

# LASERPOINT

THE POINT OF DIFFERENCE IN PHOTONICS

BLINK<sup>HS</sup>

High Speed Sensor



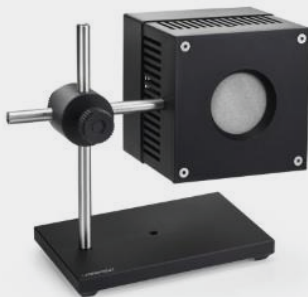
BLINK<sup>FR</sup>

Fast Response Sensor



**NEW:** HIGH SPEED LASER SENSORS

## Thermal Sensors



## Sensors Meters



## OEM Products



## Power Probes



## Photodiodes



## Calorimeters



# ABOUT LASER POINT

Laser Point is located in Italy and operates since 1986 in the laser market as manufacturer of laser measurement systems. It is an independent company, constantly focussed on innovation to always provide customers with the smartest solutions for laser monitoring.

Laser Point employs a highly skilled staff of physicists, engineers and technicians with solid experience in laser technologies, laser diagnostics and laser process monitoring.

Proprietary technologies cover a wide range of markets and applications, including industrial laser applications, monitoring of laser sources, monitoring of laser systems, medical laser applications, laboratory power monitoring.

Laser Point has developed many proprietary and patented technologies that allow to withstand the power density typical of high brightness lasers and multi-kW lasers and to measure ultrafast pulsed lasers with pulse durations down to femtoseconds.

Laser Point designs and manufactures power and energy measurement instruments from low power ( $\mu\text{W}$ ) up to multi-kW. All sensors are supplied with calibration certificates traceable to NIST/PTB international standards.

Laser Point quality management system is certified according to ISO9001-2015 standard.

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# Selecting a meter for the application

Laser Point solutions are characterized by a flexible approach to laser measurements: different sensor meters are available, allowing reading measurements on a stand-alone portable instrument, on PC screen or simply storing them on a memory device.

|  |  |   |  |
|--|--|---|--|
|   |   |   |   |
| <b>PLUS2</b>   | <b>PC-LINK</b>   | <b>PcPlug V3</b>  | <b>HSM</b>   |
| <b>Ordering Code:<br/>PLUS2</b>  | <b>Ordering Code:<br/>PC-LINK</b>  | <b>Ordering Code:<br/>sensor heads code</b>   | <b>Ordering code:<br/>HSM-1000</b>   |
| Connectivity:<br>DB15 To Head;<br>USB to PC.   | Connectivity:<br>DB15 to Head;<br>USB to PC.   | Connectivity:<br>USB or RS232 to PC   | Connectivity:<br>HS connector to Head<br>Ethernet to PC  |
| Meter for all thermal sensors and power probe (FIT-H), (including Blink FR up to 6Hz rep. rate) and Photodiode Sensors.  | Meter for all thermal sensors and FIT-H. Blink FR and photodiodes are not supported.   | Meter Integrated head for all thermal sensors and power probe (FIT-H), (including Blink FR up to 6Hz rep. rate) and Photodiode Sensors.   | High Speed Meter (HSM) for Blink HS.   |
| Plus2 is a handheld, lightweight, touch-screen Meter designed to measure the optical power/energy of lasers and other light sources. It features a 4.3" color touch screen display and an intuitive and ergonomic Graphical User Interface which allow exploiting all its characteristics by just few touches. It's powered by a USB rechargeable Lithium battery for a run time up to 15 hrs. Plus2 offers a configurable Analogue Output and easy Data Saving. | PC-LINK is a smart "sensor head to PC" interface that converts any PC or laptop into a powerful instrument which measures, analyses and records power and energy from a thermal sensor head. PC-LINK is supplied with user-friendly communication software for single channel PC-LINK provides a full statistical analysis without the need of any display. Software includes many mathematical functions. | The PC Plug Meter Integrated series of sensors has been specifically developed for all those applications that do not require a display but where readings can be analyzed and displayed on the now ubiquitous computer. 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. | HSM is a high speed electronics specifically developed to connect High Speed Sensor Blink HS to PC via Ethernet, to acquire and display data of laser pulse trains and perform statistics on many laser parameters as energy, power, repetition rate, peak power. HSM can sample data with a sampling rate up to 500 Msamples/s to provide a precise energy measurement of each single ultrashort pulse up to 1 MHz repetition rate. |

- PLUS 2

Plus 2 is a handheld, lightweight, touch screen meter designed to measure the optical power/energy of lasers and other light sources.

The Plus2 meter is compatible with all released Laser Point thermal sensors (including Blink FR up to 6Hz rep. rate) and photodiode sensors. It features a 4.3" color touch screen display and an intuitive and ergonomic Graphical User Interface which allow to easily exploiting all its characteristics. The instrument is powered by a rechargeable lithium battery for a run time of up to 15 hrs.

Among its features, the Plus 2 offers a configurable Analogue Output and easy Data Saving.

Wavelengths can be selected opening the "edit lambda" window where a set of most popular laser wavelengths are displayed. 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.

The "Mode" screen button easily switches from Power measurement mode to Energy measurement mode; measurement units are shown according to sensor head type and expected range. The Plus 2 can measure the single shot or the integral energy of a burst of 2 or more pulses.

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.

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". Three processing options are available:

- Continuous:** statistical 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.

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. Display off time can be set from 1 to 30 minutes and after a certain time of inactivity Plus 2 turns off.

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



- a Date - Time - Battery/network icons
- b Head model, serial number and operating temperature ( $^{\circ}C$ )
- 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

| Ordering Code                     | PLUS2   |
|-----------------------------------|---|
| Power Mode                        |   |
| Power Range                       | 100 nW – 10 kW  |
| Resolution                        | 0.01% - 0.1% of Full Scale  |
| Energy Mode                       |   |
| Energy Range                      | 1 mJ – 1 kJ   |
| Resolution                        | 0.01% - 0.1% of Full Scale  |
| Pulse repetition rate Range       | Single shot - 6 Hz (a)  |
| Power Probe Mode (FIT-H)          |   |
| Power Range                       | 100 mW – 10 kW  |
| Resolution                        | 0.5 ‰ (a)   |
| General Operating Characteristics |   |
| Detector Compatibility            | Thermal sensors, OEM thermal sensors, FIT-H power probes, Photodiodes Blink FR  |
| Storage Temperature Range         | -20 / +70 °C  |
| Operating Temperature Range       | +5 / +40 °C   |
| Relative Humidity Range           | 10 – 70 %   |
| PC connectivity                   | USB   |
| Sensor Head connectivity          | DB15  |
| Selectable Wavelengths            | 1 nm resolution (b)   |
| Dimensions                        | 170 H x 100 W x 36-50 D (mm)  |
| Weight                            | 380 g   |
| Display                           | 4.3" TFT LCD high brightness; 480 x 272 resolution; resistive touch screen; 96 H x 55 W (mm)                                |
| Battery                           | Built in rechargeable Li-Pol; 3.7 V, 3700 mAh   |
| Battery charge time               | 7-8 hours if not working; 15-20 hours if working  |
| Battery run time                  | >9 hours in normal operations; >15 hours in stand-by display mode   |
| Supplied battery charger          | Input 100/240 Vac; 50/100 Hz; 5 Vdc; 1A; Charging current: 0.5 A;<br>(Plus2 may be charged through a PC USB port)           |
| Electronics characteristics       |   |
| ADC sampling rate                 | 64 Hz – 192 Hz (c)  |
| ADC resolution                    | 23 bit  |
| Electrical accuracy               | ± 0.5 %   |
| Analog Output                     | 0.025 – 2 V (with 16 bit resolution; 0.0015% resolution)  |
| Analog Output Accuracy            | ± 0.1%; ± 2 mV relative to display  |
| Notes                             |   |
|                                   | a) for Blink FR<br>b) available wavelength range is sensor head dependent<br>c) sampling frequency is sensor head dependent |

- **PC-LINK**

To work with PC-LINK is very easy: it is sufficient to install the software, connect the sensor heads to PC-LINK unit and these latter to the USB port of a PC. No other operation and external power source are needed.

This sophisticated monitor is "plug and play" with all thermal heads and FIT-H power probes. 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; PC-LINK is in fact the ideal candidate for use in laser machines, in particular when associated to FIT-H (Fast Integrative Thermopile Heads) family of OEM power probes, that work up to 6KW without the need of water cooling.

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 acceleration circuitry to insure a fast response and will use the calibration data stored in the DB15 connector of each head to provide the most accurate power/energy measurement.

One feature offers the possibility to access to the "User Calibration Factor" (UCF) and there is also X10 gain to enhance measurement flexibility (e.g. low power measurements to 20 $\mu$ W resolution).

Software allows measuring and analyzing data with full statistical functions (Min., Max., mean and standard deviation). Data from each detector can be logged simultaneously to file.

The "Power mode" allows 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 with Laser Point's Fit-H power probes; 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.

The "Energy mode" allows the measurement of single shot energy.

Laser tuning function is used to achieve a high resolution tweaking of your laser; an analogue needle shows the direction of tuning: in the middle of the tuning display a box shows the current measured power, while the maximum value reached during the tuning procedure is kept in a second box of the screen.





| .Ordering Code                    | PC-LINK  |
|-----------------------------------|--|
| .Power Mode                       |  |
| Power Range                       | 1mW – 10kW   |
| Resolution                        | 0.5 ‰ (a)  |
| Energy Mode                       |  |
| Energy Range                      | 1 mJ – 300J  |
| Resolution                        | 0.5 ‰ (a)  |
| Pulse repetition rate Range       | Single Shot  |
| Power Probe Mode (FIT-H)          |  |
| Power Range                       | 100 mW – 10 kW   |
| Resolution                        | 0.5 ‰ (a)  |
| General Operating Characteristics |  |
| Detector Compatibility            | Thermal sensors, OEM thermal sensors, OEM FIT-H power probes |
| Storage Temperature Range         | -10 / +60 °C   |
| Operating Temperature Range       | +5 / +45 °C  |
| Relative Humidity Range           | 20 / 80%   |
| PC connectivity                   | USB  |
| Sensor Head connectivity          | DB15   |
| Selectable Wavelengths            | 6  |
| Dimensions                        | 113 L x 56 W x35 H (mm)                                      |
| Weight                            | 106 g  |
| Display                           | N.A.   |
| Battery                           | N.A.   |
| Battery charge time               | N.A.   |
| Battery run time                  | N.A.   |
| Supplied battery charger          | N.A.   |
| Electronics characteristics       |  |
| ADC sampling rate                 | 64 Hz  |
| ADC resolution                    | 16 bit   |
| Electrical accuracy               | ± 0.5 %  |
| Analog Output                     | N.A.   |
| Analog Output Accuracy            | N.A.   |
| Notes                             |  |
|                                   | a) For any Full Scale  |



- **PC-PLUG**

The PC-PLUG series of sensor heads has been specifically developed for all those applications that do not require a display but when readings can be analyzed and displayed on the now ubiquitous computer.

With simple “plug and play” functionality, integrated meter and at a lower cost, the PC PLUG sensors have all the power and sophistication of signal processing and software of the traditional PLUS 2 meter.

The PC-PLUG series has two different connectivity options: USB (option U) or RS-232 (option R).

The PC-PLUG series with USB connectivity gets its power supply from the PC through the USB port while the only requirement for PC-PLUG series with RS-232 connectivity is a + 12VDC input.

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.

The PC-PLUG is 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.

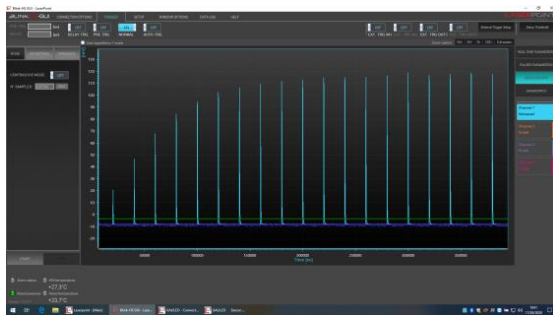


| .Ordering Code                           | PC-Plug sensor heads code   |
|--|---|
| <b>.Power Mode</b>                       |   |
| Power Range                              | 100 nW – 10 kW  |
| Resolution                               | 0.01% - 0.1% of Full Scale  |
| <b>Energy Mode</b>                       |   |
| Energy Range                             | 1 mJ – 1 kJ   |
| Resolution                               | 0.01% - 0.1% of Full Scale  |
| Pulse repetition rate Range              | Single shot - 6 Hz (a)  |
| <b>Power Probe Mode (FIT-H)</b>          |   |
| Power Range                              | 100 mW – 10 kW  |
| Resolution                               | 0.5 ‰ (a)   |
| <b>General Operating Characteristics</b> |   |
| Detector Compatibility                   | Thermal sensors, OEM thermal sensors, FIT-H power probes, Photodiodes Blink FR  |
| Storage Temperature Range                | -20 / +70 °C  |
| Operating Temperature Range              | +5 / +40 °C   |
| Relative Humidity Range                  | 10 – 70 %   |
| PC connectivity                          | USB / RS-232  |
| Sensor Head connectivity                 | N.A.  |
| Selectable Wavelengths                   | 1 nm resolution (b)   |
| Dimensions                               | 78 x 26.4 x 14.6 mm   |
| Weight                                   | 26 g  |
| Display                                  | N.A.  |
| Battery                                  | N.A.  |
| Battery charge time                      | N.A.  |
| Battery run time                         | N.A.  |
| Supplied battery charger                 | N.A.  |
| <b>Electronics characteristics</b>       |   |
| ADC sampling rate                        | 64 Hz – 192 Hz (c)  |
| ADC resolution                           | 23 bit  |
| Electrical accuracy                      | ± 0.5%  |
| Analog Output                            | N.A.  |
| Analog Output Accuracy                   | N.A.  |
| <b>Notes</b>                             |   |
|  | a) for Blink FR<br>b) available wavelength range is sensor head dependent<br>c) sampling frequency is sensor head dependent |

- **High Speed Meter (HSM)**

HSM is a High Speed Meter specifically developed to connect High Speed Sensor Blink HS to PC via Ethernet, to acquire and display data of laser pulse trains and perform statistics on many laser parameters such as energy, power, repetition rate, peak energy.

HSM is able to sample data with a sampling rate up to 500 Msamples/s to provide a precise energy measurement of each single ultrashort pulse up to 1 MHz repetition rate. It is suitable for ultrashort pulsed lasers down to femtosecond pulse duration.



Oscilloscope Mode



Real Time Parameter

HSM can work according to two different modes, the "Oscilloscope mode" allowing to display on the PC the acquired laser pulse train and the "Real Time Parameters" where the user can monitor the behavior of many different parameters of the acquired laser pulse train such as the energy of each pulse, power, repetition rate and peak power. A user friendly Graphic User Interface (Blink-HS-GUI) is supplied with HSM to easily display data on PC using the two modes. External power supply for HSM is 12 V with 2 A maximum current. Blink HS sensor is connected to HSM via a specific microwave cable supplied with the sensor. Measurement resolution of HSM (% full scale) is 0.1% with measurement accuracy of  $\pm 1\%$ . Trigger IN and trigger OUT SMA connectors are available on the HSM front panel to allow triggering of HSM measurements from an external trigger source or to provide an internal trigger signal respectively.

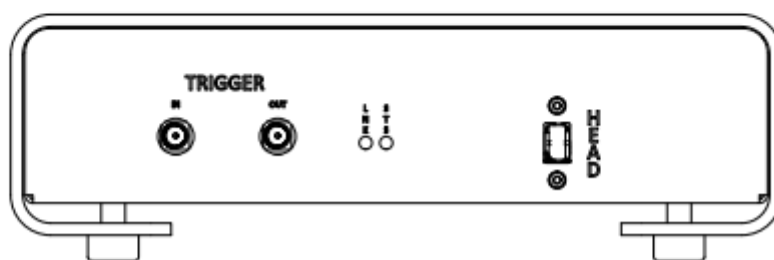
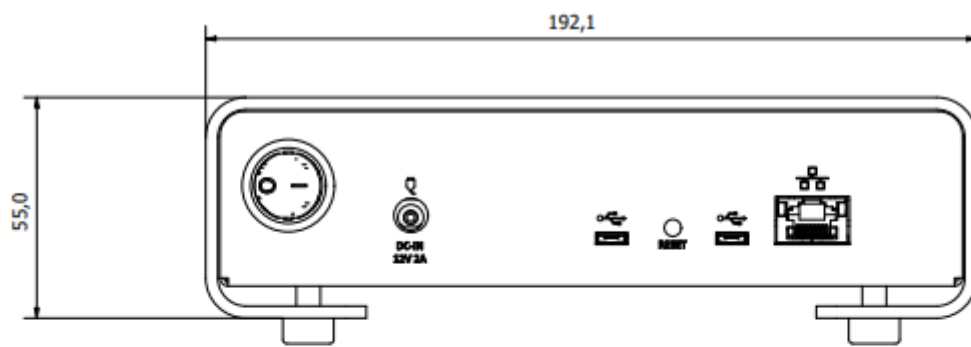


Rear Panel with Trigger IN and OUT



Front Panel with Ethernet port

|  |                                  |
|--|----------------------------------|
| <b>.Ordering Code</b>                    | <b>HSM-1000</b>                  |
| <b>.Power Mode</b>                       |                                  |
| Power Range                              | 20 W                             |
| Resolution                               | 0.1% of Full Scale               |
| <b>Energy Mode</b>                       |                                  |
| Energy Range                             | 1 $\mu$ J – 10 mJ                |
| Resolution                               | 0.1 % of Full Scale              |
| Pulse repetition rate Range              | 1 kHz – 1 MHz                    |
| <b>Power Probe Mode (FIT-H)</b>          |                                  |
| Power Range                              | N.A.                             |
| Resolution                               | N.A.                             |
| <b>General Operating Characteristics</b> |                                  |
| Detector Compatibility                   | BLINK HS                         |
| Storage Temperature Range                | -20 / +70 °C                     |
| Operating Temperature Range              | +5 / +40 °C                      |
| Relative Humidity Range                  | 20 / 80 %                        |
| PC connectivity                          | Ethernet 100/1 G                 |
| Sensor Head connectivity                 | Hirose IX - High Speed connector |
| Selectable Wavelengths                   | Up to 16 wavelengths             |
| Dimensions                               | 192.1 L x 162.0 W x 55.0 H (mm)  |
| Weight                                   | 740 g                            |
| Display                                  | N.A.                             |
| Battery                                  | N.A.                             |
| Battery charge time                      | N.A.                             |
| Battery run time                         | N.A.                             |
| Supplied battery charger                 | 12V 24W AC/DC Power Supply       |
| <b>Electronics characteristics</b>       |                                  |
| ADC sampling rate                        | 500 Msamples/s                   |
| ADC resolution                           | 14 bit                           |
| <b>Notes</b>                             |                                  |
|  | a) For any Full Scale            |



# Software

- Galileo Software

GALILEO is a step forward in simplification and easy to use of measurement instruments: a single software compatible with all Laser Point readout electronics, which makes any laptop a true power and energy meter. Galileo can in fact read and display data from any Laser Point Meter (PLUS2, PC-Plug series, PC-link).

A completely new graphic interface has been developed to be user friendly, intuitive and ready to use. Users can start their measurement process within a few mouse clicks and be immediately ready for measurement.

Galileo has been enriched with new useful functions:

- a visualizer of logged data (useful to load logged data in a trend graph for further analysis)
- a function to monitor whether process parameters remain within a preset range (it keeps under control a laser process and generates alarms whenever the measured values are outside the prefixed limits)
- automatic software update over the internet.
- new functions for the trend graph, like zoom, auto-sizing and three displaying modes for time flow.
- managing of up to 4 different sensors heads
- Power and energy density based on user defined laser beam size.

Using the processing power of PCs, Galileo gathers data at high speed from the readout electronic and displays information in a smooth and fast way.

All settings related to a specific head will be stored on the PC in use: in this way the

same settings can be reloaded each time the sensor is connected to the same PC.

On top to the main window of Galileo a tab control hosts all the relevant functions for setting up measurements in few mouse clicks. A large, highly visible, area is used to show measured data, depending on the selected mode for display (Digital, Trend, Analog).

Galileo can manage up to 4 different sensor heads arranging its windows in different ways for the most efficient visualization.



**Measurement Mode:** enables the selection between Power, Energy or FIT (power probe) modes of measurement and to display power data in Watt or in Joule.

**Full Scale Range:** enables the selection of up to four different full scale ranges (depending on the electronics) to increase the measurement resolution.

**Lambda:** Sets the wavelength for the sensor in use.

The "Wavelength Selection" page shows a table with the most popular wavelengths which are stored in the EEPROM of the head. Should the sensor head be used at other wavelengths not shown in the list, those can be chosen with 1 nm resolution on the box "Edit nm".

**Display Mode:** gives access to three different display modes of power measured data, namely:

- 1) Digital Display: shows the instantaneous value of measured power; the coloured bar represents the measured value as a fraction of full scale.
- 2) Trend Display (Power Mode):  
shows both laser power evolution (Y axis) as a function of time (X axis) and the instantaneous value of the measured function. Statistical information is visible in the upper part of the display. Various controls are available in the bottom to customize the display of measured data.  
Trend display in Energy and FIT (Power Probe) modes:  
the display becomes a histogram-like graph where the energy or power of each measure is represented as a vertical bar; the last measured value is also digitally shown. The statistical information is available in the upper part of the display.
- 3) Analogue Display:  
shows the instantaneous value of measured power both by a needle-like representation and in digital form.  
The "Start Tuning" key activates the tuning function for optical alignments: the MAX and MIN values reached during the operation will be updated.

**Statistics & Logging:** the tab hosts controls for elaboration of measured data, like data-logging or statistics.

**Data Logging:** saves measured data on a ".txt" file that can be open and managed using external programs (like Excel).

**Snap Shot:** saves a screen shot as an image file.

**Statistics:** provides statistical data on measured values:

**Type:** are available three options for acquisition and elaboration of statistical data:

- Continuous: data acquisition and elaboration are continuously made.
- Repeated: data are repeatedly collected and elaborated within a user's defined time period.
- Single: data are collected and elaborated over a single run within a user's defined time period.

Whether operators need to work using values shown as power or energy density ( $W/cm^2$  or  $J/cm^2$ ), the beam area will be automatically calculated after the insertion of beam shape parameters.

### Gain and Smoothing:

Multiply Factor is a useful tool to multiply the measured values by a correction factor (it can be  $>1$  or  $<1$ ). For example, when a power meter is behind a beam splitter to monitor a laser beam, the full power can be reconstructed multiplying the signal by a factor that takes into account the beam splitter attenuation. The sensor's natural response time can be used as it is (Natural) or can be Accelerated: in this case an internal algorithm on the instrument will speed the response time by several factors (it depends on the head type).



- **Communication Protocols for System Integrators**

Besides their use as standalone laser measurement meters, Laser Point devices (PLUS2, PC-LINK, PC-PLUG series with USB or RS-232 option) can also be used through a COM object control. This allows system integrators or anyone willing to write his own software, to integrate Laser Point measurement capabilities into their systems.

Laser Point drivers are compatible and certified for Windows XP, Windows 7 (32-bit and 64-bit), Windows 8 Desktop (32-bit and 64-bit), Windows 8.1 and Windows 10.

When drivers are installed on PC, a COM port and a USB device are added to the operating system.

Laser Point USB devices are compatible with USB 1.1, USB 2.0 and USB 3.0. Power is provided via USB connection.

The communication between PC and electronics is managed by a FTDI chip and is based on ASCII host commands.

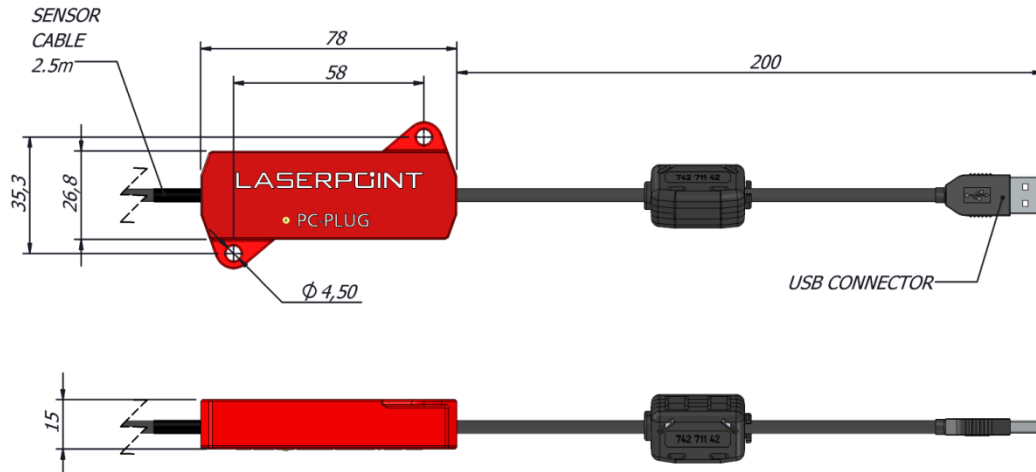
FTDI DLL commands have to be used to identify the Laser Point electronics and open the communication. Once communication has been correctly open, commands will be sent to retrieve information on sensor features (like available wavelengths, head name, etc.) and measured data (measured power or measured energy).

Communication protocol for PC-LINK, PLUS2, and PC-PLUG are available to download from the Laser Point website [www.laserpoint.eu](http://www.laserpoint.eu)

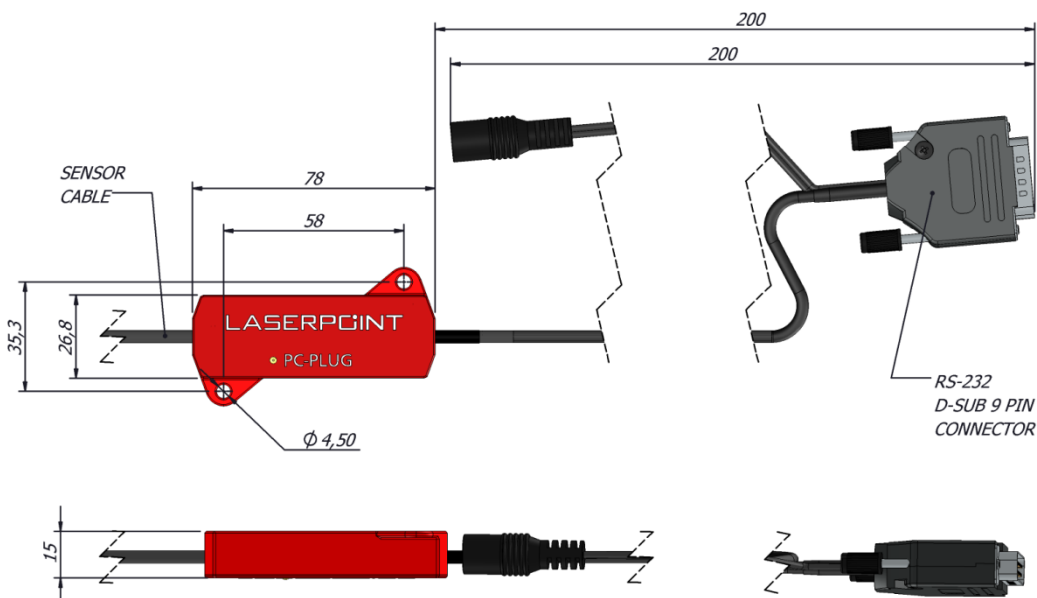
# PC-PLUG connectivity options

Two types of connectivity for PC-Plug option are available to connect the sensor head to PC or to OEM system.

- USB connectivity (PC-Plug U option)



- RS-232 connectivity (PC-Plug R option)

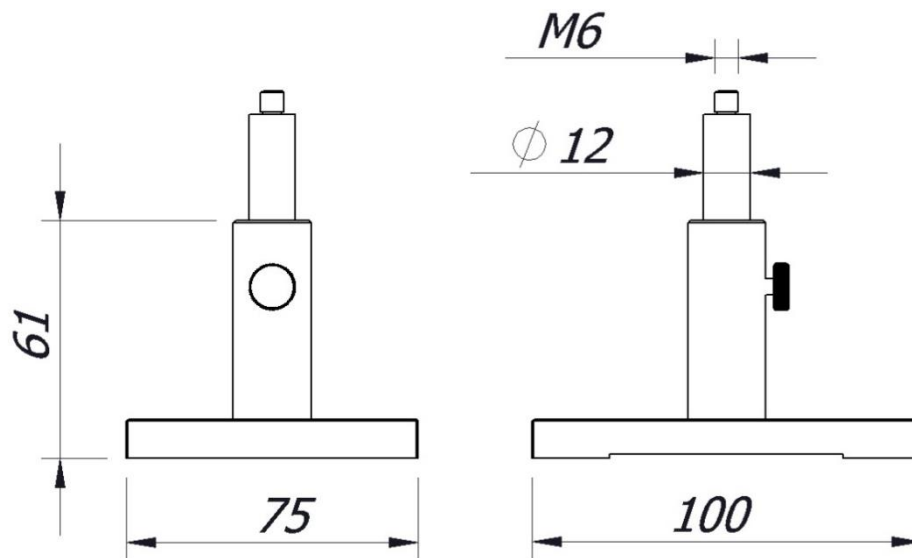


## Duty Stand options

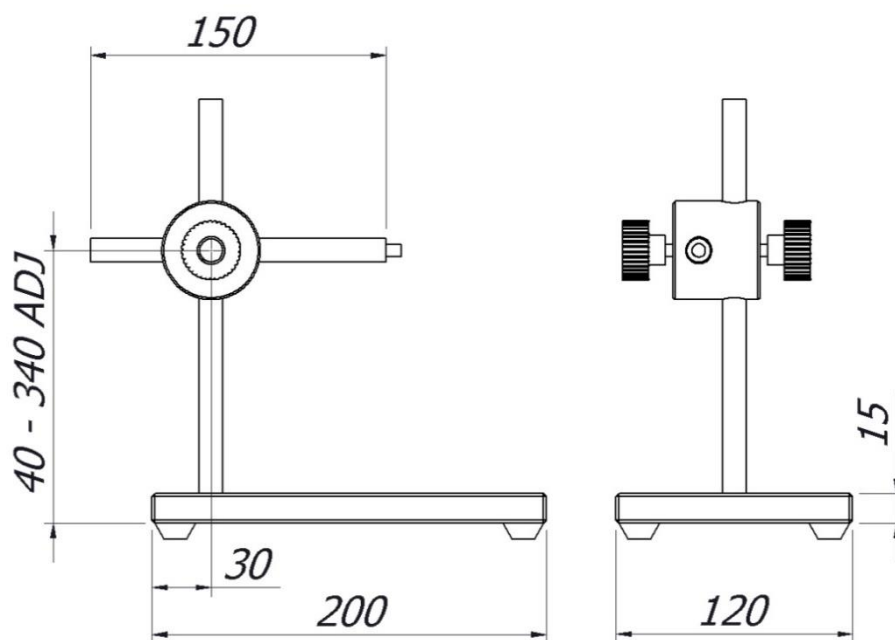
Two types of duty stand have been designed to be used with measurement heads according to the size of the head itself to allow a stable and safe mounting of the head on the stand.

Light Duty Stand is provided with all measurement heads up to 600W while Heavy Duty Stand is used for higher power.

Light Duty Stand



Heavy Duty Stand



# High Speed Thermal Sensor – Blink Series

Blink is a new family of sensors, patent pending, which enables unprecedented lower response times compared to traditional thermopile detectors, while maintaining broadband operation.

Blink can be used in all industrial, medical and laboratory applications requiring performing accurate measurements of power or energy of pulsed laser up to femtosecond pulse duration and up to 1 MHz Repetition rate.

Blink family comes in two variants, **Blink FR** (Fast Response) and **Blink HS** (High Speed).

## BLINK FR: Fast Response Sensor

BLINK FR is a new generation of fast response laser sensors (patent pending), based on a technology that enables to reach high speeds unreachable with standard thermopile detectors. BLINK FR sensors are based on a proprietary technology which enables natural response times of 90 ms (typ.) while still keeping broadband spectral range, power density capability and direct high-power operation up to 60W of comparable thermopile detectors. The response time is a key parameter for laser detectors when a faster response is required because several phenomena like pointing stability, fast drifts, and instabilities can only be monitored if the detector responds very quickly. However, traditional fast detectors cannot withstand high powers (as in the case of all photodetectors) or, vice-versa, when detectors can withstand the power, they are typically slow (as it happens with thermopile sensors or Peltier devices). Photodetectors can respond to pulses  $< 1\text{ns}$ , but they can only withstand few mW of direct laser power and their advantage of a fast response is, in most of applications, spoiled by standard readout electronics which curb the response time to 0.1-0.2s. On the other hand, thermopile detectors are inherently slow: their natural response times range from  $> 1\text{s}$  to several tens of seconds, depending on the maximum power rating. Those natural response times can be reduced by electronics circuits and speed-up algorithms, but cannot be lower than 800ms-1 s, and only in the case of very low power heads. BLINK FR sensors, differently from thermopile sensors, offer an unreached natural (without any acceleration by additional electronics) response time down to 90 ms (typ.). This is a game changing feature for laser power measurement because it paves the way to a number of applications that were not possible before.

BLINK<sup>FR</sup>



Broadband Calibration Range  
(250-1100 nm and 10.6  $\mu\text{m}$ )

Natural Response Time (0-90%): 90 ms (typ.)

Max. Rep. Rate: 5Hz

## HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 Meter;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

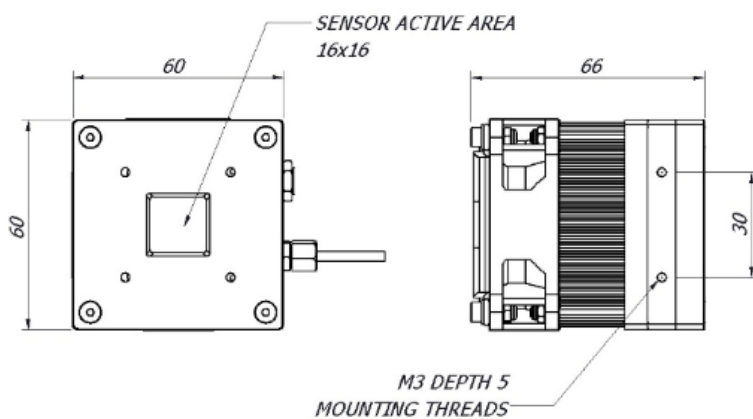
| Ordering code | Power Range | Energy range | Useful Aperture | Spectral Range   | Cooling    | Connectivity |
|---------------|-------------|--------------|-----------------|------------------|------------|--------------|
| BL-A-5-16-K   | 25 mW - 5W  | 20 mJ - 5 J  | 16x 16 mm       | 0.2 - 25 $\mu$ m | passive    | DB15         |
| BL-A-8-16-K   | 25 mW - 8W  | 20 mJ - 5 J  | 16x 16 mm       | 16x 16 mm        | Convection | DB15         |
| BL-A-25W-16-K | 25 mW - 25W | 20 mJ - 5 J  | 16x 16 mm       | 0.2 - 25 $\mu$ m | Forced Air | DB15         |
| BL-W-50W-16-K | 30 mW - 50W | 20 mJ - 5 J  | 16x 16 mm       | 0.2 - 25 $\mu$ m | Water      | DB15         |

# Fast Response Thermal Sensors

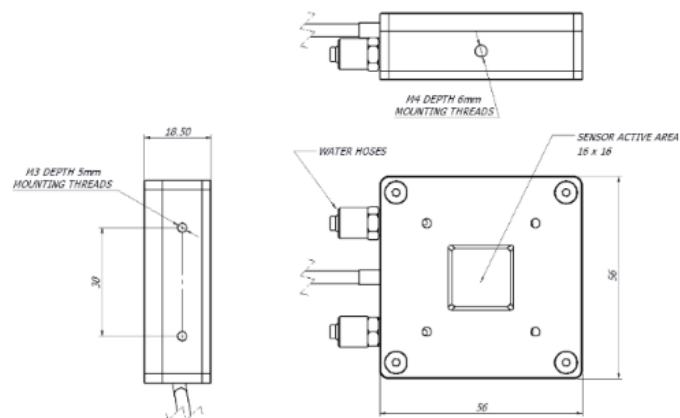
Range: 25 mW to 50 W



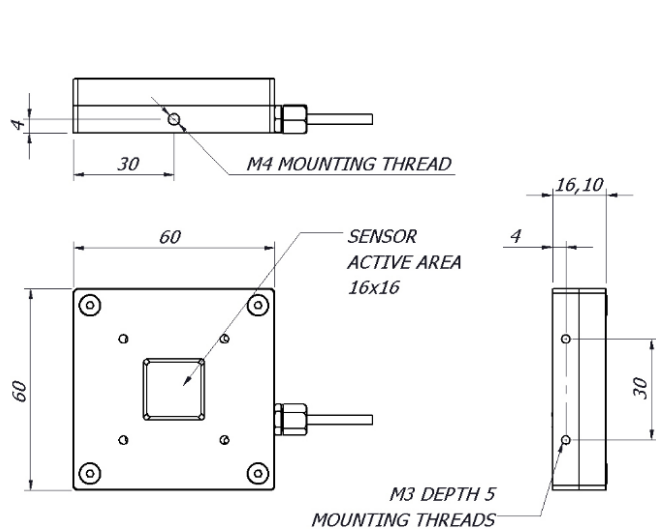
| Ordering Code  | BL-A-5W-16-K   | BL-A-8W-16-K  | BL-A-25W-16-K   | BL-W-50W-16-K  |
|--|--|---|---|--|
| <b>Power Mode</b>  |  |   |   |  |
| Max. Average Power   | 5 W  | 8 W   | 25 W  | 50 W   |
| Max. Intermittent Power (1)  | 25 W   | 25 W  | N.A.  | N.A.   |
| Min. Power   | 25 mW  | 25 mW   | 25 mW   | 30 mW  |
| Noise Equivalent Power (NEP)   | 1 mW   | 1 mW  | 1 mW  | 15 mW  |
| Natural Response Time (0-90%)  | Typ. 90 ms (min. 50 ms – max. 120 ms)  | Typ. 90 ms (min. 50 ms – max. 120 ms)   | Typ. 90 ms (min. 50 ms – max. 120 ms)   | Typ. 90ms (min. 50 ms – max. 120 ms)   |
| Power Calibration Uncertainty  | ± 3%   | ± 3%  | ± 3%  | ± 3%   |
| Power Linearity (2)  | ± 3%   | ± 3%  | ± 3%  | ± 5%   |
| Spatial uniformity (3)   | ± 3%   | ± 3%  | ± 3%  | ± 3%   |
| <b>Energy Mode</b>   |  |   |   |  |
| Max. Energy  | 5 J  | 5 J   | 5 J   | 5 J  |
| Min. Energy  | 20 mJ  | 20 mJ   | 20 mJ   | 25 mJ  |
| Max repetition rate  | 5 Hz   | 5 Hz  | 5 Hz  | 5 Hz   |
| Energy Calibration Uncertainty   | ± 5%   | ± 5%  | ± 5%  | ± 5%   |
| <b>Absorber Specs</b>  |  |   |   |  |
| Aperture   | 16 x 16 mm   | 16 x 16 mm  | 16 x 16 mm  | 16 x 16 mm   |
| Type   | K  | K   | K   | K  |
| Absorber Spectral Range  | 0.2 - 25 µm  | 0.2 - 25 µm   | 0.2 - 25 µm   | 0.2 - 25 µm  |
| Calibration Spectral Range   | 0.25 - 1.1 µm;<br>10.6 µm  | 0.25 - 1.1 µm;<br>10.6 µm   | 0.25 - 1.1 µm;<br>10.6 µm   | 0.25 - 1.1 µm;<br>10.6 µm  |
| Max Power Density (4)  | 1.5 kW/cm <sup>2</sup> (a)   | 1.5 kW/cm <sup>2</sup> (a)  | 1.5 kW/cm <sup>2</sup> (a)  | 1.5 kW/cm <sup>2</sup>   |
| Max energy density (J/cm <sup>2</sup> )  | 10ns pulse width: 1  | 10ns pulse width: 1   | 10ns pulse width: 1   | 10ns pulse width: 1  |
| <b>General Characteristics</b>   |  |   |   |  |
| Cooling  | Passive (b)  | Convection (b)  | Forced Air (b)  | Water (a)  |
| Maximum sensor operating temperature   | 60 °C  | 60 °C   | 40 °C   | N.A.   |
| Weight   | 140 g  | 240 g   | 380 g   | 130 g  |
| Dimension  | 60 x 60 x 16.1 mm  | 60 x 60 x 41.2 mm   | 60 x 60 x 66 mm   | 56 x 56 x 18.5 mm  |
| Cable length - connector   | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)               | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)              | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)              | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)   |
| Stand and Post   | Light Duty Stand   | Light Duty Stand  | Light Duty Stand  | Light Duty Stand   |
| <b>Notes</b>   |  |   |   |  |
| (1) max 2 sec exposure, max 20% duty cycle.<br>(2) Detector centrally irradiated @50% of useful surface.<br>(3) 3mm beam diameter, scanning 80% of active area<br>(4) Damage thresholds depend on power level. | (a) Measured at 1064 nm, 2 W.<br>(b) Recommended ambient temperature: 10 - 30 °C | (a) Measured at 1064 nm, 2 W.<br>(b) Recommended ambient temperature: 10 -30 °C | (a) Measured at 1064 nm, 5 W.<br>(b) Recommended ambient temperature: 10 -35 °C | (a) Measured at 1064 nm, 10 W.<br>(b) Water min. 1 l/min, max. 4 l/min (@ 10 - 25 °C); Admissible rate of water temperature variation < 1 °C/min |



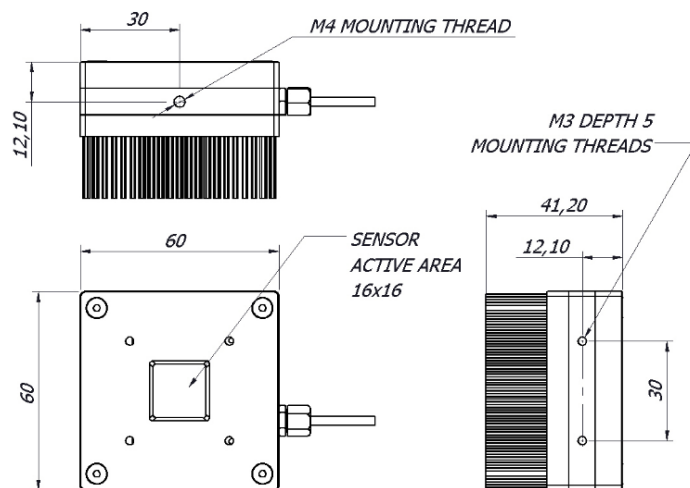
BL-A-25W-16-K



BL-W-50W-16-K



BL-A-5W-16-K



BL-A-8W-16-K



## BLINK FR: Amplified Fast Response Sensor

BLINK FR head can be provided with an amplified analog output (0-5V) for OEM applications requiring integration into machines or laser sources. Two models are currently available, one for measures up to 50W, the other up to 20W. Both units maintain the benefits of the standard Blink FR head, such as the fast response time (typ. 70ms), broadband operation and high-power handling capability. OEM applications requiring a fast feedback on power levels or fluctuations can benefit from the exceptional properties of the Blink FR technology.

### BLINK<sup>•</sup>FR AMPLIFIED HEAD



Broadband Calibration Range  
(250-1100 nm and 10.6  $\mu$ m)

Natural Response Time (0-90%): 70 ms (typ.)

Max. Rep. Rate: Hz

### HOW TO ORDER:

Select Ordering Code without any option for bare wires head connectivity;  
No other connectivity option is available.

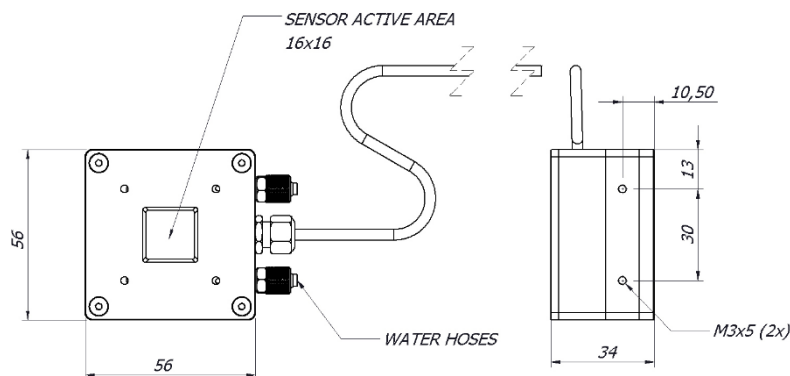
| Ordering code  | Power Range  | Useful Aperture | Spectral Range   | Cooling | Connectivity |
|----------------|--------------|-----------------|------------------|---------|--------------|
| BAL-W-20W-16-K | 25 mW - 20 W | 16 x 16 mm      | 0.2 - 25 $\mu$ m | Water   | Bare wire    |
| BAL-W-50W-16-K | 50 mW - 50 W | 16 x 16 mm      | 0.2 - 25 $\mu$ m | Water   | Bare wire    |

# Fast Response Amplified Thermal Sensors

Range: 25 mW to 50 W



| Ordering Code  | BAL-W-20W-16-K  | BAL-W-50W-16-K                                |
|--|---|---|
| <b>Power Mode</b>  |   |   |
| Max. Average Power   | 20 W  | 50 W  |
| Min. Power   | 25 mW   | 50 mW   |
| Response time (0-90%)  | Typ. 70 ms (min. 50 ms, max. 90 ms)   | Typ. 70 ms (min. 50 ms, max. 90 ms)           |
| Power Calibration Uncertainty  | ± 3%  | ± 3%  |
| Power Linearity  | ± 5%  | ± 5%  |
| <b>Absorber Specs</b>  |   |   |
| Aperture   | 16 mm x 16 mm   | 16 mm x 16 mm                                 |
| Type   | K   | K   |
| Absorber Spectral Range  | 0.2 - 25 $\mu\text{m}$  | 0.2 - 25 $\mu\text{m}$                        |
| Calibration Spectral Range   | 0.25 - 1.1 $\mu\text{m}$ ; 10.6 $\mu\text{m}$   | 0.25 - 1.1 $\mu\text{m}$ ; 10.6 $\mu\text{m}$ |
| Max Power Density (1)  | 1.5 kW/cm <sup>2</sup>  | 1.5 kW/cm <sup>2</sup>                        |
| Max Energy Density J/cm <sup>2</sup> (2)   | 1 J/cm <sup>2</sup>   | 1 J/cm <sup>2</sup>                           |
| <b>Amplifier Specs</b>   |   |   |
| Amplifier Input Voltage  | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating |
| Output Voltage @ Full Scale  | 5 V   | 5 V   |
| Min Detectable Voltage   | 5 mV  | 5 mV  |
| Sensitivity  | 250 mV/W  | 100 mV/W                                      |
| <b>General Characteristics</b>   |   |   |
| Cooling  | Water (a)   | Water (a)                                     |
| Weight   | 300 g   | 300 g   |
| Dimension  | 56 x 56 x 34 mm   | 56 x 56 x 34 mm                               |
| Cable length - connector   | 1.5 m   | 1.5 m   |
| <b>Notes</b>   |   |   |
| (1). Measured at 1064nm, 10W,<br>Damage thresholds also depend on<br>power level.<br>(2). 10 ns @ 1064nm | (a) Water min. 1 l/min, max. 4 l/min (@ 15 - 30 °C);<br>Admissible rate of water temperature variation < 1 °C/min |   |



BAL-W-20W-16-K BAL-W-50W-16-K

## BLINK HS: High Speed Sensor

BLINK HS is the latest Laser Point's achievement specifically developed to measure ultrafast lasers with pulse duration down to femtoseconds. It is the ultimate solution for whatever application requiring: accurate energy measurements for ultrafast pulsed lasers, monitoring of fast manufacturing processes in production lines and detection of fast instabilities in ultrafast lasers. BLINK HS patent pending technology, based on thermopile design, makes this product the fastest laser power and energy sensor currently available in the market. This technology allows combining the high response speed of a photodiode with the broadband and high-power operation of a thermopile. Laser applications requiring high speed measurements can take advantage of the sub-microsecond response time; this BLINK HS feature allows measuring the energy of each pulse emitted by laser sources with repetition rates up to 1 MHz, pulse durations down to fs and average power up to 20W, specifications that cannot be present all together in pyroelectric or photodiode sensors. Moreover, its high damage threshold and efficient water cooling allow withstanding energies up to 10mJ. BLINK HS can be deployed by laser manufactures to detect fast instabilities in laser sources as well as by system

integrators to monitor fast processes in production lines. Combining all advantages present in photodiodes, pyroelectric and thermal detectors, BLINK HS is a very versatile product, suited to measure most of the laser sources commercially available, whatever the emitting wavelength (UV-VIS-IR). High speed electronics is also available with a sampling rate up to 500 Msample/s to provide a precise energy measurement of each single ultrashort pulse.

# BLINK<sup>•</sup>HS



Broadband Operation  
(250-1100 nm and 10.6  $\mu\text{m}$ )

Pulse Energy Measurement  
(up to 1 MHz)

Max. Rep. Rate: 1 MHz

Suitable for ultrashort pulsed lasers up to  
femtosecond

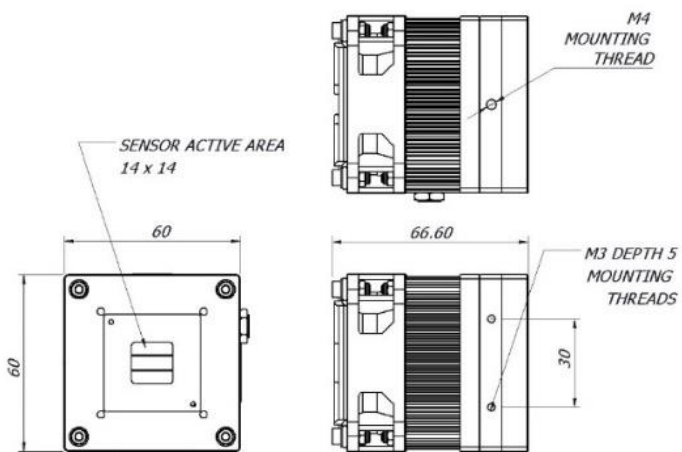
| Ordering code | Power Range | Energy range            | Useful Aperture | Spectral Range         | Cooling    | Connectivity     |
|---------------|-------------|-------------------------|-----------------|------------------------|------------|------------------|
| BM-A-5W-14-T  | 1 mW - 5W   | 1 $\mu\text{J}$ - 10 mJ | 14 x 14 mm      | 0.2 - 11 $\mu\text{m}$ | Passive    | Hirose IX to HSM |
| BM-A-8W-14-T  | 1 mW - 8W   | 1 $\mu\text{J}$ - 10 mJ | 14 x 14 mm      | 0.2 - 11 $\mu\text{m}$ | Convection | Hirose IX to HSM |
| BM-A-15W-14-T | 1 mW - 15W  | 1 $\mu\text{J}$ - 10 mJ | 14 x 14 mm      | 0.2 - 11 $\mu\text{m}$ | Forced Air | Hirose IX to HSM |
| BM-W-20W-14-T | 1 mW - 20W  | 1 $\mu\text{J}$ - 10 mJ | 14 x 14 mm      | 0.2 - 11 $\mu\text{m}$ | Water      | Hirose IX to HSM |

# High Speed Thermal Sensors

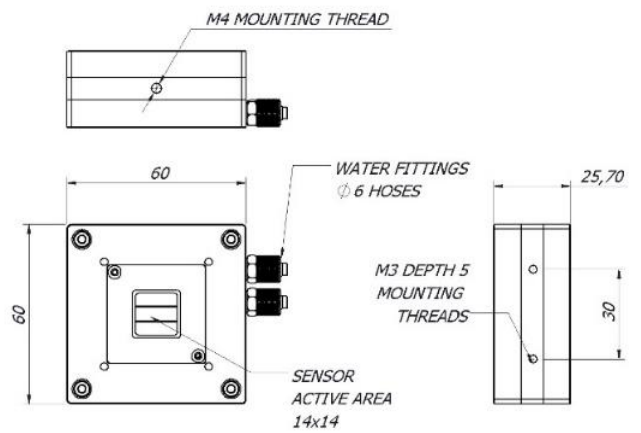
Range: 1 mW to 20 W



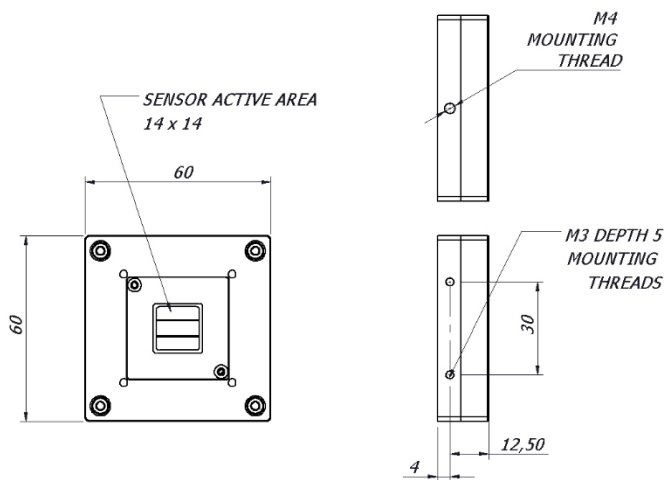
| Ordering Code  | BM-A-5W-14-T  | BM-A-8W-14-T  | BM-A-15W-14-T  | BM-W-50W-14-T  |
|--|---|---|--|--|
| <b>Power Mode</b>  |   |   |  |  |
| Max. Average Power   | 5 W   | 8 W   | 15 W   | 20 W   |
| Max. Intermittent Power (1)  | 15 W  | 15 W  | N.A..  | N.A..  |
| Power Calibration Uncertainty  | ± 5%  | ± 5%  | ± 5%   | ± 5%   |
| Spatial Uniformity (2)   | ± 5%  | ± 5%  | ± 5%   | ± 5%   |
| Min. Beam diameter   | 3 mm  | 3 mm  | 3 mm   | 3 mm   |
| <b>Energy Mode</b>   |   |   |  |  |
| Max. Energy  | 10 mJ   | 10 mJ   | 10 mJ  | 10 mJ  |
| Min. Energy  | 1 µJ  | 1 µJ  | 1 µJ   | 1 µJ   |
| Max repetition rate  | 1 MHz   | 1 MHz   | 1 MHz  | 1 MHz  |
| Energy Resolution  | 0.25 µJ   | 0.25 µJ   | 0.25 µJ  | 0.25 µJ  |
| Energy Calibration Uncertainty   | ± 5%  | ± 5%  | ± 5%   | ± 5%   |
| <b>Absorber Specs</b>  |   |   |  |  |
| Aperture   | 14 x 14 mm  | 14 x 14 mm  | 14 x 14 mm   | 14 x 14 mm   |
| Type   | T   | T   | T  | T  |
| Absorber Spectral Range  | 0.2 - 11 µm   | 0.2 - 11 µm   | 0.2 - 11 µm  | 0.2 - 11 µm  |
| Calibration Spectral Range   | 0.355 µm<br>0.532 µm<br>1.07 µm<br>10.6 µm (a)<br>(b)   | 0.355 µm<br>0.532 µm<br>1.07 µm<br>10.6 µm (a)<br>(b)   | 0.355 µm<br>0.532 µm<br>1.07 µm<br>10.6 µm (a)<br>(b)  | 0.355 µm<br>0.532 µm<br>1.07 µm<br>10.6 µm (a)<br>(b)  |
| Max Power Density (3)  | 0.1 kW / cm <sup>2</sup>  | 0.1 kW / cm <sup>2</sup>  | 0.1 kW / cm <sup>2</sup>   | 0.1 kW / cm <sup>2</sup>   |
| Max energy density (4)   | 35 mJ/cm <sup>2</sup>   | 35 mJ/cm <sup>2</sup>   | 35 mJ/cm <sup>2</sup>  | 35 (mJ /cm <sup>2</sup> )  |
| <b>General Characteristics</b>   |   |   |  |  |
| Cooling  | Passive (c)   | Convection (c)  | Forced Air (c)   | Water (c)  |
| Maximum sensor operating temperature   | 60 °C   | 60 °C   | 40 °C  | 40 °C  |
| Weight   | 130 g   | 240 g   | 380 g  | 170 g  |
| Dimension  | 60x60x16.5 mm   | 60x60x41.6 mm   | 60 x 60 x 66 mm  | 60 x 60 x 25.7 mm  |
| Cable length   | 2. m  | 2. m  | 2. m   | 2. m   |
| Stand and Post   | Light Duty Stand  | Light Duty Stand  | Light Duty Stand   | Light Duty Stand   |
| (1) max 2 sec exposure, max 20% duty cycle.<br>(2) Detector centrally irradiated @50% of useful surface.<br>(3) 3mm beam diameter, scanning 80% of active area<br>(4) Damage thresholds depend on power level. | (a). @ 10.6 µm sensor reflectivity 70%<br>(b). Others wavelength on request<br>(c). Recommended ambient temperature: 10 - 30 °C | (a). @ 10.6 µm sensor reflectivity 70%<br>(b). Others wavelength on request<br>(c). Recommended ambient temperature: 10 - 30 °C | (a). @ 10.6 µm sensor reflectivity 70%<br>(b). Others wavelength on request<br>(c). Recommended ambient temperature: 10 -35 °C | (a). @ 10.6 µm sensor reflectivity 70%<br>(b). Others wavelength on request<br>(c). Water Min. 1 l/min, Max 4 l/min (@ 10-25 °C). Admissible rate of water temperature variation < 1 °C/min. |



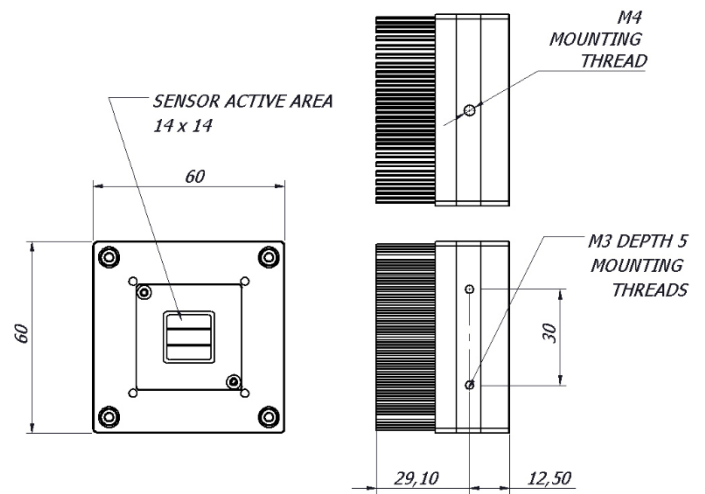
BM-A-15W-14-T



BM-W-20W-14-T



BM-A-5W-14-T



BM-A-8W-14-T

# Thermal Sensors

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 measure can be done using thermocouples arrays (thermopile). The temperature difference will generate a voltage at the end of each single thermocouple and the resulting total voltage will be proportional to the incident power or energy. 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. All thermal sensors allow performing **"long term"** laser power measurements. Different cooling methods among convection, forced air and water are used depending on the maximum measurable power. Each thermal sensor is provided with certificate with NIST and PTB traceability. Thermal sensors can be provided with DB15 or with USB and RS-232 connector (PC-plug option).

- Thermal sensors for Low power lasers

- Models up to 40W (200W intermittent)
- Sensitive thermopile sensors for power detection down to 10 $\mu$ W and energy to 2mJ
- Broadband and High resistant coatings to 28KW/cm<sup>2</sup>
- Energy measurement up to 200 Joules
- NIST and PTB (Physikalisch-Technische Bundesanstalt) traceability

## HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 and PC-Link Meters;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

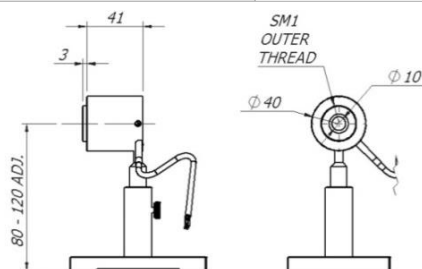
| Ordering code    | Power Range    | Max Intermittent Power | Energy range   | Useful Aperture | Spectral Range    | Cooling    | Connectivity |
|------------------|----------------|------------------------|----------------|-----------------|-------------------|------------|--------------|
| A-02-D12-BBF     | 0.1 mW - 0.2 W | 200 mW                 | 1 mJ - 200 mJ  | 10 mm           | 0.19 - 25 $\mu$ m | Convection | DB15         |
| A-2-D12-BBF      | 1 mW - 2 W     | 2 W                    | 1 mJ - 2 J     | 10 mm           | 0.19 - 25 $\mu$ m | Convection | DB15         |
| A-2-D12-HPB      | 1 mW - 2 W     | 2 W                    | 1 mJ - 2 J     | 10 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-5-D12-BBF      | 10 mW - 5 W    | 7.5 W                  | 10 mJ - 5 J    | 10 mm           | 0.19 - 25 $\mu$ m | Convection | DB15         |
| A-10-D12-HPB     | 10 mW - 10 W   | 15 W                   | 10 mJ - 15 J   | 12 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-10-D20-BBF     | 10 mW - 10 W   | 15 W                   | 10 mJ - 15 J   | 20 mm           | 0.19 - 25 $\mu$ m | Convection | DB15         |
| A-10-D20-HPB     | 10 mW - 10 W   | 15 W                   | 10 mJ - 15 J   | 20 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-30-D25-HPB     | 20 mW - 30 W   | 45 W                   | 50 mJ - 45 J   | 25 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-40-D25-BBF     | 20 mW - 40 W   | 60 W                   | 50 mJ - 60 J   | 25 mm           | 0.19 - 25 $\mu$ m | Convection | DB15         |
| A-40-D25-HPB     | 20 mW - 40 W   | 60 W                   | 50 mJ - 60 J   | 25 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-40-D40-HPB     | 20 mW - 40 W   | 60 W                   | 50 mJ - 60 J   | 40 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-40/200-D25-HPB | 150 mW - 40 W  | 200 W                  | 200 mJ - 200 J | 25 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-40/200-D40-HPB | 100 mW - 40 W  | 200 W                  | 150 mJ - 200 J | 40 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |
| A-40/200-D60-HPB | 200 mW - 40 W  | 200 W                  | 250 mJ - 200 J | 60 mm           | 0.19 - 11 $\mu$ m | Convection | DB15         |

# Thermal Sensors for Low Power Lasers

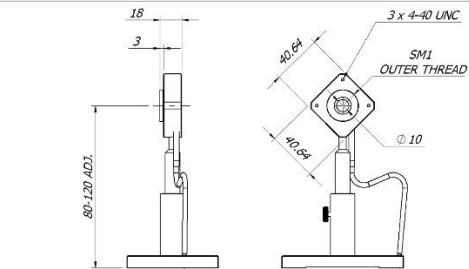
Range: 100  $\mu$ W to 5 W



| Ordering Code   | A-02-D12-BBF   | A-2-D12-BBF  | A-2-D12-HPB   | A-5-D12-HPB  |
|---|--|--|---|--|
| <b>Power Mode</b>   |  |  |   |  |
| 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 $\mu$ W   | 10 $\mu$ W   | 10 $\mu$ W  | 100 $\mu$ W  |
| Noise Equivalent Power (NEP)  | 5 $\mu$ W  | 50 $\mu$ W   | 50 $\mu$ W  | 500 $\mu$ W  |
| Response Time (0-90%)   | 2 sec  | 2 sec  | 2.5 sec   | 0.7 sec  |
| Power Calibration Uncertainty   | $\pm 3\%$  | $\pm 3\%$  | $\pm 3\%$   | $\pm 3\%$  |
| Power Linearity (2)   | $\pm 1\%$  | $\pm 1\%$  | $\pm 1\%$   | $\pm 1\%$  |
| <b>Single Shot Energy Mode</b>  |  |  |   |  |
| 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 $\mu$ J   | 10 $\mu$ J   | 10 $\mu$ J  | 0.1 mJ   |
| Energy Calibration Uncertainty  | $\pm 5\%$  | $\pm 5\%$  | $\pm 5\%$   | $\pm 5\%$  |
| <b>Absorber Specs</b>   |  |  |   |  |
| Aperture  | 10 mm  | 10 mm  | 10 mm   | 10 mm  |
| Type  | BBF  | BBF  | HPB   | BBF  |
| Absorber Spectral Range   | 0.19 - 25 $\mu$ m  | 0.19 - 25 $\mu$ m  | 0.19 - 11 $\mu$ m   | 0.19 - 25 $\mu$ m  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             |
| Max Power Density (3)   | 200 W/cm <sup>2</sup>  | 200 W/cm <sup>2</sup>  | 18 kW/cm <sup>2</sup> @10 W   | 200 W/cm <sup>2</sup>  |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 |
| <b>General Characteristics</b>  |  |  |   |  |
| Cooling   | Convection   | Convection   | Convection  | Convection   |
| Weight  | 0.2 kg   | 0.2 kg   | 0.2 kg  | 0.2 kg   |
| Dimension   | $\varnothing$ 40 x 44 mm   | $\varnothing$ 40 x 44 mm   | $\varnothing$ 40 x 44 mm  | 41 x 41 x 18 mm  |
| Cable length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)           | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)           | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)          | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)           |
| Stand and Post  | Light Duty Stand   | Light Duty Stand   | Light Duty Stand  | Light Duty Stand   |
| <b>Notes</b>  |  |  |   |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | Available with fiber adapter   |  |   |  |



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



A-5-D12-HPB

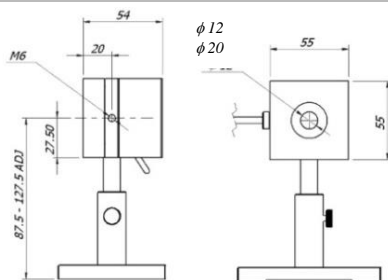


# Thermal Sensors for Low Power Lasers

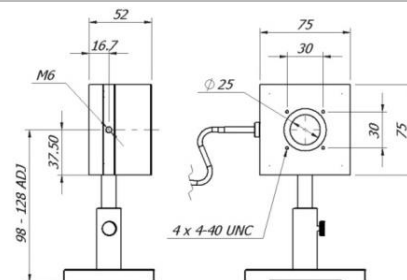
Range: 10 mW to 30 W



| Ordering Code   | A-10-D12-HPB  | A-10-D20-BBF   | A-10-D20-HPB   | A-30-D25-HPB  |
|---|---|--|--|---|
| <b>Power Mode</b>   |   |  |  |   |
| 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 $\mu$ W   | 100 $\mu$ W  | 100 $\mu$ W  | 1 mW  |
| Noise Equivalent Power (NEP)  | 500 $\mu$ W   | 600 $\mu$ W  | 600 $\mu$ W  | 1 mW  |
| Response Time (0-90%)   | 0.8 sec   | 1 sec  | 1 sec  | 1.5 sec   |
| Power Calibration Uncertainty   | $\pm 3\%$   | $\pm 3\%$  | $\pm 3\%$  | $\pm 3\%$   |
| Power Linearity (2)   | $\pm 1\%$   | $\pm 1\%$  | $\pm 1\%$  | $\pm 1\%$   |
| <b>Single Shot Energy Mode</b>  |   |  |  |   |
| 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  | $\pm 5\%$   | $\pm 5\%$  | $\pm 5\%$  | $\pm 5\%$   |
| <b>Absorber Specs</b>   |   |  |  |   |
| Aperture  | 12 mm   | 20 mm  | 20 mm  | 25 mm   |
| Type  | HPB   | BBF  | HPB  | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 25 $\mu$ m  | 0.19 - 11 $\mu$ m  | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m   | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (3)   | 18 kW/cm <sup>2</sup> @10 W   | 200 W/cm <sup>2</sup>  | 18 kW/cm <sup>2</sup> @10 W  | 18 kW/cm <sup>2</sup> @10 W   |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 <sup>2</sup> | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>  |   |  |  |   |
| 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 length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)          | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)           | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)                       | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)          |
| Stand and Post  | Light Duty Stand  | Light Duty Stand   | Light Duty Stand   | Light Duty Stand  |
| <b>Notes</b>  |   |  |  |   |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | Available with fiber adapter  |  |  |   |



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



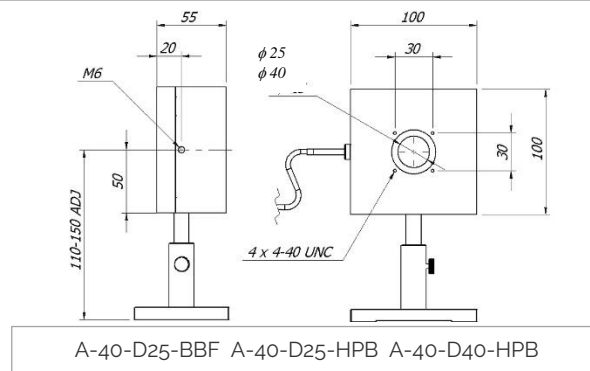
A-30-D25-HPB

# Thermal Sensors for Low Power Lasers

Range: 20 mW to 40 W



| Ordering Code   | A-40-D25-BBF   | A-40-D25-HPB  | A-40-D40-HPB  |
|---|--|---|---|
| <b>Power Mode</b>   |  |   |   |
| 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 (0-90%)   | 1.5 sec  | 1.5 sec   | 1.8 sec   |
| Power Calibration Uncertainty   | ± 3%   | ± 3%  | ± 3%  |
| Power Linearity (2)   | ± 1%   | ± 1%  | ± 1%  |
| <b>Single Shot Energy Mode</b>  |  |   |   |
| 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%  |
| <b>Absorber Specs</b>   |  |   |   |
| 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/cm <sup>2</sup>  | 9 kW/cm <sup>2</sup> @40 W  | 9 kW/cm <sup>2</sup> @40 W  |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 3.6<br>10µs pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>  |  |   |   |
| 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 length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)     | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)    | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)    |
| Stand and Post  | Light Duty Stand   | Light Duty Stand  | Light Duty Stand  |
| <b>Notes</b>  |  |   |   |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | Available with fiber adapter   | Available with fiber adapter  |   |

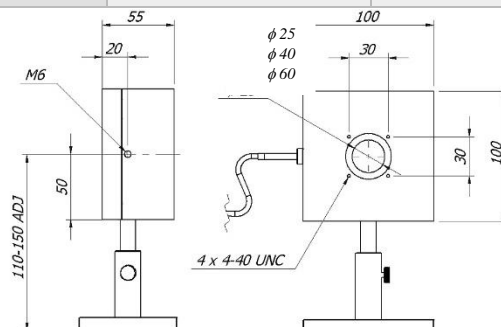


# Thermal Sensors for Low Power Lasers

Range: 20 mW to 40 W (200W intermittent)



| Ordering Code  | A-40/200-D25-HPB  | A-40/200-D40-HPB  | A-40/200-D60-HPB  |
|--|---|---|---|
| <b>Power Mode</b>  |   |   |   |
| 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 (0-90%)  | 1.7 sec   | 1.7 sec   | 3 sec   |
| Power Calibration Uncertainty  | ± 3%  | ± 3%  | ± 3%  |
| Power Linearity (2)  | ± 1%  | ± 1%  | ± 1%  |
| <b>Single Shot Energy Mode</b>   |   |   |   |
| 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%  |
| <b>Absorber Specs</b>  |   |   |   |
| 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/cm <sup>2</sup> @40 W   | 11 kW/cm <sup>2</sup> @40 W   | 11 kW/cm <sup>2</sup> @40 W   |
| Max Energy Density J/cm <sup>2</sup> (3)   | 5ms pulse width: 36<br>10μs pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10μs pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10μs pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>   |   |   |   |
| 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 length - connector   | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)    | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)    | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)    |
| Stand and Post   | Light Duty Stand  | Light Duty Stand  | Light Duty Stand  |
| <b>Notes</b>   |   |   |   |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level.<br>Please see damage graphs for more details. | Available with fiber adapter  |   |   |



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

- Thermal sensors for Medium power lasers

- Air Cooled models to 600W for continuous use and 800 W for intermittent
- Energy measurement up to 800 joules
- High resistant coatings: up to 12 KW/cm<sup>2</sup> at the maximum rated power
- Energy damage threshold up to 250J/cm<sup>2</sup>
- NIST and PTB (Physikalisch-Technische Bundesanstalt) traceability



### HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 and PC-Link Meters;  
 Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);  
 Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

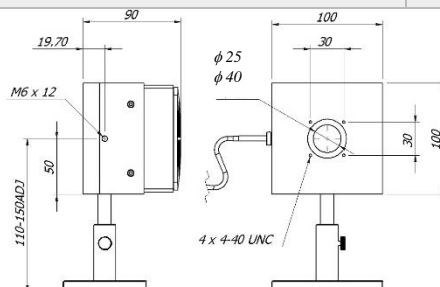
| Ordering code | Power Range   | Max Intermittent Power | Energy range  | Useful Aperture | Spectral Range | Cooling    | Connectivity |
|---------------|---------------|------------------------|---------------|-----------------|----------------|------------|--------------|
| A-200-D25-HPB | 0.2 W - 200 W | 250 W                  | 0.5 J - 250 J | 25 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| A-200-D25-SHC | 0.2 W - 200 W | 250 W                  | 0.5 J - 250 J | 25 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| A-200-D40-HPB | 0.2 W - 200 W | 250 W                  | 0.5 J - 250 J | 40 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| A-200-D40-SHC | 0.2 W - 200 W | 250 W                  | 0.5 J - 250 J | 40 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| A-200-D60-HPB | 0.3 W - 200 W | 250 W                  | 1 J - 250 J   | 60 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| A-200-D60-SHC | 0.3 W - 200 W | 250 W                  | 1 J - 250 J   | 60 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| W-200-D40-HPB | 0.2 W - 200 W | 300 W                  | 1 J - 300 J   | 40 mm           | 0.19 - 11 μm   | Water      | DB15         |
| W-200-D40-SHC | 0.2 W - 200 W | 300 W                  | 1 J - 300 J   | 40 mm           | 0.19 - 11 μm   | Water      | DB15         |
| A-300-D60-HPB | 0.5 W - 300 W | 400 W                  | 1 J - 400 J   | 60 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| A-600-D40-HPB | 0.5 W - 600 W | 800 W                  | 1 J - 800 J   | 40 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| A-600-D60-SHC | 0.5 W - 600 W | 800 W                  | 1 J - 800 J   | 60 mm           | 0.19 - 11 μm   | Forced Air | DB15         |
| W-600-D30-HPB | 0.5 W - 600 W | 800 W                  | 1 J - 800 J   | 30 mm           | 0.19 - 11 μm   | Water      | DB15         |
| W-600-D30-SHC | 0.5 W - 600 W | 800 W                  | 1 J - 800 J   | 30 mm           | 0.19 - 11 μm   | Water      | DB15         |
| W-600-D70-HPB | 0.5 W - 600 W | 700 W                  | 1 J - 700 J   | 70 mm           | 0.19 - 11 μm   | Water      | DB15         |
| W-600-D70-SHC | 0.5 W - 600 W | 700 W                  | 1 J - 700 J   | 70 mm           | 0.19 - 11 μm   | Water      | DB15         |

# Thermal Sensors for Medium Power Lasers

Range: 200 mW to 200 W



| Ordering Code   | A-200-D25-HPB   | A-200-D25-SHC  | A-200-D40-HPB   | A-200-D40-SHC  |
|---|---|--|---|--|
| <b>Power Mode</b>   |   |  |   |  |
| 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 (0-90%)   | 1.7 sec   | 1.7 sec  | 2 sec   | 2 sec  |
| Power Calibration Uncertainty   | ± 3%  | ± 3%   | ± 3%  | ± 3%   |
| Power Linearity (2)   | ± 1%  | ± 1%   | ± 1%  | ± 1%   |
| <b>Single Shot Energy Mode</b>  |   |  |   |  |
| 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%   |
| <b>Absorber Specs</b>   |   |  |   |  |
| 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 - 11 µm, 9 - 11 µm   | 0.19 - 2.1 µm, 2.94µm, 9 - 11 µm                                      | 0.2 - 11 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 J/cm² (3)  | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 115<br>10µs pulse width: 4<br>10ns pulse width: 1 | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 115<br>10µs pulse width: 4<br>10ns pulse width: 1 |
| <b>General Characteristics</b>  |   |  |   |  |
| 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 length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)    | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)    | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) |
| Stand and Post  | Light Duty Stand  | Light Duty Stand   | Light Duty Stand  | Light Duty Stand   |
| <b>Notes</b>  |   |  |   |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | Available with fiber adapter<br>(a). 12V DC Power Supply Included     |  | (a). 12V DC Power Supply Included                                     |  |



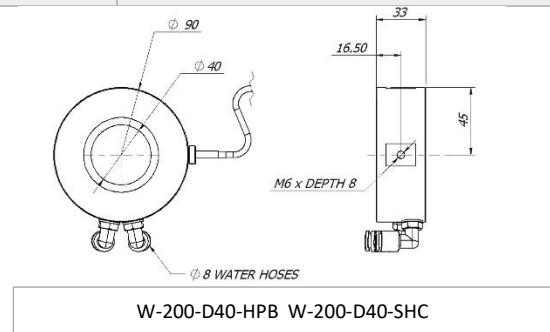
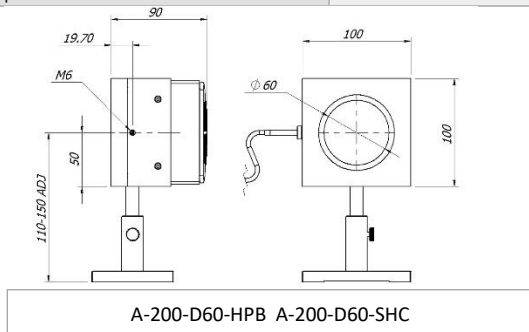
A-200-D25-HPB A-200-D25-SHC A-200-D40-HPB A-200-D40-SHC

# Thermal Sensors for Medium Power Lasers

Range: 200 mW to 200 W



| Ordering Code   | A-200-D60-HPB   | A-200-D60-SHC  | W-200-D40-HPB  | W-200-D40-SHC  |
|---|---|--|--|--|
| <b>Power Mode</b>   |   |  |  |  |
| 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 (0-90%)   | 3 sec   | 3 sec  | 2 sec  | 2 sec  |
| Power Calibration Uncertainty   | ± 3%  | ± 3%   | ± 3%   | ± 3%   |
| Power Linearity (2)   | ± 1%  | ± 1%   | ± 1.5%   | ± 1.5%   |
| <b>Single Shot Energy Mode</b>  |   |  |  |  |
| 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%   |
| <b>Absorber Specs</b>   |   |  |  |  |
| Aperture  | 60 mm   | 60 mm  | 40 mm  | 40 mm  |
| Type  | HPB   | SHC  | HPB  | SHC  |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m  | 0.19 - 11 $\mu$ m  | 0.19 - 11 $\mu$ m  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.2 - 11 $\mu$ m, 9 - 11 $\mu$ m   | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                                       | 0.2 - 11 $\mu$ m, 9 - 11 $\mu$ m   |
| Max Power Density (3)   | 4 kW/cm <sup>2</sup> @200 W   | 17 kW/cm <sup>2</sup> @200 W   | 7 kW/cm <sup>2</sup> @200 W  | 28 kW/cm <sup>2</sup> @200 W   |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 115<br>10 $\mu$ s pulse width: 4<br>10ns pulse width: 1 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3            | 5ms pulse width: 115<br>10 $\mu$ s pulse width: 4<br>10ns pulse width: 1 |
| <b>General Characteristics</b>  |   |  |  |  |
| 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 length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)          | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)       | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)                     | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)       |
| Stand and Post  | Light Duty Stand  | Light Duty Stand   | Light Duty Stand   | Light Duty Stand   |
| <b>Notes</b>  |   |  |  |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | (a). 12V DC Power Supply Included   |  | (a). Water 1.5 liter/min (@ 22°C); admissible rate of temperature variation < 1 °C/min |  |

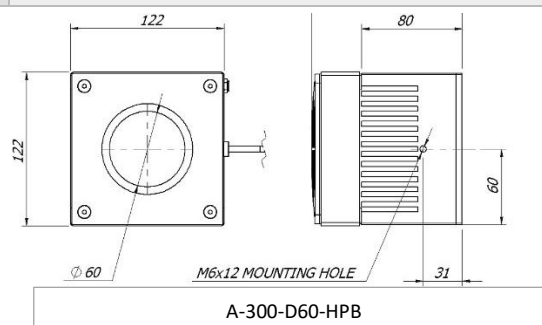


# Thermal Sensors for Medium Power Lasers

Range: 500 mW to 300 W



| Ordering Code   | A-300-D60-HPB   |
|---|---|
| <b>Power Mode</b>   |   |
| 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 (0-90%)   | 3.5 sec   |
| Power Calibration Uncertainty   | ± 3%  |
| Power Linearity (2)   | ± 1%  |
| <b>Single Shot Energy Mode</b>  |   |
| Max. Energy (with 100 ms pulse)   | 400 J   |
| Min. Energy   | 1 J   |
| Energy Resolution   | 10 mJ   |
| Energy Calibration Uncertainty  | ± 5%  |
| <b>Absorber Specs</b>   |   |
| Aperture  | 60 mm   |
| Type  | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (3)   | 6 kW/cm <sup>2</sup> @200 W   |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>  |   |
| Cooling   | Forced Air with Fan (a)   |
| Weight  | 2.1 kg  |
| Dimension   | 122 x 122 x 120 mm  |
| Cable length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)          |
| Stand and Post  | Heavy Duty Stand  |
| <b>Notes</b>  |   |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | (a). 12V DC Power Supply Included   |



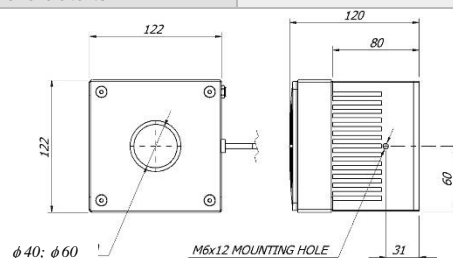


# Thermal Sensors for Medium Power Lasers

Range: 500 mW to 600 W



| Ordering Code   | A-600-D40-HPB   | A-600-D60-SHC  |
|---|---|--|
| <b>Power Mode</b>   |   |  |
| Max. Average Power  | 600 W   | 600 W  |
| Max. Intermittent Power (1)   | 800 W   | 800 W  |
| Min. Power  | 0.5 W   | 0.5 W  |
| Power Resolution  | 10 mW   | 10 mW  |
| Noise Equivalent Power (NEP)  | 50 mW   | 50 mW  |
| Response Time (0-90%)   | 5 sec   | 4 sec  |
| Power Calibration Uncertainty   | ± 3%  | ± 3%   |
| Power Linearity (2)   | ± 1.5%  | ± 1.5%   |
| <b>Single Shot Energy Mode</b>  |   |  |
| Max. Energy (with 100 ms pulse)   | 800 J   | 800 J  |
| Min. Energy   | 1 J   | 1 J  |
| Energy Resolution   | 10 mJ   | 10 mJ  |
| Energy Calibration Uncertainty  | ± 5%  | ± 5%   |
| <b>Absorber Specs</b>   |   |  |
| Aperture  | 40 mm   | 60 mm  |
| Type  | HPB   | SHC  |
| Absorber Spectral Range   | 0.19 - 11 $\mu\text{m}$   | 0.19 - 11 $\mu\text{m}$  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              | 0.2 - 1.1 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$                                 |
| Max Power Density (3)   | 3 kW/cm <sup>2</sup> @500 W   | 11 kW/cm <sup>2</sup> @500 W   |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 115<br>10 $\mu\text{s}$ pulse width: 4<br>10ns pulse width: 1 |
| <b>General Characteristics</b>  |   |  |
| Cooling   | Forced Air with Fan (a)   | Forced Air with Fan (a)  |
| Weight  | 2.2 kg  | 2.5 kg   |
| Dimension   | 122 x 122 x 120 mm  | 122 x 122 x 120 mm   |
| Cable length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)                | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)             |
| Stand and Post  | Heavy Duty Stand  | Heavy Duty Stand   |
| <b>Notes</b>  |   |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | (a). 12V DC Power Supply Included   |  |



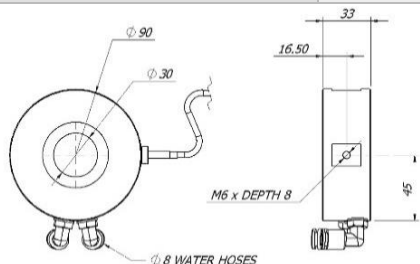
A-600-D40-HPB A-600-D60-SHC

# Thermal Sensors for Medium Power Lasers

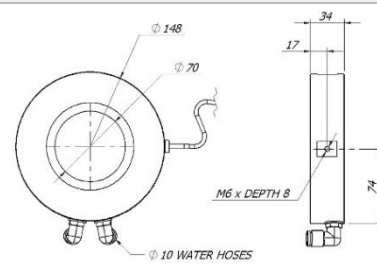
Range: 500 mW to 600 W



| Ordering Code   | W-600-D30-HPB  | W-600-D30-SHC  | W-600-D70-HPB   | W-600-D70-SHC  |
|---|--|--|---|--|
| <b>Power Mode</b>   |  |  |   |  |
| Max. Average Power  | 600 W  | 600 W  | 600 W   | 600 W  |
| Max. Intermittent Power (1)   | 800 W  | 800 W  | 700 W   | 700 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)  | 25 mW  | 25 mW  | 30 mW   | 30 mW  |
| Response Time (0-90%)   | 2 sec  | 2 sec  | 4 sec   | 4 sec  |
| Power Calibration Uncertainty   | ± 3%   | ± 3%   | ± 3%  | ± 3%   |
| Power Linearity (2)   | ± 1.5%   | ± 1.5%   | ± 1.5%  | ± 1.5%   |
| <b>Single Shot Energy Mode</b>  |  |  |   |  |
| Max. Energy (with 100 ms pulse)   | 800 J  | 800 J  | 700 J   | 700 J  |
| Min. Energy   | 2 J  | 2 J  | 1 J   | 1 J  |
| Energy Resolution   | 10 mJ  | 10 mJ  | 10 mJ   | 10 mJ  |
| Energy Calibration Uncertainty  | ± 5%   | ± 5%   | ± 5%  | ± 5%   |
| <b>Absorber Specs</b>   |  |  |   |  |
| Aperture  | 30 mm  | 30 mm  | 70 mm   | 70 mm  |
| Type  | HPB  | SHC  | HPB   | SHC  |
| Absorber Spectral Range   | 0.19 - 11 $\mu\text{m}$  | 0.19 - 11 $\mu\text{m}$  | 0.19 - 11 $\mu\text{m}$   | 0.19 - 11 $\mu\text{m}$  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$                 | 0.2 - 11 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$                                  | 0.2 - 11 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$                                     | 0.2 - 11 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$                                  |
| Max Power Density (3)   | 5 kW/cm <sup>2</sup> @500 W  | 19 kW/cm <sup>2</sup> @500 W   | 5 kW/cm <sup>2</sup> @500 W   | 19 kW/cm <sup>2</sup> @500 W   |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3    | 5ms pulse width: 115<br>10 $\mu\text{s}$ pulse width: 4<br>10ns pulse width: 1 | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 115<br>10 $\mu\text{s}$ pulse width: 4<br>10ns pulse width: 1 |
| <b>General Characteristics</b>  |  |  |   |  |
| Cooling   | Water (a)  | Water (a)  | Water (a)   | Water (a)  |
| Weight  | 0.6 kg   | 0.6 kg   | 1.9 kg  | 1.9 kg   |
| Dimension   | Ø 90 x 33 mm   | Ø 90 x 33 mm   | Ø 148 x 34 mm   | Ø 148 x 34 mm  |
| Cable length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)                   | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)             | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)                | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)             |
| Stand and Post  | Light Duty Stand   | Light Duty Stand   | Light Duty Stand  | Light Duty Stand   |
| <b>Notes</b>  |  |  |   |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(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-600-D30-HPB; W-600-D30-SHC



W-600-D70-HPB; W-600-D70-SHC;

- Thermal sensors for High power lasers

- Water Cooled Heads to 6KW for continuous use and 9kW for intermittent
- High resistant coatings: up to 6KW/cm<sup>2</sup> at the maximum rated power
- Energy damage threshold up to 250J/cm<sup>2</sup>
- NIST and PTB (Physikalisch-Technische Bundesanstalt) traceable calibrations

### HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 and PC-Link Meters;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

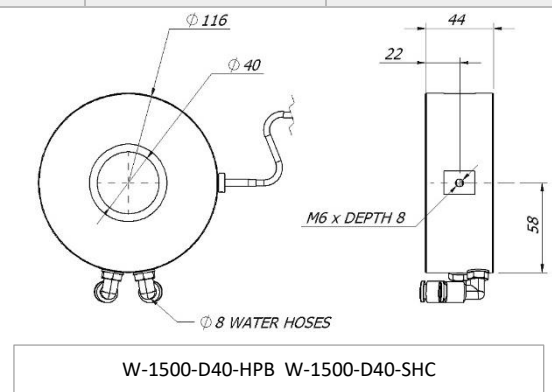
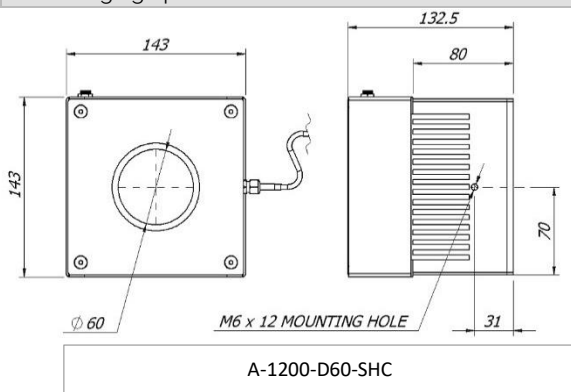
Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

| Ordering code  | Power Range  | Max Intermittent Power | Energy range | Useful Aperture | Spectral Range | Cooling    | Connectivity |
|----------------|--------------|------------------------|--------------|-----------------|----------------|------------|--------------|
| A-1200-D60-SHC | 2 W - 1200 W | 1400 W                 | 5 J - 1200 J | 60 mm           | 0.19 - 11 µm   | Forced Air | DB15         |
| W-1500-D40-HPB | 4 W - 1500 W | 2250 W                 | 5 J - 2250 J | 40 mm           | 0.19 - 11 µm   | Water      | DB15         |
| W-1500-D40-SHC | 4 W - 1500 W | 2250 W                 | 5 J - 2250 J | 40 mm           | 0.19 - 11 µm   | Water      | DB15         |
| W-3000-D55-HPB | 6 W - 3 kW   | 4.5 kW                 | n.a.         | 55 mm           | 0.19 - 11 µm   | Water      | DB15         |
| W-3000-D55-SHC | 6 W - 3 kW   | 4.5 kW                 | n.a.         | 55 mm           | 0.19 - 11 µm   | Water      | DB15         |
| W-6000-D55-SHC | 15 W - 6 kW  | 9 kW                   | n.a.         | 55 mm           | 0.19 - 11 µm   | Water      | DB15         |

# Thermal Sensors for High Power Lasers

Range: 2 W to 1500 W

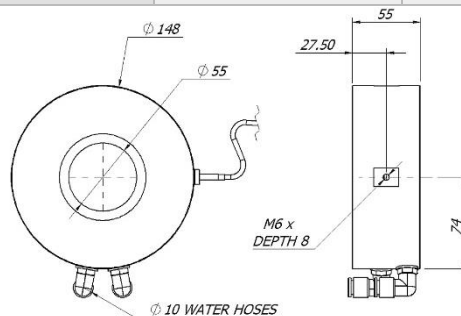
| Ordering Code   | A-1200-D60-SHC   | W-1500-D40-HPB   | W-1500-D40-SHC   |
|---|--|--|--|
| <b>Power Mode</b>   |  |  |  |
| Max. Average Power  | 1200 W   | 1500 W   | 1500 W   |
| Max. Intermittent Power (1)   | 1400 W   | 2250 W   | 2250 W   |
| Min. Power  | 2 W  | 4 W  | 4 W  |
| Power Resolution  | 100 mW   | 100 mW   | 100 mW   |
| Noise Equivalent Power (NEP)  | 100 mW   | 200 mW   | 200 mW   |
| Response Time (0-90%)   | 6 sec  | 4 sec  | 4 sec  |
| Power Calibration Uncertainty   | ± 3%   | ± 5%   | ± 5%   |
| Power Linearity (2)   | ± 1.5%   | ± 1.5%   | ± 1.5%   |
| <b>Single Shot Energy Mode</b>  |  |  |  |
| 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%   |
| <b>Absorber Specs</b>   |  |  |  |
| 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 - 11 µm,<br>9 - 11 µm  | 0.19 - 2.1 µm, 2.94µm,<br>9 - 11 µm  | 0.2 - 11 µm,<br>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 J/cm² (3)  | 5ms pulse width: 115<br>10µs pulse width: 4<br>10ns pulse width: 1 | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3                | 5ms pulse width: 115<br>10µs pulse width: 4<br>10ns pulse width: 1                   |
| <b>General Characteristics</b>  |  |  |  |
| 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 length - connector  | 5 m - DB15<br>5 m - USB (U option)<br>5 m - RS232 (R option)       | 5 m - DB15<br>5 m - USB (U option)<br>5 m - RS232 (R option)                         | 5 m - DB15<br>5 m - USB (U option)<br>5 m - RS232 (R option)                         |
| Stand and Post  | Heavy Duty Stand   | Heavy Duty Stand   | Heavy Duty Stand   |
| <b>Notes</b>  |  |  |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. | (a). 24V 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 |



# Thermal Sensors for High Power Lasers

Range: 6 W to 6 kW

| Ordering Code   | W-3000-D55-HPB   | W-3000-D55-SHC   | W-6000-D55-SHC   |
|---|--|--|--|
| <b>Power Mode</b>   |  |  |  |
| 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 (0-90%)   | 5 sec  | 5 sec  | 3.5 sec  |
| Power Calibration Uncertainty   | ± 5%   | ± 5%   | ± 5%   |
| Power Linearity (2)   | ± 2%   | ± 2%   | ± 2%   |
| <b>Single Shot Energy Mode</b>  |  |  |  |
| Max. Energy (with 100 ms pulse)   | n.a.   | n.a.   | n.a.   |
| Min. Energy   | n.a.   | n.a.   | n.a.   |
| Energy Resolution   | n.a.   | n.a.   | n.a.   |
| Energy Calibration Uncertainty  | n.a.   | n.a.   | n.a.   |
| <b>General Characteristics</b>  |  |  |  |
| 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 length - connector  | 5 m - DB15<br>5 m - USB (U option)<br>5 m - RS232 (R option) | 5 m - DB15<br>5 m - USB (U option)<br>5 m - RS232 (R option)                         | 5 m - DB15<br>5 m - USB (U option)<br>5 m - RS232 (R option) |
| Stand and Post  | Heavy Duty Stand   | Heavy Duty Stand   | Heavy Duty Stand   |
| <b>Notes</b>  |  | <b>Notes</b>   |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(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 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

- Thermal sensors for pulsed lasers

- High damage thresholds volume absorbers:  
peak powers to 100GW/cm<sup>2</sup>; energy densities to 4J/cm<sup>2</sup> @ ns pulses
- Large Area Detectors to 40 mm
- Avg. Power and Single Shot Energy Measurement
- NIST and PTB (Physikalisch-Technische Bundesanstalt) traceable Calibrations

### HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 and PC-Link Meters;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

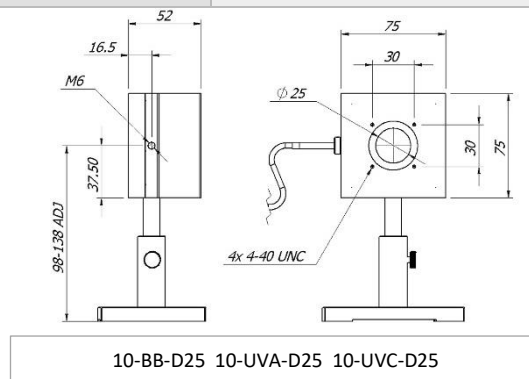
Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

| Ordering code | Power Range  | Max Intermittent Power | Energy range  | Useful Aperture | Spectral Range | Cooling    | Connectivity |
|---------------|--------------|------------------------|---------------|-----------------|----------------|------------|--------------|
| 10-BB-D25     | 2 mW - 10 W  | 15 W                   | 50 mJ - 10 J  | 25 mm           | 0.4 - 5.2 μm   | Convection | DB15         |
| 10-UVA-D25    | 2 mW - 10 W  | 15 W                   | 50 mJ - 10 J  | 25 mm           | 0.25 - 0.4 μm  | Convection | DB15         |
| 10-UVC-D25    | 2 mW - 10 W  | 15 W                   | 50 mJ - 10 J  | 25 mm           | 0.19 - 0.25 μm | Convection | DB15         |
| 20-BB-D40     | 40 mW - 20 W | 30 W                   | 100 mJ - 20 J | 40 mm           | 0.4 - 5.2 μm   | Convection | DB15         |
| 20-UVA-D40    | 40 mW - 20 W | 30 W                   | 100 mJ - 20 J | 40 mm           | 0.25 - 0.4 μm  | Convection | DB15         |
| 20-UVC-D40    | 40 mW - 20 W | 30 W                   | 100 mJ - 20 J | 40 mm           | 0.19 - 0.25 μm | Convection | DB15         |

# Thermal Sensors for Pulsed Lasers

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

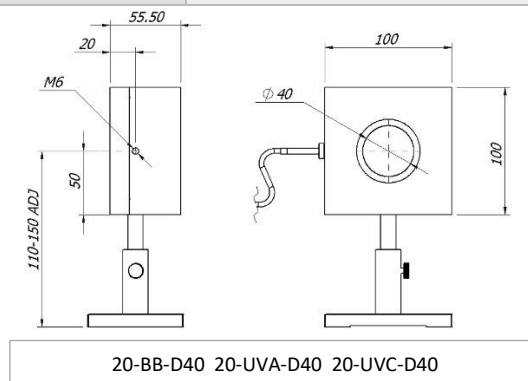
| Ordering Code   | 10-BB-D25  | 10-UVA-D25   | 10-UVC-D25  |
|---|--|--|---|
| <b>Power Mode</b>   |  |  |   |
| Max. Average Power  | 10 W   | 10 W   | 10 W  |
| Max. Intermittent Power (1)   | 15 W   | 15 W   | 15 W  |
| Min. Power  | 2 mW   | 2 mW   | 2 mW  |
| Power Resolution  | 100 $\mu$ W  | 100 $\mu$ W  | 100 $\mu$ W   |
| Noise Equivalent Power (NEP)  | 100 $\mu$ W  | 100 $\mu$ W  | 100 $\mu$ W   |
| Response Time (0-90%)   | 3 sec  | 3 sec  | 3 sec   |
| Power Calibration Uncertainty   | $\pm 3\%$  | $\pm 3\%$  | $\pm 3\%$   |
| Power Linearity (2)   | $\pm 1\%$  | $\pm 1\%$  | $\pm 1\%$   |
| <b>Single Shot Energy Mode</b>  |  |  |   |
| 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  | $\pm 5\%$  | $\pm 5\%$  | $\pm 5\%$   |
| <b>Absorber Specs</b>   |  |  |   |
| Aperture  | 25 mm  | 25 mm  | 25 mm   |
| Type  | BB   | UVA  | UVC   |
| Absorber Spectral Range   | 0.4 - 5.2 $\mu$ m  | 0.25 - 0.4 $\mu$ m   | 0.19 - 0.25 $\mu$ m   |
| Calibration Spectral Range  | 0.4 - 5.2 $\mu$ m  | 0.25 - 0.4 $\mu$ m   | 0.19 - 0.25 $\mu$ m   |
| Max Power Density (3)   | 35 W/cm <sup>2</sup>   | 9 W/cm <sup>2</sup>  | 40 W/cm <sup>2</sup>  |
| Max Energy Density J/cm <sup>2</sup> (3)  | Single Pulse: (a)<br>10ms pulse width: 13<br><10 $\mu$ s pulse width: 10 | Single Pulse: (a)<br>10ms pulse width: 5<br><10 $\mu$ s pulse width: 4                       | Single Pulse: (a)<br>10ms pulse width: 15<br><10 $\mu$ s pulse width: 9 |
| <b>General Characteristics</b>  |  |  |   |
| 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 length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)       | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)                           | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)      |
| Stand and Post  | Light Duty Stand   | Light Duty Stand   | Light Duty Stand  |
| <b>Notes</b>  |  |  |   |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. |  | Available with fiber adapter<br>(a). For repeated pulses, see volume absorber damage graphs. |   |



# Thermal Sensors for Pulsed Lasers

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

| Ordering Code   | 20-BB-D40  | 20-UVA-D40   | 20-UVC-D40   |
|---|--|--|--|
| <b>Power Mode</b>   |  |  |  |
| 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 (0-90%)   | 3 sec  | 3 sec  | 3 sec  |
| Power Calibration Uncertainty   | ± 3%   | ± 3%   | ± 3%   |
| Power Linearity (2)   | ± 1%   | ± 1%   | ± 1%   |
| <b>Single Shot Energy Mode</b>  |  |  |  |
| 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%   |
| <b>Absorber Specs</b>   |  |  |  |
| 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/cm <sup>2</sup>   | 9 W/cm <sup>2</sup>  | 40 W/cm <sup>2</sup>   |
| Max Energy Density J/cm <sup>2</sup> (3)  | Single Pulse: (a)<br>10ms pulse width: 13<br><10µs pulse width: 10 | Single Pulse: (a)<br>10ms pulse width: 5<br><10µs pulse width: 4   | Single Pulse: (a)<br>10ms pulse width: 15<br><10µs pulse width: 9  |
| <b>General Characteristics</b>  |  |  |  |
| 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 length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) |
| Stand and Post  | Light Duty Stand   | Light Duty Stand   | Light Duty Stand   |
| <b>Notes</b>  |  |  |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. |  | (a). For repeated pulses, see volume absorber damage graphs.       |  |





- Thermal sensors for high energy density lasers

- Designed for High Energy Density, High Peak Power Lasers
- Avg. Power and Single Shot Energy Measurement
- Beam Expander associated to High damage absorbers:  
avg. power density to 100GW/cm<sup>2</sup> peak power density to 30GW/cm<sup>2</sup>;  
energy density to 30J/cm<sup>2</sup>
- Energy measurement up to 10 joules with ns pulses
- NIST and PTB (Physikalisch-Technische Bundesanstalt) traceable Calibrations



### HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 and PC-Link Meters;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

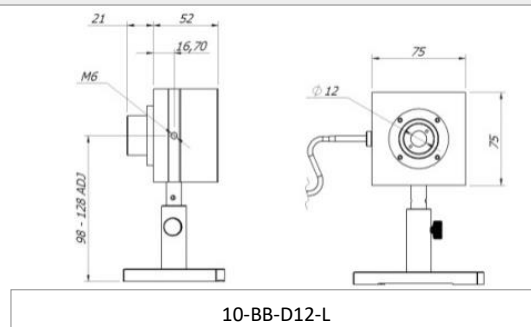
| Ordering code | Power Range  | Max Intermittent Power | Energy range  | Useful Aperture | Spectral Range | Cooling    | Connectivity |
|---------------|--------------|------------------------|---------------|-----------------|----------------|------------|--------------|
| 10-BB-D12-L   | 2 mW - 10 W  | 15 W                   | 50 mJ - 10 J  | 12 mm           | 0.4 - 2 μm     | Convection | DB15         |
| A-10-D12-DIF  | 10 mW - 10 W | 15 W                   | 10 mJ - 15 J  | 12 mm           | 0.2 - 2.1 μm   | Convection | DB15         |
| A-30-D18-DIF  | 25 mW - 30 W | 45 W                   | 100 mJ - 45 J | 18 mm           | 0.2 - 2.1 μm   | Convection | DB15         |
| A-40-D33-DIF  | 25 mW - 40 W | 60 W                   | 100 mJ - 60 J | 33 mm           | 0.2 - 2.1 μm   | Convection | DB15         |

# Thermal Sensors for high energy density lasers

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



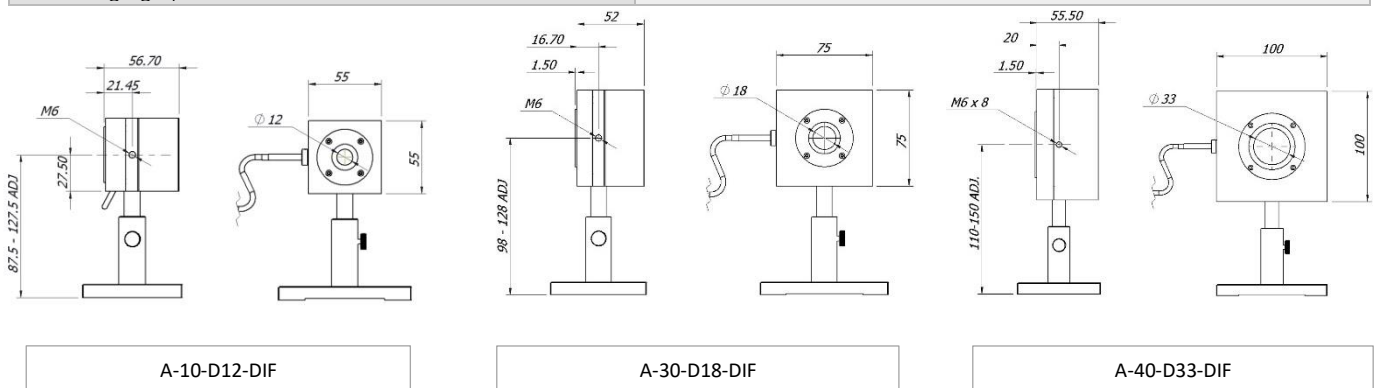
| Ordering Code   | 10-BB-D12-L  |
|---|--|
| <b>Power Mode</b>   |  |
| Max. Average Power  | 10 W   |
| Max. Intermittent Power (1)   | 15 W   |
| Min. Power  | 2 mW   |
| Power Resolution  | 100 $\mu$ W  |
| Noise Equivalent Power (NEP)  | 100 $\mu$ W  |
| Response Time (0-90%)   | 3 sec  |
| Power Calibration Uncertainty   | $\pm 3\%$  |
| Power Linearity (2)   | $\pm 1\%$  |
| <b>Single Shot Energy Mode</b>  |  |
| Max. Energy (with 100 ms pulse)   | 10 J   |
| Min. Energy   | 50 mJ  |
| Energy Resolution   | 1 mJ   |
| Energy Calibration Uncertainty  | $\pm 5\%$  |
| <b>Absorber Specs</b>   |  |
| Aperture  | 12 mm  |
| Type  | BB + L   |
| Absorber Spectral Range   | 0.4 - 2 $\mu$ m  |
| Calibration Spectral Range  | 0.4 - 2 $\mu$ m  |
| Max Power Density (3)   | 140 W/cm <sup>2</sup>  |
| Max Energy Density J/cm <sup>2</sup> (3)  | Single Pulse: (a)<br>10ms pulse width: 40<br><10 $\mu$ s pulse width: 30 |
| <b>General Characteristics</b>  |  |
| Cooling   | Convection   |
| Weight  | 0.6 kg   |
| Dimension   | 75 x 75 x 73 mm  |
| Cable length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)       |
| Stand and Post  | Light Duty Stand   |
| <b>Notes</b>  |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(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.      |



# Thermal Sensors for high energy density lasers

Range: 10 mW to 40 W; 10 mJ to 60 J

| Ordering Code   | A-10-D12-DIF   | A-30-D18-DIF   | A-40-D33-DIF   |
|---|--|--|--|
| <b>Power Mode</b>   |  |  |  |
| Max. Average Power  | 10 W   | 30 W   | 40 W   |
| Max. Intermittent Power (1)   | 15 W   | 45 W   | 60 W   |
| Min. Power  | 10 mW  | 25 mW  | 25 mW  |
| Power Resolution  | 100 $\mu$ W  | 1 mW   | 1 mW   |
| Noise Equivalent Power (NEP)  | 600 $\mu$ W  | 1 mW   | 1 mW   |
| Response Time (0-90%)   | 1 sec  | 1.5 sec  | 1.8 sec  |
| Power Calibration Uncertainty   | $\pm 3\%$  | $\pm 3\%$  | $\pm 3\%$  |
| Power Linearity (2)   | $\pm 1\%$  | $\pm 1.5\%$  | $\pm 1.5\%$  |
| <b>Single Shot Energy Mode</b>  |  |  |  |
| Max. Energy (with 100 ms pulse)   | 15 J   | 45 J   | 60 J   |
| Min. Energy   | 10 mJ  | 100 mJ   | 100 mJ   |
| Energy Resolution   | 0.1 mJ   | 1 mJ   | 1 mJ   |
| Energy Calibration Uncertainty  | $\pm 5\%$  | $\pm 5\%$  | $\pm 5\%$  |
| <b>Absorber Specs</b>   |  |  |  |
| Aperture  | 12 mm  | 18 mm  | 33 mm  |
| Type  | DIF  | DIF  | DIF  |
| Absorber Spectral Range   | 0.2 - 2.1 $\mu$ m  | 0.2 - 2.1 $\mu$ m  | 0.2 - 2.1 $\mu$ m  |
| Calibration Spectral Range  | 0.2 - 2.1 $\mu$ m  | 0.2 - 2.1 $\mu$ m  | 0.2 - 2.1 $\mu$ m  |
| Max Power Density (3)   | 160 kW/cm <sup>2</sup>   | 160 kW/cm <sup>2</sup>   | 160 kW/cm <sup>2</sup>   |
| Max Energy Density J/cm <sup>2</sup> (3)  | 5ms pulse width: 1200<br>10 $\mu$ s pulse width: 22<br>10ns pulse width: 6.5 | 5ms pulse width: 1200<br>10 $\mu$ s pulse width: 22<br>10ns pulse width: 6.5 | 5ms pulse width: 1200<br>10 $\mu$ s pulse width: 22<br>10ns pulse width: 6.5 |
| <b>General Characteristics</b>  |  |  |  |
| Cooling   | Convection   | Convection   | Convection   |
| Weight  | 0.6 kg   | 0.6 kg   | 0.9 kg   |
| Dimension   | 75 x 75 x 52 mm  | 75 x 75 x 52 mm  | 100 x 100 x 55 mm  |
| Cable length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)           | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)           | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)           |
| Stand and Post  | Light Duty Stand   | Light Duty Stand   | Light Duty Stand   |
| <b>Notes</b>  |  |  |  |
| (1). 2 minutes max<br>(2). Detector centrally irradiated @50% of useful surface.<br>(3). Damage thresholds also depend on power level. Please see damage graphs for more details. |  |  |  |



# Beam Dumps

Beam Dumps are used to block and absorb unwanted beams, preventing them to propagate in the working environment. Laser Point provides both air and water cooled dumps, from laser power up to 6000W.

## HOW TO ORDER:

Select Ordering Code without any option for head without any connectivity

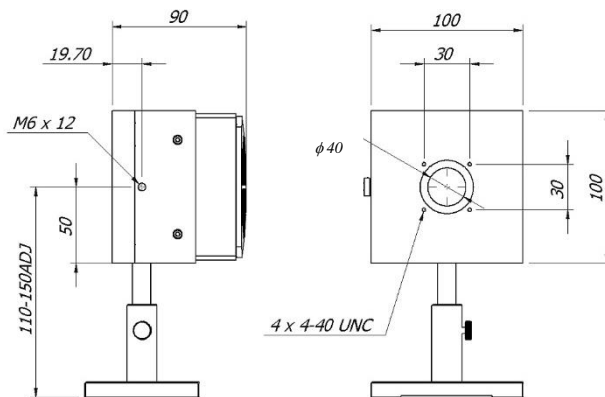
| Ordering code       | Max Power | Max Intermittent Power | Useful Aperture | Spectral Range          | Cooling    | Connectivity  |
|---------------------|-----------|------------------------|-----------------|-------------------------|------------|---------------|
| A-200-D40-HPB-DUMP  | 200 W     | 250 W                  | 40 mm           | 0.19 - 11 $\mu\text{m}$ | Forced Air | Without cable |
| A-200-D40-SHC-DUMP  | 200 W     | 250 W                  | 40 mm           | 0.19 - 11 $\mu\text{m}$ | Forced Air | Without cable |
| A-600-D60-SHC-DUMP  | 600 W     | 800 W                  | 60 mm           | 0.19 - 11 $\mu\text{m}$ | Forced Air | Without cable |
| W-1500-D40-SHC-DUMP | 1500 W    | 2250 W                 | 40 mm           | 0.19 - 11 $\mu\text{m}$ | Water      | Without cable |
| W-6000-D55-SHC-DUMP | 6000 W    | 9000 W                 | 55 mm           | 0.19 - 11 $\mu\text{m}$ | Water      | Without cable |

## Beam Dump for Medium Power Lasers

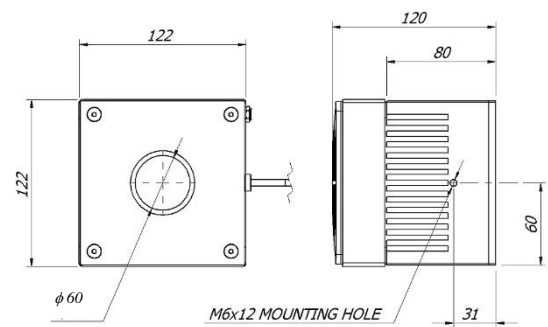
Range: 200 W to 600 W



| Ordering Code   | A-200-D40-HPB   | A-200-D40-SHC  | A-600-D60-SHC  |
|---|---|--|--|
| <b>Power Mode</b>   |   |  |  |
| Max. Average Power  | 200 W   | 200 W  | 600 W  |
| Max. Intermittent Power (1)   | 250 W   | 250 W  | 800 W  |
| <b>Absorber Specs</b>   |   |  |  |
| Aperture  | 40 mm   | 40 mm  | 60 mm  |
| Type  | HPB   | SHC  | SHC  |
| Absorber Spectral Range   | 0.19 - 11 $\mu\text{m}$   | 0.19 - 11 $\mu\text{m}$  | 0.19 - 11 $\mu\text{m}$  |
| Max Power Density (2)   | 4 kW/cm <sup>2</sup> @ 200 W  | 17 kW/cm <sup>2</sup> @200 W   | 17 kW/cm <sup>2</sup> @200 W<br>11 kW/cm <sup>2</sup> @500 W                   |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 115<br>10 $\mu\text{s}$ pulse width: 4<br>10ns pulse width: 1 | 5ms pulse width: 115<br>10 $\mu\text{s}$ pulse width: 4<br>10ns pulse width: 1 |
| <b>General Characteristics</b>  |   |  |  |
| Cooling   | Forced Air with Fan (a)   | Forced Air with Fan (a)  | Forced Air with Fan (a)  |
| Weight  | 1.2 kg  | 1.2 kg   | 2.5 kg   |
| Dimension   | 100 x 100 x 85 mm   | 100 x 100 x 85 mm  | 122 x 122 x 120 mm   |
| Cable length - connector  | N.A   | N.A  | N.A  |
| Stand and Post  | Light Duty Stand  | Light Duty Stand   | Heavy Duty Stand   |
| <b>Notes</b>  |   |  |  |
| (1). 2 minutes max<br>(2). 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). 12V DC Power Supply Included  |



A-200-D40-HPB-DUMP A-200-D40-SHC-DUMP

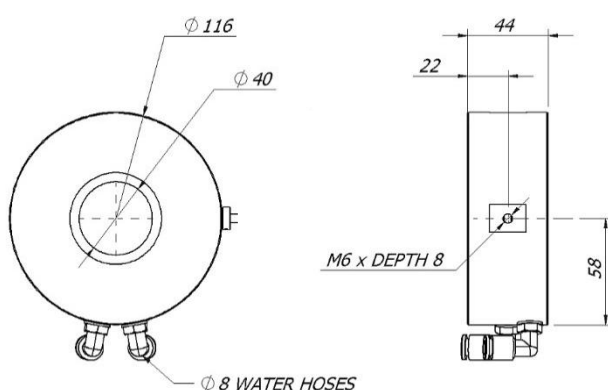


A-600-D60-SHC-DUMP

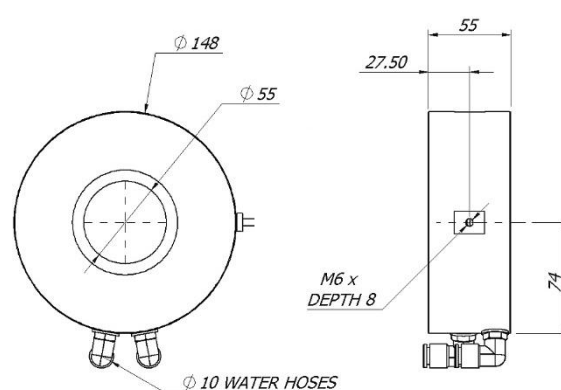
# Beam Dump for High Power Lasers

Range: 1500 W to 6000 W

| Ordering Code   | W-1500-D40-SHC   | W-6000-D55-SHC   |
|---|--|--|
| <b>Power Mode</b>   |  |  |
| Max. Average Power  | 1500 W   | 6000 W   |
| Max. Intermittent Power (1)   | 2250 W   | 9000 W   |
| <b>Absorber Specs</b>   |  |  |
| Aperture  | 40 mm  | 55 mm  |
| Type  | SHC  | SHC  |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m  | 0.19 - 11 $\mu$ m  |
| Max Power Density (2)   | 11 kW/cm <sup>2</sup> @500 W<br>7 kW/cm <sup>2</sup> @1 kW               | 11 kW/cm <sup>2</sup> @500 W<br>4 kW/cm <sup>2</sup> @5kW  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 115<br>10 $\mu$ s pulse width: 4<br>10ns pulse width: 1 | 5ms pulse width: 115 J/cm <sup>2</sup><br>10 $\mu$ s pulse width: 4 J/cm <sup>2</sup><br>10ns pulse width: 1 J/cm <sup>2</sup> |
| <b>General Characteristics</b>  |  |  |
| Cooling   | Water (a)  | Water (a)  |
| Weight  | 1.1 kg   | 4.2 kg   |
| Dimension   | $\varnothing$ 116 x 44 mm  | $\varnothing$ 148 x 55 mm  |
| Cable length - connector  | N.A.   | N.A.   |
| Stand and Post  | Heavy Duty Stand   | Heavy Duty Stand   |
| <b>Notes</b>  |  |  |
| (1). 2 minutes max<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. | (a). Water 4 liter/min (@ 22°C);   | (a). Water 8 liter/min (@ 22°C);   |



W-1500-D40-SHC-DUMP



W-6000-D55-SHC-DUMP

# Calorimeters

Laser Point has developed a Calorimeter capable to measure very high powers, up to 12 kW. This product is the result of Laser Point's ability to explore new materials and manage the heat dissipation through a sophisticated thermal design. The new calorimeter is extremely compact and lightweight compared to alternative instruments of the same class; moreover, it does not require any defocusing optics in the absorbing cavity. The detector is characterized by a Linearity of  $\pm 2\%$  to its full scale and it is supplied with  $\pm 5\%$  calibration accuracy, traceable to PTB/NIST standards.

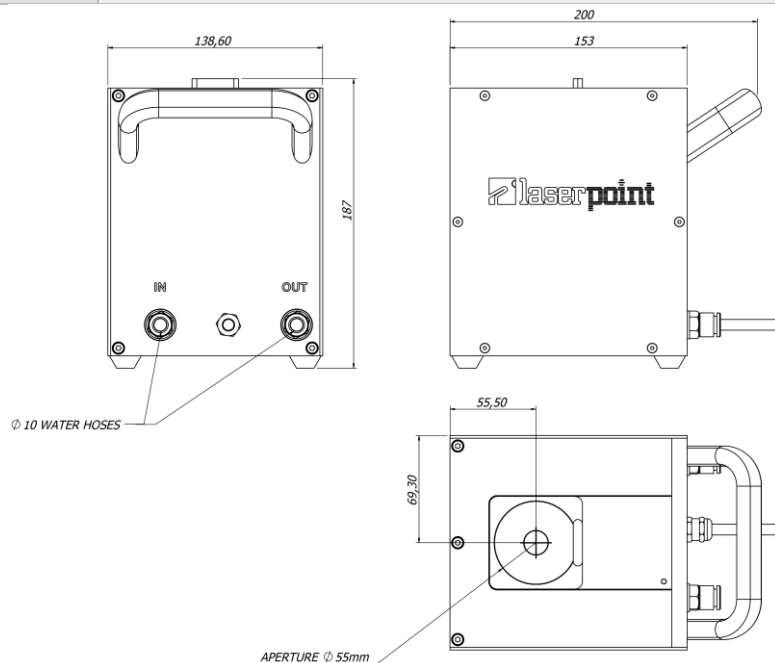
## HOW TO ORDER:

Select Ordering Code for USB head connectivity; no other connectivity option are available.

| Ordering code   | Power Range   | Useful Aperture | Spectral Range          | Cooling | Connectivity |
|-----------------|---------------|-----------------|-------------------------|---------|--------------|
| W-12K-D55-SHC-U | 100 W - 12 kW | 55 mm           | 0.19 - 11 $\mu\text{m}$ | Water   | USB          |



|   |  |
|---|--|
| Ordering Code   | W-12K-D55-SHC-U  |
| Power Mode  |  |
| Max. Average Power  | 12 kW  |
| Min. Power  | 100 W  |
| Power Resolution  | 10 W   |
| Noise Equivalent Power (NEP)  | 5 W  |
| Response Time (0-90%)   | 7 sec  |
| Power Calibration Uncertainty   | ± 5%   |
| Power Linearity (1)   | ± 2%   |
| Absorber Specs  |  |
| Aperture  | 55 mm  |
| Type  | SHC  |
| Absorber Spectral Range   | 0.19 - 11 µm   |
| Calibration Spectral Range  | 1.06µm, 10.6µm   |
| Max Power Density (2)   | 5 kW/cm <sup>2</sup> @5kW  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 115<br>10µs pulse width: 4<br>10ns pulse width: 1                   |
| General Characteristics   |  |
| Cooling   | Water (a)  |
| Weight  | 6 kg   |
| Dimension   | 140 x 200 x 180 mm   |
| Cable length - connector  | 5 m – USB (U option)   |
| Stand and Post  | n.a.   |
| Notes   |  |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). 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 |



W-12K-D55-SHC-U



# Power Probes

Many applications do not require "long term" power monitoring, but it is sufficient to have readings in a snapshot just to monitor if the power level is ok, as there is no necessity to measure over an extended period of time the laser power stability; moreover, many times water is not available on the laser machines, so service operations are easier if the measurement instrument do not require water cooling: that's the world for a different class of instruments known as "**Power Probes**". These instruments are stand-alone meters made of a thermal probe connected to electronics with its display. In general, instruments of this type are thermometers that measure a temperature difference in a fixed time and have a simple digital display. **FIT** and **CRONOS** have been ergonomically designed in all their details, such as the LCD display and the balance of weights, to provide a comfortable and safe operation.

Laser Point 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.

The absorbers feature low reflections and high damage thresholds; in particular the high power, multi kilowatt CRONOS have a concave conical shape to avoid dangerous back-reflections toward the operator.

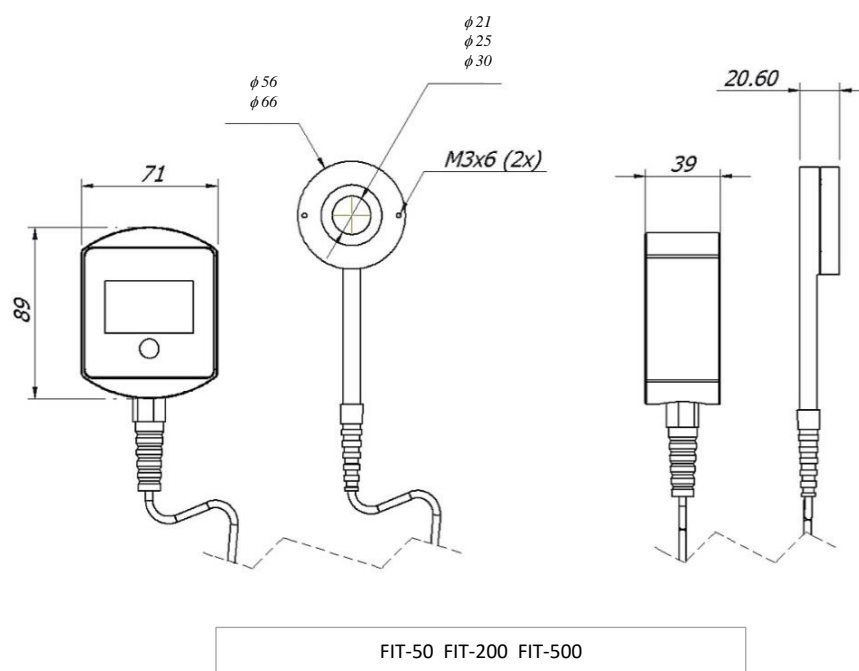
- **FIT Series: Fully automatic, handheld Low/Medium Power Probes**

- 3 models cover from 500mW to 500W.
- dual wavelength (CO<sub>2</sub> and Yag) ,
- ±1% repeatability
- ±3% accuracy
- 10 mW resolution on 50W probe
- Recalibration possible by User



| Ordering code | Power Range  | Max Intermittent Power | Energy range | Useful Aperture | Spectral Range | Cooling    | Connectivity |
|---------------|--------------|------------------------|--------------|-----------------|----------------|------------|--------------|
| Fit-50        | 0.5 W – 50 W | N.A.                   | N.A.         | 20 mm           | 0.19 - 1.1 µm  | Convection | N.A.         |
| Fit-200       | 2 W – 200 W  | N.A.                   | N.A.         | 20 mm           | 0.19 - 1.1 µm  | Convection | N.A.         |
| Fit-500       | 5 W – 500 W  | N.A.                   | N.A.         | 20 mm           | 0.19 - 1.1 µm  | Convection | N.A.         |

| Ordering Code   | FIT-50  | FIT-200   | FIT-500   |
|---|---|---|---|
| <b>Power Mode</b>   |   |   |   |
| 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%  |
| <b>Absorber Specs</b>   |   |   |   |
| Aperture  | 20 mm   | 20 mm   | 25 mm   |
| Type  | HPB   | HPB   | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu\text{m}$   | 0.19 - 11 $\mu\text{m}$   | 0.19 - 11 $\mu\text{m}$   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              |
| Max Power Density (1)   | 9 kW/cm <sup>2</sup> @40 W  | 6 kW/cm <sup>2</sup> @200 W   | 4 kW/cm <sup>2</sup> @500 W   |
| Max Energy Density J/cm <sup>2</sup> (1)  | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>  |   |   |   |
| Max Allowed Probe Temperature   | 70 °C   | 70 °C   | 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<br>(sensor head)<br>89 x 71 x 39 mm<br>(meter)                       | Ø 56 x 25 mm<br>(sensor head)<br>89 x 71 x 39 mm<br>(meter)                       | Ø 66 x 30 mm<br>(sensor head)<br>89 x 71 x 39 mm<br>(meter)                       |
| Cable length  | 1.2 m   | 1.2 m   | 1.2 m   |
| <b>Notes</b>  |   |   |   |
| (1). Damage thresholds also depend on power level. Please see damage graphs for more details. |   |   |   |



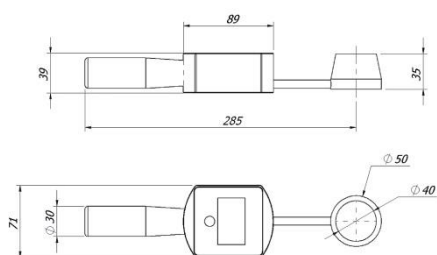
- **Cronos Series: Fully automatic, handheld High Power Probes**

- 3 models cover from 30W to 10kW
- dual wavelength (CO<sub>2</sub> and Yag) ,
- ±2% repeatability (±5% for 5 and 10kW models)
- ±4% accuracy
- 1W resolution on 10kW probe
- Recalibration possible by User

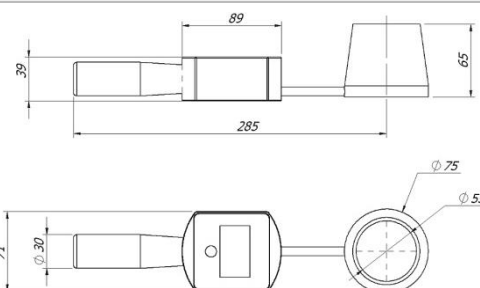


| Ordering code | Power Range   | Max Intermittent Power | Energy range | Useful Aperture | Spectral Range | Cooling    | Connectivity |
|---------------|---------------|------------------------|--------------|-----------------|----------------|------------|--------------|
| Cronos-LP15   | 30 W - 1500 W | N.A.                   | N.A.         | 40 mm           | 0.19 - 1.1 μm  | Convection | N.A.         |
| Cronos-LP5.0  | 100 W - 5 kW  | N.A.                   | N.A.         | 55 mm           | 0.19 - 1.1 μm  | Convection | N.A.         |
| Cronos-LP10   | 200 W - 10 kW | N.A.                   | N.A.         | 65 mm           | 0.19 - 1.1 μm  | Convection | N.A.         |

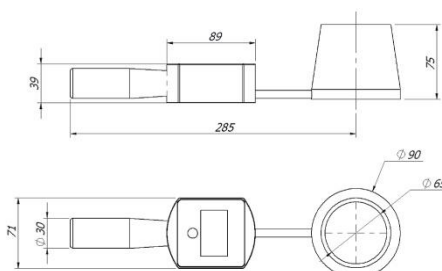
| Ordering Code   | Cronos-LP1.5  | Cronos-LP5.0  | Cronos-LP10   |
|---|---|---|---|
| <b>Power Mode</b>   |   |   |   |
| Max. Average Power  | 1500 W  | 5 kW  | 10 kW   |
| Min. Measurable Power   | 30 W  | 100 W   | 200 W   |
| Min. Meas. Power @3% accuracy   | 150 W   | 500 W   | 1000 W  |
| Power Resolution  | 1 W   | 1 W   | 1 W   |
| Time to measure and display:  | 8-15 sec (a)  | 8-15 sec (a)  | 8-15 sec (a)  |
| Power Calibration Uncertainty   | ± 4%  | ± 4%  | ± 4%  |
| Repeatability:  | ± 2%  | ± 5%  | ± 5%  |
| <b>Absorber Specs</b>   |   |   |   |
| Aperture  | 40 mm   | 55 mm   | 65 mm   |
| Type  | HPB   | HPB   | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu\text{m}$   | 0.19 - 11 $\mu\text{m}$   | 0.19 - 11 $\mu\text{m}$   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              |
| Max Power Density (1)   | 3.5 kW/cm <sup>2</sup> @1 kW  | 2.5 kW/cm <sup>2</sup> @5kW   | 2 kW/cm <sup>2</sup> @10kW  |
| Max Energy Density J/cm <sup>2</sup> (1)  | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>  |   |   |   |
| 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   | 310 x 71 x 39 mm  | 322 x 75 x 65 mm  | 330 x 90 x 75 mm  |
| Cable length  | n.a.  | n.a.  | n.a.  |
| <b>Notes</b>  |   |   |   |
| (1). Damage thresholds also depend on power level. Please see damage graphs for more details. |   | (a). From 8 s for max power measurements, up to 15 s for min power.               |   |



Cronos-LP1.5



Cronos-LP5.0



Cronos-LP10

- FIT-IPL-R: Handheld Energy/Power Probes for Intense Pulsed Light (IPL)

| Ordering code | Power Range | Max Intermittent Power | Energy range  | Useful Aperture | Spectral Range          | Cooling    | Connectivity |
|---------------|-------------|------------------------|---------------|-----------------|-------------------------|------------|--------------|
| Fit-IPL-R     | 1 W - 100 W | N.A.                   | 3.5 J - 350 J | 20 x 60 mm      | 0.4 - 2.1 $\mu\text{m}$ | Convection | N.A.         |

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

Fit-IPL-R 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 ( $\pm 1\%$ ), accuracy ( $\pm 3\%$ ) and high resolution (10 mW and 100mJ) associated with a wide dynamic range of measurement (down to 1% of f.s.).

The broadband detector works in the range from 400 nm to 1400 nm, which is the range of interest for the majority of applications (photo-epilation, skin rejuvenation, treatments of acne, vascular and pigmented lesions, and 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 fluence (up to  $90\text{J}/\text{cm}^2$ ) of professional systems (medical and clinic) where the highest pulse energies are involved. Moreover, it is also very flexible since it can operate with semi-professional systems (beauty salons) and consumer-oriented systems (2 to  $10\text{J}/\text{cm}^2$ ).

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 (single shot for energy or repetitive for power), probe model and warning for low-battery. A bar graph 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 recalibrations by means of a lateral micro-switch usable to modify the sensitivity.

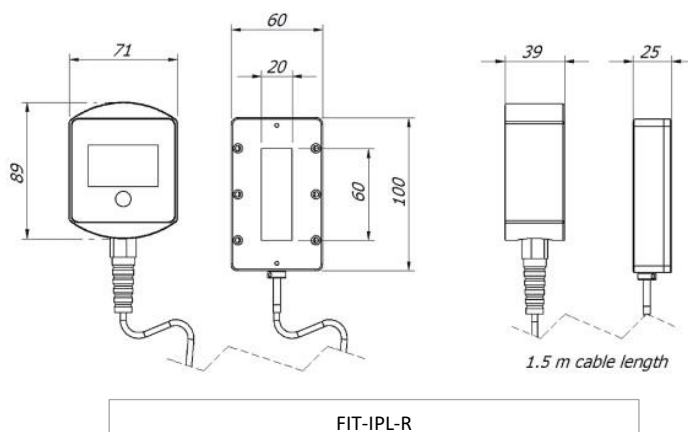
1  $\text{cm}^2$  diaphragm (available as a 10x10mm or 20x0.5 mm) can be mounted on the head to get the value of fluence ( $\text{J}/\text{cm}^2$ ) delivered to the patient.

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

| Ordering Code  | FIT-IPL-R  |
|--|--|
| <b>Power Mode</b>  |  |
| Max. Average Power   | 100 W  |
| Min. Measurable Power  | 1 W  |
| Min. Meas. Power @3% accuracy  | 2 W  |
| Power Resolution   | 100 mW   |
| Time to measure and display:   | 10 sec   |
| Power Calibration Uncertainty  | ± 3%   |
| Repeatability:   | ± 1%   |
| <b>Single Shot Energy Mode</b>   |  |
| Max. Energy (with 100 ms pulse)  | 350 J  |
| Min. Measurable Energy   | 3.5 J  |
| Min. Meas Energy @3% accuracy  | 7 J  |
| Energy Resolution  | 100 mJ   |
| Wait time between 2 measures   | 25 sec   |
| Energy Calibration Uncertainty   | ± 5%   |
| Repeatability:   | ± 3%   |
| <b>Absorber Specs</b>  |  |
| Aperture   | 20 x 60 mm (a)   |
| Type   | IPL-R  |
| Absorber Spectral Range  | 0.4 - 2.1 $\mu\text{m}$  |
| Calibration Spectral Range   | 0.45 - 1.1 $\mu\text{m}$   |
| Max Power Density (1)  | 10 kW/cm <sup>2</sup> @40 W  |
| Max Energy Density J/cm <sup>2</sup> (1)   | 10ms pulse width: 30<br>1ms pulse width: 6<br>100 $\mu\text{s}$ pulse width: 2   |
| <b>General Characteristics</b>   |  |
| Power Supply   | 3V (2 AA Batteries)  |
| Battery runtime:   | 200 hrs  |
| Cooling  | Convection   |
| Weight   | 0.6 kg   |
| Dimension  | 60 x 100 x 25 mm (sensor head)<br>89 x 71 x 39 mm (electronics)  |
| Cable length   | 1.5 m  |
| <b>Notes</b>   |  |
| (1). Damage thresholds also depend on power level. Please see damage graphs for more details | (a). Option: plate with 1 cm <sup>2</sup> bore for fluence (J/cm <sup>2</sup> ) measurement.<br>Available sizes 10 x 10 mm <sup>2</sup> and 20 x 5 mm <sup>2</sup> . |



# OEM Solutions

## A customer-driven supplier of OEM sensors

Laser Point has developed a series of compact power sensors that can be easily integrated into laser machines to monitor the power during the operation. For more than two decades Laser Point has been supplying OEM power & energy sensors to some of the world's leading laser manufacturers. R&D activities are still strong, especially on new applications or on the design of new detectors.



## Advantages of Laser Point OEM Laser Measurement Products

Sensor discs manufactured by Laser Point are characterized by high sensitivity and low impedance. High sensitivity is important to maximize the signal-to-noise ratio when working at low powers. Around those sensor disks, complete OEM heads are designed and supplied with housings, cooling systems and amplifying electronics based on Customer's requirements and specifications. 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.



Laser Point sensors are made with robust materials and coatings that can be used from UV to Far Infrared and with concentrated beams, without the risk of damaging the detector even at extreme power densities.

Laser Point provides thermopiles with a high degree of linearity over their entire working range and with large areas suitable for the largest beams.

Thermopile sensors are almost insensitive to the position and the size of the beam when it strikes on their active area. Therefore alignment is never critical and installation time for OEM applications is fast.

Everything has been designed to provide accurate and reliable measurements of lasers such as CO<sub>2</sub>, Excimers, Laser Diodes, Nd-Yag from 3W to 200W at competitive prices.

All OEM sensors undergo to a series of 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.

## Custom Products and Technical Support

If you do not find in our current catalog what you need, we can design custom sensors, housings and electronics that fit your requirements. Ask our Application Engineers for technical support: we have extensive knowledge in optics, lasers, thermal behaviors and materials to answer your requests.

- **OEM Thermal sensors**

Thermal sensor series can be provided with bare wires connectivity or with USB and RS-232 connector.

- OEM Thermal Heads embedding high sensitivity sensor disks
- Compact size
- Available with air and water cooling
- Broadband operation from UV to Far Infrared
- Sensors Disks with High Resistant Coatings to endure high power densities
- High degree of linearity over the sensor's entire working range
- Single shot energy measurement capability with suitable electronics
- Supplied with 1.5m cable (up to 5m on request) or DB15 connector for Laser Point's Meters

### HOW TO ORDER:

Select Ordering Code without any option for bare wires;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

| Ordering code   | Power Range    | Useful Aperture | Spectral Range    | Cooling    | Connectivity | External Size (mm) |
|-----------------|----------------|-----------------|-------------------|------------|--------------|--------------------|
| CSA-2-D12-BBF   | 10 mW – 2 W    | 12 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wires   | 50 x 50 x 15       |
| CSA-2-D12-HPB   | 10 mW – 2 W    | 12 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wires   | 50 x 50 x 15       |
| CSA-5-D12-BBF   | 10 mW - 5 W    | 12 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wires   | 50 x 50 x 15       |
| CSA-20-D20-BBF  | 20 mW - 20 W   | 20 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wires   | 50 x 50 x 15       |
| CSA-20-D20-HPB  | 20 mW - 20 W   | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wires   | 50 x 50 x 15       |
| CSA-50-D30-HPB  | 50 mW - 50 W   | 30 mm           | 0.19 - 11 $\mu$ m | Forced Air | Bare wires   | 60 x 60 x 67       |
| CSW-50-D20-HPB  | 50 mW - 50 W   | 20 mm           | 0.19 - 11 $\mu$ m | Water      | Bare wires   | 50 x 50 x 20       |
| CSW-50-D25-HPB  | 50 mW - 50 W   | 25 mm           | 0.19 - 11 $\mu$ m | Water      | Bare wires   | 60 x 60 x 20       |
| CSA-100-D30-HPB | 100 mW - 100 W | 30 mm           | 0.19 - 11 $\mu$ m | Forced Air | Bare wires   | 60 x 60 x 67       |
| CSW-200-D20-HPB | 0.2 W - 200 W  | 20 mm           | 0.19 - 11 $\mu$ m | Water      | Bare wires   | 50 x 50 x 23       |
| CSW-200-D30-HPB | 0.2 W - 200 W  | 30 mm           | 0.19 - 11 $\mu$ m | Water      | Bare wires   | 60 x 60 x 23       |

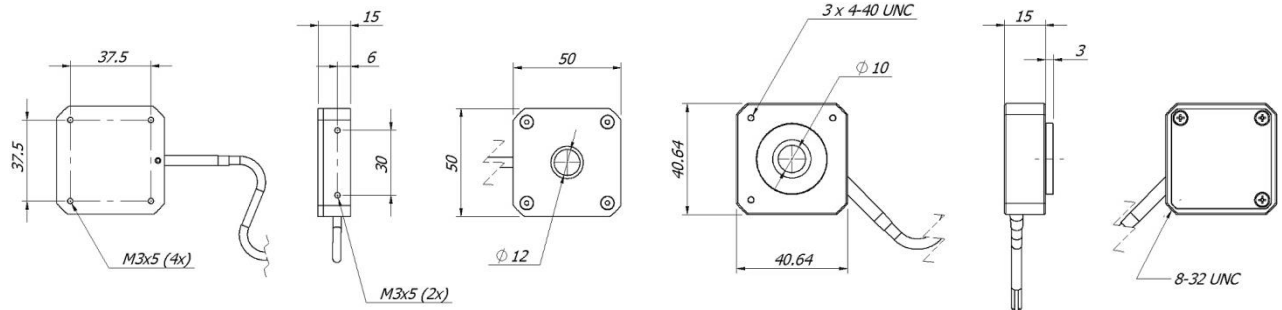


## OEM Thermal Sensors

Range: 10 mW to 5 W



| Ordering Code   | CSA-2-D12-BBF  | CSA-2-D12-HPB  | CSA-5-D12-BBF  |
|---|--|--|--|
| <b>Power Mode</b>   |  |  |  |
| Max. Average Power  | 2 W  | 2 W  | 5 W  |
| Nominal Sensitivity   | 2.2 mV/W   | 1.8 mV/W   | 2 mV/W   |
| Min. Power  | 10 mW  | 10 mW  | 10 mW  |
| Power Resolution  | 100 $\mu$ W  | 100 $\mu$ W  | 100 $\mu$ W  |
| Noise Equivalent Power (NEP)  | 500 $\mu$ W  | 500 $\mu$ W  | 500 $\mu$ W  |
| Response Time (0-90%)   | 1 sec (a)  | 1 sec (a)  | 1 sec (a)  |
| Power Calibration Uncertainty   | $\pm 3\%$  | $\pm 3\%$  | $\pm 3\%$  |
| Power Linearity (1)   | $\pm 1\%$  | $\pm 1\%$  | $\pm 1\%$  |
| <b>Absorber Specs</b>   |  |  |  |
| Aperture  | 12 mm  | 12 mm  | 12 mm  |
| Type  | BBF  | HPB  | BBF  |
| Absorber Spectral Range   | 0.19 - 25 $\mu$ m  | 0.19 - 11 $\mu$ m  | 0.19 - 25 $\mu$ m  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m   | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             |
| Max Power Density (2)   | 200 W/cm <sup>2</sup>  | 18 kW/cm <sup>2</sup> @10 W  | 200 W/cm <sup>2</sup>  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3  | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 |
| <b>General Characteristics</b>  |  |  |  |
| Cooling   | Conduction (b)   | Conduction (b)   | Conduction (b)   |
| 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 length - connector  | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)  | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)  | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)  |
| <b>Notes</b>  |  |  |  |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |  | (a). Accelerated by Laser Point electronics<br>(b). Conduction, through heat sink.<br>(c). Available, on request, with DB15 connector. |  |



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

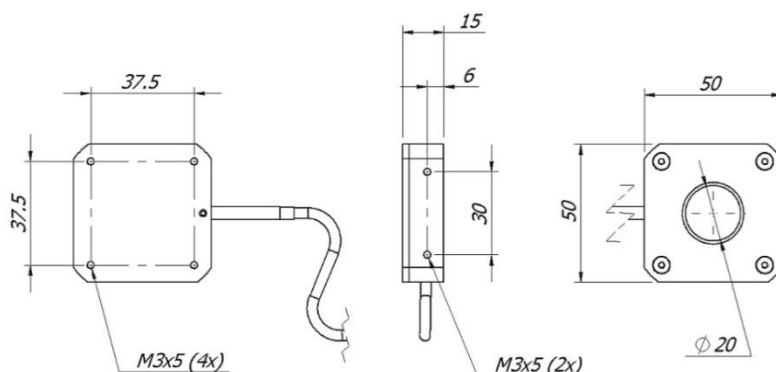
CSA-5-D12-BBF

## OEM Thermal Sensors

Range: 20 mW to 20 W



| Ordering Code   | CSA-20-D20-BBF   | CSA-20-D20-HPB   |
|---|--|--|
| <b>Power Mode</b>   |  |  |
| Max. Average Power  | 20 W   | 20 W   |
| Nominal Sensitivity   | 1.8 mV/W   | 1.6 mV/W   |
| Min. Power  | 20 mW  | 20 mW  |
| Power Resolution  | 100 $\mu$ W  | 100 $\mu$ W  |
| Noise Equivalent Power (NEP)  | 600 $\mu$ W  | 600 $\mu$ W  |
| Response Time (0-90%)   | 1.5 sec (a)  | 1.5 sec (a)  |
| Power Calibration Uncertainty   | $\pm 3\%$  | $\pm 3\%$  |
| Power Linearity (1)   | $\pm 1.5\%$  | $\pm 1.5\%$  |
| <b>Absorber Specs</b>   |  |  |
| Aperture  | 20 mm  | 20 mm  |
| Type  | BBF  | HPB  |
| Absorber Spectral Range   | 0.19 - 25 $\mu$ m  | 0.19 - 11 $\mu$ m  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m   |
| Max Power Density (2)   | 200 W/cm <sup>2</sup>  | 14 kW/cm <sup>2</sup> @10 W  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3  |
| <b>General Characteristics</b>  |  |  |
| Cooling   | Conduction (b)   | Conduction (b)   |
| Weight  | 0.15 kg  | 0.15 kg  |
| Dimension   | 50 x 50 x 15 mm  | 50 x 50 x 15 mm  |
| Cable length - connector  | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)  | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)  |
| <b>Notes</b>  |  |  |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |  | (a). Accelerated by Laser Point electronics<br>(b). Conduction, through heat sink.<br>(c). Available, on request, with DB15 connector. |



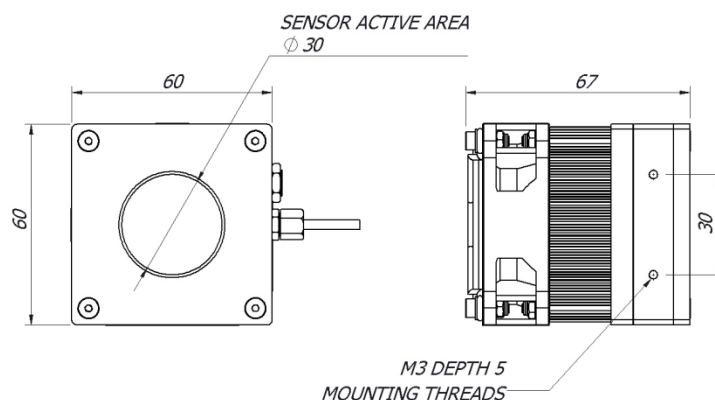
CSA-20-D20-BBF CSA-20-D20-HPB

## OEM Thermal Sensors

Range: 50 mW to 50 W



| Ordering Code   | CSA-50-D30-HPB  |
|---|---|
| <b>Power Mode</b>   |   |
| Max. Average Power  | 50 W  |
| Nominal Sensitivity   | 1 mV/W  |
| Min. Power  | 50 mW   |
| Power Resolution  | 1 mW (a)  |
| Noise Equivalent Power (NEP)  | 1 mW (a)  |
| Response Time (0-90%)   | 2 sec (b)   |
| Power Calibration Uncertainty   | ± 3%  |
| Power Linearity (1)   | ± 1.5%  |
| <b>Absorber Specs</b>   |   |
| Aperture  | 30 mm   |
| Type  | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (2)   | 4 kW/cm <sup>2</sup> @50 W  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>  |   |
| Cooling   | Forced Air with Fan (c)   |
| Weight  | 0.3 kg  |
| Dimension   | 60 x 60 x 67 mm   |
| Cable length - connector  | 1.5 m - Bare wire (d)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) |
| <b>Notes</b>  |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details.                                 |   |
| (a). Using Laserpoint Plus 2 electronics<br>(b). Accelerated with Laserpoint electronics<br>(c). 12V DC Fan. Power supply not included.<br>(d). Available, on request, with DB15 connector. |   |



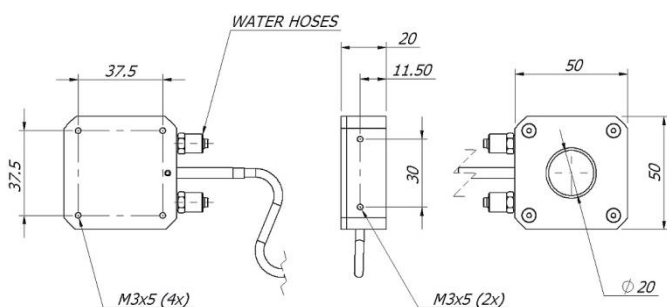
CSA-50-D30-HPB

## OEM Thermal Sensors

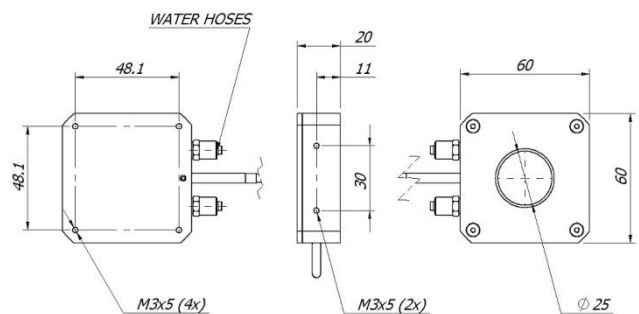
Range: 50 mW to 50 W



| Ordering Code   | CSW-50-D20-HPB  | CSW-50-D25-HPB   |
|---|---|--|
| <b>Power Mode</b>   |   |  |
| Max. Average Power  | 50 W  | 50 W   |
| Nominal Sensitivity   | 0.9 mV/W  | 1 mV/W   |
| Min. Power  | 50 mW   | 50 mW  |
| Power Resolution  | 1 mW  | 1 mW   |
| Noise Equivalent Power (NEP)  | 2 mW  | 2 mW   |
| Response Time (0-90%)   | 2 sec (a)   | 2 sec (a)  |
| Power Calibration Uncertainty   | ± 3%  | ± 3%   |
| Power Linearity (1)   | ± 1.5%  | ± 1.5%   |
| <b>Absorber Specs</b>   |   |  |
| Aperture  | 20 mm   | 25 mm  |
| Type  | HPB   | HPB  |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m   |
| Max Power Density (2)   | 11 kW/cm <sup>2</sup> @40 W   | 11 kW/cm <sup>2</sup> @40 W  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3  |
| <b>General Characteristics</b>  |   |  |
| Cooling   | Water (b)   | Water (b)  |
| Weight  | 0.25 kg   | 0.25 kg  |
| Dimension   | 50 x 50 x 20 mm   | 60 x 60 x 20 mm  |
| Cable length - connector  | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)  |
| <b>Notes</b>  |   |  |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |   | (a). Accelerated by Laser Point electronics<br>(b). Water 0.5 liter/min (@ 22°C)<br>(c). Available, on request, with DB15 connector. |



CSW-50-D20-HPB



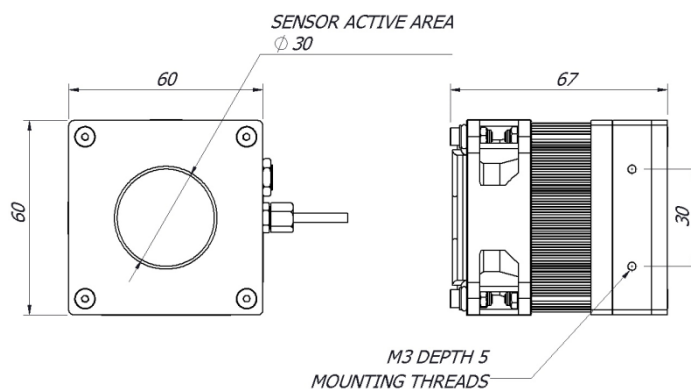
CSW-50-D25-HPB

## OEM Thermal Sensors

Range: 200 mW to 100 W



| Ordering Code  | CSA-100-D30-HPB   |
|--|---|
| Power Mode   |   |
| Max. Average Power   | 100 W   |
| Nominal Sensitivity  | 0.2 mV/W  |
| Min. Power   | 200 mW  |
| Power Resolution   | 10 mW (a)   |
| Noise Equivalent Power (NEP)   | 10 mW (a)   |
| Response Time (0-90%)  | 3 sec (b)   |
| Power Calibration Uncertainty  | ± 3%  |
| Power Linearity (1)  | ± 1.5%  |
| Absorber Specs   |   |
| Aperture   | Ø 30 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 (2)  | 4 kW/cm <sup>2</sup> @100 W   |
| Max Energy Density J/cm <sup>2</sup> (2)   | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3       |
| General Characteristics  |   |
| Cooling  | Forced Air with Fan (c)   |
| Weight   | 0.3 kg  |
| Dimension  | 60 x 60 x 67 mm   |
| Cable length - connector   | 1.5 m - Bare wire (d)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option) |
| Notes  |   |
| <p>(1). Detector centrally irradiated @50% of useful surface.<br/> (2). Damage thresholds also depend on power level.<br/> Please see damage graphs for more details.</p> <p>(a). Using Laserpoint Plus 2 electronics<br/> (b). Accelerated with Laserpoint electronics<br/> (c). 12V DC Fan. Power supply not included.<br/> (d). Available, on request, with DB15 connector.</p> |   |

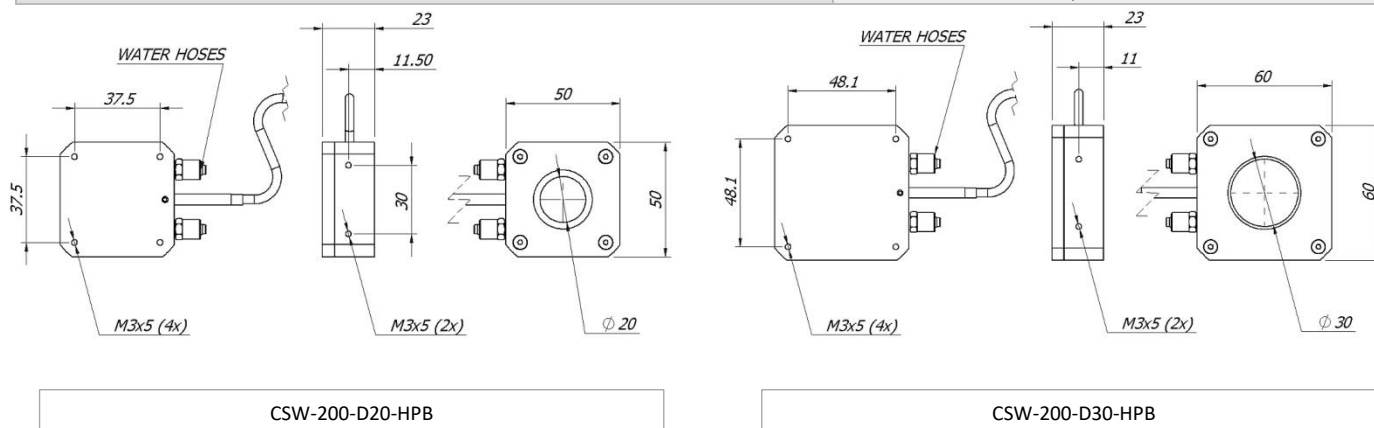


CSA-100-D30-HPB

# OEM Thermal Sensors

Range: 200 mW to 200 W

| Ordering Code   | CSW-200-D20-HPB  | CSW-200-D30-HPB  |
|---|--|--|
| <b>Power Mode</b>   |  |  |
| Max. Average Power  | 200 W  | 200 W  |
| Nominal Sensitivity   | 0.22 mV/W  | 0.22 mV/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 (0-90%)   | 3 sec (a)  | 2.5 sec (a)  |
| Power Calibration Uncertainty   | ± 3%   | ± 3%   |
| Power Linearity (1)   | ± 1.5%   | ± 1.5%   |
| <b>Absorber Specs</b>   |  |  |
| Aperture  | 20 mm  | 30 mm  |
| Type  | HPB  | HPB  |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m  | 0.19 - 11 $\mu$ m  |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m   | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m   |
| Max Power Density (2)   | 7 kW/cm <sup>2</sup> @200 W  | 7 kW/cm <sup>2</sup> @200 W  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36 J <sup>2</sup><br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3  |
| <b>General Characteristics</b>  |  |  |
| Cooling   | Water (b)  | Water (b)  |
| Weight  | 0.25 kg  | 0.25 kg  |
| Dimension   | 50 x 50 x 23 mm  | 60 x 60 x 23 mm  |
| Cable length - connector  | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)                | 1.5 m - Bare wire (c)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)  |
| <b>Notes</b>  |  |  |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |  | (a). Accelerated by Laser Point electronics<br>(b). Conduction, through heat sink.<br>(c). Available, on request, with DB15 connector. |



- **OEM Power Probes**

OEM Power Probes can be provided with DB15 connectivity or with USB and RS-232 connector.

- Lowest cost solution for monitoring of laser power
- No Water Cooling up to 6KW
- Complete laser power measurement in 4-6sec

## HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 and PC-Link Meters;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

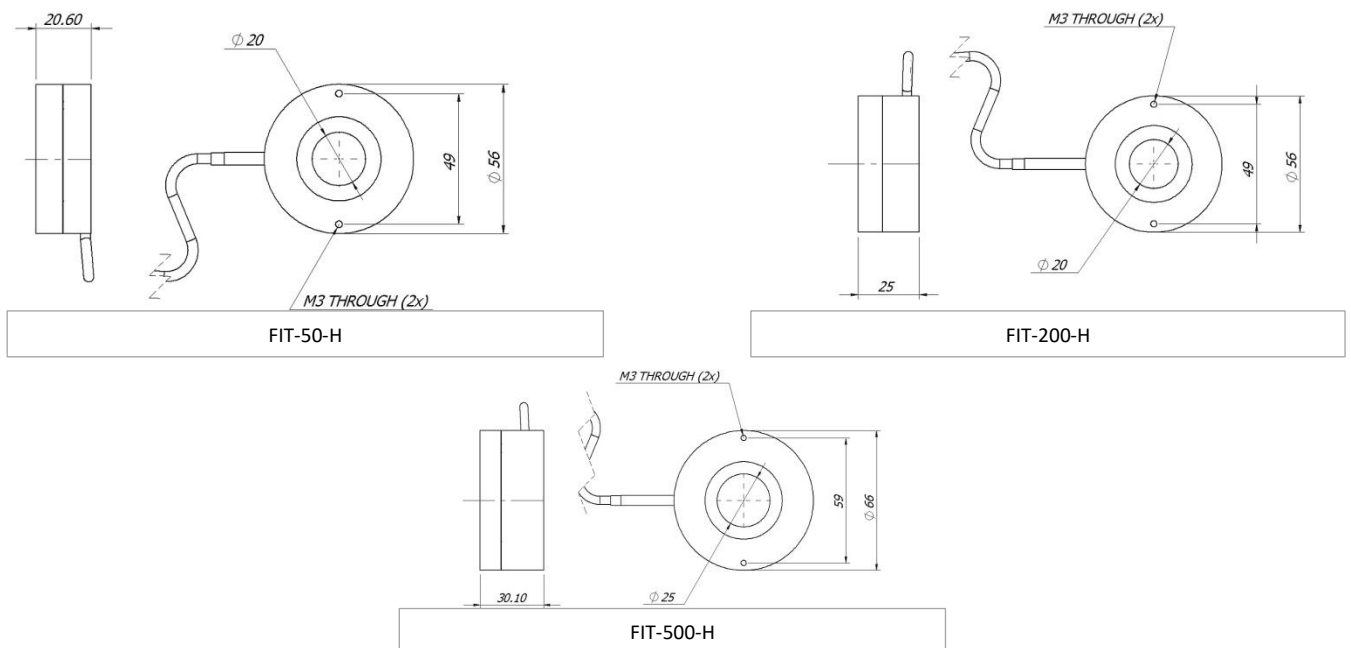
Add connectivity option "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

| Ordering code | Power Range    | Useful Aperture | Spectral Range    | Cooling    | Connectivity | External Size (mm) |
|---------------|----------------|-----------------|-------------------|------------|--------------|--------------------|
| Fit-50-H      | 0.1 W - 50 W   | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | DB15         | Ø 56 x 21          |
| Fit-200-H     | 0.5 W - 200 W  | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | DB15         | Ø 56 x 25          |
| Fit-500-H     | 1 W - 500 W    | 25 mm           | 0.19 - 11 $\mu$ m | Conduction | DB15         | Ø 66 x 30          |
| Fit-3000-H    | 60 W - 3000 W  | 40 mm           | 0.19 - 11 $\mu$ m | Conduction | DB15         | Ø 92 x 65          |
| Fit-6000-H    | 150 W - 6000 W | 60 mm           | 0.19 - 11 $\mu$ m | Conduction | DB15         | Ø 100 x 100        |
| Fit-IPL-R-H   |                |                 |                   |            |              |                    |

# OEM Power Probe

Range: 100 mW to 500 W

| Ordering Code   | FIT-50-H  | FIT-200-H   | FIT-500-H   |
|---|---|---|---|
| <b>Power Mode</b>   |   |   |   |
| 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 (0-90%)   | 5 sec   | 5 sec   | 5 sec   |
| Power Calibration Uncertainty   | ± 3%  | ± 3%  | ± 3%  |
| Power Linearity (1)   | ± 1%  | ± 1%  | ± 1%  |
| <b>Absorber Specs</b>   |   |   |   |
| Aperture  | 20 mm   | 20 mm   | 25 mm   |
| Type  | HPB   | HPB   | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (2)   | 9 kW/cm <sup>2</sup> @40 W  | 6 kW/cm <sup>2</sup> @200 W   | 4 kW/cm <sup>2</sup> @500 W   |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>General Characteristics</b>  |   | <b>General Characteristics</b>  | <b>General Characteristics</b>  |
| 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 length - connector  | 1.5 m - DB15)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)         | 1.5 m - DB15)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)         | 1.5 m - DB15)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)         |
| <b>Notes</b>  |   |   |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |   | (a). Conduction, through heat sink  |   |

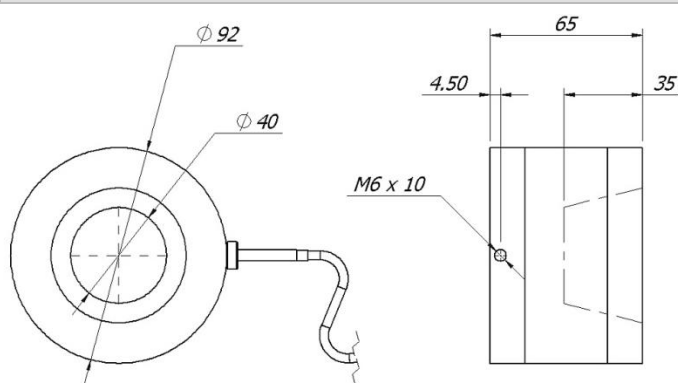




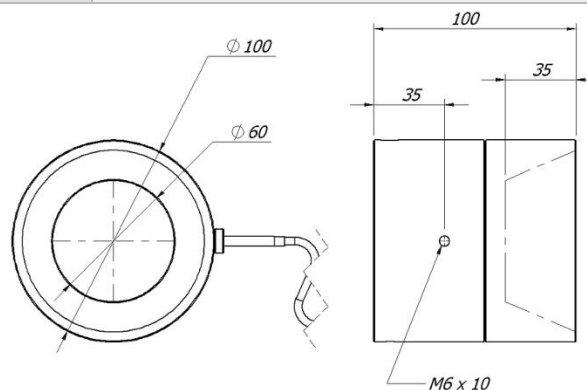
# OEM Power Probe

Range: 60 W to 6k W

| Ordering Code  | FIT-3000-H  | FIT-6000-H   |
|--|---|--|
| <b>Power Mode</b>  |   |  |
| 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 (0-90%)  | 6 sec   | 6 sec  |
| Power Calibration Uncertainty  | ± 5%  | ± 5%   |
| Power Linearity (1)  | ± 1.5%  | ± 1.5%   |
| <b>Absorber Specs</b>  |   |  |
| Aperture   | 40 mm   | 60 mm  |
| Type   | HPB   | SHC  |
| Absorber Spectral Range  | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m  |
| Calibration Spectral Range   | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.25 - 11 $\mu$ m, 9 - 11 $\mu$ m  |
| Max Power Density (2)  | 3 kW/cm <sup>2</sup> @2kW   | 4 kW/cm <sup>2</sup> @5kW  |
| Max Energy Density J/cm <sup>2</sup> (2)   | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 115<br>10 $\mu$ s pulse width: 4<br>10ns pulse width: 1 |
| <b>General Characteristics</b>   |   |  |
| Cooling  | Conduction (a)  | Conduction (a)   |
| Weight   | 1.1 kg  | 2.5 kg   |
| Dimension  | Ø 92 x 65 mm  | Ø 100 x 100 mm   |
| Cable length - connector   | 1.5 m - DB15)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)         | 1.5 m - DB15)<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)      |
| <b>Notes</b>   |   |  |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details |   | (a). Conduction, through heat sink                                       |



FIT-3000-H



FIT-6000-H

# OEM Power Probe

Range: 60 W to 6k W

| Ordering Code   | FIT-IPL-R-H  |
|---|--|
| <b>Power Mode</b>   |  |
| Max. Average Power  | 100 W  |
| Min. Power  | 2 W  |
| Power Resolution  | 100 mW   |
| Noise Equivalent Power (NEP)  | 50 mW  |
| Power Calibration Uncertainty   | ± 3%   |
| Power Linearity (1)   | ± 1%   |
| <b>Single Shot Energy Mode</b>  |  |
| Max. Energy (with 100 ms pulse)   | 350 J  |
| Min. Measurable Energy  | 2 J  |
| Energy Resolution   | 100 mJ   |
| Wait time between 2 measures  | 20 sec   |
| Energy Calibration Uncertainty  | ± 5%   |
| <b>Absorber Specs</b>   |  |
| Aperture  | 20 x 60 mm (a)   |
| Type  | IPL-R  |
| Absorber Spectral Range   | 0.4 - 2.1 $\mu\text{m}$  |
| Calibration Spectral Range  | 0.45 - 1.1 $\mu\text{m}$   |
| Max Power Density (2)   | 10 kW/cm <sup>2</sup> @40 W  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 10ms pulse width: 30<br>1ms pulse width: 6<br>100 $\mu\text{s}$ pulse width: 2 |
| <b>Absorber Specs</b>   |  |
| Cooling   | Conduction (b)   |
| Weight  | 0.2 kg   |
| Dimension   | 60 x 100 x 26 mm   |
| Cable length - connector  | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)             |
| <b>Notes</b>  |  |
| <p>(1). Detector centrally irradiated @50% of useful surface.<br/> (2). Damage thresholds also depend on power level. Please see damage graphs for more details.</p>                                      |  |
| <p>(a). Option: plate with 1 cm<sup>2</sup> bore for fluence (J/cm<sup>2</sup>) measurement. Available sizes 10 x 10 mm<sup>2</sup> and 20 x 5 mm<sup>2</sup>.<br/> (b) Conduction, through heat sink</p> |  |

FIT-IPL-R-H

- **OEM Amplified Thermal Sensors**

- OEM Thermal Heads embedding sensor disks and analog electronics
- Out Voltage: 5V @ full scale
- Electronics for Amplification and signals acceleration
- Compact size
- Available with air and water cooling
- Broadband operation from UV to Far Infrared
- Sensors Disks with High Resistant Coatings to endure high power densities
- High degree of linearity over the sensor's entire working range
- Single shot energy measurement capability with suitable electronics.
- Standard supplied with 4x 150 mm leads

### HOW TO ORDER:

Select Ordering Code without any option for bare wires head connectivity;  
No other connectivity option is available.

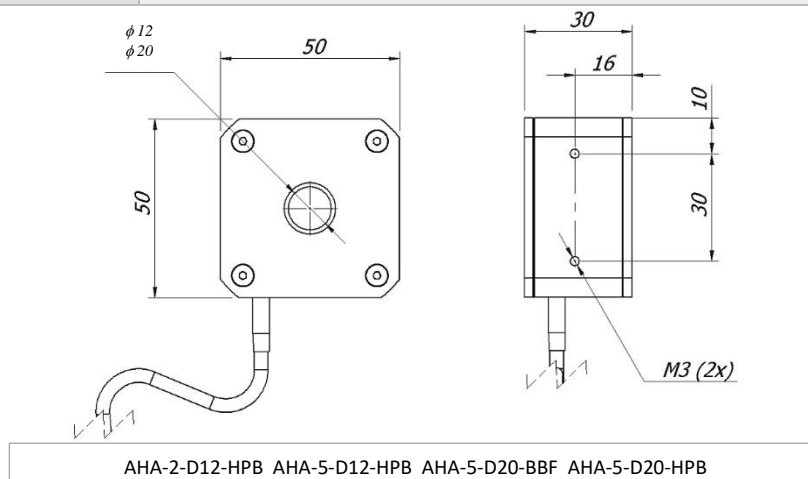
| Ordering code   | Power Range    | Useful Aperture | Spectral Range    | Cooling    | Connectivity | External Size (mm) |
|-----------------|----------------|-----------------|-------------------|------------|--------------|--------------------|
| AHA-2-D12-HPB   | 8 mW - 2 W     | 12 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHA-5-D12-HPB   | 20 mW - 5 W    | 12 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHA-5-D20-BBF   | 20 mW - 5 W    | 20 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHA-5-D20-HPB   | 20 mW - 5 W    | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHA-10-D20-BBF  | 40 mW - 10 W   | 20 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHA-10-D20-HPB  | 40 mW - 10 W   | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHA-20-D20-BBF  | 80 mW - 20 W   | 20 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHA-20-D20-HPB  | 80 mW - 20 W   | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHW-20-D20-BBF  | 80 mW - 20 W   | 20 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHW-20-D20-HPB  | 80 mW - 20 W   | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHW-20-D25-BBF  | 80 mW - 20 W   | 25 mm           | 0.19 - 25 $\mu$ m | Conduction | Bare wire    | 60 x 60 x 30       |
| AHW-20-D25-HPB  | 80 mW - 20 W   | 25 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 60 x 60 x 30       |
| AHW-50-D20-HPB  | 200 mW - 50 W  | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHW-50-D25-HPB  | 200 mW - 50 W  | 25 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 60 x 60 x 30       |
| AHW-100-D20-HPB | 400 mW - 100 W | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHW-100-D30-HPB | 400 mW - 100 W | 30 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 60 x 60 x 33       |
| AHW-150-D30-HPB | 600 mW - 150 W | 30 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 60 x 60 x 33       |
| AHW-200-D20-HPB | 800 mW - 200 W | 20 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 50 x 50 x 30       |
| AHW-200-D30-HPB | 800 mW - 200 W | 30 mm           | 0.19 - 11 $\mu$ m | Conduction | Bare wire    | 60 x 60 x 33       |

# OEM Amplified Thermal Sensors

Range: 8 mW to 5 W



| Ordering Code   | AHA-2-D12-HPB   | AHA-5-D12-HPB   | AHA-5-D20-BBF  | AHA-5-D20-HPB   |
|---|---|---|--|---|
| <b>Power Mode</b>   |   |   |  |   |
| 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 (0-90%)   | < 1 sec   | < 1 sec   | < 1 sec  | < 1 sec   |
| Power Linearity (1)   | ± 1%  | ± 1%  | ± 1%   | ± 1%  |
| <b>Absorber Specs</b>   |   |   |  |   |
| Aperture  | 12 mm   | 12 mm   | 20 mm  | 20 mm   |
| Type  | HPB   | HPB   | BBF  | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m   | 0.19 - 25 $\mu$ m  | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                             | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (2)   | 14 kW/cm <sup>2</sup> @10 W   | 14 kW/cm <sup>2</sup> @10 W   | 200 W/cm <sup>2</sup>  | 14 kW/cm <sup>2</sup> @10 W   |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 3.6<br>10 $\mu$ s pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>Amplifier Specs</b>  |   |   |  |   |
| Amplifier Input Voltage   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                               | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                               | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                                | ±7 to ±12 VDC,<br>or<br>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   |
| <b>General Characteristics</b>  |   |   |  |   |
| 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   | 50 x 50 x 30 mm   | 50 x 50 x 30 mm  | 50 x 50 x 30 mm   |
| Cable length - connector  | 1.5 m - Bare wire   | 1.5 m - Bare wire   | 1.5 m - Bare wire  | 1.5 m - Bare wire   |
| <b>Notes</b>  |   |   |  |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. | (a). Conduction, through heat sink  |   |  |   |

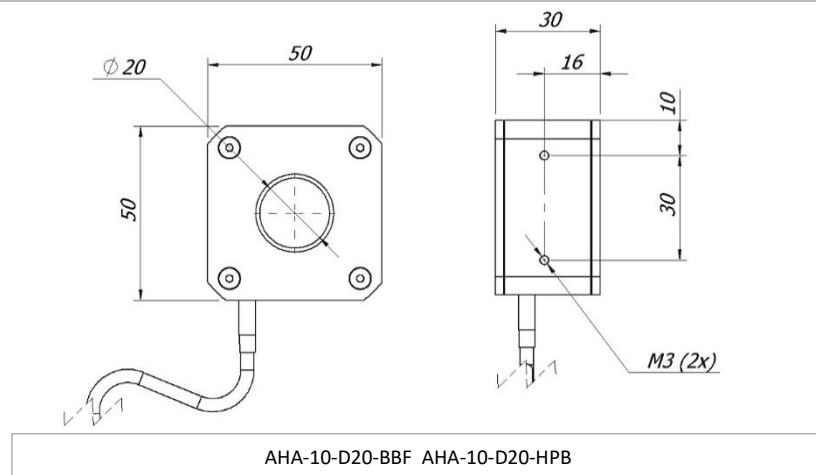


# OEM Amplified Thermal Sensors

Range: 40 mW to 10 W



| Ordering Code  | AHA-10-D20-BBF   | AHA-10-D20-HPB  |
|--|--|---|
| <b>Power Mode</b>  |  |   |
| Max. Average Power   | 10 W   | 10 W  |
| Min. Power   | 40 mW  | 40 mW   |
| Power Resolution   | 2 mW   | 2 mW  |
| Response time (0-90%)  | < 1 sec  | < 1 sec   |
| Power Linearity (1)  | ± 1%   | ± 1%  |
| <b>Absorber Specs</b>  |  |   |
| Aperture   | 20 mm  | 20 mm   |
| Type   | BBF  | HPB   |
| Absorber Spectral Range  | 0.19 - 25 $\mu\text{m}$  | 0.19 - 11 $\mu\text{m}$   |
| Calibration Spectral Range   | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$               | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ , 9 - 11 $\mu\text{m}$              |
| Max Power Density (2)  | 200 W/cm <sup>2</sup>  | 14 kW/cm <sup>2</sup> @10 W   |
| Max Energy Density J/cm <sup>2</sup> (2)   | 5ms pulse width: 3.6<br>10 $\mu\text{s}$ pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>Amplifier Specs</b>   |  |   |
| Amplifier Input Voltage  | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                                      | ±7 to ±12 VDC,<br>or<br>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  |
| <b>General Characteristics</b>   |  |   |
| Cooling  | Conduction (a)   | Conduction (a)  |
| Weight   | 0.2 kg   | 0.2 kg  |
| Dimension  | 50 x 50 x 30 mm  | 50 x 50 x 30 mm   |
| Cable length - connector   | 1.5 m - Bare wire  | 1.5 m - Flying leads  |
| <div> <div> (1). Detector centrally irradiated<br/>@50% of useful surface.<br/>(2). Damage thresholds also depend<br/>on power level. Please see damage<br/>graphs for more details. </div> <div> (a). Conduction, through heat sink </div> </div> |  |   |

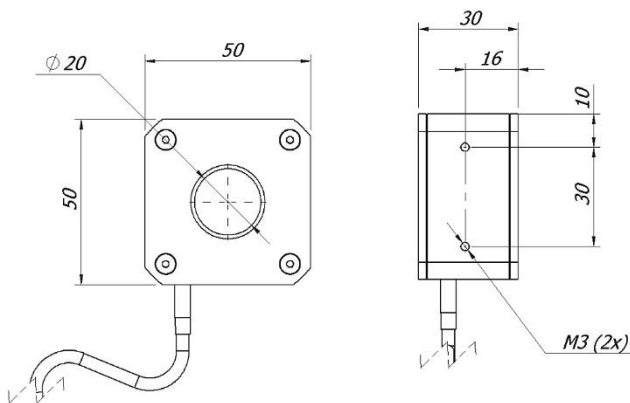


# OEM Amplified Thermal Sensors

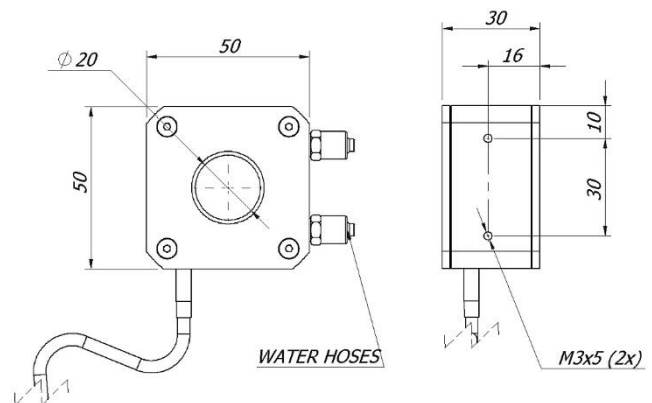
Range: 80 mW to 20 W



| Ordering Code   | AHA-20-D20-BBF   | AHA-20-D20-HPB  | AHW-20-D20-BBF   | AHW-20-D20-HPB  |
|---|--|---|--|---|
| <b>Power Mode</b>   |  |   |  |   |
| 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 (0-90%)   | < 1 sec  | < 1 sec   | < 1 sec  | < 1 sec   |
| Power Linearity (1)   | ± 1%   | ± 1%  | ± 1%   | ± 1%  |
| <b>Absorber Specs</b>   |  |   |  |   |
| 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/cm <sup>2</sup>  | 14 kW/cm <sup>2</sup> @10 W   | 200 W/cm <sup>2</sup>  | 14 kW/cm <sup>2</sup> @10 W   |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 3.6<br>10µs pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 3.6<br>10µs pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10µs pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>Amplifier Specs</b>  |  |   |  |   |
| Amplifier Input Voltage   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                          | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                         | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                          | ±7 to ±12 VDC,<br>or<br>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  |
| <b>General Characteristics</b>  |  |   |  |   |
| 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  | 50 x 50 x 30 mm   | 50 x 50 x 30 mm  | 50 x 50 x 30 mm   |
| Cable length - connector  | 1.5 m - Bare wire  | 1.5 m - Bare wire   | 1.5 m - Bare wire  | 1.5 m - Bare wire   |
| <b>Notes</b>  |  |   |  |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. | (a). Conduction, through heat sink                                     |   | (a). Water 0.5 liter/min (@ 22°C)                                      |   |



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



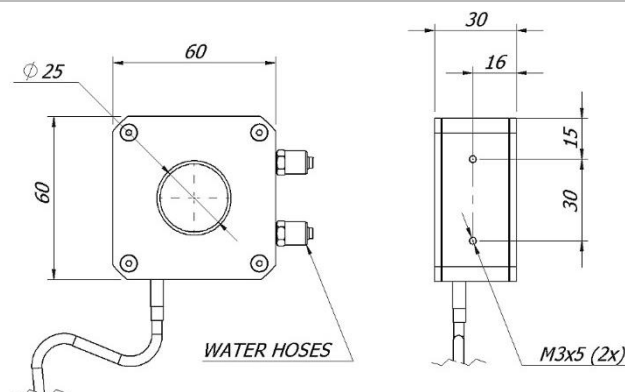
AHW-20-D20-BBF AHW-20-D20-HPB

# OEM Amplified Thermal Sensors

Range: 80 mW to 20 W



| Ordering Code   | AHW-20-D25-BBF   | AHW-20-D25-HPB  |
|---|--|---|
| <b>Power Mode</b>   |  |   |
| Max. Average Power  | 20 W   | 20 W  |
| Min. Power  | 80 mW  | 80 mW   |
| Power Resolution  | 4 mW   | 4 mW  |
| Response time (0-90%)   | 1.5 sec  | 1.5 sec   |
| Power Linearity (1)   | ± 1%   | ± 1%  |
| <b>Absorber Specs</b>   |  |   |
| Aperture  | 25 mm  | 25 mm   |
| Type  | BBF  | HPB   |
| Absorber Spectral Range   | 0.19 - 25 $\mu\text{m}$  | 0.19 - 11 $\mu\text{m}$   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ ,<br>9 - 11 $\mu\text{m}$            | 0.19 - 2.1 $\mu\text{m}$ , 2.94 $\mu\text{m}$ ,<br>9 - 11 $\mu\text{m}$           |
| Max Power Density (2)   | 200 W/cm <sup>2</sup>  | 14 kW/cm <sup>2</sup> @10 W   |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 3.6<br>10 $\mu\text{s}$ pulse width: 0.2<br>10ns pulse width: 0.1 | 5ms pulse width: 36<br>10 $\mu\text{s}$ pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>Amplifier Specs</b>  |  |   |
| Amplifier Input Voltage   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                                      | ±7 to ±12 VDC,<br>or<br>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  |
| <b>General Characteristics</b>  |  |   |
| Cooling   | Water (a)  | Water (a)   |
| Weight  | 0.2 kg   | 0.2 kg  |
| Dimension   | 60 x 60 x 30 mm  | 60 x 60 x 30 mm   |
| Cable length - connector  | 1.5 m - Bare wire  | 1.5 m - Bare wire   |
| <b>Notes</b>  |  |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |  |   |
| (a). Water 0.5 liter/min (@ 22°C)   |  |   |



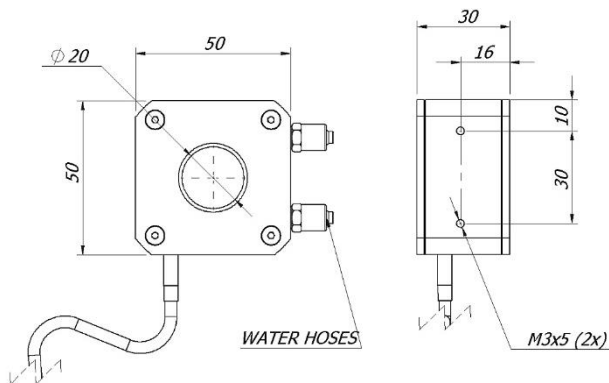
AHW-20-D25-BBF AHW-20-D25-HPB

# OEM Amplified Thermal Sensors

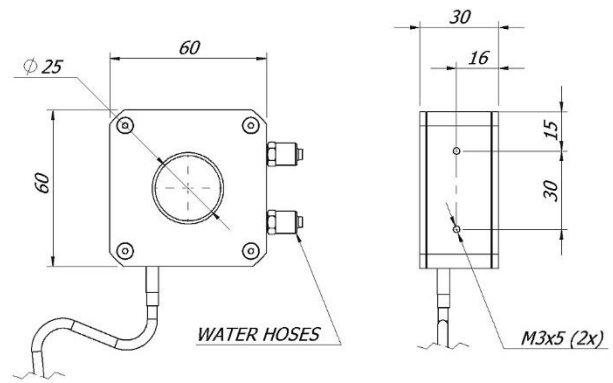
Range: 200 mW to 50 W



| Ordering Code   | AHW-50-D20-HPB  | AHW-50-D25-HPB  |
|---|---|---|
| <b>Power Mode</b>   |   |   |
| Max. Average Power  | 50 W  | 50 W  |
| Min. Power  | 200 mW  | 200 mW  |
| Power Resolution  | 10 mW   | 10 mW   |
| Response time (0-90%)   | 1.5 sec   | 1.5 sec   |
| Power Linearity (1)   | ± 1%  | ± 1%  |
| <b>Absorber Specs</b>   |   |   |
| Aperture  | 20 mm   | 25 mm   |
| Type  | HPB   | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (2)   | 9 kW/cm <sup>2</sup> @40 W  | 9 kW/cm <sup>2</sup> @40 W  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>Amplifier Specs</b>  |   |   |
| Amplifier Input Voltage   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                               | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                               |
| Output Voltage @ Full Scale   | 5 V   | 5 V   |
| Min Detectable Voltage  | 5 mV  | 5 mV  |
| Sensitivity   | 100 mV/W  | 100 mV/W  |
| <b>General Characteristics</b>  |   |   |
| Cooling   | Water (a)   | Water (a)   |
| Weight  | 0.3 kg  | 0.3 kg  |
| Dimension   | 50 x 50 x 30 mm   | 60 x 60 x 30 mm   |
| Cable length - connector  | 1.5 m - Bare wire   | 1.5 m - Bare wire   |
| <b>Notes</b>  |   |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |   | (a). Water 0.5 liter/min (@ 22°C)   |



AHW-50-D20-HPB



AHW-50-D25-HPB

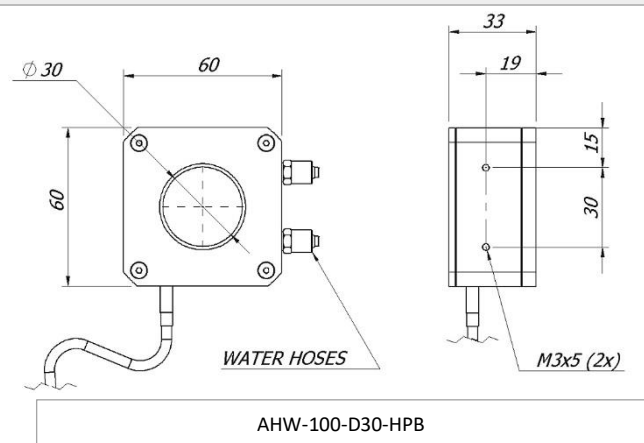
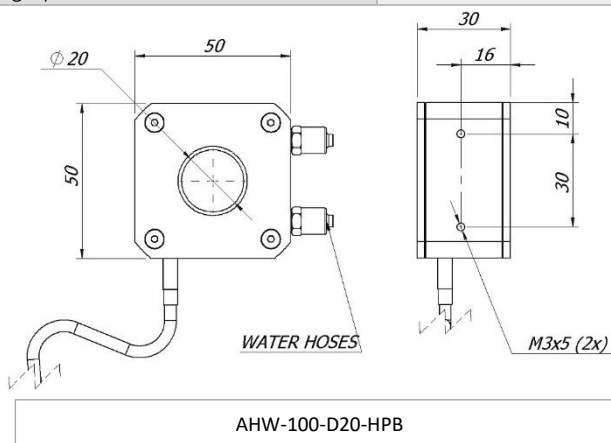


# OEM Amplified Thermal Sensors

Range: 400 mW to 100 W



| Ordering Code   | AHW-100-D20-HPB   | AHW-100-D30-HPB   |
|---|---|---|
| <b>Power Mode</b>   |   |   |
| Max. Average Power  | 100 W   | 100 W   |
| Min. Power  | 400 mW  | 400 mW  |
| Power Resolution  | 20 mW   | 20 mW   |
| Response time (0-90%)   | 2.5 sec   | 2.5 sec   |
| Power Linearity (1)   | ± 1%  | ± 1%  |
| <b>Absorber Specs</b>   |   |   |
| Aperture  | 20 mm   | 30 mm   |
| Type  | HPB   | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (2)   | 9 kW/cm <sup>2</sup> @40 W  | 9 kW/cm <sup>2</sup> @40 W  |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>Amplifier Specs</b>  |   |   |
| Amplifier Input Voltage   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                               | ±7 to ±12 VDC,<br>or<br>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   |
| <b>General Characteristics</b>  |   |   |
| Cooling   | Water (a)   | Water (a)   |
| Weight  | 0.3 kg  | 0.3 kg  |
| Dimension   | 50 x 50 x 30 mm   | 60 x 60 x 33 mm   |
| Cable length - connector  | 1.5 m - Bare wire   | 1.5 m - Bare wire   |
| <b>Notes</b>  |   |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |   |   |
| (a). Water 1.5 liter/min (@ 22°C)   |   |   |

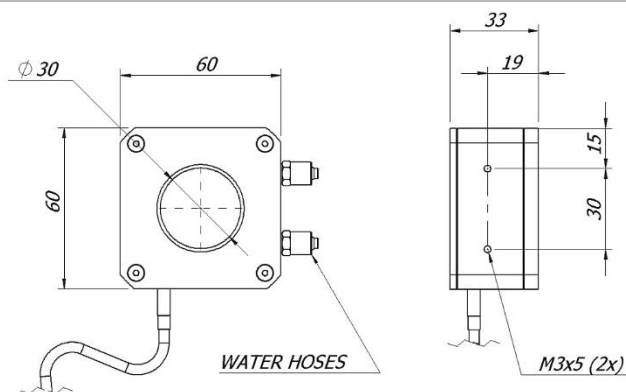


# OEM Amplified Thermal Sensors

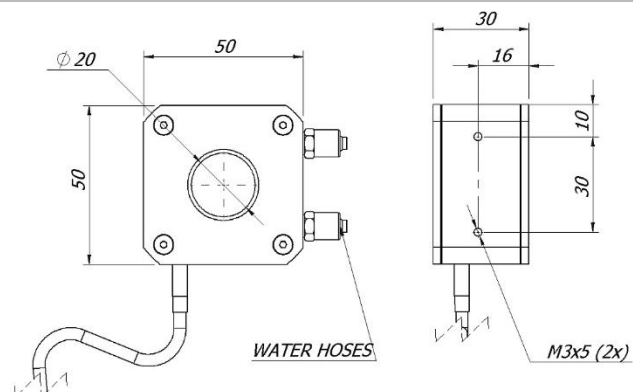
Range: 600 mW to 200 W



| Ordering Code   | AHW-150-D30-HPB   | AHW-200-D20-HPB   | AHW-200-D30-HPB   |
|---|---|---|---|
| <b>Power Mode</b>   |   |   |   |
| 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 (0-90%)   | 2.5 sec   | 2.5 sec   | 2.5 sec   |
| Power Linearity (1)   | ± 1%  | ± 1%  | ± 1%  |
| <b>Absorber Specs</b>   |   |   |   |
| Aperture  | 30 mm   | 20 mm   | 30 mm   |
| Type  | HPB   | HPB   | HPB   |
| Absorber Spectral Range   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m   | 0.19 - 11 $\mu$ m   |
| Calibration Spectral Range  | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            | 0.19 - 2.1 $\mu$ m, 2.94 $\mu$ m, 9 - 11 $\mu$ m                            |
| Max Power Density (2)   | 9 kW/cm <sup>2</sup> @40 W  | 6 kW/cm <sup>2</sup> @200 W   | 6 kW/cm <sup>2</sup> @200 W   |
| Max Energy Density J/cm <sup>2</sup> (2)  | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 | 5ms pulse width: 36<br>10 $\mu$ s pulse width: 1.2<br>10ns pulse width: 0.3 |
| <b>Amplifier Specs</b>  |   |   |   |
| Amplifier Input Voltage   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                               | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating                               | ±7 to ±12 VDC,<br>or<br>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   |
| <b>General Characteristics</b>  |   |   |   |
| Cooling   | Water (a)   | Water (a)   | Water (a)   |
| Weight  | 0.3 kg  | 0.3 kg  | 0.3 kg  |
| Dimension   | 60 x 60 x 33 mm   | 50 x 50 x 30 mm   | 60 x 60 x 33 mm   |
| Cable length - connector  | 1.5 m – Bare wire   | 1.5 m – Bare wire   | 1.5 m – Bare wire   |
| <b>Notes</b>  |   |   |   |
| (1). Detector centrally irradiated @50% of useful surface.<br>(2). Damage thresholds also depend on power level. Please see damage graphs for more details. |   | (a). Water 1.5 liter/min (@ 22°C)   |   |



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



AHW-200-D20-HPB

## Fast Response OEM Amplified Series

- OEM Thermal Heads
- Fast Response Time (typ. 70 ms)
- Out Voltage: 5V @ full scale
- Electronics for Amplification and signals acceleration
- Compact size
- Water cooled
- Broadband operation from UV to Far Infrared

### HOW TO ORDER:

Select Ordering Code without any option for bare wires head connectivity;  
No other connectivity option is available.

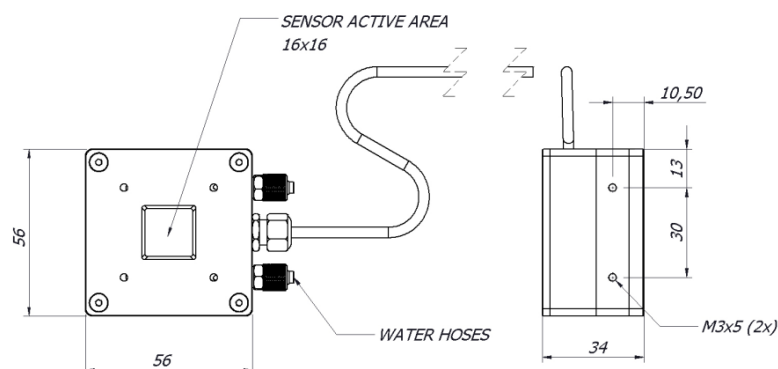
| Ordering code  | Power Range  | Useful Aperture | Spectral Range   | Cooling | Connectivity |
|----------------|--------------|-----------------|------------------|---------|--------------|
| BAL-W-20W-16-K | 25 mW - 20 W | 16 x 16 mm      | 0.2 - 25 $\mu$ m | Water   | Bare wire    |
| BAL-W-50W-16-K | 50 mW - 50 W | 16 x 16 mm      | 0.2 - 25 $\mu$ m | Water   | Bare wire    |

# OEM Amplified High Speed Thermal Sensors

Range: 25 mW to 50 W



| Ordering Code  | BAL-W-20W-16-K  | BAL-W-50W-16-K                                |
|--|---|---|
| <b>Power Mode</b>  |   |   |
| Max. Average Power   | 20 W  | 50 W  |
| Min. Power   | 25 mW   | 50 mW   |
| Response time (0-90%)  | Typ. 70 ms (min. 50 ms, max. 90 ms)   | Typ. 70 ms (min. 50 ms, max. 90 ms)           |
| Power Calibration Uncertainty  | ± 3%  | ± 3%  |
| Power Linearity  | ± 5%  | ± 5%  |
| <b>Absorber Specs</b>  |   |   |
| Aperture   | 16 mm x 16 mm   | 16 mm x 16 mm                                 |
| Type   | K   | K   |
| Absorber Spectral Range  | 0.2 - 25 $\mu\text{m}$  | 0.2 - 25 $\mu\text{m}$                        |
| Calibration Spectral Range   | 0.25 - 11 $\mu\text{m}$ ; 10.6 $\mu\text{m}$  | 0.25 - 11 $\mu\text{m}$ ; 10.6 $\mu\text{m}$  |
| Max Power Density (1)  | 15 kW/cm <sup>2</sup>   | 15 kW/cm <sup>2</sup>                         |
| Max Energy Density J/cm <sup>2</sup> (2)   | 1 J/cm <sup>2</sup>   | 1 J/cm <sup>2</sup>                           |
| <b>Amplifier Specs</b>   |   |   |
| Amplifier Input Voltage  | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating   | ±7 to ±12 VDC,<br>or<br>14 to 24 VDC floating |
| Output Voltage @ Full Scale  | 5 V   | 5 V   |
| Min Detectable Voltage   | 5 mV  | 5 mV  |
| Sensitivity  | 250 mV/W  | 100 mV/W                                      |
| <b>General Characteristics</b>   |   |   |
| Cooling  | Water (a)   | Water (a)                                     |
| Weight   | 300 g   | 300 g   |
| Dimension  | 56 x 56 x 34 mm   | 56 x 56 x 34 mm                               |
| Cable length - connector   | 1.5 m   | 1.5 m   |
| <b>Notes</b>   |   |   |
| (1). Measured at 1064nm, 10W,<br>Damage thresholds also depend on<br>power level.<br>(2). 10 ns @ 1064nm | (a) Water min. 1 L/min, max. 4 L/min (@ 15 - 30 °C);<br>Admissible rate of water temperature variation < 1 °C/min |   |



BAL-W-20W-16-K BAL-W-50W-16-K

# Photodiode Sensors

Photodiode Sensors convert incident laser photons into carriers (electrons and holes), which are afterwards measured as voltage or current. Being characterized by low noise and high sensitivity, photodiodes are suitable to detect very low light levels, making them ideal for low power measurements of CW lasers. Compared to thermal sensors, photodiodes have a limited spectral range of operation and a low saturation value ( $1\text{mW}/\text{cm}^2$  approximately), so it is often necessary to use attenuating filters when measuring relatively high powers. On the other end, photodiodes are the ideal choice for very low power measurements and when a fast response time is required.

Laser Point's sensors are calibrated with traceability to NIST and PTB standards and are shipped with a Calibration Certificate. Laser Point's series of photodiode can measure powers up to 500mW and can cover a wavelength range that extends from UV to the near IR.

They can be provided with DB15 connectivity or with USB and RS-232 connector.



- **Photodiode Sensors**

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

## HOW TO ORDER:

Select Ordering Code without any option for DB15 head connectivity to Plus2 Meter;

Add connectivity option "U" to the Ordering Code for USB connectivity (PC-PLUG series);

Add option connectivity "R" to the Ordering Code for RS-232 connectivity (PC-PLUG series).

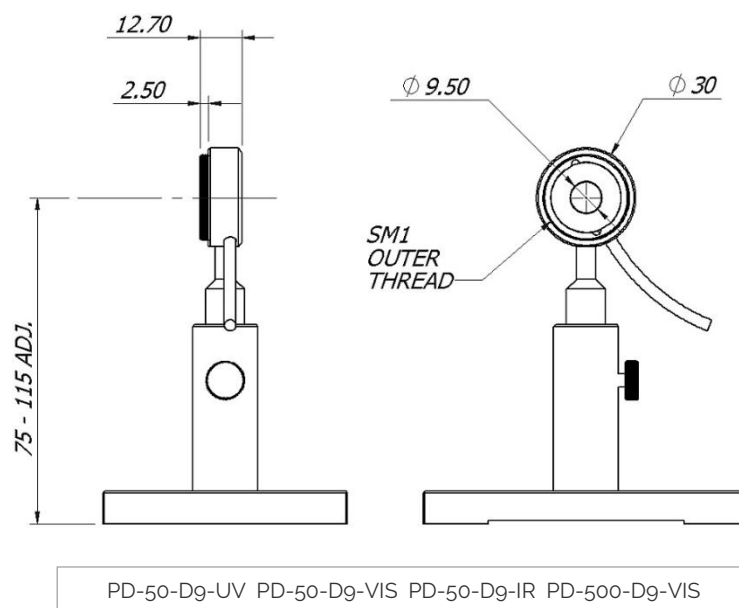
| Ordering code | Detector type | Power Range                | Power Resolution | Useful Aperture | Spectral Range | Cooling    | Connectivity |
|---------------|---------------|----------------------------|------------------|-----------------|----------------|------------|--------------|
| PD-50-D9-UV   | Silicon       | 10 $\mu\text{W}$ - 50 mW   | 100 nW           | 9.5 mm          | 200 - 1100 nm  | Convection | DB15         |
| PD-50-D9-VIS  | Silicon       | 10 $\mu\text{W}$ - 50 mW   | 100 nW           | 9.5 mm          | 400 - 1100 nm  | Convection | DB15         |
| PD-50-D9-IR   | Germanium     | 100 $\mu\text{W}$ - 40 mW  | 1 $\mu\text{W}$  | 9.5 mm          | 800 - 1800 nm  | Convection | DB15         |
| PD-500-D9-VIS | Silicon       | 100 $\mu\text{W}$ - 500 mW | 1 $\mu\text{W}$  | 9.5 mm          | 400 - 1100 nm  | Convection | DB15         |

## Photodiode sensors

Range: 10  $\mu$ W to 500 mW



| Ordering Code                    | PD-50-Dg-UV   | PD-50-Dg-VIS  | PD-50-Dg-IR   | PD-500-Dg-VIS   |
|----------------------------------|---|---|---|---|
| <b>Power Mode</b>                |   |   |   |   |
| Max. Average Power (1)           | 50 mW   | 50 mW   | 40 mW   | 500 mW  |
| Min. Power                       | 10 $\mu$ W  | 10 $\mu$ W  | 100 $\mu$ W   | 100 $\mu$ W   |
| Power Resolution                 | 100 nW  | 100 nW  | 1 $\mu$ W   | 1 $\mu$ W   |
| Noise Equivalent Power (NEP) (1) | 10 nW   | 10 nW   | 100 nW  | 100 nW  |
| Response Time (0-90%)            | 0.25 sec  | 0.25 sec  | 0.25 sec  | 0.25 sec  |
| Power Calibration Uncertainty    | $\pm 5\%$ @200-400nm,<br>$\pm 3\%$ @400-1000nm,<br>$\pm 5\%$ @1000-1100nm | $\pm 5\%$ @400-500nm,<br>$\pm 3\%$ @500-1000nm,<br>$\pm 5\%$ @1000-1100nm | $\pm 7\%$ @800-1000nm,<br>$\pm 3\%$ @1000-1650nm,<br>$\pm 5\%$ @1650-1800nm | $\pm 5\%$ @400-500nm,<br>$\pm 3\%$ @500-1000nm,<br>$\pm 5\%$ @1000-1100nm |
| Dependence on beam position      | $\pm 2\%$   | $\pm 2\%$   | $\pm 2\%$   | $\pm 2\%$   |
| <b>Absorber Specs</b>            |   |   |   |   |
| 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/cm <sup>2</sup>  | 20 W/cm <sup>2</sup>  | 10 W/cm <sup>2</sup>  | 20 W/cm <sup>2</sup>  |
| <b>General Characteristics</b>   |   |   |   |   |
| Cooling                          | Convection  | Convection  | Convection  | Convection  |
| Weight                           | 0.1 Kg  | 0.1 Kg  | 0.1 Kg  | 0.1 Kg  |
| Dimension                        | $\varnothing 31 \times 14$ mm   | $\varnothing 31 \times 14$ mm   | $\varnothing 31 \times 14$ mm   | $\varnothing 31 \times 14$ mm   |
| Cable length - connector         | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)        | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)        | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)          | 1.5 m - DB15<br>2.5 m - USB (U option)<br>1.5 m - RS232 (R option)        |
| Stand and Post                   | Light Duty Stand  | Light Duty Stand  | Light Duty Stand  | Light Duty Stand  |
| <b>Notes</b>                     |   |   |   |   |
| (1). Wavelength dependent.       |   |   |   |   |



# Laser Beam Delivery

Laser beam delivery components are used in laser applications requiring:

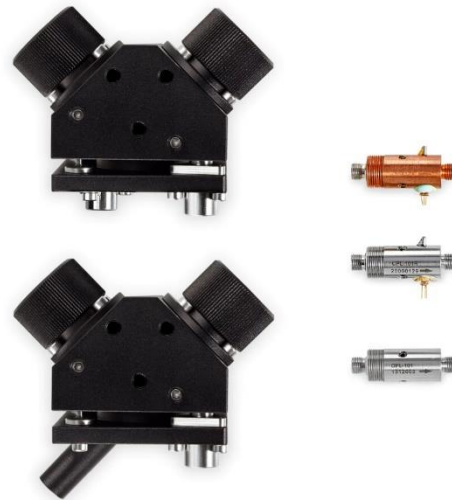
- high efficiency optical power coupling between two specific optic fibers (Fiber to Fiber Couplers – FFC)
- laser beam splitting and bending to reach the working area and to monitor the laser power (Beam Benders – BB or Beam Splitters – BS)

## FIBER TO FIBER COUPLER

FFC-R is a Fiber to Fiber coupler to efficiently couple single or combined wavelength power laser beams into the user output fiber. Its coupling design based on free space lens ensures a reliable and repeatable delivery of laser power into the user fiber, hence right to the working area. This device is suitable to couple laser power into larger core output fibers with output fiber/input fiber core ratio  $\geq 1.5$ . Additionally to the efficient coupling of the power from the primary laser beam, FFC-R integrates a red aiming beam Laser Diode (LD) coaxially coupled into the user output fiber.

FFC-R can be provided without the red aiming beam (FFC).

Class III B Laser Diode operating at 660nm can be efficiently coupled using the same mechanical design of the coupler (FFC-660).



## BEAM BENDER / SPLITTER

The Beam Bender (BB) series provides 90° angular beam displacement of reflected beam over 15.5 mm useful aperture. Reflectivity (%R) > 98% ordering with wavelength options.

The Beam Splitter (BS) series provides a 90° angular beam displacement of reflected beam over 10.0 mm useful aperture with minimal lateral beam displacement of transmitted beam.

BB and BS series have the following characteristics:

- Independent Orthogonal splitter adjustment providing precise and repeatable alignment;
- Optics removal and replacement which can be accomplished without affecting alignment;
- Face & Side Mounting Holes;
- Sealed Design;
- Anodized Aluminum Construction.

## HOW TO ORDER:

### FIBER TO FIBER COUPLER:

| Ordering Code | Max. Power - Laser | Spectral Range - Laser  | Max. Power - Red Laser | Spectral Range Red Laser  | Connectivity | External Size              |
|---------------|--------------------|-------------------------|------------------------|---------------------------|--------------|----------------------------|
| FCC           | 10 W               | 0.8 - 1.0 $\mu\text{m}$ | N.A.                   | N.A.                      | SMA 905      | $\varnothing$ 12 x 36.5 mm |
| FFC-R         | 10 W               | 0.8 - 1.0 $\mu\text{m}$ | 0.35-1.0 mW            | 0.630-0.643 $\mu\text{m}$ | SMA 905      | $\varnothing$ 12 x 36.5 mm |
| FFC-660       | 10 W               | 0.8 - 1.0 $\mu\text{m}$ | 20 mW                  | 0.652-0.664 $\mu\text{m}$ | SMA 905      | $\varnothing$ 12 x 36.5 mm |

## HOW TO ORDER:

### BEAM BENDER / SPLITTER

BB / BS ordering codes are for Beam Bender / Splitter without optics (Customer has to mount its own optics according to the provided mechanical specifications)

Add Wavelength option to the Ordering Code BB or BS-50-50 from the following available nominal wavelengths:

BB wavelength options: 266nm: 0266; 355nm: 0355; 532nm: 0532; 1064nm: 1064.

BS-50-50 wavelength options: 355nm: 0355; 532nm: 0532; 1064nm: 1064.

Other wavelengths are available under request

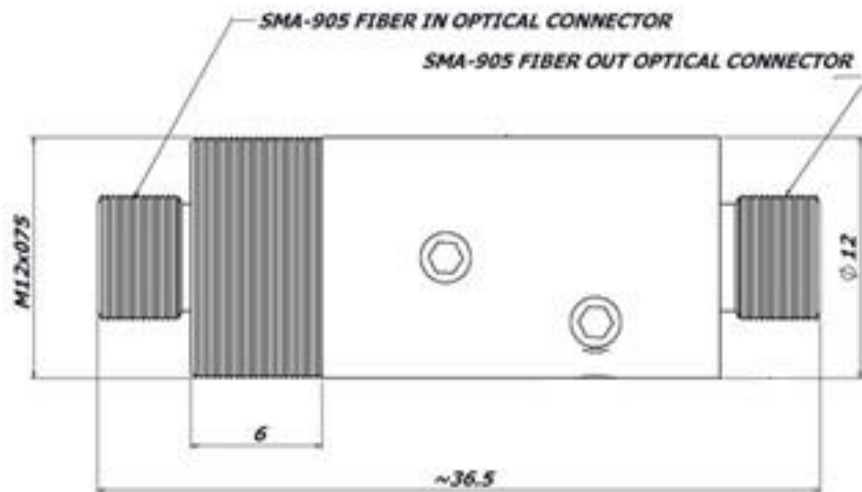
| Ordering Code | Max. Power - Laser | Spectral Range - Laser | Max. Power - Red Laser | Spectral Range Red Laser |
|---------------|--------------------|------------------------|------------------------|--------------------------|
| BB            | N.A.               | N.A.                   | 15.5 mm                | 60 x 60 x 58.5 mm        |
| BS            | N.A.               | N.A.                   | 10.0 mm                | 60 x 60 x 72 mm          |
| BS-50-50      | 50                 | 50                     | 10.0 mm                | 60 x 60 x 72 mm          |



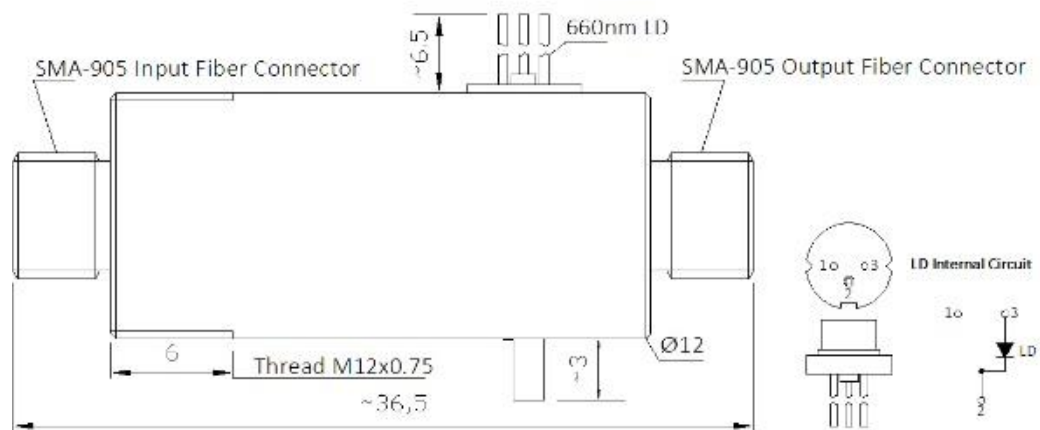
## Fiber to Fiber Coupler

- High Power Optical Couplers for Multimode Fibers
- High Power Optical Couplers for Multimode Fibers, with Therapeutic 660 nm Laser Diode (LD) integrated
- High Power Optical Couplers for Multimode Fibers, with Red Aiming Beam Laser Diode (LD) Integrated

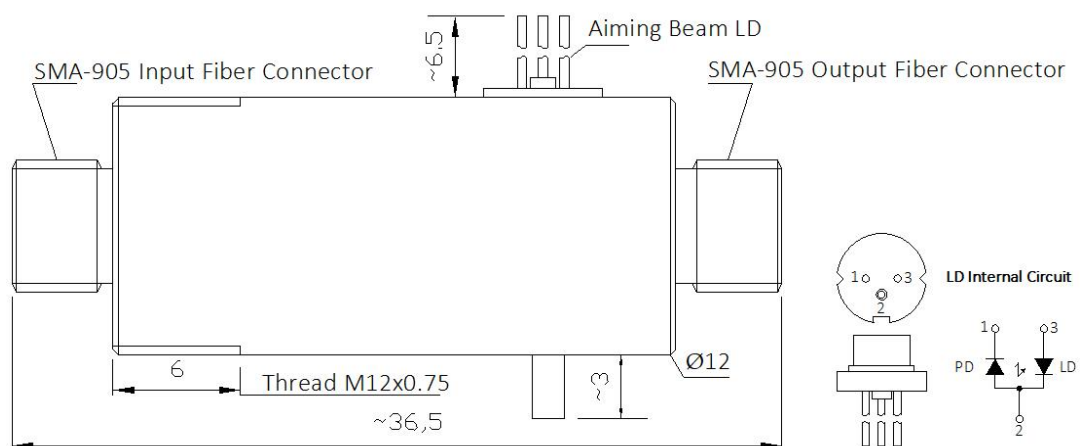
| Ordering Code  | FFC                        | FFC-R  | FFC-660   |
|--|----------------------------|--|---|
| <b>Functional Characteristics</b>  |                            |  |   |
| Input Optical Power Max.   | 10 W                       | 10 W   | 10 W  |
| Wavelength Operating Range   | 0.800-1.000 $\mu\text{m}$  | 0.800-1.000 $\mu\text{m}$  | 0.800-1.000 $\mu\text{m}$   |
| Magnification Factor   | Typ. 1 : 1                 | Typ. 1 : 1   | Typ. 1 : 1  |
| Output Fiber N.A. (1) Min.   | 0.22                       | 0.22   | 0.22  |
| (Output Fiber) / (Input Fiber) Core Diameter Ratio Min.  | > 1.5                      | > 1.5  | > 1.5   |
| Intrinsic Coupling Efficiency (2)  | 95 %                       | 95 %   | 95 %  |
| Red Beam LD Wavelength (3)   | N.A.                       | 0.630-0.643 $\mu\text{m}$ (a)  | 0.652-0.664 $\mu\text{m}$ (a)   |
| Red Beam LD Power (3)  | N.A.                       | 0.35-1.0 mW (a)  | 20 mW (a)   |
| Operating Temperature Range  | 15 – 40 °C                 | 15 – 40 °C   | 15 – 40 °C  |
| <b>General Characteristics</b>   |                            |  |   |
| Input Fiber Connector  | SMA 905                    | SMA 905  | SMA 905   |
| Output Fiber Connector   | SMA 905                    | SMA 905  | SMA 905   |
| Weight   | 30 gr                      | 30 gr  | 30 gr   |
| Dimensions (3)   | Length: 36.5mm, Diam. 12mm | Length: 36.5mm, Diam. 12mm   | Length: 36.5mm, Diam. 12mm  |
| <b>LD Electrical Specifications (Tc = 25°C)</b>  |                            |  |   |
| <i>Absolute Maximum Ratings</i>  | N.A.                       |  |   |
| LD reverse voltage $V_{R(LD)}$   | N.A.                       | 2 V  | 2 V   |
| PD reverse voltage $V_{R(PD)}$   | N.A.                       | 30 V   | 250°C (Max. 5 sec.)   |
| Soldering Temperature  | N.A.                       | 250°C (Max. 5 sec.)  |   |
| <i>Electrical Characteristics</i>  | N.A.                       |  | 60-75 mA  |
| Threshold current $I_{th}$   | N.A.                       | 25-35 mA   | 210 mA  |
| Operating current $I_{op}$ Max.  | N.A.                       | 50 mA  | 350 mA ( $p_w = 30$ ns, duty = 35%)   |
| Operating voltage $V_{op}$   | N.A.                       | 2.3-2.5 V  | 2.5-3.0 V   |
| Monitor current $I_s$ ( $V_{RPD} = 5V$ )   | N.A.                       | 0.5-2.0 mA   |   |
| <b>Notes</b>   |                            |  |   |
| (1) Input Fiber N.A. 0.22<br>(2) Input Fiber Core Diameter 105 $\mu\text{m}$ NA 0.22;<br>Output Fiber Core Diameter 200 $\mu\text{m}$ NA 0.22 AR/AR Coated<br>T <sub>CASE</sub> 25°C<br>(3) Aiming Beam LD Pins Excluded |                            | (a) $I_{LD}$ 38mA.<br>Output Fiber Core Diameter 200 $\mu\text{m}$ NA 0.22. T <sub>CASE</sub> 25°C | (a) $I_{LD}$ 190mA.<br>Output Fiber Core Diameter 400 $\mu\text{m}$ NA 0.22. T <sub>CASE</sub> 25°C |



FFC



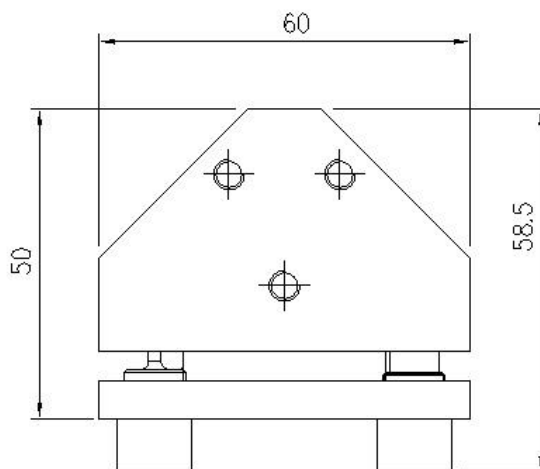
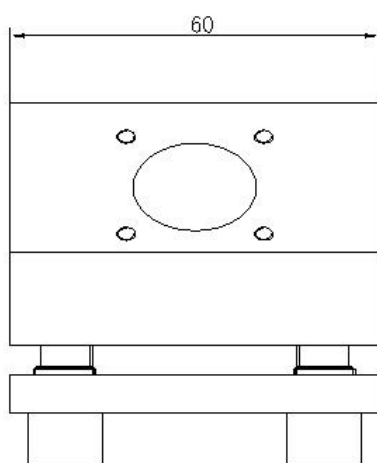
FFC-R



FFC-660

# Beam Bender

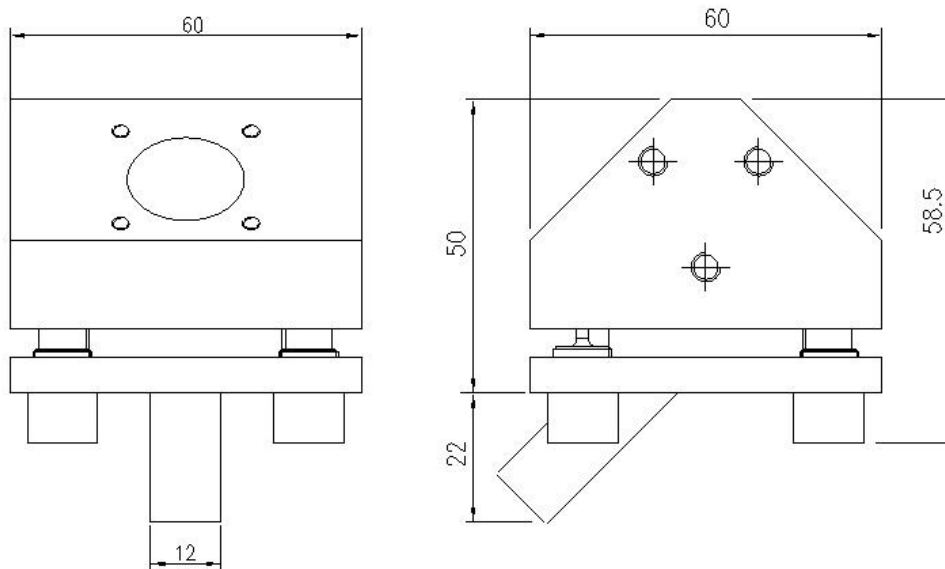
| Ordering Code   | BB  |
|---|---|
| Functional Characteristics  |   |
| Nominal Wavelength / Operating Range (1)  | 0.266 / (0.250 – 0.266) $\mu\text{m}$<br>0.355 / (0.343 – 0.355) $\mu\text{m}$<br>0.532 / (0.527 – 0.532) $\mu\text{m}$<br>1.064 / (1.020 – 1.070) $\mu\text{m}$  |
| Nominal Wavelength / Reflectance s/p  | 0.266 / (>99/>98) %<br>0.355 / (>99.5/>99) %<br>0.532 / (>99.8/>99.3) %<br>1.064 / (>99.8/>99.6) %  |
| Nominal Wavelength / LIDT (2)   | 0.266 / (1.4 J/cm <sup>2</sup> @0.266 $\mu\text{m}$ ; 3.8ns; 50Hz)<br>0.355 / (3.4 J/cm <sup>2</sup> @0.355 $\mu\text{m}$ ; 4.8 ns; 50 Hz)<br>3.0 J/cm <sup>2</sup> @0.355 $\mu\text{m}$ ; 7.8 ns; 100 Hz)<br>0.532 / (9.0 J/cm <sup>2</sup> @0.532 $\mu\text{m}$ ; 5.2 ns; 50 Hz)<br>1.064 / (15.8 J/cm <sup>2</sup> @1.064 $\mu\text{m}$ ; 7.4 ns; 50 Hz) |
| Independent Orthogonal Mirror Adjustment  | $\pm 3^\circ$   |
| Adjustment Screws   | M10x0.50  |
| Useful Aperture   | 15.5 mm   |
| Surface quality, S-D  | 10 - 5  |
| Surface flatness, P-V   | $<\lambda/10$ @ 0.6328 $\mu\text{m}$  |
| Operating Temperature Range   | 15 – 40 °C  |
| General Characteristics   |   |
| Nominal Wavelength / Substrate material   | 0.266 / UVFS<br>0.355 / UVFS<br>0.532 / BK7<br>1.064 / UVFS   |
| Mirror Diameter   | 25.4mm or 2.0"  |
| Mirror Thickness  | 3 – 9 mm  |
| Weight  | 395 gr  |
| Dimensions  | 60.0 x 60.0 x 58.5 mm   |
| Notes   |   |
| (1) Other Wavelengths available under request<br>(2) LIDT: Laser Induced Damage Threshold |   |



BB

# Beam Splitter

| Ordering Code   | BS   |
|---|--|
| Functional Characteristics  |  |
| Nominal Wavelength / Operating Range (1)  | 0.355 / (0.355) $\mu\text{m}$<br>0.532 / (0.515 – 0.532) $\mu\text{m}$<br>1.064 / (1.025 – 1.095) $\mu\text{m}$  |
| Nominal Wavelength / Reflectance s/p  | 0.355 / (50+/-5) %<br>0.532 / (50+/-5) %<br>1.064 / (50+/-5) %   |
| Separation of polarizations, Rs-Rp  | < 5 %  |
| Nominal Wavelength / LIDT (2)   | 0.355 / (6 J/cm <sup>2</sup> @1.064 $\mu\text{m}$ ; 10 ns)<br>0.532 / (6 J/cm <sup>2</sup> @1.064 $\mu\text{m}$ ; 10 ns)<br>1.064 / (6 J/cm <sup>2</sup> @1.064 $\mu\text{m}$ ; 10 ns) |
| Independent Orthogonal Mirror Adjustment  | $\pm 3^\circ$  |
| Adjustment Screws   | M10x0.50   |
| Useful Aperture   | 10.0 mm  |
| Surface quality, S-D  | 20 - 10  |
| Transmitted wavefront distortion  | $\lambda/8$ @ 0.6328 $\mu\text{m}$   |
| Coating on S2. ARsp   | <0.75%   |
| Operating Temperature Range   | 15 – 40 °C   |
| General Characteristics   |  |
| Nominal Wavelength / Substrate material   | 0.355 / UVFS<br>0.532 / UVFS<br>1.064 / UVFS   |
| Beamsplitter Diameter   | 25.4mm or 2.0"   |
| Beamsplitter Thickness  | 3 mm   |
| Angle of incidence AOI  | 45 °   |
| Weight  | 395 gr   |
| Dimensions  | 60.0 x 60.0 x 72.0 mm  |
| Notes   |  |
| (1) Other Wavelengths available under request<br>(2) LIDT: Laser Induced Damage Threshold |  |



BS BS-50-50

# Radiation Absorbers

A highly resistant absorber is fundamental to the correct operation, performance and reliability of any detector. On thermopile detectors the absorbing coating is directly deposited on the same substrate of the thermocouple.

**The Damage threshold** of the absorber is defined as the power density ( $\text{W}/\text{cm}^2$ ) above which it occurs a variation  $>1\%$  (larger than  $1\%$ ) in the laser power measurement.

This variation is mostly due to an irreversible change in the chemical and physical properties of the materials after the laser absorption. In order to have the largest possible value of the damage threshold, the absorber should be made by a material with the largest value of both the melting point and the thermal conductivity.

It should also resist to extreme thermal stresses happening for example in the case of narrow Gaussian beams or focused laser radiation (hot spots). Thermal dimensioning and material selection is optimized when the area interested by the laser is kept below  $250^\circ\text{C}$ , even with several kW of laser power applied. In the case of pulsed lasers, the pulse duration has a strong influence on the damage threshold and can lead to two different kinds of coating damage. The damage process is ablative for very short pulses (typically below 100 ns): in this temporal regime the diffusion time of the generated heat within the material is much longer than the pulse length itself and this condition determines a strong localization of the laser energy and thus the direct ablation of the absorber's atoms. On the other hand, a pulse duration sufficiently long to allow a diffusion of heat within the absorber (pulses  $> 10\text{msec}$ ) can lead to damages created by thermal effect.

Another important parameter is the absorption coefficient of the material at the laser wavelength ranges, which needs to have the following general characteristics:

- to be as high as possible (typically  $>70\%$ ), to guarantee an efficient absorption of the radiation even in the case of very thin thickness of deposited materials and to provide the lowest reflection at any wavelength;
- to have a spectral response that covers the broadest possible range of laser wavelengths;
- to provide the lowest possible reflection at any incidence angle.

Laser Point has always invested significant resources on the research for innovative coatings with the highest standards on the market; an example is the Super Hard Coating (SHC) that is characterized by an efficient and fast heat transfer, allowing resisting to extremely high power densities. SHC damage threshold is among the highest available on the market and makes it suitable for measuring very high power lasers.

- **Surface Absorbers**

Surface absorbers consist of a thin layer, 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  $>300\mu\text{sec}$ ). Radiation is almost entirely absorbed within that thin layer and then released as heat that flows through the thermopile.

- **Volume Absorbers**

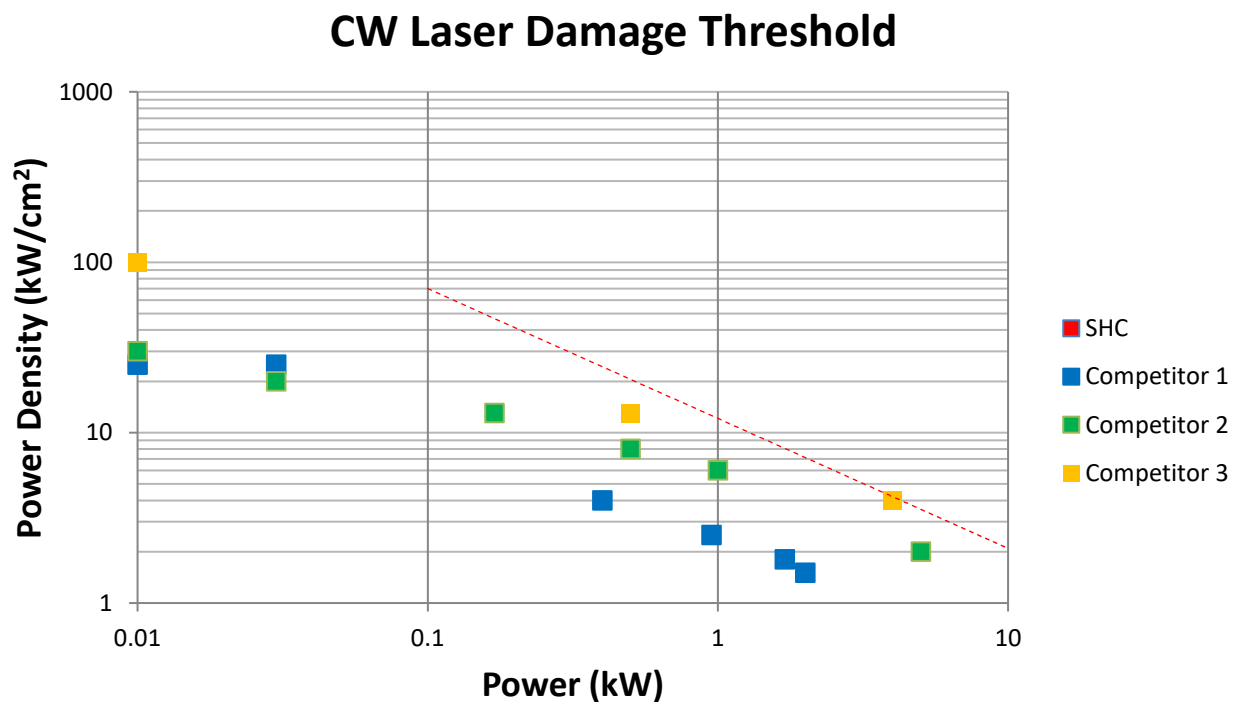
For pulsed lasers with short pulse durations (lower than microseconds), the time needed by the heat to transfer from the area of impact and to be removed by the cooling system is longer than the duration of the pulse length. Therefore an excess of heat remains concentrated within a thin layer on the sensor's surface where it generates a sudden overheating of the absorbing material. Above a certain level, this excess of energy can cause damages such as the absorber's ablation.

To overcome this problem, volume absorption technology is often used. Volume absorbers with depths of 0.5-2 mm rather than few microns allow the heat to spread over a larger volume and thus reducing overheating effects. Various types of glasses and ceramics are used by Laser Point as absorbers to cover the UV-C range (190-250 nm), the UV-A (250-400 nm) and the VIS-NIR (BB absorber from 400nm to 5µm). Those absorbers can withstand peak powers up to 100GW/cm<sup>2</sup> and energy densities up to 30J/cm<sup>2</sup>.

- **The very best of laser absorbers: the Super Hard Coating (SHC)**

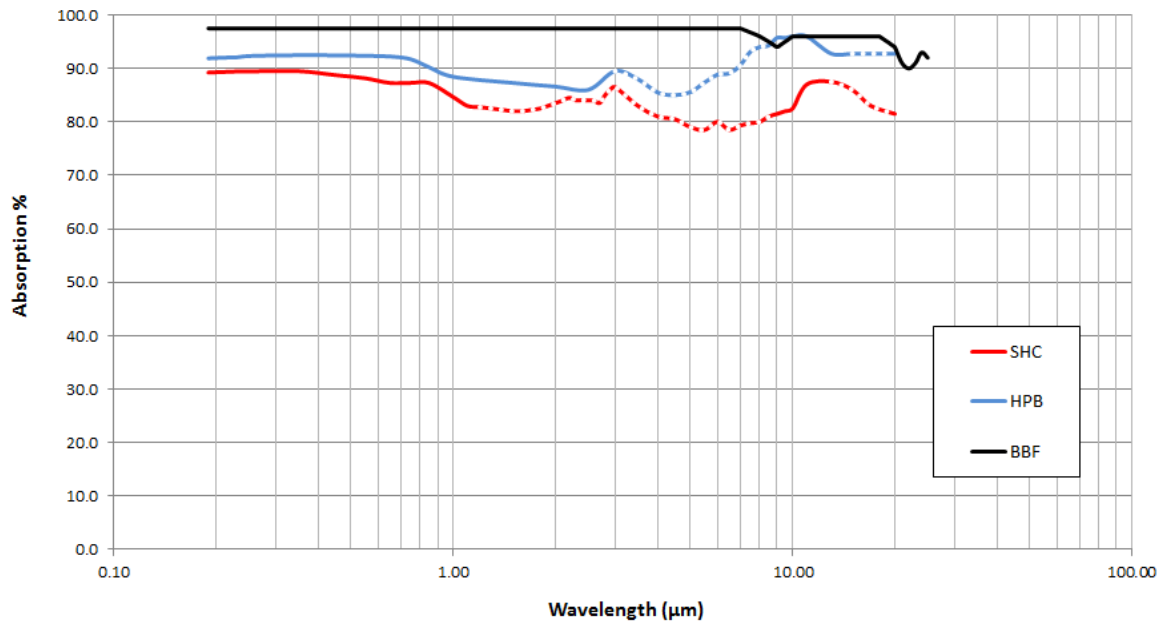
SHC is one of the best laser coatings available on the market.

Specification curves and values shown below for the SHC are based on test campaigns performed in collaboration with our customers in disruptive conditions; SHC can withstands more than 12KW/cm<sup>2</sup> in CW operation, when applying 1KW Yag laser, or 40J/cm<sup>2</sup> with laser diodes peak powers of 3.2 KW @1 ms. SHC also has an extended working range (0,25µm to 11µm) and a very high absorption ratio, making it suitable for a safe use in almost all laser applications. The graph below shows a comparison of the damage threshold values between Laser Point's SHC absorber and three other competitor absorbers available on the market, in CW conditions. The study was performed by an independent University Lab and the SHC was found to have the highest damage threshold values.

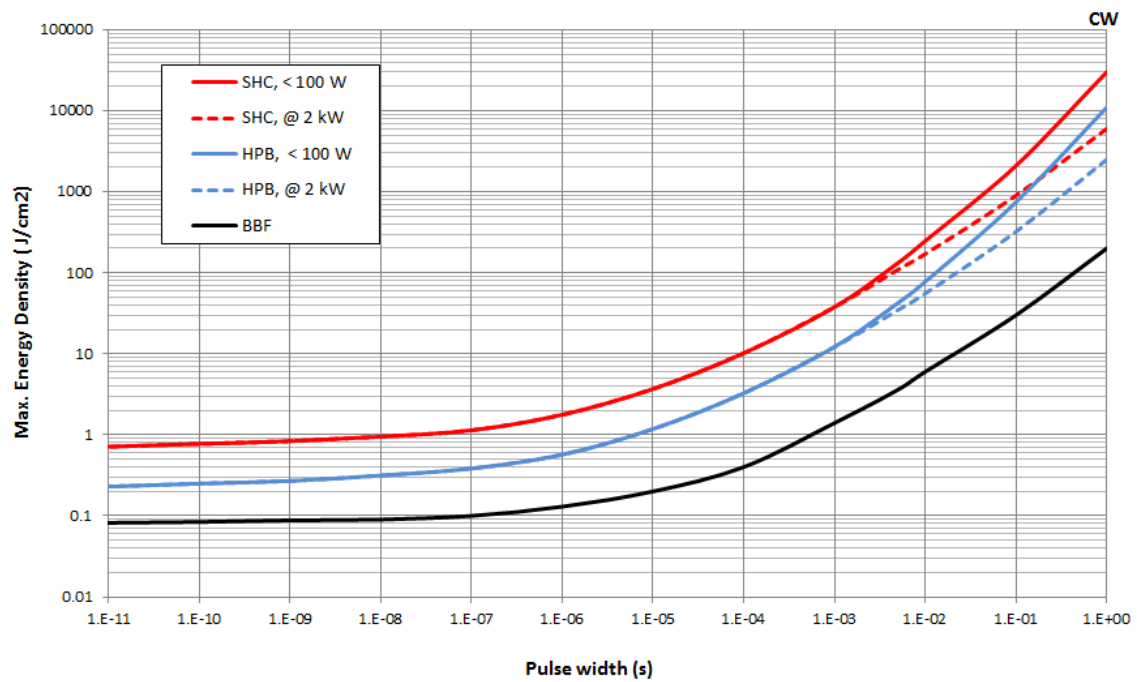


- Surface Absorbers: Absorption and Damage Threshold Curves

**General Absorption Curves: BBF, HPB, SHC**

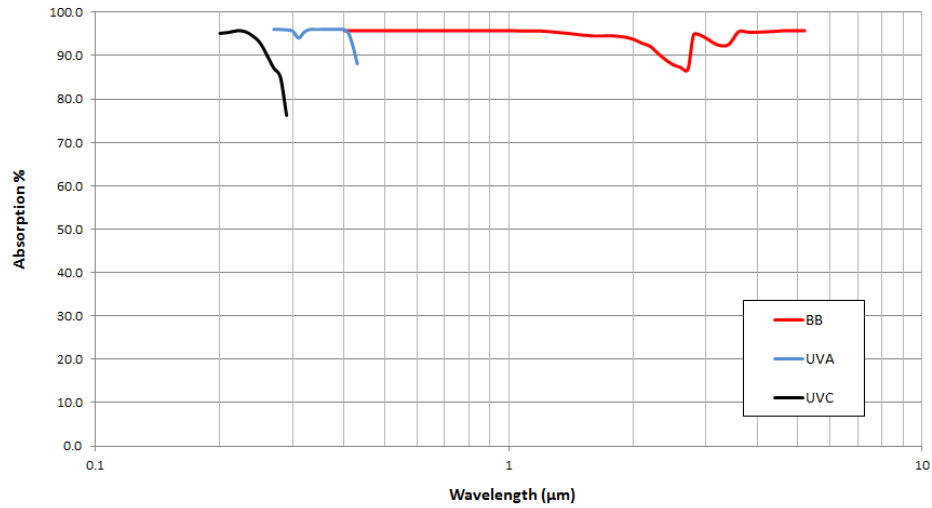


**Pulse Energy Ratings and Damage Thresholds: BBF, HPB, SHC**

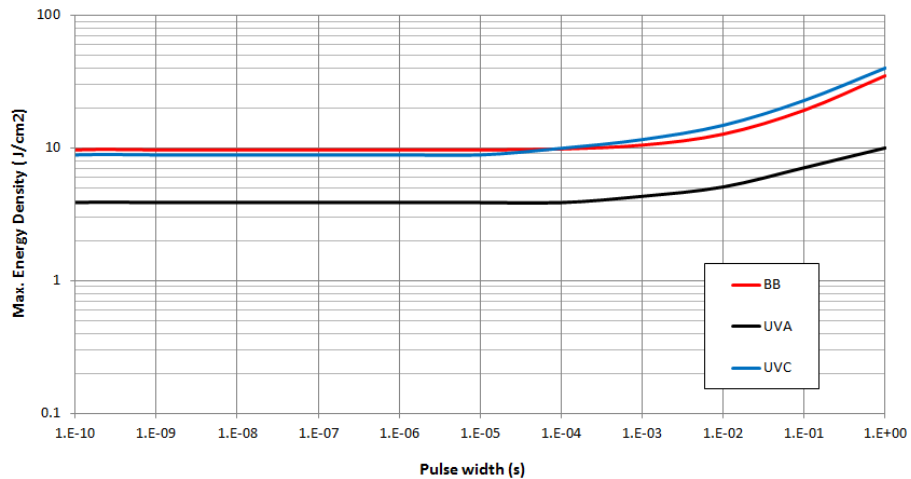


- Volume Absorbers: Absorption and Damage Threshold Curves

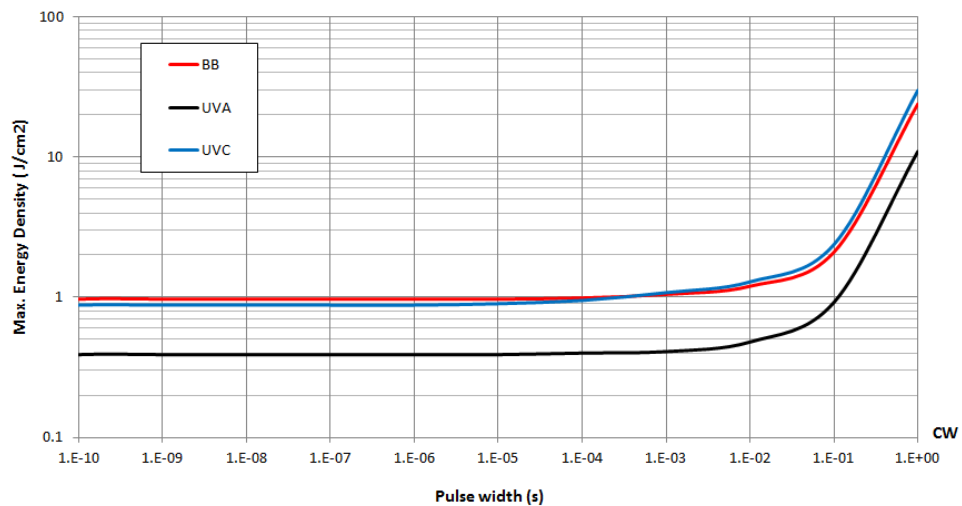
General Absorption Curves: BB, UVA, UVC



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



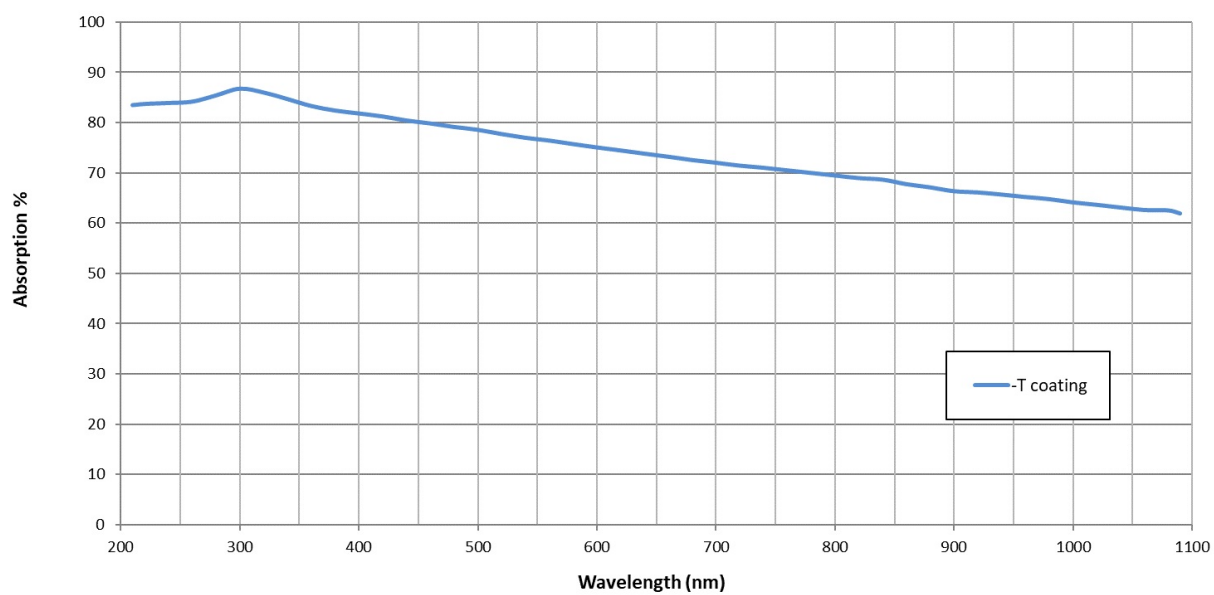
Pulse Energy Ratings and Damage Thresholds: BB, UVC, UVA  
Pulses Repetition 5-30Hz



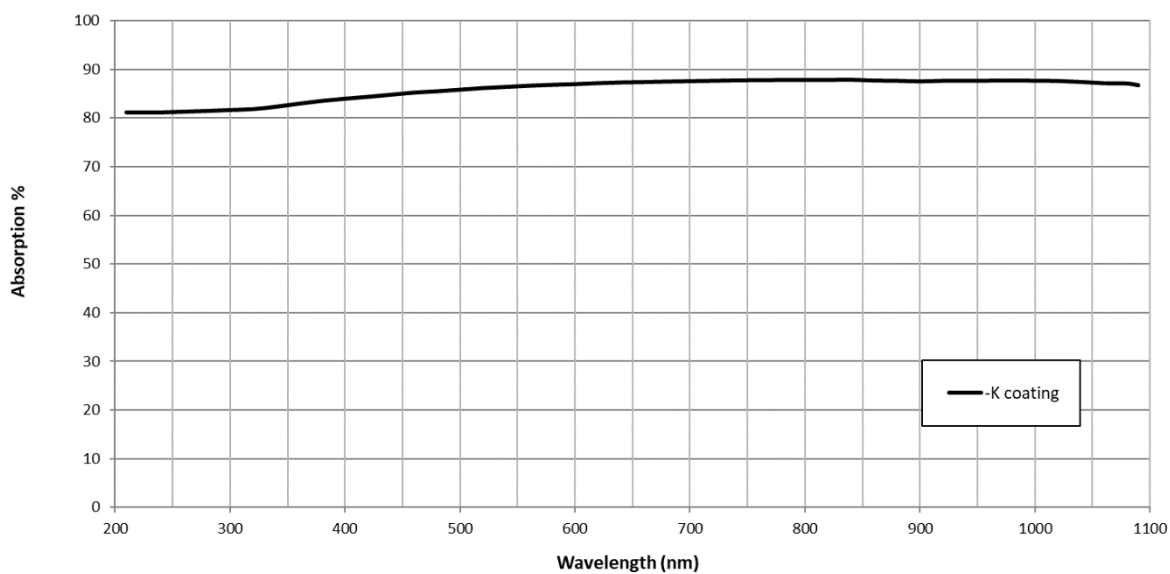


- Blink series Absorbers: Absorption Curves

**General Absorption Curves: -T coating**

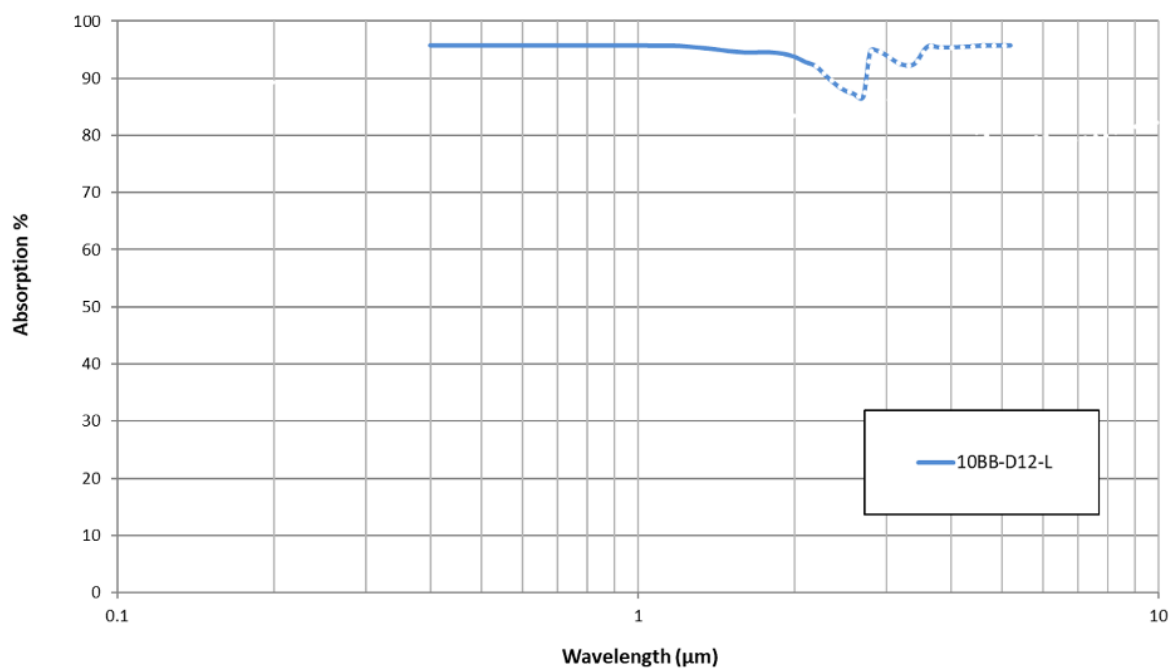


**General Absorption Curves: -K coating**

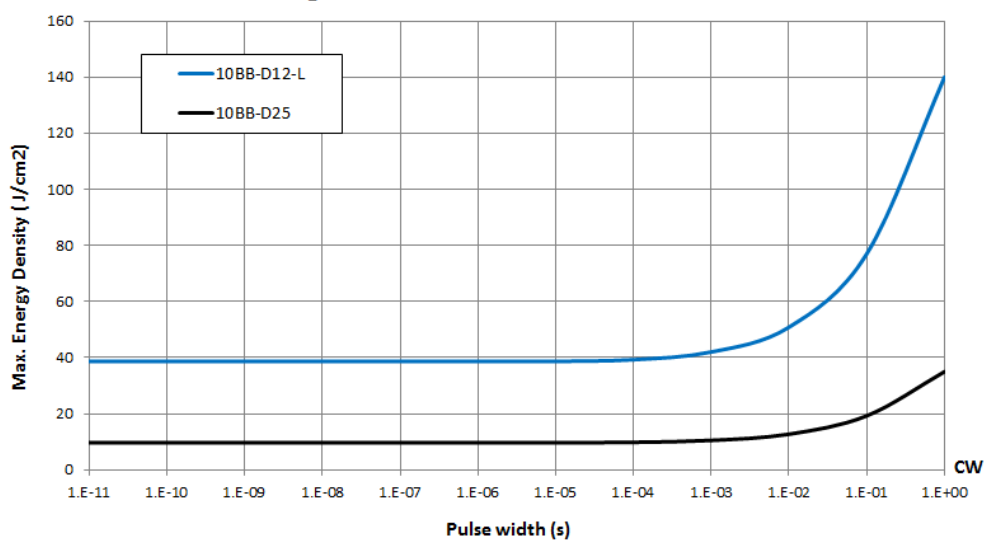


- Absorbers for High Energy Density: Absorption and Damage Threshold Curves

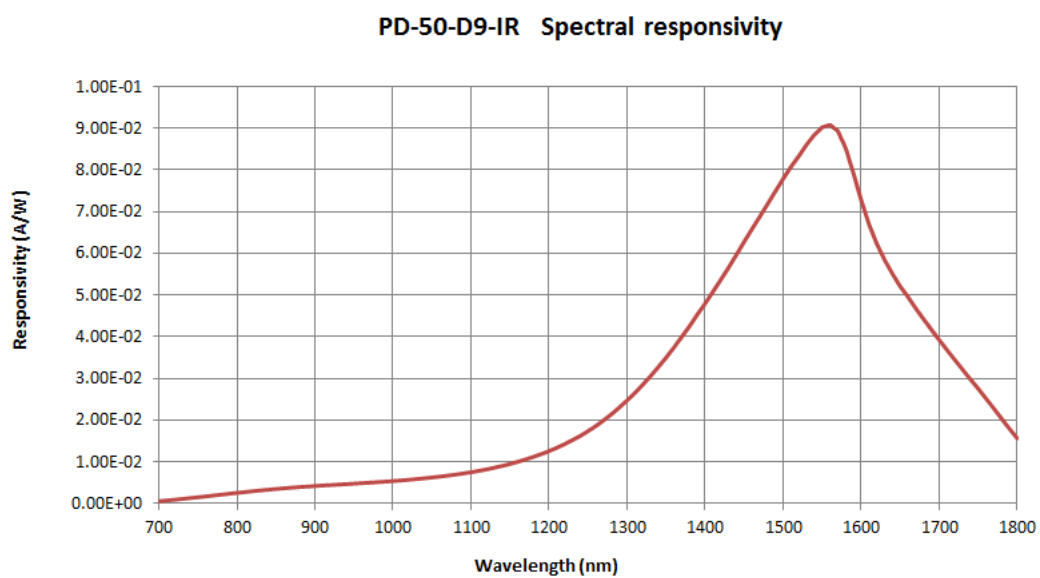
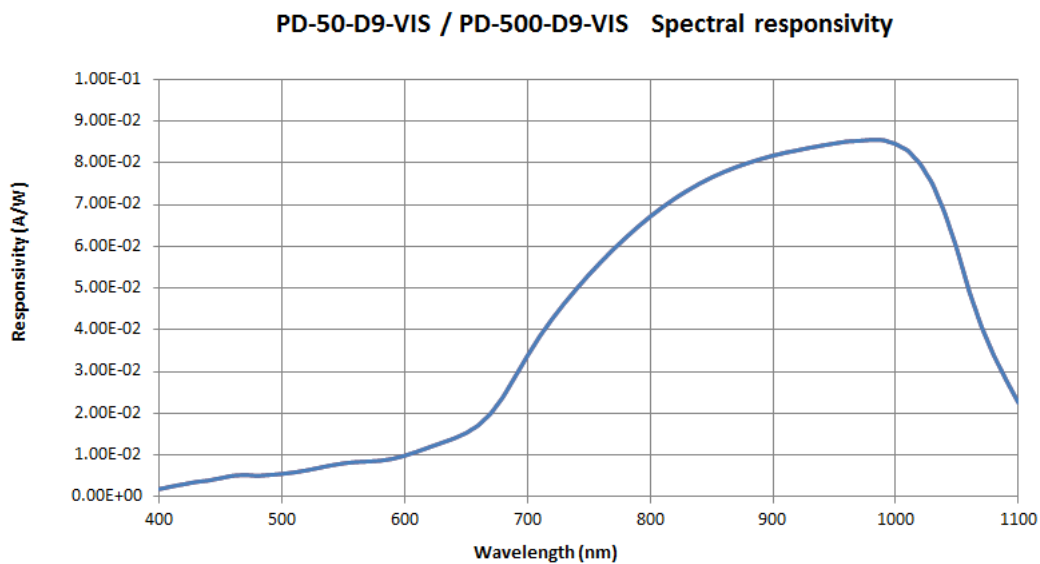
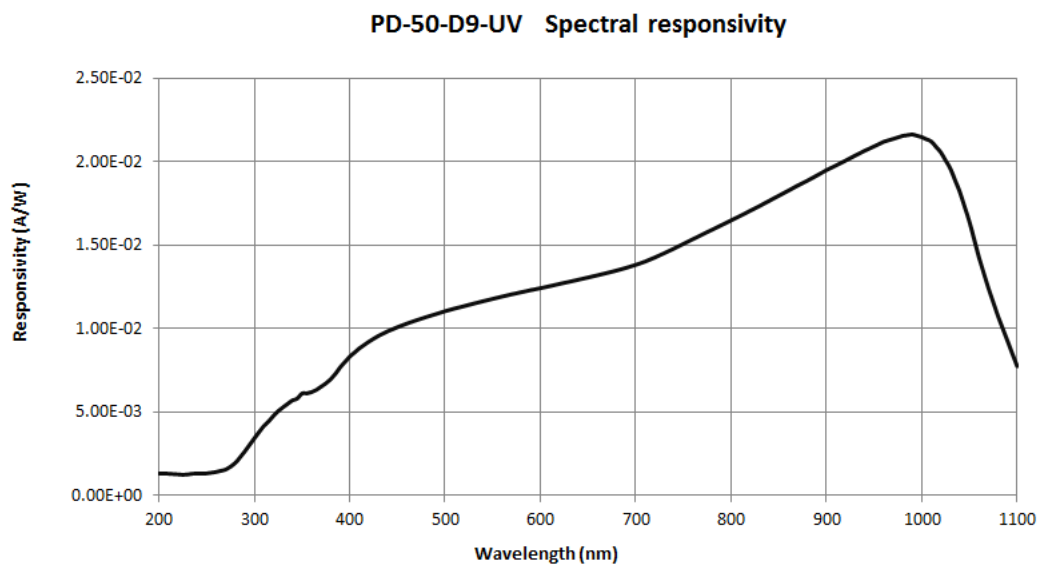
### General Absorption Curves: 10BB-D12-L



### Damage Thresholds: 10BB-D12-L vs 10BB-D25



- Photodiode: Absorption curves



# Calibration and warranty

## Certified Calibrations

Laser Point sensors are provided with a Calibration Certificates with traceability to the National Institute of Standards and Technology (NIST) Laboratories in Boulder, Colorado (USA) or the Physikalisch-Technische Bundesanstalt (PTB) in Berlin (Germany).

## Periodic Recalibrations

The actual need for recalibration depends on how the instrument has been used, its conditions and also on the working environment conditions. However a regular maintenance and recalibration are essential to ensure the performances and accuracy of the instruments. International Metrology Laboratories, such as NIST and PTB, recommend an annual recalibration. In order to have your instruments properly serviced, the units must be shipped back to Laser Point where they will undergo a general check-up and full recalibration procedure.

## Calibration Capabilities in Laser Point

Laser Point owns a number of laser sources that are used for in-house calibrations; these sources cover powers up to 300W and include pulsed lasers.

Laser Point also relies on contracts for the use of multi-kilowatt lasers with local Scientific Institutes for tests and standard calibrations for its high power heads.

A number of detector heads, calibrated at NIST and PTB at different wavelengths, are internally used as Golden Standards for calibration procedures.

To trace sensors' linearity to their full scale, some of those Golden Standards have been calibrated over their entire working range, up to > 1KW for CO<sub>2</sub> and 300W for YAG.

All measurements made by PTB and NIST, show the outstanding linearity of Laser Point sensors.

## Warranty

Laser Point is in the laser measurement business since more than 25 years. Over this period it has sold tens of thousands of sensors worldwide which have shown an incredibly low rate of returns for defects in materials and workmanship.

Years of innovation in technology and product reliability have created the actual reputation of Laser Point. It's the confidence in its reliability that allows Laser Point to provide, first in this industry, a 3 YEARS WARRANTY on its products.

## 3 Years Limited Warranty Policy

All Laser Point products are warranted against defects in materials and workmanship for 36 months from the date of shipment. During the warranty period Laser Point will repair, or at its sole option, replace at no charge products proven to be defective.

Defective products can only be returned to Laser Point after issuance of an RMA number.

Shipment to and from Laser Point are at customer's charge.

The 3 Years 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 3 Years Warranty covers only those Laser Point Products sold after June 2017, 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 Warranty. Refurbished, customized, and discontinued Laser Point products are not eligible for the Warranty services. The Warranty excludes all options, accessories and consumables.

No other expressed warranty is provided by Laser Point.

# Optical fiber adapter

| Ordering code | Fiber Adapter type |
|---------------|--------------------|
| S120-SMA      | SMA                |
| S120-SC       | SC                 |
| S120-FC       | FC                 |
| S120-ST       | ST                 |
| S120-LC       | LC                 |

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

## Other ordering options

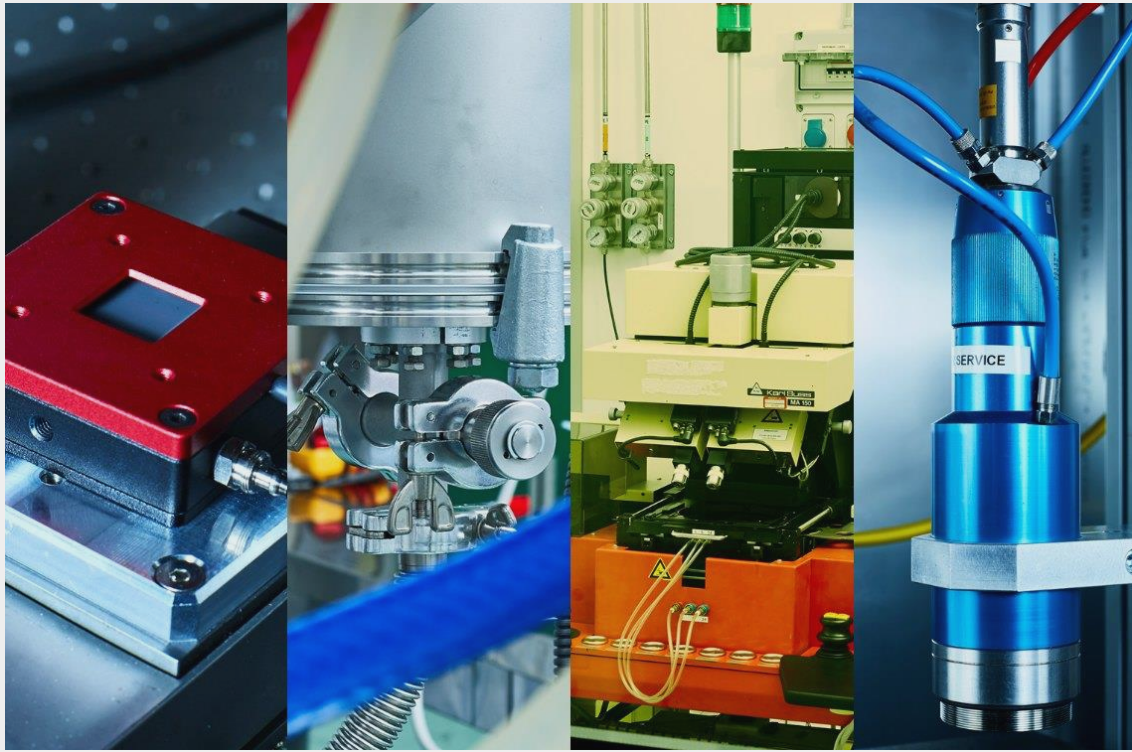
Further product customizations can be provided adding the following options to the ordering code:

| Option | Option description           |
|--------|------------------------------|
| h      | Cable length 0.4 m           |
| y      | Cable length 1.5 m           |
| e      | Cable length 3 m             |
| c      | Cable length 5 m             |
| f      | Cable length 7.5 m           |
| d      | Cable length 10 m            |
| b      | Without Light Duty Stand (*) |
| z      | Without Heavy Duty Stand (*) |

(\*) See product specification to select the proper option.

### Examples of Ordering Code with options:

- A-02-D12-BBF -> Thermal sensor head with DB15 connectivity
- A-02-D12-BBF-U -> Thermal sensor head with USB connectivity
- A-02-D12-BBF-R -> Thermal sensor head with RS-232 connectivity
- A-02-D12-BBFhb -> Thermal sensor head with DB15 connectivity – 0.4 m cable length – without light duty stand
- A-02-D12-BBF-Uhb -> Thermal sensor head with USB connectivity - 0.4 m cable length – without light duty stand
- A-02-D12-BBF-Rhb -> Thermal sensor head with RS-232 connectivity - 0.4 m cable length – without light duty stand



## LASERPOINT SRL

Via Burona, 51 20055

Vimodrone ITALY

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[sales@psci.cn](mailto:sales@psci.cn)

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