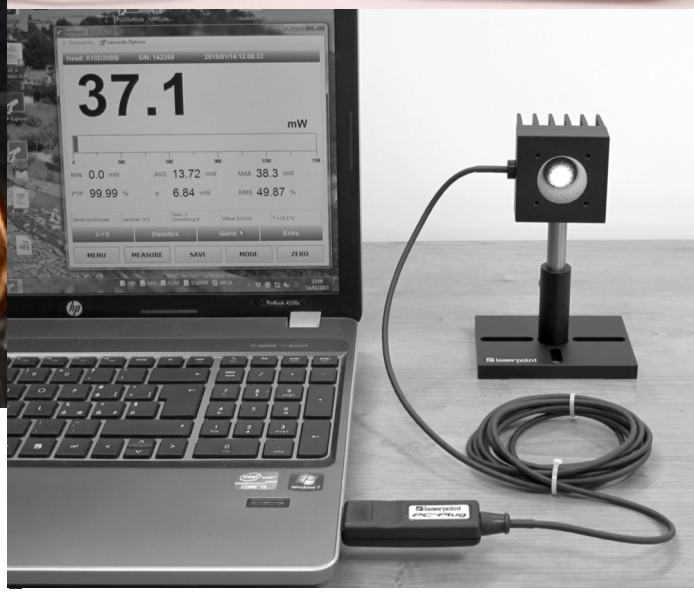
laserpoint

Laser Measurement Instruments

Power/Energy Sensors and Meters
USB/RS232Meterless Sensors
Custom Power and Energy Solutions
Power Probes



2015 Catalog

Release 10- Apr.15

About Laser Point

Laser Point was founded in 1987, as a distribution Company. Over the years it has diversified its activities into other laser related areas.

Our company employs a highly-skilled staff of physicists, engineers and technicians , all with a solid experience in laser technologies and work in R&D or manufacturing in fields like plasma physics, microelectronics, telecommunication.

Export to the major technological or fastest growing markets (Europe, Japan, China, etc) is the destination of Laser Point's laser measurement instruments that are marketed in more than 25 Countries by a network of worldwide Distributors.

Laser Point's original fully certified calibration facility and repair center covers all Europe, while the new open center in China supports our Asian Customers.

Our Facility

Laser Point's R&D and manufacturing facility is located in a modern, proprietary building in the outskirt of Milano, Italy.

The premises are fully equipped for the coating deposition, assembling and testing of our laser measuring instrumentation, medical devices and laser systems engineering.

Furthermore, Laser Point's facilities have in-house the capability for our products complete design, from thermal modelling software to 3D CAD design.

Laser Point activities are focused on:

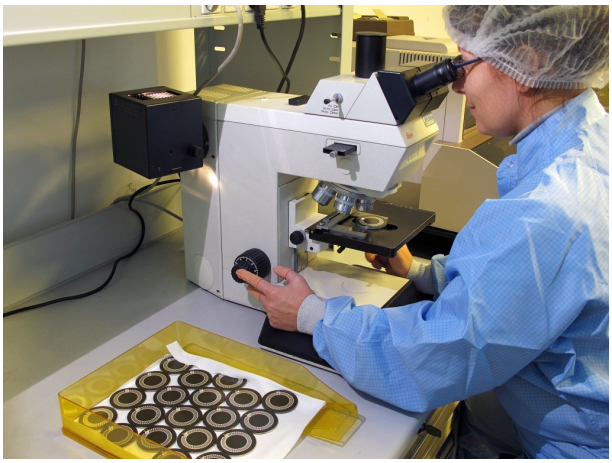
The manufacturing of a stunning offer of laser measurement instruments both for OEM and off-the shelf.

The manufacturing of a laser diode line of modular photonic systems for OEM applications (Multi-Laser Platform (MLP)) for :

- Laser marking, monitoring systems, dimensional control;

- Medical systems for therapy and surgery at different wavelengths.

Custom designed micromachining systems powerd by nano and picosencond lasers: application include micro-drilling and micro-cutting of exotic materials (eg Aluminum Nitride) for medical, automotive, electronics and industrial use.



PRODUCT GUIDE 2015

New Products on this Catalogue

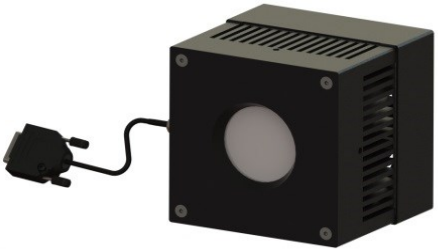
Design Optimization & New Technologies: Air Cooled Detector for 1.2kW and Compact Calorimeter for 12kW

LaserPoint introduces two new instruments that can safely face the extremely high power densities of our days' lasers and which synthetize the technological level of the Company. In both instruments, the presence of SHC as radiation absorber lead to achieve a higher absolute power measurement capability with very compact footprints (in particular for the calorimeter) associated to a higher damage of threshold.

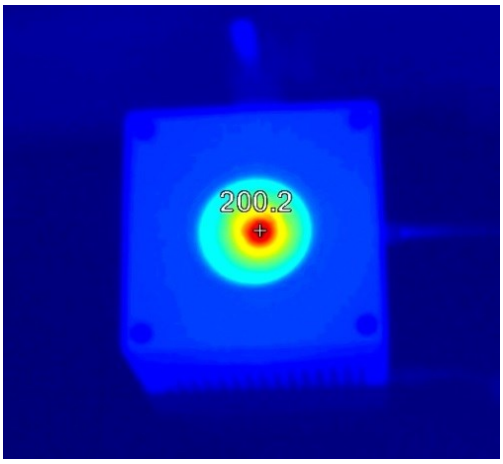
Laserpoint, who has been leading the technology in the past years with an air cooled detector for 600 W (850W for short term measurements) designed for the fiber laser market, is now offering a detector with forced air cooling for 1200 W (Mod. A-1200-D60-SHC) . It is a leap ahead in thermal management, coating improvement, optimization of design.

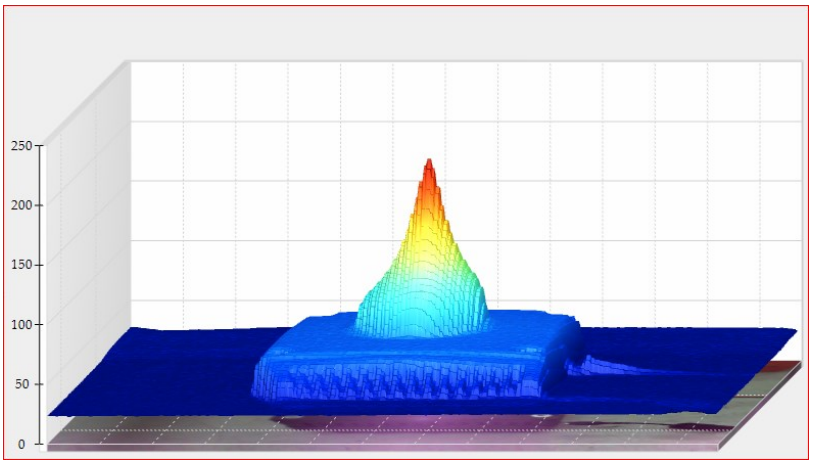
This detector has a Linearity of ±1.5% to its full scale and is supplied with ±3% calibration accuracy traceable to PTB/NIST standards.

The aperture is 60mm, Dimensions 140Lx140Px140H mm, Weight 4.4 Kg.



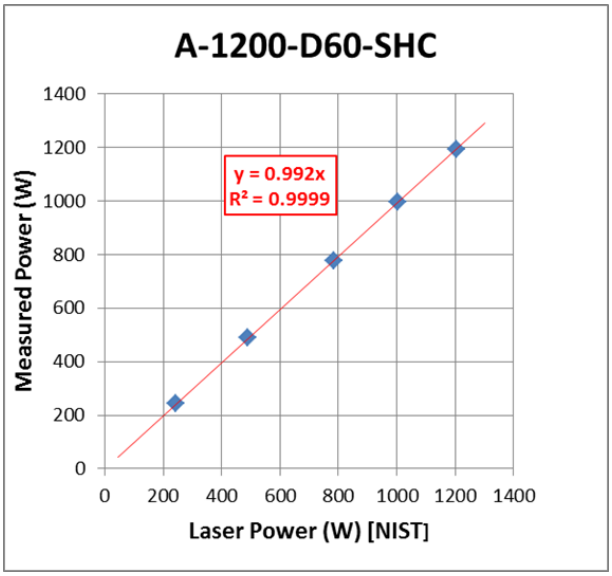
Mod. A-1200-D60-SHC





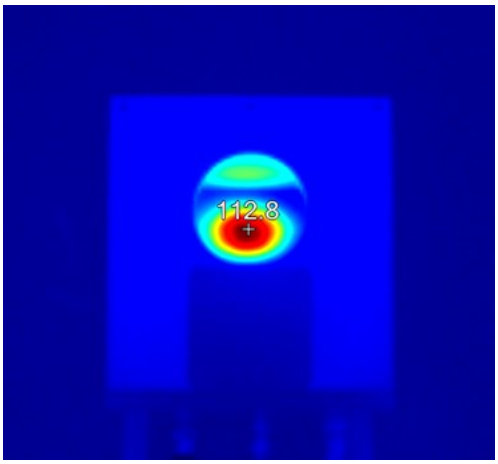
Mod. A-1200-D60-SHC: Thermal images of the absorbing surface at 1200W- Max. Temperature in the coating is 200°C (IPG fiber laser YLS 2000)

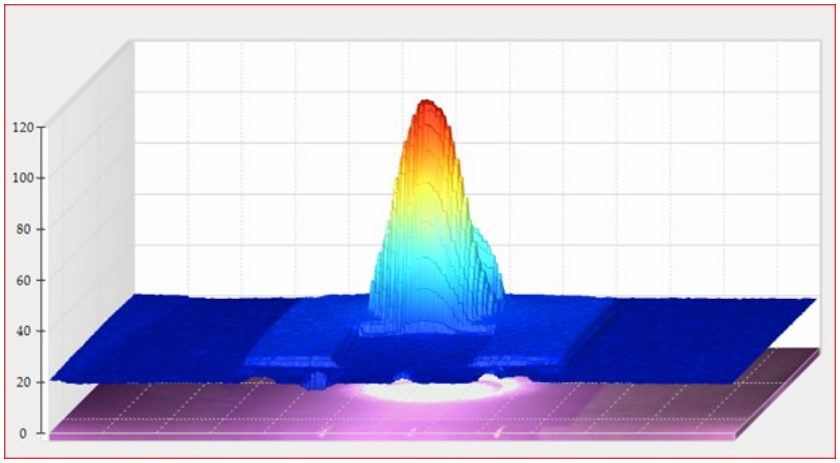
Mod. A-1200-D60-SHC: Linearity



Mod. W-12K-D55-SHC-USB

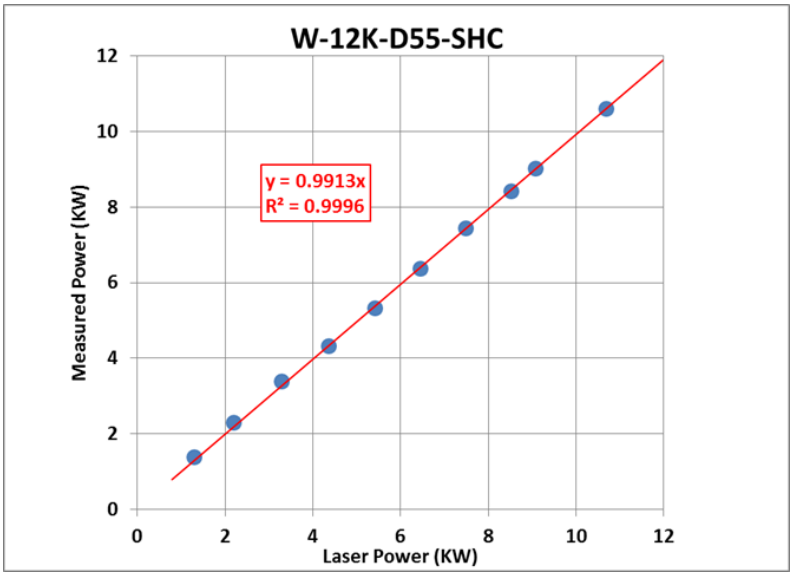
Together with the air cooled detector for 1200W , Laser Point is also introducing a calorimeter up to 12kW, result of Company's capacity to explore new materials, manage thermal design, create innovative products.
The new calorimeter (Mod. W-12K-D55-SHC-USB) is extremely compact and light weight compared to alternative instruments of the same class and does not require any defocussing optics in the absorbing cavity.
This detector has a Linearity ± 2% to its full scale and is supplied with ±5% calibration accuracy traceable to PTB/NIST standards.
The aperture is 55mm, Dimensions L140xP200xH180 mm, Weight is 6 Kg.





Mod. W-12K-D55-SHC-USB: Thermal images of the absorbing surface at 10 KW- Max. Temperature on the coating is 113 °C (IPG fiber laser YLS 10000)

W-12K-D55-SHC-USB: Linearity



Tools For Accurate Laser Measurement

A Long History

For more than 15 years Laser Point has consistently supplied OEM, industrial, medical and scientific customers worldwide with laser power and energy measurement tools that proved their accuracy and reliability.

Our team of highly skilled engineers, all formed in the best R&D labs of the Country, have set several standards in products innovation and in the improvement of their sturdiness and accuracy.

A Tradition in Improvements

Our commitment to our customers has always been to provide sturdy, accurate and hassle–free instruments.

We thus focused on material science technologies and thermal modelling in order to continuously heighten the operational limits of our devices, in particular our coatings and our heat removal systems.

We reached those goals since the beginning of our history and we continue to keep an undisputed first rank on the front of laser measurement technologies. At the same time we also reached our goal to provide our customers the most robust and reliable products in the market.

Laser Point holds several patents that show the Company's creativity, its commitment to research and innovation and its capacity in mastering all laser related technologies. A relevant side effect to this capacity of innovation and knowledge is Laser Point ability in designing and providing custom solutions to our customers.

We apply a constant care to our manufacturing and calibration methods in order to further stiffen our leadership in delivering instrumentation with superior reliability and accuracy.

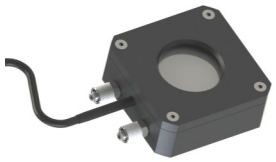
Our Commitment

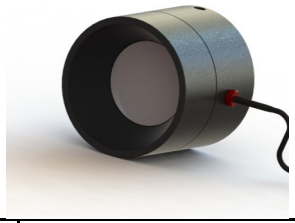
We are aware that Laser Point products are critical parts in a number of applications where durability, reliability and accuracy are mandatory requisites; they are applications in all laser fields: industrial, medical and scientific.

With this awareness in mind, we commit to strive for innovation , research , new developments and improvements of our products to remain on the frontline and undisputed leaders in laser measurement instrumentation.

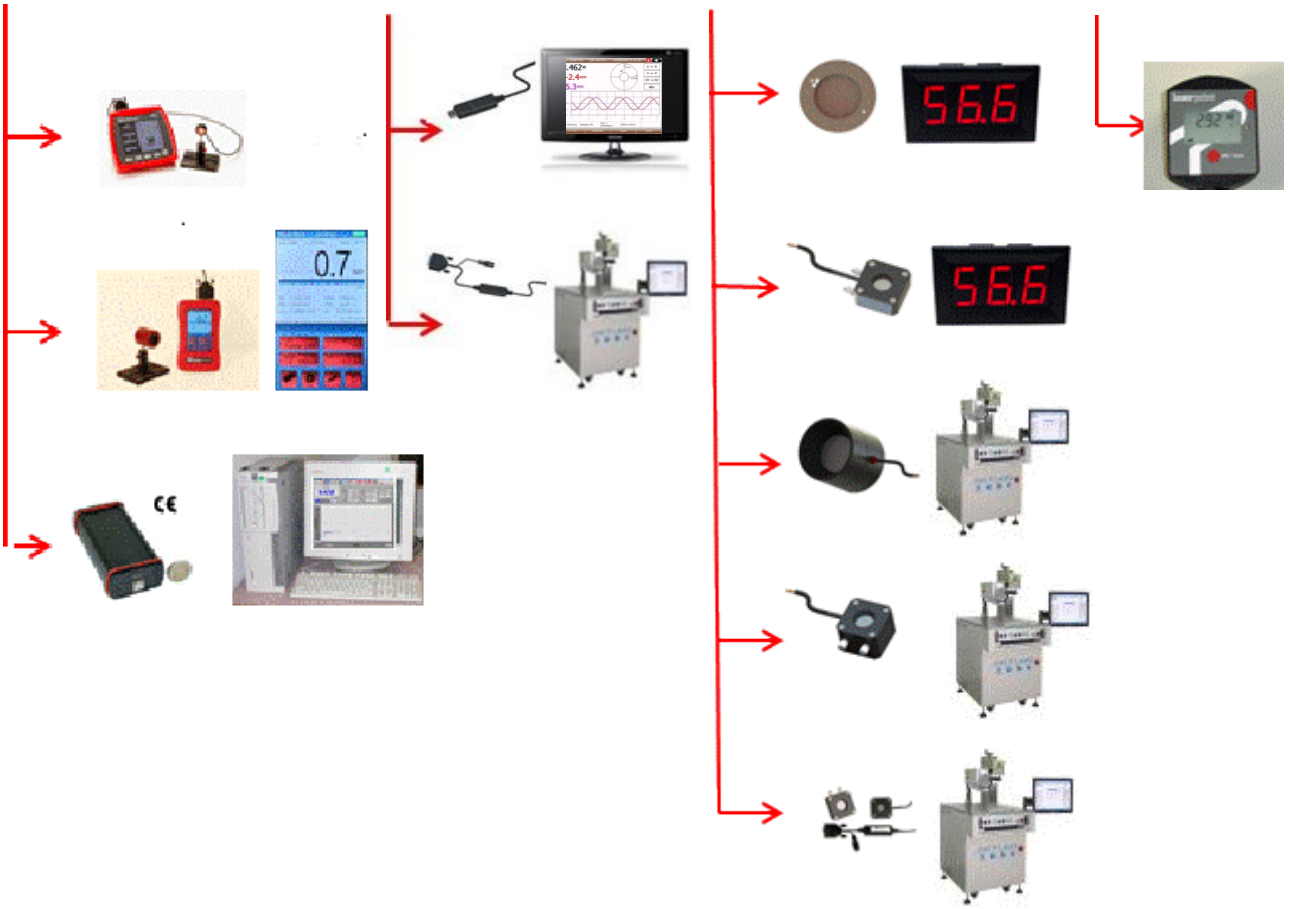
Off-the Shelf or Custom, Instruments Thought for your Applications

Laser Point has one of the widest range of sensors, probes, OEM solutions on the market to satisfy almost any measurement need with the highest reliability and accuracy.
The philosophy on the background of Laser Point solutions is to supply a flexible approach to measurements: results can be displayed on the PC screen or on the power meter screen, can be saved on several platforms like storing data on board, or a USB or RS-232 connectivity.





Sensors for Beam Position, Laser Power and Single Shot Energy	**Meterless Solutions**	**OEM Solutions**	**Laser Power Probes**
Position Accuracy :100µ Laser Powers: 6KW Laser Energies mJ to J	Flexibility of USB/RS232 connectivity Lower cost Laser Powers: 12 KW Laser Energies mJ to J	Sensor Discs, Amplified sensors Sensors with USB / RS232 connectivity	Authomatic, Highly repeatable Accurate Rugged



EXPLORER: the Detector Finder Program

Find the instrument that responds to your application

The EXPLORER program is a useful tool to finds, simply by entering the laser parameters, the proper instrument that meets your measurement needs. EXPLORER will calculate the power or energy densities specific for that beam and it will relate those values and other input laser data to available detectors. In a few seconds it will be defined which heads, monitors and coatings can be used.

There are a few initial steps to be performed before entering the beam parameters:

1) -specify the laser type: CW or Pulsed.

2) -indicate the beam shape. To take into account the residual energy outside the sizes generally found on laser specs the program will then chose the heads considering their sensitive diameter to be at least 14% larger.

3) Select the type of measurement to be performed; this can be chosen between "Average Power", and "Single Shot Energy". In the first case the program will find heads and monitors which are more suitable to measure only the average power. In the second case the program will address to those heads & monitors that are better for both the energy of a single pulse and the average power.

4)The last selection to be done is more related to the application: if this requires long term measurements, laser alignments, the necessity of making statistics on measured values, etc, then chose "Sensor+ Meter " If the application is a periodic check of laser power, then a " Handheld Power Probe" is probably the needed product. The program will address there.

Input Beam Parameters, Explore and Reset Data keys

In this frame, beam data with their appropriate measurement units have to be inserted.

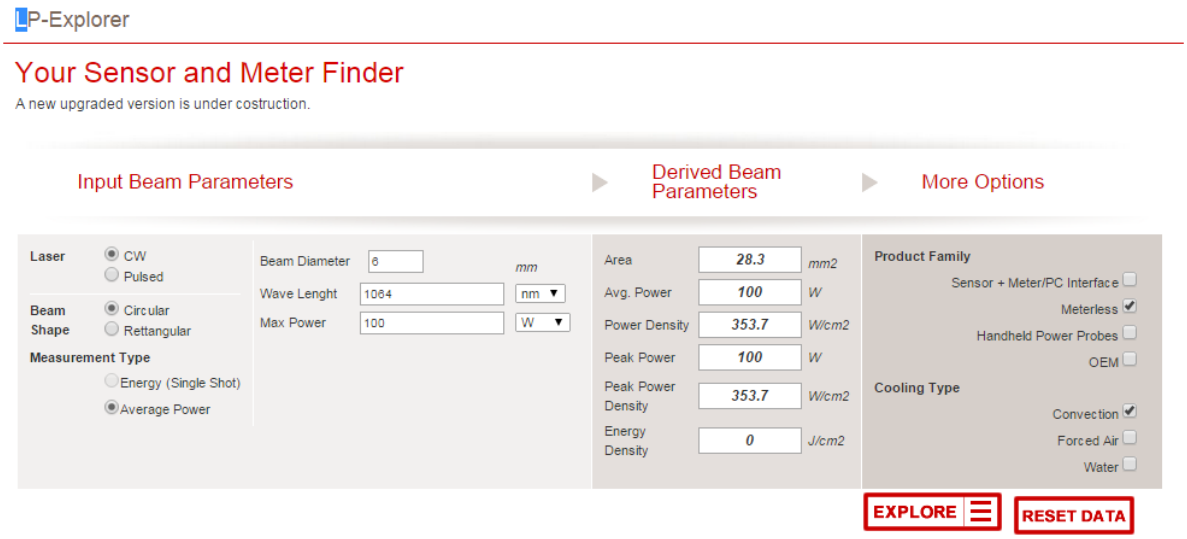
For CW lasers the needed parameters are Beam Diameter, Wavelength and Max Power.

For Pulsed lasers it is necessary to specify also Pulse Width, Repetition Rate and Max Energy. Once all boxes have been filled , just click on the Explore key to obtain all information .

To explore what can be used in case of more wavelengths, the screen has to be refresh by clicking on the Reset Data box.

Derived Beam Parameters

This frame shows several important calculated beam parameters derived from your input data and will give a synthetic, yet exhaustive, picture of your beam .



Available Heads & Coatings, Damage Threshold :

All detectors that fit with specifications for your beam parameters are shown and, to simplify selection, head types are separately listed in their various versions of coatings or absorbers. Aside the head model is reported the corresponding level of risk of damage for that coating/ absorber when subject to the inserted laser parameters. This value is expressed as a % of the damage threshold.
It will undoubtedly result that some detectors may be closer to the damage threshold than others : always prefer a head which is below the 50% of damage threshold. This will put the coating on the safe side from hot spots and compensate from laser modes.

When Explore cannot find a suitable sensor an error message appears recommending to re-enter data with a larger beam size: most of times, in fact , the power /energy density are too high and considering a larger beam area (density will lower) will solve the problem.

To proceed on your selection you may single click on each head model to open the "Power/Energy Resolution with Monitor " frame; a double click will open a pdf file showing both specifications and a mechanical outlook for each head of interest.
Some additional selection criteria are more personal and depend on the way the head will be used or the kind of application; for example LaserPoint manufactures a series of compact heads designed to work intermittently or for short periods. They are the heads with double code (e.g. the A-40/200 series) which can extend their measurement range, repeatedly but intermittently, These heads have a temperature sensor and , when associated with PLUS/ LPM monitors , can be used until a COOL message is displayed .

GET E-Quote	Sensor Code	Short Description/note	You are the following % of Coating's Damage Thresold on Flat-Top Beams	You are the following % of Coating's Damage Thresold on Gaussian Beams	Compatible Meter						
					PLUS	4PI	PC-Link	PC-Plug	LPM	OEM Amp Board	PLUS 2.0
☐	A-40/200-D25-HPB	Up to 200W for 2 minutes	9 %	18 %	✓	✓	✓	✗	✗	✗	✓
☑	A-40/200-D40-HPB	Up to 200W for 2 minutes	9 %	18 %	✓	✓	✓	✗	✗	✗	✓
☐	A-40/200-D60-HPB	Up to 200W for 2 minutes	9 %	18 %	✓	✓	✓	✗	✗	✗	✓
☐	A-600-D40-HPB		9 %	18 %	✓	✓	✓	✗	✓	✗	✓
☐	W-6000-D55-SHC	New Super Hard Coating	6 %	12 %	✓	✓	✓	✗	✓	✗	✓

Power/Energy Resolution with Monitor

This frame displays another important information which has to be taken into account when selecting a detector: the power or energy resolution provided by a complete measurement setup. Resolution depends on the noise of both monitor and head and can be seen as the least value which can be read having a practical meaning.

Whenever a monitor is then available for the selected detectors (if not, a n.a.. is displayed), the box underneath each monitor model reports the achievable resolution.

Always consider what the frame reports, both for determining which monitor has to be used, but mostly to be aware of the real minimum values (at least 10 times the resolution) of Power/ Energy which can be read.

Coating and Absorber Curves Characteristics

The program also lists the absorption and damage threshold curves for coating and absorbers used by LaserPoint . Once you have selected a head with its coating or absorber, you may click on the side key to visualize , as pdf files, the complete performance of the coating/ absorber itself.

This additional check can be very useful if the head is intended to be used at other wavelengths or with different pulse lengths.

Print

To print a hard copy of the screen, just click on the Print Key

Updates

The latest version of the LP-Explorer is available any time from the Laser Point website at http://www.laserpoint.eu

How to Read Products ID Codes

To ease and speed up the sensors selection we have assembled codes that synthetically describe them. The complete code, to be used when asking for quotes or when ordering, is immediate and gives an accurate, synthetic and a no-doubt description of the heads and the way it is going to be used; this helps Laser Point to serve you better and faster .

Head codes , as you will find on the catalogue or given by the **LP Explorer**, report a string which synthesizes the head basic

Example of Code Number : A-200-D25-HPB-USB-P

Cooling Type
A stays for air cooling (which can either be by convection or forced: please check on the single head specs);
W stays for water cooling

Full scale power
(e.g. 200 means that the head can withstand up to 200W).
Some of the new heads have a double code separated by a / . (egg 40/200) : those are heads with sensors capable to withstand many times the max nominal power, in case of short term use.
In these cases the first digits identify the maximum power on continuous operation; the latter digits report the max power when the head is used for a limited period .

Sensitive Diameter
Some detectors may have the same power but different acceptance areas as they have been developed for different applications. Chose which fits better for your case remembering that nominal beam diameters are always given to include the 86% ($1/e^2$) of the beam energy. Real beams are larger !

Absorbers types
Sometimes more than one coating is available for a head. Select the model with the most suitable coating for your application: egg **– SHC** For any doubt refer to coating specifications or take advantage of the LP Explorer **.**

Connectivity
Some families of detectors show the connectivity type (USB or RS232) to distinguish them from other types that work in association with a separate electronics.

Measurement Mode
detectors can be configured to work as Power Meters (P), as energy meters (E) or both (P+E). When constructing the code, specify which are the measurement modes of your necessity : e.g. **–P**.

Calibrations at Laser Point

Each time an instrument, sensor or probe is sent back to Laser Point for re-calibration we provide more than the re- calibration itself. First of all we completely verify the complete functionality of each unit and make all needed minor repairs, for free.

The small repairs include re-works like fixing damaged cables, small hardware repairs, software updates, firmware updates, etc .

Major damages caused by customers or other repairs, like replacements of laser damaged sensors or repair of damages caused by misuse, are not covered and a repair service charge is applied.

In those cases our customers will receive a quote or an advantageous proposal for complete replacement.

Calibration of laser measurement products from Laser Point also include:

• Calibration to power/energy levels traceable to in house NIST or PTB golden standards.

• Optional Extended Warranty for 24 additional months

• Booking of preferential slots for faster calibration turn-around time.

Those customers who take advantage of this type of service and regularly plan the return of their products for annual calibration will have the benefits of constantly working instruments, lower downturns, lower cost of ownership and a longer lifetime duration for their products.

• Extended Warranty Policy (Only applicable to eligible products)

With the sign and purchase of its Two (2)-Year Extended Warranty Agreement, Laser Point expressly warrants that Product nominated and registered in its Extended Warranty Order Form (available on request from Laser Point or its Distributors) , are free from defects in workmanship and materials for a period of three years from the date of purchase.

Laser Point's Extended Warranty program includes all parts and labor and is provided for a fixed service fee on top to Laser Point's Standard Calibrations fee.
Laser Point's Extended Warranty Agreement applies provided the Product has been sold with 1 Year Limited Warranty directly by Laser Point or through its Licensed Resell and Distribution Network .

The Two (2)-Year Extended Warranty applies only to a Product that was new, was certified by Laser Point on the date of its purchase and for which the Customer has an invoice showing proof of purchase.

Laser Point's Extended Warranty Agreement applies if the Product is returned for annual recalibration and will be effective after acceptance and payment of the Contract Fee as identified in the Order Form.

The purchase of this Extended Warranty Agreement will only be accepted for registration within the Product's original warranty period.
The Extended Warranty does not provide for remedy of failures caused by accidental and physical damage, improper installation and operation, cleaning or un-authorized maintenance, misuse, abuse, modifications to the product not made by Laser Point personnel, software faults, normal wear and tear or any other event, act, default or omission outside Laser Point's control.

The Extended Warranty covers only those Laser Point Products bearing their serial numbers identified on the Order Form and corresponding to the serial numbers displayed on the instruments; no other Laser Point Products are covered by this Extended Warranty. Refurbished, customized, and discontinued Laser Point products are not eligible for the Extended Warranty services.
The Warranty excludes all options, accessories and consumables.

• Re-Calibrate Once a Year

Laser Point instruments can provide many years of precious service provided they undergo, like any precision measurement instrument, to care and recalibrations.

It is obvious that extended use, operation in adverse environment and various environmental factors can affect the accuracy of measurements or wear parts. To hold the original level of performance, it is important that instruments are periodically checked and that they undergo to an annual recalibration.

The original calibration and successive recalibrations are the most important steps for LaserPoint.

Since the responsivity of laser absorbers can have a strong dependence on wavelengths, it is necessary to calibrate at several laser wavelengths and provide the instruments' software with absorption correction data that can be selected by operators depending on the wavelength of use.

Golden standards, originally calibrated by NIST and PTB, are used to calibrate the instruments with traceability to those standards.

To insure the best possible calibration accuracy also at high powers and get rid of other possible sources of errors, for example non-linearity with power, LaserPoint has in house a number of lasers up to 1KW.

Re-calibration Procedures and Timing

Forward to Laser Point a specific Purchase Order for recalibration: no RMA number is necessary. Ship the products taking care that shipping documents include your PO number.

• It is mandatory that the PO includes, for each sent item, the following information: recalibration wavelength/ s, whether recalibration has to be done for Power or Power+ Energy ; Products Models ; Products Serial Numbers.

POs with incomplete information cannot be correctly processed and turnaround times will be delayed.

• Shipment costs to Laser Point, both ways, are always on customer's behalf.

Fast Recalibration Service .

Following this procedure, the typical turnaround times for calibrations up to 600W will be reduced to 5 working days. Higher power calibrations will require 10 working days (period is for items already received at Laser Point premises).

a) To book a slot for faster re-calibration turnaround time contact : sales@laserpoint.it and ask for the first available time slot which can be reserved for calibration of instruments;

b) include in the request the following information: recalibration wavelength/ s, whether recalibration has to be done for Power or Power+ Energy ; Products Models ; Products Serial Numbers

c) Laser Point will communicate the first available time slot and customer are requested to take care that goods arrive in advance to the agreed date.

d) items that do not conform to the fast re-calibration procedure will be handled on a first-in-first-out calibration sequence.

Re-Calibration and Repair

Comply to our return and shipping policy conditions :

a)-No Product can be returned directly to Laser Point without prior asking for a Return Material Authorization ("RMA") number.

b)-Material for which an RMA number has not been issued, will be returned to the customer at his own expenses.

c)-Laser Point is the only body entitled to repair or replace defective parts or products, in accordance with Laser Point internal procedures.

d)-After their servicing, parts will be shipped back to the customer, provided that all issued invoices have been previously paid in full unless differently agreed

Instructions for returning equipment :

•Ask for the RMA number prior to shipping any product.

•Fill the Customer RMA Form (provided by LaserPoint Customer Service)

• RMA number has to be clearly reported on all related documentation and on the outside of package.

•Ship items through a traceable carrier.

Re-calibration and Service

To arrange for servicing or annual recalibrations, contact your closest Laser Point service center to obtain a Return Material Authorization (RMA) number (not necessary for re-calibrations).

Location	Phone	Fax	E-mail
Europe	39 0227400236	39 0225029161	sales@laserpoint.it
Asia	80 400-659-8096	80 571-88225252	service@zcnsci.cn

Please always report the following information:

- Model Number
- Serial Number
- Purchase Order Number

Additional instructions can be found below on the RMA tab.

Laser Point and the environment: RoHS and WEEE

Laser Point has extreme care of environment and as, a European Manufacturer, complied to those Directives as soon as the European Union released them.

All Laser Point products now RoHS compliant.

RoHS (Restriction of Hazardous Substances) directive originated in the European Union to restrict the use of four heavy metals (lead, cadmium, mercury, hexavalent chromium) and two categories of brominated flame retardants (PBBs and PBDEs) .The RoHS norm specifies the maximum levels for the above six materials.

RoHS prevents that, every year, many thousands of tons of banned substances are disposed of and potentially released into the environment with a substantial increase on the protection of human health. At the same time, by increasing manufacturers' awareness of product composition and toxicity, it has brought important changes in the design of electrical and electronic products.

WEEE is the acronym for Waste from Electrical and Electronic Equipment (Directive 2002/96/EC of the European Parliament).

WEEE directs the treatment, recovery and recycling of electric and electronic equipment and aims to encourage the design of electronic products with environmentally-safe recycling and recovery in mind.

All applicable products in the EU market must pass WEEE compliance and carry the "Wheelie Bin" sticker.

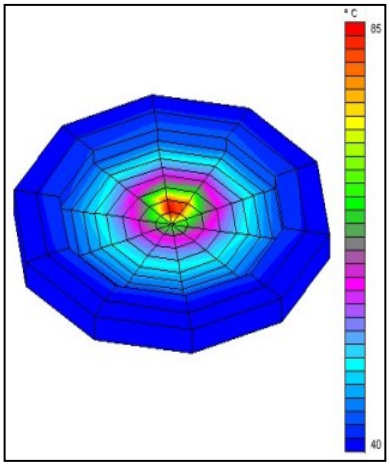
RoHS regulates the hazardous substances used in electrical and electronic equipment, while WEEE regulates the disposal of this same equipment .

Thermal Sensors

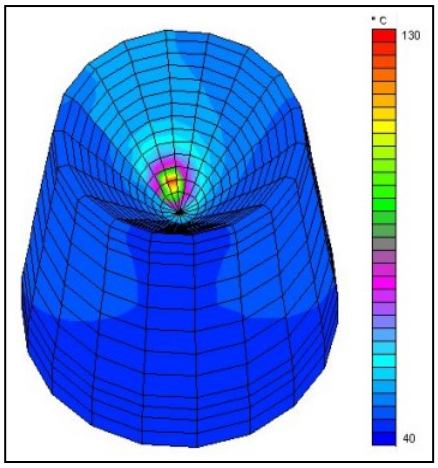
Laser Point manufactures different families of state-of-the-art detector heads for measurement of powers and energies of all lasers, from UV to the Far Infrared, in any application within the industrial, medical or scientific fields.
Those detectors can mate to a broad family of precise and sophisticated monitors and electronics which include touchscreen displays, RS232 and USB interfaces and application softwares .

A Unique Thermal Design

A head is substantially made of a sensor disk and a housing with its heat sink or cooling devices. Each of these assemblies are critical in view of the final performance of the system. Parameters like thermal stability, linearity, spatial uniformity, heat dissipation are calculated by Laser Point's Engineers and extensive thermal design modelling is adopted to predict the sensors' behaviour and achieve their highest reliability.
Laser Absorbers are another important chapter in the head design. They have to withstand high damage thresholds as a function of the wavelength of use. Laser Point adopts various types of radiation absorbers, deposited under the tightest specifications, to resist extreme thermal and mechanical stresses.



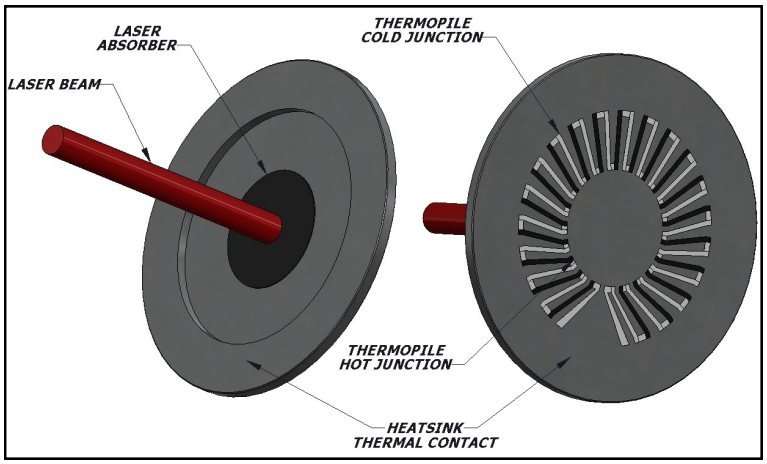
10W-Sensor Disk



5KW-Cronos Power Probe

Thermal Sensors for Laser Power and Energy

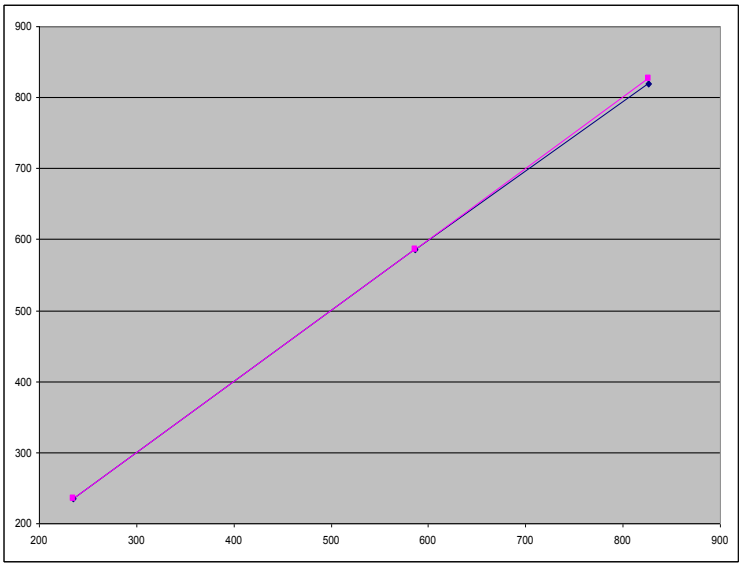
Thermal methods of measuring power and energy are those in which radiant energy is absorbed and converted into heat, which generates a temperature rise in the absorber. The absorbed energy is then measured through a function that takes into account the temperature gradient between the hot area (where the laser strikes) and a cool area (where the generated heat is dissipated). This measurement can be done by means of thermocouples arrays (thermopile). The temperature difference will generate a voltage at the end of each single thermocouple and, if the array is duly distributed over the sensor's surface, the resulting total voltage will be proportional to the incident power or energy.



A strong advantage of this approach is that there is no influence on the measurement from ambient temperature variations because the generated voltage depends on the temperature difference between the hot and the cold areas .
To dissipate the generated heat, a thermal sensor must be placed within a housing which, depending on the amount of heat to be driven away, can dissipate by simple convection, have electrical low voltage fans or can be water cooled.
The final shape and dimensions of the heads must be carefully designed to maintain the sensor temperature within its working limits.

Thermal detectors also have an intrinsic high degree of linear response at the increase of power levels (linearity); a compensation for those minor drops in linearity that occur at the working extremes are, in general, made by using thermistors.

Linearity of Laser Point's detectors, thanks to their optimised thermal design, is excellent: the picture shows linearity of a non-compensated air cooled 600W head (Mod A-600-D60-HPB) working up to 850 W, compared against a NIST reference. It show only a 3% drop at the extreme values, far above specifications.



Another strong point in favour of thermal detectors is their almost non-dependence from laser beam size and position. In fact, since the generated heat all flows through the thermocouples, whether they are deposited on circles (*radial thermopiles*) or linearly, with the hot and cold areas facing each other (*axial thermopiles*) the total signal (laser power) is given by the sum of contributions from all thermocouples.

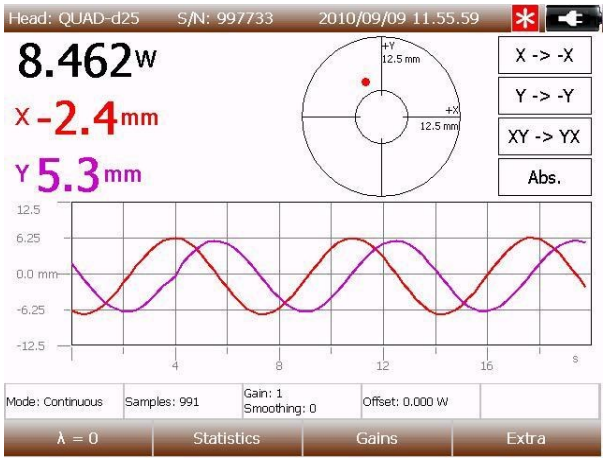
The response time is determined the thermal resistances, the thermal capacities and, mostly, by the geometrical sizes of the sensor disks. The intrinsic response times of detectors are significantly reduced by appropriate acceleration algorithms in Laser Point's monitors.

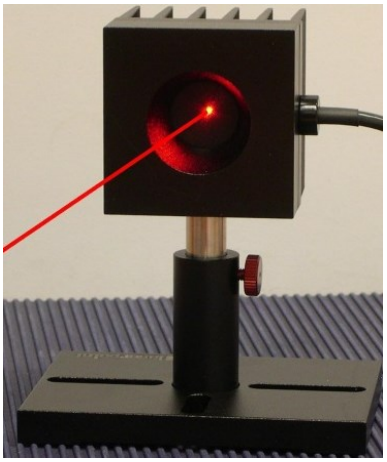
• Thermal Sensors for Laser Power and Beam Position

Laser Point family of products bearing the "QA (air cooled) – QW (water cooled)" suffix are position sensing thermopiles that, in addition to give the measure of laser power, display the position of the incident beam on the sensor disk.

They utilize a thermopile disk where the thermocouple array is split into four quadrants, allowing those heads to provide very accurate information on beam position (100 microns resolution)..

This type of detectors, particularly useful for non-visible beams, .are recommended for those applications that require the alignment of complex laboratory optical setups and the alignment of beam lines in industrial machinery.





Laser Power Probes

Those products a grouped under two families, both belonging to the ***Fit*** line. They are sensors that use a technique of measuring the temperature dynamics throughout thermopiles developed by LaserPoint (Patented.) A dedicated algorithm converts data originating from the sensors into fast , repeatable and precise readings.

Fit detectors have provided a series of breakthroughs in laser measurement: in fact, while still keeping the advantages of thermopile sensor heads (e.g. their use at any wavelength), they do not need water cooling even when working at several kilowatts. No other power probe on the market has ever been so repeatable and precise before .

These laser power sensors give accurate power laser measurements up to 10KWina simple way and can be used in all those cases where the availability of cooling water is an issue or when quick, occasional checks of laser power are necessary are enough.

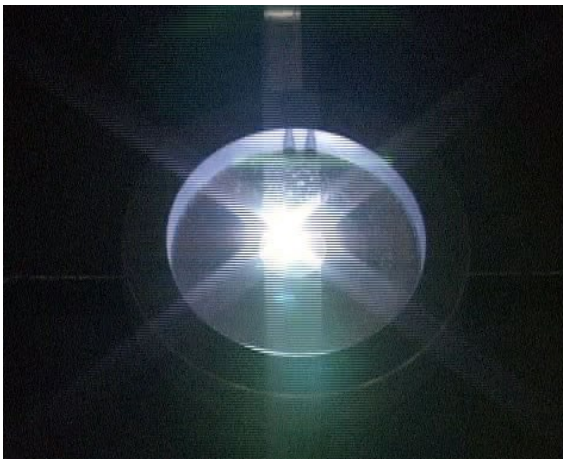
Laser power probes, as standalone instruments (***Fit*** Series), are perfect for laser job shops or service engineers; the ***Fit-H*** series has been designed to be associated to an external electronics for integration into laser systems.

FIT-6000-H (6KW)- No Water Cooling

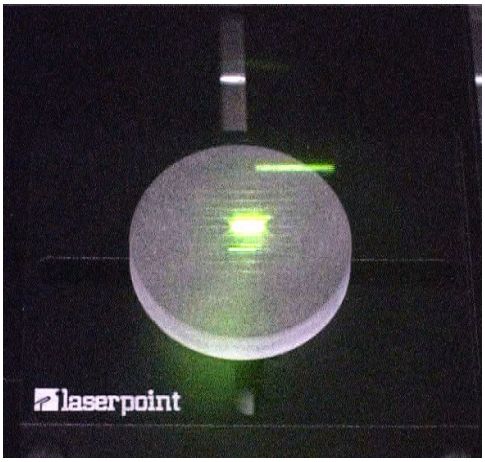
Radiation Absorbers for Thermal Sensors

Tight needs for laser absorbers

In all kind of detectors, a highly resistant absorber is a prominent ingredient that contributes to ensure their cor- rect operation, performance and reliability .
On thermopile detectors the absorbing coating is directly deposited on the same substrate where the thermocou- ples also lay, while in calorimeters the absorber coats the water cooled elements used as heat exchangers.
When designing a new device for laser power measurements, there are tight parameters for the materials that must be investigated and to which the material, then selected as laser absorber, must comply.



First, a number of chemical, physical and structural parameters that influence its damage threshold capability must be evaluated and tested. Those parameters vary from absorber to absorber and from manufacturer to manufacturer.
Damage threshold is defined as the power density (W/cm2) beyond which it is encountered a variation >1% in the measurement of laser power, mostly as a consequence of an irreversible change in the chemical and physical
properties of the materials after laser absorption.
Among those parameters, both the melting points and thermal conductivities (W/m *°K) of materials must be carefully considered and must be the highest possible. Materials must also maintain a constant behaviour on variations of temperature and, above all, resist without degrading or detaching from substrate upfront to ex- treme thermal stresses: those can be very high as it happens in the case of narrow Gaussian beams or in the case of localized delivery of laser radiation (hot spots). Thermal dimensioning and material selection can be said to be really optimized when the area inter- ested by the laser is kept below 250°C, even with sev- eral KW of laser power applied.



In the case of pulsed lasers, also pulse duration has a sound influence on the damage threshold and can
drive to substantially two modalities of coating damage. The dam- age process is ablative for very short pulses (below 100 nsec): in this temporal regime the diffusion time of generated heat within the material is much longer than the pulse length itself and this condi- tion entails a strong localization of laser energy and the direct abla- tion of the absorber's atoms. On the other extreme, with a pulse duration sufficiently long to allow a diffusion of heat within the ab- sorber (pulses > 10msec), damages are created by thermal effect.

The other important parameter to be considered for materials is their absorption coefficient in the laser wavelength ranges, which needs to have the following general characteristics:

-be as high as possible (typically >70%), to guarantee an efficient absorption of radiation even in the case of very thin thickness of deposited materials and to provide the lowest reflection at any wavelength;

-have a spectral response that covers the broadest range of laser wavelengths;-

-provide the lowest possible reflection at any incidence angle;

The above general behaviors must last over time and possibly, (misuse is not considered) for the entire lifetime of the instrument; measurements, in fact, must not be affected by ageing or any change of properties (like oxidations) which might modify the chemical and optical properties of the absorbing surface.

Given the above constraints, manufacturers of laser measurement instrumentation are compelled to make very selective techno- logical choices because many of those materials, which could be potential candidates to be absorbers for the tough environ- ments of high powers and high brightness lasers, have one or more characteristics that do not comply with those of a suitable coating.

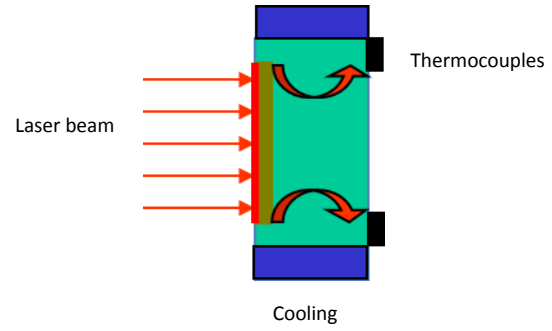
A successful technological achievement, reached by combining new technologies, materials and by overcoming the constraints described in the present article is Laserpoint's Super Hard Coating (SHC).

Its property to allow an efficient and fast heat transfer gives it the capacity to resist to extremely high power densities and has been the real engine that generated two latest instruments designed for high power lasers.

Surface Absorbers

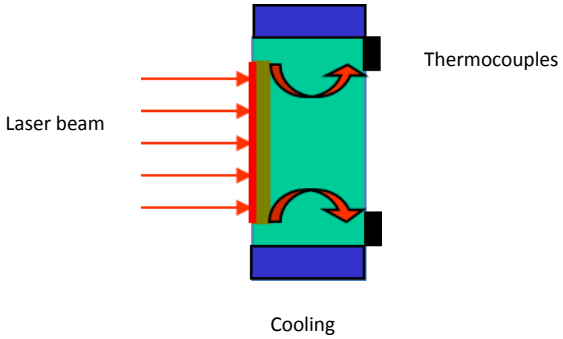
Surface absorbers consist of a thin layers of materials, in general made of special mattes or refractory materials, deposited onto substrates, that can easily transfer heat like high conductivity metals. They are used for CW lasers or other sources that emit long pulses (with duration >300µsec). Radiation is almost entirely absorbed within that thin layer and then released as heat that flows through the thermopile.

Surface Absorber : Continuous Emission or Long Pulses (>500 µsec)



Light penetrates through a thin layer of optically absorbing refractory materials (10-40µm thick) . Generated heat flows through the substrate toward the thermocouple array and the cooling system.

Surface Absorber : Short Pulses (<500µsec)



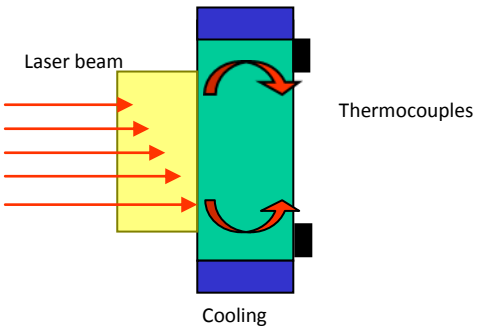
Light penetrates within the same thin layer of optically absorbing material, as previously shown. During the shorter laser pulse duration, the suddenly generated amount of heat cannot flow through the substrate. Major damages to absorbers may occur. Volume Absorbers offer far better performances.

Volume Absorbers

In lasers that deliver short time pulses (lower than microseconds), the time needed by heat to flow away from the impact area and to be removed by the cooling system is longer than the duration of the pulse length. An excess of heat remains concentrated within a thin layer on the sensor's surface where it generates a sudden overheating of the absorbing material. Above a certain level, this excess of energy can cause damages; often it will cause the absorber's ablation.

To overcome similar situations, volume absorption technology is used. Volume absorption is where a gradual absorption of radiation occurs as this penetrates into the material. Total absorption is obtained on depths of 0.5-2mm rather than on few microns: the consequence is a slower distribution of energy and a far lower local temperature increase.

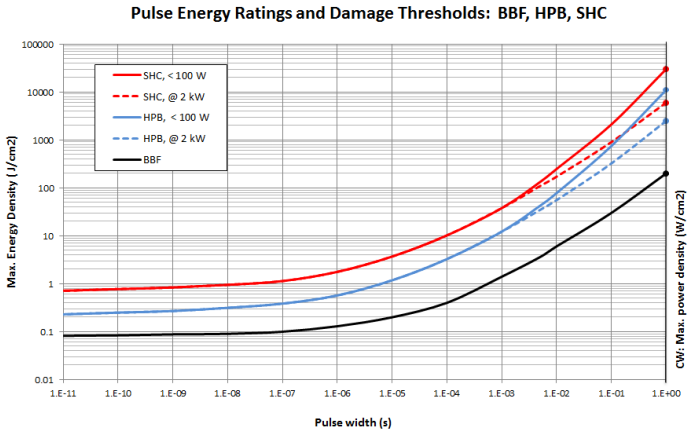
Various types of glasses and ceramics are used by Laser Point to cover the UV-C range (190-250nm) , the UV-A (250-400nm) and the VIS-NIR (BB absorber from 400nm to 5µm).Those absorbers can withstand peak powers of 100GW/cm^2 and energy densities up to 30J/cm^2.



Volume Absorber : Short Pulses (<500 µsec)

Light penetrates and is absorbed by a thick layer of a gradually absorbing material (1-2 mm thick) . Heat is generated within a volume and safely flows through substrate to thermocouples and cooling system. Volume absorbers can measure very short pulses and high energies much better than surface absorbers.

The very best of laser absorbers: the SHC coating



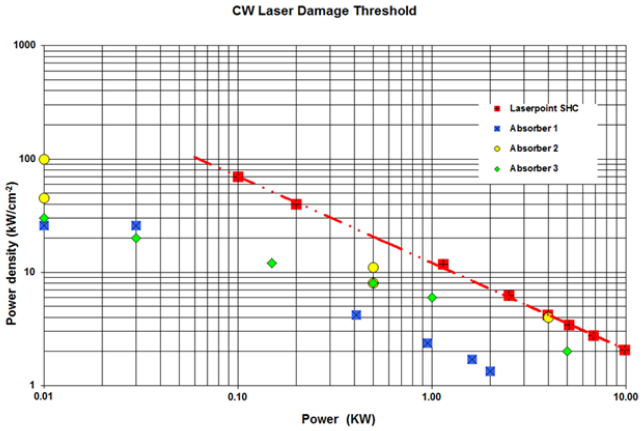
Laser Point's SHC coating is a real high power coating. Performances of SHC are stunning and definitely place it to be the best laser coating available on the market.

Specification curves and values for the SHC are based on test campaigns made with our customers in disruptive conditions and show that the properties of SHC are steps ahead any other coating: it withstands more than 12KW/ cm2 in CW operation, with an effec- tive applied power of 1KW of Yag laser, or 40J/cm2 with laser diodes peak powers of 3.2 KW @1 msec!

Compared to other absorbers for high pow- ers that can be used on limited spectral ranges, the SHC also has an extended working range (0,25µ to 11µ) and a very high absorption ratio, making it suitable for a safe use in almost all laser applications. The graph shows a comparison of damage threshold values among Laserpoint's SHC absorber against various types of commercial high power laser absorbers.

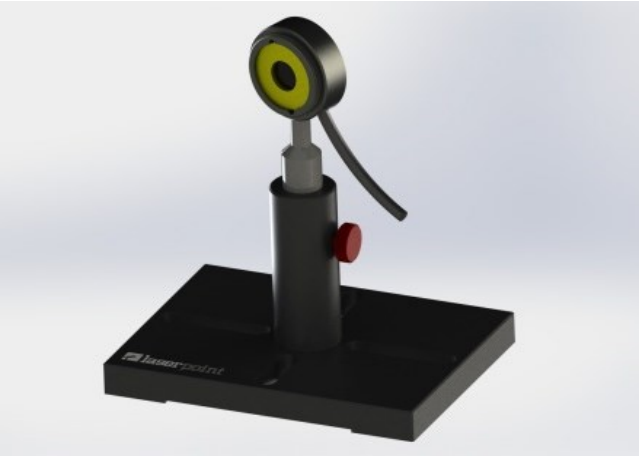
The upper graph shows the SHC behavior under different laser pulses conditions up to CW.

The lower graph shows the results obtained when a 6KW head from Laser Point coated with SHC has been compared, under multi-kilowatt beams, against similar heads from our Competitors bearing their best coating.



Semiconductor Optical Sensors

Photodiode Sensors



Photodiode Sensors convert incident laser photons into charge carriers (electron and holes), which are afterwards measured as voltage or current. Their behaviour of having low noise and high sensitivity enables Photodiodes to detect very low light levels and makes them ideal for low power measurements of CW lasers.
Compared to thermal sensors, Photodiodes have a much more confined spectral range and lower spatial uniformity, which can affect the measurement repeatability of very small beams or of beams that are not stable on the detector surface.
Photodiode sensors have a saturation limit at, approximately, 1mW/cm2: to operate at higher powers attenuating filters must then be used.

Main Features

Laser Point's series of Photodiode Sensors for laser power measurement was designed to cover a range of powers up to 500mW and a wavelength range that extends to the near IR. These sensors are offered in a slim case that provides enhanced shielding against EM interference and can be supplied with a set of fiber adapters to connect them to standard optical fiber patch cords.
In general, Photodiode Sensors are the best choice when very low power measurement and when a fast response time is required .
Each of Laser Point's sensor is individually calibrated against a NIST and PTB standard and is shipped with a Calibration Certificate. Calibration and identification data are stored in the IIS (Intelligent Identification System) sensor's connector to be automatically downloaded to the power monitor.
To ensure constantly accurate measurements, we recommend to recalibrate the sensors every year: Laser Point offers an accurate recalibration service also for Photodiode power sensors. Please contact Laser Point support team or its distributors for recalibration information and pricing. Refer to the "Calibrations at Laser Point" section for a faster turnaround sensor calibration.
Laser Point's Photodiode Sensors are compatible with all Laser Point's power meters and can also be supplied in the Meterless configuration.
The sensors have M4 or 8-32 mounting holes for mounting to 12 mm posts. Posts and holders are included.

Summary of Sensors Specifications

Sensors for Laser Power and Energy

Photodiode Power Sensors : 10 µW to 500 mW

Ordering code	Power range	Detector Type	Power Resolution	Useful Aperture	Spectral Range	Cooling
PD-50-D9-UV	10 µW - 50 mW	Silicon	100 nW	9.5 mm	200 - 1100 nm	Convection
PD-50-D9-VIS	10 µW - 50 mW	Silicon	100 nW	9.5 mm	400 - 1100 nm	Convection
PD-50-D9-IR	100 µW - 40 mW	Germanium	1 µW	9.5 mm	800 - 1800 nm	Convection
PD-500-D9-VIS	100 µW - 500 mW	Silicon	1 µW	9.5 mm	400 - 1100 nm	Convection

Sensors for Laser Power and Position: 10 mW to 6 kW (9 kW intermittent)

Ordering code	Power range	Max intermittent	Positioning Resolution	Useful Aperture	Spectral Range	Cooling
QA-10-D20-BBF	10 mW - 10 W	15 W	10µm	20 mm	0.19 - 25 µm	Convection
QA-10-D20-HPB	10 mW - 10 W	15 W	10µm	20 mm	0.19 - 11 µm	Convection
QA-40-D40-HPB	100 mW - 40 W	60 W	100µm	40 mm	0.19 - 11 µm	Convection
QA-200-D40-HPB	1 W - 200 W	250 W	100µm	40 mm	0.19 - 11 µm	Forced Air
QA-200-D40-SHC	1 W - 200 W	250 W	100µm	40 mm	0.19 - 11 µm	Forced Air
QW-1500-D40-HPB	10 W - 1500 W	2250 W	100µm	40 mm	0.19 - 11 µm	Water
QW-1500-D40-SHC	10 W - 1500 W	2250 W	100µm	40 mm	0.19 - 11 µm	Water
QW-3000-D55-HPB	20 W - 3000 W	4500 W	100µm	55 mm	0.19 - 11 µm	Water
QW-3000-D55-SHC	20 W - 3000 W	4500 W	100µm	55 mm	0.19 - 11 µm	Water
QW-6000-D55-SHC	30 W - 6000 W	9000 W	100µm	55 mm	0.19 - 11 µm	Water

Thermal Sensors for Low Power Lasers: 100 µW to 40 W (200 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aper-ture	Spectral Range	Cooling
A-02-D12-BBF	0.1 mW - 200 mW	200 mW	1 mJ - 200 mJ	10 mm	0.19 - 25 µm	Convection
A-2-D12-BBF	1 mW - 2 W	2 W	1 mJ - 2 J	10 mm	0.19 - 25 µm	Convection
A-2-D12-HPB	1 mW - 2 W	2 W	1 mJ - 2 J	10 mm	0.19 - 11 µm	Convection
A-5-D12-BBF	10 mW - 5 W	7.5 W	10 mJ - 5 J	10 mm	0.19 - 25 µm	Convection
A-10-D12-HPB	10 mW - 10 W	15 W	10 mJ - 15 J	12 mm	0.19 - 11 µm	Convection
A-10-D20-BBF	10 mW - 10 W	15 W	10 mJ - 15 J	20 mm	0.19 - 25 µm	Convection
A-10-D20-HPB	10 mW - 10 W	15 W	10 mJ - 15 J	20 mm	0.19 - 11 µm	Convection
A-30-D25-HPB	20 mW - 30 W	45 W	50 mJ - 45 J	25 mm	0.19 - 11 µm	Convection
A-40-D25-BBF	20 mW - 40 W	60 W	50 mJ - 60 J	25 mm	0.19 - 25 µm	Convection
A-40-D25-HPB	20 mW - 40 W	60 W	50 mJ - 60 J	25 mm	0.19 - 11 µm	Convection
A-40-D40-HPB	20 mW - 40 W	60 W	50 mJ - 60 J	40 mm	0.19 - 11 µm	Convection
A-40/200-D25-HPB	150 mW - 40 W	200 W	200 mJ - 200 J	25 mm	0.19 - 11 µm	Convection
A-40/200-D40-HPB	100 mW - 40 W	200 W	150 mJ - 200 J	40 mm	0.19 - 11 µm	Convection
A-40/200-D60-HPB	200 mW - 40 W	200 W	250 mJ - 200 J	60 mm	0.19 - 11 µm	Convection

Thermal Sensors for Medium Power Lasers: 200 mW to 600 W (800 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aper-ture	Spectral Range	Cooling
A-200-D25-HPB	0.2 W - 200 W	250 W	0.5 J - 250 J	25 mm	0.19 - 11 µm	Forced Air
A-200-D25-SHC	0.2 W - 200 W	250 W	0.5 J - 250 J	25 mm	0.19 - 11 µm	Forced Air
A-200-D40-HPB	0.2 W - 200 W	250 W	0.5 J - 250 J	40 mm	0.19 - 11 µm	Forced Air
A-200-D40-SHC	0.2 W - 200 W	250 W	0.5 J - 250 J	40 mm	0.19 - 11 µm	Forced Air
A-200-D60-HPB	0.3 W - 200 W	250 W	1 J - 250 J	60 mm	0.19 - 11 µm	Forced Air
A-200-D60-SHC	0.3 W - 200 W	250 W	1 J - 250 J	60 mm	0.19 - 11 µm	Forced Air
A-300-D60-HPB	0.5 W - 300 W	400 W	1 J - 400 J	60 mm	0.19 - 11 µm	Forced Air
A-600-D40-HPB	0.5 W - 600 W	800 W	1 J - 800 J	40 mm	0.19 - 11 µm	Forced Air
A-600-D60-SHC	0.5 W - 600 W	800 W	1 J - 800 J	60 mm	0.19 - 11 µm	Forced Air
W-200-D40-HPB	0.2 W - 200 W	300 W	1 J - 300 J	40 mm	0.19 - 11 µm	Water
W-200-D40-SHC	0.2 W - 200 W	300 W	1 J - 300 J	40 mm	0.19 - 11 µm	Water
W-500-D70-SHC	0.5 W - 500 W	700 W	1 J - 700 J	70 mm	0.19 - 11 µm	Water
W-600-D30-HPB	0.5 W - 600 W	800 W	1 J - 800 J	30 mm	0.19 - 11 µm	Water
W-600-D30-SHC	0.5 W - 600 W	800 W	1 J - 800 J	30 mm	0.19 - 11 µm	Water

Thermal Sensors for High Power Lasers : 2 W to 6 kW (9 kW intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
A-1200-D60-SHC	2 W - 1200 W	tbd	5 J - 1200 J	60 mm	0.19 - 11 µm	Forced Air
W-1500-D40-HPB	4 W - 1500 W	2250 W	5 J - 2250 J	40 mm	0.19 - 11 µm	Water
W-1500-D40-SHC	4 W - 1500 W	2250 W	5 J - 2250 J	40 mm	0.19 - 11 µm	Water
W-3000-D55-HPB	6 W - 3 kW	4.5 kW	n.a.	55 mm	0.19 - 11 µm	Water
W-3000-D55-SHC	6 W - 3 kW	4.5 kW	n.a.	55 mm	0.19 - 11 µm	Water
W-6000-D55-SHC	15 W - 6 kW	9 kW	n.a.	55 mm	0.19 - 11 µm	Water

Thermal Sensors for Pulsed Lasers: 2 mW to 20 W (30 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
10-BB-D25	2 mW - 10 W	15 W	50 mJ - 10 J	25 mm	0.4 - 5.2 µm	Convection
10-UVA-D25	2 mW - 10 W	15 W	50 mJ - 10 J	25 mm	0.25 - 0.4 µm	Convection
10-UVC-D25	2 mW - 10 W	15 W	50 mJ - 10 J	25 mm	0.19 - 0.25 µm	Convection
20-BB-D40	40 mW - 20 W	30 W	100 mJ - 20 J	40 mm	0.4 - 5.2 µm	Convection
20-UVA-D40	40 mW - 20 W	30 W	100 mJ - 20 J	40 mm	0.25 - 0.4 µm	Convection
20-UVC-D40	40 mW - 20 W	30 W	100 mJ - 20 J	40 mm	0.19 - 0.25 µm	Convection

Thermal Sensors for High Energy Density Lasers: 2 mW to 40 W (60 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
A-30-D12-SHC-L	20 mW - 30 W	45 W	100 mJ - 45 J	12 mm	0.2 - 1.1 µm	Convection
10-BB-D12-L	2 mW - 10 W	15 W	50 mJ - 10 J	12 mm	0.4 - 2 µm	Convection
A-30-D18-DIF	25 mW - 30 W	45 W	100 mJ - 45 J	18 mm	1.06 µm	Convection
A-40-D33-DIF	25 mW - 40 W	60 W	100 mJ - 60 J	33 mm	1.06 µm	Convection

USB/RS 232 Meterless Sensors

USB Photodiode Power Sensors: 10 µW to 500 mW

Ordering code	Power range	Detector Type	Power Resolution	Useful Aperture	Spectral Range	Cooling
PD-50-D9-UV-USB	10 µW - 50 mW	Silicon	100 nW	9.5 mm	200 - 1100 nm	Convection
PD-50-D9-VIS-USB	10 µW - 50 mW	Silicon	100 nW	9.5 mm	400 - 1100 nm	Convection
PD-50-D9-IR-USB	100 µW - 40 mW	Germanium	1 µW	9.5 mm	800 - 1800 nm	Convection
PD-500-D9-VIS-USB	100 µW - 500 mW	Silicon	1 µW	9.5 mm	400 - 1100 nm	Convection

USB/RS232 Sensors for Low Power Lasers: 100 µW to 40 W (200 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
A-02-D12-BBF-USB / A-02-D12-BBF-RS	0.1 mW - 200 mW	200 mW	0.5 mJ - 200 mJ	10 mm	0.19 - 25 µm	Convection
A-2-D12-BBF-USB / A-2-D12-BBF-RS	1 mW - 2 W	2 W	2.5 mJ - 2 J	10 mm	0.19 - 25 µm	Convection
A-2-D12-HPB-USB / A-2-D12-HPB-RS	1 mW - 2 W	2 W	2.5 mJ - 2 J	10 mm	0.19 - 11 µm	Convection
A-5-D12-BBF-USB / A-5-D12-BFF-RS	10 mW - 5 W	7.5 W	25 mJ - 5 J	10 mm	0.19 - 25 µm	Convection
A-10-D12-HPB-USB / A-10-D12-HPB-RS	10 mW - 10 W	15 W	25 mJ - 15 J	12 mm	0.19 - 11 µm	Convection
A-10-D20-BBF-USB / A-10-D20-BBF-RS	10 mW - 10 W	15 W	25 mJ - 15 J	20 mm	0.19 - 25 µm	Convection
A-10-D20-HPB-USB / A-10-D20-HPB-RS	10 mW - 10 W	15 W	25 mJ - 15 J	20 mm	0.19 - 11 µm	Convection
A-30-D25-HPB-USB / A-30-D25-HPB-RS	20 mW - 30 W	45 W	100 mJ - 45 J	25 mm	0.19 - 11 µm	Convection
A-40-D25-BBF-USB / A-40-D25-BBF-RS	20 mW - 40 W	60 W	100 mJ - 60 J	25 mm	0.19 - 25 µm	Convection
A-40-D25-HPB-USB / A-40-D25-HPB-RS	20 mW - 40 W	60 W	100 mJ - 60 J	25 mm	0.19 - 11 µm	Convection
A-40-D40-HPB-USB / A-40-D40-HPB-RS	20 mW - 40 W	60 W	100 mJ - 60 J	40 mm	0.19 - 11 µm	Convection
A-40/200-D25-HPB-USB / A-40/200-D25-HPB-RS	150 mW - 40 W	200 W	200 mJ - 200 J	25 mm	0.19 - 11 µm	Convection
A-40/200-D40-HPB-USB / A-40/200-D40-HPB-RS	100 mW - 40 W	200 W	300 mJ - 200 J	40 mm	0.19 - 11 µm	Convection
A-40/200-D60-HPB-USB / A-40/200-D60-HPB-RS	200 mW - 40 W	200 W	500 mJ - 200 J	60 mm	0.19 - 11 µm	Convection

USB/RS232 Sensors for Medium Power Lasers: 200 mW to 600 W (800 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
A-200-D25-HPB-USB / A-200-D25-HPB-RS	0.2 W - 200 W	250 W	0.5 J - 250 J	25 mm	0.19 - 25 µm	Forced Air
A-200-D25-SHC-USB / A-200-D25-SHC-RS	0.2 W - 200 W	250 W	0.5 J - 250 J	25 mm	0.19 - 25 µm	Forced Air
A-200-D40-HPB-USB / A-200-D40-HPB-RS	0.2 W - 200 W	250 W	0.5 J - 250 J	40 mm	0.19 - 11 µm	Forced Air
A-200-D40-SHC-USB / A-200-D40-SHC-RS	0.2 W - 200 W	250 W	0.5 J - 250 J	40 mm	0.19 - 25 µm	Forced Air
A-200-D60-HPB-USB / A-200-D60-HPB-RS	0.3 W - 200 W	250 W	0.5 J - 250 J	60 mm	0.19 - 11 µm	Forced Air
A-200-D60-SHC-USB / A-200-D60-SHC-RS	0.3 W - 200 W	250 W	0.5 J - 250 J	60 mm	0.19 - 25 µm	Forced Air
A-300-D60-HPB-USB / A-300-D60-HPB-RS	0.5 W - 300 W	400 W	1 J - 400 J	60 mm	0.19 - 11 µm	Forced Air
A-600-D40-HPB-USB / A-600-D40-HPB-RS	0.5 W - 600 W	750 W	1 J - 800 J	40 mm	0.19 - 11 µm	Forced Air
A-600-D60-SHC-USB / A-600-D60-SHC-RS	0.5 W - 600 W	750 W	1 J - 800 J	60 mm	0.19 - 25 µm	Forced Air
W-200-D40-HPB-USB / W-200-D40-HPB-RS	0.2 W - 200 W	300 W	1 J - 300 J	40 mm	0.19 - 11 µm	Water
W-200-D40-SHC-USB / W-200-D40-SHC-RS	0.2 W - 200 W	300 W	1 J - 300 J	40 mm	0.19 - 11 µm	Water
W-500-D70-SHC-USB / W-500-D70-SHC-RS	0.5 W - 500 W	700 W	2 J - 700 J	70 mm	0.19 - 11 µm	Water
W-600-D30-HPB-USB / W-600-D30-HPB-RS	0.5 W - 600 W	800 W	1 J - 800 J	30 mm	0.19 - 11 µm	Water
W-600-D30-SHC-USB / W-600-D30-SHC-RS	0.5 W - 600 W	800 W	1 J - 800 J	30 mm	0.19 - 11 µm	Water

USB/RS232 Sensors for High Power Lasers : 2 W to 12 kW

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
A-1200-D60-SHC-USB / A-1200-D60-SHC-RS	2 W - 1200 W	1200 W	5 J - 1200 J	60 mm	0.19 - 11 µm	Forced Air
W-1500-D40-HPB-USB / W-1500-D40-HPB-RS	4 W - 1500 W	2250 W	5 J - 2250 J	40 mm	0.19 - 11 µm	Water
W-1500-D40-SHC-USB / W-1500-D40-SHC-RS	4 W - 1500 W	2250 W	5 J - 2250 J	40 mm	0.19 - 11 µm	Water
W-3000-D55-HPB-USB / W-3000-D55-HPB-RS	6 W - 3 kW	4.5 kW	n.a.	55 mm	0.19 - 11 µm	Water
W-3000-D55-SHC-USB / W-3000-D55-SHC-RS	6 W - 3 kW	4.5 kW	n.a.	55 mm	0.19 - 11 µm	Water
W-6000-D55-SHC-USB / W-6000-D55-SHC-RS	15 W - 6 kW	9 kW	n.a.	55 mm	0.19 - 11 µm	Water
W-12K-D55-SHC-USB	100 W - 12 kW	12 kW	n.a.	55 mm	0.19 - 11 µm	Water

USB Sensors for Pulsed Lasers : 2 mW to 20 W (30 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
10-BB-D25-USB	20 mW - 10 W	15 W	50 mJ - 10 J	25 mm	0.4 - 5.2 µm	Convection
10-UVA-D25-USB	20 mW - 10 W	15 W	50 mJ - 10 J	25 mm	0.25 - 0.4 µm	Convection
10-UVC-D25-USB	20 mW - 10 W	15 W	50 mJ - 10 J	25 mm	0.19 - 0.25 µm	Convection
20-BB-D40-USB	40 mW - 20 W	30 W	100 mJ - 20 J	40 mm	0.4 - 5.2 µm	Convection
20-UVA-D40-USB	40 mW - 20 W	30 W	100 mJ - 20 J	40 mm	0.25 - 0.4 µm	Convection
20-UVC-D40-USB	40 mW - 20 W	30 W	100 mJ - 20 J	40 mm	0.19 - 0.25 µm	Convection

USB Sensors for High Energy Density Lasers: 2 mW to 40 W (60 W intermittent)

Ordering code	Power range	Max intermittent	Energy range	Useful Aperture	Spectral Range	Cooling
A-30-D12-SHC-L-USB	20 mW - 30 W	45 W	100 mJ - 45 J	12 mm	0.2 - 1.1 µm	Convection
10-BB-D12-L-USB	20 mW - 10 W	15 W	50 mJ - 10 J	12 mm	0.4 - 2 µm	Convection
A-30-D18-DIF-USB	25 mW - 30 W	45 W	100 mJ - 45 J	18 mm	1.06 µm	Convection
A-40-D33-DIF-USB	25 mW - 40 W	60 W	100 mJ - 60 J	33 mm	1.06 µm	Convection

OEM Solutions

Thermal OEM Sensors Disks: up to 200W

Ordering code	Max Average Power	Nominal Sensitivity	Useful Aperture	Spectral Range	Cooling	External Size
SD-20-D12-BBF	20 W	2 mV/W	12 mm	0.19 - 25 µm	Air cooled heat sink	Ø 44 x 3 mm - 8 g
SD-20-D12-HPB	20 W	1.8 mV/W	12 mm	0.19 - 11 µm	Air cooled heat sink	Ø 44 x 3 mm - 8 g
SD-20-D20-BBF	20 W	2 mV/W	20 mm	0.19 - 25 µm	Air cooled heat sink	Ø 44 x 3 mm - 8 g
SD-20-D20-HPB	20 W	1.8 mV/W	20 mm	0.19 - 11 µm	Air cooled heat sink	Ø 44 x 3 mm - 8 g
SD-50-D20-BBF	50 W	1.2 mV/W	20 mm	0.19 - 25 µm	Water cooled heat sink	Ø 44 x 3 mm - 10 g
SD-50-D20-HPB	50 W	1.1 mV/W	20 mm	0.19 - 11 µm	Water cooled heat sink	Ø 44 x 3 mm - 10 g
SD-50-D25-BBF	50 W	1.1 mV/W	25 mm	0.19 - 25 µm	Water cooled heat sink	Ø 54 x 3 mm - 12 g
SD-50-D25-HPB	50 W	1.0 mV/W	25 mm	0.19 - 11 µm	Water cooled heat sink	Ø 54 x 3 mm - 12 g
SD-200-D20-HPB	200 W	0.22 mV/W	20 mm	0.19 - 11 µm	Water cooled heat sink	Ø 44 x 6 mm - 20 g
SD-200-D25-HPB	200 W	0.22 mV/W	25 mm	0.19 - 11 µm	Water cooled heat sink	Ø 54 x 6 mm - 30 g

Thermal OEM Laser Sensors: 10 mW to 200 W

Ordering code	Power range	Energy Range	Useful Aperture	Spectral Range	Recommended Cooling	External Size
CSA-2-D12-BBF	10 mW - 2000 mW	10 mJ - 2000 mJ	12 mm	0.19 - 25 µm	Conduction	50 x 50 x 15 mm
CSA-2-D12-HPB	10 mW - 2000 mW	10 mJ - 2000 mJ	12 mm	0.19 - 11 µm	Conduction	50 x 50 x 15 mm
CSA-5-D12-BBF	10 mW - 5 W	10 mJ - 5 J	12 mm	0.19 - 25 µm	Conduction	50 x 50 x 15 mm
CSA-20-D20-BBF	20 mW - 20 W	10 mJ - 20 J	20 mm	0.19 - 25 µm	Conduction	50 x 50 x 15 mm
CSA-20-D20-HPB	20 mW - 20 W	10 mJ - 20 J	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 15 mm
CSW-50-D20-BBF	50 mW - 50 W	100 mJ - 50 J	20 mm	0.19 - 25 µm	Water	50 x 50 x 20 mm
CSW-50-D20-HPB	50 mW - 50 W	100 mJ - 50 J	20 mm	0.19 - 11 µm	Water	50 x 50 x 20 mm
CSW-50-D25-BBF	50 mW - 50 W	100 mJ - 50 J	25 mm	0.19 - 25 µm	Water	60 x 60 x 20 mm
CSW-50-D25-HPB	50 mW - 50 W	100 mJ - 50 J	25 mm	0.19 - 11 µm	Water	60 x 60 x 20 mm
CSW-200-D20-HPB	0.2 W - 200 W	1 J - 200 J	20 mm	0.19 - 11 µm	Water	50 x 50 x 23 mm
CSW-200-D30-HPB	0.2 W - 200 W	1 J - 200 J	30 mm	0.19 - 11 µm	Water	60 x 60 x 23 mm

OEM Laser Power Probes: 100 mW to 6 kW

Ordering code	Power range	Useful Aperture	Spectral Range	Cooling	External Size
Fit-50-H	0.1 W - 50 W	20 mm	0.19 - 11 µm	Conduction	Ø 56 x 21 mm
Fit-200-H	0.5 W - 200 W	20 mm	0.19 - 11 µm	Conduction	Ø 56 x 25 mm
Fit-500-H	1 W - 500 W	25 mm	0.19 - 11 µm	Conduction	Ø 66 x 30 mm
Fit-3000-H	60 W - 3000 W	40 mm	0.19 - 11 µm	Conduction	Ø 92 x 65 mm
Fit-6000-H	150 W - 6000 W	60 mm	0.19 - 11 µm	Conduction	Ø 100 x 100 mm

OEM Sensors with Analogue Built-in Amplifier: 8 mW to 200 W

Ordering code	Power range	Output Voltage	Useful Aperture	Spectral Range	Recommended Cooling	External Size
AHA-2-D12-HPB	8 mW - 2 W	5 V @ Full Scale	12 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHA-5-D12-HPB	20 mW - 5 W	5 V @ Full Scale	12 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHA-5-D20-BBF	20 mW - 5 W	5 V @ Full Scale	20 mm	0.19 - 25 µm	Conduction	50 x 50 x 30 mm mm
AHA-5-D20-HPB	20 mW - 5 W	5 V @ Full Scale	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHA-10-D20-BBF	40 mW - 10 W	5 V @ Full Scale	20 mm	0.19 - 25 µm	Conduction	50 x 50 x 30 mm mm
AHA-10-D20-HPB	40 mW - 10 W	5 V @ Full Scale	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHA-20-D20-BBF	80 mW - 20 W	5 V @ Full Scale	20 mm	0.19 - 25 µm	Conduction	50 x 50 x 30 mm mm
AHA-20-D20-HPB	80 mW - 20 W	5 V @ Full Scale	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHW-20-D20-BBF	80 mW - 20 W	5 V @ Full Scale	20 mm	0.19 - 25 µm	Conduction	50 x 50 x 30 mm mm
AHW-20-D20-HPB	80 mW - 20 W	5 V @ Full Scale	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHW-20-D25-BBF	80 mW - 20 W	5 V @ Full Scale	25 mm	0.19 - 25 µm	Conduction	60 x 60 x 30 mm mm
AHW-20-D25-HPB	80 mW - 20 W	5 V @ Full Scale	25 mm	0.19 - 11 µm	Conduction	60 x 60 x 30 mm mm
AHW-50-D20-BBF	200 mW - 50 W	5 V @ Full Scale	20 mm	0.19 - 25 µm	Conduction	50 x 50 x 30 mm mm
AHW-50-D20-HPB	200 mW - 50 W	5 V @ Full Scale	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHW-50-D25-BBF	200 mW - 50 W	5 V @ Full Scale	25 mm	0.19 - 25 µm	Conduction	60 x 60 x 30 mm mm
AHW-50-D25-HPB	200 mW - 50 W	5 V @ Full Scale	25 mm	0.19 - 11 µm	Conduction	60 x 60 x 30 mm mm
AHW-100-D20-HPB	400 mW - 100 W	5 V @ Full Scale	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHW-100-D30-HPB	400 mW - 100 W	5 V @ Full Scale	30 mm	0.19 - 11 µm	Conduction	60 x 60 x 33 mm mm
AHW-150-D30-HPB	600 mW - 150 W	5 V @ Full Scale	30 mm	0.19 - 11 µm	Conduction	60 x 60 x 33 mm mm
AHW-200-D20-HPB	800 mW - 200 W	5 V @ Full Scale	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 30 mm mm
AHW-200-D30-HPB	800 mW - 200 W	5 V @ Full Scale	30 mm	0.19 - 11 µm	Conduction	60 x 60 x 33 mm mm

OEM Sensors with RS232 or USB Interfacing: 2 mW to 200 W

Ordering code	Power range	Energy Range	Useful Aperture	Spectral Range	Recommended Cooling	External Size
CSA-2-D12-BBF-USB / CSA-2-D12-BBF-RS	2 mW - 2000 mW	2 mJ - 2000 mJ	12 mm	0.19 - 25 µm	Conduction	50 x 50 x 15 mm
CSA-2-D12-HPB-USB / CSA-2-D12-HPB-RS	2 mW - 2000 mW	2 mJ - 2000 mJ	12 mm	0.19 - 11 µm	Conduction	50 x 50 x 15 mm
CSA-5-D12-BBF-USB / CSA-5-D12-BBF-RS	10 mW - 5 W	10 mJ - 5 J	12 mm	0.19 - 25 µm	Conduction	50 x 50 x 15 mm
CSA-20-D20-BBF-USB / CSA-20-D20-BBF-RS	20 mW - 20 W	10 mJ - 20 J	20 mm	0.19 - 25 µm	Conduction	50 x 50 x 15 mm
CSA-20-D20-HPB-USB / CSA-20-D20-HPB-RS	20 mW - 20 W	10 mJ - 20 J	20 mm	0.19 - 11 µm	Conduction	50 x 50 x 15 mm
CSW-50-D20-BBF-USB / CSW-50-D20-BBF-RS	50 mW - 50 W	100 mJ - 50 J	20 mm	0.19 - 25 µm	Water	50 x 50 x 20 mm
CSW-50-D20-HPB-USB / CSW-50-D20-HPB-RS	50 mW - 50 W	100 mJ - 50 J	20 mm	0.19 - 11 µm	Water	50 x 50 x 20 mm
CSW-50-D25-BBF-USB / CSW-50-D25-BBF-RS	50 mW - 50 W	100 mJ - 50 J	25 mm	0.19 - 25 µm	Water	60 x 60 x 20 mm
CSW-50-D25-HPB-USB / CSW-50-D25-HPB-RS	50 mW - 50 W	100 mJ - 50 J	25 mm	0.19 - 11 µm	Water	60 x 60 x 20 mm
CSW-200-D20-HPB-USB / CSW-200-D20-HPB-RS	0.2 W - 200 W	1 J - 200 J	20 mm	0.19 - 11 µm	Water	50 x 50 x 23 mm
CSW-200-D30-HPB-USB / CSW-200-D30-HPB-RS	0.2 W - 200 W	1 J - 200 J	30 mm	0.19 - 11 µm	Water	60 x 60 x 23 mm

OEM Power Probes with RS232 or USB Interfacing:100 mW to 6 kW

Ordering code	Power range	Useful Aperture	Spectral Range	Cooling	External Size
Fit-50-H-USB / Fit-50-H-RS	0.1 W - 50 W	20 mm	0.19 - 11 µm	Conduction	Ø 56 x 21 mm
Fit-200-H-USB / Fit-200-H-RS	0.5 W - 200 W	20 mm	0.19 - 11 µm	Conduction	Ø 56 x 25 mm
Fit-500-H-USB / Fit-500-H-RS	1 W - 500 W	25 mm	0.19 - 11 µm	Conduction	Ø 66 x 30 mm
Fit-3000-H-USB / Fit-3000-H-RS	60 W - 3000 W	40 mm	0.19 - 11 µm	Conduction	Ø 92 x 65 mm
Fit-6000-H-USB / Fit-6000-H-RS	150 W - 6000 W	60 mm	0.19 - 11 µm	Conduction	Ø 100 x 100 mm

Handheld Laser Power Probes

Handheld Laser Power Probes - 500 mW to 10 kW

Ordering code	Power range	Useful Aperture	Spectral Range	Cooling	External Size
Fit-50	0.5 W - 50 W	20 mm	0.19 - 11 µm	Convection	Ø 56 x 21 mm (sensor head)
Fit-200	2 W - 200 W	20 mm	0.19 - 11 µm	Convection	Ø 56 x 21 mm (sensor head)
Fit-500	5 W - 500 W	25 mm	0.19 - 11 µm	Convection	Ø 56 x 21 mm (sensor head)
Cronos-LP1.5	30 W - 1500 W	40 mm	0.19 - 11 µm	Convection	306 x 71 x 40 mm
Cronos-LP 5.0	100 W - 5 kW	55 mm	0.19 - 11 µm	Convection	312 x 71 x 65 mm
Cronos-LP10	200 W - 10 kW	65 mm	0.19 - 11 µm	Convection	318 x 71 x 75 mm

Handheld Power Probe for IPL : FIT-IPL-R

Ordering code	Power range	Energy Range	Useful Aperture	Spectral Range	Cooling	External Size
Fit-IPL-R	1 W - 100 W	3.5 J - 350 J	20 x 60 mm	0.4 - 2.1 µm	Convection	60 x 100 x 26 mm (sensor head)

Absorptivity and Damage Thresholds Curves

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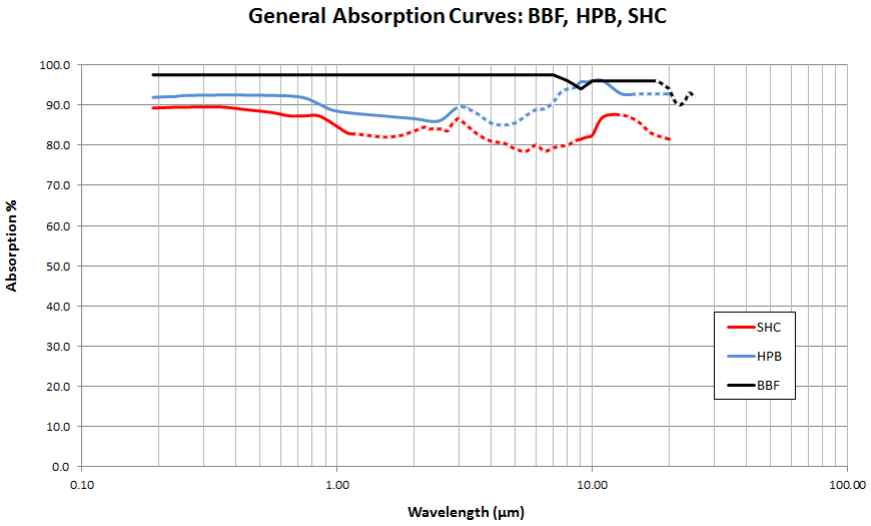
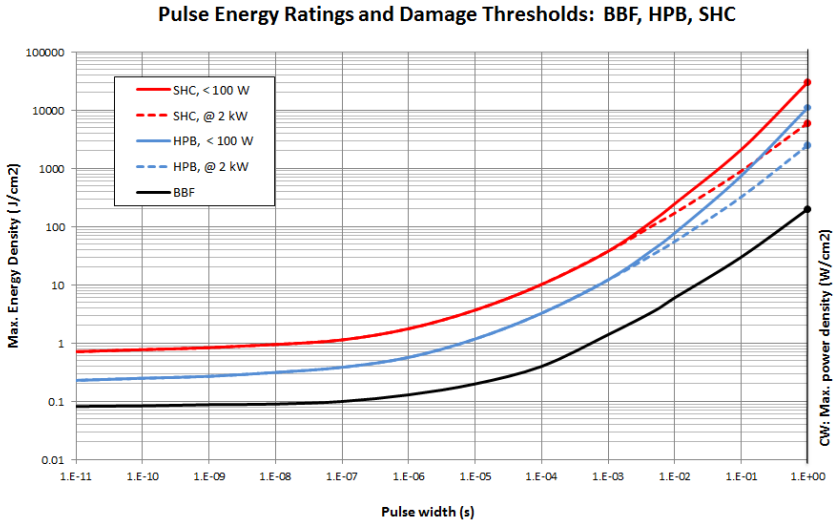
Surface Absorbers

- **Absorption and Damage Threshold Curves for Thermal Heads and Beam Position Sensors**

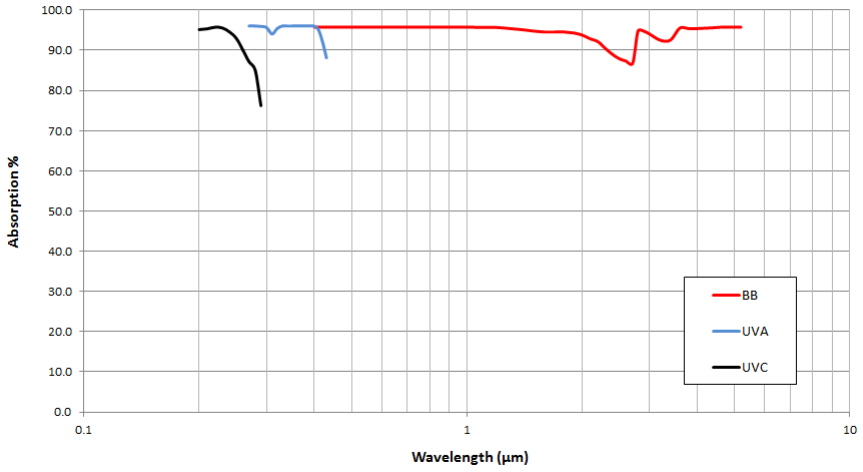




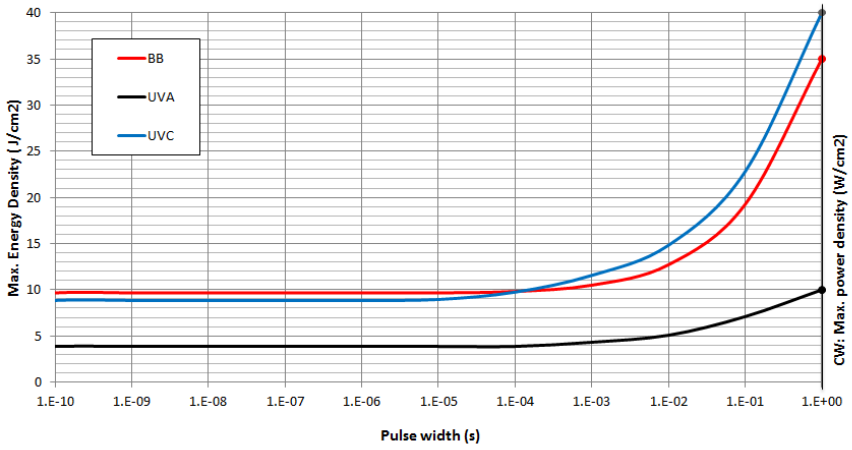
Volume Absorbers

- **Absorption and Damage Threshold Curves for Pulsed Laser Heads**

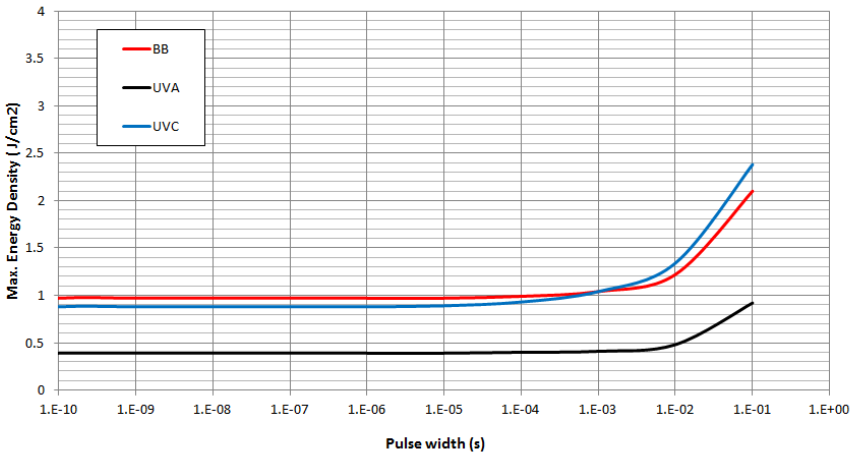
General Absorption Curves: BB, UVA, UVC



Pulse Energy Ratings and Damage Thresholds: BB, UVC, UVA
Single Pulse

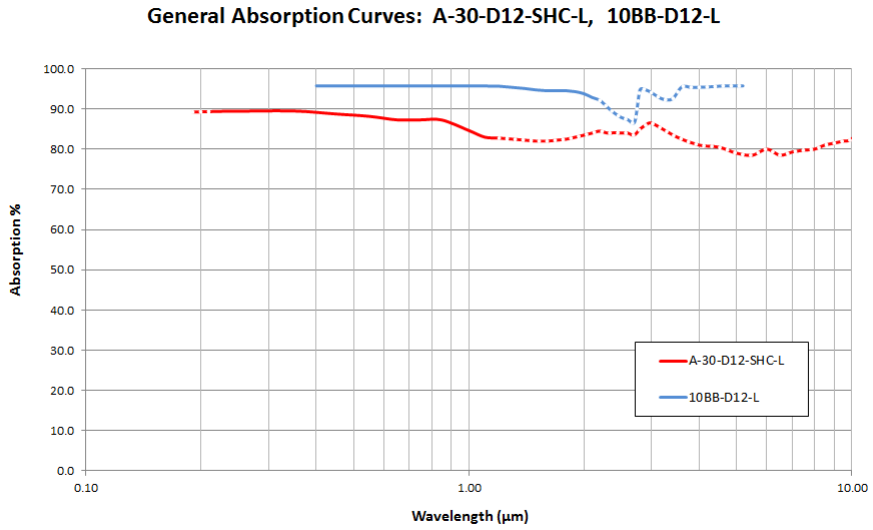


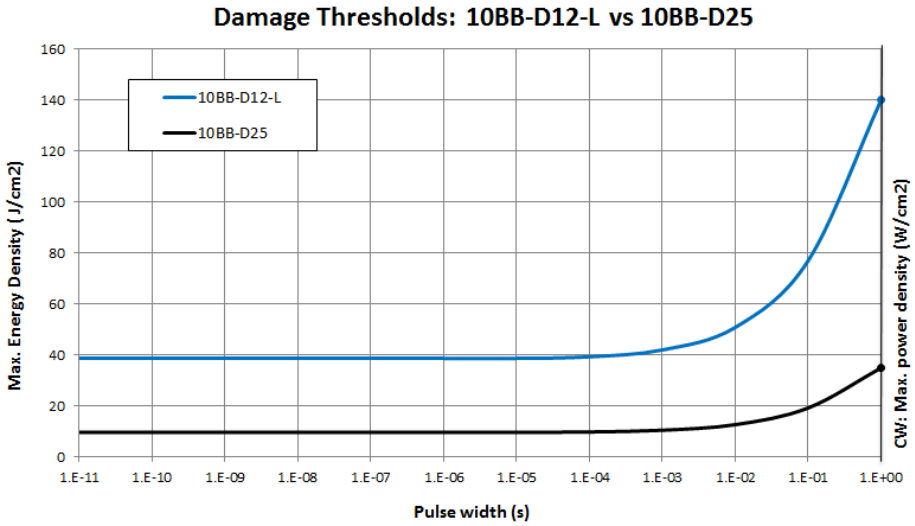
Pulse Energy Ratings and Damage Thresholds: BB, UVC, UVA
Pulses Repetition 5-30Hz

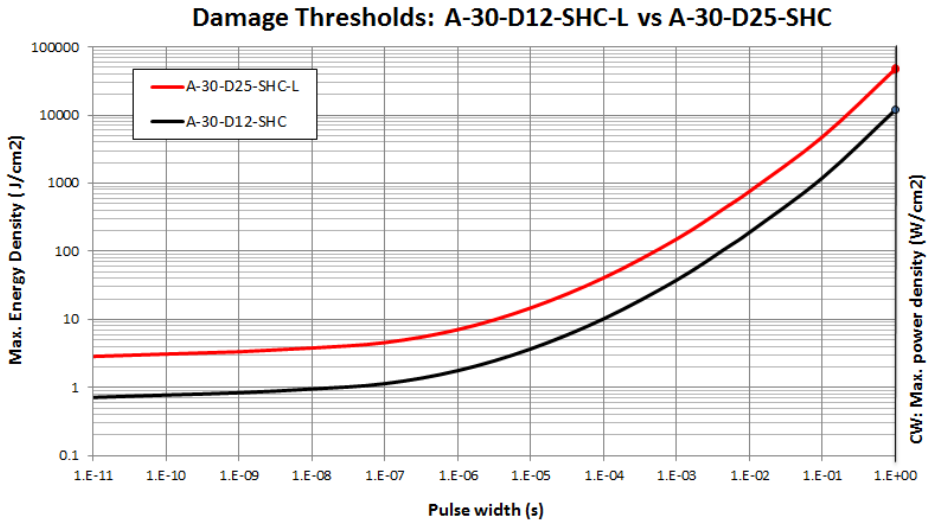


Absorbers for High Energy Density Lasers

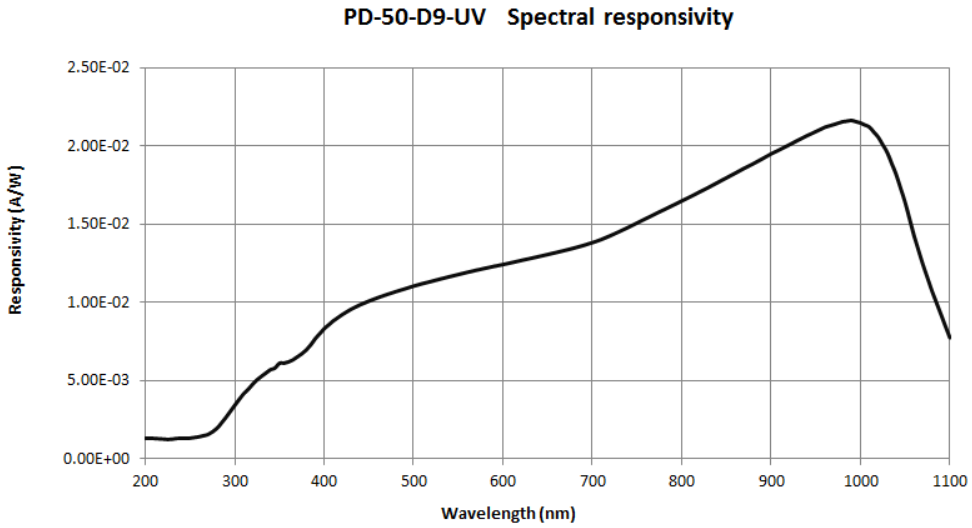
- **Absorption and Damage Threshold Curves for High Energy Density Laser Heads**

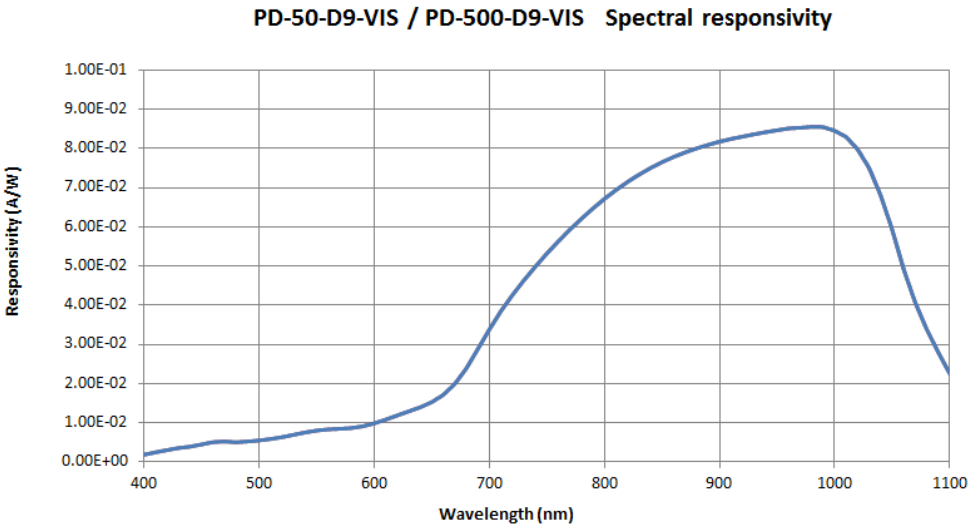


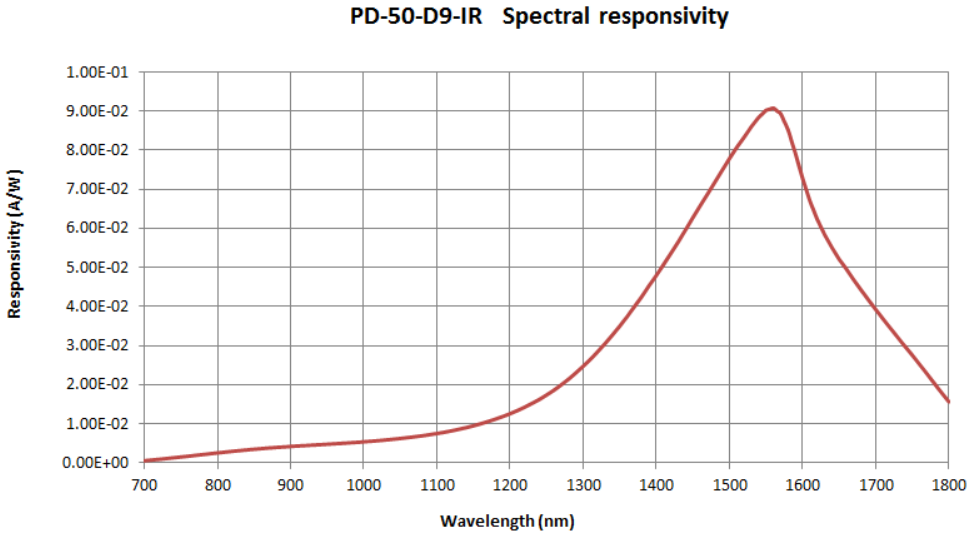




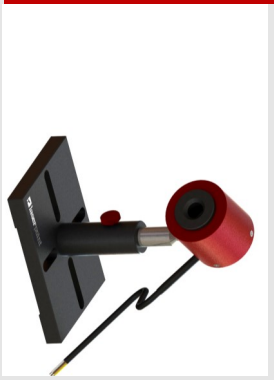
General Absorption Curves for Photodiode Sensors







Sensors for Laser Power and Energy



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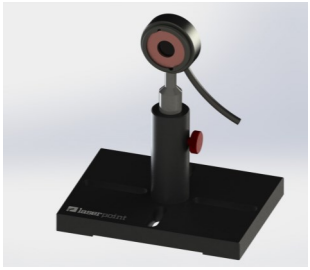
Photodiode Power Sensors

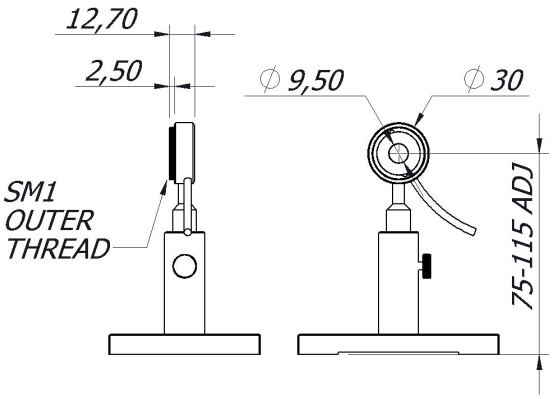
Range: 10 µW – 500mW

Features:

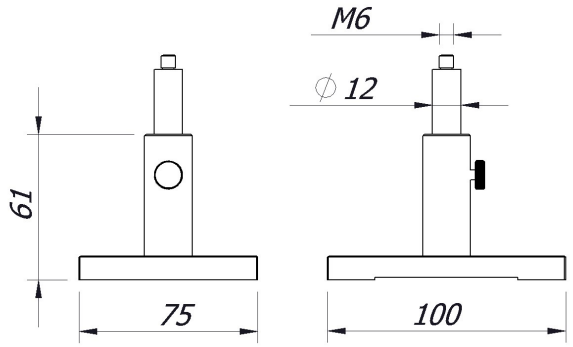
- Sensitive detectors for low power measurements
- UV enhanced and NIR Detectors (200nm to 1800nm)
- Fiber adapters available (SMA,ST, FC,LC,SC)



Model	PD-50-D9-UV	PD-50-D9-VIS	PD-50-D9-IR	PD-500-D9-VIS
Power Mode				
Max. Average Power (1)	50 mW	50 mW	40 mW	500 mW
Min. Power	10 µW	10 µW	100 µW	100 µW
Power Resolution	100 nW	100 nW	1 µW	1 µW
Noise Equivalent Power (NEP) (1)	10 nW	10 nW	100 nW	100 nW
Response Time	0.25 sec	0.25 sec	0.25 sec	0.25 sec
Power Calibration Uncertainty	± 5% @200-400nm, ±3% @400-1000nm, ±5% @1000-1100nm	± 5% @400-500nm, ±3% @500-1000nm, ±5% @1000-1100nm	± 7% @800-1000nm, ±3% @1000-1650nm, ±5% @1650-1800nm	± 5% @400-500nm, ±3% @500-1000nm, ±5% @1000-1100nm
Dependance on beam postion	± 2%	± 2%	± 2%	± 2%
Absorber Specs				
Aperture	9.5 mm	9.5 mm	9.5 mm	9.5 mm
Type	Silicon	Silicon	Germanium	Silicon
Calibration Spectral Range	200 - 1100 nm	400 - 1100 nm	800 - 1800 nm	400 - 1100 nm
Max Power Density	20 W/cm²	20 W/cm²	10 W/cm²	20 W/cm²
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.1 Kg	0.1 Kg	0.1 Kg	0.1 Kg
Dimension	Ø 31 x 14 mm	Ø 31 x 14 mm	Ø 31 x 14 mm	Ø 31 x 14 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). Wavelength dependent.				



PD-50-D9-UV PD-50-D9-VIS PD-50-D9-IR PD-500-D9-VIS



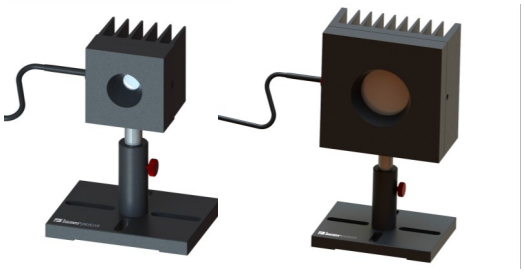
Light Duty Stand

Sensors for Laser Power and Position

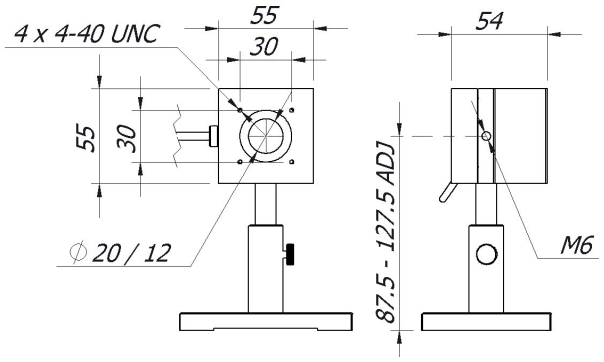
Range: 10mW to 40W

Features:

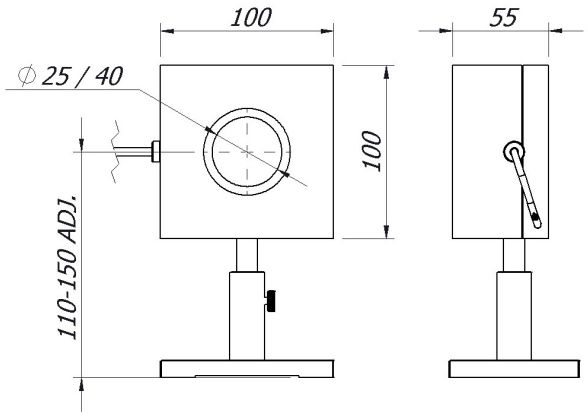
- High Beam Position Accuracy
- Low power measurements
- HPB coating is also suitable for Excimer Lasers



Model	QA-10-D20-BBF	QA-10-D20-HPB	QA-40-D40-HPB
Power Mode			
Max. Average Power	10 W	10 W	40 W
Max. Intermittent Power (1)	15 W	15 W	60 W
Min. Power	10 mW	10 mW	100 mW
Power Resolution	100 µW	100 µW	1 mW
Noise Equivalent Power (NEP)	0.6 mW	0.6 mW	1 mW
Response Time	1 sec	1 sec	1.8 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Beam Sensing Mode			
Beam Position Accuracy	50µm	50µm	100µm
Beam Position Resolution	10µm	10µm	100µm
Minimum Power (3)	50 mW	50 mW	200 mW
Absorber Specs			
Aperture	20 mm	20 mm	40 mm
Type	BBF	HPB	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (4)	200 W/cm²	18 kW/cm² @10 W	11 kW/cm² @40 W
Max Energy Density (4)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.3 kg	0.3 kg	0.9 kg
Dimension	55 x 55 x 54 mm	55 x 55 x 54 mm	100 x 100 x 55 mm
Cable lenght - connector	1.5 m - DB25	1.5 m - DB25	1.5 m - DB25
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). necessary for beam position sen-sing. (4). Damage thresholds also depend on power level. Please see damage graphs for more details			



QA-10-D20-BBF QA-10-D20-HPB



QA-40-D40-HPB

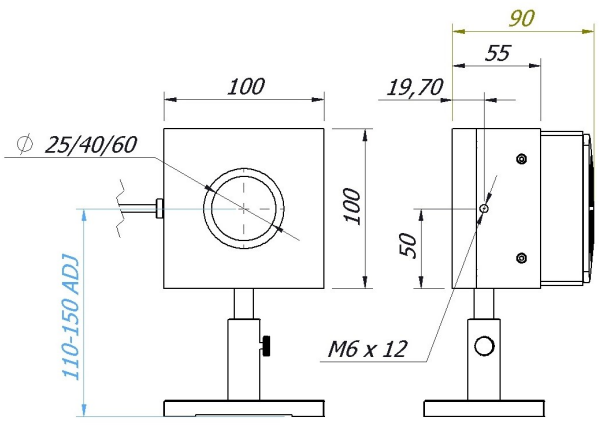
Sensors for Laser Power and Position Sensing

Range: 1W to 200 W

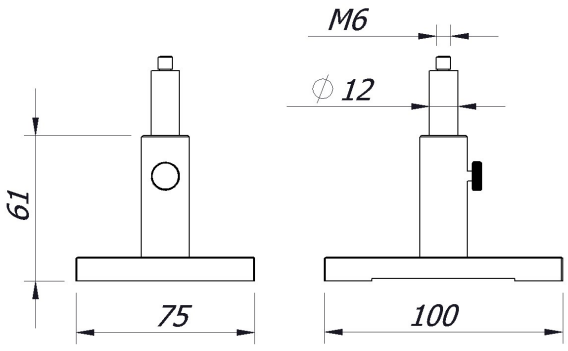
Features:

- High Beam Position Accuracy
- Highest Power Density on SHC Coating
- HPB coating is suitable for Excimer Lasers

Model	QA-200-D40-HPB	QA-200-D40-SHC
Power Mode		
Max. Average Power	200 W	200 W
Max. Intermittent Power (1)	250 W	250 W
Min. Power	1 W	1 W
Power Resolution	10 mW	10 mW
Noise Equivalent Power (NEP)	10 mW	10 mW
Response Time	2 sec	2 sec
Power Calibration Uncertainty	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%
Beam Sensing Mode		
Beam Position Accuracy	100µm	100µm
Beam Position Resolution	100µm	100µm
Minimum Power (3)	1 W	1 W
Absorber Specs		
Aperture	40 mm	40 mm
Type	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm
Max Power Density (4)	7 kW/cm² @200 W	28 kW/cm² @200 W
Max Energy Density (4)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics		
Cooling	Forced Air with Fan (a)	Forced Air with Fan (a)
Weight	1.2 kg	1.2 kg
Dimension	100 x 100 x 85 mm	100 x 100 x 85 mm
Cable lenght - connector	1.5 m - DB25	1.5 m - DB25
Stand and Post	Light Duty Stand Included	Light Duty Stand Included
Notes		
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). necessary for beam position sensing. (4). Damage thresholds also depend on power level. Please see damage graphs for more details	a). 12V DC Power Supply Included	a). 12V DC Power Supply Included



QA-200-D40-HPB QA-200-D40-SHC



Light Duty Stand

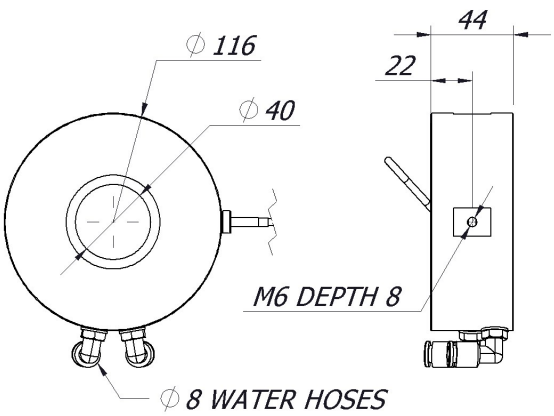
Sensors for Laser Power and Position Sensing

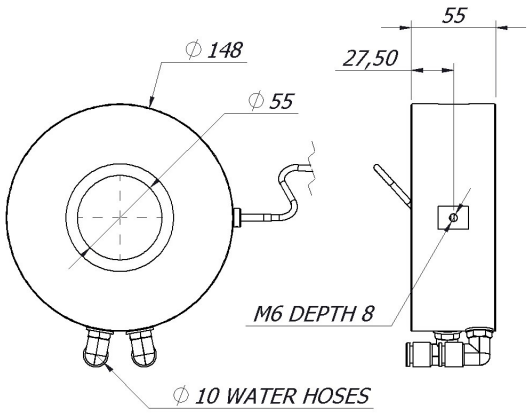
Range: 10W to 3kW

Features:

- High Beam Position Accuracy
- Water cooled heads to 3000 W
- Corrosion-Proof Water-Cooled Sensors

Model	QW-1500-D40-HPB	QW-1500-D40-SHC	QW-3000-D55-HPB	QW-3000-D55-SHC
Power Mode				
Max. Average Power	1500 W	1500 W	3000 W	3000 W
Max. Intermittent Power (1)	2250 W	2250 W	4500 W	4500 W
Min. Power	10 W	10 W	20 W	20 W
Power Resolution	100 mW	100 mW	100 mW	100 mW
Noise Equivalent Power (NEP)	100 mW	200 mW	250 mW	250 mW
Response Time	4 sec	4 sec	5 sec	5 sec
Power Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Power Linearity (2)	± 1.5%	± 1.5%	± 2%	± 2%
Beam Sensing Mode				
Beam Position Accuracy	100µm	200µm	300µm	300µm
Beam Position Resolution	100µm	100µm	100µm	100µm
Minimum Power (3)	7.5 W	7.5 W	15 W	15 W
Absorber Specs				
Aperture	40 mm	40 mm	55 mm	55 mm
Type	HPB	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm
Max Power Density (4)	2.4 kW/cm² @1 kW	7 kW/cm² @1 kW	1.8 kW/cm² @2kW	3.6 kW/cm² @2kW
Max Energy Density (4)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics				
Cooling	Water (a)	Water (a)	Water (a)	Water (a)
Weight	1.1 kg	1.1 kg	2.3 kg	4.2 kg
Dimension	Ø 116 x 44 mm	Ø 116 x 44 mm	Ø 148 x 55 mm	Ø 148 x 55 mm
Cable lenght - connector	5 m - DB25	5 m - DB25	5 m - DB25	5 m - DB25
Stand and Post	Heavy Duty Stand Included	Heavy Duty Stand Included	Heavy Duty Stand Included	Heavy Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). necessary for beam position sensing. (4). Damage thresholds also depend on power level. Please see damage graphs for more details	(a). Water 4 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 4 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 5 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 5 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min





QW-1500-D40-HPB QW-1500-D40-SHC

QW-3000-D55-HPB QW-3000-D55-SHC

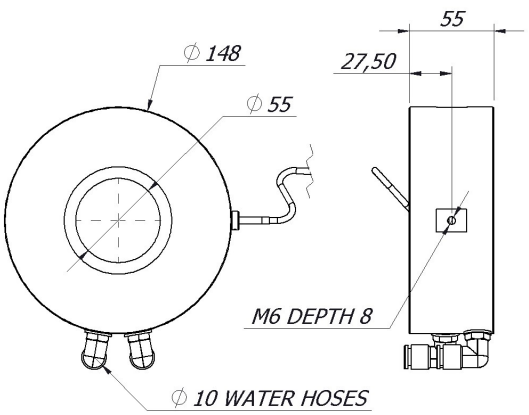
Sensors for Laser Power and Position Sensing

Range: 30W to 6kW

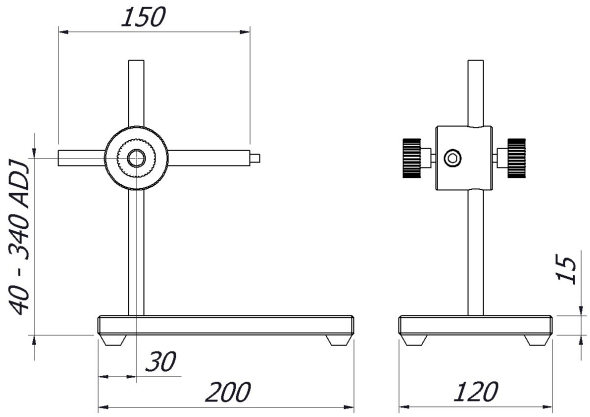
Features:

- High Beam Position Accuracy
- Water cooled heads to 3000 W
- Corrosion-Proof Water-Cooled Sensors

Model	QW-6000-D55-SHC
Power Mode	
Max. Average Power	6000 W
Max. Intermittent Power (1)	9000 W
Min. Power	30 W
Power Resolution	100 mW
Noise Equivalent Power (NEP)	500 mW
Response Time	3.5 sec
Power Calibration Uncertainty	± 5%
Power Linearity (2)	± 2%
Beam Sensing Mode	
Beam Position Accuracy	300µm
Beam Position Resolution	100µm
Minimum Power (3)	30 W
Absorber Specs	
Aperture	55 mm
Type	SHC
Absorber Spectral Range	0.19 - 11 µm
Calibration Spectral Range	0.25 - 1.1 µm, 9 - 11 µm
Max Power Density (4)	4 kW/cm² @5kW
Max Energy Density (4)	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics	
Cooling	Water (a)
Weight	4.2 kg
Dimension	Ø 148 x 55 mm
Cable lenght - connector	5 m - DB25
Stand and Post	Heavy Duty Stand Included
Notes	
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). necessary for beam position sensing. (4). Damage thresholds also depend on power level. Please see damage graphs for more details	(a). Water 8 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min



QW-6000-D55-SHC



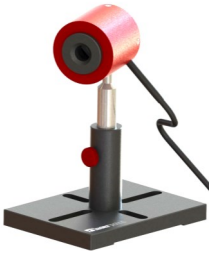
Heavy Duty Stand

Thermal Sensors for Low Power Lasers

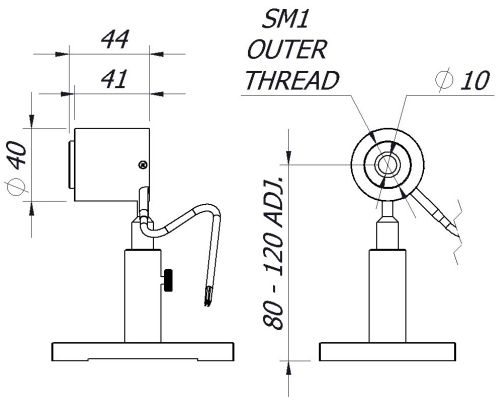
Range: 100µW to 5W

Features:

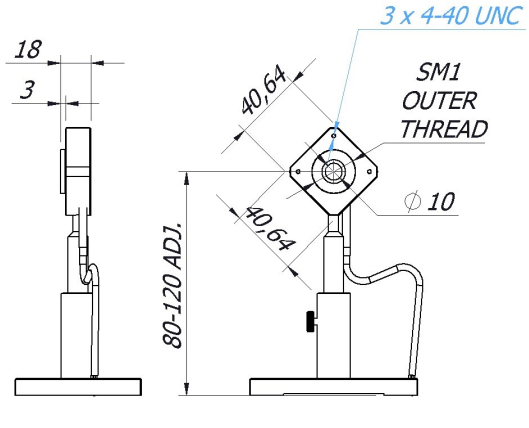
- Very low power measurements
- Small footprints
- Broadband absorbers



Model	A-02-D12-BBF	A-2-D12-BBF	A-2-D12-HPB	A-5-D12-BBF
Power Mode				
Max. Average Power	200 mW	2 W	2 W	5 W
Max. Intermittent Power (1)	200 mW	2 W	2 W	7.5 W
Min. Power	0.1 mW	1 mW	1 mW	10 mW
Power Resolution	10 µW	10 µW	10 µW	100 µW
Noise Equivalent Power (NEP)	5 µW	50 µW	50 µW	500 µW
Response Time	2 sec	2 sec	2.5 sec	0.7 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%	± 1%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	200 mJ	2 J	2 J	5 J
Min. Energy	1 mJ	1 mJ	1 mJ	10 mJ
Energy Resolution	10 µJ	10 µJ	10 µJ	0.1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	10 mm	10 mm	10 mm	10 mm
Type	BBF	BBF	HPB	BBF
Absorber Spectral Range	0.19 - 25 µm	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	200 W/cm²	200 W/cm²	18 kW/cm² @10 W	200 W/cm²
Max Energy Density (3)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.2 kg	0.2 kg	0.2 kg	0.2 kg
Dimension	Ø 40 x 44 mm	Ø 40 x 44 mm	Ø 40 x 44 mm	41 x 41 x 18 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter



A-02-D12-BBF A-2-D12-BBF A-2-D12-HPB



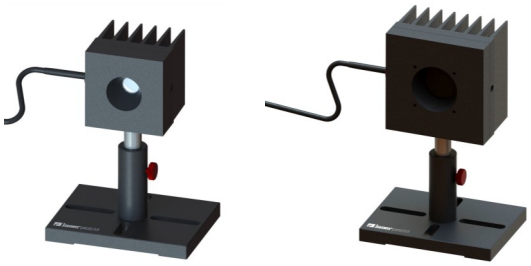
A-5-D12-BBF

Thermal Sensors for Low Power Lasers

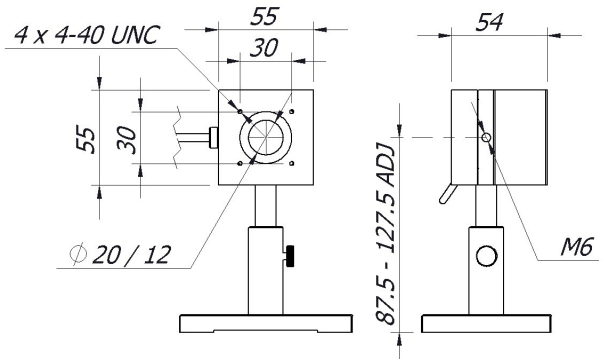
Range: 10mW to 30W

Features:

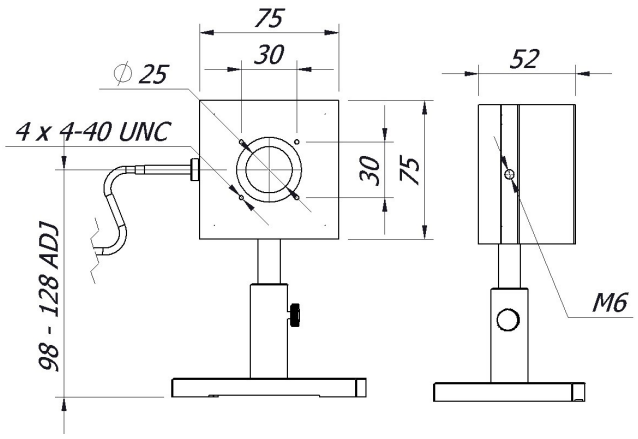
- Very low power measurements
- Small footprints
- Broadband absorbers



Model	A-10-D12-HPB	A-10-D20-BBF	A-10-D20-HPB	A-30-D25-HPB
Power Mode				
Max. Average Power	10 W	10 W	10 W	30 W
Max. Intermittent Power (1)	15 W	15 W	15 W	45 W
Min. Power	10 mW	10 mW	10 mW	20 mW
Power Resolution	100 µW	100 µW	100 µW	1 mW
Noise Equivalent Power (NEP)	500 µW	600 µW	600 µW	1 mW
Response Time	0.8 sec	1 sec	1 sec	1.5 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%	± 1%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	15 J	15 J	15 J	45 J
Min. Energy	10 mJ	10 mJ	10 mJ	50 mJ
Energy Resolution	0.1 mJ	0.1 mJ	0.1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	12 mm	20 mm	20 mm	25 mm
Type	HPB	BBF	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	18 kW/cm² @10 W	200 W/cm²	18 kW/cm² @10 W	18 kW/cm² @10 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.3 kg	0.3 kg	0.3 kg	0.5 kg
Dimension	55 x 55 x 54 mm	55 x 55 x 54 mm	55 x 55 x 54 mm	75 x 75 x 52 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter



A-10-D12-HPB A-10-D20-BBF A-10-D20-HPB



A-30-D25-HPB

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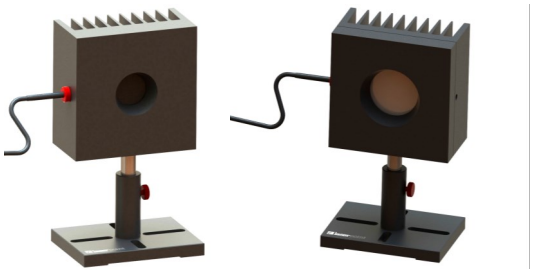
Thermal Sensors for Low Power Lasers

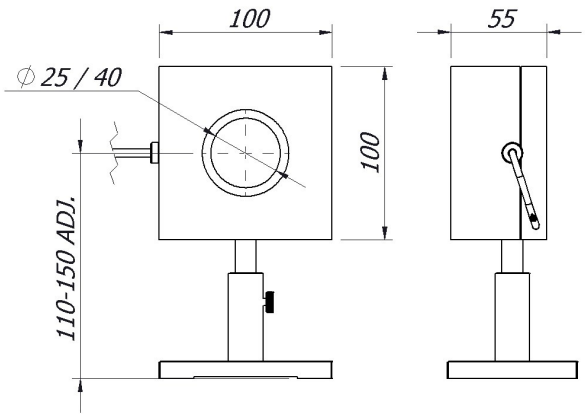
Range: 20mW to 40W

Features:

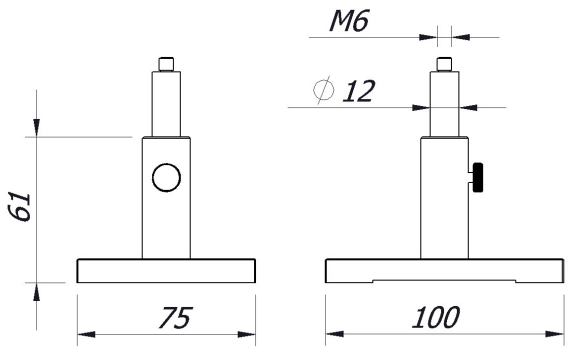
- Very low power measurements
- Small footprints
- HPB coating is also suitable for Excimer Lasers



Model	A-40-D25-BBF	A-40-D25-HPB	A-40-D40-HPB
Power Mode			
Max. Average Power	40 W	40 W	40 W
Max. Intermittent Power (1)	60 W	60 W	60 W
Min. Power	20 mW	20 mW	20 mW
Power Resolution	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	1 mW	1 mW	1 mW
Response Time	1.5 sec	1.5 sec	1.8 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	60 J	60 J	60 J
Min. Energy	50 mJ	50 mJ	50 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	25 mm	25 mm	40 mm
Type	BBF	HPB	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	200 W/cm²	9 kW/cm² @40 W	9 kW/cm² @40 W
Max Energy Density (3)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.9 kg	0.9 kg	0.9 kg
Dimension	100 x 100 x 55 mm	100 x 100 x 55 mm	100 x 100 x 55 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Model available with fiber adapter	Model available with fiber adapter	



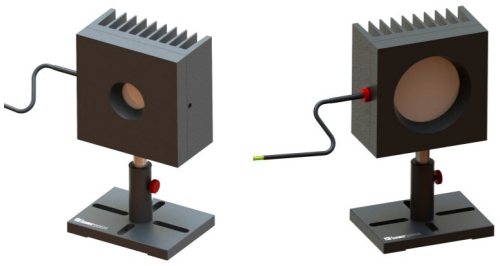
A-40-D25-BBF A-40-D25-HPB A-40-D40-HPB



Light Duty Stand

Thermal Sensors for Medium Power Lasers

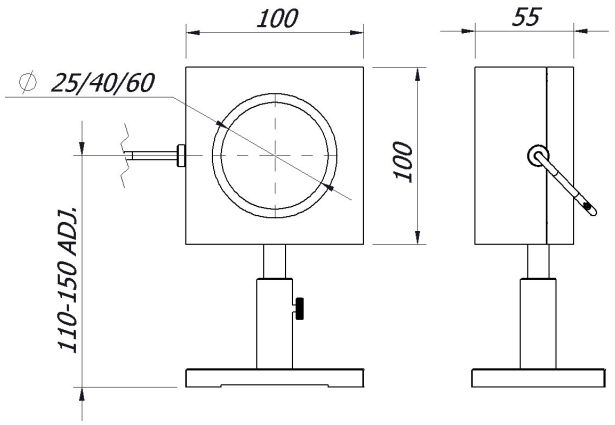
Range: 100mW to 200W

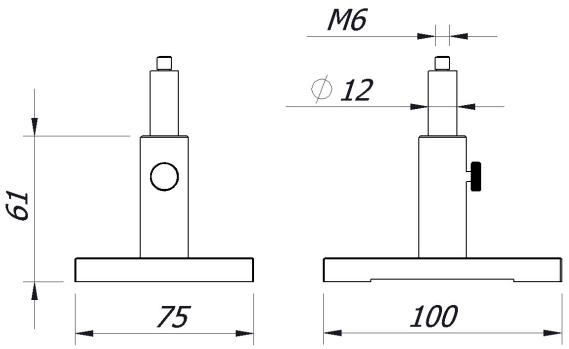


Features:

- Very low power measurements
- Small footprints
- HPB coating is also suitable for Excimer Lasers

Model	A-40/200-D25-HPB	A-40/200-D40-HPB	A-40/200-D60-HPB
Power Mode			
Max. Average Power	40 W	40 W	40 W
Max. Intermittent Power (1)	200 W	200 W	200 W
Min. Power	150 mW	100 mW	200 mW
Power Resolution	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	6 mW	5 mW	10 mW
Response Time	1.7 sec	1.7 sec	3 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	200 J	200 J	200 J
Min. Energy	200 mJ	150 mJ	250 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	25 mm	40 mm	60 mm
Type	HPB	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	11 kW/cm² @40 W	11 kW/cm² @40 W	11 kW/cm² @40 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.9 kg	0.9 kg	0.9 kg
Dimension	100 x 100 x 55 mm	100 x 100 x 55 mm	100 x 100 x 55 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Model available with fiber adapter		





A-40/200-D25-HPB A-40/200-D40-HPB A-40/200-D60-HPB

Light Duty Stand

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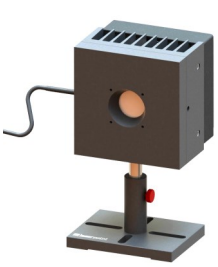
Thermal Sensors for Medium Power Lasers

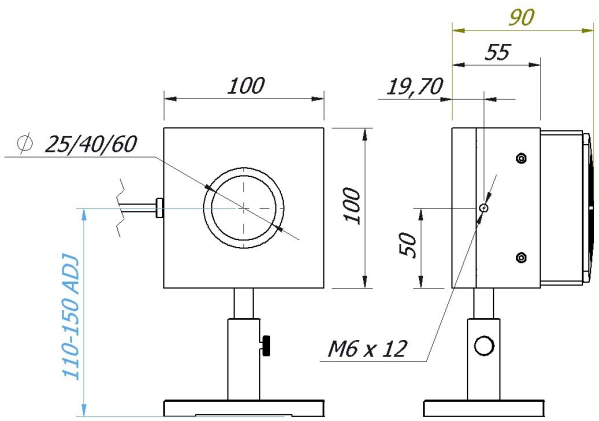
Range: 200mW to 200 W

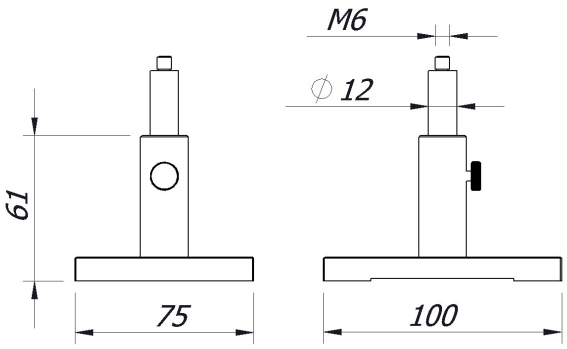
Features:

- Highest Power Density on SHC Coating
- Small footprints
- HPB coating is suitable for Excimer Lasers



Model	A-200-D25-HPB	A-200-D25-SHC	A-200-D40-HPB	A-200-D40-SHC
Power Mode				
Max. Average Power	200 W	200 W	200 W	200 W
Max. Intermittent Power (1)	250 W	250 W	250 W	250 W
Min. Power	0.2 W	0.2 W	0.2 W	0.2 W
Power Resolution	10 mW	10 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	10 mW	10 mW	10 mW	10 mW
Response Time	1.7 sec	1.7 sec	2 sec	2 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%	± 1%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	250 J	250 J	250 J	250 J
Min. Energy	0.5 J	0.5 J	0.5 J	0.5 J
Energy Resolution	10 mJ	10 mJ	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	25 mm	25 mm	40 mm	40 mm
Type	HPB	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	4 kW/cm² @200 W	17 kW/cm² @200 W	4 kW/cm² @200 W	17 kW/cm² @200 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics				
Cooling	Forced Air with Fan (a)	Forced Air with Fan (a)	Forced Air with Fan (a)	Forced Air with Fan (a)
Weight	1.2 kg	1.2 kg	1.2 kg	1.2 kg
Dimension	100 x 100 x 85 mm	100 x 100 x 85 mm	100 x 100 x 85 mm	100 x 100 x 85 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter (a). 12V DC Power Supply Included	Available with fiber adapter (a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included





A-200-D25-HPB A-200-D25-SHC A-200-D40-HPB A-200-D40-SHC

Light Duty Stand

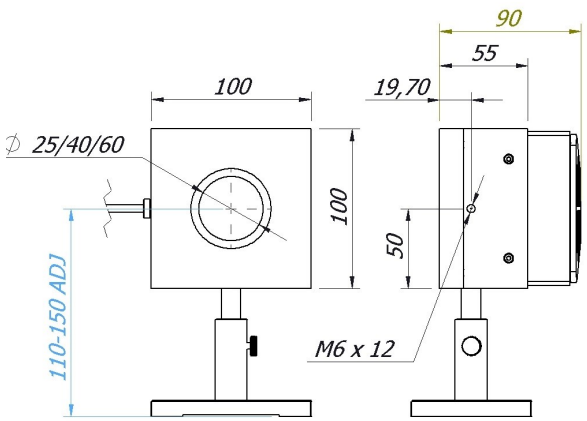
Thermal Sensors for Medium Power Lasers

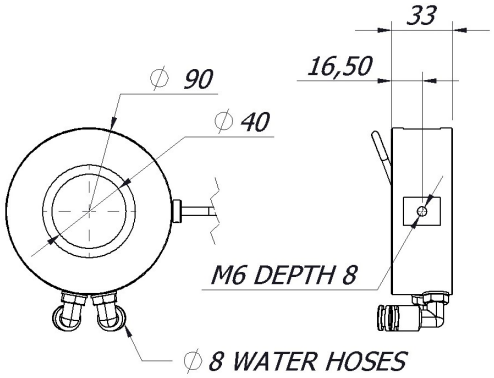
Range: 200mW to 200W

Features:

- Large Area , Air and Water Cooled Units
- Corrosion-Proof Water-Cooled Sensor
- HPB coating is suitable for Excimer Lasers

Model	A-200-D60-HPB	A-200-D60-SHC	W-200-D40-HPB	W-200-D40-SHC
Power Mode				
Max. Average Power	200 W	200 W	200 W	200 W
Max. Intermittent Power (1)	250 W	250 W	300 W	300 W
Min. Power	0.3 W	0.3 W	0.2 W	0.2 W
Power Resolution	10 mW	10 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	15 mW	15 mW	10 mW	10 mW
Response Time	3 sec	3 sec	2 sec	2 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	250 J	250 J	300 J	300 J
Min. Energy	1 J	1 J	1 J	1 J
Energy Resolution	10 mJ	10 mJ	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	60 mm	60 mm	40 mm	40 mm
Type	HPB	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	4 kW/cm² @200 W	17 kW/cm² @200 W	7 kW/cm² @200 W	28 kW/cm² @200 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics				
Cooling	Forced Air with Fan (a)	Forced Air with Fan (a)	Water (a)	Water (a)
Weight	1.2 kg	1.2 kg	0.6 kg	0.6 kg
Dimension	100 x 100 x 85 mm	100 x 100 x 85 mm	Ø 90 x 33 mm	Ø 90 x 33 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs	(a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included	(a). Water 1.5 liter/min (@ 22° C); admissible rate of temperature variation < 1 °C/min	(a). Water 1.5 liter/min (@ 22° C); admissible rate of temperature variation < 1 °C/min





A-200-D60-HPB A-200-D60-SHC

W-200-D40-HPB W-200-D40-SHC

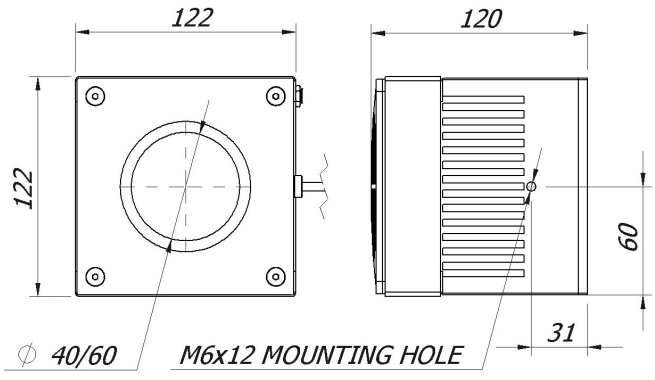
Thermal Sensors for Medium Power Lasers

Range: 500mW to 300W

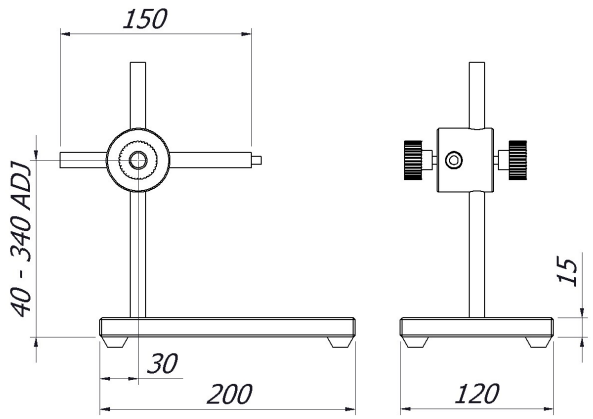
Features:

- 60mm Aperture
- Air Cooled
- HPB coating also suitable for Excimer Lasers

Model	A-300-D60-HPB
Power Mode	
Max. Average Power	300 W
Max. Intermittent Power (1)	400 W
Min. Power	0.5 W
Power Resolution	10 mW
Noise Equivalent Power (NEP)	25 mW
Response Time	3.5 sec
Power Calibration Uncertainty	± 3%
Power Linearity (2)	± 1%
Single Shot Energy Mode	
Max. Energy (with 100 ms pulse)	400 J
Min. Energy	1 J
Energy Resolution	10 mJ
Energy Calibration Uncertainty	± 5%
Absorber Specs	
Aperture	60 mm
Type	HPB
Absorber Spectral Range	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	6 kW/cm² @200 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics	
Cooling	Forced Air with Fan (a)
Weight	2.1 kg
Dimension	122 x 122 x 120 mm
Cable lenght - connector	1.5 m - DB15
Stand and Post	Heavy Duty Stand Included
Notes	
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). 12V DC Power Supply Included



A-300-D60-HPB



Heavy Duty Stand

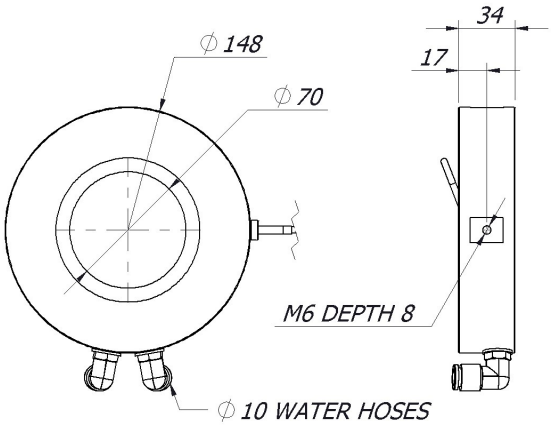
Thermal Sensors for Medium Power Lasers

Range: 500mW to 500W

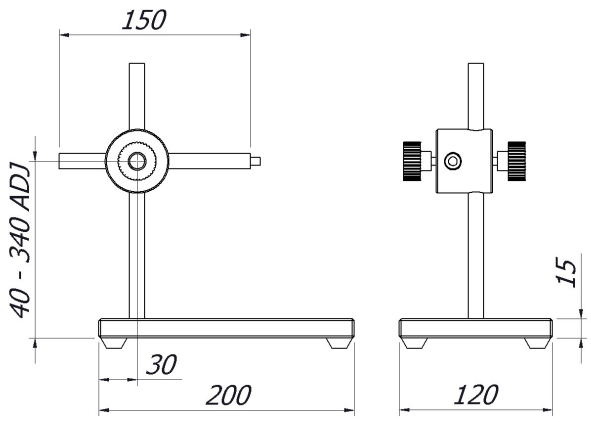
Features:

- Corrosion-Proof Water-Cooled Sensor
- Large aperture for Laser Diode Stacks
- Highest Power Density on SHC Coating

Model	W-500-D70-SHC
Power Mode	
Max. Average Power	500 W
Max. Intermittent Power (1)	700 W
Min. Power	0.5 W
Power Resolution	10 mW
Noise Equivalent Power (NEP)	30 mW
Response Time	4 sec
Power Calibration Uncertainty	± 3%
Power Linearity (2)	± 1.5%
Single Shot Energy Mode	
Max. Energy (with 100 ms pulse)	700 J
Min. Energy	1 J
Energy Resolution	10 mJ
Energy Calibration Uncertainty	± 5%
Absorber Specs	
Aperture	70 mm
Type	SHC
Absorber Spectral Range	0.19 - 11 µm
Calibration Spectral Range	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	19 kW/cm² @500 W
Max Energy Density (3)	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics	
Cooling	Water (a)
Weight	1.9 kg
Dimension	Ø 148 x 34 mm
Cable lenght - connector	1.5 m - DB15
Stand and Post	Heavy Duty Stand Included
Notes	
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 3 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min



W-500-D70-SHC



Heavy Duty Stand

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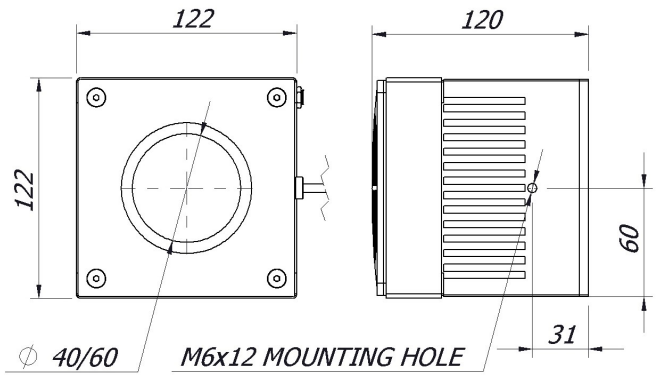
Thermal Sensors for Medium Power Lasers

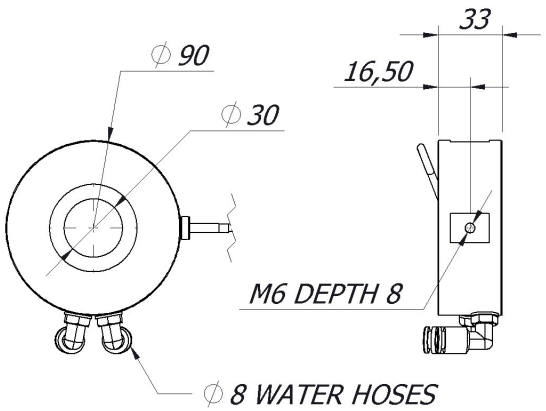
Range: 500mW to 600W

Features:

- Air and water cooled heads to 600 W
- Corrosion-Proof Water-Cooled Sensor
- Highest Power Density on SHC Coating

Model	A-600-D40-HPB	A-600-D60-SHC	W-600-D30-HPB	W-600-D30-SHC
Power Mode				
Max. Average Power	600 W	600 W	600 W	600 W
Max. Intermittent Power (1)	800 W	800 W	800 W	800 W
Min. Power	0.5 W	0.5 W	0.5 W	0.5 W
Power Resolution	10 mW	10 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	50 mW	50 mW	25 mW	25 mW
Response Time	5 sec	4 sec	2 sec	2 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1.5%	± 1.5%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	600 J	700 J	600 J	600 J
Min. Energy	1 J	1 J	2 J	2 J
Energy Resolution	10 mJ	10 mJ	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	40 mm	60 mm	30 mm	30 mm
Type	HPB	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	3 kW/cm² @500 W	11 kW/cm² @500 W	5 kW/cm² @500 W	19 kW/cm² @500 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics				
Cooling	Forced Air with Fan (a)	Forced Air with Fan (a)	Water (a)	Water (a)
Weight	2.2 kg	2.5 kg	0.6 kg	0.6 kg
Dimension	122 x 122 x 120 mm	122 x 122 x 120 mm	Ø 90 x 33 mm	Ø 90 x 33 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Heavy Duty Stand Included	Heavy Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included	(a). Water 3 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 3 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min





A-600-D40-HPB A-600-D60-SHC

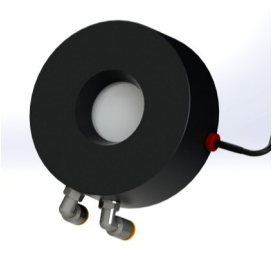
W-600-D30-HPB W-600-D30-SHC

Thermal Sensors for High Power Lasers

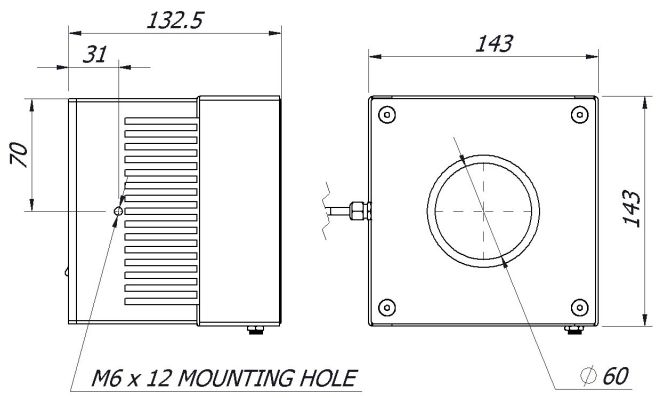
Range: 2W to 1500W

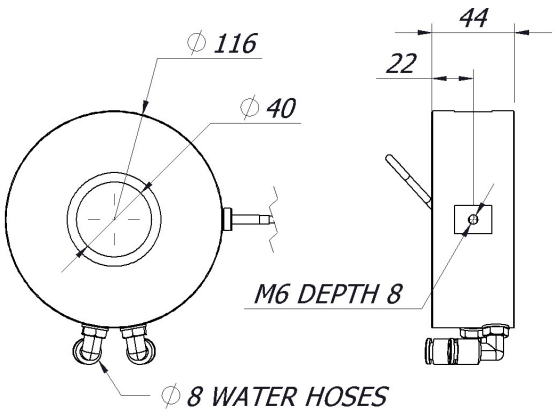
Features:

- Air cooled head to 1200 W
- Water cooled heads to 1500 W
- Corrosion-Proof Water-Cooled Sensors



Model	A-1200-D60-SHC	W-1500-D40-HPB	W-1500-D40-SHC
Power Mode			
Max. Average Power	1200 W	1500 W	1500 W
Max. Intermittent Power (1)	n.a.	2250 W	2250 W
Min. Power	2 W	4 W	4 W
Power Resolution	100 mW	100 mW	100 mW
Noise Equivalent Power (NEP)	100 mW	200 mW	200 mW
Response Time	4.5 sec	4 sec	4 sec
Power Calibration Uncertainty	± 3%	± 5%	± 5%
Power Linearity (2)	± 1.5%	± 1.5%	± 1.5%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	1200 J	2250 J	2250 J
Min. Energy	5 J	5 J	5 J
Energy Resolution	100 mJ	100 mJ	100 mJ
Energy Calibration Uncertainty	± 5%	± 7%	± 7%
Absorber Specs			
Aperture	60 mm	40 mm	40 mm
Type	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.25 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	5 kW/cm² @1 kW	2.4 kW/cm² @1 kW	7 kW/cm² @1 kW
Max Energy Density (3)	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics			
Cooling	Forced Air with Fan (a)	Water (a)	Water (a)
Weight	4.4 kg	1.1 kg	1.1 kg
Dimension	143 x 143 x 132 mm	Ø 116 x 44 mm	Ø 116 x 44 mm
Cable lenght - connector	5 m - DB15	5 m - DB15	5 m - DB15
Stand and Post	Heavy Duty Stand Included	Heavy Duty Stand Included	Heavy Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). 12V DC Power Supply Included	(a). Water 4 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 4 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min





A-1200-D60-SHC

W-1500-D40-HPB W-1500-D40-SHC

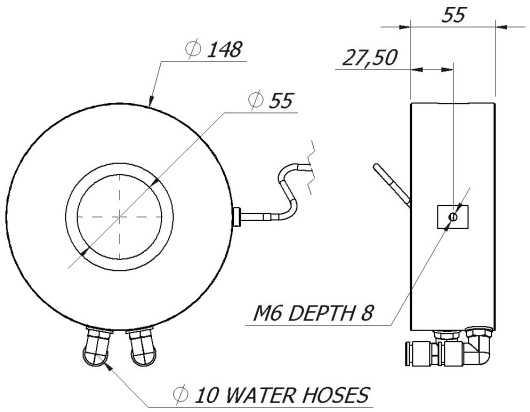
Thermal Sensors for High Power Lasers

Range: 6W to 6kW

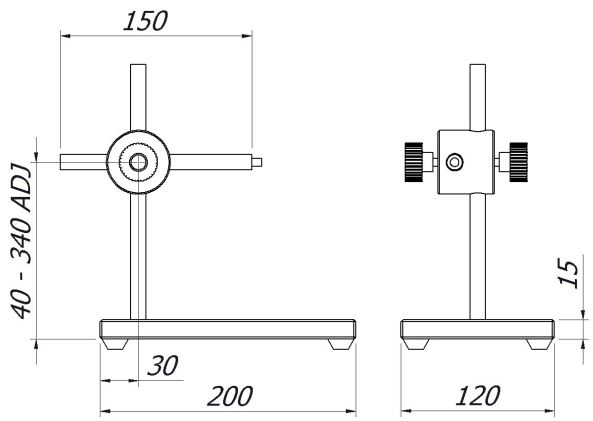
Features:

- Water cooled heads to 6000 W
- Corrosion-Proof Water-Cooled Sensors
- Highest Power Density on SHC Coating

Model	W-3000-D55-HPB	W-3000-D55-SHC	W-6000-D55-SHC
Power Mode			
Max. Average Power	3 kW	3 kW	6 kW
Max. Intermittent Power (1)	4.5 kW	4.5 kW	9 kW
Min. Power	6 W	6 W	15 W
Power Resolution	1 W	1 W	1 W
Noise Equivalent Power (NEP)	0.25 W	0.25 W	0.5 W
Response Time	5 sec	5 sec	3.5 sec
Power Calibration Uncertainty	± 5%	± 5%	± 5%
Power Linearity (2)	± 2%	± 2%	± 2%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	4500 J	4500 J	6000 J
Min. Energy	10 J	10 J	15 J
Energy Resolution	1 J	1 J	1 J
Energy Calibration Uncertainty	± 7%	± 7%	± 7%
Absorber Specs			
Aperture	55 mm	55 mm	55 mm
Type	HPB	SHC	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	1.8 kW/cm² @2kW	3.6 kW/cm² @2kW	4 kW/cm² @5kW
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics			
Cooling	Water (a)	Water (a)	Water (a)
Weight	2.3 kg	4.2 kg	4.2 kg
Dimension	Ø 148 x 55 mm	Ø 148 x 55 mm	Ø 148 x 55 mm
Cable lenght - connector	5 m - DB15	5 m - DB15	5 m - DB15
Stand and Post	Heavy Duty Stand Included	Heavy Duty Stand Included	Heavy Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 5 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 5 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 8 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min



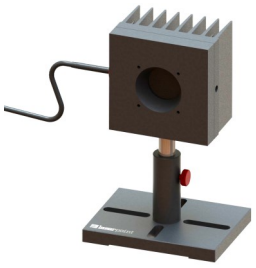
W-3000-D55-HPB W-3000-D55-SHC W-6000-D55-SHC



Heavy Duty Stand

Thermal Sensors for Pulsed Lasers

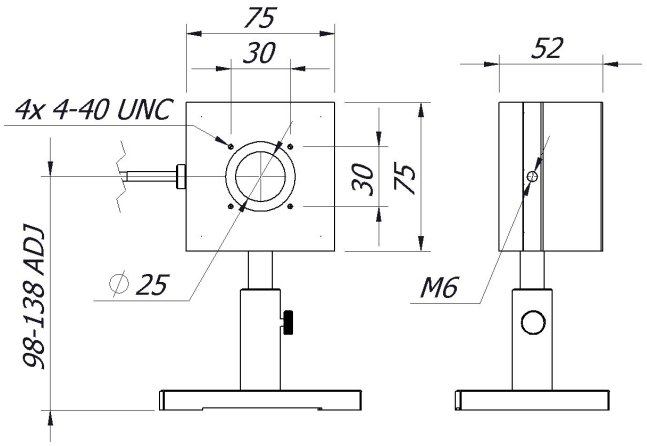
Range: 2mW to 10W / 50mJ to 10J



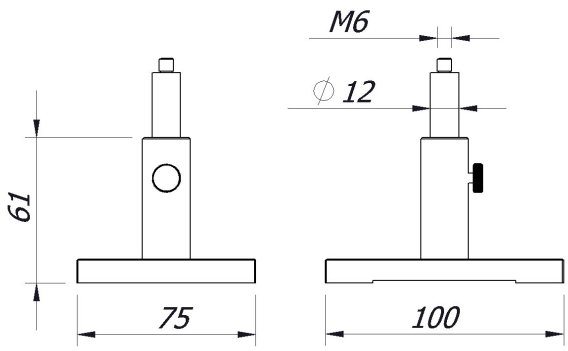
Features:

- Very high damage thresholds
- Air Cooled
- Designed for High Peak Powers and High Energy Densities

Model	10-BB-D25	10-UVA-D25	10-UVC-D25
Power Mode			
Max. Average Power	10 W	10 W	10 W
Max. Intermittent Power (1)	15 W	15 W	15 W
Min. Power	2 mW	2 mW	2 mW
Power Resolution	100 µW	100 µW	100 µW
Noise Equivalent Power (NEP)	100 µW	100 µW	100 µW
Response Time	3 sec	3 sec	3 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	10 J	10 J	10 J
Min. Energy	50 mJ	50 mJ	50 mJ
Energy Resolution	0.1 mJ	0.1 mJ	0.1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	25 mm	25 mm	25 mm
Type	BB	UVA	UVC
Absorber Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Calibration Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Max Power Density (3)	35 W/cm²	9 W/cm²	40 W/cm²
Max Energy Density (3)	Single Pulse: (a) 10ms pulse width: 13 J/cm² <10µs pulse width: 10 J/cm²	Single Pulse: (a) 10ms pulse width: 5 J/cm² <10µs pulse width: 4 J/cm²	Single Pulse: (a) 10ms pulse width: 15 J/cm² <10µs pulse width: 9 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.5 kg	0.5 kg	0.5 kg
Dimension	75 x 75 x 52 mm	75 x 75 x 52 mm	75 x 75 x 52 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter (a). For repeated pulses, please see volume absorber damage graphs.	Available with fiber adapter (a). For repeated pulses, please see volume absorber damage graphs.	Available with fiber adapter (a). For repeated pulses, please see volume absorber damage graphs.



10-BB-D25 10-UVA-D25 10-UVC-D25

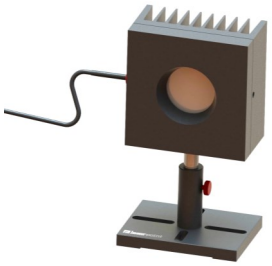


Light Duty Stand

Via Burona, 51 - Vimodrone (Milano) - ITALY
Ph: +39 02 27 40 02 36 Fax: +39 02 25 02 91 61
For latest updates please visit our website: www.laserpoint.eu

Thermal Sensors for Pulsed Lasers

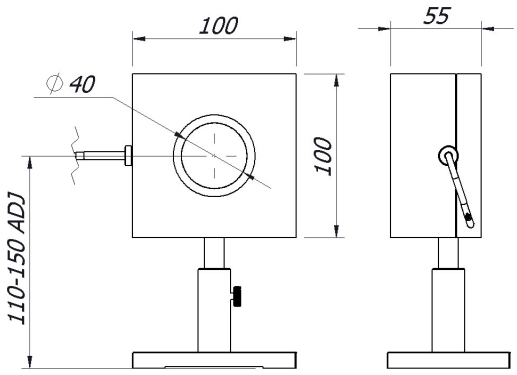
Range: 40 mW to 20W / 100mJ to 20J

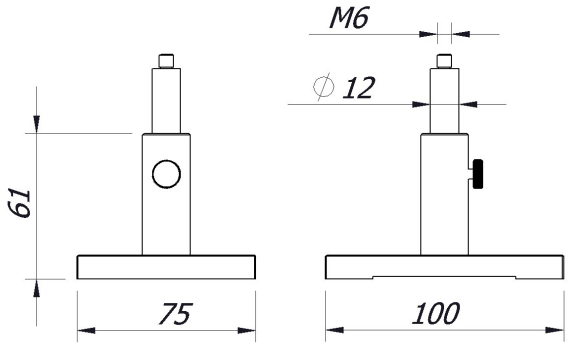


Features:

- Very high damage thresholds
- Air Cooled
- Designed for High Peak Powers and High Energy Densities

Model	20-BB-D40	20-UVA-D40	20-UVC-D40
Power Mode			
Max. Average Power	20 W	20 W	20 W
Max. Intermittent Power (1)	30 W	30 W	30 W
Min. Power	40 mW	40 mW	40 mW
Power Resolution	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	1 mW	1 mW	1 mW
Response Time	3 sec	3 sec	3 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	20 J	20 J	20 J
Min. Energy	100 mJ	100 mJ	100 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	40 mm	40 mm	40 mm
Type	BB	UVA	UVC
Absorber Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Calibration Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Max Power Density (3)	35 W/cm²	9 W/cm²	40 W/cm²
Max Energy Density (3)	Single Pulse: (a) 10ms pulse width: 13 J/cm² <10µs pulse width: 10 J/cm²	Single Pulse: (a) 10ms pulse width: 5 J/cm² <10µs pulse width: 4 J/cm²	Single Pulse: (a) 10ms pulse width: 15 J/cm² <10µs pulse width: 9 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.9 kg	0.9 kg	0.9 kg
Dimension	100 x 100 x 55 mm	100 x 100 x 55 mm	100 x 100 x 55 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	((a). For repeated pulses, please see volume absorber damage graphs.	(a(a). For repeated pulses, please see volume absorber damage graphs.	((a). For repeated pulses, please see volume absorber damage graphs.





20-BB-D40 20-UVA-D40 20-UVC-D40

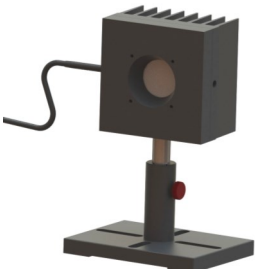
Light Duty Stand

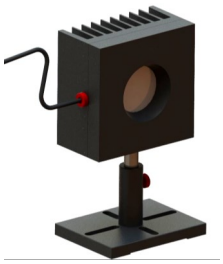
Thermal Sensors for High Energy Density Lasers

Range: 2mW to 40W / 100mJ to 60J

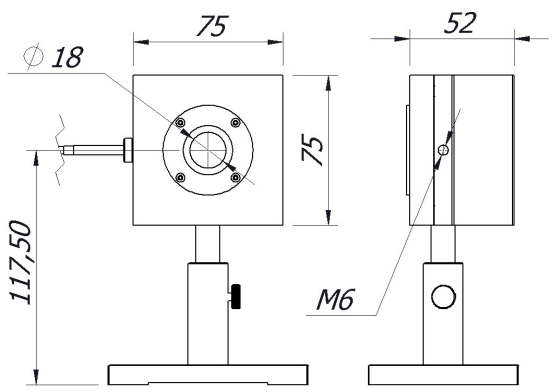
Features:

- Very high damage thresholds
- Air Cooled
- Designed for High Peak Powers and High Energy Densities

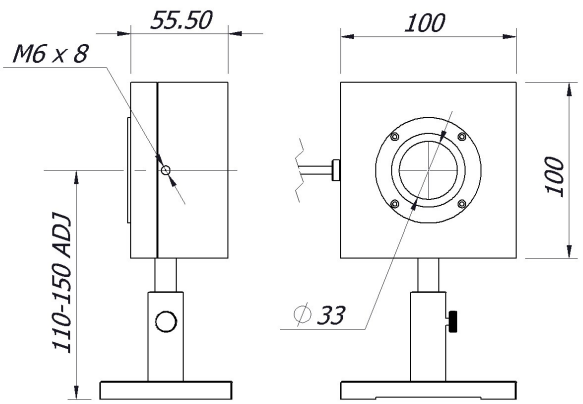




Model	A-30-D12-SHC-L	10-BB-D12-L	A-30-D18-DIF	A-40-D33-DIF
Power Mode				
Max. Average Power	30 W	10 W	30 W	40 W
Max. Intermittent Power (1)	45 W	15 W	45 W	60 W
Min. Power	20 mW	2 mW	25 mW	25 mW
Power Resolution	1 mW	100 µW	1 mW	1 mW
Noise Equivalent Power (NEP)	1 mW	100 µW	1 mW	1 mW
Response Time	1.5 sec	3 sec	1.5 sec	1.8 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	45 J	10 J	45 J	60 J
Min. Energy	100 mJ	100 mJ	100 mJ	100 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	12 mm	12 mm	18 mm	33 mm
Type	SHC + L	BB + L	DIF	DIF
Absorber Spectral Range	0.2 - 1.1 µm	0.4 - 2 µm	1.06 µm	1.06 µm
Calibration Spectral Range	0.2 - 1.1 µm	0.4 - 2 µm	1.06 µm	1.06 µm
Max Power Density (3)	100 kW/cm²	140 W/cm²	t.b.d.	t.b.d.
Max Energy Density (3)	5ms pulse width: 320 J/cm² 10µs pulse width: 12 J/cm² 10ns pulse width: 3 J/cm²	Single Pulse: (a) 10ms pulse width: 40 J/cm² <10µs pulse width: 30 J/cm²	t.b.d.	t.b.d.
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.6 kg	0.6 kg	0.6 kg	0.6 kg
Dimension	75 x 75 x 73 mm	75 x 75 x 73 mm	75 x 75 x 52 mm	100 x 100 x 55 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.		(a). For repeated pulses, please see volume absorber damage graphs. .		



A-30-D18-DIF



A-40-D33-DIF

Options

Optical Fibers Adapters for Thermal and Photodiodes Heads

Fiber Adapter Type	SMA	SC	FC	ST	LC
Model	 S120-SMA	 S120-SC	 S120-FC	 S120-ST	 S120-LC

Carrying Case

Optional Hard case for 4π Meter, low power heads and power supply

Laser Power and Energy Meters

Selecting a meter for the application

The first step in defining a measurement system is to choose the detector needed for a specific application with the help of the LP- Explorer program.
The following step is the meter selection, based on the following three basic considerations:
a)-where the meter is going to be used. For example, if the operator is a laser engineer who spends most of his time in the lab, then he needs multi-function and sophisticated equipment for his qualitative measurements and laser set-up alignment. Laser Point's **4π** is the small, battery operated meter designed for those applications.
b)-which are the needed additional features. A different case is when budget or environment constraints require a simpler monitoring system.
For these applications the tool can be the PLUS Monitor. For example if the requirement is the use of a power meter for the final validation of a laser system before its delivery to the customer, it may still be then necessary to do advanced statistical analysis .Laser Point's PLUS-SOFT powerful analysis software extend measurement capabilities
c)-foresee future developments. Perhaps in a near future there will be a service engineer who will need compact and low weight equipment when travelling. At the same time he will have the necessity to use different heads, e.g. for high and low powers. The PC-Link offers this possibility, since it mates with all LaserPoint detectors and can be plugged to any portable PC.
The following at-a-glance table will help in a first selection.

Capabilities	PLUS2	4π	PC-LINK
• **Detectors**	Thermal Power & Energy Heads OEM Laser Probes	Photodiodes, Thermal Power & Energy Heads Position Sensing Detectors	Thermal Power & Energy Heads OEM Laser Probes
• **Data Display**	4.3" TFT LCD Touch Screen Display	116x87 mm LCD Touch Screen Display (RGB 640x480 px)	PC & Laptop Screens
• **Functions**	W, J, Full Statistics	W, J, Full Statistics Plotting, Math, dBm, Hz, Fluence (J/cm^2)	W, J, Full Statistics
• **Outputs**	USB 0-2V Analog Out with 16 bit resolution	Ethernet Port, 0 2VDC Analog Out with 16 bit resolution	USB
• **Data Storage**	Data logging to USB memory stick	Via internal memory (250k data samples). Data logging to USB memory stick	N
• **Process Alarms**	N	N	on PC-Link-SOFT screen
• **Wavelenght Selection**	1 nm Lambda Selection	1 nm Lambda Selection	Y (up to 6 Pre-set Wavelengths)
• **Tuning Function**	N	Digital accuracy with analogue-like needle	Analogue-like Needle
• **User's Calibration Capability**	Y	Y	Y
• **Min/Max. Full Scales**	10µW-10KW	50nW-10KW 1mJ-300J	10µW-10KW
• **Dimensions**	170x100x36mm	178x160x60 mm	113 x 56 x 35 mm
• **Operation**	Battery and line 100/240Vac 50/60Hz Out 5Vdc 1A	Rechargeable battery pack and 90-260VAC	External Power Supply Not Required

Plus 2: Power & Energy Meter

Introduction

Plus 2 is a handheld, lightweight, touch screen Meter designed by Laserpoint to measure the optical power/energy of lasers and other light sources.
The Plus 2 meter is compatible with all released of Laserpoint thermopile and photodiode sensors; it features a 4.3" color touch screen display and an intuitive and ergonomic Graphical User Interface which allows to exploit all its characteristics by just one or two touches. The instrument is powered by a USB rechargeable lithium battery for a run time of up to 15hrs.
Among its features, the Plus 2 offers a configurable Analogue Output and easy Data Saving/

a Date - Time - Battery/network icons

b Head model, serial number and operating temperature (°C)

c 4 digits numerical display and measurement function units

d Analog bar graph normalized to the selected full scale

e Sample counts and time considered for the statistical elaboration, if selected. Also warnings and alarms/alert messages are displayed in this section.

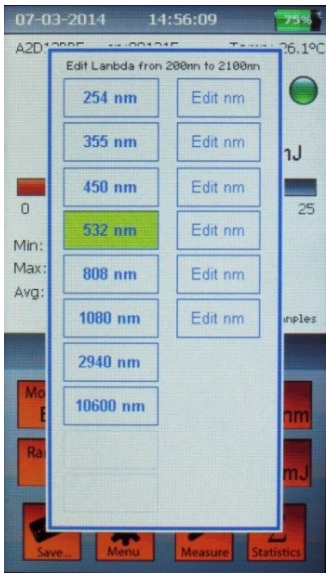
f Mode (Power- Energy), Wavelength Selection

g Range and Zero

h Duration of the data logging and specific measurement settings when selected

Wavelength Settings

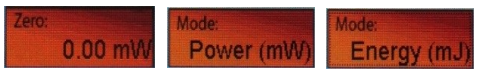
Wavelengths can be selected by first opening the "edit lambda" window where a set of most popular laser wavelengths are displayed. To input a specific wavelength not shown in the list it is sufficient click on"edit nm" and select the desired wavelength on the keyboard that pops up



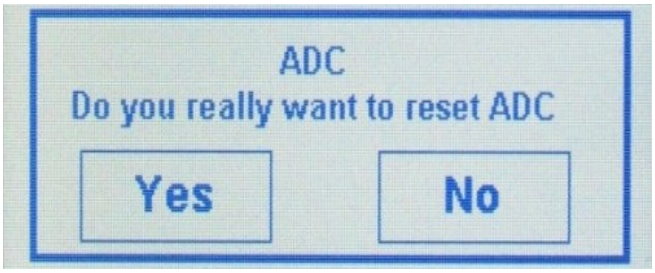
Manual or Automatic Power Range

The measurement full scale or range can be adjusted according to user's needs by touching the "Range" screen button and scrolling to choose the range option. Selection can be done manually, or by choosing the "Auto" mode .
ally, or by choosing the "Auto" mode

Offset and Zero



The offset level in a measurement. can be activated by touching the "Zero" screen button to acquire the presently measured power value as offset level. All meter adjustments, including ADC zeroing, are carried out by the Plus 2 firmware. However, a manual zeroing can be done, eg every time a new sensor head is plugged onto the Plus 2 by a longer press on the Zero button. If "Yes" is selected the display will show the "Wait for zeroing" notice and when the ADC has been reset the notice "Zeroing Completed" will be displayed .

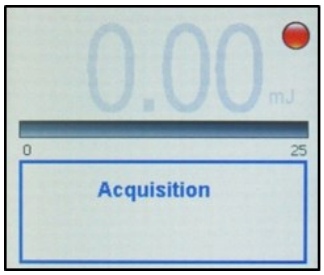


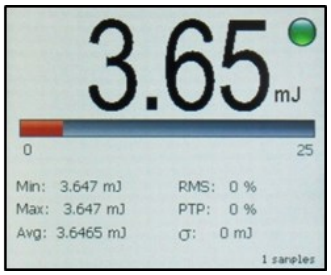
Power and Energy Mode

The "Mode" screen button easily switches from Power measurement mode to Energy measurement mode ; measurement units are according to sensor head type and expected range.

Measurement of Single Shot or Burst Energy

The Plus 2 can measure the single shot or the integral energy of a burst of 2 or more pulses.Once the Energy Mode has been chosen, the green led on the display indicates that the Plus 2 is ready to measure an energy pulse
During the laser pulse, the message "Acquisition" is displayed for a time ranging between 1 to 5 seconds depending on the sensor and whether a single pulse or multiple pulses are recorded. When a pulse/burst energy acquisition is completed, the measured energy will be displayed as shown in Figure 8. Once the led returns to green. a new measure can then be done.





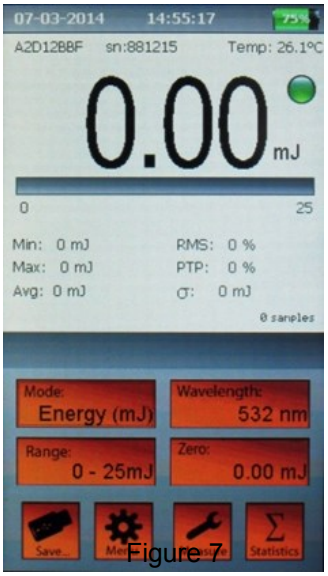
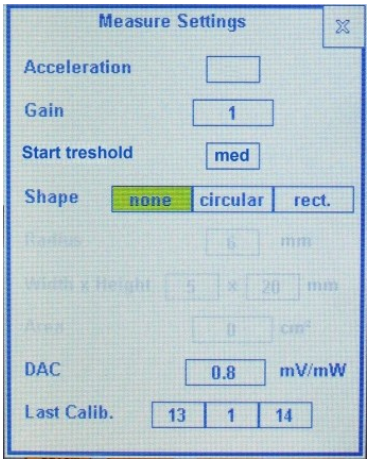


Figure 7

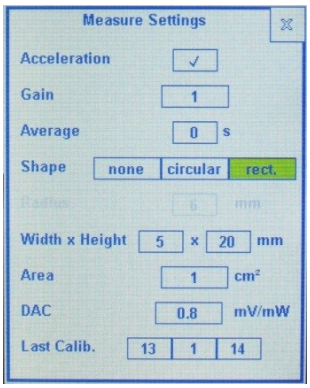
Setting the energy threshold

To avoid unwanted contribution of thermal noise or background radiation to the measured pulse energy, the instrument has been designed not to respond to pulses below a preset energy threshold. Hence an Energy Threshold has to be set and to do so follow the instructions below:

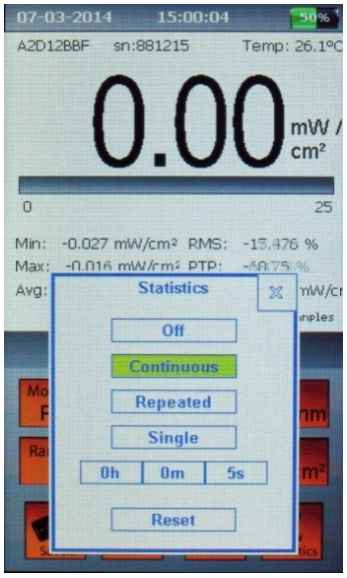


Measure Irradiance and Fluence

Measures in Power mode can be displayed as Irradiance (W/cm^2), as well as measures in Energy mode can be displayed as Fluence (J/cm^2) by inserting the beam Shape (Radius for a circular shape, Width and Height for rectangular shape) on "Measure Settings" .



Statistics



The Statistics key opens the corresponding window . Four processing options are available:

-Continuous: the elaboration is carried out on a continuous data collection basis.

-Repeated: the data are repeatedly collected and elaborated within a user's defined time period.

-Single: the data are collected and elaborated only once within a user's defined time period.

-Off

Data logging to a USB memory stick

By inserting the USB memory key into the port on Plus 2 left side and touching the "Save…" button the Data Logging window is open.

A selection of both the desired data to be saved (Values, statistics or both) and Sample Rate (between 0.5 s and 99 s) together with the acquisition mode can be done. This latter can be :

Manual or

Timed: if a defined time acquisition period is neededThe "START" button starts data logging. During data logging a timer shows the elapsed time if the selected acquisition mode is Manual or the time left if the selected acquisition mode is Timed.

• The "Menu" Button

Menu" button opens to:

-Date and Time settings. **-Language and Display Colour** choices (soon ready).

- Display Off :Display off time can be set from 1 to 30 minutes

-Auto off: after a certain time of inactivity Plus 2 turns off. By selecting Auto off, time can be set from 1 to 600 minutes.

-Factory restore: this function resets measurement, statistics and wavelength settings to the factory conditions

-90° Full Screen: this option switches the screen to a 90° turned full screen high visibility / high contrast display showing only the measurement value and related units.

Plus 2 Specifications

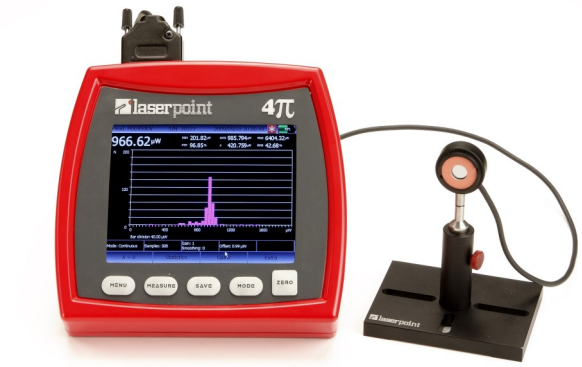
For customers who like to write their own software or for system integrators sensors can be supplied with an easy to access command set with DLL drivers that support simple ASCII host commands

• **Detector Compatibility**	Laserpoint Thermopile, Photodiode and OEM heads
• **Input ranges**	7 mV – 700mV full scale, in 9 ranges
• **A to D Sampling rate**	64 Hz
• **A to D resolution**	23 bit ADC resolution, 16bit processing resolution
• **Electrical accuracy**	± 0.5%
• **Electrical input noise level**	500nV Input Offset Voltage drift (typical): -4nV/°C
• **Dynamic range**	8 decades
• **Analog output**	0.025 - 2 Volt, with 16-bit (0.0015% resolution.)
• **Analog output accuracy**	±0.1% ±2mV relative to display
• **Dimensions**	170H x 100W x 36-50D (mm)
• **Weight**	380 g
• **Display**	4.3" TFT LCD high brightness, 480 x 272 resolution, resistive touch panel (96H x 55W mm).
• **Display digit height**	15mm - 25mm Full Screen
• **Bargraph segments**	250 pixel width
• **Battery**	Built in rechargeable Li-Pol. 3.7V 3700mAh
• **Battery charge time**	7-8 hours if not working 15-20 hours if working
• **Battery run time**	> 9 hours in normal operation > 15 hours in stand-by display mode
• **Supplied Battery Charger**	Input 100/240Vac 50/60Hz Out 5Vdc 1A, Charging current is 0.5A (Plus 2 may be charged through a PC USB port).

4π: Touch Screen, Power&Energy Meter

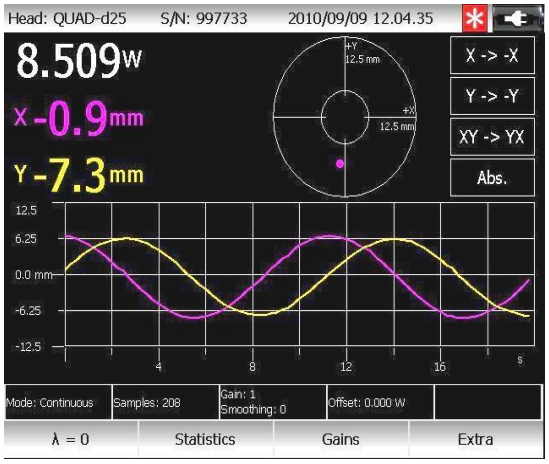
Enjoy its Measurement Possibilities

- Ethernet Linkable for general networking
- Touch screen display,
- Intuitive SW, based on OS Windows CE 5.0
- Large size (116x87mm; RGB640x480 px) display
- Display selectable colours for use with laser eyewere on
- Choice of digital, analogue needle or beam position display
- Laser tuning screen and power and energy log
- Menu driven functions
- Several software features: W/cm^2,J/cm^2, full statistics, scaling, dBm, etc
- Compatible with all LaserPoint thermopile and optical sensors
- Wavelength selection with 1 nm resolution
- Powers to 10KW, Single Shot Energy to 600J
- Data logging to USB memory stick up to 345.600 samples
- PC interfacing via USB/RS-232 (option)
- Configurable Analogue output
- NiMH rechargeable battery and Line Power Supply
- CE marked, RoHS Compliant,
- Calibrations provided with NIST or PTB traceability



Beam Position Display:

The 4π can be associated to our beam position sensing thermal heads that sense the position of the beam on the detector surface. Alignment of complex optical lines can be made fast, simply and with a centering accuracy of 100 microns



Digital Display:

It shows the instantaneous value of the measured function in the form of a large sized numbers with the selected resolution of decimal digits; a coloured bar represents the measured value as a fraction of full scale.

Statistical information is given in the lower part of the display .

Trend Display:

It shows the evolution of the measured function over time;

the instantaneous value is displayed in digital form at the upper left side.

Statistical information is given in the upper part of the display.

Analogue &Tuning Displays:

it show the instantaneous value by a needle-like representation.

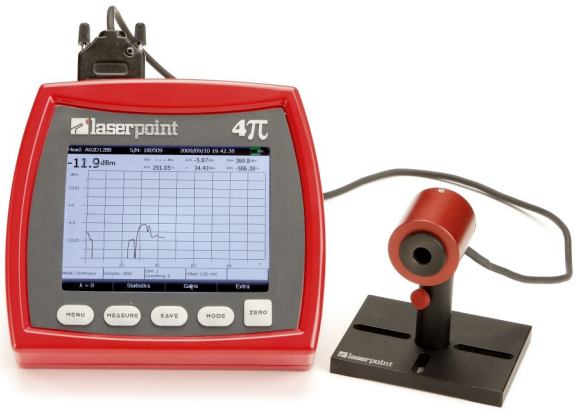
The Tune button changes the analogue representation into a very sensitive tuning tool; the range is expanded to span between -25% to +25% of value measured when the tuning function was activated

The Max. reached value is continuously updated on the small digital display.

Histogram Display:

it shows, in form of histogram, how many times the same value occurs during a session; measured values are shown in the X axis and the number of events in the Y axis.
This display is a powerful tool to monitor, e.g., laser sources stability.
Instantaneous values are shown in digital form.
The vertical scale automatically adjusts to allow the adding of more data.
Statistical information is also given in the upper part of the display .

Five Keys Get to the Right Function



MENU:
■ *USER INTERFACE* to chose:
-Display Theme: for background and digits screen colours;
-Language: actual selection is between English, German French, Spanish or Italian (more languages to come);
-Auto-Off: function aimed to battery saving.
-DATE and TIME: to set date and time on buffered RTC.

MEASURE:
■*MEASUREMENT:* selects *Power* , *Energy* or *dBm* .
■ *RESOLUTION:* to set the reading resolution up to 5 digits or 1/99999 of full-scale
■*AREA:* after setting shape and size of the laser beam, measurements will be displayed as *W/cm2 (irradiance)* and *J/cm2 (fluence)*

SAVE:
save measured data and define data logging schedule through two interactive pages:
■ *SCREENSHOT*: the screen content, and/or the last value of the measured function and/or the statistical data can be saved in a USB key, as a *.jpg and *.CSV (text) files.
■ *DATA LOGGING:* measured values, and/or the current statistical values can be saved and transferred from the instrument memory to a USB key. The minimum sampling rate setting is 1 second.
Transferred information is saved in a folder containing two different text files (*.CSV).

MODE: opens 5 different modes to set the display:
■ *Beam Position Dispaly*
■ *Digital Display;*
■ *Trend Display;*
■ *Analogue & Tuning Display;*
■ *Histogram Display* .

ZERO:
Can establish an optical zero for the head and the electrical zero by resetting the ADC.

Additional Functions

SCREEN'S TOP AND BOTTOM BARS:
The upper bar displays the sensor head model with its S/N, the date, the type of power supply in use (Battery or wall AC) and the level of battery charge.
Four touch keys are located in the bottom bar:
■ *LAMBDA:* shows the wavelength being used on the head. Via a numerical keypad the head can be set to work at any custom wavelength, with *1 nm resolution*
■ *STATISTICS*: provides *Full Statistics* (Min., max., mean, average, std. dev. PTP stability, RMS) on measured data
■ *GAINS*: introduces a multiplying factor, particularly useful when beam splitters or partializing devices are used
■ *SMOOTHING:* digital filtering of signal smooths unstable or noisy measures by removing signal ripples or overshoots
■ *EXTRA*:
Info: informs about the instrument HW and FW versions, next calibration date and remaining charge level.of battery
Calibration: shows the factory-set calibration coefficient. Calibration factors can be user changed by simply acting on the up-down arrows on the screen .
LaserPoint: mainly reserved to LaserPoint engineers, it is also available to the user, on a limited extent to make SW updates, new language releases, etc.

External Communication

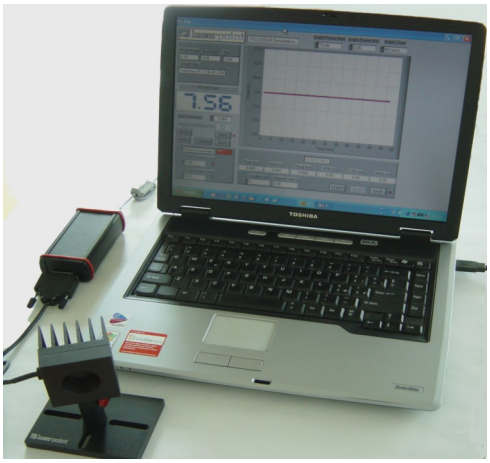
An Ethernet communication port allows to connect the 4π Meter for general networking.
Examples include monitoring an experiment from a different location (e.g. from office or home), on-line sharing of data with far away colleagues, remote maintenance, etc .
A second port can be used to plug in a USB pen or a mouse to operate the instrument as alternative to the touch screen.

4π: Technical Specifications

Display:	• Touch Screen 116x87mm; RGB640x480 px color graphics LCD. • Customer selectable colours • High res. analog needle page for laser tuning, system alignment, etc • Screen Refreshing: 4 times/sec
Head Features:	• Works with thermopile and photodiode heads
Measurement & Analysis:	• Power, Energy (single shot), dBm • Full Statistics (min., max., mean, RMS, std. dev. PTP stability), Trend, Tuning • Additional features include: Wavelength selection every 1nm, laser power with colour bar graph, graphs, scaling and more. • Area function for Radiance (W/cm^2) and Fluence (J/cm^2) • Status Bar
Sampling Rate:	• 1KHz
Gain:	• 24 Bit ADC
Resolutions:	• Measurement Resolution: 1/100.000 of full-scale • Displayable Resolution: 3, 4,or 5 digits (user selectable, head depend.)
Instrument Accuracy:	• Digital Meter ±1.0% • Analog Output ±1.0%
Data Storage:	• Data logging to USB memory stick up to 345.600 samples (4 samples /sec for 24h) • Screen Print, Current Value and Statistics on USB Memory Stick
Program Features:	• Preferred start up configuration can be set by user. • User can recalibrate power, energy, response time and zero offset.
Analog Output (VDC):	• 2 VDC on 10.000 steps (configurable full scale) • Analogue Output Update Rate : 4 Hz for thermopile and optical heads
Temperature Ranges:	• Operating: +5° to +40°C • Storage Range: -20° to 70°C
Supply Voltages:	• AC : 90 to 260 VAC, 50/60 Hz • Rechargeable NiMH batteries: 2 hours between charges, typical. Charger (included) also functions as AC adapter.
Case:	• Molded high impact plastic with optimized angle kickstand • EMI rejection • Dimensions (H x W x D): 160 x 180 x 60 mm(6.3 x 7.1 x 2.4 in.) • Weight: 730 g (1.6 lbs.)
International Regulations Met:	• CE, RoHS, WEEE

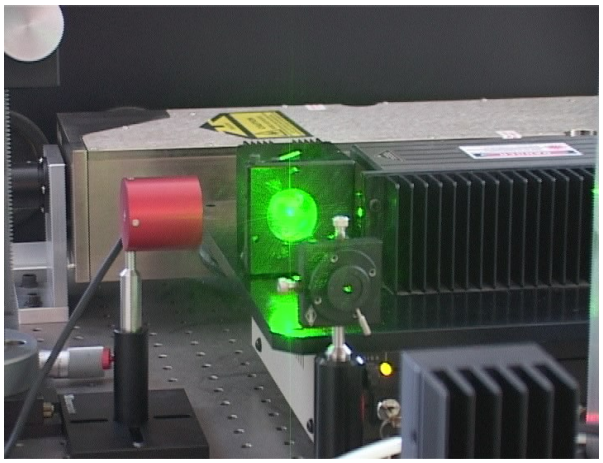
PC-Link: Single and Dual Channel USB Interface

Convert Your PC Into a Single or Dual Channel Power / Energy Meter



LaserPoint's **PC-Link** is a smart head to USB interface that converts any PC or laptop into a powerful instrument which measures, analyses and records power and energy from any of LaserPoint detector heads.
PC-Links are supplied with LaserPoint's user-friendly communication software packages for single channel or dual channel operations.
When 2 heads are connected to the PC via two **PC-Links,** the dual channel SW is accessible to have data or compare signals from both heads .
To work with PC-Links is very easy: it is sufficient to install the software, connect the heads to the interface units and these latter to the USB ports of a PC. No other operation and external power source are needed.
This sophisticated monitor is plug and play with all LaserPoint heads. The advanced features of PC-Link**,** together with the fact that it is very compact and has low weight, make this monitor an ideal partner for service applications, laboratory or OEM use offering the convenience, flexibility and value of computer-based operations.
The PC-Link is infact the candidate for use in laser machines, in particular when associated to LaserPoint's FIT-H (Fast Integrative Thermopile Heads) family of OEM detectors, that work up to 6KW without the need of water cooling.

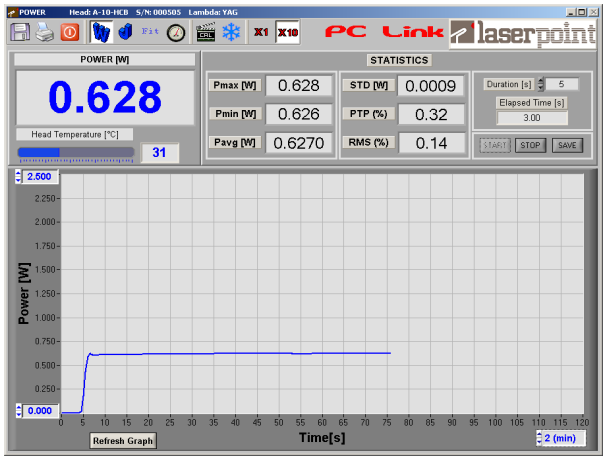
Rich and Versatile Laser Monitoring



The use of PC-Link is straightforward. The unit will recognize the power/energy head as soon as it is plugged-in; furthermore, the PC-Link will use its anticipation circuitry to insure a fast response and will use the calibration data stored in the intelligent connector (IIS) of each head to provide the most accurate measurement .
The software packages for Single Channel and Dual Channel operation supplied with the PC Link are extremely rich. One feature offers the possibility to access to the User's Own Calibration Factor (UCF) and a there is also X10 gain to enhance measurement flexibility (eg low power measurements to 20µW resolution).
Both SW versions allow to measure, analyse with full statistical functions (Min., Max., mean, and standard deviation) and record power and energy from all LaserPoint heads without the need of a display. Data from each detector can be logged simultaneously to file.
The PC-2-Link software package includes in addition Mathematical functions to compare signals from both channel, e.g. A/B or A-B.
The same SW also includes a ZOOM function which permits to see the details, e.g. random events or small fluctuations, within both signal tracks.

Measurements Modes: Power, Energy and FIT

The PC-Link will dialogue with any head from LaserPoint to supply Power, Energy or FIT-type accurate readings.
The *Power mode* permits measurements of laser powers with direct display of their actual values. The screen also shows the evolution of power over time allowing stability measurements as long as several hours (up to 12 h depending on the PC).
The *FIT mode* provides values of laser power by an automatic measurement cycle of 4 seconds with LaserPoint's Fit-H heads.



This family of detectors is used for accurate, yet once in a while readings and whenever simple power checks instead of long term measurements are needed. In this configuration the operator only has to expose the head to the laser beam and, after the correct timing generated by the PC Link's'internal firmware, the measurement is over. (There is no need to provide the time window to the laser shutter).
The *Energy mode* allows the measurement of single shot energy. This function is available on request on most of thermal heads manufactured by LaserPoint.

On top of the screen a toolbar is displayed. Each icon activates a particular software function, and a brief explanation pops up by simply moving the mouse cursor on the icon.

Saves acquired power data in a .txt file. The operator is simply requested to d ecide sampling time and file name. Acquisition data are continuously saved until the icon is next clicked.

When the icon background is green, acquired data are being saved in the specified file.

Prints the current screen by a printer.

Activates measurements of laser power and its display

Activates measurement of laser energy and its display

Activates measurements with FIT-H heads

Activates the *Tuning* function and its display

Zeroes the instrument to remove any residual offset.

The *Freeze* function stops the data acquisition and the statistic calculations in progress.

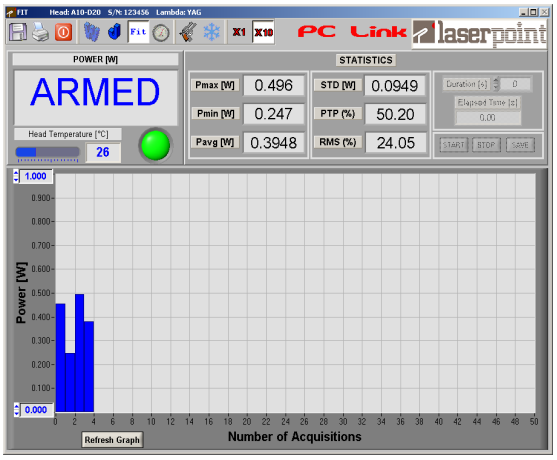
Quits the application.

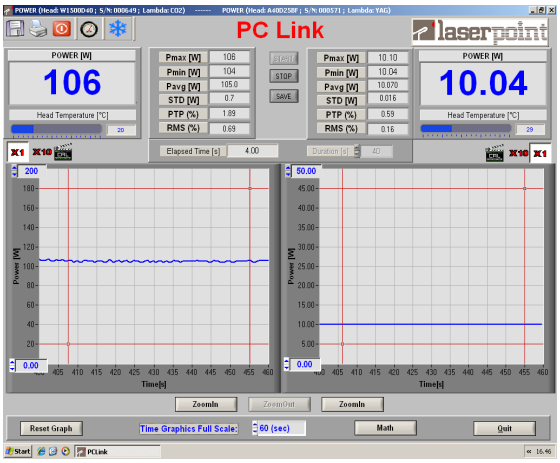
Sets the input gain to x1.

Amplifies head signals by a factor of 10: consequently the new full scale will be 1/10 of head's nominal full scale and measurement resolution will be increased 10 times.

Two cross-air cursors permit to select an area and expand it to the full window

Signals from 2 heads can be compared : A/B; B/A; A-B; B-A ; A+B; A*B

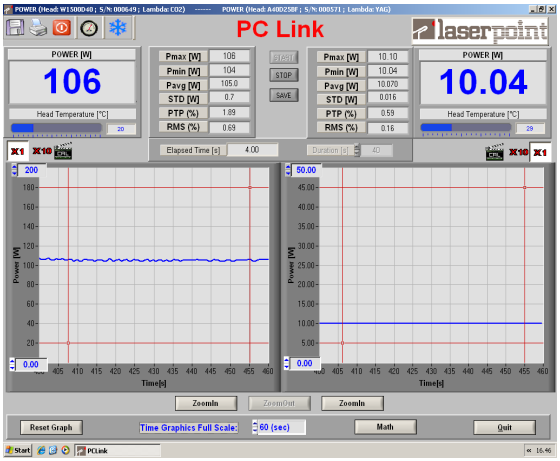




• Statistics

This function is also available on both channels of PC-2 Link SW.
In the statistics section a series of statistical data are calculated and displayed. This function is available for the Power, Energy and FIT mode.
Each time the counting of elapsed time has reached the set value, the following statistical data are calculated:

- *Pmax(W)*: Shows the max power value measured during the last acquisition interval
- *Pmin(W)*: Shows the min power value measured during the last acquisition interval
- *Pavg(W)*: Shows the average value of power measured during the last acquisition interval



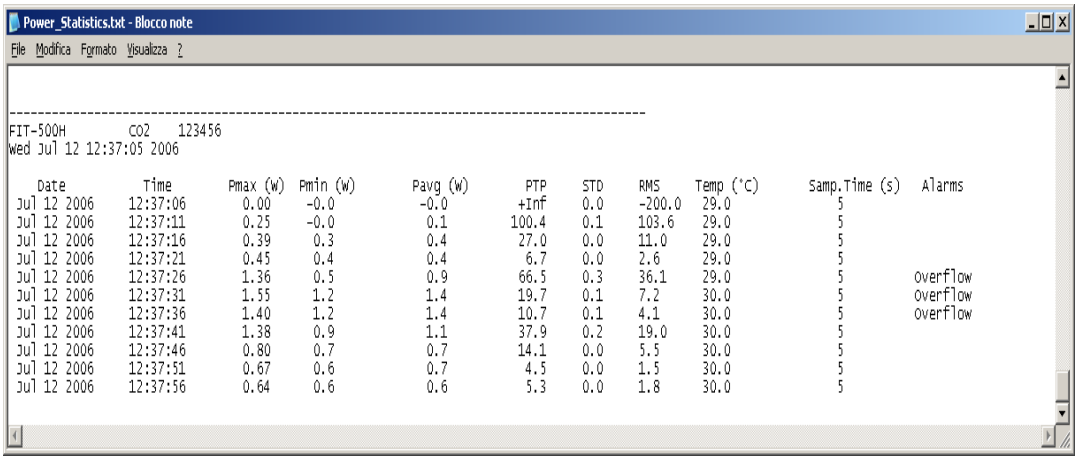
▪*PTP(%)*: Shows the Peak-to-Peak stability based on the formula $$PTP = \frac{P\max - P\min}{P\max} \cdot 100$$

▪*STD(W)*: Shows the measurement Standard Deviation based on the formula: $$RMS = \frac{STD}{Pavg} \cdot 100$$

▪*RMS(%)*: Shows the RMS stability based on the formula $$STD = \sqrt{\frac{\sum_{i=1}^{n}(Pi - Pavg)^2}{n-1}}$$

Saving Statistics Data on a File

Whenever measured data need to be saved on a file, this can be simply done by clicking on the "*SAVE*" button in the statistic section.


Power_Statistics.txt - Blocco note

File Modifica Formato Visualizza ?

FIT-500H CO2 123456
Wed Jul 12 12:37:05 2006

Date	Time	Pmax (W)	Pmin (W)	Pavg (W)	PTP	STD	RMS	Temp (°C)	Samp.Time (s)	Alarms
Jul 12 2006	12:37:06	0.00	-0.0	-0.0	+Inf	0.0	-200.0	29.0	5	
Jul 12 2006	12:37:11	0.25	-0.0	0.1	100.4	0.1	103.6	29.0	5	
Jul 12 2006	12:37:16	0.39	0.3	0.4	27.0	0.0	11.0	29.0	5	
Jul 12 2006	12:37:21	0.45	0.4	0.4	6.7	0.0	2.6	29.0	5	
Jul 12 2006	12:37:26	1.36	0.5	0.9	66.5	0.3	36.1	29.0	5	Overflow
Jul 12 2006	12:37:31	1.55	1.2	1.4	19.7	0.1	7.2	30.0	5	Overflow
Jul 12 2006	12:37:36	1.40	1.2	1.4	10.7	0.1	4.1	30.0	5	Overflow
Jul 12 2006	12:37:41	1.38	0.9	1.1	37.9	0.2	19.0	30.0	5	
Jul 12 2006	12:37:46	0.80	0.7	0.7	14.1	0.0	5.5	30.0	5	
Jul 12 2006	12:37:51	0.67	0.6	0.7	4.5	0.0	1.5	30.0	5	
Jul 12 2006	12:37:56	0.64	0.6	0.6	5.3	0.0	1.8	30.0	5	

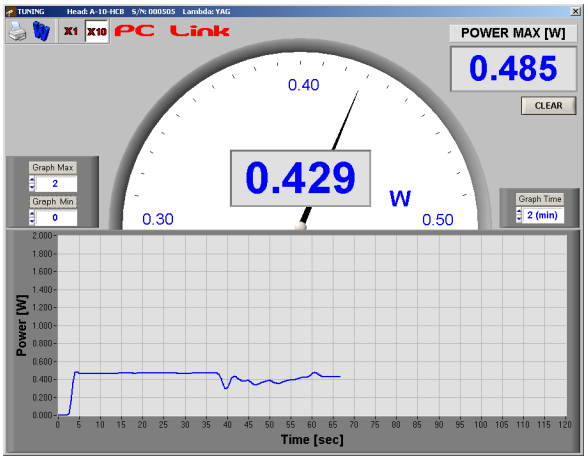
The structure of saved file (*.txt), as shown in the picture, is:

-headline, reporting the head model, the calibration wavelength, the head serial number, the date and the time of saving action.

-twelve columns reporting date, time, calculated values of statistical measurements, temperature of sensor, sampling interval duration, alarms (cool, overflow) and active gain value are updated at each acquisition. Data of each saved file can be imported into a spreadsheet (e.g.Excel).

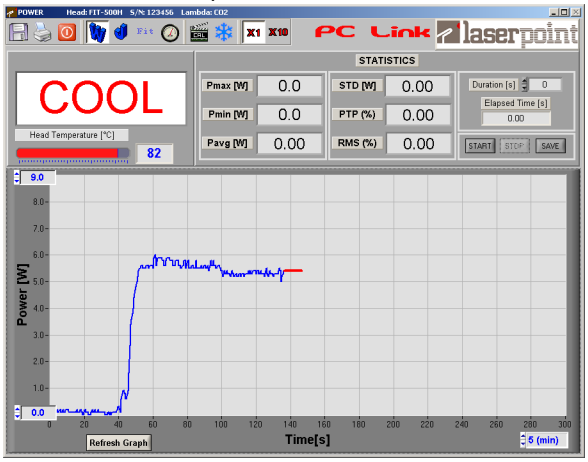
Laser Tuning

Laser Tuning is only allowed in Power Mode and is used to achieve a high resolution tweaking of your laser. On top of the tuning window a toolbar is displayed. Each icon activates a particular software function. An analogue needle shows the direction of tuning. In the middle of the tuning display a box shows the actual power, while the maximum value reached during the tuning procedure is kept in a second box at the upper right corner of the screen.



Warning Messages

Each time the laser power or energy exceeds the head full scale the OVERFLOW alarm is displayed as shown in the picture.
Should a measurement head reach its limit temperature (overheating of a head may be due to problems to the cooling circuit such as low water pressure, lack of fluid, obstructions, etc, or poor heat exchange in air cooled heads), the COOL message will be displayed on the main window and the data displayed in the graph are pinned to the last power value acquired before the alarm.



PC-Link: Technical Specifications

For customer written software or for system integration the unit is supplied with an easy to access command set with DLL drivers that support simple ASCII host commands

- **Power Meter Mode**

Power Ranges: *1mW to 10kW*
Resolution: 0.5‰ *for any Full Scale*
Response Time: *<1-5sec.(depends on specific head)*

- **Energy Meter Mode**

Energy Range: *1mJ to 300J*
Resolution: *0.5‰ for any Full Scale*
Response Time*:* *<1-5 sec (depends on specific head)*

- **FIT Mode**

Power Ranges: *1mW to 10kW*
Resolution: *0.5‰ for any Full Scale*
Response Time*:* *4 sec (final value)*

- **Tuning**

Displays a Digital Bargraph for Tuning Direction
Displays Actual Power Value
Displays Variations (as %) form Tuning Initial Value

- **Wavelengths Selections**

EXC : UV and excimer laser (250-350nm)
VIS: Visible (400-700nm)
LD: Laser Diodes (800-900nm)
Yag: Nd-Yag (1064 nm)
Erb: Erbium (2943 nm)
CO2 : CO2 (10600nm)
UCF:User's Own Re-Calibration Factor

- **GENERAL SPECIFICATIONS**

Software: Full Window application software
Communication: Full Speed USB 1.1 Communicn between Host Computer and PC-LINK
Display: Computer Screen
Data Storage: Limited by PC capacity
Data Displays: Real time, Histogram, Statistics
Additional Input Gain: 10X
Dimensions 113 (L) x 56 (W) x 35 (H) mm
Weight 0.106 kg
External Power Supply Not required

- **Operating environment**:

Storage Temperature*:-10 to 60 °C*
Range of Use :*5 to 45 °C*
Reference Conditions : *21 ± 4 °C ;RH 20-80%*

USB/RS232 Meterless Sensors

Via Burona, 51 - Vimodrone (Milano) - ITALY
Ph: +39 02 27 40 02 36 Fax: +39 02 25 02 91 61
For latest updates please visit our website: www.laserpoint.eu

USB/RS232 Sensors: Plug Directly to your PC

Technology evolves toward simplification, makes cheaper and reduced-size working tools. Instrumentation for laser power measurement is subject to the same process. Traditionally the complete measurement set is made of a detector head connected to separate electronic unit to display results: Laser Point has developed a series of laser power measurement instruments introducing new microelectronics circuitry that has reduced the complete electronics to the size of a USB 2.0 or RS-232 plug.

The result is new family of measurement tools that are smaller, more economical, easy to be embedded in laser systems either in machines or in laboratory.
The PC-Plug series of sensors has been specifically developed for all those applications that do not require a display but where readings can be analysed and displayed on the now ubiquitous computer.
With simple plug and play functionality, no additional meter and at a lower cost, the new PC Plugs-USB/RS 232 sensors have all the power and sophistication of signal processing and software of a traditional power meter.
The RS-232 version is the most convenient platform to have power measurement integrated inside laser processing systems.
The PC-Plug-USB sensors get their supply power from the USB connection while the only requirement for RS-232 version is a + 12VDC input.

• Who will need the PC-Plugs?

The PC-Plug sensors have been primarily developed for applications that need a power measurement station on board of machines, like in laser marking, cutting, welding, micro-machining; these instruments are also the perfect monitoring tool for other industrial applications such as laser burn-in or long-term reliability testing.
The PC-Plugs are also the best choice for service engineers and technicians who always travel with a laptop computer, because they will no longer need to carry separate instruments and additional weight.
Finally, thanks to their lower cost and smaller size, these sensors can be also successfully integrated in more standard laboratory applications that already use computer controlled instrumentation.
Laser Point has several years of experience in providing sensors and heads to OEM customers. Many of these users prefer to solve their laser measurement problem by purchasing the bare sensor and design a specific electronics for signal processing. This is obviously a method but it has some limitations: for example the user must have both the tools and the know-how of adding accurate calibrations, the capacity of designing very low noise amplification and accurate A/D conversion which will drive to good stability and low noise measurements.
PC-Plugs sensors connect directly to a PC and now offer to system integrators or machine builders the possibility to save precious resources to develop their own electronics and software. The PC-Plugs then simplify the work of OEMs who no longer need to take a thermopile sensor head and produce a calibrated power measurement instrument.
The PC-Plug approach provides the system designer the possibility of an immediate integration of a power meter with other devices of his system.

leonardo : SW for USB Power/Energy Sensors

Introduction

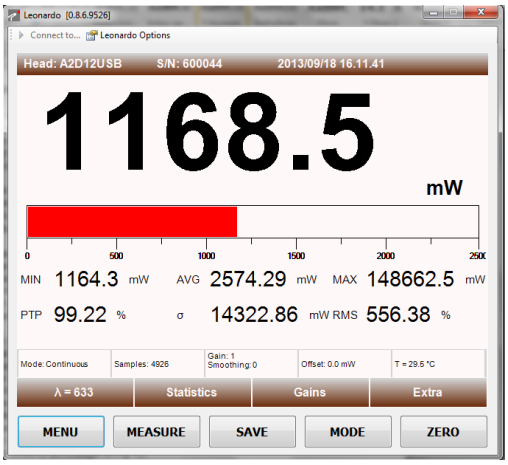
leonardo is an advanced measurement software and graphic interface developed by LaserPoint to make any laptop a true power and energy meter when used to read out, elaborate and manage the data generated by LaserPoint PC-Plug Series sensor heads with USB interface.

leonardo graphic interface

Upon opening *Leonardo's* graphic interface features a large window showing the digital mode measurement screen at its first connection. Beside the measurement data, the window hosts information regarding the head, the screen keys and tools to set up and manage the sensor head before and during the measurement session as well as to set up a representation and the storage of the measurement data .
Leonardo's window displays nine functional keys needed to plan the measurements and the data representation as well an upper band and a lower line of small boxes showing the relevant information regarding the sensor head type, date /time, head settings and environmental conditions. At the very left top of the window:
Connect to… can be used to select another head connected to a different USB port or, in the case a USB sensor head was disconnected from the PC, to access *leonardo* wizard and select the desired USB sensor head to use without launching *leonardo* again.
Leonardo Options can create a folder to save and store the measurement data.
Upper band (at the window top): from left to right it shows the sensor head model (e.g. A2-D12-BBF-USB), the head S/N and date / time information.
Lower band : displays five boxes laid in a row showing information about statistics mode, the number of samples taken during the measurement session, Gain and Smoothing values, Offset value and Sensor head temperature value .

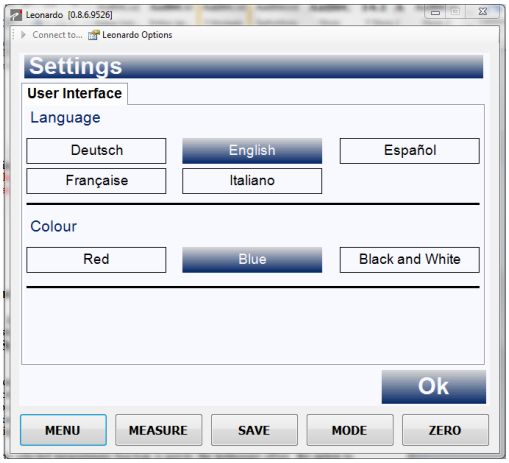
Main Keys

The five main keys of the interface: (**MENU-MEASURE-SAVE-MODE-ZERO)** offer a quick access to set up and manage the measurement session.
MENU :
opens the *USER INTERFACE* window enabling the selection of the *Language* and a *Display Colour* (background and main window features colour) .
MEASURE :
gives access to measurement settings by means of three sub-keys:
- *MEASUREMENT :* enables to select between Power or Energy measurements and to display power data in Watt related units (mW, mW or W) or dBm units by activating the *dBm* function
- *RESOLUTION :* enables to set and display the selected number of digits after the decimal point of the measured value.
- *AREA* :enables to display the measured function value also in terms of function density (power or energy per cm^2) by setting the size parameters of the laser beam under test.



SAVE:
allows to select the relevant data that will be saved, to freeze the selected measured data and save them in a dedicated folder.
MODE:
gives access to four different display modes of power measured data, namely:
-Digital mode
-Trend mode
-Analogue/Tuning mode
-Histogram mode
ZERO:
enables the user to define the optical zero of the sensor head and to reset the ADC of the head electronics

Additional Functional Keys

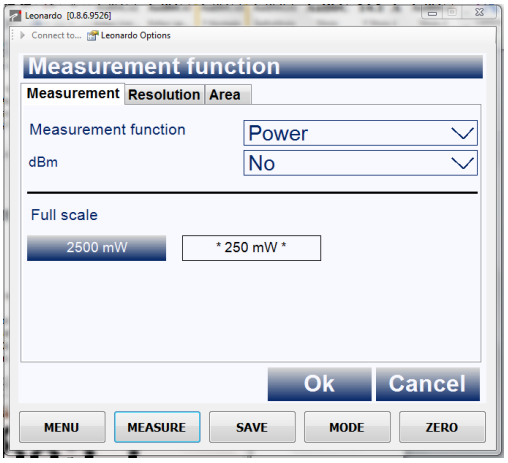


Above the five Main Keys there are four additional keys, from left to right side:
λ = …. sets and shows the wavelength of the sensor head in use.
Statistics: defines the statistical setting of measured data collection and elaboration.
Gains : customizes the read out unit gain and manages the time response of the sensor head through a filter and an acceleration algorithm.
Extra : allows the user to access some information concerning the product and the factory engineers to update the FW loaded in the sensor head, and check and change its calibration status .

Main Menu (MENU key)

MENU gives access to the main instrument settings.
Language selection - The present release of the software features German, English, Spanish, French and Italian as available languages (Fig 4). The chosen language settings are instantaneosly displayed.
Display colour selection- A proper instrument colour theme selection may be useful to guarantee a correct screen view in different lighting conditions; depending on the available lighting and/or type of laser protection glasses, a specific display colour may offer a better view of the screen relevant information.

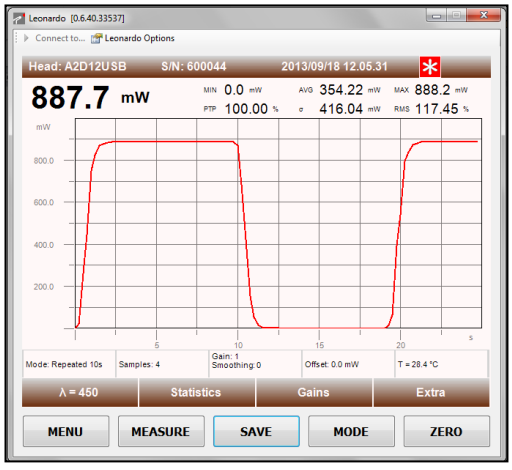
Measurement Menu (MEASURE key)



Measurement Function - LaserPoint heads can measure both power and single laser pulse energy so, to change measurement function, it is sufficient to click on the pop up that appears .
Power Measurement : In the case power is the selected measurement function, the instrument offers the option to display the measured data in Watt related units (mW, mW or W) or in dBm units.
Single shot energy: If the selected measurement function is single shot energy, the associated display screen appears: this is a histogram where the energy of each laser pulse is shown as a bar proportional to the pulse energy and the last energy measured value is shown.
Resolution: The resolution sheet allows to select the number of decimal digits after the dot .
Area: The area sheet allows the user to chose whether displaying the values of the measured function as absolute values (e.g in case of power in Watt related units) or as density values (e.g. in case of power density in W/cm^2) .

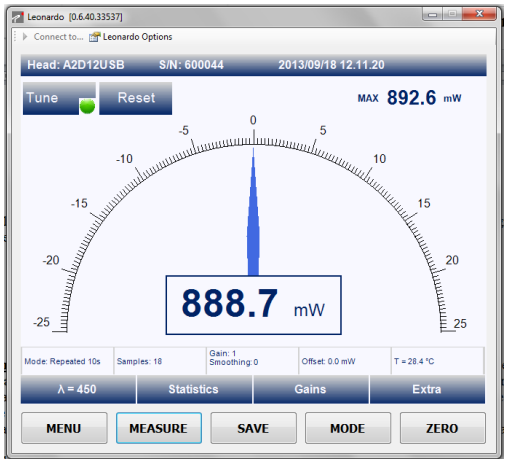
Display Mode Menu (MODE key)

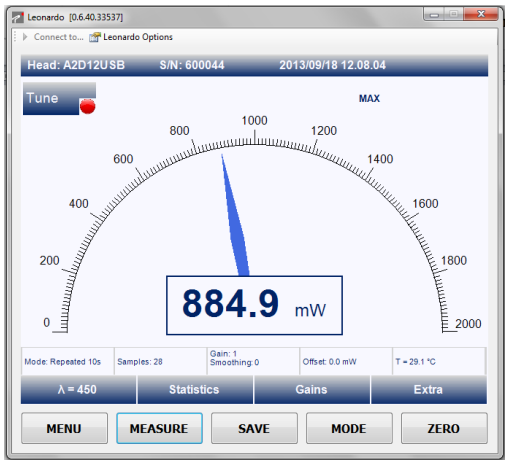
MODE:
allows the user to select one out of four modes to display the measured power data i.e: Digital mode, Trend mode, Analogue/ Tuning mode, Histogram mode.
A series of additional functional keys placed just on top of the main five keys: W**avelength setting, Statistics, Gains, Extra** complete the functional features of measurement planning, running and managing .
Digital mode: shows the instantaneous value of the measured power in form of a large sized number; this display mode features also a coloured bar representing the measured value as a proportional fraction of the sensor full scale .
Statistical information about all the measured samples is also given in the lower half of the display (Fig. 3).
Trend mode – shows a graph describing the measured values of power (Y axis) as a function of time (X axis) and the instantaneous value of the measured function .
For a full scale lower than 60 seconds the track shown on the display starts to scroll when it reaches the X axis full scale limit for a set time; for settings longer than 60 seconds the displayed trace does not scroll and the display is refreshed when the elapsed time reaches the full scale value.
Statistical information is also given in the upper part of the display (Fig. 6).



Analogue/Tuning mode –

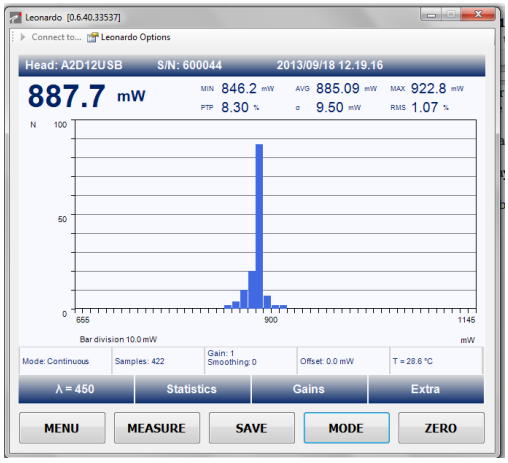
This display mode shows both the instantaneous value of the measured power indicated by a needle-like representation and in digital form .
For optical alignments, LaserPoint introduced also a "tuning" option : the user can align his setup or laser to an optimized power value





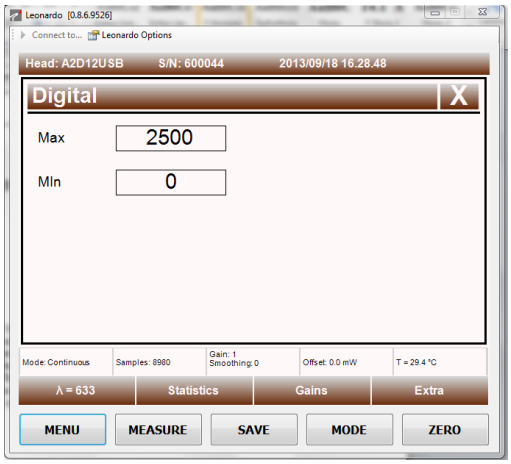
Histogram mode

Shows the historical collection of all measured samples represented in a typical histogram format. Measured power values is shown in the X axis and the number of counts in the Y axis; the instantaneous value of the measured power in shown in numerical form at the upper left hand side of the display.
The count of samples is automatically adjusted .
Meaningful statistical information is reported in the upper part of the display (
This measurement data display mode is particularly useful to analyse the power stability of a laser beam.

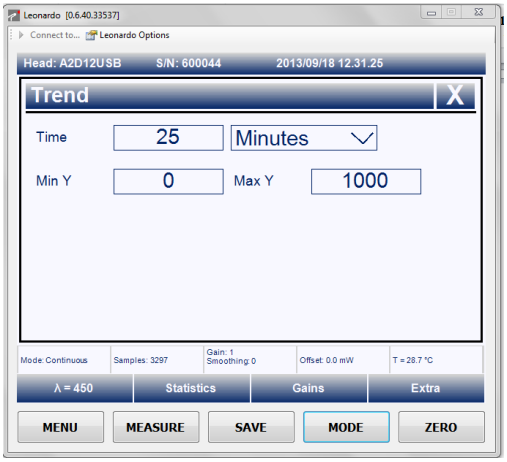


Scale setting

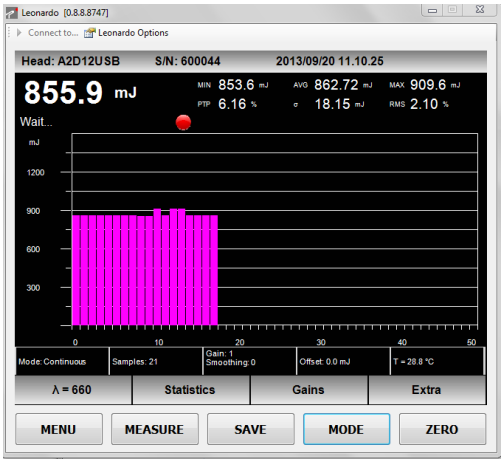
The initial scale setting of all display modes is automatic according to the sensor full scale or can be set to 10% of full scale .



The scale setting page appears and two small rectangular boxes show the present lower and upper scale values. By clicking on one of the two windows, a digital keyboard pops up , to change vales
Another example is the Trend mode setting : it features a scale with two axis, where the Y axis refers to the values of measured function and the X axis refers to time. By clicking on one of the two scale axis, the scale setting page shows two more windows that enable also the re-setting of time upper limit and the time lapse (seconds, minutes and hours).



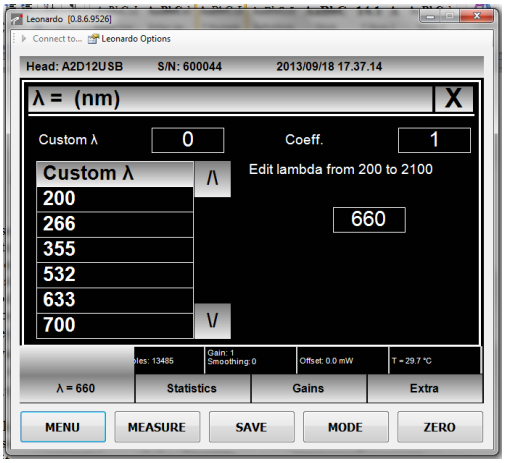
Single shot energy mode:



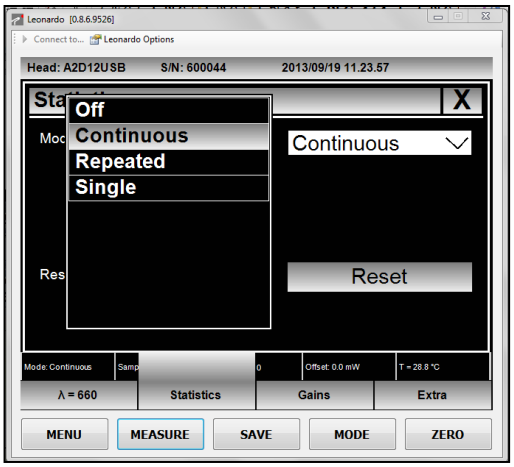
The energy display mode screen is a histogram-like graph where the energy of each laser pulse is represented as a vertical bar and the last measured energy value is also digitally shown . The statistical information about the measured data is shown in the upper part of the display.
A coloured spot shows three possible head/measurement states : when green the head is ready for a new measurement; after the sensor is hit by a laser pulse, the spot colour converts to yellow and then to red.

Additional functions keys

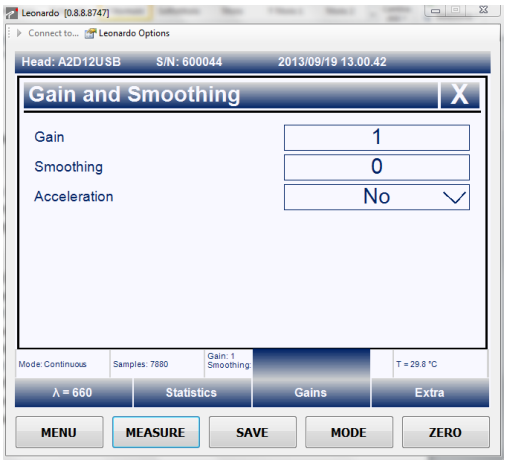
Each representation mode features also a series of additional functional keys placed just on top of the main five keys: From left to right: □
λ =……" (wavelength setting), Statistics, Gains, Extra.



Wavelength setting:
"λ =……" This function key is active in all display modes.
Thermal sensor heads: all LaserPoint sensor thermal heads are calibrated in range from 200nm to 2100nm and other discrete lambdas up to 10.6microns; the measured sensitivity spectrum is loaded too into the head EEPROM .
Upon clicking on the wavelength selection window, the page appears on the screen showing a table of pre-set wavelengths stored in the EEPROM of the sensor head. Should the sensor head be used at any wavelength not shown in the list, this can be chosen*, with 1 nm resolution ,on* the box "Edit lambda from 200 to 2100" .
Other wavelengths outside the stored wavelength range, can be calibrated on request by Laser Point



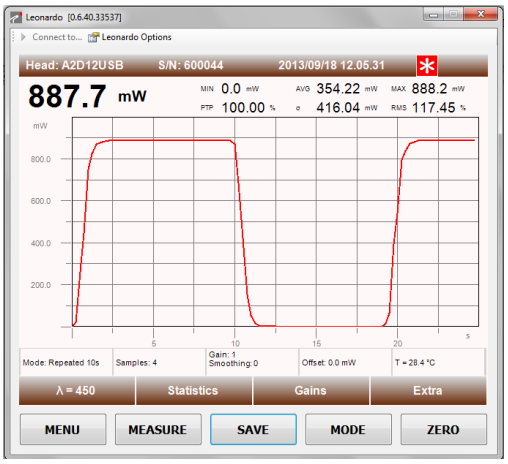
Statistics setting :
the statistics page shows rectangular small windows to select the mode of statistical elaboration. By a dialogue box, four options for the statistical collection mode and elaboration of data can be chosen The options are:
-Off: no statistics.
-Continuous: the data elaboration is made on a continuous data collection basis.
-Repeated: the data are repeatedly collected and elaborated within a user's defined time period.
-Single: the data are collected and elaborated once only within a user's defined time period.



Gains settings-
enables the change of the head electronics gain (factory setting =1), smoothing and acceleration factors .
This tool is particularly useful when it is desired to normalise a measurement or when the measurement is taken out of a complex optical systems and , e.g., a beam splitter is used to extract part of the optical signal;
The **Smoothing** parameter is related to the response time change of the head against its measured power. This function helps smoothing the signal fluctuations in the case the head responds too quickly, thus improving the head signal stability and signal to noise ratio.
The **Acceleration** option activate an acceleration algorithm that is particularly useful to speed up the thermopile sensor head measurement response and for this type of heads is normally on.

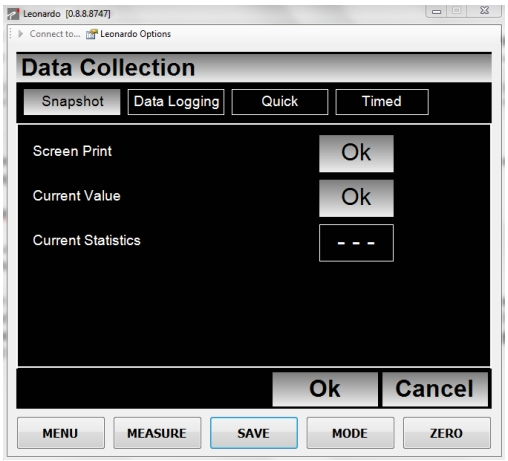
Extra-
The fourth function key, enables the user and LaserPoint service engineer to access information and tools regarding the sensor head electronics.
The Extra page opens providing access to three sheets: Info, Calibration, LaserPoint.
Info: provides information about the head HW and FW versions and the suggested next calibration date.
Calibration: the sheet contains calibration data and the is currently not available to users.
LaserPoint: the access to this sheet is protected by password and is exclusively reserved to LaserPoint engineers.

Data Saving Function (SAVE key)

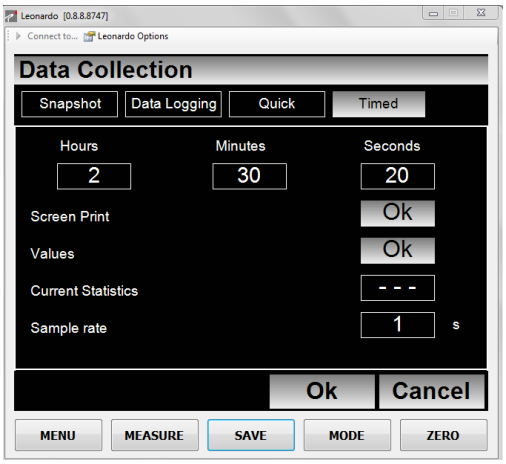


This key allows to save the measured data and to define the data logging mode through three available saving mode options: Snapshot, Timed and Quick.
SAVE key has two functions::
-the former is the **freezing of the display** content (display graph and figures) and
-the latter is the planning data collection and saving mode by accessing the **Data Collection**

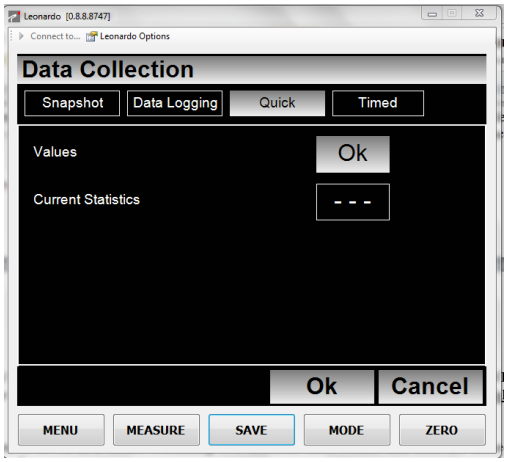
Snapshot mode:



This mode allows to save the screen content, and/or the last value of the measured function and/or the relative statistics .
Data information is saved in a folder hosted in the previously created **main folder** by means of Leonardo Options; this folder may contain up to three different files: one for the screen print and two for the measured and statistics data.



Timed mode: saves the measured values, and/or the current set statistics values by defining the measurement session time (in hours, minutes and seconds) and the sample rate (in seconds).
The measurement time can be selected between a minimum of 1s and a maximum limit of 23h 59m 59s and the sample rate can be set to any integer value between 1s and 300s.
Similarly to the previously described **Snapshot mode**, the user can decide to save the measured values, and/or the planned set of statistics values. All data saved within the same day are loaded into the same folder.



Quick mode - This mode has been provided to help Manufacturing departments to save the testing data of lasers under. This mode allows to save the measured values, and/or the current set statistics values ordered in a .csv file that can easily be associated to a file containing the S/Ns of devices under test and to help producing a manufacturing lot test sheet. .

Re-setting Menu (ZERO key)

ZERO enables to define the optical zero of the sensor head and the electrical zero by resetting the head electronics ADC.

Alarms

The Sw graphic interface can display three types of alarms:
Calibration overdue alarm: In the case the head recommended calibration date has been overcome .
NO head alarm: This alarm appears on the screen when the head is disconnected .
Temperature Alarm (thermopiles only): This alarm appears when the thermopile sensor head temperature exceeds its specified safety limit (typically 80°C).
Overflow Alarm: This alarm appears when the signal detected by the instrument exceeds the instantaneous maximum power the sensor head can bear.

leonardo SW Specifications

- **System Requirements**

CPU 1.2 GHz (x86 or x64-bit); 10 MB hard-disk space; 1 GB RAM; 1024x600 minimum display resolution

Operative System: Win XP (service pack 3), Vista or Windows 7

Compatible Heads

All LaserPoint PC-Plug heads with USB-SWL electronics interface

- **Measurement Features & Analysis**

Power Measurement and Display in linear units (W and related units) or logarithmic units (dBm)

Energy Measurement and Display in linear units (J and fractional related units)

Measurement resolution: 1/50,000 full scale

Visual resolution: 3,4 or 5 digits (custom settable)

Instrument Accuracy: ±1.0%

Sampling Frequency: 1kHz

Elaboration frequency: 64Hz

Power measurement representation Modes: Digital, Trend, Analogue with Tuning Function, Histogram

Energy measurement representation Mode: Histogram like

- **Statistical Functions**

Full Statistics (Min., Max., Mean, RMS, Std. Dev., Peak-to-Peak).

Programmable data collection modes

- **Additional Functions and Information**

Wavelength selection with 1nm pitch over 200nm to 2100nm

Area function for Radiance (W/cm2) and Fluence (J/cm2) measurements

Gain settable by User to compensate the beam splitting ratio or to normalise the measurement data

Smoothing Function for head time response optimisation

Programmable Measurement Data Saving

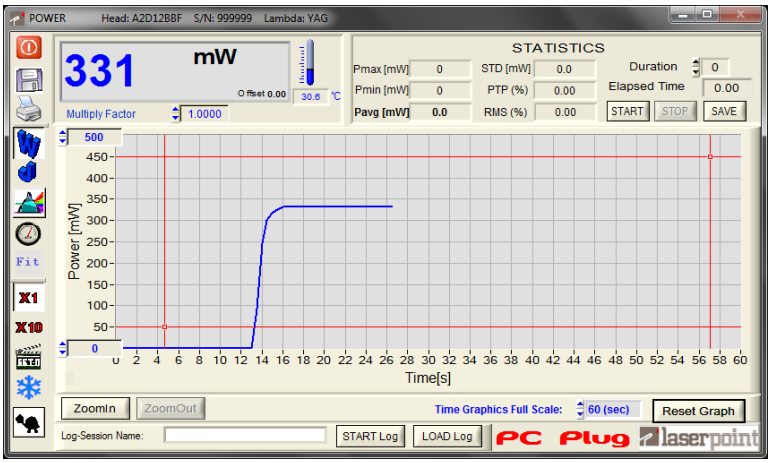
Head Temperature indication

Next Calibration date indication

Date and time indication

PC-Plug : SW for RS-232 Power/Energy Sensors

The applications software for PC-Plugs is supplied free with each sensor.
It enables the operator to get instantaneous readings of power, monitor laser stability, have measurement statistics (minimum, maximum, mean, standard deviation), log power data.
To those integrators that require an in-house written software, Laser Point will provide a DLL driver that supports simple ASCII remote interfacing host commands on both the PC-Plug-RS232 and PC-Plug-USB sensors.
Furthermore, PC-PLug-USB sensors are recognized as a COM port by Windows, which makes the addressing of ASCII commands to the port another easy task.
The *Power panel* permits measurements of laser powers with direct display of their actual values. The screen also shows the evolution of power over time allowing long term stability measurements as long as 12 hours .

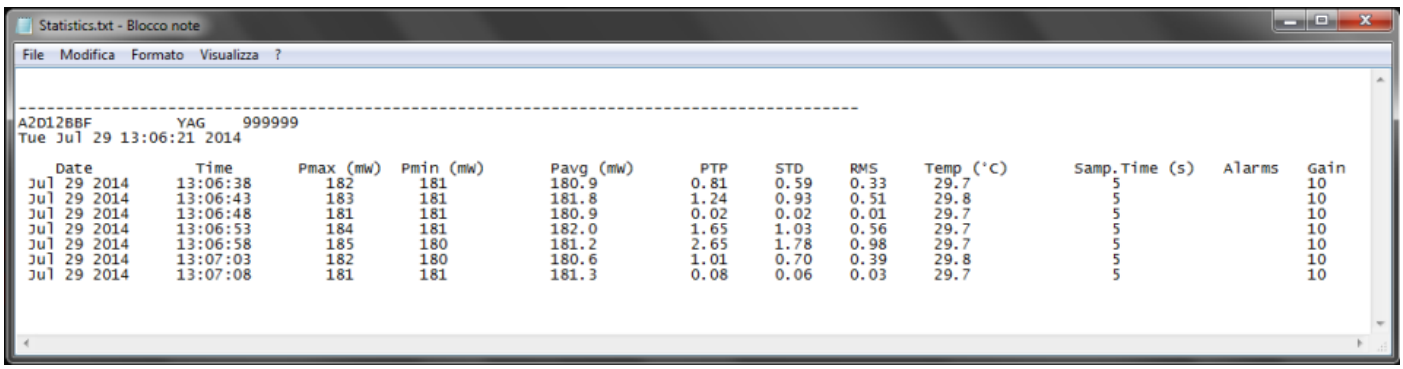


Icons

Saves acquired power data in a .txt file. The operator is simply requested to set the sampling time and provide the file name Acquisition data are continuously saved until the icon clicked again	Activates the Tuning function
Sends the current panel information to a printer	Zeroes the instrument to remove any residual offset.
Activates the laser power measurement function	Stops data acquisition and running statistics
Allows the wavelength selection	Amplifies head signals by a factor of 10

Save Data on File

By the simple click of the "SAVE" key, measured data can be saved as a text (*.txt) file.
The structure of saved files includes sensor model, calibration wavelength, sensor serial number, date and time of file generation . Each acquisition records date, time, statistical data, sensor temperature, duration of sampling interval, generated alarms. Data can later be imported into a spreadsheet (e.g.Excel).

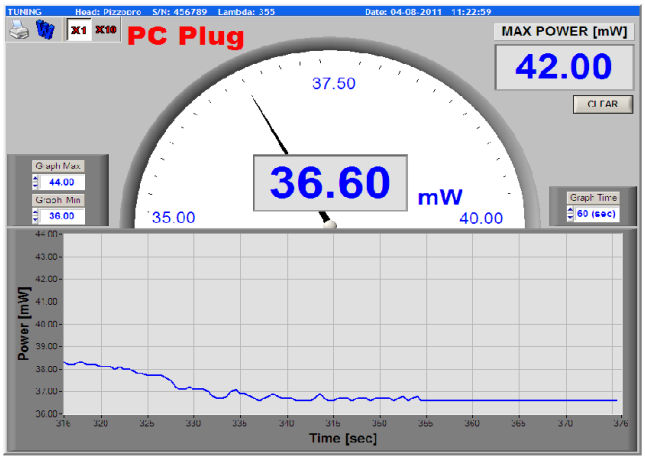


Log Comment Line

This software feature allows to log power data up to 12 hours, automatically. Loaded data are saved in text file that can be delivered together with the laser/machine as a proof of its performance, saved by manufacturer as an internal record or used by service technicians to restore initial conditions.

Laser Tuning

Laser Tuning is used to achieve a fine alignment of your laser. The needle shows the direction of tuning. The central box displays the actual power, while the maximum value reached during the tuning procedure is kept in the Power Max box.



Warning Messages

Each time the laser power or energy exceeds the head full scale the OVERFLOW alarm is displayed.
Should a measurement head reach its limit temperature (overheating of a head may be due to problems to the cooling circuit such as low water pressure, lack of fluid, obstructions, etc, or poor heat exchange in air cooled heads), the COOL message will be displayed on the main window and the data displayed in the graph are pinned to the last power value acquired before the alarm .

Technical Specifications

For customers who like to write their own software or for system integrators sensors can be supplied with an easy to access command set with DLL drivers that support simple ASCII host commands

Platform compatible with Thermal sensors

Sensors are supplied with NIST/PTB traceable calibration.
Measurement Resolution: 4 digits

Power Meter Mode

Power Ranges: 1mW to 6 kW
Resolution: 0.5‰ for any Full Scale
Response Time <1-5sec.(depends on specific head)

Tuning

-Displays a Digital Bargraph for Tuning Direction
-Displays Actual Power Value
-Displays Variations (as %) form Tuning Initial Value)

Wavelength Selections

Customers can select up to 5 different wavelengths.
Spectral compensation is provided for wavelengths different from calibration wavelength.

GENERAL

High resolution A/D converter

Software: Full Windows application software

Communication: -PC-Plugs-USB provide USB 2.0 connection to PC.
-PC-Plugs-RS232 provide RS232 connection to PC

Display: Computer Screen

Speed up Algorithm to accelerate detector's natural response time

Data Log: up to 12h

Data Displays: Trending, Full Statistics, Tuning, Alarms

Additional Input Gain: 10X

Dimensions 75 (L) x 22 (W) x 13 (H) mm

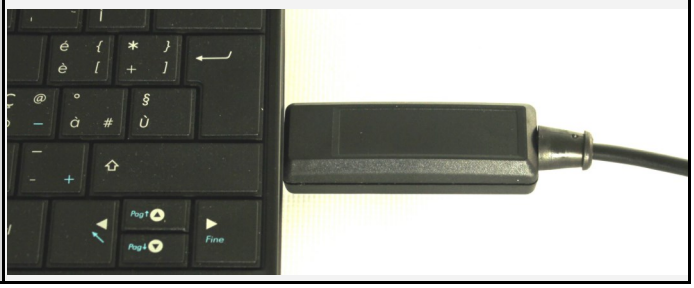
Power :provided by external +12 VDC input for RS-232 Sensors

Operating environment:

°Storage Temperature:-10 to 60 ºC

° Range of Use :5 to 45 ºC

°Reference Conditions : 21 ± 4 ºC ;RH 20-80%

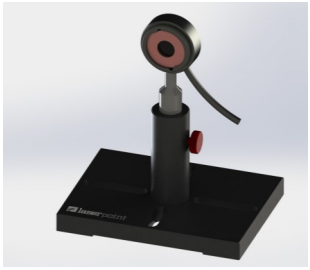


USB Photodiode Power Sensors

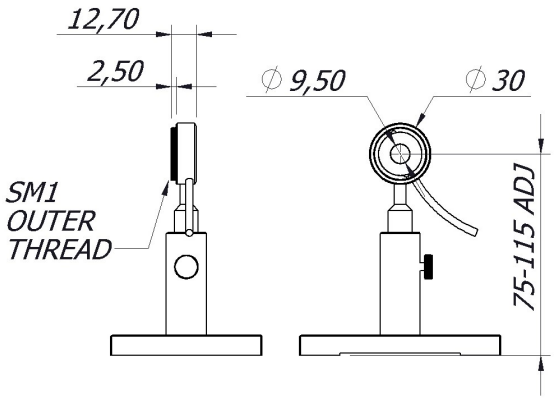
Range: 10 µW – 500mW

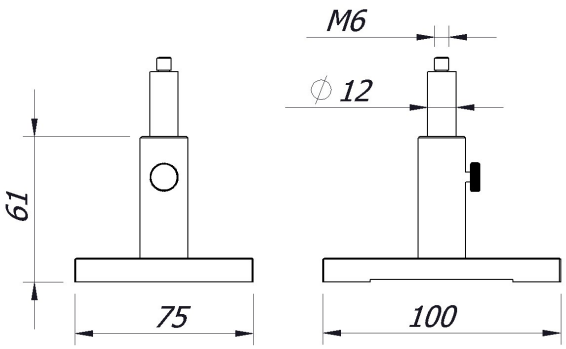
Features:

- Sensitive detectors for low power measurements
- UV enhanced and NIR Detectors (200nm to 1800nm)
- Fiber adapters available (SMA,ST, FC,LC,SC)



Model	PD-50-D9-UV-USB	PD-50-D9-VIS-USB	PD-50-D9-IR-USB	PD-500-D9-VIS-USB
Power Mode				
Max. Average Power (1)	50 mW	50 mW	40 mW	500 mW
Min. Power	10 µW	10 µW	100 µW	100 µW
Power Resolution	100 nW	100 nW	1 µW	1 µW
Noise Equivalent Power (NEP) (1)	50 nW	50 nW	500 nW	500 nW
Response Time	0.5 sec	0.5 sec	0.5 sec	0.5 sec
Power Calibration Uncertainty	± 5% @200-400nm, ±3% @400-1000nm, ±5% @1000-1100nm	± 5% @400-500nm, ±3% @500-1000nm, ±5% @1000-1100nm	± 7% @800-1000nm, ±3% @1000-1650nm, ±5% @1650-1800nm	± 5% @400-500nm, ±3% @500-1000nm, ±5% @1000-1100nm
Dependance on beam postion	± 2%	± 2%	± 2%	± 2%
Absorber Specs				
Aperture	9.5 mm	9.5 mm	9.5 mm	9.5 mm
Type	Silicon	Silicon	Germanium	Silicon
Calibration Spectral Range	200 - 1100 nm	400 - 1100 nm	800 - 1800 nm	400 - 1100 nm
Max Power Density	20 W/cm²	20 W/cm²	10 W/cm²	20 W/cm²
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.1 Kg	0.1 Kg	0.1 Kg	0.1 Kg
Dimension	Ø 31 x 14 mm	Ø 31 x 14 mm	Ø 31 x 14 mm	Ø 31 x 14 mm
Cable lenght - connector	1.5 m - USB	1.5 m - USB	1.5 m - USB	1.5 m - USB
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). Wavelength dependent.				





PD-50-D9-UV-USB
PD-50-D9-VIS-USB
PD-50-D9-IR-USB
PD-500-D9-VIS-USB

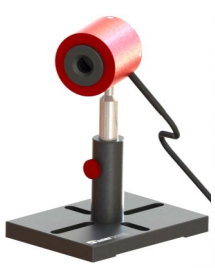
Light Duty Stand

USB/RS232 Sensors for Low Power Lasers

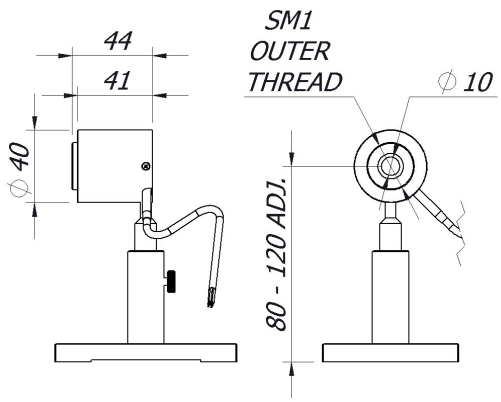
Range: 100µW to 5W

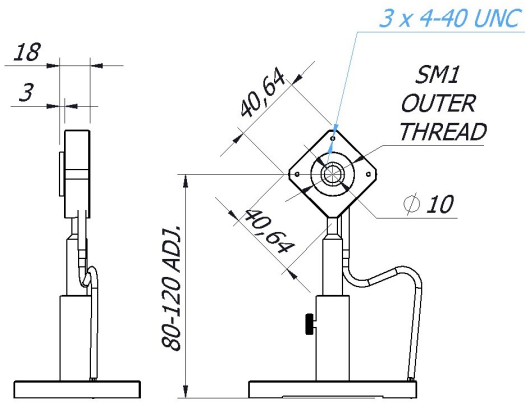
Features:

- Very low power measurements
- Small footprints
- Broadband absorbers



Model	A-02-D12-BBF-USB / A-02-D12-BBF-RS	A-2-D12-BBF-USB / A-2-D12-BBF-RS	A-2-D12-HPB-USB / A-2-D12-HPB-RS	A-5-D12-BBF-USB / A-5-D12-BFF-RS
Power Mode				
Max. Average Power	200 mW	2 W	2 W	5 W
Max. Intermittent Power (1)	200 mW	2 W	2 W	7.5 W
Min. Power	0.1 mW	1 mW	1 mW	10 mW
Power Resolution	10 µW	100 µW	100 µW	100 µW
Noise Equivalent Power (NEP)	5 µW	50 µW	50 µW	500 µW
Response Time	2.5 sec	2.5 sec	3 sec	1 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%	± 1%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	200 mJ	2 J	2 J	5 J
Min. Energy	0.5 mJ	2.5 mJ	2.5 mJ	25 mJ
Energy Resolution	10 µJ	10 µJ	10 µJ	100 µJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	10 mm	10 mm	10 mm	10 mm
Type	BBF	BBF	HPB	BBF
Absorber Spectral Range	0.19 - 25 µm	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	200 W/cm²	200 W/cm²	18 kW/cm² @10 W	200 W/cm²
Max Energy Density (3)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.2 kg	0.2 kg	0.2 kg	0.2 kg
Dimension	Ø 40 x 44 mm	Ø 40 x 44 mm	Ø 40 x 44 mm	41 x 41 x 18 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter





A-02-D12-BBF-USB / A-2-D12-BBF-RS
A-2-D12-BBF-USB/ A-2-D12-BBF-RS
A-2-D12-HPB-USB/ A-2-D12-HPB-RS

A-5-D12-BBF-USB/ A-5-D12-BFF-RS

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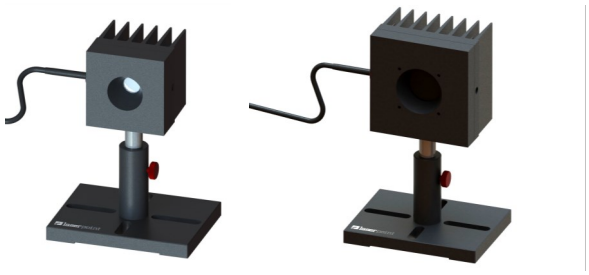
USB/RS232 Sensors for Low Power Lasers

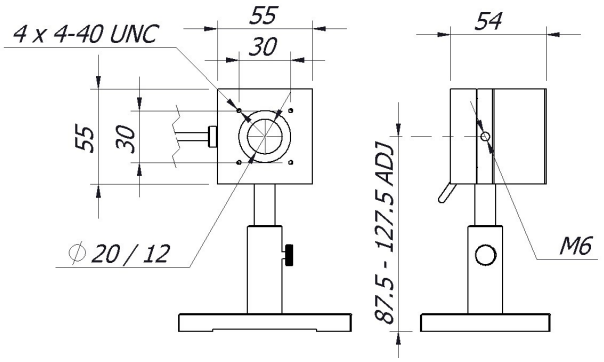
Range: 10mW to 30W

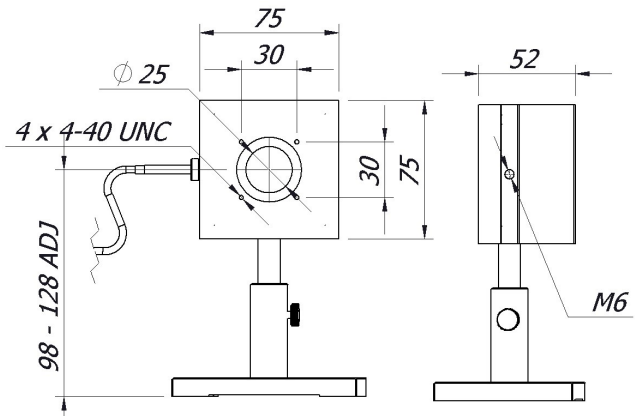


Features:

- Very low power measurements
- Small footprints
- Broadband absorbers

Model	A-10-D12-HPB-USB / A-10-D12-HPB-RS	A-10-D20-BBF-USB / A-10-D20-BBF-RS	A-10-D20-HPB-USB / A-10-D20-HPB-RS	A-30-D25-HPB-USB / A-30-D25-HPB-RS
Power Mode				
Max. Average Power	10 W	10 W	10 W	30 W
Max. Intermittent Power (1)	15 W	15 W	15 W	45 W
Min. Power	10 mW	10 mW	10 mW	20 mW
Power Resolution	100 µW	100 µW	100 µW	1 mW
Noise Equivalent Power (NEP)	500 µW	600 µW	600 µW	1 mW
Response Time	1 sec	1 sec	1 sec	1.8 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%	± 1%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	15 J	15 J	15 J	45 J
Min. Energy	25 mJ	25 mJ	25 mJ	100 mJ
Energy Resolution	100 µJ	100 µJ	100 µJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	12 mm	20 mm	20 mm	25 mm
Type	HPB	BBF	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	18 kW/cm² @10 W	200 W/cm²	18 kW/cm² @10 W	18 kW/cm² @10 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.3 kg	0.3 kg	0.3 kg	0.5 kg
Dimension	55 x 55 x 54 mm	55 x 55 x 54 mm	55 x 55 x 54 mm	75 x 75 x 52 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter	Available with fiber adapter





A-10-D12-HPB-USB/ A-10-D12-HPB-RS
A-10-D20-BBF-USB/ A-10-D20-BBF-RS
A-10-D20-HPB-USB/ A-10-D20-HPB-RS

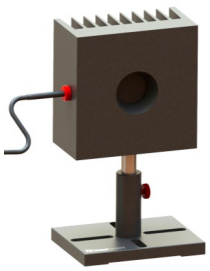
A-30-D25-HPB-USB/ A-30-D25-HPB-RS

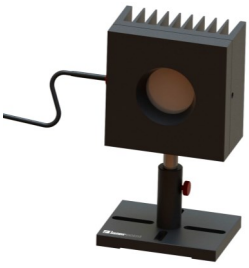
USB/RS232 Sensors for Low Power Lasers

Range: 20mW to 40W

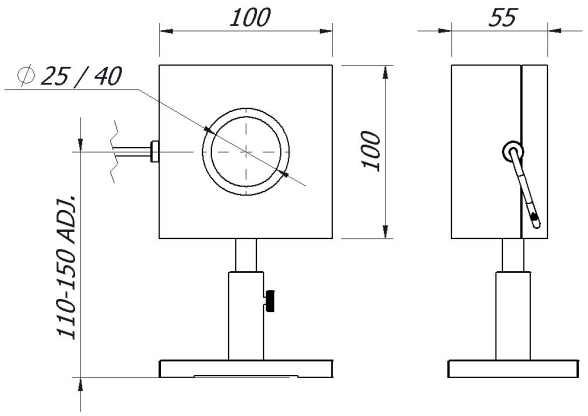
Features:

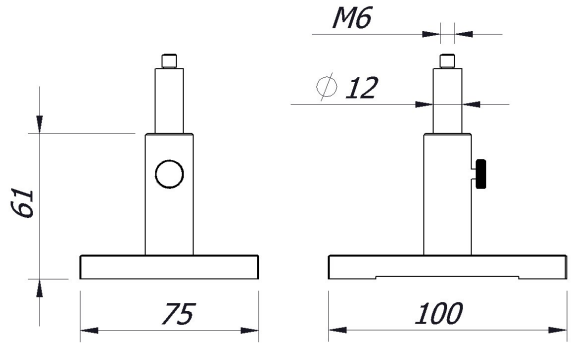
- Very low power measurements
- Small footprints
- HPB coating is also suitable for Excimer Lasers





Model	A-40-D25-BBF-USB / A-40-D25-BBF-RS	A-40-D25-HPB-USB / A-40-D25-HPB-RS	A-40-D40-HPB-USB / A-40-D40-HPB-RS
Power Mode			
Max. Average Power	40 W	40 W	40 W
Max. Intermittent Power (1)	60 W	60 W	60 W
Min. Power	20 mW	20 mW	20 mW
Power Resolution	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	1 mW	1 mW	1 mW
Response Time	1.8 sec	1.8 sec	2 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	60 J	60 J	60 J
Min. Energy	100 mJ	100 mJ	100 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	25 mm	25 mm	40 mm
Type	BBF	HPB	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	200 W/cm²	9 kW/cm² @40 W	9 kW/cm² @40 W
Max Energy Density (3)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.9 kg	0.9 kg	0.9 kg
Dimension	100 x 100 x 55 mm	100 x 100 x 55 mm	100 x 100 x 55 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter	Available with fiber adapter	





A-40-D25-BBF-USB/ A-40-D25-BBF-RS
A-40-D25-HPB-USB/ A-40-D25-HPB-RS
A-40-D40-HPB-USB/ A-40-D40-HPB-RS

Light Duty Stand

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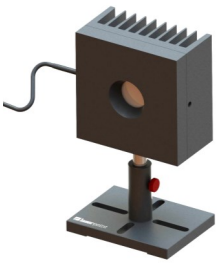
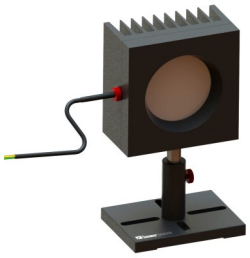
USB/RS232 Sensors for Medium Power Lasers

Range: 100mW to 200W

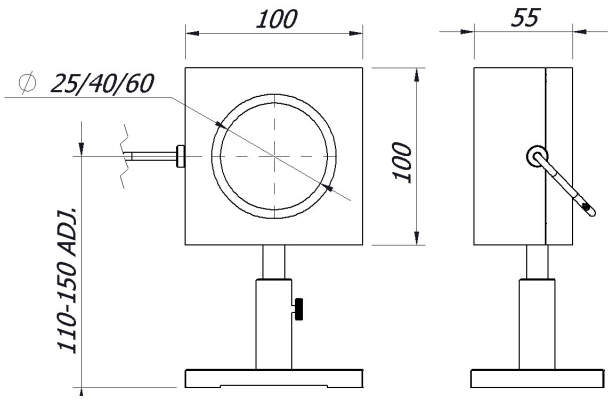


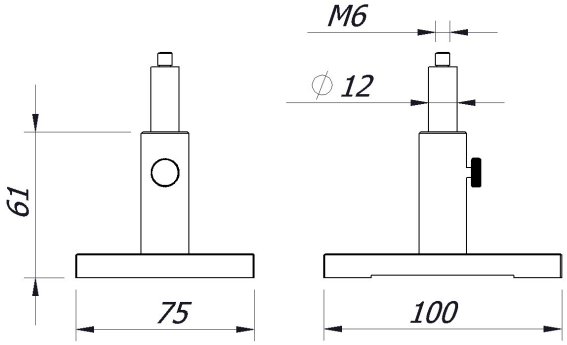


Features:

- Very low power measurements
- Small footprints
- HPB coating is also suitable for Excimer Lasers

Model	A-40/200-D25-HPB-USB / A-40/200-D25-HPB-RS	A-40/200-D40-HPB-USB / A-40/200-D40-HPB-RS	A-40/200-D60-HPB-USB / A-40/200-D60-HPB-RS
Power Mode			
Max. Average Power	40 W	40 W	40 W
Max. Intermittent Power (1)	200 W	200 W	200 W
Min. Power	150 mW	100 mW	200 mW
Power Resolution	10 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	6 mW	5 mW	10 mW
Response Time	2 sec	2.5 sec	3.5 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	200 J	200 J	200 J
Min. Energy	200 mJ	300 mJ	500 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	25 mm	40 mm	60 mm
Type	HPB	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	11 kW/cm² @40 W	11 kW/cm² @40 W	11 kW/cm² @40 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.9 kg	0.9 kg	0.9 kg
Dimension	100 x 100 x 55 mm	100 x 100 x 55 mm	100 x 100 x 55 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter		





A-40/200-D25-HPB-USB/ A-40/200-D25-HPB-RS
A-40/200-D40-HPB-USB/ A-40/200-D40-HPB-RS
A-40/200-D60-HPB-USB/ A-40/200-D60-HPB-RS

Light Duty Stand

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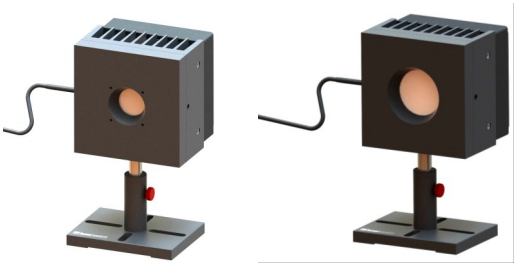
USB/RS232 Sensors for Medium Power Lasers

Range: 200mW to 200W

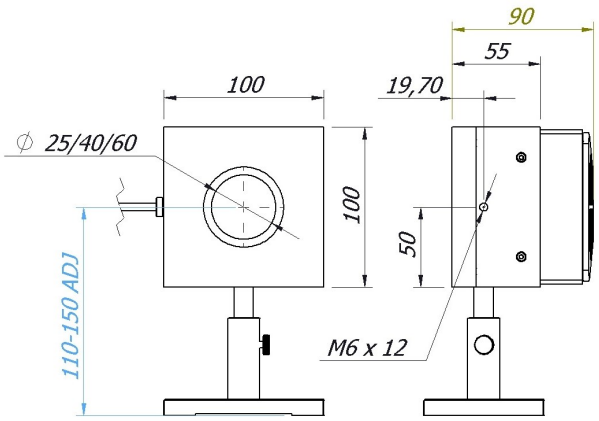


Features:

- Highest Power Density on SHC Coating
- Small footprints
- HPB coating is suitable for Excimer Lasers

Model	A-200-D25-HPB-USB / A-200-D25-HPB-RS	A-200-D25-SHC-USB / A-200-D25-SHC-RS	A-200-D40-HPB-USB / A-200-D40-HPB-RS	A-200-D40-SHC-USB / A-200-D40-SHC-RS
Power Mode				
Max. Average Power	200 W	200 W	200 W	200 W
Max. Intermittent Power (1)	250 W	250 W	250 W	250 W
Min. Power	0.2 W	0.2 W	0.2 W	0.2 W
Power Resolution	10 mW	10 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	10 mW	10 mW	10 mW	10 mW
Response Time	2.2 sec	2.2 sec	3 sec	3 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%	± 1%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	250 J	250 J	250 J	250 J
Min. Energy	0.5 J	0.5 J	0.5 J	0.5 J
Energy Resolution	10 mJ	10 mJ	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	25 mm	25 mm	40 mm	40 mm
Type	HPB	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	4 kW/cm² @200 W	17 kW/cm² @200 W	4 kW/cm² @200 W	17 kW/cm² @200 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics				
Cooling	Forced Air with Fan (a)	Forced Air with Fan (a)	Forced Air with Fan (a)	Forced Air with Fan (a)
Weight	1.2 kg	1.2 kg	1.2 kg	1.2 kg
Dimension	100 x 100 x 85 mm	100 x 100 x 85 mm	100 x 100 x 85 mm	100 x 100 x 85 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter (a). 12V DC Power Supply Included	Available with fiber adapter (a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included

A-200-D25-HPB-USB/ A-200-D25-HPB-RS
A-200-D25-SHC-USB/ A-200-D25-SHC-RS
A-200-D40-HPB-USB/ A-200-D40-HPB-RS
A-200-D40-SHC-USB/ A-200-D40-SHC-RS



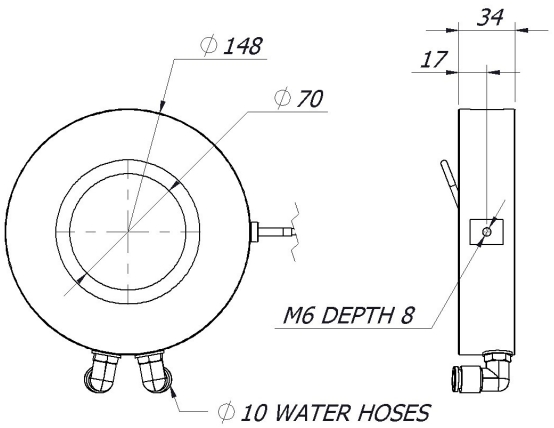
USB/RS232 Sensors for Medium Power Lasers

Range: 500mW to 500W

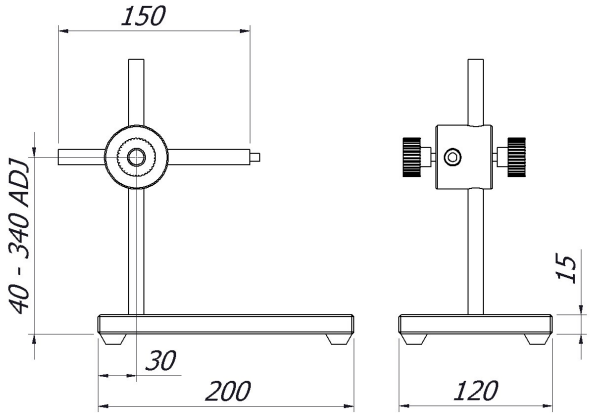
Features:

- Corrosion-Proof Water-Cooled Sensor
- Large aperture for Laser Diode Stacks
- Highest Power Density on SHC Coating

Model	W-500-D70-SHC-USB / W-500-D70-SHC-RS
Power Mode	
Max. Average Power	500 W
Max. Intermittent Power (1)	700 W
Min. Power	0.5 W
Power Resolution	10 mW
Noise Equivalent Power (NEP)	30 mW
Response Time	5 sec
Power Calibration Uncertainty	± 3%
Power Linearity (2)	± 1.5%
Single Shot Energy Mode	
Max. Energy (with 100 ms pulse)	700 J
Min. Energy	2 J
Energy Resolution	10 mJ
Energy Calibration Uncertainty	± 5%
Absorber Specs	
Aperture	70 mm
Type	SHC
Absorber Spectral Range	0.19 - 11 µm
Calibration Spectral Range	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	19 kW/cm² @500 W
Max Energy Density (3)	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics	
Cooling	Water (a)
Weight	1.9 kg
Dimension	Ø 148 x 34 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232
Stand and Post	Heavy Duty Stand Included
Notes	
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 3 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min



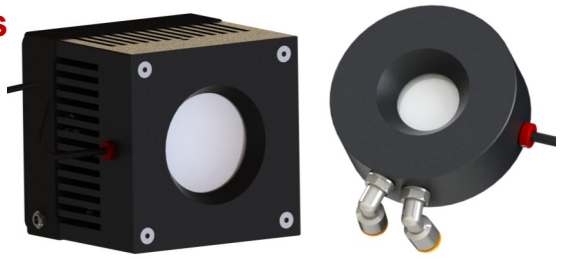
W-500-D70-SHC-USB/ W-500-D70-SHC-RS



Heavy Duty Stand

USB/RS232 Sensors for Medium Power Lasers

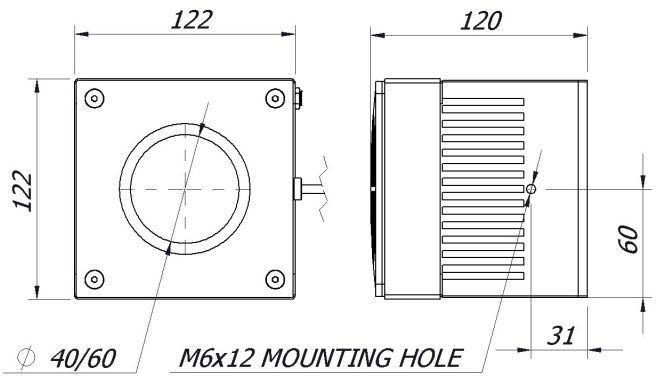
Range: 500mW to 600W

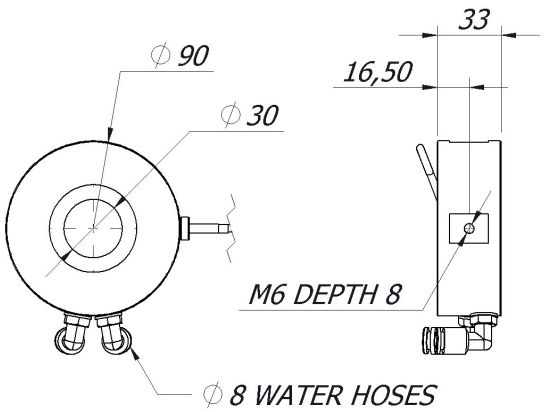


Features:

- Air and water cooled heads to 600 W
- Corrosion-Proof Water-Cooled Sensor
- Highest Power Density on SHC Coating

Model	A-600-D40-HPB-USB / A-600-D40-HPB-RS	A-600-D60-SHC-USB / A-600-D60-SHC-RS	W-600-D30-HPB-USB / W-600-D30-HPB-RS	W-600-D30-SHC-USB / W-600-D30-SHC-RS
Power Mode				
Max. Average Power	600 W	600 W	600 W	600 W
Max. Intermittent Power (1)	750 W	750 W	800 W	800 W
Min. Power	0.5 W	0.5 W	0.5 W	0.5 W
Power Resolution	10 mW	10 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	50 mW	50 mW	25 mW	25 mW
Response Time	5 sec	4 sec	2.5 sec	2.5 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1.5%	± 1.5%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	600 J	700 J	600 J	600 J
Min. Energy	1 J	1 J	2 J	2 J
Energy Resolution	10 mJ	10 mJ	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	40 mm	60 mm	30 mm	30 mm
Type	HPB	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	3 kW/cm² @500 W	11 kW/cm² @500 W	5 kW/cm² @500 W	19 kW/cm² @500 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics				
Cooling	Forced Air with Fan (a)	Forced Air with Fan (a)	Water (a)	Water (a)
Weight	2.2 kg	2.5 kg	0.6 kg	0.6 kg
Dimension	122 x 122 x 120 mm	122 x 122 x 120 mm	Ø 90 x 33 mm	Ø 90 x 33 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Stand and Post	Heavy Duty Stand Included	Heavy Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included	(a). Water 3 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 3 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min





A-600-D40-HPB-USB/ A-600-D40-HPB-RS
A-600-D60-SHC-USB/ A-600-D60-SHC-RS

W-600-D30-HPB-USB/ W-600-D30-HPB-RS
W-600-D30-SHC-USB/ W-600-D30-SHC-RS

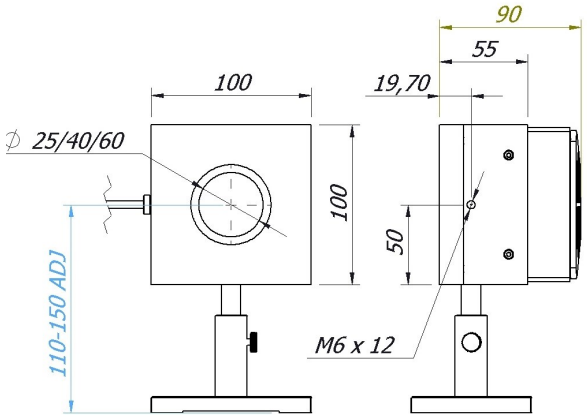
USB/RS232 Sensors for Medium Power Lasers

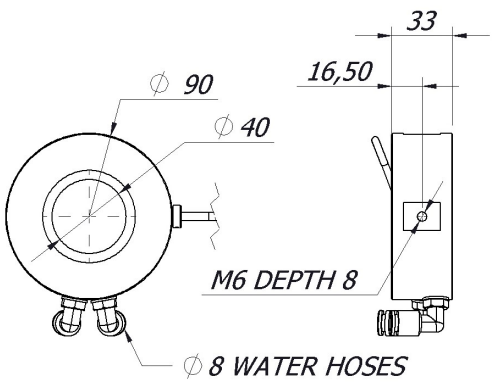
Range: 200mW to 200W

Features:

- Large Area, Air and Water Cooled Units
- Corrosion-Proof Water-Cooled Sensor
- HPB coating is suitable for Excimer Lasers

Model	A-200-D60-HPB-USB / A-200-D60-HPB-RS	A-200-D60-SHC-USB / A-200-D60-SHC-RS	W-200-D40-HPB-USB / W-200-D40-HPB-RS	W-200-D40-SHC-USB / W-200-D40-SHC-RS
Power Mode				
Max. Average Power	200 W	200 W	200 W	200 W
Max. Intermittent Power (1)	250 W	250 W	300 W	300 W
Min. Power	0.3 W	0.3 W	0.2 W	0.2 W
Power Resolution	10 mW	10 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	15 mW	15 mW	10 mW	10 mW
Response Time	4 sec	4 sec	2.5 sec	2.5 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	250 J	250 J	300 J	300 J
Min. Energy	0.5 J	0.5 J	1 J	1 J
Energy Resolution	10 mJ	10 mJ	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	60 mm	60 mm	40 mm	40 mm
Type	HPB	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	4 kW/cm² @200 W	17 kW/cm² @200 W	7 kW/cm² @200 W	28 kW/cm² @200 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics				
Cooling	Forced Air with Fan (a)	Forced Air with Fan (a)	Water (a)	Water (a)
Weight	1.2 kg	1.2 kg	0.6 kg	0.6 kg
Dimension	100 x 100 x 85 mm	100 x 100 x 85 mm	Ø 90 x 33 mm	Ø 90 x 33 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs	(a). 12V DC Power Supply Included	(a). 12V DC Power Supply Included	(a). Water 1.5 liter/min (@ 22° C); admissible rate of temperature variation < 1 °C/min	(a). Water 1.5 liter/min (@ 22° C); admissible rate of temperature variation < 1 °C/min





A-200-D60-HPB-USB/ A-200-D60-HPB-RS
A-200-D60-SHC-USB/ A-200-D60-SHC-RS

W-200-D40-HPB-USB/ W-200-D40-HPB-RS
W-200-D40-SHC-USB/ W-200-D40-SHC-RS

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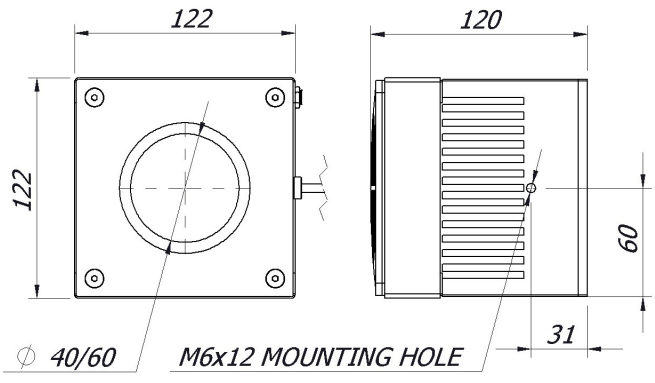
USB/RS232 Sensors for Medium Power Lasers

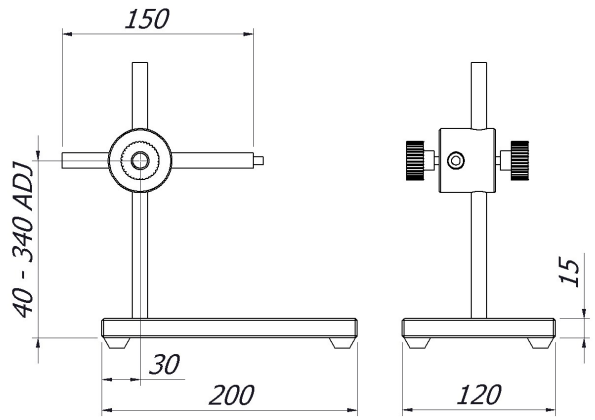
Range: 500mW to 300W

Features:

- 60mm Aperture
- Air Cooled
- HPB coating also suitable for Excimer Lasers

Model	A-300-D60-HPB-USB / A-300-D60-HPB-RS
Power Mode	
Max. Average Power	300 W
Max. Intermittent Power (1)	400 W
Min. Power	0.5 W
Power Resolution	10 mW
Noise Equivalent Power (NEP)	25 mW
Response Time	4 sec
Power Calibration Uncertainty	± 3%
Power Linearity (2)	± 1%
Single Shot Energy Mode	
Max. Energy (with 100 ms pulse)	400 J
Min. Energy	0.75 J
Energy Resolution	10 mJ
Energy Calibration Uncertainty	± 5%
Absorber Specs	
Aperture	60 mm
Type	HPB
Absorber Spectral Range	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (3)	6 kW/cm² @200 W
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics	
Cooling	Forced Air with Fan (a)
Weight	2.1 kg
Dimension	122 x 122 x 120 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232
Stand and Post	Heavy Duty Stand Included
Notes	
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). 12V DC Power Supply Included





A-300-D60-HPB-USB/ A-300-D60-HPB-RS

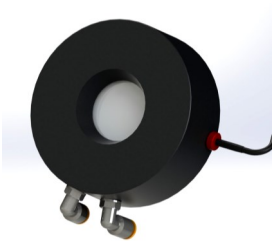
Heavy Duty Stand

USB/RS232 Sensors for High Power Lasers

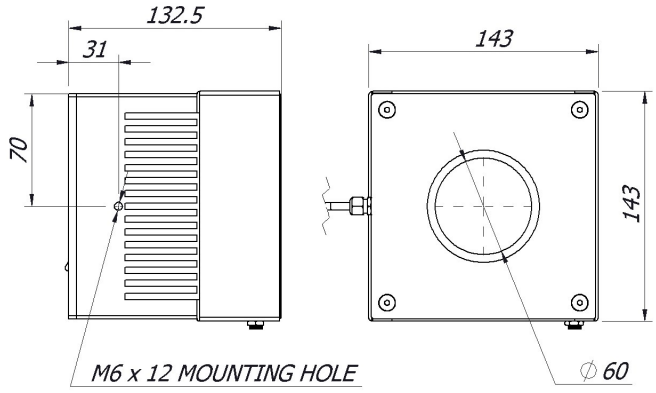
Range: 2W to 1500W

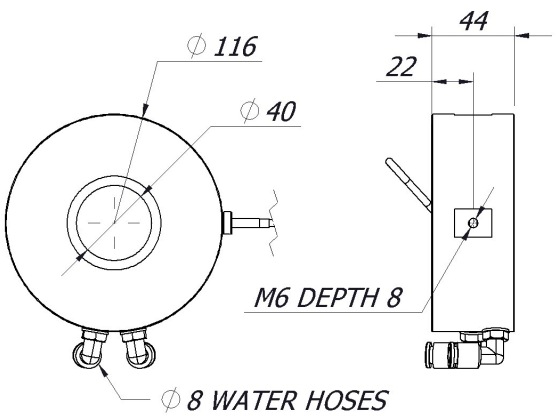
Features:

- Air cooled head to 1200 W
- Water cooled heads to 1500 W
- Corrosion-Proof Water-Cooled Sensors



Model	A-1200-D60-SHC-USB / A-1200-D60-SHC-RS	W-1500-D40-HPB-USB / W-1500-D40-HPB-RS	W-1500-D40-SHC-USB / W-1500-D40-SHC-RS
Power Mode			
Max. Average Power	1200 W	1500 W	1500 W
Max. Intermittent Power (1)	1200 W	2250 W	2250 W
Min. Power	2 W	4 W	4 W
Power Resolution	100 mW	100 mW	100 mW
Noise Equivalent Power (NEP)	100 mW	200 mW	200 mW
Response Time	7 sec	4.5 sec	4.5 sec
Power Calibration Uncertainty	± 3%	± 5%	± 5%
Power Linearity (2)	± 1.5%	± 1.5%	± 1.5%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	1000 J	2250 J	2250 J
Min. Energy	4 J	5 J	5 J
Energy Resolution	100 mJ	100 mJ	100 mJ
Energy Calibration Uncertainty	± 5%	± 7%	± 7%
Absorber Specs			
Aperture	60 mm	40 mm	40 mm
Type	SHC	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.2 - 1.1 µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	5 kW/cm² @1 kW	2.4 kW/cm² @1 kW	7 kW/cm² @1 kW
Max Energy Density (3)	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics			
Cooling	Forced Air with Fan (a)	Water (a)	Water (a)
Weight	4.4 kg	1.1 kg	1.1 kg
Dimension	143 x 143 x 132 mm	Ø 116 x 44 mm	Ø 116 x 44 mm
Cable lenght - connector	5 m - USB / 5 m - RS232	5 m - USB / 5 m - RS232	5 m - USB / 5 m - RS232
Stand and Post	Heavy Duty Stand Included	Heavy Duty Stand Included	Heavy Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). 12V DC Power Supply Included	(a). Water 4 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 4 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min



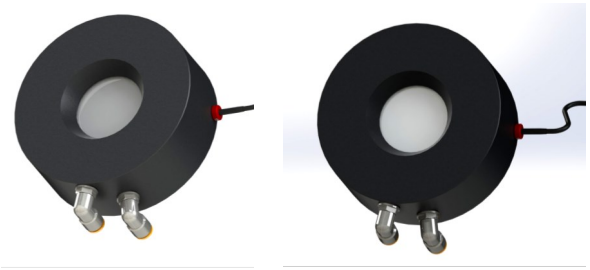


A-1200-D60-SHC-USB/ A-1200-D60-SHC-RS

W-1500-D40-HPB-USB/ W-1500-D40-HPB-RS
W-1500-D40-SHC-USB/ W-1500-D40-SHC-RS

USB/RS232 Sensors for High Power Lasers

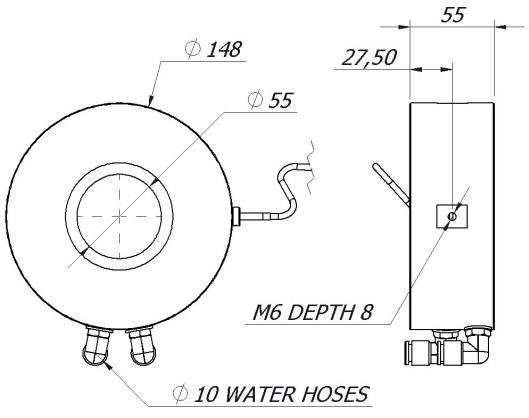
Range: 6W to 6kW



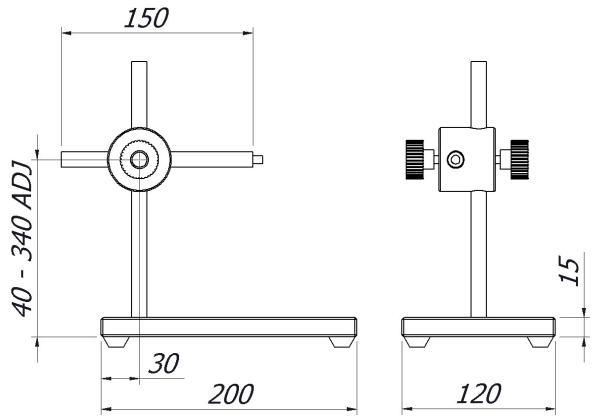
Features:

- Water cooled heads to 6000 W
- Corrosion-Proof Water-Cooled Sensors
- Highest Power Density on SHC Coating

Model	W-3000-D55-HPB-USB / W-3000-D55-HPB-RS	W-3000-D55-SHC-USB / W-3000-D55-SHC-RS	W-6000-D55-SHC-USB / W-6000-D55-SHC-RS
Power Mode			
Max. Average Power	3 kW	3 kW	6 kW
Max. Intermittent Power (1)	4.5 kW	4.5 kW	9 kW
Min. Power	6 W	6 W	15 W
Power Resolution	1 W	1 W	1 W
Noise Equivalent Power (NEP)	0.25 W	0.25 W	0.5 W
Response Time	6 sec	6 sec	4.5 sec
Power Calibration Uncertainty	± 5%	± 5%	± 5%
Power Linearity (2)	± 2%	± 2%	± 2%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	4500 J	4500 J	6000 J
Min. Energy	10 J	10 J	15 J
Energy Resolution	1 J	1 J	1 J
Energy Calibration Uncertainty	± 7%	± 7%	± 7%
Absorber Specs			
Aperture	55 mm	55 mm	55 mm
Type	HPB	SHC	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm	0.2 - 1.1 µm, 9 - 11 µm
Max Power Density (3)	1.8 kW/cm² @2kW	3.6 kW/cm² @2kW	4 kW/cm² @5kW
Max Energy Density (3)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics			
Cooling	Water (a)	Water (a)	Water (a)
Weight	2.3 kg	4.2 kg	4.2 kg
Dimension	Ø 148 x 55 mm	Ø 148 x 55 mm	Ø 148 x 55 mm
Cable lenght - connector	5 m - USB / 5 m - RS232	5 m - USB / 5 m - RS232	5 m - USB / 5 m - RS232
Stand and Post	Heavy Duty Stand Included	Heavy Duty Stand Included	Heavy Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 5 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 5 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min	(a). Water 8 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min



W-3000-D55-HPB-USB/ W-3000-D55-HPB-RS
W-3000-D55-SHC-USB/ W-3000-D55-SHC-RS
W-6000-D55-SHC-USB/ W-6000-D55-SHC-RS



Heavy Duty Stand

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For latest updates please visit our website: www.laserpoint.eu

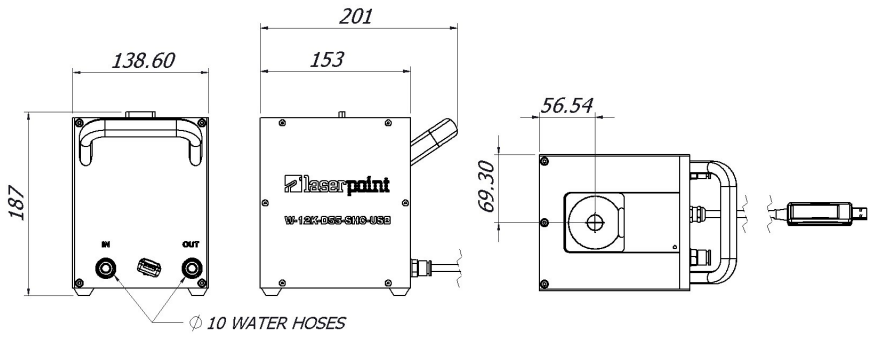
USB- Calorimeter for Very High Power Lasers

Range: 100W to 12000W

Features:

- Corrosion-Proof Water-Cooled Sensor
- Highest Power Density on SHC Coating
- Compact Design for Field Applications

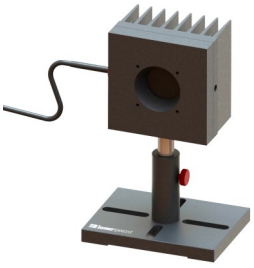
Model	W-12K-D55-SHC-USB
Power Mode	
Max. Average Power	12 kW
Max. Intermittent Power (1)	12 kW
Min. Power	100 W
Power Resolution	10 W
Noise Equivalent Power (NEP)	5 W
Response Time	7 sec
Power Calibration Uncertainty	± 5%
Power Linearity (2)	± 2%
Single Shot Energy Mode	
Max. Energy (with 100 ms pulse)	n.a.
Min. Energy	n.a.
Energy Resolution	n.a.
Energy Calibration Uncertainty	± 7%
Absorber Specs	
Aperture	55 mm
Type	SHC
Absorber Spectral Range	0.19 - 11 µm
Calibration Spectral Range	1.06µm, 10.6µm
Max Power Density (3)	5 kW/cm² @5kW
Max Energy Density (3)	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics	
Cooling	Water (a)
Weight	6 kg
Dimension	140 x 200 x 180 mm
Cable lenght - connector	5 m - USB
Stand and Post	n.a.
Notes	
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs	(a). Water 8 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min



W-12K-D55-SHC-USB

USB Sensors for Pulsed Lasers

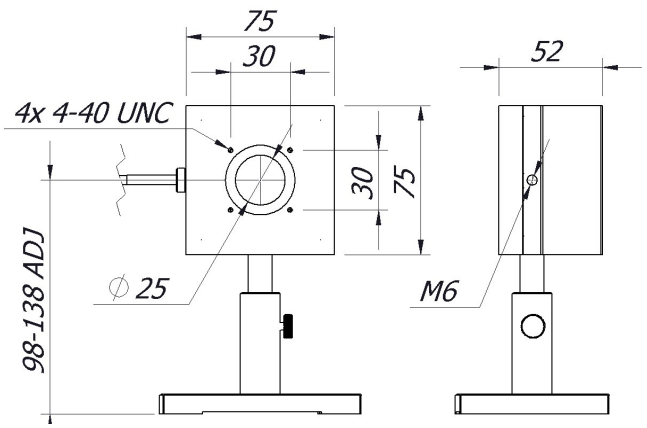
Range: 20mW to 10W / 50mJ to 10J

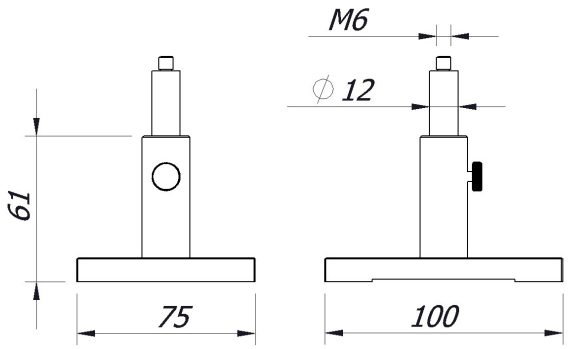


Features:

- Very high damage thresholds
- Air Cooled
- Designed for High Peak Powers and High Energy Densities

Model	10-BB-D25-USB	10-UVA-D25-USB	10-UVC-D25-USB
Power Mode			
Max. Average Power	10 W	10 W	10 W
Max. Intermittent Power (1)	15 W	15 W	15 W
Min. Power	20 mW	20 mW	20 mW
Power Resolution	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	1 mW	1 mW	1 mW
Response Time	4 sec	4 sec	4 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	10 J	10 J	10 J
Min. Energy	50 mJ	50 mJ	50 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	25 mm	25 mm	25 mm
Type	BB	UVA	UVC
Absorber Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Calibration Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Max Power Density (3)	35 W/cm²	9 W/cm²	40 W/cm²
Max Energy Density (3)	Single Pulse: (a) 10ms pulse width: 13 J/cm² <10µs pulse width: 10 J/cm²	Single Pulse: (a) 10ms pulse width: 5 J/cm² <10µs pulse width: 4 J/cm²	Single Pulse: (a) 10ms pulse width: 15 J/cm² <10µs pulse width: 9 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.5 kg	0.5 kg	0.5 kg
Dimension	75 x 75 x 52 mm	75 x 75 x 52 mm	75 x 75 x 52 mm
Cable lenght - connector	2.5 m - USB	2.5 m - USB	2.5 m - USB
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	Available with fiber adapter (a). For repeated pulses, please see volume absorber damage graphs.	Available with fiber adapter (a). For repeated pulses, please see volume absorber damage graphs.	Available with fiber adapter (a). For repeated pulses, please see volume absorber damage graphs.





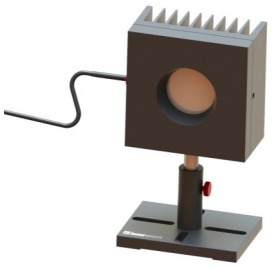
10-BB-D25-USB 1 0-UVA-D25-USB 10-UVC-D25-USB

Light Duty Stand

laserpoint
Via Burona, 51 - Vimodrone (Milano) - ITALY
Ph: +39 02 27 40 02 36 Fax: +39 02 25 02 91 61
For latest updates please visit our website: www.laserpoint.eu

USB Sensors for Pulsed Lasers

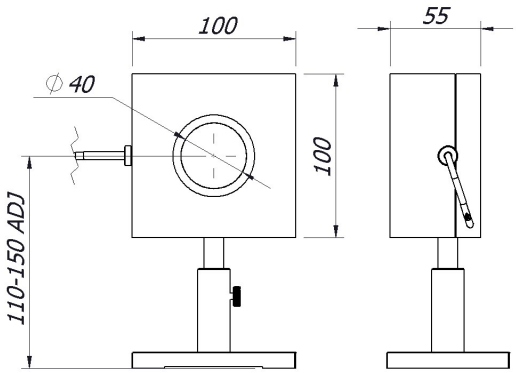
Range: 40 mW to 20W / 100mJ to 20J



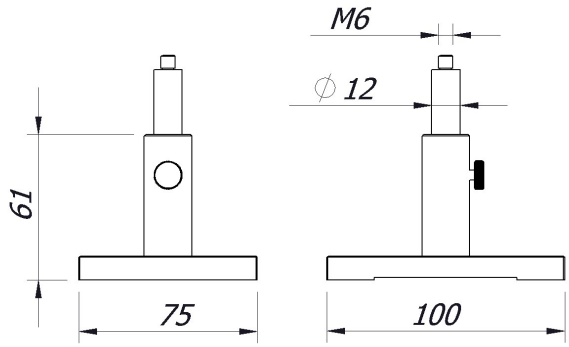
Features:

- Very high damage thresholds
- Air Cooled
- Designed for High Peak Powers and High Energy Densities

Model	20-BB-D40-USB	20-UVA-D40-USB	20-UVC-D40-USB
Power Mode			
Max. Average Power	20 W	20 W	20 W
Max. Intermittent Power (1)	30 W	30 W	30 W
Min. Power	40 mW	40 mW	40 mW
Power Resolution	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	1 mW	1 mW	1 mW
Response Time	4 sec	4 sec	4 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	20 J	20 J	20 J
Min. Energy	100 mJ	100 mJ	100 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	40 mm	40 mm	40 mm
Type	BB	UVA	UVC
Absorber Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Calibration Spectral Range	0.4 - 5.2 µm	0.25 - 0.4 µm	0.19 - 0.25 µm
Max Power Density (3)	35 W/cm²	9 W/cm²	40 W/cm²
Max Energy Density (3)	Single Pulse: (a) 10ms pulse width: 13 J/cm² <10µs pulse width: 10 J/cm²	Single Pulse: (a) 10ms pulse width: 5 J/cm² <10µs pulse width: 4 J/cm²	Single Pulse: (a) 10ms pulse width: 15 J/cm² <10µs pulse width: 9 J/cm²
General Characteristics			
Cooling	Convection	Convection	Convection
Weight	0.9 kg	0.9 kg	0.9 kg
Dimension	100 x 100 x 55 mm	100 x 100 x 55 mm	100 x 100 x 55 mm
Cable lenght - connector	2.5 m - USB	2.5 m - USB	2.5 m - USB
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes			
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). For repeated pulses, please see volume absorber damage graphs.	(a). For pulse repetition and more details, please see volume absorber damage graphs.	(a). For pulse repetition and more details, please see volume absorber damage graphs.



20-BB-D40-USB 20-UVA-D40-USB 20-UVC-D40-USB



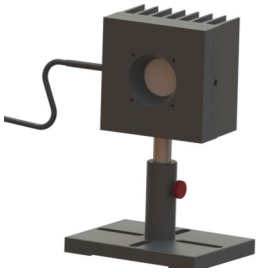
Light Duty Stand

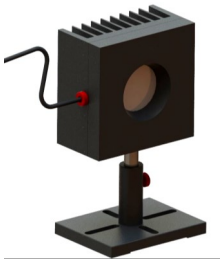
USB Sensors for High Energy Density Lasers

Range: 2mW to 40W / 50mJ to 60J

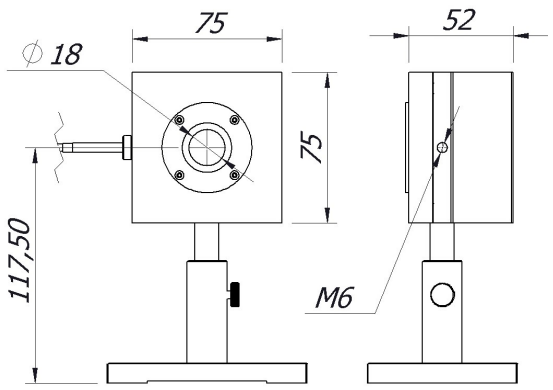
Features:

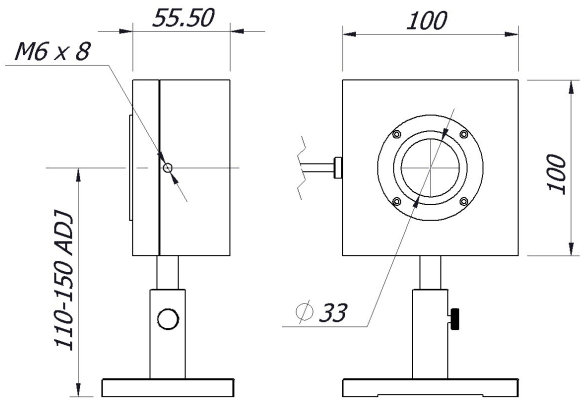
- Very high damage thresholds
- Air Cooled
- Designed for High Peak Powers and High Energy Densities





Model	A-30-D12-SHC-L-USB	10-BB-D12-L-USB	A-30-D18-DIF-USB	A-40-D33-DIF-USB
Power Mode				
Max. Average Power	30 W	10 W	30 W	40 W
Max. Intermittent Power (1)	45 W	15 W	45 W	60 W
Min. Power	20 mW	20 mW	25 mW	25 mW
Power Resolution	1 mW	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	1 mW	1 mW	1 mW	1 mW
Response Time	1.5 sec	4 sec	1.5 sec	1.5 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (2)	± 1%	± 1%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	45 J	10 J	45 J	60 J
Min. Energy	100 mJ	50 mJ	125 J	125 J
Energy Resolution	1 mJ	1 mJ	mJ	mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	12 mm	12 mm	18 mm	33 mm
Type	SHC + L	BB + L	DIF	DIF
Absorber Spectral Range	0.2 - 1.1 µm	0.4 - 2 µm	1.06 µm	1.06 µm
Calibration Spectral Range	0.2 - 1.1 µm	0.4 - 2 µm	1.06 µm	1.06 µm
Max Power Density (3)	100 kW/cm²	140 W/cm²	t.b.d.	t.b.d.
Max Energy Density (3)	5ms pulse width: 320 J/cm² 10µs pulse width: 12 J/cm² 10ns pulse width: 3 J/cm²	Single Pulse: (a) 10ms pulse width: 40 J/cm² <10µs pulse width: 30 J/cm²	t.b.d.	t.b.d.
General Characteristics				
Cooling	Convection	Convection	Convection	Convection
Weight	0.6 kg	0.6 kg	0.6 kg	0.6 kg
Dimension	75 x 75 x 73 mm	75 x 75 x 73 mm	75 x 75 x 52 mm	100 x 100 x 55 mm
Cable lenght - connector	2.5 m - USB	2.5 m - USB	2.5 m - USB	2.5 m - USB
Stand and Post	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included	Light Duty Stand Included
Notes				
(1). 2 minutes max (2). Detector centrally irradiated @50% of useful surface. (3). Damage thresholds also depend on power level. Please see damage graphs		(a). For repeated pulses, please see volume absorber damage graphs.		





A-30-D18-DIF-USB

A-40-D33-DIF-USB

Options

Optical Fibers Adapters for Thermal and Photodiodes Heads

Fiber Adapters can be removed or added in a later time since heads can either work with or without adapters.

Fiber Adapter Type	SMA	SC	FC	ST	LC
Model	 S120-SMA	 S120-SC	 S120-FC	 S120-ST	 S120-LC

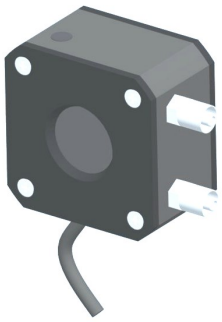
Carrying Case

Optional Hard case for 4π Meter, low power heads and power supply.

OEM Solutions

OEM and Custom Products

A customer-driven supplier of OEM sensors



Since long more than a decade LaserPoint has been supplier of OEM power & energy sensors to some of the world's leading laser manufacturers. Our presence in the OEM market, several patents and the participation to a number of European Projects on laser monitoring are the best cards LaserPoint can give his customers, either in supplying standard products or in providing technical support in the discussion for new applications or the design of new detectors.
The following table shows the basic characteristics of LaserPoint most popular sensors. Around those sensors complete heads are designed and supplied with housings, cooling systems and amplifying electronics based on Customer's requirements and specifications.

Advantages of LaserPoint OEM Laser Measurement Products

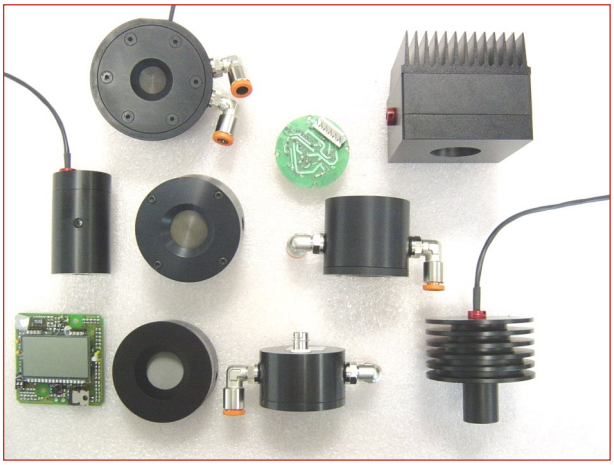
Reliable and Versatile Measurements Tools

OEM sensors discs manufactured by LaserPoint are high sensitivity, low impedance thermopiles. High sensitivity is important to maximize the signal-to-noise ratio when working at low powers .
Compared to other types of sensors which might be used in equivalent applications, thermopile detectors can be applied directly onto the beam, even at high powers.
LaserPoint sensors are made with resistant materials and coatings that extend their applicability from UV to Far Infrared and to concentrated beams, without damaging even at extreme power densities.
LaserPoint provides thermopiles which exhibit a high degree of linearity over their entire working range and have large areas that sample the whole laser beam.
Thermopile sensors are almost insensitive to the position and the size of beam when it strikes on their active areas. Alignment is never critical and installation time in OEM applications is fast.
Everything has been designed to provide accurate and reliable measurements of lasers like CO2, Excimers, Laser Diodes, Nd-Yag from 3W to 200W at competitive pricing .

Compact Design

Off-the-shelf sizes of sensor discs range from 15x15x3mm to Dia 90x6mm, with active areas up to 40mm.

Calibration



All OEM sensors undergo to a series in house inspections and controls, which include individual tests of sensitivity and impedance.
A full calibration, with NIST or PTB traceability, is available on request.

Technical Support

If you do not find what you need today we can design custom sensors, housings and electronics that fit your requirements. Ask our Application Engineers for technical support: we have a full knowledge of optics, lasers, thermal behaviors, materials to cover your requests.
A commitment to servicing with quality products, prompt deliveries and after sales assistance is another support provided by LaserPoint on which customers can rely on.

Building-up a Laser Measurement System

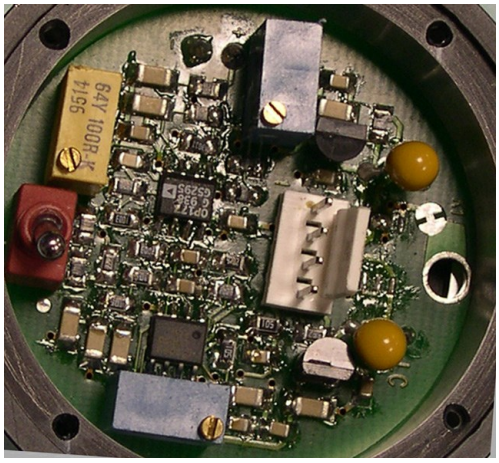
Long Term Measurement?	Once in a While Monitoring ?
 **OEM Discs & Sensors**	 **OEM Laser Probes (FIT-H Series)**
Typical Applications, •Continuous or Long Term Measurement of Laser or system performance •Feedback to laser/system control •Beam Dump •Certification of laser processes	**Typical Applications**, •Once in while check of laser power •Power monitoring at the workpiece •Optimization of laser set-ups •Monitoring of laser power stability •Certification of laser processes •Predictive maintenance of beam line components
Fields, •Laser source monitoring •System monitoring •Material processing •Medical systems	**Fields** •System monitoring •Material processing •Medical systems
and Sources. •Excimers •CO2 •Nd-Yag •Diode Lasers •Medical Lasers	**and Sources.** •CO2 •Nd-Yag •Diode Lasers •Medical Lasers
Hints •Slim design for installation in tight areas •Flexibility in integration :various connection types, models with /without ampl circuits; cased/non-cased solutions •Coatings with high power densities for any application •Usable with Customers' own electronics or SW •NIST & PTB traceable calibration procedures	**Hints** •Slim design for installation in tight areas •Work up to 6KW without water cooling •Coatings with high power densities for any application •Give value of laser power in 4-6 sec with 1% repeatability •NIST & PTB traceable calibration procedures

Standard configurations of OEM solutions

Sensor Family	Structure
SD Series	**Discs with raw analog output** : by far the lowest cost solution when a more specialized connectivity.is not required
CSA Series : Air cooled units **CSW Series** : Water cooled units	**Sensors with row analog output** : discs are mounted into a housing with optimized heat removal design. Available as air colled or water cooled units
AHA Series : Air cooled units **AHW Series** : Water cooled units	**Sensors with amplified analog output** : discs are mounted into a housing with amplifier to reduce noise and with optimized response time acceleration . Customers will enjoy a factory pre-calibrated unit .
Series with –RS ending code All sensors from Laser Point can be supplied in this configuration; Standard products are listed with	**Sensors with RS232 interface:** direct RS232 interfacing of the OEM sensor with the host computer
Series with –USB ending code All sensors from Laser Point can be supplied in this configuration; Standard products are listed with	**Sensors with USB interface:** direct USB interfacing of the OEM sensor with the host computer

Analog Electronics Circuit for OEM Sensors

This ultra-compact product fulfils diverse OEM requirements being a circuit board, internal to the AHA/AHW series heads, which amplifies and speeds up response times of sensors discs.



A main feature is the possibility to vary sensors sensitivities, via a variable resistor, to make all detectors equally performing.

The board can work with additional custom electronics or read with a display The it also offers fast response times, high sensitivity, accuracy and linearity.

Output connectivity options for the amplified heads include Molex or a simple 4 wires pigtail

Output voltage, Full Scale: 5V

Min. detectable voltage : 5mV

Total sensitivity: 5V/ Max Power Value for the sensor in use

Linearity: ± 1%

Max power values: 5W,10W,20W,50W,100W,200W, depending on sensor type

Minimum detectable power: 1/1000 of Full Scale

Head response times: 0.8 sec.typ,

Supply voltages range : ± 7VDC to ± 12VDC or 14 to 24VDC floating.

Dimensions: Dia 43mmx10mm

Max Head Temperature :60 °C

Meterless OEM USB/RS232 Sensors

This series of sensors has been specifically developed for all those applications that do not require a display but where readings can be analysed and displayed on a computer.
With simple plug and play functionality, no additional meter and at a lower cost, the new PC Plugs-USB/RS 232 sensors have all the power and sophistication of signal processing and software of a traditional power meter.
The RS-232 version is the most convenient platform to have power measurement integrated inside laser processing systems.

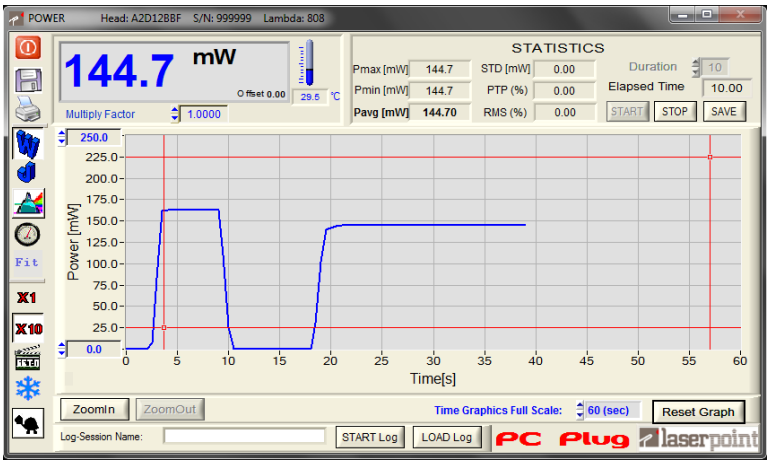
- **Who will need the PC-Plugs?**

The PC-Plug sensors have been primarily developed for applications that need a power measurement station on board of machines; these instruments are also the perfect monitoring tool for other industrial applications such as laser burn-in or long-term reliability testing.
Laser Point has several years of experience in providing sensors and heads to OEM customers. Many of these users prefer to solve their laser measurement problem by purchasing the bare sensor and design a specific electronics for signal processing. This is obviously a method but it has some limitations: for example the user must have both the tools and the know-how of adding accurate calibrations, the capacity of designing very low noise amplification and accurate A/D conversion which will drive to good stability and low noise measurements.
PC-Plugs sensors connect directly to a PC and now offer to system integrators or machine builders the possibility to save precious resources to develop their own electronics and software. The PC-Plugs then simplify the work of OEMs who no longer need to take a thermopile sensor head and produce a calibrated power measurement instrument.
The PC-Plug approach provides the system designer the possibility of an immediate integration of a power meter with other devices of his system.

Features	
RS-232 connectivity Power input provided via +12 VDC input.	Sensors include a speed-up algorithm to accelerate, without overshoot, their natural response .
USB connectivity Provides direct USB 2.0 connection to PC.	Single pulse energy capability
Easy to access command set with DLL drivers that support simple ASCII host commands is available. Pc Plug Software and driver compatible with Microsoft XP, Vista (32-bit and 64-bit), and Windows 7 (32-bit and 64-bit). The driver is qualified by Microsoft.	Sensors include spectral compensation for up to 5 different wavelengths . NIST / PTB Calibration supplied
High resolution 14-bit A/D converter .	
Four digits of measurement resolution	

PC-Plug : SW for USB and RS232 OEM Sensors *

**** For customers who like to write their own software or for system integrators sensors can be supplied with an easy to access command set with DLL drivers that support simple ASCII host commands***



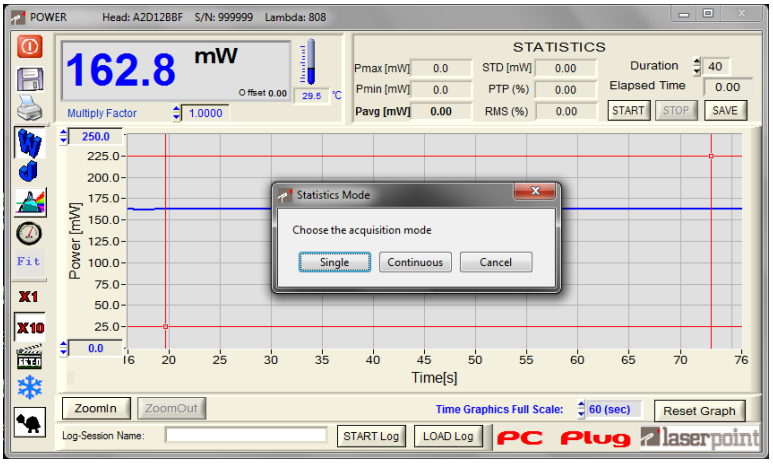
The applications software for PC-Plugs is supplied free with each sensor.
It enables the operator to get instantaneous readings of power, monitor laser stability, have measurement statistics (minimum, maximum, mean, standard deviation), log power data.
To those integrators that require an in-house written software, Laser Point will provide a DLL driver that supports simple ASCII remote interfacing host commands on both the PC-Plug-RS232 and PC-Plug-USB sensors.
Furthermore, PC-PLug-USB sensors are recognized as a COM port by Windows, which makes the addressing of ASCII commands to the port another easy task.
The *Power panel* permits measurements of laser powers with direct display of their actual values. The screen also shows the evolution of power over time allowing long term stability measurements as long as 12 hours .

Saves acquired power data in a .txt file. The operator is requested to set the sampling time and provide the file Acquisition data are continuously saved until the icon clicked again	Activates the Tuning function
Sends the current panel information to a printer	Zeroes the instrument to remove any residual offset.
Activates the laser power measurement function	Stops data acquisition and running statistics
Allows the wavelength selection	Amplifies head signals by a factor of 10

• Icons

• Save Data on File

By the simple click of the “SAVE” key, measured data can be saved as a text (*.txt) file.
The structure of saved files includes sensor model, calibration wavelength, sensor serial number, date and time of file generation . Each acquisition records date, time, statistical data, sensor temperature, duration of sampling interval, generated alarms. Data can later be imported into a spreadsheet (e.g.Excel).

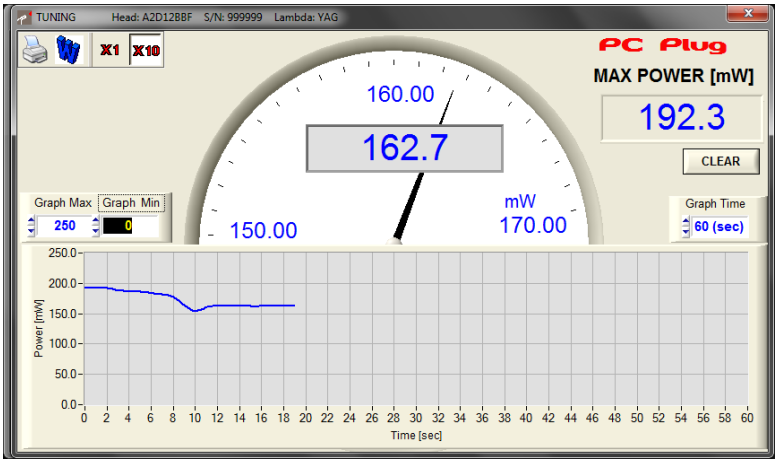


Log Comment Line

This software feature allows to log power data up to 12 hours, automatically. Loaded data are saved in text file that can be delivered together with the laser/ machine as a proof of its performance, saved by manufacturer as an internal record or used by service technicians to restore initial conditions.

Laser Tuning

Laser Tuning is used to achieve a fine alignment of your laser. The needle shows the direction of tuning. The central box displays the actual power, while the maximum value reached during the tuning procedure is kept in the Power Max box.



Warning Messages

Each time the laser power or energy exceeds the head full scale the OVERFLOW alarm is displayed.
Should a measurement head reach its limit temperature (overheating of a head may be due to problems to the cooling circuit such as low water pressure, lack of fluid, obstructions, etc, or poor heat exchange in air cooled heads), the COOL message will be displayed on the main window and the data displayed in the graph are pinned to the last power value acquired before the alarm .

Technical Specifications

For customers who like to write their own software or for system integrators sensors can be supplied with an easy to access command set with DLL drivers that support simple ASCII host commands

Platform compatible with Thermal sensors

Sensors are supplied with NIST/PTB traceable calibration.
Measurement Resolution: 4 digits

Power Meter Mode

Power Ranges: 1mW to 6 kW
Resolution: 0.5‰ for any Full Scale
Response Time <1-5sec.(depends on specific head)

Tuning

-Displays a Digital Bargraph for Tuning Direction
-Displays Actual Power Value
-Displays Variations (as %) form Tuning Initial Value)

Wavelength Selections

Customers can select up to 5 different wavelengths.
Spectral compensation is provided for wavelengths different from calibration wavelength.

GENERAL

High resolution A/D converter

Software: Full Windows application software

Communication: -PC-Plugs-USB provide USB 2.0 connection to PC.
-PC-Plugs-RS232 provide RS232 connection to PC

Display: Computer Screen

Speed up Algorithm to accelerate detector's natural response time

Data Log: up to 12h

Data Displays: Trending, Full Statistics, Tuning, Alarms

Additional Input Gain: 10X

Dimensions 75 (L) x 22 (W) x 13 (H) mm

Power :provided by external +12 VDC input for RS-232 Sensors

Operating environment:

°Storage Temperature:-10 to 60 ºC

° Range of Use :5 to 45 ºC

°Reference Conditions : 21 ± 4 ºC ;RH 20-80%

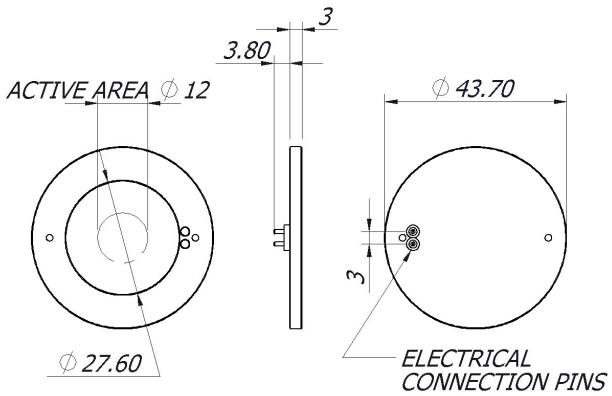
Thermal OEM Sensors Disks

Range: up to 20W

Features:

- High sensitivity sensor disks for machine integration
- Extended applicability from UV to Far Infrared
- Highly Resistant Coatings

Model	SD-20-D12-BBF	SD-20-D12-HPB	SD-20-D20-BBF	SD-20-D20-HPB
Power Mode				
Max. Average Power	20 W	20 W	20 W	20 W
Nominal Sensitivity	2 mV/W	1.8 mV/W	2 mV/W	1.8 mV/W
Response Time	<1 sec (a)	<1 sec (a)	<1 sec (a)	<1 sec (a)
Noise Equivalent Power (NEP)	2.5 mW	2.5 mW	3 mW	3 mW
Power Linearity (1)	± 1%	± 1%	± 1%	± 1%
Absorber Specs				
Aperture	12 mm	12 mm	20 mm	20 mm
Type	BBF	HPB	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm
Max Power Density (2)	200 W/cm²	18 kW/cm² @10 W	200 W/cm²	18 kW/cm² @10 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics				
Recommended cooling	Air cooled heat sink	Air cooled heat sink	Air cooled heat sink	Air cooled heat sink
Weight	8 g	8 g	8 g	8 g
Dimension	Ø 44 x 3 mm	Ø 44 x 3 mm	Ø 44 x 3 mm	Ø 44 x 3 mm
Connectivity	12 cm Flying Leads	12 cm Flying Leads	12 cm Flying Leads	12 cm Flying Leads
Notes				
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Accelerated by Laserpoint electronics.	(a). Accelerated by Laserpoint electronics.	(a). Accelerated by Laserpoint electronics.	(a). Accelerated by Laserpoint electronics.



SD-20-D12-BBF SD-20-D12-HPB SD-20-D20-BBF SD-20-D20-HPB

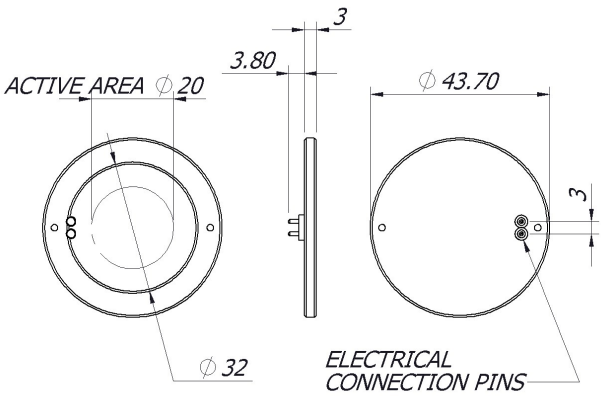
Thermal OEM Sensors Disks

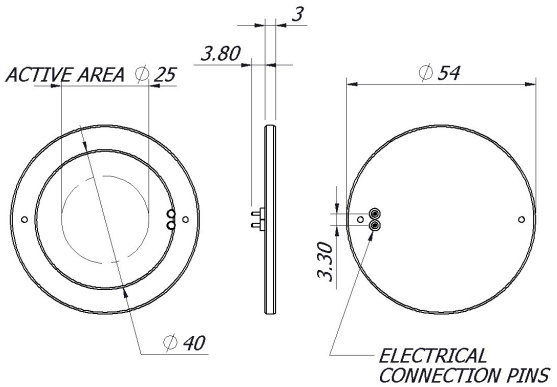
Range: up to 50W

Features:

- High sensitivity sensor disks for machine integration
- Extended applicability from UV to Far Infrared
- Highly Resistant Coatings

Model	SD-50-D20-BBF	SD-50-D20-HPB	SD-50-D25-BBF	SD-50-D25-HPB
Power Mode				
Max. Average Power	50 W	50 W	50 W	50 W
Nominal Sensitivity	1.2 mV/W	1.1 mV/W	1.1 mV/W	1.0 mV/W
Response Time	1 sec [(a)]	1 sec [(a)]	1 sec [(a)]	1 sec [(a)]
Noise Equivalent Power (NEP)	4 mW	4 mW	4 mW	4 mW
Power Linearity [(1)]	± 1%	± 1%	± 1%	± 1%
Absorber Specs				
Aperture	20 mm	20 mm	25 mm	25 mm
Type	BBF	HPB	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm
Max Power Density [(2)]	200 W/cm²	11 kW/cm² @40 W	200 W/cm²	11 kW/cm² @40 W
Max Energy Density [(2)]	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics				
Recommended cooling	Water cooled heat sink	Water cooled heat sink	Water cooled heat sink	Water cooled heat sink
Weight	10 g	10 g	12 g	12 g
Dimension	Ø 44 x 3 mm	Ø 44 x 3 mm	Ø 54 x 3 mm	Ø 54 x 3 mm
Connectivity	12 cm Flying Leads	12 cm Flying Leads	12 cm Flying Leads	12 cm Flying Leads
Notes				
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Accelerated by Laserpoint electronics.	(a). Accelerated by Laserpoint electronics.	(a). Accelerated by Laserpoint electronics.	(a). Accelerated by Laserpoint electronics.





SD-50-D20-BBF SD-50-D20-HPB

SD-50-D25-BBF SD-50-D25-HPB

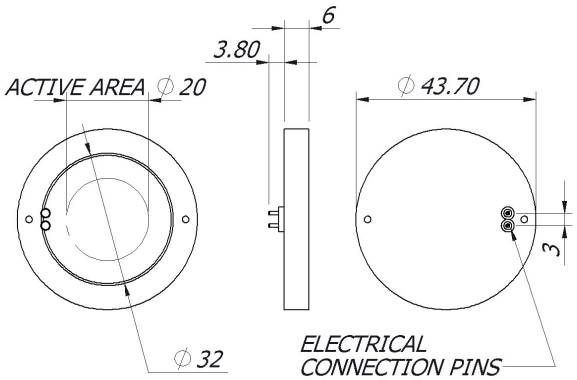
Thermal OEM Sensors Disks

Range: up to 200W

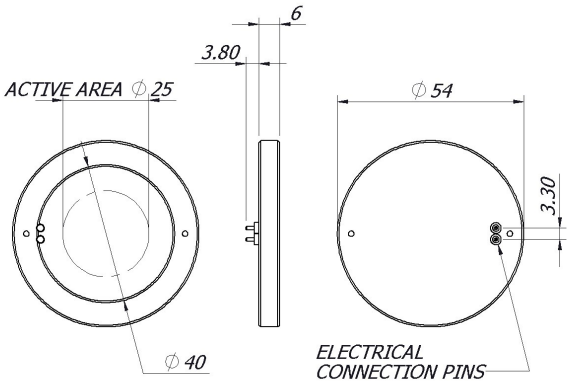
Features:

- High sensitivity sensor disks for machine integration
- Extended applicability from UV to Far Infrared
- Highly Resistant Coatings

Model	SD-200-D20-HPB	SD-200-D25-HPB
Power Mode		
Max. Average Power	200 W	200 W
Nominal Sensitivity	0.22 mV/W	0.22 mV/W
Response Time	2 sec [(a)]	2 sec [(a)]
Noise Equivalent Power (NEP)	23 mW	23 mW
Power Linearity [(1)]	± 1%	± 1%
Absorber Specs		
Aperture	20 mm	25 mm
Type	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Max Power Density [(2)]	7 kW/cm² @200 W	7 kW/cm² @200 W
Max Energy Density [(2)]	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics		
Recommended cooling	Water cooled heat sink	Water cooled heat sink
Weight	20 g	30 g
Dimension	Ø 44 x 6 mm	Ø 54 x 6 mm
Connectivity	12 cm Flying Leads	12 cm Flying Leads
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Accelerated by Laserpoint electronics.	(a). Accelerated by Laserpoint electronics.



SD-200-D20-HPB



SD-200-D25-HPB

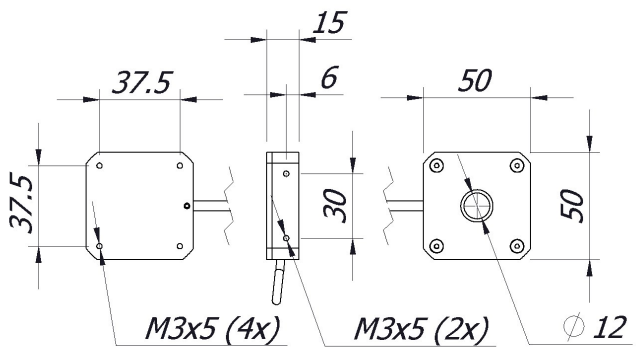
Thermal OEM Laser Sensors

Range: 10mW to 5W

Features:

- OEM Heads embedding high sensitivity sensor disks
- Extended applicability from UV to Far Infrared
- Highly Resistant Coatings

Model	CSA-2-D12-BBF	CSA-2-D12-HPB	CSA-5-D12-BBF
Power Mode			
Max. Average Power	2000 mW	2000 mW	5 W
Min. Power	10 mW	10 mW	10 mW
Power Resolution	100 µW	100 µW	100 µW
Noise Equivalent Power (NEP)	500 µW	500 µW	500 µW
Response Time	1 sec	1 sec	1 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (1)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	2000 mJ	2000 mJ	5 J
Min. Energy	10 mJ	10 mJ	10 mJ
Energy Resolution	100 µJ	100 µJ	100 µJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	12 mm	12 mm	12 mm
Type	BBF	HPB	BBF
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	18 kW/cm² @10 W	200 W/cm²
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²
General Characteristics			
Cooling	Conduction (a)	Conduction (a)	Conduction (a)
Weight	0.15 kg	0.15 kg	0.15 kg
Dimension	50 x 50 x 15 mm	50 x 50 x 15 mm	50 x 50 x 15 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Notes			
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink	(a). Conduction, through heat sink



CSA-2-D12-BBF CSA-2-D12-HPB CSA-5-D12-BBF

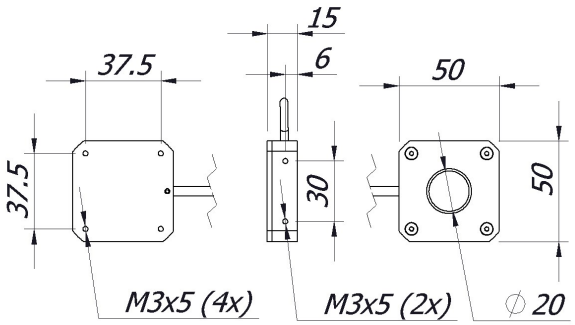
Thermal OEM Laser Sensors

Range: 20mW to 20W

Features:

- OEM Heads embedding high sensitivity sensor disks
- Extended applicability from UV to Far Infrared
- Highly Resistant Coatings

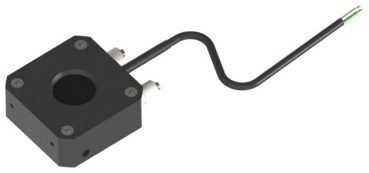
Model	CSA-20-D20-BBF	CSA-20-D20-HPB
Power Mode		
Max. Average Power	20 W	20 W
Min. Power	20 mW	20 mW
Power Resolution	100 µW	100 µW
Noise Equivalent Power (NEP)	600 µW	600 µW
Response Time	1.5 sec	1.5 sec
Power Calibration Uncertainty	± 3%	± 3%
Power Linearity (1)	± 1.5%	± 1.5%
Single Shot Energy Mode		
Max. Energy (with 100 ms pulse)	20 J	20 J
Min. Energy	10 mJ	10 mJ
Energy Resolution	100 µJ	100 µJ
Energy Calibration Uncertainty	± 5%	± 5%
Absorber Specs		
Aperture	20 mm	20 mm
Type	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	14 kW/cm² @10 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics		
Cooling	Conduction (a)	Conduction (a)
Weight	0.15 kg	0.15 kg
Dimension	50 x 50 x 15 mm	50 x 50 x 15 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink



CSA-20-D20-BBF CSA-20-D20-HPB

Thermal OEM Laser Sensors

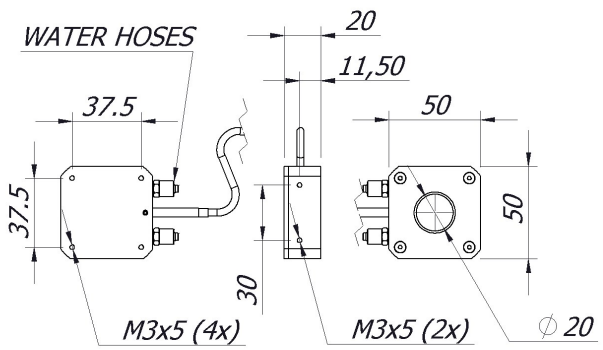
Range: 50mW to 50W

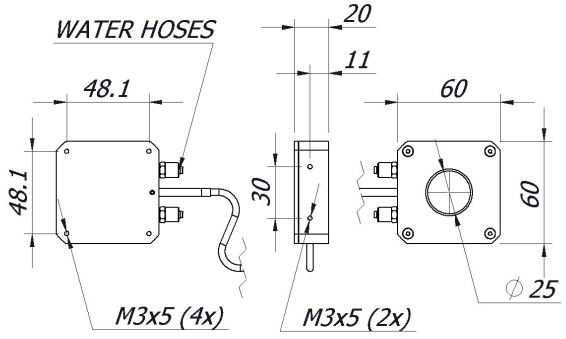


Features:

- OEM Heads embedding high sensitivity sensor disks
- Extended applicability from UV to Far Infrared
- Highly Resistant Coatings

Model	CSW-50-D20-BBF	CSW-50-D20-HPB	CSW-50-D25-BBF	CSW-50-D25-HPB
Power Mode				
Max. Average Power	50 W	50 W	50 W	50 W
Min. Power	50 mW	50 mW	50 mW	50 mW
Power Resolution	1 mW	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	2 mW	2 mW	2 mW	2 mW
Response Time	2 sec	2 sec	2 sec	2 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (1)	± 1.5%	± 1.5%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	50 J	50 J	50 J	50 J
Min. Energy	100 mJ	100 mJ	100 mJ	100 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	20 mm	20 mm	25 mm	25 mm
Type	BBF	HPB	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11	0.19 - 2.1 µm, 2.94µm, 9 - 11	0.19 - 2.1 µm, 2.94µm, 9 - 11	0.19 - 2.1 µm, 2.94µm, 9 - 11
Max Power Density (2)	200 W/cm²	11 kW/cm² @40 W	200 W/cm²	11 kW/cm² @40 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics				
Cooling	Water (a)	Water (a)	Water (a)	Water (a)
Weight	0.25 kg	0.25 kg	0.25 kg	0.25 kg
Dimension	50 x 50 x 20 mm	50 x 50 x 20 mm	60 x 60 x 20 mm	60 x 60 x 20 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Notes				
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)



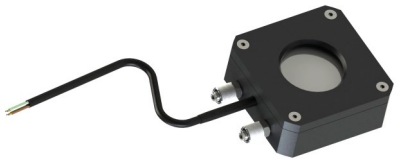


CSW-50-D20-BBF CSW-50-D20-HPB

CSW-50-D25-BBF cSW-50-D25-HPB

Thermal OEM Laser Sensors

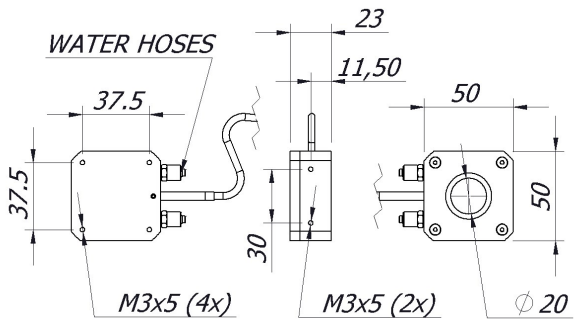
Range: 200mW to 200W

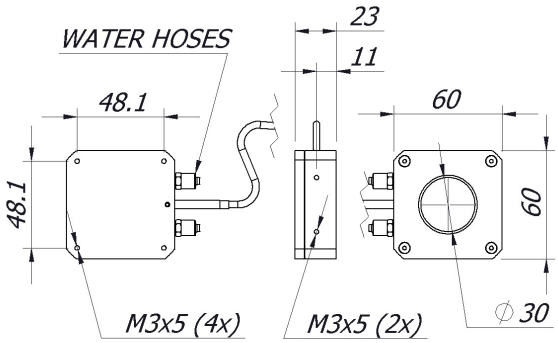


Features:

- OEM Heads embedding high sensitivity sensor disks
- Extended applicability from UV to Far Infrared
- High Resistant Coatings

Model	CSW-200-D20-HPB	CSW-200-D30-HPB
Power Mode		
Max. Average Power	200 W	200 W
Min. Power	0.2 W	0.2 W
Power Resolution	10 mW	10 mW
Noise Equivalent Power (NEP)	10 mW	10 mW
Response Time	3 sec	2.5 sec
Power Calibration Uncertainty	± 3%	± 3%
Power Linearity (1)	± 1.5%	± 1.5%
Single Shot Energy Mode		
Max. Energy (with 100 ms pulse)	200 J	200 J
Min. Energy	1 J	1 J
Energy Resolution	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%
Absorber Specs		
Aperture	20 mm	30 mm
Type	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	7 kW/cm² @200 W	7 kW/cm² @200 W
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics		
Cooling	Water (a)	Water (a)
Weight	0.25 kg	0.25 kg
Dimension	50 x 50 x 23 mm	60 x 60 x 23 mm
Cable lenght - connector	1.5 m - DB15	1.5 m - DB15
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 1.5 liter/min (@ 22°C)	(a). Water 1.5 liter/min (@ 22°C)





CSW-200-D20-HPB

CSW-200-D30-HPB

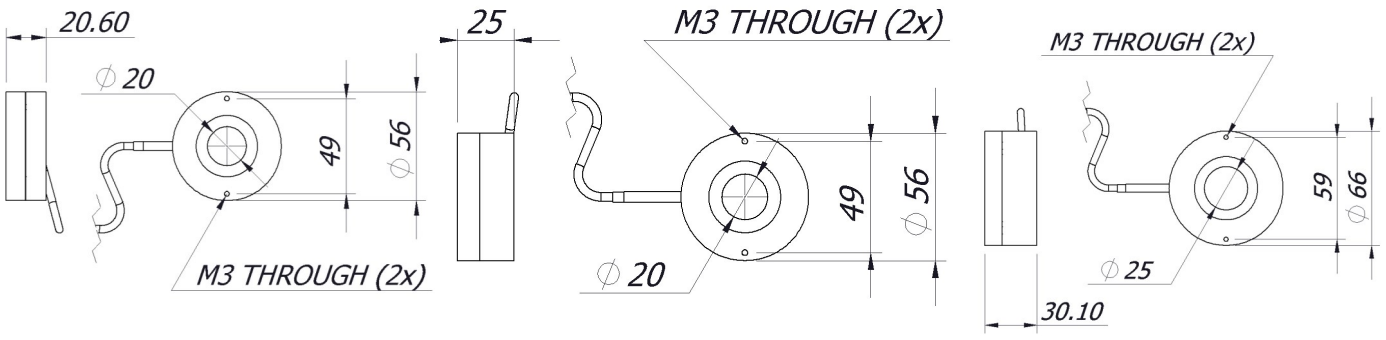
OEM Laser Power Probes

Range: 100mW to 500W

Features:

- Lowest cost solution for monitoring of laser power
- No Water Cooling up tp 500W
- Complete laser power measure in 4-6 sec

Model	Fit-50-H	Fit-200-H	Fit-500-H
Power Mode			
Max. Average Power	50 W	200 W	500 W
Min. Power	0.1 W	0.5 W	1 W
Power Resolution	1 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	2 mW	10 mW	20 mW
Response Time	5 sec	5 sec	5 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (1)	± 1%	± 1%	± 1%
Absorber Specs			
Aperture	20 mm	20 mm	25 mm
Type	HPB	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	9 kW/cm² @40 W	6 kW/cm² @200 W	4 kW/cm² @500 W
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Cooling	Conduction (a)	Conduction (a)	Conduction (a)
Weight	0.2 kg	0.2 kg	0.3 kg
Dimension	Ø 56 x 21 mm	Ø 56 x 25 mm	Ø 66 x 30 mm
Cable lenght– Connector	1.5 m - DB15	1.5 m - DB15	1.5 m - DB15
Notes			
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink	(a). Conduction, through heat sink



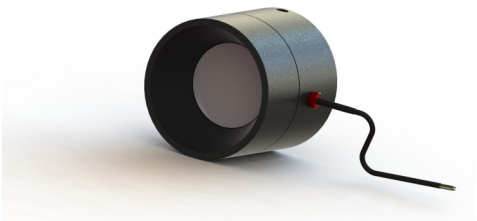
Fit-50-H

Fit-200-H

Fit-500H

OEM Laser Power Probes

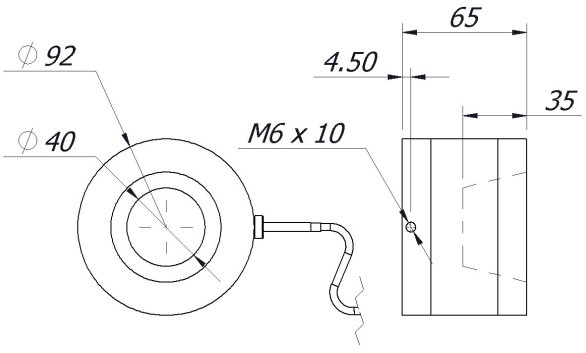
Range: 60W to 6KW

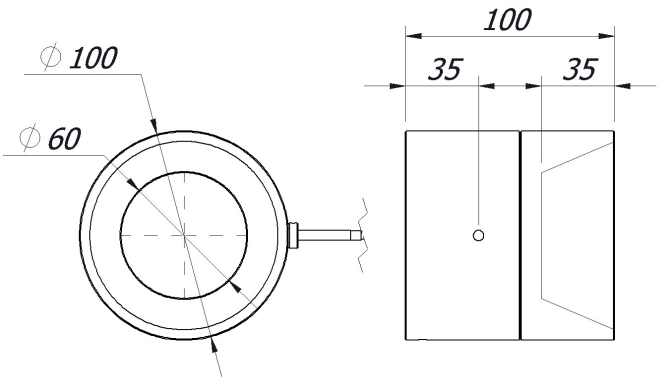


Features:

- Lowest cost solution for monitoring of laser power
- No Water Cooling up tp 500W
- Complete laser power measure in 4-6 sec

Model	Fit-3000-H	Fit-6000-H
Power Mode		
Max. Average Power	3000 W	6000 W
Min. Power	60 W	150 W
Power Resolution	100 mW	1 W
Noise Equivalent Power (NEP)	100 mW	0.25 W
Response Time	6 sec	6 sec
Power Calibration Uncertainty	± 5%	± 5%
Power Linearity (1)	± 1.5%	± 1.5%
Absorber Specs		
Aperture	40 mm	60 mm
Type	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm
Max Power Density (2)	3 kW/cm² @2kW	4 kW/cm² @5kW
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics		
Cooling	Conduction (a)	Conduction (a)
Weight	1.1 kg	2.5 kg
Dimension	Ø 92 x 65 mm	Ø 100 x 100 mm
Cable lenght– Connector	5 m - DB15	5 m - DB15
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink





Fit-3000-H

Fit-6000-H

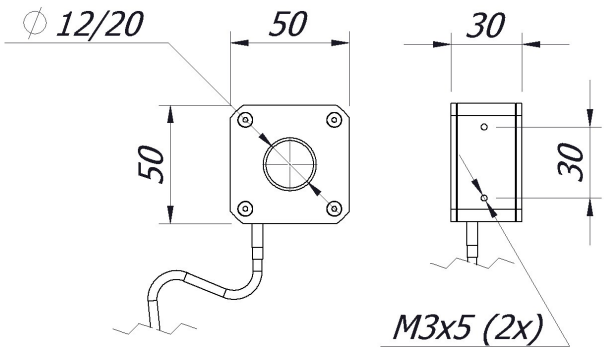
OEM Sensors with Analogue Built-in Amplifier

Range: 8mW to 5W

Features:

- OEM Thermal Sensors embedding sensor disks and analog electronics
- Amplification and Speed-Up of natural sensor's signals
- Conduction cooling

Model	AHA-2-D12-HPB	AHA-5-D12-HPB	AHA-5-D20-BBF	AHA-5-D20-HPB
Power Mode				
Max. Average Power	2 W	5 W	5 W	5 W
Min. Power	8 mW	20 mW	20 mW	20 mW
Power Resolution	0.4 mW	1 mW	1 mW	1 mW
Response Time	< 1 sec sec	< 1 sec sec	< 1 sec sec	< 1 sec sec
Power Linearity (1)	± 1%	± 1%	± 1%	± 1%
Absorber Specs				
Aperture	12 mm	12 mm	20 mm	20 mm
Type	HPB	HPB	BBF	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	14 kW/cm² @10 W	14 kW/cm² @10 W	200 W/cm²	14 kW/cm² @10 W
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
Amplifier Specs				
Amplifier Input Voltage	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating
Output Voltage @ Full Scale	5 V	5 V	5 V	5 V
Min Detectable Voltage	5 mV	5 mV	5 mV	5 mV
Sensitivity	2500 mV/W	1000 mV/W	1000 mV/W	1000 mV/W
General Characteristics				
Cooling	Conduction (a)	Conduction (a)	Conduction (a)	Conduction (a)
Weight	0.2 kg	0.2 kg	0.2 kg	0.2 kg
Dimension	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm
Cable lenght - connector	1.5 m - none	1.5 m - none	1.5 m - none	1.5 m - none
Notes				
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink	(a). Conduction, through heat sink	(a). Conduction, through heat sink



AHA-2-D12-HPB AHA-5-D12-HPB AHA-5-D20-BBF AHA-5-D20-HPB

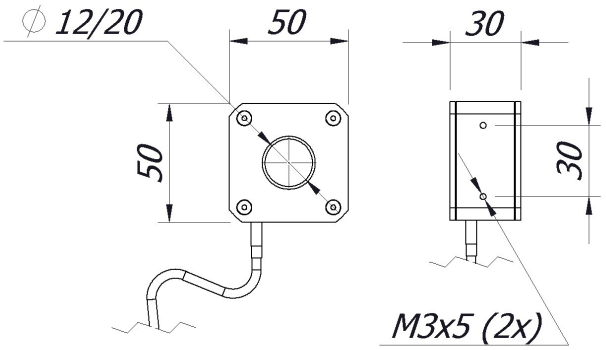
OEM Sensors with Analogue Built-in Amplifier

Range: 40mW to 10W

Features:

- OEM Thermal Sensors embedding sensor disks and analog electronics
- Amplification and Speed-Up of natural sensor's signals
- Conduction cooling

Model	AHA-10-D20-BBF	AHA-10-D20-HPB
Power Mode		
Max. Average Power	10 W	10 W
Min. Power	40 mW	40 mW
Power Resolution	2 mW	2 mW
Response Time	< 1 sec sec	< 1 sec sec
Power Linearity (1)	± 1%	± 1%
Absorber Specs		
Aperture	20 mm	20 mm
Type	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	14 kW/cm² @10 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
Amplifier Specs		
Amplifier Input Voltage	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating
Output Voltage @ Full Scale	5 V	5 V
Min Detectable Voltage	5 mV	5 mV
Sensitivity	500 mV/W	500 mV/W
General Characteristics		
Cooling	Conduction (a)	Conduction (a)
Weight	0.2 kg	0.2 kg
Dimension	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm
Cable lenght - connector	1.5 m - none	1.5 m - none
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink



AHA-10-D20-BBF AHA-10-D20-HPB

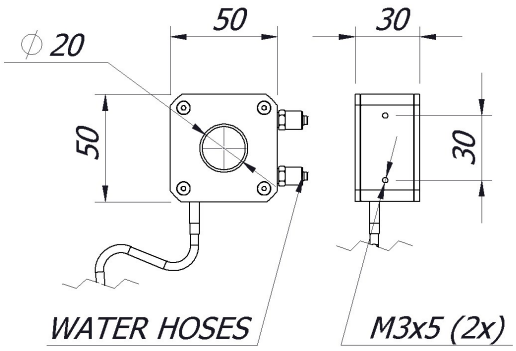
OEM Sensors with Analogue Built-in Amplifier

Range: 80mW to 20W

Features:

- OEM Thermal Sensors embedding sensor disks and analog electronics
- Amplification and Speed-Up of natural sensor's signals
- Conduction and water cooled

Model	AHA-20-D20-BBF	AHA-20-D20-HPB	AHW-20-D20-BBF	AHW-20-D20-HPB
Power Mode				
Max. Average Power	20 W	20 W	20 W	20 W
Min. Power	80 mW	80 mW	80 mW	80 mW
Power Resolution	4 mW	4 mW	4 mW	4 mW
Response Time	< 1 sec sec	< 1 sec sec	< 1 sec sec	< 1 sec sec
Power Linearity (1)	± 1%	± 1%	± 1%	± 1%
Absorber Specs				
Aperture	20 mm	20 mm	20 mm	20 mm
Type	BBF	HPB	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	14 kW/cm² @10 W	200 W/cm²	14 kW/cm² @10 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
Amplifier Specs				
Amplifier Input Voltage	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating
Output Voltage @ Full Scale	5 V	5 V	5 V	5 V
Min Detectable Voltage	5 mV	5 mV	5 mV	5 mV
Sensitivity	250 mV/W	250 mV/W	250 mV/W	250 mV/W
General Characteristics				
Cooling	Conduction (a)	Conduction (a)	Water (a)	Water (a)
Weight	0.2 kg	0.2 kg	0.2 kg	0.2 kg
Dimension	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm
Cable lenght - connector	1.5 m - none	1.5 m - none	1.5 m - none	1.5 m - none
Notes				
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)



AHA-20-D20-BBF AHA-20-D20-HPB AHW-20-D20-BBF AHW-20-D20-HPB

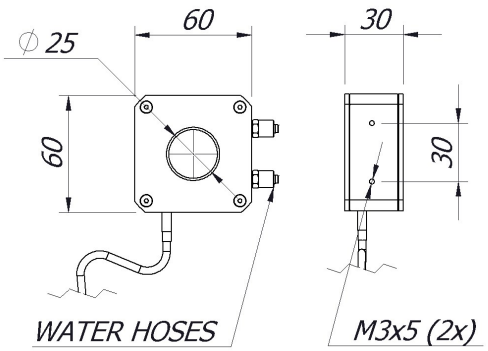
OEM Sensors with Analogue Built-in Amplifier

Range: 80mW to 20W

Features:

- OEM Thermal Sensors embedding sensor disks and analog electronics
- Amplification and Speed-Up of natural sensor's signals
- Large area sensors

Model	AHW-20-D25-BBF	AHW-20-D25-HPB
Power Mode		
Max. Average Power	20 W	20 W
Min. Power	80 mW	80 mW
Power Resolution	4 mW	4 mW
Response Time	1.5 sec sec	1.5 sec sec
Power Linearity (1)	± 1%	± 1%
Absorber Specs		
Aperture	25 mm	25 mm
Type	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	14 kW/cm² @10 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
Amplifier Specs		
Amplifier Input Voltage	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating
Output Voltage @ Full Scale	5 V	5 V
Min Detectable Voltage	5 mV	5 mV
Sensitivity	250 mV/W	250 mV/W
General Characteristics		
Cooling	Water (a)	Water (a)
Weight	0.2 kg	0.2 kg
Dimension	60 x 60 x 30 mm mm	60 x 60 x 30 mm mm
Cable lenght - connector	1.5 m - none	1.5 m - none
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 0.5 liter/min (@ 22°C)	(a). Water 0.5 liter/min (@ 22°C)



AHW-20-D25-BBF AHW-20-D25-HPB

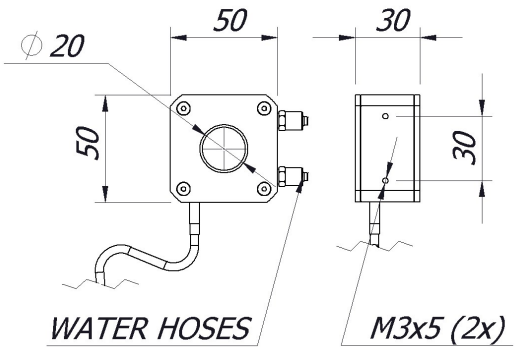
OEM Sensors with Analogue Built-in Amplifier

Range: 200mW to 50W

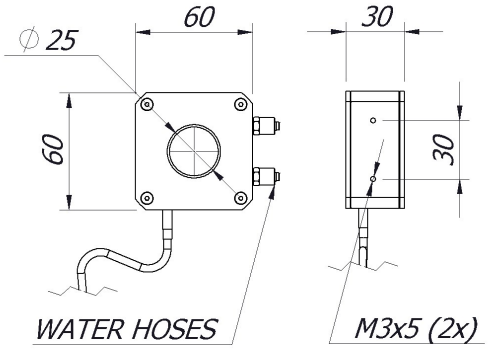
Features:

- OEM Thermal Sensors embedding sensor disks and analog electronics
- Amplification and Speed-Up of natural sensor's signals
- Large area sensors

Model	AHW-50-D20-BBF	AHW-50-D20-HPB	AHW-50-D25-BBF	AHW-50-D25-HPB
Power Mode				
Max. Average Power	50 W	50 W	50 W	50 W
Min. Power	200 mW	200 mW	200 mW	200 mW
Power Resolution	10 mW	10 mW	10 mW	10 mW
Response Time	1.5 sec sec	1.5 sec sec	1.5 sec sec	1.5 sec sec
Power Linearity (1)	± 1%	± 1%	± 1%	± 1%
Absorber Specs				
Aperture	20 mm	20 mm	25 mm	25 mm
Type	BBF	HPB	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	9 kW/cm² @40 W	200 W/cm²	9 kW/cm² @40 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
Amplifier Specs				
Amplifier Input Voltage	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating
Output Voltage @ Full Scale	5 V	5 V	5 V	5 V
Min Detectable Voltage	5 mV	5 mV	5 mV	5 mV
Sensitivity	100 mV/W	100 mV/W	100 mV/W	100 mV/W
General Characteristics				
Cooling	Water (a)	Water (a)	Water (a)	Water (a)
Weight	0.3 kg	0.3 kg	0.3 kg	0.3 kg
Dimension	50 x 50 x 30 mm mm	50 x 50 x 30 mm mm	60 x 60 x 30 mm mm	60 x 60 x 30 mm mm
Cable lenght - connector	1.5 m - none	1.5 m - none	1.5 m - none	1.5 m - none
Notes				
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)



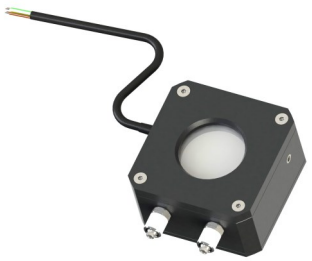
AHW-50-D20-BBF AHW-50-D20-HPB



AHW-50-D25-BBF AHW-50-D25-HPB

OEM Sensors with Analogue Built-in Amplifier

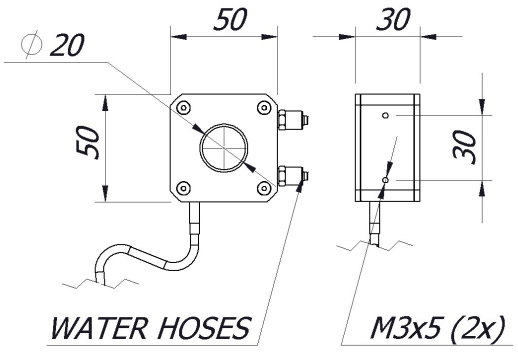
Range: 400mW to 100W

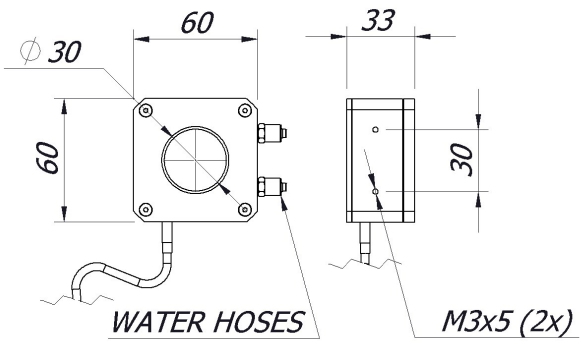


Features:

- OEM Thermal Sensors embedding sensor disks and analog electronics
- Amplification and Speed-Up of natural sensor's signals
- Water cooled high power sensors

Model	AHW-100-D20-HPB	AHW-100-D30-HPB
Power Mode		
Max. Average Power	100 W	100 W
Min. Power	400 mW	400 mW
Power Resolution	20 mW	20 mW
Response Time	2.5 sec sec	2.5 sec sec
Power Linearity (1)	± 1%	± 1%
Absorber Specs		
Aperture	20 mm	30 mm
Type	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	9 kW/cm² @40 W	9 kW/cm² @40 W
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
Amplifier Specs		
Amplifier Input Voltage	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating
Output Voltage @ Full Scale	5 V	5 V
Min Detectable Voltage	5 mV	5 mV
Sensitivity	50 mV/W	50 mV/W
General Characteristics		
Cooling	Water (a)	Water (a)
Weight	0.3 kg	0.3 kg
Dimension	50 x 50 x 30 mm mm	60 x 60 x 33 mm mm
Cable lenght - connector	1.5 m - none	1.5 m - none
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 1.5 liter/min (@ 22°C)	(a). Water 1.5 liter/min (@ 22°C)





AHW-100-D20-HPB

AHW-100-D30-HPB

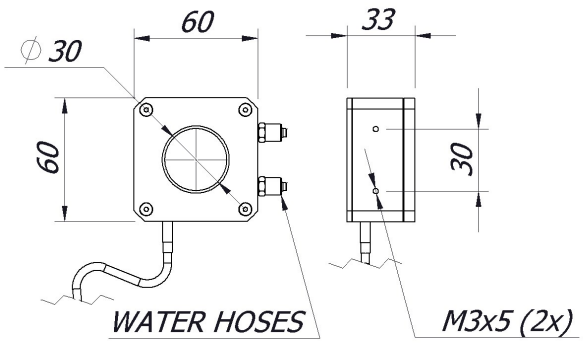
OEM Sensors with Analogue Built-in Amplifier

Range: 600mW to 200W

Features:

- OEM Thermal Sensors embedding sensor disks and analog electronics
- Amplification and Speed-Up of natural sensor's signals
- High power, large area sensors

Model	AHW-150-D30-HPB	AHW-200-D20-HPB	AHW-200-D30-HPB
Power Mode			
Max. Average Power	150 W	200 W	200 W
Min. Power	600 mW	800 mW	800 mW
Power Resolution	30 mW	40 mW	40 mW
Response Time	2.5 sec sec	2.5 sec sec	2.5 sec sec
Power Linearity (1)	± 1%	± 1%	± 1%
Absorber Specs			
Aperture	30 mm	20 mm	30 mm
Type	HPB	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	9 kW/cm² @40 W	6 kW/cm² @200 W	6 kW/cm² @200 W
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
Amplifier Specs			
Amplifier Input Voltage	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating	±7 to ±12 VDC, or 14 to 24 VDC floating
Output Voltage @ Full Scale	5 V	5 V	5 V
Min Detectable Voltage	5 mV	5 mV	5 mV
Sensitivity	33.3 mV/W	25 mV/W	25 mV/W
General Characteristics			
Cooling	Water (a)	Water (a)	Water (a)
Weight	0.3 kg	0.3 kg	0.3 kg
Dimension	60 x 60 x 33 mm mm	50 x 50 x 30 mm mm	60 x 60 x 33 mm mm
Cable lenght - connector	1.5 m - none	1.5 m - none	1.5 m - none
Notes			
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 1.5 liter/min (@ 22°C)	(a). Water 1.5 liter/min (@ 22°C)	(a). Water 1.5 liter/min (@ 22°C)



AHW-150-D30-HPB AHW-200-D20-HPB AHW-200-D30-HPB

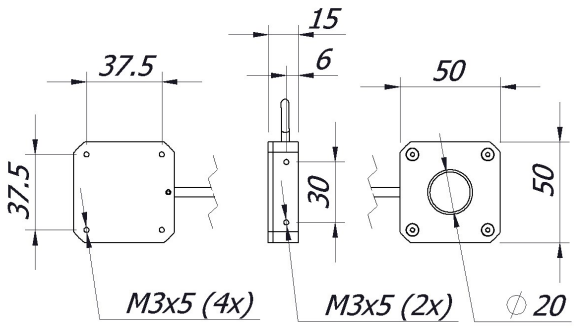
OEM Sensors with RS232 or USB Interfacing

Range: 2mW to 5W

Features:

- Slim Design
- PC-Plug Applications software supplied with sensors
- DLL driver available

Model	CSA-2-D12-BBF-USB / CSA-2-D12-BBF-RS	CSA-2-D12-HPB-USB / CSA-2-D12-HPB-RS	CSA-5-D12-BBF-USB / CSA-5-D12-BBF-RS
Power Mode			
Max. Average Power	2000 mW	2000 mW	5 W
Min. Power	2 mW	2 mW	10 mW
Power Resolution	20 µW	20 µW	100 µW
Noise Equivalent Power (NEP)	50 µW	50 µW	500 µW
Response Time	1 sec	1 sec	1 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (1)	± 1%	± 1%	± 1%
Single Shot Energy Mode			
Max. Energy (with 100 ms pulse)	2000 mJ	2000 mJ	5 J
Min. Energy	2 mJ	2 mJ	10 mJ
Energy Resolution	100 µJ	100 µJ	100 µJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%
Absorber Specs			
Aperture	12 mm	12 mm	12 mm
Type	BBF	HPB	BBF
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	18 kW/cm² @10 W	200 W/cm²
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²
General Characteristics			
Cooling	Conduction (a)	Conduction (a)	Conduction (a)
Weight	0.15 kg	0.15 kg	0.15 kg
Dimension	50 x 50 x 15 mm	50 x 50 x 15 mm	50 x 50 x 15 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Notes			
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink	(a). Conduction, through heat sink



CSA-2-D12-BBF-USB /CSA-2-D12-BBF-RS
CSA-2-D12-HPB-USB /CSA-2-D12-HPB-RS
CSA-5-D12-BBF-USB /CSA-5-D12-BBF-RS

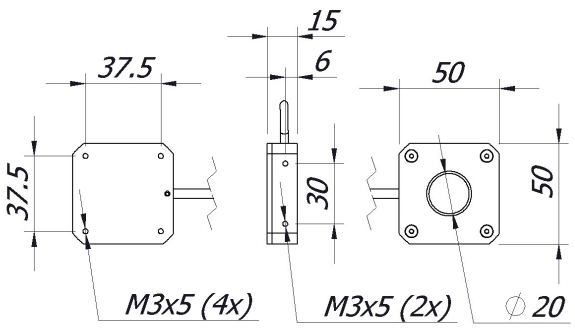
OEM Sensors with RS232 or USB Interfacing

Range: 20mW to 20W

Features:

- Slim Design
- PC-Plug Applications software supplied with sensors
- DLL driver available

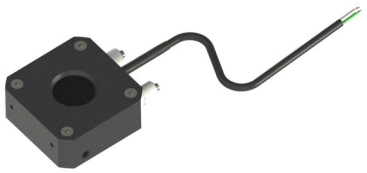
Model	CSA-20-D20-BBF-USB / CSA-20-D20-BBF-RS	CSA-20-D20-HPB-USB / CSA-20-D20-HPB-RS
Power Mode		
Max. Average Power	20 W	20 W
Min. Power	20 mW	20 mW
Power Resolution	100 µW	100 µW
Noise Equivalent Power (NEP)	600 µW	600 µW
Response Time	1.8 sec	1.8 sec
Power Calibration Uncertainty	± 3%	± 3%
Power Linearity (1)	± 1.5%	± 1.5%
Single Shot Energy Mode		
Max. Energy (with 100 ms pulse)	20 J	20 J
Min. Energy	10 mJ	10 mJ
Energy Resolution	100 µJ	100 µJ
Energy Calibration Uncertainty	± 5%	± 5%
Absorber Specs		
Aperture	20 mm	20 mm
Type	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	14 kW/cm² @10 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics		
Cooling	Conduction (a)	Conduction (a)
Weight	0.15 kg	0.15 kg
Dimension	50 x 50 x 15 mm	50 x 50 x 15 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink



QA-200-D40-HPB QA-200-D40-SHC

OEM Sensors with RS232 or USB Interfacing

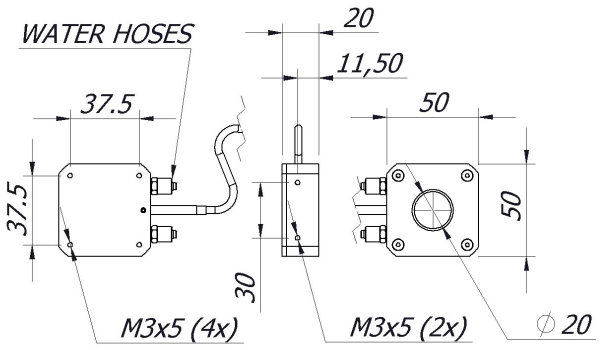
Range: 50mW to 50W

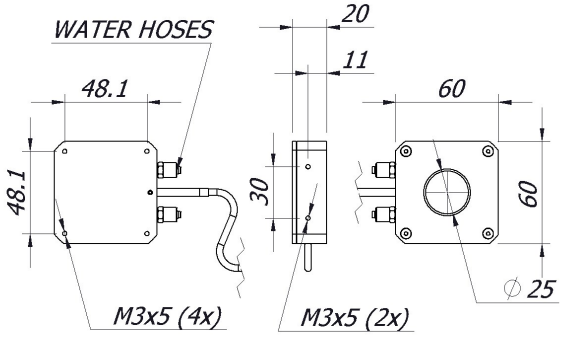


Features:

- Slim design, water cooled series
- PC-Plug Applications software supplied with sensors
- DLL driver available

Model	CSW-50-D20-BBF-USB / CSW-50-D20-BBF-RS	CSW-50-D20-HPB-USB / CSW-50-D20-HPB-RS	CSW-50-D25-BBF-USB / CSW-50-D25-BBF-RS	CSW-50-D25-HPB-USB / CSW-50-D25-HPB-RS
Power Mode				
Max. Average Power	50 W	50 W	50 W	50 W
Min. Power	50 mW	50 mW	50 mW	50 mW
Power Resolution	1 mW	1 mW	1 mW	1 mW
Noise Equivalent Power (NEP)	2 mW	2 mW	2 mW	2 mW
Response Time	2 sec	2 sec	2 sec	2 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%	± 3%
Power Linearity (1)	± 1.5%	± 1.5%	± 1.5%	± 1.5%
Single Shot Energy Mode				
Max. Energy (with 100 ms pulse)	50 J	50 J	50 J	50 J
Min. Energy	100 mJ	100 mJ	100 mJ	100 mJ
Energy Resolution	1 mJ	1 mJ	1 mJ	1 mJ
Energy Calibration Uncertainty	± 5%	± 5%	± 5%	± 5%
Absorber Specs				
Aperture	20 mm	20 mm	25 mm	25 mm
Type	BBF	HPB	BBF	HPB
Absorber Spectral Range	0.19 - 25 µm	0.19 - 11 µm	0.19 - 25 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	200 W/cm²	11 kW/cm² @40 W	200 W/cm²	11 kW/cm² @40 W
Max Energy Density (2)	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 3.6 J/cm² 10µs pulse width: 0.2 J/cm² 10ns pulse width: 0.1 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics				
Cooling	Water (a)	Water (a)	Water (a)	Water (a)
Weight	0.25 kg	0.25 kg	0.25 kg	0.25 kg
Dimension	50 x 50 x 20 mm	50 x 50 x 20 mm	60 x 60 x 20 mm	60 x 60 x 20 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Notes				
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)	(a). Water 0.5 liter/min (@ 22° C)



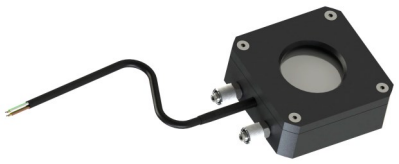


CSW-50-D20-BBF-USB /CSW-50-D20-BBF-RS
CSW-50-D20-HPB-USB /CSW-50-D20-HPB-RS

CSW-50-D25-BBF-USB /CSW-50-D25-BBF-RS
CSW-50-D25-HPB-USB / CSW-50-D25-HPB-RS

OEM Sensors with RS232 or USB Interfacing

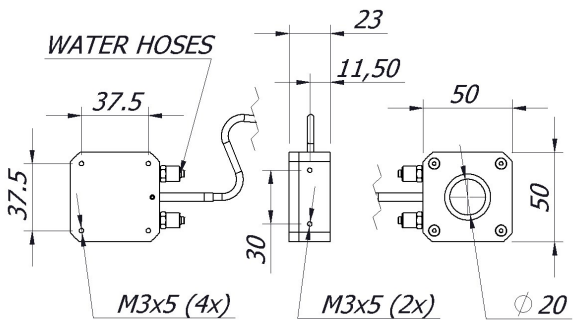
Range: 200mW to 200W

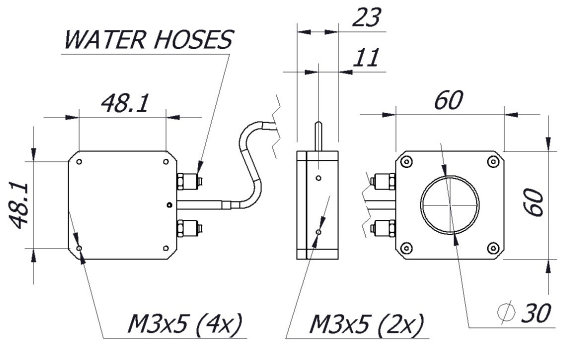


Features:

- High Power Series
- PC-Plug Applications software supplied with sensors
- DLL driver available

Model	CSW-200-D20-HPB-USB / CSW-200-D20-HPB-RS	CSW-200-D30-HPB-USB / CSW-200-D30-HPB-RS
Power Mode		
Max. Average Power	200 W	200 W
Min. Power	0.2 W	0.2 W
Power Resolution	10 mW	10 mW
Noise Equivalent Power (NEP)	10 mW	10 mW
Response Time	3 sec	3 sec
Power Calibration Uncertainty	± 3%	± 3%
Power Linearity (1)	± 1.5%	± 1.5%
Single Shot Energy Mode		
Max. Energy (with 100 ms pulse)	200 J	200 J
Min. Energy	1 J	1 J
Energy Resolution	10 mJ	10 mJ
Energy Calibration Uncertainty	± 5%	± 5%
Absorber Specs		
Aperture	20 mm	30 mm
Type	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	7 kW/cm² @200 W	7 kW/cm² @200 W
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics		
Cooling	Water (a)	Water (a)
Weight	0.25 kg	0.25 kg
Dimension	50 x 50 x 23 mm	60 x 60 x 23 mm
Cable lenght - connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Water 1.5 liter/min (@ 22°C)	(a). Water 1.5 liter/min (@ 22°C)





CSW-200-D20-HPB-USB /CSW-200-D20-HPB-RS

CSW-200-D30-HPB-USB /CSW-200-D30-HPB-RS

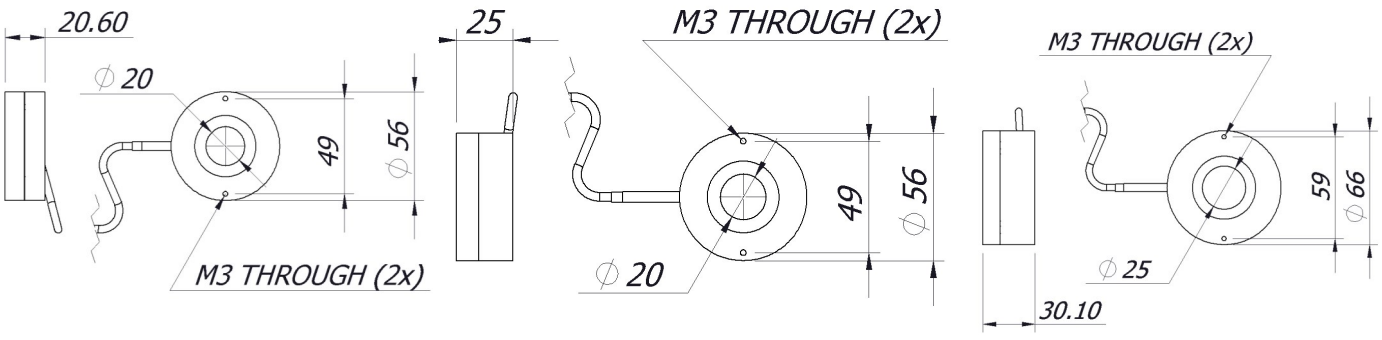
OEM Power Probes with RS232 or USB Interfacing

Range: 100mW to 500W

Features:

- No Water Cooling up to 500W
- PC-Plug Applications software supplied with sensors
- DLL driver available

Model	Fit-50-H-USB / Fit-50-H-RS	Fit-200-H-USB / Fit-200-H-RS	Fit-500-H-USB / Fit-500-H-RS
Power Mode			
Max. Average Power	50 W	200 W	500 W
Min. Power	0.1 W	0.5 W	1 W
Power Resolution	1 mW	10 mW	10 mW
Noise Equivalent Power (NEP)	2 mW	10 mW	20 mW
Response Time	5 sec	5 sec	5 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Power Linearity (1)	± 1%	± 1%	± 1%
Absorber Specs			
Aperture	20 mm	20 mm	25 mm
Type	HPB	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (2)	9 kW/cm² @40 W	6 kW/cm² @200 W	4 kW/cm² @500 W
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Cooling	Conduction (a)	Conduction (a)	Conduction (a)
Weight	0.2 kg	0.2 kg	0.3 kg
Dimension	Ø 56 x 21 mm	Ø 56 x 25 mm	Ø 66 x 30 mm
Cable lenght– Connector	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232	2.5 m - USB / 1.5 m - RS232
Notes			
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink	(a). Conduction, through heat sink



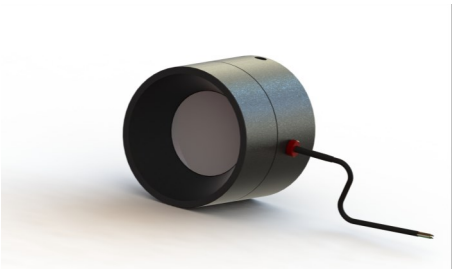
Fit-50-H-USB /Fit-50-H-RS

Fit-200-H-USB /Fit-200-H-RS

Fit-500-H-USB /Fit-500-H-RS

OEM Power Probes with RS232 or USB Interfacing

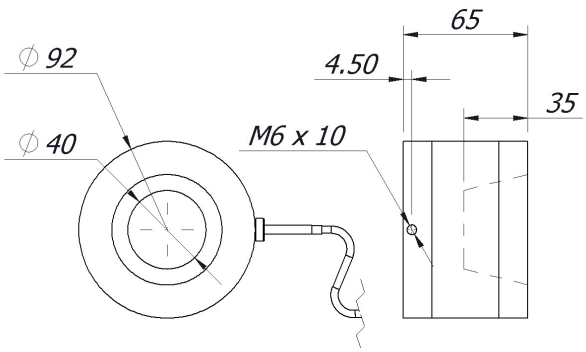
Range: 60W to 6KW

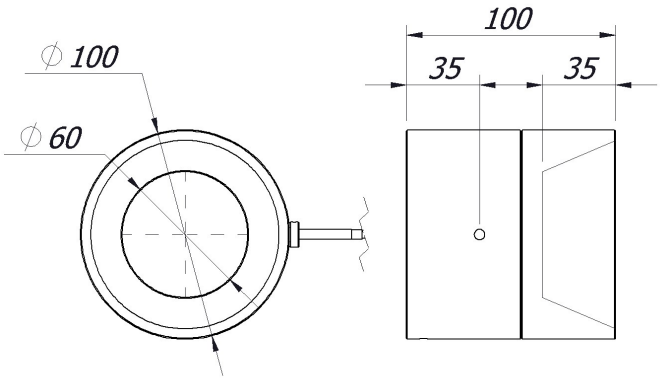


Features:

- No Water Cooling up to 6KW
- PC-Plug Applications software supplied with sensors
- DLL driver available

Model	Fit-3000-H-USB / Fit-3000-H-RS	Fit-6000-H-USB / Fit-6000-H-RS
Power Mode		
Max. Average Power	3000 W	6000 W
Min. Power	60 W	150 W
Power Resolution	100 mW	1 W
Noise Equivalent Power (NEP)	100 mW	0.25 W
Response Time	6 sec	6 sec
Power Calibration Uncertainty	± 5%	± 5%
Power Linearity (1)	± 1.5%	± 1.5%
Absorber Specs		
Aperture	40 mm	60 mm
Type	HPB	SHC
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.25 - 1.1 µm, 9 - 11 µm
Max Power Density (2)	3 kW/cm² @2kW	4 kW/cm² @5kW
Max Energy Density (2)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 115 J/cm² 10µs pulse width: 4 J/cm² 10ns pulse width: 1 J/cm²
General Characteristics		
Cooling	Conduction (a)	Conduction (a)
Weight	1.1 kg	2.5 kg
Dimension	Ø 92 x 65 mm	Ø 100 x 100 mm
Cable lenght– Connector	5 m - USB / 5 m - RS232	5 m - USB / 5 m - RS232
Notes		
(1). Detector centrally irradiated @50% of useful surface. (2). Damage thresholds also depend on power level. Please see damage graphs for more details.	(a). Conduction, through heat sink	(a). Conduction, through heat sink





Fit-3000-H-USB /Fit-3000-H-RS

Fit-6000-H-USB /Fit-6000-H-RS

Laser Power Probes

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For latest updates please visit our website: www.laserpoint.eu

Handheld Laser Power Probes

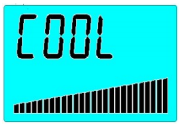
Fit and Cronos: Simple, yet Advanced Measurements

Many applications do not require the tight specifications of power meters. In many cases it is sufficient to have readings in a snapshot just to monitor if power is ok as there is no necessity to measure over an extended period of time; many times water is not available on the machine or it is simply a bare matter of limited budget: that's the world for a different class of instruments known as laser probes or power probes.

Those instruments are stand alone units made of a thermal probe connected to an electronics and its display. In general, existing instruments of this type are thermometers that measure a temperature difference in a fixed time and have a simple dial or a digital display. They have a dependence on the accuracy of measurement time, which in most of cases has to be evaluated by the operator, have poor repeatability and accuracy, or need to be cooled after each measurement etc.

LaserPoint has introduced a real breakthrough in the field with two series of fully automatic laser power probes that calculate laser power by a microprocessor based measurement of temperature dynamics. Their measurement and acquisition technique self-determines the time needed to carry out a measurement: data acquisition is triggered and stopped by detecting set heat parameters thresholds. This technique is totally free from induced errors due to measurements of exposure times and may allow multiple measurements without the need of forcing cooling to the absorber.

Both ***Fit*** and ***CRONOS*** feature a large multifunction LCD that simultaneously indicates the measured power, the wavelength of calibration (CO2, Nd-YAG) and low-battery. Furthermore a moving bar shows the actual absorber temperature; this informs the operator whether he can still perform more measurements before the absorber reaches needs to be cooled. Additionally, the probe status is displayed by a two colour LED: probe is ready (steady green), measurement is in progress (flashing green), measurement is over (steady red) or cooling is needed (flashing red).



Fit and ***CRONOS*** are both operated by a single button. They store the last measurement in memory and shut automatically off after 5 minutes of non operation. Two common AA batteries allow a minimum of 5000 measurements.

Fit and ***CRONOS*** have been ergonomically designed in all their details like the LCD display and the balance of weights, to provide a comfortable and safe operation. The absorbers feature low reflections and high damage thresholds; in particular the hi-power, multi kilowatt ***CRONOS*** have a concave conical shape to avoid dangerous back-reflections toward the operator.

Recalibrations can be made user.

Fit Series :

Fully automatic, low power probe series
3 models cover from 500mW to 500W.
dual wavelength (CO2 and Yag) ,
4sec to measure and display
±1% repeatability
±3% accuracy
10 mW resolution on 50W probe
Recalibration possible by User

Cronos Series

Fully automatic, high power probe series
3 models cover from 1.5W to 10kW
dual wavelength (CO2 and Yag) ,
8sec to measure and display
±2% repeatability (±5% for 5 and 10KW models)
±4% accuracy
1W resolution on 10KW probe
Recalibration possible by User

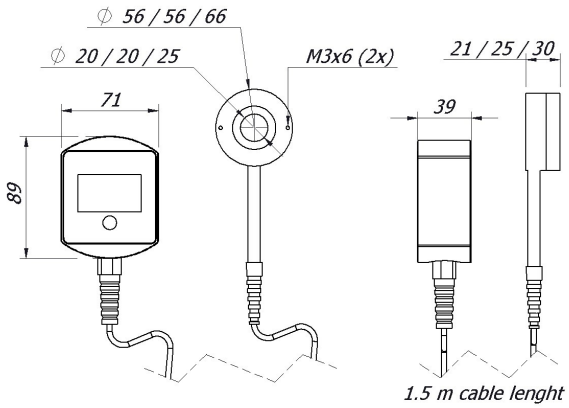
Handheld Laser Power Probes :FIT Series

Range: 500mW to 500W

Features:

- Stand Alone, Portable Unit
- Dual Wavelength Units
- Fully Automatic Instruments

Model	Fit-50	Fit-200	Fit-500
Power Mode			
Max. Average Power	50 W	200 W	500 W
Min. Measurable Power	0.5 W	2 W	5 W
Min. Meas. Power @3% accuracy	2 W	8 W	20 W
Power Resolution	10 mW	100 mW	100 mW
Time to measure and display:	4 sec	4 sec	4 sec
Power Calibration Uncertainty	± 3%	± 3%	± 3%
Repeatability:	± 1%	± 1%	± 1%
Absorber Specs			
Aperture	20 mm	20 mm	25 mm
Type	HPB	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (1)	9 kW/cm² @40 W	6 kW/cm² @200 W	4 kW/cm² @500 W
Max Energy Density (1)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Max Allowed Probe Temperature	70	70	70
Power Supply	3V (2 AA Batteries)	3V (2 AA Batteries)	3V (2 AA Batteries)
Battery runtime:	200 hrs	200 hrs	200 hrs
Cooling	Convection	Convection	Convection
Weight	0.5 kg	0.5 kg	0.6 kg
Dimension	Ø 56 x 21 mm (sensor head) 95 x 71 x 46 mm (electronic)	Ø 56 x 25 mm (sensor head) 95 x 71 x 46 mm (electronic)	Ø 66 x 30 mm (sensor head) 95 x 71 x 46 mm (electronic)
Cable lenght	1.2 m	1.2 m	1.2 m
Notes			
(1). Damage thresholds also depend on power level. Please see damage graphs for more details.			



Fit-50 Fit-200 Fit-500

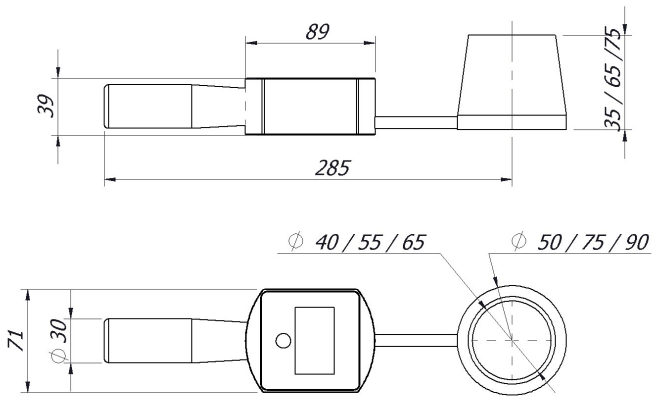
Handheld Laser Power Probes : Cronos Series

Range: 30W to 10KW

Features:

- Stand Alone, Portable Unit
- Dual Wavelength Units
- Fully Automatic Instruments

Model	Cronos-LP1.5	Cronos-LP 5.0	Cronos-LP10
Power Mode			
Max. Average Power	1500 W	5 kW	10 kW
Min. Measurable Power	30 W	100 W	200 W
Min. Meas. Power @3% accuracy	150 W	500 W	1000 W
Power Resolution	1 W	1 W	1 W
Time to measure and display:	8-15 sec (1)	8-15 sec (1)	8-15 sec (1)
Power Calibration Uncertainty	± 4%	± 4%	± 4%
Repeatability:	± 2%	± 5%	± 5%
Absorber Specs			
Aperture	40 mm	55 mm	65 mm
Type	HPB	HPB	HPB
Absorber Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Calibration Spectral Range	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm	0.19 - 2.1 µm, 2.94µm, 9 - 11 µm
Max Power Density (1)	3.5 kW/cm² @1 kW	2.5 kW/cm² @5kW	2 kW/cm² @10kW
Max Energy Density (1)	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²	5ms pulse width: 36 J/cm² 10µs pulse width: 1.2 J/cm² 10ns pulse width: 0.3 J/cm²
General Characteristics			
Max Allowed Probe Temperature	150	150	150
Power Supply	3V (2 AA Batteries)	3V (2 AA Batteries)	3V (2 AA Batteries)
Battery runtime:	200 hrs	200 hrs	200 hrs
Cooling	Convection	Convection	Convection
Weight	0.6 kg	1.1 kg	1.6 kg
Dimension	306 x 71 x 40 mm	312 x 71 x 65 mm	318 x 71 x 75 mm
Cable lenght	n.a.	n.a.	n.a.
Notes			
(1). Damage thresholds also depend on power level. Please see damage graphs for more details.	(1). From 8 seconds for max power measurements, up to 15 seconds for min power.	(1). From 8 seconds for max power measurements, up to 15 seconds for min power.	(1). From 8 seconds for max power measurements, up to 15 seconds for min power.



Cronos-LP1.5 Cronos-LP 5.0 Cronos-LP10

Fit-IPL: Energy/ Power Meter for Intense Pulsed Light

Fit-IPL-R is a fully automatic, hand-held energy and power meter designed for IPL (Intense Pulsed Light) applications.

Fit-IPL-R works on a microprocessor based patent pending measurement technique of temperature dynamics through a thermopile sensor. Measurement and data acquisition are fully automatic, making this technique virtually free from operator induced errors.

Fit-IPL-R can measure both flash-lamps single shot energies up to 350 Joules and average powers, when in burst mode operation, up to 100 W.
Fit-IPL-R innovative measurement concept reduces the time of measurement and display to 10 sec. with excellent repeatability (±1%), accuracy (±3%) and high resolution (10 mW and 100mJ) associated with a wide dynamic range of measurement (down to 1% of f.s.).

Fit-IPL-R is extremely friendly in use and features a large rectangular exposure area (60x18mm) to match with all handpieces.

The broadband detector works in the range from 400 to 1400 nm, which is the range of interest for the majority of applications (photoepilation, skin rejuvenation, treatments of acne, vascular and pigmented lesions, psoriasis).

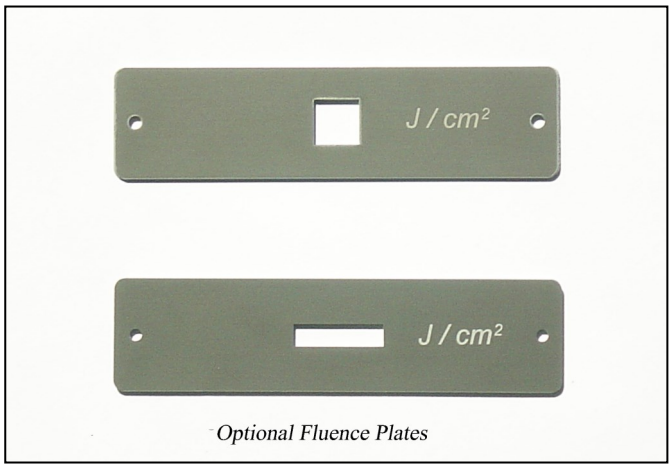
The absorber coating of ***Fit-IPL-R*** remains fully responsive also when filters are used to reduce the lamp spectral bandwidth. This absorber is very robust, as it has been designed to face the extreme fluences (up to 90J/cm2) of professional systems (medical and clinic) where the highest pulse energies are involved. But it is also very flexible since it can operate with semi-professional systems (beauty salons) and consumer-oriented systems (2 to 10J/cm2).

Fit-IPL-R has a window for gel or water coupled handpieces but can also measure air coupled IPLs. The unit bears a multifunction LCD that simultaneously indicates the flash-lamp energy (or power) delivered by the handpiece; it also shows the mode of operation [**Sin** for single shot (energy) or **rEP** for repetitive (power)], probe model and warning for low-battery. A bargraph shows the sensor temperature to inform the operator whether he can still perform more measurements before the sensor reaches its maximum allowable temperature. Additionally, the probe status is displayed by a two colour LED indicating if the instrument is ready for measurement, if the reading is in progress or over and if cooling is needed.

An important feature of this instrument is the possibility, given to users, to match to a custom reference or make in house re-calibrations by means of a lateral micro-switch usable to modify the sensitivity.

A plate, bearing a high precision, laser carved 1 cm2 diaphragm (available as a 10x10mm or 20x0.5mm) can be mounted on the head to get the value of fluence (J/cm2) delivered to the patient.

Fit-IPL-R is operated by a single button; it shuts automatically off after 5 minutes of non operation and always stores its last measurement in memory. Two common AA batteries allow a minimum of 4000 measurements.



Optional Fluence Plates

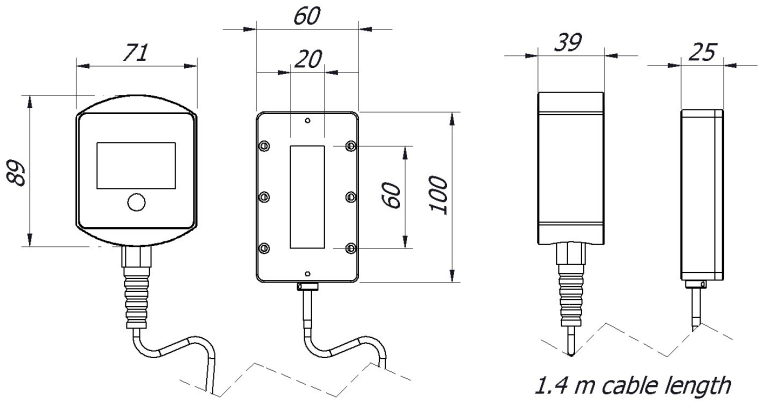
Handheld Power Probe for IPL : FIT-IPL-R

Range: 7J to 350J or 2W to 100W

Features:

- Accurate Energy or Power in Hair Removal Applications
- Glass window for gel or water couples IPL sources
- Optional Calibrated 1cm^2 plate for Fluence measurement

Parameter	Power (rEP)	Energy (Sin)
Maximum Measurable Power (W)/Energy (J):	100	350
Minimum Measurable Power @ ±3% Accuracy (W/J):	2	7
Absolute Minimum Measurable Power/Energy (W/J):	1	3,5
Maximum Spot Size (mm) (W x H):	18x60	
Power density damage threshold @ full scale at 1064 nm (YAG laser wavelength) (W/cm^2):	10000	
Repeatability (W/J):	± 1%	± 3%
ADC Resolution (W/J):	± 0.12	± 0.45
Display Resolution (W/J):	0.01	0.1
Measurement Accuracy [1]	±3%	±5%
Maximum allowable sensor head temperature (°C):	70	
Time to measure and display data (s):	10	-
Waiting time between 2 energy measures (s):	-	25
Power consumption in On status (mW):	26	
Power consumption in Off status (microW):	25	
Power supply (2x AA Batteries) (V):	3	
Continuous operation without battery replacement (h):	200	
Operating temperature range (°C):	from +10 a +40	
Storage temperature range (°C):	from -10 a +60	
Weight (body)(g):	336	
Weight (sensor with cable) (g):	178	
Size (head) LxWxH (mm):	60x100x26	
Size (body) LxWxH (mm):	95x71x46	



FIT-IPL-R

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