels or even up to 4 channels.



### LINK SERIES

The U-LINK, P-LINK, S-LINK and M-LINK are PC interfaces for our power or energy detectors and are provided with free software applications.

- U-LINK is a universal power & energy meter that measures ALL detectors in our product range up to 10 kHz repetition rate. It has a very small footprint.
- P-LINK is a small power meter, available with either a USB or RS-232 connector. A 4 Channel version is also available.
- S-LINK comes with 1 or 2 channels and measures energy detectors at a very fast rate. It comes with a USB connector, Ethernet also available in option.
- M-LINK is a universal power & energy meter that measures ALL detectors in our product range and features a unique noise suppression method.
- PC-BASED POWER OR ENERGY METERS

# **DISPLAY DEVICES**

	MIRO ALTITUDE	MAESTRO	TUNER	UNO
Detector Compatibility				
Power measurement	UP, XLP, PH, HP	UP, XLP, PH, HP, UM-B, THZ-D	UP, XLP, PH & HP	UP, XLP, PH & HP
Energy measurement	QE, also UP & XLP in SSE mode	QE, PE, also UP & XLP in SSE mode	N/A	N/A
Display	10in touchscreen	5.6in touchscreen	3.8in LCD, backlit	3.8in LCD
Output	2xUSB, USB-C, RS-232, Ethernet	USB, RS-232, Ethernet, analog output	Analog output	N/A
Data logging	Internal memory and USB key	USB key	N/A	N/A
External trigger	Yes	Yes	N/A	N/A
Number of channels	1	1	1	1

# **PC INTERFACES**





# DISPLAYS & PC INTERFACES



## **PC INTERFACES**

While the vast majority of Gentec-EO detector heads are compatible with the U-LINK and S-LINK PC interfaces, a few of our specialized detectors require different data processing methods. In this case, we offer dedicated PC interfaces that are optimized for these measurements.

■ HIGH-PERFORMANCE ELECTRONICS FOR SPECIALIZED MEASUREMENTS

# **DEDICATED PC INTERFACES**



	T-RAD	T-RAD-ANALOG	QUAD-4TRACK	MACH 6	APM (D)
Detector Compatibility					
Power measurement	THZ-B series (-DZ models)	THZ-B series (-DA models)	QUAD-P series	N/A	UM-B series & THZ9D
Energy measurement	N/A	N/A	QUAD-E series	M6 series	M6 (with adaptor), QE-B & PE-B series
Output	USB & analog output	Analog output	USB & analog output	USB & analog output	Analog output
External trigger	Yes	Yes	Yes	Yes	N/A
Maximum repetition rate	N/A	N/A	1 kHz	200 kHz	Depends on the detector
Number of channels	1	1	4 (1 detector)	1	1

# ALL-IN-ONE DETECTORS

Overview of the different models

We also offer displays and PC interfaces which are integrated with the detector head. We offer four families of these all-in-one detectors. INTEGRA features either a USB or RS-232 output for a direct connection to your PC. BLU is available for all our thermal power detectors and allows you to view and log power measurements on your mobile device or PC. PRONTO includes a display, so you have everything you need in a single, portable device.





## INTEGRA

The INTEGRA version of our standard laser power or energy detectors allows you to read your measurements directly on your PC thanks to our free software.

Simply carry your all-in-one detector and plug it in your PC any time you need to measure your laser power or energy. No need to buy a separate meter!

USB LASER POWER OR ENERGY METER

### BLU

Our thermal power detectors (UP and HP series) are available in their BLU version, which allows you to read your power measurement directly on your mobile phone or PC thanks to Bluetooth connectivity.

You get the same high accuracy measurements without the need to connect any wires or to carry a separate acquisition & readout device. This solution is not only more practical, but also more economical compared to our other laser power measurement systems.

WIRELESS LASER POWER METER





# PRONTO

Our PRONTO series is of high interest for those who need a laser measurement system that is portable and compact. These products can be handheld (for low power only) or placed on a stand like our standard detectors.

These user-friendly products are so simple to use that anyone can start using them within seconds. They all offer data logging on their internal memory. Data can then be transferred to your PC via USB.

PORTABLE, ALL-IN-ONE LASER POWER METERS

# HP

Our HP series of high power detectors include internal signal processing and two data output options: USB to read and log measurements with your computer, or DB15 to use a Gentec-EO display such as MAESTRO.

If you prefer going wireless, the HP detectors are also available with the BLU option.

ALL-IN-ONE SOLUTIONS FOR HIGH POWER MEASUREMENT

# **MRO ALTITUDE** Tøuchscreen, single-channel, laser power & energy meter



#### CONNECTIVITY





#### **KEY FEATURES**

## > READS ALL HEADS

Power: thermopiles, photodetectors and pyroelectrics Energy: thermopiles (in SSE mode) and pyroelectrics

#### LARGE TOUCHSCREEN DISPLAY 10in diagonal

1280 x 800 resolution Touchscreen controls

#### > INTUITIVE USER INTERFACE

Easy to navigate interface, with 3 display modes: scope, needle and bar chart. Instant access to the detector settings

#### > **REAL-TIME STATISTICAL FUNCTIONS** Max, min, average, standard deviation, RMS and PTP stability, and repetition rate

#### > MULTIPLE OUTPUTS

Multiple USB ports for computer connection and charging (1x USB-C, 2x USB-A), BNC analog output, RS-232, Ethernet, programmable I/O (coming soon)

#### ACCESSORIES

















USB-C wall charger (US only)



STAND-R-443



Extra USB-C to USB-A

Extra carrying sleeve



gentec-eo.com/displays-and-pc-interfaces
# **MIRO ALTITUDE** Specifications





	MIRO ALTITUDE	
DETECTOR TYPES	Thermopiles, pyroelectrics, photodetectors	
DISPLAY	10" high-resolution, anti-glare, touchscreen	
POWER METER SPECIFICATIONS		
Power range	4 pW to 150 kW	
Meter accuracy	±0.5% ± 3 µV from 20% to full scale	
Statistics	Current value, max, min, average, standard deviation, RMS & PTP stability, time	
ENERGY METER SPECIFICATIONS		
Energy range	2 fJ to 30 kJ	
Meter accuracy	1.0% ± 50 μV (< 500 Hz) 2.0% ± 50 μV (500 Hz to 10 kHz)	
Software trigger level	0.1 to 99.9%, 0.1% resolution, default 2%	
Repetition rate	10 kHz for data acquisition in real time with time stamp, no missing point	
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, pulse #, rep. rate and average power	
DETECTOR COMPATIBILITY		
Thermopile	Average power & single shot energy (UP, XLP & HP series)	
Photodetector	Average power (PH series)	
Pyroelectric	Average power & pulse energy (QE series, except QE8)	
GENERAL SPECIFICATIONS		
Digital display size	10.1-inch diagonal LCD - 1280 x 800 pixels	
Outputs	Analog out, 0 - 5 V (BNC) Sync out (BNC) RS-232 (DB9) Ethernet (RJ45) USB-C 2x USB-A	
Rising edge external trigger	3.3-24 V (BNC)	Î
Serial commands via	USB-C, RS-232 or Ethernet	
Data storage via	Internal memory or USB key	
Battery type	Rechargeable Li-ion cell	
Battery life	6 hours	-
External power supply	12 VDC power supply included, or UBS-C (min 18 W)	
PHYSICAL CHARACTERISTICS		
Mounting holes	1/4"-20 and 2x10-32 threaded holes	
Dimensions	268W x 196H x 36D mm	
Weight	1.36 kg	
ORDERING INFORMATION		
Compatible stand	STAND-R-443	
Product page		

# MIRO ALTITUDE



# **1** NAVIGATION BAR

The upper part of the screen includes a direct access to the control center, data acquisition buttons and various indicators (battery level and time).

# 2 MEASUREMENT SETTINGS PANEL

Use the various measurement settings available for your detector to set everything related to your measurement.



Wavelength: Enter your wavelength or choose from a list of recently used wavelengths



Measurement mode: Choose what you want to measure:
 power, SSE, moving average, etc.



**Trigger:** Enter the desired trigger level or choose from a list of recently used values



XNR Anticipation<sup>™</sup>: Toggle on to measure up to 10x-20x faster without losing any significant accuracy in your readings

**Correction:** Set a multiplier and an offset value for your measurements

Attenuator: Toggle when using a Gentec-EO calibrated attenuator with your detector

# **3 DISPLAY AREA**

The top part of the display area is the same for all three display modes.



**Clear:** Use this button to reset the statistics and erase the scope graph's data



**Display mode:** Toggle your display mode between: scope, needle and bar chart



**Zero:** Set the current measured value to zero

# MIRO ALTITUDE Display modes

# SCOPE DISPLAY

With this display mode, you can travel in time using the time line at the bottom to view measurements at any point in time while MIRO ALTITUDE continues to measure.

The dotted blue line shows the average value.



# NEEDLE DISPLAY

Faster than an analog needle thanks to XNR Anticipation<sup>™</sup>! This mode is particularly useful when tuning a laser. The real-time value and statistics are always visible at the top of the screen.

Arrows indicate the minimum and maximum measured values since the last reset. The zoom function sets these values as full scale of the digital gauge.



## **BAR DISPLAY**

This is the simplest display mode. Its main advantage is that the current measured value is displayed in huge size, allowing you to read the measurement from a good distance.

Arrows indicate the minimum and maximum measured values.

63.9 mW

# MIRO ALTITUDE

# BUILT-IN FILE MANAGER AND DATA VIEWER

MIRO's built-in file manager lets you access and organize all your screenshots and recorded measurement sessions. You can also copy files on your USB key.



Visualize a recorded measurement session with our built-in data viewer. Data will be displayed in the scope chart display.

There is also a built-in image viewer so you can view your screenshots directly on your MIRO ALTITUDE.

< Back to display File Manager	local > acquisition				
	Name	Date modified	Size	Туре	
Local storage	acquisition_2	Wed, 30.06.2021 15:04:23	70.63 KB	Session	•
	acquisition_1	Tue, 15.06.2021 14.26.17	1.07 KB	Session	•
	New folder	today		Folder	

# **CONTROL CENTER**

The control center is accessible from all screens in the top left corner.

Easily navigate between the main screens of the app:



Connect/disconnect your Gentec-EO detector to MIRO ALTITUDE

۰ <del></del>	Brightness	Sleep 10 ses	
~	<b>-</b>	DB-15 UP19K-30H-VR	
Display	manager	Serial number 178018	
\$		Last calibration Calibration due 1 Jan 2021 30 Nov 2021	
Settings		DISCONNECT	

# **MIRO ALTITUDE**



# **DEVICE SETTINGS**

Set	ttings	S	ystem	
٠	System		Set date & time automatically	
	Recording			16 March 2022 ⇒
<u>((1))</u>	Ethernet			09:39 AM >
	RS232			
	Analog output		Sleep	
Ŧ	Trigger			
()	About		Number of digits	Default >

Recording: Set your default recording parameters for power/energy measurement and destination.

((<u>•</u>))

RS-232: Set your RS-232 parameters.

 $\odot$ 

·····7

Analog output: Set your analog output parameters. (coming soon)

Ethernet: Set your Ethernet parameters or let MIRO manage this automatically.

4

Ŧ

Trigger: Use an external trigger and set your trigger level.

About: View important information about your device (serial number, firmware version, software version, calibration date) and find support.

# MAESTRO Touchscreen, single channel, power & energy monitor

#### CONNECTIVITY



MULTIPLE LANGUAGES





#### **KEY FEATURES**

#### > READS ALL HEADS

- Power: thermopiles, photodetectors and pyroelectrics
- Energy: thermopiles (in single shot mode), photodetectors and pyroelectrics

#### LARGE TOUCHSCREEN COLOR LCD DISPLAY

- 5.6in diagonal
- FULLY touchscreen controls

#### > UNIQUE ERGONOMIC DESIGN

Great for both handheld and tabletop use, with improved rubber bands and kickstand for better stability

#### > INTUITIVE USER INTERFACE

Easy to navigate interface, with many display features:

- Single or dual graph display
- Instant access to the main functions
- Function search tool
- Interface available in multiple languages

#### USB KEY ACCESS

Store data directly on a USB key

REAL-TIME STATISTICAL FUNCTIONS

Max, min, average, standard deviation, RMS and PTP stability, pulse # and repetition rate

#### > AVAILABLE OUTPUTS

USB Key, analog output, RS-232, PC-USB, Ethernet

# ACCESSORIES







Additional 9V power supply

Battery pack

USB, RS-232, external trigger & analog out cables



Pelican carrying case







		POW
	MAESTRO	VER D
DETECTOR TYPES	ALL MODELS: thermopiles, pyroelectrics, photodetectors	ETE
DISPLAY	Touchscreen 5.6 in color LCD	стор
POWER METER SPECIFICATIONS		S
Power Range		
Thermopile	1 μW to 30 kW	
Photodetector	4 pW to 3 W	m
Monitor accuracy	$0.25\% \pm 5 \ \mu V$ best scale	ERC
Statistics	Current value, max, min, average, standard deviation, RMS & PTP stability, time	≺ DE
ENERGY METER SPECIFICATIONS		TEC
Energy range	2 fJ to 30 kJ	TOR
Monitor accuracy	±1% best scale	Ś
Software trigger level	0.1 to 99.9%, 0.1% resolution, default 2%	
Repetition rate	2000 Hz / 10 000 Hz in sampling	
Real-time data transfer (To USB key)	2000 Hz	B
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, pulse #, rep. rate and avg power	AM
DETECTOR COMPATIBILITY		PRC
Thermopile	Average power & single shot energy	PELL
Photodetector	Average power & pulse energy	ZO
Pyroelectric	Pulse energy & average power	
GENERAL SPECIFICATIONS		
Interface languages	English, German, French and Japanese	Ħ
Digital display size	112.9 x 84.7 mm LCD - 640 x 480 pixels	RAH
Data display	Real-time, scope, statistics, digital tuning needle and averaging	E R T
Analog output	0-1 Volt, full scale, ±0.5%	Z DE
Rising edge external trigger	TTL compatible, 2-25 V at 0.4 mA	TEC
Serial commands via	USB (standard), Ethernet or RS-232 (cable in option)	TOR
Data storage via	USB key	<sup>(</sup> )
Dimensions	210W x 122H x 45D mm	
Weight (with batteries)	0.67 kg	ISPI
Battery type	4 x rechargeable 1.2 V Ni-MH AA	_AYS
Battery life	6.5 hours	© ,
External power supply	100/240 VAC 50 - 60 Hz to 9 VDC 1.66 A	C IN
ORDERING INFORMATION		TEF

Product page



CUSTOM / OEM PRODUCTS

# MAESTRO Specifications



## HOME

Set Device:	Set all the parameters related to your MAESTRO device.
Set Measure:	Set all the parameters related to your sensor.
Display:	Set the device in dual or full screen display mode and choose the display(s) you want.
Acquisition:	Set all your acquisition parameters (time, sample rate, etc.).
Startup Config:	Choose how your MAESTRO will remember your sensor settings at startup.
About:	View the main parameters and update your MAESTRO.



# SET DEVICE

Use the elements in this menu to set the parameters related to your MAESTRO:

Number of Digits:	Use this menu to set the precision of the measurement.
Serial Commands:	Set compatibility with SOLO2 and use the RS-232, USB and analog outputs
Ethernet:	Configure the Ethernet communication protocol.
Languages:	Select the display language: English, German, Japanese or French
Recalibrate touchscreen:	Recalibrate your touchscreen by following the simple step-by-step procedure

### **SET MEASURE**

Use the elements in this menu to set everything related to your measurements:

Wavelength:	Select one of the standard wavelengths offered, or enter a custom value and create your own list of standard wavelengths.
Range:	Set the measuring range to autoscale or a fixed scale.
Measure Mode:	Use this menu to decide what type of measurements will be displayed: average power, single shot energy, pulse-to-pulse energy, etc.
Corrections:	Enter multipliers and offsets.
Trigger Level:	Set the trigger level in 0.1% steps, from 0.1% and 99.9%.

## DUAL SCREEN DISPLAY (SHOWN WITH SCOPE DISPLAY)

Any display mode can be used in both single or dual display mode. In dual display mode, the Real-Time display takes the upper portion of the screen, while any of the other displays (Scope, Needle, Averaging or Statistics) is set on the lower portion. The display in the lower portion can be easily changed using the parameters bar with drop-down menus in the center of the screen. You can also expand one of the displays to have it in Full Screen mode using the maximize button. Just as easily, you can go back to Dual Screen display by using the minimize button.









# **REAL-TIME DISPLAY**

This display shows the measured value in real time, with a corresponding bar graph below. The large size of the digits and high contrast of the graphics allow to see the measurement from a good distance. This mode is also always present in dual screen mode, in the upper portion of the screen.

- Very large digits
- Bar graph



# **SCOPE DISPLAY**

With its line filling from the right of the screen, in a first-in/first-out manner, this display mode is a good approximation of an actual oscilloscope reading. Settings include time (x-axis) and range (y-axis). Basic statistics can also be displayed directly on the screen.

- Oscilloscope-type graph
- On-screen, real-time statistics (min, max and average)
- Fully customizable x and y axis



# **NEEDLE DISPLAY**

Exactly like an analog needle, only faster! This mode is particularly useful when tuning a laser. The Real-time value is also displayed at the top of the screen.

- Ultra-fast readings
- Great for tuning
- Real-time value at the top of the screen
- Min and Max Values hold



### **AVERAGING DISPLAY**

This very unique mode is perfect to show the trend of a laser over time. Set the number of points per batch and let the MAESTRO identify the minimum and maximum values of every batch. A yellow curve then follows the average of each batch, displayed as bars on the screen. The wider the difference between the white and blue portions of a bar (corresponding to the min and max values), the more unstable your laser is.

- Calculates the min, max and average values of batches of measurements
- Perfect to check laser stability over time



# TUNER Single Channel, Power Monitor with Tuning Needle



#### **DISPLAY MODE**

#### > TAIL:

Follows the speed of the power change. The comet tail is longer for faster reading changes and shorter for slower reading changes.

#### BAR GRAPH:

Fills the needle display up to the real-time value (best mode when viewing from a distance).

#### > HIGH/LOW:

When activated, indicates the highest and lowest powers since activation. The high and low needles blink to help distinguish them from the real-time value.







#### **KEY FEATURES**

- > ULTRA-FAST NEEDLE Less than 1 second response time
- READS ALL POWER DETECTORS Thermopiles and photodetectors of the PH100 and PH20 Series

#### > LARGE LCD DISPLAY

- 77 x 58 mm
- 17.5 mm digits
- Backlight (with AC adaptor)

#### > 3 DISPLAY FUNCTIONS FOR THE NEEDLE

- Normal
- Tail Mode (indicates speed)
- Bar graph

Also HIGH and LOW values hold

#### SINGLE-BUTTON NAVIGATION

Direct access and long press access to the main functions

#### > LOW CONSUMPTION

Lasts 500 hours with 4 AA alkaline batteries

#### ACCESSORIES



Additional 9V power supply





Wall support

Pelican carrying case





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	TUNER	VER D
DETECTOR TYPES	Thermopiles, photodetectors (PH series)	ETE
DISPLAY	LCD with tuning needle and backlight	CTO
POWER METER SPECIFICATIONS		S
Power range	10 pW to 10 kW	
Digital resolution		
PH series	10 pW	Ē
XLP series	1μW	ERG
UP series	1 mW	Y DE
HP series	100 mW (HP60A), 1 W (HP100A)	ETEC
Monitor accuracy	±1%, full scale	TOR
Statistics	Min, max	S
Response time	<1s	
DETECTOR COMPATIBILITY		
Thermopiles	Average power (W, dBm)	B
Photodetectors (PH series)	Average power (W, dBm)	AM
GENERAL SPECIFICATIONS		PRC
Digital display size	77 x 58 mm LCD	FILI
Needle display	Ultrafast tuning needle	NC
Needle accuracy	0.9%	
Refresh rate	4 Hz	
Analog output	0-1 Volt, full scale, ± 1%	H
Dimensions (without stand)	210W x 122H x 44D mm	RAH
Weight (with batteries)	0.47 kg	ERT
Battery type	4 x AA alkaline	Z DE
Battery life (estimated)	500 hours with detector	ETEC
External power supply	100/240 VAC 50 - 60 Hz to 9 VDC 1.66 A	TOP
ORDERING INFORMATION		2, S
Product page		





#### NOW AVAILABLE

W/dBm

You can toggle your display between Watts or dBm units



#### **KEY FEATURES**

- READS ALL POWER DETECTORS Thermopiles and photodetectors of the PH Series
- > LARGE LCD DISPLAY
  - 76 x 57 mm
  - 32 mm digits
- > UNIQUE ERGONOMIC DESIGN Great for both handheld and tabletop use
- ACCURATE 24 bit A/D converter for high resolution measurements
- SINGLE-BUTTON NAVIGATION Direct access and long press access to all the functions
- **EXTREMELY LOW CONSUMPTION** Lasts 670 hours with 4 AA alkaline batteries

#### > ECONOMICAL

Get the best value for your money with this inexpensive and simple to use power monitor

#### ACCESSORIES







Optional 9V power supply

Wall support

Pelican carrying case

gentec-eo.com/displays-and-pc-interfaces





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DETECTOR TYPES	Thermopiles, photodetectors (PH series)	ETE
DISPLAY	LCD	CTO
POWER METER SPECIFICATIONS		S
Power range	10 nW to 10 kW	
Thermopile	Single wide range scale	
Photodetector	Autoscale	E
Digital resolution		ERG
PH series	1 pW	✓ DE
XLP series	1 µW	TEC
UP series	1 mW	TOR
Monitor accuracy	±1%	S
Response time	1s	
DETECTOR COMPATIBILITY		
Thermopiles	Average power (W, dBm)	B
Photodetectors	Average power (W, dBm)	AM
GENERAL SPECIFICATIONS		PRC
Digital display size	76 x 57 mm LCD	FILI
Digit height	32 mm	NC
Digit type	High contrast fields	
Data display	Real-time	
Dimensions (without stand)	210W x 122H x 44D mm	Ē
Weight (with batteries)	0.47 kg	RAH
Battery type	4 x AA alkaline	ERT
Battery life (estimated)	670 hours with detector	Z DE
External power supply (optional)	100/240 VAC 50 - 60 Hz to 9 VDC 1.66 A	ETEC
ORDERING INFORMATION		TOR
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Product page





#### CONNECTIVITY



#### **KEY FEATURES**

- > THE UNIVERSAL PC-BASED METER Reads ALL heads:
  - Power: thermopiles, photodetectors and pyroelectrics
  - Energy: thermopiles (in single shot mode), photodetectors and pyroelectrics

#### MEASURE fJ ENERGY LEVELS

Thanks to a unique digital method for suppressing the noise on the lower ranges

#### > EXTERNAL TRIGGER

Synchronize your U-LINK to your pulsed laser or digital chopper (available on U-LINK (USB) model only)

#### > SYNCHRONIZE MULTIPLE CHANNELS

With the "SYNC. OUT" port, you can plug multiple U-LINK devices together and create a low-cost multichannel system (available on U-LINK (USB) model only)

#### SERIAL COMMANDS

Serial commands are available on both versions to let you take full control

#### REAL-TIME STATISTICAL FUNCTIONS

Max, min, average, standard deviation, RMS and PTP stability.

#### ACCESSORIES







Pelican carrying case



Additional 9V power supply (RS-232 version only)

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	U-LINK (USB)	U-LINK (RS-232)
DETECTOR TYPES	ALL MODELS: thermopiles, pyroelectrics, photodetectors	ALL MODELS: thermopiles, pyroelectrics, photodetectors
DISPLAY	1-Channel / PC-based	1-Channel / PC-based
POWER METER SPECIFICATIONS		
Power range	4 pW to 30 kW	4 pW to 30 kW
Resolution (digital)	23 bits on current scale	23 bits on current scale
Monitor accuracy	±0.5% ± 3 μV	$\pm 0.5\% \pm 3 \ \mu V$
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, time	Current value, max, min, average, std dev., RMS & PTP stability, time
ENERGY METER SPECIFICATIONS		
Energy range	2 fJ to 30 kJ	2 fJ to 30 kJ
Resolution (digital)	Current scale/3754	Current scale/3754
Monitor accuracy	1% ± 50 μV (< 500 Hz) / 2% ± 50 μV (500 Hz - 10 kHz)	1% ± 50 μV (< 500 Hz) / 2% ± 50 μV (500 Hz - 10 kHz)
Software trigger level	0.1 to 99.9%, 0.1% resolution, default 2%	0.1 to 99.9%, 0.1% resolution, default 2%
Repetition rate <sup>a</sup>	10 kHz	10 kHz
Real-time data transfer	10 kHz with time stamp, no missing point	10 kHz with time stamp, no missing point
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, pulse #, repetition rate, average power	Current value, max, min, average, std dev., RMS & PTP stability, pulse #, repetition rate, average power
DETECTOR COMPATIBILITY		
Thermopile	Average power & single shot energy	Average power & single shot energy
Pyroelectric	Pulse energy & average power	Pulse energy & average power
Photodetectors	Average power & pulse energy	Average power & pulse energy
GENERAL SPECIFICATIONS		
Digital display	Computer screen	Computer screen
Data display	With PC-Gentec-EO: real-time, scope, averaging, statistics and digital tuning needle	With PC-Gentec-EO: real-time, scope, averaging, statistics and digital tuning needle
Serial commands and data transfer via	USB	RS-232
Real-time data transfer rate <sup>a</sup>	Up to 10 kHz with time stamp, no missing point (for pyroelectrics only)	Up to 10 kHz with time stamp, no missing point (for pyroelectrics only)
Analog output	0 - 2 V, full scale, ± 1%, user-defined	0 - 2 V, full scale, ±1%, user-defined
External trigger	3.3 to 12 V	3.3 to 12 V
Dimensions	57W x 26H x 91D mm	57W x 26H x 91D mm
Weight	0.12 kg	0.12 kg
ORDERING INFORMATION		
Product page		

a. Maximum repetition rate and data transfer rate may vary with PC and detector speeds.





#### **KEY FEATURES**

- > READS BOTH POWER AND ENERGY Thermopiles and pyroelectrics
- > AVAILABLE WITH 1 OR 2 CHANNELS S-LINK-1 and S-LINK-2 models now available
- PC-BASED Connects to your PC with included software
- SERIAL COMMANDS Serial commands are available on all versions to let you take full control
- FASTEST DATA TRANSFER RATE Get all the points transferred directly into your PC at 10 kHz/channel
- > USB OR ETHERNET Choose your favourite communications port.
- > EXTERNAL TRIGGER

Every model comes standard with a 2.4 V to 24 V external trigger

#### ACCESSORIES

CONNECTIVITY







Additional 9V power supply

USB cable

Pelican carrying case









	S-LINK-1	S-LINK-2
DETECTOR TYPES	Thermopiles, pyroelectrics	Thermopiles, pyroelectrics
CHANNELS / DISPLAY	1-Channel / PC-based	2-Channels / PC-based
POWER METER SPECIFICATIONS		
Power range	1 µW to 10 kW	1 μW to 10 kW
Monitor accuracy	±0.75% for 10% to full scale	±0.75% for 10% to full scale
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, time	Current value, max, min, average, std dev., RMS & PTP stability, time
Response time	1s	1 s
ENERGY METER SPECIFICATIONS		
Energy range	8 fJ to 20 kJ	8 fJ to 20 kJ
Resolution (digital)	Normal mode: Current scale/4096	Normal mode: Current scale/4096
Monitor accuracy		
< 500 Hz (мв), < 1200 Hz (мт)	1%	1%
500 to 1200 Hz (мв)	2%	2%
1200 to 6000 Hz (мт)	3%	3%
6000 to 10 000 Hz (мт)	6%	6%
Real rime data transfer <sup>a</sup>	10 kHz in normal mode, no missing point	10 kHz/Channel in normal mode, no missing point
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, pulse #, repetition rate, average power	
DETECTOR COMPATIBILITY		
Thermopile	Average power & single shot energy	Average power & single shot energy
Pyroelectric	Pulse energy	Pulse energy
GENERAL SPECIFICATIONS		
Number of channels	1	2
Digital display	Computer screen	Computer screen
Data display	Real-time, ratio, line plot, histogram, statistics and 3D histogram	Real-time, ratio, line plot, histogram, statistics and 3D histogram
Serial commands and data transfer via	USB or Ethernet	USB or Ethernet
Real-time data transfer rate	10 kHz/channel in normal mode, no missing point (for pyroelectrics only) <sup>a</sup>	10 kHz/channel in normal mode, no missing point (for pyroelectrics only) <sup>a</sup>
Rising edge external trigger	3-24 V at 13 mA, optically isolated	3-24 V at 13 mA, optically isolated
Dimensions	106W x 34H x 147D mm	106W x 34H x 147D mm
Weight	0.424 kg	0.424 kg
Ext. power supply	100/240 VAC 50 - 60 Hz to 9 VDC 1.66 A	100/240 VAC 50 - 60 Hz to 9 VDC 1.66 A
ORDERING INFORMATION		
Product page		

a. Actual rate may depend on the computer.

ENERGY DETECTORS

POWER DETECTORS

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#### CONNECTIVITY





#### **KEY FEATURES**

- > READS ALL POWER DETECTORS TYPES Thermopiles and photodetectors of the PH Series
- > PC-BASED Connects to your PC with included software
- > MULTI-CHANNEL CAPABILITIES Available with 1 or 4 channels
- > SERIAL COMMANDS

Serial commands are available on both versions to let you take full control

#### > REAL-TIME STATISTICAL FUNCTIONS

Max, min, average, standard deviation, RMS and PTP stability. Also high low alarm and post-analysis mode (P-LINK-4 only)

#### > USB OR RS-232

Choose your favourite communications port. The USB version is port-powered.

#### ACCESSORIES







Additional 9V power supply (RS-232 version only)

USB & RS-232 cables

Pelican carrying case





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	P-LINK (USB)	P-LINK (RS-232)	P-LINK-4 (USB)
DETECTOR TYPES	Thermopiles, photodetectors	Thermopiles, photodetectors	Thermopiles, photodetectors
CHANNELS / DISPLAY	1-Channel / PC-based	1-Channel / PC-based	4-Channels / PC-based
POWER METER SPECIFICATIONS			
Power range			
Thermopile	3 µW to 10 kW	3 µW to 10 kW	3 µW to 30 kW
Photodetector	1 nW to 3 W	1 nW to 3 W	1 pW to 3 W
Monitor accuracy	±0.5% full scale	±0.5% full scale	±0.5% full scale
Statistics	<sup>a</sup> Current value, max, min, average, std dev., RMS & PTP stability, time	° Current value, max, min, average, std dev., RMS & PTP stability, time	<sup>b</sup> Current value, max, min, average, std dev., RMS & PTP stability, time
Response time	1 s	1 s	ls
DETECTOR COMPATIBILITY			
Thermopile	Average power & single shot energy	Average power & single shot energy	Average power
Photodetector	Average power (mW, dBm)	Average power (mW, dBm)	Average power (mW)
GENERAL SPECIFICATIONS			
Number of channels	1	1	4
Digital display	Computer screen	Computer screen	Computer screen
Data display	<sup>a</sup> Real-time, histogram, statistics, Digital tuning needle	<sup>a</sup> Real-time, histogram, statistics, Digital tuning needle	<sup>b</sup> Real-time, graphic, statistics, high/low alarm, Post-analysis mode, multi-channel
Analog output	0 - 2 Volt, adjustable, full scale, ±1%	0 - 2 Volt, adjustable, full scale, ± 1%	N/A
Serial commands and data transfer via	USB	USB	USB
Real-time data transfer rate	10 Hz	10 Hz	10 Hz
Dimensions	57W x 26H x 91D mm	57W x 26H x 91D mm	286W x 233H x 43D mm
Weight	0.12 kg	0.12 kg	2.5 kg
External power supply	100/240 VAC 50 - 60 Hz to 12 VDC 200 mA	100/240 VAC 50 - 60 Hz to 12 VDC 200 mA	100/240 VAC 50 - 60 Hz to 5 VDC, 3 A
ORDERING INFORMATION			

Product page







a. Using PC-Gentec-EO software.b. Using Octolink software.



#### CONNECTIVITY



#### **KEY FEATURES**

- > THE UNIVERSAL PC-BASED METER Reads ALL heads:
  - Power: thermopiles, photodetectors and pyroelectrics
  - Energy: thermopiles (in single shot mode), photodetectors and pyroelectrics

#### > MEASURE fJ ENERGY LEVELS

Thanks to a unique digital method for suppressing the noise on the lower ranges

#### > EXTERNAL TRIGGER

Synchronize your M-LINK to your pulsed laser or digital chopper

## DIGITAL (USB) OUTPUT

Connect the M-LINK module directly to your PC

#### POWERFUL LABVIEW SOFTWARE

Features include:

- Complete instrument controls: range, trigger, wavelength, etc.
- Live display in J and J/cm2 or W and W/cm2
- Full Statistics: min, max, mean, standard deviation, RMS stability, repetition rate, etc.
- Graphic displays: strip chart, histogram, tuning needle
   and more
- Data file collection and analysis

#### ACCESSORIES





Pelica

#### Pelican carrying case







	M-LINK
DETECTOR TYPES	ALL MODELS: thermopiles, pyroelectrics, photodetectors
DISPLAY	PC-based
POWER METER SPECIFICATIONS	
Power range	4 pW to 30 kW
Resolution (digital)	Current scale/3000
Monitor accuracy	±0.5% ± 2 digits
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, time
ENERGY METER SPECIFICATIONS	
Energy range	30 fJ to 30 kJ
Resolution (digital)	Current scale/3000
Monitor accuracy	1% ± 2 digits (< 1 kHz)
Software trigger level	0.1 to 99.9%, 0.1% resolution, default 2%
Repetition rate <sup>a</sup>	1000 Hz
Real-time data transfer	1000 Hz with time stamp, no missing point
Statistics	Current value, max, min, average, std dev., RMS & PTP stability, pulse #, repetition rate, average power
DETECTOR COMPATIBILITY	
Thermopile	Average power & single shot energy
Pyroelectric	Pulse energy & average power
Photodetectors	Average power & pulse energy
GENERAL SPECIFICATIONS	
Digital display	Computer screen
Data display	Real-time, scope, averaging, statistics and digital tuning needle
Serial commands and data transfer via	USB
Real-time data transfer rate	1000 Hz with time stamp, no missing point (for pyroelectrics only)
Analog output	0 - 2 V, full scale, ± 2% (joulemeters) ± 4% (wattmeters)
Rising or falling edge external trigger	4.5 to 10 V @ 20 mA, optically isolated
Dimensions	106W x 34H x 147D mm
Weight	0.424 kg
ORDERING INFORMATION	
Product page	

a. Maximum repetition rate may vary with PC and detector speeds.





#### CONNECTIVITY

- > Three models available:
  - USB output (-INT)
  - RS-232 output (-IDR)
  - USB with external trigger (-INE)



#### **KEY FEATURES**

- ALL-IN-ONE DETECTOR + METER Plug your detectors directly into your PC with the INTEGRA embedded PC interface
- INCREDIBLE PERFORMANCE INTEGRA detectors offer the same performance as the usual detector + PC interface combination
- USB OR RS-232 INTEGRA detectors are offered with a choice of

USB or RS-232 connector

COMPACT SIZE

Perfect for the lab, OEM applications and field servicing. No need to carry a meter!

- LOWER RECALIBRATION COSTS One product = one calibration. Reduce your recalibration costs by half!
- UNIVERSAL SOFTWARE-PC-GENTEC-EO Control your INTEGRA detector with the same powerful software as the MAESTRO
- CUSTOMIZABLE Contact us for custom cable lengths and serial commands

#### ACCESSORIES





Adaptateur USB-A à USB-C

Convertisseur RS-232 à USB-A

### EASY TO MOUNT



Secure it on your optical table

#### WATCH OUT FOR THIS LOGO!



# **PC-GENTEC-EO** Universal software for INTEGRA, MAESTRO, P-LINK, U-LINK AND HP



ý

TIG

1.72 W

Real Time

Averaging

# MAIN CONTROLS

Complete and easi	ly navigable software interface with all the necessary options and tools:
Connection:	Connect or Disconnect your device.
Controls:	Turn the Turbo Mode ON or OFF, make a Zero to remove the thermal offset, start the Acquisition of the data and start the calculations of the Statistics associated with this data.
Startup Config:	Save your measurements settings or Load the settings associated with an already existing file.
Help:	Get information about the PC-Gentec-EO software and read the user manual.
Measure:	Configure the parameters related to your measurements.
Display:	Set the desired number of digits and settings associated with the selected display.
Acquisition:	Enter the parameters related to the acquisition of data.

# **MEASUREMENT PARAMETERS**

The Measure tab allows you to configure the parameters related to your measurements:		
Wavelength:	Enter the Wavelength of your laser and the software will apply the appropriate correction factor on the measurements.	
Range:	Set the power or energy Range to a fixed scale or let the software automatically adjust the scale.	
Measure Mode:	Select the type of Measurement that will be displayed (power, energy) and let the software know if you want Anticipation and if there is any Attenuation.	

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Corrections:	Apply a Multiplication	n Factor and/or a	an Offset to your measu	urements.

Trigger Level: Set the Trigger Level in 0.1 % steps, from 0.1 % to 99.9 % (in energy mode only).

# **MULTIPLE DISPLAYS**

Select the display that suits you best and watch your measurements in real time! With the options toolbar in the bottom of the interface, you can manage the displays at your convenience:

Real-time:	Real-time value and corresponding bar graph
Scope:	Line filling graph
Needle:	Fast analog-like needle
Averaging:	Shows trend of laser over time
Histogram:	Displays up to 100 bars
Statistics:	Min, Max, Average, RMS and PTP Stability, Rep. Rate and Standard Deviation



Histogram

Needle

Statistics

# DATA ACQUISITION

The Acquisition tab allows you to enter the parameters for data acquisition:

Power Mode:	Choose a Sampling Rate (number of measurements per interval of time), a Total Duration (in days, hours, minutes and seconds) for the data acquisition, a Time Stamp for each value and the File Name and File Location. You can choose to save only the raw data and/or the statistics associated with your data acquisition.
Energy Mode:	Choose a sampling rate (I pulse out of X pulses), a total duration (total number of pulses) for the acquisition of data, a timestamp for each value, the file name and file location. Decide if you want to save raw data and/or the statistics associated with this data.



# BLU<sup>, '</sup> Wireless Bluetooth® PC interface



#### MEASURE WITH YOUR SMARTPHONE, TABLET OR PC

Display the results on your mobile device with the Gentec-EO BLU app available FREE on Google Play and Apple Store. Need to use it with a PC? Simply plug in the included Bluetooth receptor and use PC-Gentec-EO.





The Bluetooth® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Gentec-EO is under license.

#### WATCH OUT FOR THIS LOGO!



#### **KEY FEATURES**

#### > ALL-IN-ONE DETECTOR + METER

This new line of All-in-One detectors combine a detector and a meter with Bluetooth connectivity in one convenient product. No need to carry a meter!

#### > SAVE 50% ON CALIBRATION COSTS

One product = one calibration. Reduce your recalibration costs by half!

#### > EXTENSIVE COVERAGE

Receive data at up to 30m from the detector, with the same performance as the usual detector + PC interface combination.

#### > EASY TO SET UP

Perfect for field service, labs and OEM applications.

#### > GO WIRELESS

No need to worry about cable length or PC interface location.

#### LONG BATTERY LIFE

The USB-rechargeable Li-ion battery lasts up to 5 continuous days with the device running





## MAIN CONTROLS

Connecting a BLU device is very simple in the mobile application. Just open the app and it will automatically search for all available devices. Then, tap on the desired device in the list.

If there are no devices within range, the app will propose a simulator.

When a BLU detector is connected to a phone or computer, no other device can communicate with it.

## MEASUREMENT PARAMETERS

The menu tab, available with the  $\equiv$  icon or by swiping from the left of the screen, allows you to configure the parameters related to your measurements:

Wavelength:	Enter the wavelength of your laser and the software will apply the appropriate correction factor on the measurements.
Range:	Set the power or energy range to a fixed scale or let the software automatically adjust the scale.
Measure Mode:	Select the type of measurement that will be displayed: power, in watts (default) or single shot energy, in joules (energy/calorimeter mode).
Corrections:	Apply a multiplication factor and/or an offset to your measurements.
Trigger Level:	Set the trigger level in 0.1 % steps, from 0.1 % to 99.9 % (in energy mode only).
Connection:	Use this option to see the list of BLU devices within range.



# **MULTIPLE DISPLAYS**

Select the display that suits you best and watch your measurements in real time! Simply swipe the screen to switch between the various displays:

Scope:	Line filling graph; grab screenshots to save & share easily with your device
Needle:	Fast analog-like needle
Real-time:	Real-time value and corresponding bar graph
Statistics:	Min, max, average, RMS and PTP stability and standard deviation

#### 6.0 W ast Value 0 Dav(s) 0 Min(s) 0 Sec(s) Duration 00.00.00.39 START

## **DATA ACQUISITION**

The acquisition screen allows you to enter the parameters for data acquisition:

Power mode:	Choose a sample rate (number of measurements per interval of time) and a duration (in days, hours, minutes and seconds) for the data acquisition.
Energy mode:	Choose a sampling rate (I pulse out of X pulses) and a duration (total number of pulses) for the acquisition of data.

Once the acquisition is complete, you can export the data to any of the data-sharing apps installed on your mobile device, or send it by email



# CUSTOM / OEM PRODUCTS Product characteristics

Gentec-EO offers OEM customers the highest flexibility so that you make no compromise. Whether you want a different housing, a specific sensitivity or another output connector, we have a solution for you. We will customize existing models or design a whole new detector to meet your needs.



# COMPACTNESS

As an OEM, we know space is often a constraint. This is why we offer very compact detectors to ease the integration inside machines. Users can mix and match existing detectors and cooling modules from a large set of combinations.



## PERFORMANCE

#### Anticipation

0-95% of the signal in as quickly as 0.3 s with the small UD12-70-H5 and in 0.6 s with the UD19-150-H5 using our external PCB.

#### Amplification

Adjust your disk sensitivity to get the perfect voltage for your acquisition system. Disks can be adjusted from 0.01 V/W up to 10 V/W depending on the model.

#### Filtering

Eliminate the high frequency noise coming from the environment with the integrated lowpass filter of our PCB.

### CONNECTIVITY

Gentec-EO offers you several types of output connectors, from the more standard DB15, BNC and Molex to any exotic type you may need.



#### **DB15**

This connector contains an EEPROM with custom calibration data for both power and energy detectors.

#### BNC

The BNC output gives you fast, easy installation and direct connection to an oscilloscope

#### Molex or bare wires

The internal PCB gives an amplified signal output that can be accessed via a Molex connector and cable or bare wires. It is convenient for integrated systems.

# CUSTOM / OEM PRODUCTS Overview of the different models

Almost anything you see in our product line can be turned into an OEM unit! We also offer standard OEM products, at different levels of integration: from the simple thermopile disk to a complete head with internal PCB for signal anticipation and amplification.

## **UD SERIES**

- Thermal sensor disks
- Designed for integration
- Many sizes and absorber choices:
  - 10, 12, 19, 25, and 55 mm Ø apertures Broadband or high damage threshold coatings
- THERMAL SENSOR DISKS



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# **UP SERIES**

Complete thermal heads with cooling modules



- Several sizes, coolings and absorber choices: Apertures from 10 to 55 mm Ø Broadband or high damage threshold coatings Convection, fan or water-cooled
- DB15, USB, RS-232 or wireless
- THERMAL SENSOR HEADS

## **UP SERIES WITH PCB**

- Complete thermal heads with cooling modules
- Internal PCB for amplification, anticipation and filtering
- Several sizes, coolings and absorber choices:
  - 10, 12, 19, 25, 50 and 55 mm Ø apertures Broadband or high damage threshold coatings Convection, fan or water-cooled
- DB15, BNC or Molex connector, or bare wires
- THERMAL SENSOR HEADS WITH PCB



#### HOW TO USE SENSOR DISKS

The UD thermal sensor disks were designed for integration into laser systems. They are the solution if you are engineering the cooling and signal processing into your system already.

The chart below and on the next page show the various possibilities that Gentec-EO offers to OEM users. The choice of a level of integration depends on your needs in terms of calibration, output signal level, cooling avaibility, etc.



#### **KEY FEATURES**

- DESIGNED FOR INTEGRATION With a broad bandwidth and high power densities
- > VERY THIN PROFILES Starting at only 2 mm deep
- VARIOUS APERTURE SIZES Choose your aperture from 10 mm Ø to 55 mm Ø

#### > 2 LEVELS OF INTEGRATION

- Disk alone
- Disk + PCB
- > CUSTOM PRODUCTS

Contact us for more options!



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	UD10-2-H5-L	UD12-70-H5	UD19-50-W5	UD19-200-H9	UD25-350-H12	UD55-700-HD
MAX AVERAGE POWER (WATER-COOLED / FAN-COOLED)	2 W / 2 W	70 W / 30 W	50 W / 50 W	200 W / 110 W	350 W / 250 W	700 W / 600 W
EFFECTIVE APERTURE	10 mm Ø	12 mm Ø	19 mm Ø	19 mm Ø	25 mm Ø	55 mm Ø
MEASUREMENT CAPABILITY						
Spectral range	0.19 - 20 µm	0.19 - 20 µm	0.19 - 10 µm	0.19 - 20 µm	0.19 - 20 µm	0.19 - 20 µm
Noise equivalent power	0.1 mW	1 mW	1 mW	3 mW	10 mW	45 mW
Rise time (nominal) <sup>a, b</sup>	3.0 s	1.6 s	5 s	4.5 s	7.9 s	14 s
Sensitivity (typ into 100 k $\Omega$ load) <sup>b</sup>	2 mV/W	0.53 mV/W	0.65 mV/W	0.23 mV/W	0.1 mV/W	0.03 mV/W
Energy mode						
Sensitivity	2.4 mV/J	0.84 mV/J	0.33 mV/J	0.23 mV/J	0.05 mV/J	0.008 mV/J
Maximum measurable energ	Ŋ°3J	5 J	200 J	25 J	40 J	200 J
Noise equivalent energy a	5 mJ	20 mJ	23 mJ	60 mJ	200 mJ	250 mJ
DAMAGE THRESHOLDS						
Maximum average power densit	<b>y</b> 36 kW/cm <sup>2</sup>	36 kW/cm <sup>2</sup>	100 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>	45 kW/cm <sup>2</sup>
Maximum energy density						
1064 nm, 360 µs, 5 Hz	5 J/cm <sup>2</sup>	5 J/cm <sup>2</sup>	100 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>	9 J/cm <sup>2</sup>
1064 nm, 7 ns, 10 Hz	1 J/cm <sup>2</sup>	1 J/cm²	1.1 J/cm <sup>2</sup>	1 J/cm²	1 J/cm <sup>2</sup>	1 J/cm²
532 nm, 7 ns, 10 Hz	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	1.1 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>	0.6 J/cm <sup>2</sup>
266 nm, 7 ns, 10 Hz	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.7 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>	0.3 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS						
Absorber	H5	H5	W5	H9	H12	HD
Dimensions	44Ø x 3D mm	36Ø x 2D mm	44Ø x 3D mm	44Ø x 3D mm	54Ø x 3D mm	85Ø x 4D mm
Weight (head only)	7 g	4 g	7 g	7 g	13 g	180 g
ORDERING INFORMATION						
Product page						

a. These characteristics depend on the thermal management and electronics provided by the user. Packaging, cooling and electronics similar to our UP Series detectors will provide similar performances. See UP Series specifications sheets for more details. Actual performance depends on the tradeoffs in a user's design. It may be possible to enhance some performance parameters at the expense of others.

b. Without anticipation algorithm or circuitry.
 c. For 360 µs pulses. Higher pulse energy possible for long pulses (ms), less for short pulses (ns).

# DISCRETE PYROS Specifications



#### **OUTPUT OPTIONS**

#### CHOOSE YOUR CONFIGURATION

- QS-L: Passive discrete pyroelectric detectors with thermally isolated crystal for high sensitivity (low noise) at low frequencies
- QS-H: Passive discrete pyroelectric detectors with heat sink for high average power and high frequency operation
- QS-IL: Current-mode hybrid sensors designed for high sensitivity, low bandwidth applications
- QS-IF: Current-mode hybrid sensors designed for high frequency applications, up to 20 MHz

#### > SEVERAL IR WINDOWS IN OPTION

- Quartz: 0.2 3.0 µm
- Barium fluoride: 0.2 17.5 µm
- Sapphire: 0.1 7.0 μm
- Silicon: 1.1 9.0 μm and 50 1000 μm
- AR germanium: 8 14 µm

#### **KEY FEATURES**

- BROAD SPECTRAL RESPONSE From 0.1 to 1000 μm
- EASY TO INTEGRATE FORMAT TO5 and TO8 packages make the QS detectors small and easy to integrate in an existing system
- LARGE AREA SENSORS 5 mm Ø and 9 mm Ø diameter pyroelectric sensors make optical alignment easier.
- TEST BOX AVAILABLE Can be used with our QS-I-TEST test box which provides mounting and power supply
- > ROOM-TEMPERATURE OPERATION
- FAST RESPONSE

#### ACCESSORIES



QS-I-TEST Evaluation test box (current)



Permanent IR windows (Various types available)



Pelican carrying case

# **QS-I-TEST EVALUATION TEST BOX**



 QS-I-TEST

 Batteries
 +9 V / -9 V

 R<sub>r</sub> resistors
 10<sup>5</sup> - 10<sup>10</sup> Ω

 C<sub>r</sub> compensating
 Yes

 Package
 101.6H x 127L x 58.4P

 Optical mount
 ¼-20 threaded

 Front bezel
 SM1 (1.035-40)

 Product number
 201693

\* For details, contact your Gentec-EO representative



#### Discrete pyro detectors, low noise level

	QS2-L	QS3-L	QS5-L	QS9-L
CURRENT RESPONSIVITY	0.5 µA/W	0.5 μA/W	0.25 μA/W	0.25 µA/W
EFFECTIVE APERTURE	2 mm Ø	3 mm Ø	5 mm Ø	9 mm Ø
PACKAGE	TO5	ТО5	ТО5	TO8
MEASUREMENT CAPABILITY				
Spectral range	0.1 - 1000 µm	0.1 - 1000 μm	0.1 - 1000 μm	0.1 - 1000 µm
Max average power	50 mW	50 mW	50 mW	50 mW
Capacitance (at 1000 Hz)	22 pF	60 pF	90 pF	250 pF
Current responsivity (at 630 nm)	0.5 µA/W	0.5 µA/W	0.25 µA/W	0.25 µA/W
Thermal frequency (3 dB)	1.6 Hz	0.8 Hz	0.5 Hz	0.25 Hz
Temperature coefficient	0.2%/°C	0.2%/°C	0.2%/°C	0.2%/°C
ORDERING INFORMATION				
Product page		国会部公司		









#### Discrete pyro detectors, high average power

	QS2-H	QS3-H	QS5-H	QS9-H
MAX AVERAGE POWER	500 mW	500 mW	500 mW	500 mW
EFFECTIVE APERTURE	2 mm Ø	3 mm Ø	5 mm Ø	9 mm Ø
PACKAGE	ТО5	T05	ТО5	TO8
MEASUREMENT CAPABILITY				
Spectral range	0.1 - 1000 µm	0.1 - 1000 µm	0.1 - 1000 µm	0.1 - 1000 μm
Max average power	500 mW	500 mW	500 mW	500 mW
Capacitance (at 1000 Hz)	12 pF	30 pF	90 pF	250 pF
Current responsivity (at 630 nm)	0.25 µA/W	0.25 μA/W	0.25 µA/W	0.25 µA/W
Thermal frequency (3 dB)	5 Hz	5 Hz	5 Hz	5 Hz
Temperature coefficient	0.2%/°C	0.2%/°C	0.2%/°C	0.2%/°C
PHYSICAL CHARACTERISTICS				
Effective aperture	2 mm Ø	3 mm Ø	5 mm Ø	9 mm Ø
Package	ТО5	TO5	TO5	TO8
Sensor	Pyroelectric	Pyroelectric	Pyroelectric	Pyroelectric
Absorber	MT	MT	MT	MT
Dimensions (excluding pins)	9.1Ø x 6.4D mm	9.1Ø x 6.4D mm	9.1Ø x 6.4D mm	15.2Ø x 6.4D mm
Weight	1.0 g	1.0 g	1.0 g	1.5 g
ORDERING INFORMATION				
Product page				





#### Hybrid pyro detectors, current mode, fast response

	QS2-IF	QS3-IF	QS5-IF	QS9-IF
VOLTAGE RESPONSIVITY	50 V/W	50 V/W	25 V/W	25 V/W
CURRENT RESPONSIVITY	0.5 µA/W	0.5 µA/W	0.25 µA/W	0.25 μA/W
EFFECTIVE APERTURE	2 mm Ø	3 mm Ø	5 mm Ø	9 mm Ø
PACKAGE	ТО5	ТО5	ТО5	ТО8
MEASUREMENT CAPABILITY				
Spectral Range	0.1 - 1000 μm	0.1 - 1000 μm	0.1 - 1000 µm	0.1 - 1000 μm
Max average power	50 mW	50 mW	50 mW	50 mW
Noise equivalent power <sup>a</sup>	8x10 <sup>-8</sup> W/(Hz) <sup>½</sup>	8x10 <sup>-8</sup> W/(Hz) <sup>½</sup>	1.6x10 <sup>-7</sup> W/(Hz) <sup>½</sup>	1.6x10⁻7 W/(Hz)½
Detectivity <sup>a</sup>	2.2x10 <sup>6</sup> cm(Hz) <sup>½</sup> /W	3.3x10 <sup>6</sup> cm(Hz) <sup>½</sup> /W	2.8x10 <sup>6</sup> cm(Hz) <sup>½</sup> /W	5.0x10 <sup>6</sup> cm(Hz) <sup>½</sup> /W
Capacitance (at 1000 Hz)	22 pF	60 pF	90 pF	250 pF
Current responsivity (at 630 nm)	0.5 µA/W	0.5 µA/W	0.25 μA/W	0.25 µA/W
Voltage responsivity <sup>b</sup>	50 V/W	50 V/W	25 V/W	25 V/W
Thermal frequency (3 dB)	1.6 Hz	0.8 Hz	0.5 Hz	0.25 Hz
Feedback resistor	100 ΜΩ	100 MΩ	100 MΩ	100 MΩ
Supply voltage	±12 V	± 12 V	± 12 V	± 12 V
PHYSICAL CHARACTERISTICS				
Effective aperture	2 mm Ø	3 mm Ø	5 mm Ø	9 mm Ø
Package	TO5	T05	ТО5	TO8
Sensor	Pyroelectric	Pyroelectric	Pyroelectric	Pyroelectric
Absorber	MT	MT	MT	MT
Dimensions	9.1Ø x 6.4D mm	9.1Ø x 6.4D mm	9.1Ø x 6.4D mm	15.2Ø x 6.4D mm
Weight	1.0 g	1.0 g	1.0 g	1.5 g
ORDERING INFORMATION				
Product page				

a. 630 nm, 15 Hz, 1 Hz bandwidth b. 630 nm, 15 Hz





#### Hybrid pyro detectors, current mode, low noise level

	QS2-IL	QS3-IL	QS5-IL	QS9-IL
VOLTAGE RESPONSIVITY	25 kV/W	25 kV/W	13 kV/W	13 kV/W
CURRENT RESPONSIVITY	0.5 µA/W	0.5 µA/W	0.25 μA/W	0.25 μA/W
EFFECTIVE APERTURE	2 mm Ø	3 mm Ø	5 mm Ø	9 mm Ø
PACKAGE	TO5	ТО5	TO5	TO8
MEASUREMENT CAPABILITY				
Spectral range	0.1 - 1000 μm	0.1 - 1000 μm	0.1 - 1000 µm	0.1 - 1000 μm
Max average power	50 mW	50 mW	50 mW	50 mW
Noise equivalent power <sup>a</sup>	2x10-9 W/(Hz) <sup>1/2</sup>	2x10 <sup>-9</sup> W/(Hz) <sup>½</sup>	6x10 <sup>-9</sup> W/(Hz) <sup>½</sup>	6x10 <sup>-9</sup> W/(Hz) <sup>½</sup>
Detectivity <sup>a</sup>	9.0x10 <sup>7</sup> cm(Hz) <sup>½</sup> /W	1.3x10 <sup>8</sup> cm(Hz) <sup>½</sup> /W	7.0x10 <sup>7</sup> cm(Hz) <sup>½</sup> /W	1.3x10 <sup>8</sup> cm(Hz) <sup>½</sup> /W
Capacitance (at 1000 Hz)	22 pF	60 pF	90 pF	250 pF
Current responsivity (at 630 nm)	0.5 µA/W	0.5 µA/W	0.25 µA/W	0.25 µA/W
Voltage responsivity <sup>b</sup>	25 kV/W	25 kV/W	13 kV/W	13 kV/W
Thermal fequency (3 dB)	1.6 Hz	0.8 Hz	0.5 Hz	0.25 Hz
Feedback resistor	100 GΩ	100 GΩ	100 GΩ	100 GΩ
Supply voltage	± 5 to ± 12 V			
PHYSICAL CHARACTERISTICS				
Effective aperture	2 mm Ø	3 mm Ø	5 mm Ø	9 mm Ø
Package	TO5	T05	ТО5	TO8
Sensor	Pyroelectric	Pyroelectric	Pyroelectric	Pyroelectric
Absorber	MT	MT	MT	MT
Dimensions	9.1Ø x 6.4D mm	9.1Ø x 6.4D mm	9.1Ø x 6.4D mm	15.2Ø x 6.4D mm
Weight	1.0 g	1.0 g	1.0 g	1.5 g
ORDERING INFORMATION				
Product page				

a. 630 nm, 5 Hz, 1 Hz bandwidth b. 630 nm, 15 Hz

# DISCRETE PYROS Specifications



# **PYROELECTRIC THERMAL DETECTORS**

Our pyroelectric detectors are a class of room temperature thermal detectors that produce a current output that is directly proportional to the rate of change of temperature when exposed to a source of radiation. They are best described by an AC current source, capacitor and resistor. Their current output is governed by the equation  $I = p(T) \cdot A \cdot dT/dt$ , where I is current, p(T) is the pyro coefficient, A is the area as defined by the front electrode, and dT/dt is the rate of temperature change of the pyro crystal. The advantages of a pyroelectric detector over other IR detectors are: room temperature operation, broad spectral response, high sensitivity (D\*) and fast response (sub-ns into 50  $\Omega$ ).



QS-L (left) and QS-H (right) pin-outs

# **QS-L AND QS-H DISCRETE PYROS**

Our passive discrete pyroelectric detectors range from 1 to 9 mm in diameter and are provided in two configurations: high sensitivity or high average power. They present a pyroelectric detector element covered with our metallic coating (MT) and are packaged in a miniature TO-5 or TO-8 can. The diagram shown left identifies the pin-out for both types of detectors. Our organic black coating (BL), increases the optical absorption and helps flatten the spectral response. We also offer a number of permanent IR Windows that can be added to the TO can. These discrete pyro detectors are ideal for pulsed laser applications.



QS-IF and QS-IL pin-out



## QS-IF AND QS-IL CURRENT MODE HYBRID PYROS

These detectors offer high gain (>10<sup>5</sup> V/W) and/or high bandwidth (>10 MHz). In this configuration, the pyroelectric detector element is combined to a low noise operational amplifier. The QS-IL models are designed for high performance at low to medium frequencies, while the QS-IF models offer good performance at medium to high frequencies. These detectors are very easy to use. Simply supply the +/- 10 to 15 V to power the operational amplifier and add an external resistor, if required, to adjust the bandwidth and you are ready to measure pulsed, modulated or chopped sources, from nJ to mJ and nW to W. These detectors also make great candidates for any variety of broadband analytical instruments or laser measurement products.

## VOLTAGE OUTPUT VS. FREQUENCY

Our QS-IL hybrid detectors are designed to maximize voltage output at low frequencies and therefore include load and feedback resistors in the 100 G $\Omega$  to 300 G $\Omega$  range. They are also designed into 8-pin TO packages that allow the addition of an "external resistor" to lower the output and increase the bandwidth. The circuit diagram at the left shows a typical hook up for our QS5-IL detector (with our MT coating), using external resistors and capacitors. Our QS-IF series, on the other hand, are designed for high bandwidth applications and therefore include a smaller feedback resistor of 100 M $\Omega$ . For expert help on designing a detector circuit please contact us info@gentec-eo.com.

# DISCRETE PYROS Specifications



Typical QS-IL voltage output in power measurement mMode

## **OPERATION IN POWER MEASUREMENT MODE**

When using our QS-IL hybrid detector to measure the power (in W) of your CW or high repetition rate source (quasi-CW), you will need to employ an optical chopper. The diagram at the left shows the typical voltage output of a QS5-IL when used with our QS-I-TEST evaluation test box. Note that the voltage output is an approximate "square wave" whose rise and fall times are governed by the RC time constant of the circuit. The optical power is directly proportional to the peak voltage minus the baseline voltage. We calibrate these devices when operating in this mode.



# OPERATION IN ENERGY MEASUREMENT MODE

Our pyroelectric detectors are an ideal choice when measuring the performance of your pulsed laser in the range of nJ to mJ, across the full spectrum! The scope trace at the left represents the typical output from a QS9-IL, when used with our QS-I-TEST set up as an integrating joulemeter. Note the fast rise to a peak and then slower decay governed by the RC time constant selected for the integrating circuit. In this configuration you can measure absolute pulse energy, rep rate, and pulse-to-pulse stability. The maximum pulse width of your source is determined by the RC time constant you select and there is no limit as to how short the pulse can be!



energy measurement mode

Absorption curves of QS pyroelectric detectors

# **BROAD SPECTRAL RESPONSE**

Unlike photoconductive and photovoltaic detectors, our pyroelectric thermal detectors are not limited to a small part of the electromagnetic spectrum. They are truly broad spectrum detectors, sensitive from 0.1  $\mu$ m to 3000  $\mu$ m (EUV, FAR IR, and THz). Any and all radiation absorbed by our coatings or pyro crystal will result in a measurable signal. The two plots at the left show the relative spectral response of detectors with MT and BL coatings. Note that the well documented, NIST traceable calibrated portion of these curves runs from 0.25  $\mu$ m to 15  $\mu$ m. There are currently no traceable optical standards for measurements > 15  $\mu$ m.

# CUSTOM DESIGN EXAMPLES



After over 50 years of experience in the laser beam measurement business, we have developped many customized solutions, sometimes for very unusual applications! This section is only a small portion of the projects we have accomplished for our customers, so do not hesitate to contact us with any special need you may have. We are always striving to find the perfect solution for your application!
# CUSTOM DESIGN EXAMPLES



## EXTREMELY HIGH POWER, LOW BACK-REFLECTIONS

When working at extremely high average power, even a low % of back-reflections can be dangerous. To manage the back-reflections and provide a safer working environment, we can equip your high-power detector with a water-cooled "TUBE" extension.

This custom project example can measure up to 100 kW of average power continuously, and less than 4 % of the incident radiation is backscattered.

CUSTOM-DESIGNED HIGH-POWER DETECTOR



## "10 PW PORTABLE BLACK HOLE"

Gentec-EO is the only supplier able to manufacture beam dumps able to withstand the tremendous peak power of a 10-petawatt laser, in a high vacuum environment.

By working closely with our client, we have designed the only existing beam dump that can fulfill the task of capturing and dissipating the energy contained in the single pulses of the ELI-NP end-of-line laser beams. Furthermore, this product was designed to be operated without external cooling, which simplifies its installation and makes it usable in a wide range of applications.

UNRIVALED DAMAGE THRESHOLDS: UP TO 200 J/CM<sup>2</sup> FOR fs PULSES

**EXTREMELY LOW BACK-REFLECTIONS:** < 0.02 %



## 8-CHANNEL ARRAY FOR THZ TOMOGRAPHY

This eight-element, pyroelectric detector array was designed for use in a THz tomography system. It was used to analyze high pressure flames by measuring absorption in the water spectral bands, using THz radiation in the 0.5 to 2 THz region.

The detector elements are 3 mm diameter, accurately spaced on 5 mm centers. Its high responsivity and very low noise level allow precise detection of weak signals.

- 8-CHANNEL PYROELECTRIC ARRAY
- 0.5 TO 2 THZ RANGE
- HIGH VOLTAGE RESPONSIVITY

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## Position sensing power & energy detectors



#### **COMPATIBLE DISPLAYS & PC INTERFACES**



QUAD-4Track module

#### **KEY FEATURES**

- MEASURE, TRACK AND ALIGN With µm resolution in real time!
- > 4-CHANNEL DETECTORS Unique pyrolectric QUADrant detector technology handles high peak power without saturation
- > FOR CW, PULSED AND HIGH REP RATE LASERS
  - QUAD-E: Energy per pulse from µJ to mJ
  - QUAD-P: Powers from  $\mu W$  to mW
- > FROM UV TO FIR AND THZ Broadband detectors cover the full spectrum, from UV to Sub-Millimeter wavelengths
- > LARGE AREA SENSORS 9 mm and 20 mm square detectors
- > INCLUDES APPLICATION SOFTWARE Complete LabVIEW application software included, with many features

#### ACCESSORIES







Stand with delrin post

Additional 9V power supply







Pelican carrying case





1

	QUAD-9-MT-E	QUAD-9-MT-P	QUAD-20-MT-E	QUAD-20-MT-P
MAX ENERGY / AVG POWER	20 mJ	200 mW	20 mJ	200 mW
MAX POSITION RESOLUTION	1 µm	10 µm	1μm	10 µm
EFFECTIVE APERTURE	9 x 9 mm	9 x 9 mm	20 x 20 mm	20 x 20 mm
MEASUREMENT CAPABILITY				
Spectral range	0.1 - 3000 µm	0.1 - 3000 µm	0.1 - 3000 μm	0.1 - 3000 µm
Min beam size ª	≥ 4.5 mm Ø	≥ 4.5 mm Ø	≥ 10 mm Ø	≥ 10 mm Ø
Position resolution with QUAD-4TRACK	1 µm	10 µm	1µm	10 µm
Maximum measurable energy/power	20 mJ/channel	200 mW	20 mJ/channel	200 mW
Noise equivalent energy/power	0.5 µJ	1 µW	1.0 µJ	2 µW
Rise time (typical 0-100%)	150 µs	< 0.02 s	150 µs	< 0.02 s
Max repetition rate	1000 Hz	N/A	1000 Hz	N/A
Maximum pulse width	2.5 µs	N/A	2.5 µs	N/A
Maximum chopping frequency	N/A	50 Hz	N/A	50 Hz
Sensitivity	1000 V/J	2000 V/W	1000 V/J	2000 V/W
DAMAGE THRESHOLDS				
Max average power density (at 1064 nm)	100 mW/cm <sup>2</sup>	100 mW/cm <sup>2</sup>	100 mW/cm <sup>2</sup>	100 mW/cm <sup>2</sup>
Max energy density (at 1064 nm 10 ns)	50 mJ/cm <sup>2</sup>	50 mJ/cm <sup>2</sup>	50 mJ/cm <sup>2</sup>	50 mJ/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS				
Effective aperture	9 x 9 mm	9 x 9 mm	20 x 20 mm	20 x 20 mm
Sensor type	Pyroelectric	Pyroelectric	Pyroelectric	Pyroelectric
Absorber	MT	MT	MT	MT
Dimensions	63.5Ø X 40.6D mm			
Weight	181 g	181 g	181 g	181 g
ORDERING INFORMATION				
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233	STAND-D-233
Product page				

a. For optimal performance.

POWER DETECTORS

CE



QUAD-4Track (front view)

QUAD-4Track (rear view) (1)



### QUAD-4TRACK

The QUAD-4Track is a laser position sensing system designed to support our unique pyroelectric quadrant detectors, QUAD-P and QUAD-E. It is a 4-channel microprocessor-based system that measures the voltage output of each QUAD element and does the math necessary to provide a measurement of the X and Y displacement of a laser beam or image. It is fast and can be used to track, align and/or measure movement in real time, with a resolution of just a few microns!

## **SPECIFICATIONS & FEATURES**

	QUAD-4TRACK				
	Number of channels	4			
Full scale ranges (4 decad Energy mode (with Power mode (with USB connection to compu-	Full scale ranges (4 decades) (E / P)				
	Energy mode (with QUAD-E)	20 µJ to 20 mJ			
USB connect	Power mode (with QUAD-P)	200 µW to 200 mW			
	USB connection to computer	YES (USB 2.0 full speed)			
	Power supply	9 VDC			
	Power on light	YES			
Power on light Detector input Detector analog o Trigger input (TTL	Detector input	DB-25 connector			
	Detector analog output	BNC connector (0 - 2 V)			
	Trigger input (TTL)	BNC connector with LED indicator			
	Product number	201517			





## **QUAD DETECTORS**

Our large area pyroelectric quadrant detectors provide unique advantages over other position sensing detectors like silicon quads or lateral effect photodiodes. They are fast, handle high peak power of pulsed lasers without saturation and respond to lasers across the spectrum, from UV to Far IR and even THz. The QUAD-E is intended for use with pulsed sources at up to 1000 Hz, while the QUAD-P is designed for CW and High Repetition Rate (Quasi-CW) sources. Both types of detectors can also be used as standalone units, in an analog mode, for incorporation into your own system application. We can provide a Lemo cable for this purpose.

## **ANALOG OUTPUT**

The analog output of the QUAD-4Track provides voltage that is directly proportional to the pulse energy or laser power irradiating each QUAD element. When the four voltage outputs are equal, the beam is centered on the QUAD detector. This provides a very useful tool when setting up our QUAD probes with your source for optical alignment.



osition Data Servar Data	Calibration	
Beam Positio	n	DPQ Pulse Track Software
-0.524	x	45- 4- 13-
2.878	Y	20- 20- 10-
Total (sum)		1-
108.0	uJ	
	Freq (Hz)	43
s 49.0 39.6	A 9.89	
c 11.3 08.1	D Internet	
Range	Tripper %	
200 uJ	7 Anto	
Single Channel Set	tings	-
Show Brandary ON	Average Show Data History OFF ON	Ream Data Stream Witter Comp Padition Use Data Binkny ON ON Calibration Acquisition Own Hattary
Brundary Dameter (mm)	F at Hatory Averages Buffer 1 20	ive Fusion Balded Per Zoon gentee.c.

### **MEASUREMENT SCREEN**

QUAD-4Track includes powerful, stand alone, LabVIEW software which is used to control the instrument, process the data, and display X and Y position. It also displays the energy or power of your source and repetition rate. The large graphic in this screen shows the position of the centroid of the beam and tracks its movement in real time. The software includes many handy features like: set boundary, zoom (2X to 128X), set resolution, data logging, and many more. The green line represents the tracking history.

Beam Position	DPQ Pulse Track Software
-0.008 x	12- 13- 13-
-0.008 <sub>Y</sub>	
Total (sum)	4.5
108.5 uJ	
Freq (Hz)	42-
27.8 26.6 D 10 10	4.51
Range Tripper %	437- 437- 437-437-437-457-457-457-457-457-457-457-457-457-45
200 til 7	x
Single Channel Settings	
Show Average Show Boundary Duta Hits CN Off C	ar Beam Data Steam Reve Comp Pusition Une Data ny History ON ON Caliberture Caliboration Augustion NY Char History @ @ ON ON Caliboration Augustion
Boundary F of Histo Diameter land Aussages Bull	ry Bean Digital Pict

## TRACKING THE BEAM OVER TIME

In the measurement screen shown on the left, we are tracking the beam stability of a pulsed Nd:YLF laser at 10 Hz. The resolution was set at 0.001  $\mu$ m, the boundary is at 20  $\mu$ m (red circle), and the zoom feature is at 64X. The total energy is 108.5  $\mu$ J, the final position of the laser is at -8  $\mu$ m in X and -8  $\mu$ m in Y. The green tracking line shows the movement of the laser about the zero position over a few hundred pulses.

Calibrate Beam Po	sition	d'4+ Ex Meanured'3 + Fx Meanured'2 :	G <sup>*</sup> Mean	red-H
et Postions	Measured Postions	Corrected Postions		Coefficients
-2.00E+0	-4.14E+0	-2.00E+0	н	7.32E-3
-1.50E+0	-3.66E+0	-1.50E+0	G	3.14E-1
-1.00E+0	-2.77E+0	-9.99E-1	F	-4.03E-3
-5.00E-1	-1.51E+0	-5.01E-1	ε	9.94E-3
0.00E+0	-1.86E-2	1.46E-3	D	6.40E-4
5.00E-1	1.50E+0	4.99E-1	c	-8.66E-4
1.00E+0	2.76E+0	1.00E+0		-2.17E-5
1.50E+0	3.62E+0	1.50E+0	A	5.12E-5
2.00E+0	4.11E+0	2.00E+0		Save Coefficients

## **POSITION CALIBRATION SCREEN**

We've developed a unique position calibration routine which allows you to calibrate our QUAD-4Track system when working with a uniformly round laser beam. It requires the use of a micrometer-driven linear stage (1-axis only). As you can see from the calibration screen on the left, the procedure involves zeroing the instrument, moving the QUAD probe to nine discrete positions (+2.000 to -2.000 mm) and then capturing the QUAD readings. It then determines correction coefficients (last column) and applies them to the raw data to arrive at "corrected positions". The QUAD probe is now calibrated!

4	A	В	С	D	E	F
	Time	Energy (uJ)	x	Y		
	54:01.9	100.3	-0.008	-0.023		
	54:05.9	100.3	-0.013	-0.024		
	54:09.9	100.4	-0.015	-0.02		
	54:13.9	100.4	0.04	0.025		
	54:17.9	100.4	0.029	-0.069		
	54:22.0	100.4	-0.376	-0.08		
	54:26.0	100.3	-0.041	-0.069		
	54:30.0	100.4	-0.036	-0.073		
14						
15						
1000	feel, feel, feel,	1. 17		241		1 12

## DATA LOGGING

Another very handy feature is "data logging". This allows you to set up the QUAD-4Track to follow the displacement, energy and/or power of your laser over several minutes, hours or even days. Need to measure the "beam steering" of your laser as it warms up? This is how you do it! Need to measure the beam displacement vs laser repetition rate or energy level? Data logging will help you measure it!

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#### **COMPATIBLE DISPLAYS & PC INTERFACES**



Plug your TP sensor into the STEP-Controller for power supply and temperature control. You can then use the analog output with a scope or lock-in



STEP-Controller

#### **KEY FEATURES**

#### > SPECTRALLY FLAT RESPONSE

These radiometers were developed for NIST, to be used with a broadband spectrometer to act as a spectral transfer standard when calibrating other detectors in the 0.25 to  $15 \,\mu$ m range.

#### > TEMPERATURE-CONTROLLED POWER MEASUREMENT

Each head is composed of a low noise detector, thermistor, TE cooler and heatsink to compensate for any temperature change

#### > THE ULTIMATE CHOICE IN MEASUREMENT STABILITY

Temperature control down to  $0.05^{\circ}$ C from 20 to  $30^{\circ}$ C gives a temperature coefficient < 0.01 %, thus a voltage output stable to 0.01 %

#### > 2 SIZES AVAILABLE

- TP5-BL: 5 mm Ø pyroelectric sensor with organic black coating
- TP9-BL: 9 mm Ø pyroelectric sensor with organic black coating

#### ACCESSORIES



Stand with delrin post



SDC-500 digital optical chopper (for -P)



Removable IR windows (Various types available)



Pelican carrying case



Fiber adaptors & connectors (FC, SC, ST and SMA)



	TP5-BL	TP9-BL
MAX AVERAGE POWER	0.5 mW	0.5 mW
EFFECTIVE APERTURE	5 mm Ø	9 mm Ø
TEMPERATURE STABILITY	± 0.05°C	± 0.05°C
MEASUREMENT CAPABILITY		
Spectral range <sup>a</sup>	0.25 - 15 μm	0.25 - 15 μm
Temperature stability	± 0.05°C	± 0.05°C
Voltage response stability	± 0.01 %	± 0.01 %
Maximum average power	0.5 mW	0.5 mW
Noise equivalent power <sup>b</sup>	< 5 nW	< 5 nW
Rise time	≤ 0.2 s	≤ 0.2 s
Calibration uncertainty	±2.5 % (633 nm)	±2.5 % (633 nm)
Chopper frequency <sup>c</sup>	10 Hz, 50% duty cycle	10 Hz, 50% duty cycle
DAMAGE THRESHOLDS		
Max average power density (at 1064 nm)	50 mW/cm <sup>2</sup>	50 mW/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Effective aperture	5 mm Ø	9 mm Ø
Sensor	Pyroelectric	Pyroelectric
Absorber	BL	BL
Dimensions	50.8Ø x 48.3D mm	50.8Ø x 48.3D mm
Weight	0.23 kg	0.23 kg
ORDERING INFORMATION		
Available output options	LEMO only	LEMO only
Compatible stand	STAND-D-233	STAND-D-233
Product page		

a. NIST-traceable calibration at 632.8 nm.
b. With STEP-Controller and scope. Noise is < 11 nW with STEP-controller and Lock-In.</li>
c. SDC-500 optical chopper sold separately.

POWER DETECTORS

ENERGY DETECTORS

CE





#### **COMPATIBLE DISPLAYS & PC INTERFACES**

> TRAP -PREAMP Low noise, high gain amplifier

#### **KEY FEATURES**

- HAVE YOUR OWN GOLDEN CALIBRATION STANDARD The high quantum efficiency (>99 %) makes it an excellent calibration transfer standard
- > INCREDIBLE SPATIAL UNIFORMITY The spatial uniformity is better than 0.05 %
- > LOW CALIBRATION UNCERTAINTY From 440 to 980 nm
- > FOR DIVERCENT OR COLLIMATED BEAMS Devices optimized for both types of lasers
- MEASURE POWER FROM NW TO MW When used with the TRAP-PREAMP amplifier that provides a direct digital readout

#### ACCESSORIES







Pelican carrying case









	TRAP7-SI-C-BNC	TRAP7-SI-D-BNC
MAX AVERAGE POWER	1 mW	1mW
EFFECTIVE APERTURE	7 mm Ø	7 mm Ø
BEAM TYPE	Collimated	Divergent
MEASUREMENT CAPABILITY		
Spectral range	200 - 1100 nm	200 - 1100 nm
Calibrated spectral range	440 - 980 nm	440 - 980 nm
Maximum average power	1 mW	1mW
Noise equivalent power	100 pW	100 pW
Current responsivity (at 630 nm)	0.5054 A/W	0.5054 A/W
Beam type	Collimated	Collimated or divergent
Field of view	± 10°	± 14°
Quantum efficiency	> 99%	>99%
Calibration uncertainty	< ±1.0 % (440 - 980 nm)	< ±1.0 % (440 - 980 nm)
Spatial uniformity	0.05 % in 5 mm diameter	0.05 % in 5 mm diameter
DAMAGE THRESHOLDS		
Maximum average power density	1 mW/cm <sup>2</sup>	1 mW/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Aperture diameter	7 mm Ø	7 mm Ø
Sensor	Silicon	Silicon
Dimensions	69Ø x 27.7D mm	69Ø x 27.7D mm
Weight	0.23 kg	0.23 kg
ORDERING INFORMATION		
Available output options	BNC only	BNC only
Compatible stand	STAND-D-233	STAND-D-233
Product page		

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## **RETURNS & WARRANTY**

## CALIBRATION AND REPAIR SERVICE

All Gentec-EO products receive a NIST-traceable calibration and are shipped with a Calibration Certificate to prove it. The certificate tells you the sensitivity of your power or energy head, the ambient calibration conditions, and a list of all the NIST-traceable standards and instruments used in the calibration.

The actual need for recalibration depends on use and environmental conditions. Under typical operating conditions and laser exposures annual recalibration is the industry standard recommended by calibration experts such as NIST. Our highly professional service department is happy to recalibrate or repair your instrument any time you need it. In every case, you will get the same accurate calibration and detailed certificate as when your instrument was new. In addition, we do an incoming calibration test to let you know how the device was performing before service. We will help you meet any ISO and guality requirements. Here is how to send an RMA request:



Mr. Nicolas Litalien 1-418-651-8003 ext. 302



service@gentec-eo.com



Go to https://www.gentec-eo.com/contact-us/support-rma-request Fill out the online form and click "SUBMIT MY REQUEST"



IN ALL CASES, PLEASE PREPARE THE FOLLOWING INFORMATION BEFORE CONTACTING US:

- Model name(s)
- Serial number(s) .
- If a repair is needed, please provide a description of the problem

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