

56 Sparta Avenue • Newton, New Jersey 07860
 (973) 300-3000 Sales • (973) 300-3600 Fax
 www.thorlabs.com

THORLABS

PM200 - JAN 7, 2019

Item # PM200 was discontinued on JAN 7, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

TOUCH SCREEN HANDHELD OPTICAL POWER AND ENERGY METER CONSOLE

- ▶ Brilliant 5.7" Color Touch Screen with VGA Resolution
- ▶ Versatile Functionality with Intuitive Usage
- ▶ Over 25 Compatible Sensors

Intuitively Operated via Touch Screen



PM200
 Connected to an S130C Sensor
 with SM1A29 SM1 Thread Adapter



The PM200 Power Meter
 Connected to the S170C
 Microscope Slide Sensor

OVERVIEW

Features of the PM200

- Brilliant 5.7" Color Touch Screen with VGA Resolution and Wide Viewing Angle
- Advanced Spectral and Attenuation Correction Features
- Power and Energy Measurements for CW and Pulsed Sources
- Compact, Rubber-Protected Enclosure:
170 mm x 125 mm x 38 mm (6.70" x 4.9" x 1.5")
- 90° Flip-Screen and Swivel Kick Stand for Landscape and Portrait Viewing
- Console Comes Calibrated with Certificate of Calibration
- Data Storage on USB Stick
- Compatible with All C-Series Sensors (Shown Below)
- USB 2.0 Remote Operation
- Sensor Upgrade and Recalibration Services Available
- Optical Power Monitor PC Software Available (See *Software* Tab for Details)

Thorlabs' PM200 touch screen power and energy meter console is the high-end counterpart to the PM100D and PM100A power meter consoles. It is equipped with a brilliant 5.7" color touch screen (118 mm x 88 mm) with VGA resolution that offers high contrast, a wide viewing angle, and a 90° flip screen that enables use in either a portrait or landscape orientation. The screen is encased in a compact, removable rubber housing that measures 170 mm x 125 mm x 38 mm. The screen is also backlit and can be dimmed to 1% of the maximum brightness.

The PM200 is compatible with all of our power and energy sensors (photodiode, thermal, and pyroelectric sensors) for use from the UV to the Mid-IR. It offers six current ranges for use with photodiode sensors (slim photodiode, microscope slide, integrating sphere, fiber) outputting currents from 10 pA to 5 mA and four voltage ranges for use with thermal sensors with thermopile voltages from 100 nV to 1 V. In both cases, manual and auto ranging are possible. The console has four manual voltage ranges for use with pyroelectric sensors with voltages from 100 μ V to 100 V, and the auto-gain threshold can be adjusted from 0.1% - 99.9%. Customers can use their own custom built sensors and upload a response curve for spectral correction. Finally, a USB 2.0 port offers full remote control. Download an interactive sensor compatibility guide for a complete overview over all compatible sensors and adapters.

For a more compact power meter console that features a capacitive touchscreen, inputs for temperature and humidity sensors, and 4 GB internal memory for saving long-term measurements please see our PM400 touchscreen power meter console.

Unique Features and Flexibility

The PM200 can load the spectral emission curve for a broadband light source and calculate the net adjusted responsivity based on the spectral profile, allowing for more accurate power measurements. Similarly, the transmission curve for a filter can be loaded, and the meter will calculate the adjusted power and display the corrected value.

Other features that were implemented into the PM200 to extend its functionality and applicability include the following:

- Data recording is stored to a large internal memory (128 MB) or a USB drive for stand-alone operation
- Relevant laser beam specifications (e.g., peak power, power density, energy density, etc.) can be determined and sensors can be suggested based on inputted parameters (e.g., diameter, wavelength, power, energy, pulse length)
- Software update using an external USB drive

See the *Display Screens* tab for further information.

[Click Here for an Interactive PM200 Touch Screen Demo](#)

Connectivity

The sensor's connector enables quick hot swapping of sensor heads and contains all the sensor information, including NIST-traceable responsivity curves, sensor types, and model number. The PM200 communicates with the sensor and accesses spectral response functions, time constants, and other information specific to the detector. The PM200 then corrects for spectral response functions automatically. The power meter also accounts for the detector time constants (which can vary greatly, especially for thermal sensors) for each sensor and can minimize the response time of the system (sensor + console), thus greatly improving the efficiency of the unit.

Data can also be recorded via the USB PC connection and optical power monitor software. This software is capable of handling up to eight consoles simultaneously. The features of the PC control software are highlighted in the *Software* tab.

Diverse I/O ports enable quick integration into non-standard applications like an analog output, auxiliary input/output for external trigger, general-purpose programmable IO-ports, or ADC.

Sensor Upgrade Service

Thorlabs' current line of sensors and power meter consoles are not compatible with old power meter consoles and sensor heads, respectively. We offer a sensor upgrade service if you want to use your existing sensors with one of our current power meter consoles. Note: upgraded sensors will be incompatible with old power meter consoles and new sensors converted to work with older consoles will not be compatible with the PM200. Please contact our Tech Support team for details.

Recalibration Service

Recalibration services are available for our thermal and photodiode power sensors, pyroelectric energy sensors, and consoles. We recommend recalibrating your Thorlabs sensor and console as a pair; however, each may be recalibrated individually. To order this service for your sensor or combined sensor and console, scroll to the bottom of the page and select the appropriate recalibration service Item # that corresponds to your sensor. To order this service for only your console, please contact Tech Support.

Item #	PM200
Compatible Sensors	Photodiode, Thermal, and Pyroelectric
Optical Power Range ^{a,b}	100 pW to 200 W
Optical Energy Range ^{a,b}	3 μ J to 15 J
Available Sensor Wavelength Range ^a	185 nm - 25 μ m
Display Refresh Rate	Max 15 Hz
Bandwidth ^a	DC - 100 kHz

- Sensor Dependent
- Ranges Selectable in Watts (Photodiode and Thermopile) or Joules (Pyroelectric), depending on the sensor used.



[Click to Enlarge](#)
The PM200 Includes a Removable Red Rubber Protective Skin, Power Adapter, Carrying Case, Flash Drive, and Cables



[Click to Enlarge](#)
Thorlabs' C-Series Power Meter Sensor Connectors Include the Sensor Calibration Data

S P E C S

Item #	PM200
Detector Compatibility	Photodiode Sensors S100C Series Thermal Sensors S300C Series Pyroelectric Sensors ES100C/ES200C Series Photodiode Sensors: 5 mA (Max) Thermopile Sensors: 1 V (Max) Pyroelectric Sensors: 100 V (Max)
Display Type	5.7" TFT, 640 x 480 Pixels, 18 bit Color
Viewing Area	118 mm x 88 mm
Display Update Rate	Max 15 Hz
Display Format	Numerical, Bargraph, Trendgraph, Statistics, Simulated Analog Needle
Backlight Display	LED, Adjustable
Overall Dimensions (H x W x D)	170 mm x 125 mm x 38 mm
Features	Rotatable Two Position Kickstand, Removable Rubberboot, Touch-Pen, Fixture for Optional Fiber Inspection Camera
Weight	0.57 kg
Operating Temperature	0 °C to 40 °C
Storage Temperature	-40 °C to 70 °C
Current Input (Photodiode Sensors)	
Connector	DB9F, Left Side
Units	W, dBm, W/cm ² , A
Measurement Ranges	6 Decades; 50 nA - 5 mA Ranges Selectable in W, Sensor Dependent
Display Resolution	1 pA / Responsivity Value (A/W)
AD Converter	16 bit
Accuracy	±0.2% full scale (5 µA - 5 mA) ±0.5% full scale (50 nA)
Bandwidth	DC - 100 kHz, Dependent on Sensor and Settings
Beam Area Setting	Diameter 1/e ² or Rectangular x,y
Voltage Input (Thermopile Sensors)	
Connector	DB9F, Left Side
Units	W, dBm, W/cm ² , V
Measurement Ranges	4 Decades; 1 mV - 1 V Ranges Selectable in W, Sensor Dependent
Display Resolution	1 µV / Responsivity Value (V/W)
AD Converter	16 bit
Accuracy	±0.5% f.s. (10 mV - 1 V) ±1% f.s. (1mV)
Bandwidth	DC - 10 Hz, Dependent on Sensor and Settings
Time Constant Correction Range	1 - 30 s
Wavelength Correction	Sensor Dependent
Beam Area Setting	Diameter 1/e ² or Rectangular x,y
Voltage Input (Pyro Sensors)	
Connector	DB9F, Left Side
Units	J, J/cm ² , W, W/cm ² , V
Measurement Ranges	4 Decades; 200 mV - 2V - 20 V - 100 V Ranges Selectable in J, Sensor Dependent
Display Resolution	100 µV / Responsivity Value (V/J)
AD Converter	16 bit
Accuracy	± 0.5% full scale
Trigger Theshold	0.1% - 99.9% full scale
Max Repetition Rate	3 kHz
Wavelength Correction	Sensor Dependent
Beam Area Setting	Diameter 1/e ² or Rectangular x,y
Analog Output	
Connector	Audio 3.5 mm, Left Side
Signal	Amplified Input Signal - Not Corrected
Voltage Range	0 to 2 V
Accuracy	±3%
Bandwidth	Up to 100 kHz, Dependent on Sensor and Settings
Auxiliary In-/Output	
Connector	2 x 6 Pins, 0.1" Socket, Top Side

Item #	PM200
Function	External Trigger Input 4 x GPIO 2 x 10 bit ADC
Sensor Temperature Control	
Supported Temperature Sensor	Thermistor
Temperature Measurement Range	-10 °C to +80 °C
Sound	
Type	Speaker 300 Hz - 5 kHz
Function	Laser Tuning Support, Console Function Support
Memory	
Type	Nand Flash
Size	128 MB
Interfaces	
Type	USB2.0
Connector (Host)	Mini USB, Top Side
Connector (Device)	USB Type A, Left Side
Power Management	
Battery	LiPo 3.7 V 2600 mAh
Charger / DC Input	5 V / 2 A
Power Connector	Center Hole
Included Accessories	
Hardcase	For Console and Sensor(s)
External Power Supply	5 VDC / 2.4 A with Power Cord
USB Cable	USB Type A Connector to Mini USB Connector (2 m)
Cable for Analog Output	3.5 mm Audio Connector to Flying Leads (2 m)
External Memory	USB Flash Drive 2 GB
Instrument Drivers	on USB Flash Drive
Application Software	on USB Flash Drive
User Manual	Quick Reference as Hardcopy, Manual on USB Flash Drive

For a full list of the sensor head specifications please visit the Photodiode Power Sensors, Thermal Power Sensors, or Pyroelectric Energy Sensors pages.




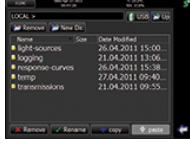


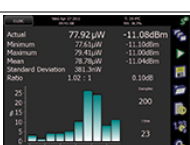



For additional information, please contact tech support.

DISPLAY

[Click Here for an Interactive PM200 Touch Screen Demo](#)

Features

- Header Line with Info About the Sensor, Date/Time, and Battery State
- Vertical Navigation Bar on the Right
- 90° Screen Flip According to Device Orientation
- Configurable Widgets on Most Screens
- Selectable Color Scheme for All Screens

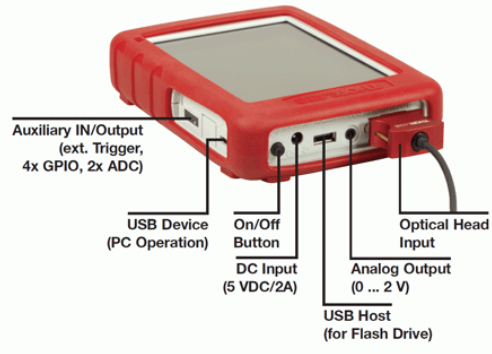
Numeric Display	Measurement Settings
 <p>Click to Enlarge</p>	 <p>Click to Enlarge</p>
 <p>Click to Enlarge</p>	 <p>Click to Enlarge</p>
 <p>Click to Enlarge</p>	 <p>Click to Enlarge</p>
 <p>Click to Enlarge</p>	 <p>Click to Enlarge</p>
 <p>Click to Enlarge</p>	 <p>Click to Enlarge</p>

The user can customize the display screen by selecting various measurement tasks to be shown on the screen. Some screens are partly configurable by the user, for example, the user can display the min and max values within a certain time period or enable visual and audible peak indicator as a tuning aid. The screen is also backlit and can be dimmed to 1% of the maximum brightness.

CONNECTORS

PM200 In/Out Connectors

PM200 CONNECTION DEVICES



APPLICATIONS

Standard Photodiode Sensor Mounting Options

Thorlabs Standard Photodiode Sensors compact design allows easy integration into existing setups. Typical mounting configurations including post, cage, and lens tube options are available. Shown on this page are several different choices for mounting these sensors.

The Standard Photodiode Sensors are compatible with all S120-xx Series fiber adapters. FC/PC and SMA adapters are shown on the right. Adapters for SC, LC, and ST connections are also available.

Flip up mounts are convenient for quick power measurements from a static location. The sensor can be placed in the path of the laser beam for the power measurement and flipped down during normal operation of the system.

FM90 Right Angle Flip-Mounts are shown to the right. Thorlabs also offers the TRB1 Articulating Post Mount. The lockable articulating mount offers almost unlimited positioning of the sensor head. The articulating mount is shown on an S13xC Slim Photodiode Sensor below.

The Standard Photodiode Sensors also feature SM1 threaded connections on the front face. The SM1 threading provides easy mounting to 1" lens tube systems and quick release mounts.

Shown to the right are the KB1P Quick-Release Post Mount and QRC1A Quick-Release 30 mm Cage Mount. Both mounts feature SM1 threaded connections to the sensor heads.

Note: Due to the thickness of the S12xC sensor, the QRC1A and CP90F (shown below) quick release mounts can only be fully removed from the cage system by backing them off an open end. The two mounts are easily removed from the cage system if only three cage mounts are used. See the picture on the right.

Thorlabs also offers the CP90F 30 mm Cage Plates with Quick-Release Mounts. These mounts feature magnetically coupled mounting for easy and repeatable mounting.

Note: Like the QRC1A, the CP90F can not be removed from a closed cage system.

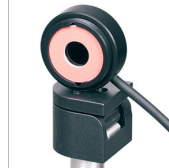
S120C and S120-FC Fiber Adapter



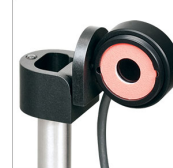
S120C and S120-SMA Fiber Adapter



S120C and Flip Mount



S120C and Flip Mount



S120C and KB1P Quick-Release Mount



S120C and QRC1A Quick-Release Mount



S120C and CP90F Quick-Release Mount



Slim Photodiode Sensor Mounting Options

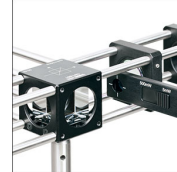
Thorlabs' Slim Photodiode Sensors are designed to fit into tight optic arrangements such as cages, lens tubs, and optic dense free space arrangements.

Shown to the right is a S130C Sensor inserted into a 30 mm cage system. The application shown highlights the ease for which the sensor can be inserted into the cage, and the minimal space needed to take a power measurement.

The Slim Photodiode Sensors may also be mounted on a TRB1 Articulating Mount.

This mount allows repeatable insertion of the sensor into tight optic arrangements. After the measurement is made, the sensor may be rotated out of the beam path for normal operation.

S130C Sensor in a 30 mm Cage



Microscope Slide Photodiode Sensor Mounting Options

The S170C microscope slide power Sensor is designed so that it can be mounted directly in a microscope slide holder. The 76.0 mm x 25.2 x 5.0 mm sensor head has the same footprint as a standard microscope slide and is compatible with most standard upright and inverted microscopes. The photo to the right shows the power sensor flipped over so that the engraved back of the housing can be used for alignment.

This power sensor also has an 8-32 (M4) tap for post mounting. In the photo to the far right, an RA90 is used with two Ø1/2" posts to mount the sensor head in a horizontal orientation.

S170C in a Microscope Slide Holder



S170C Mounted on a Post



The S170C may be post mounted via the 8-32 (M4) tap in the side of the housing.

Integrating Sphere Photodiode Sensor Mounting Options

Thorlabs' Integrating Sphere Photodiode Sensor provides a low loss cavity for diverging, non-uniform, or off-axis beam measurements. These integrating spheres are ideal for all fiber based applications due to the beam divergence at the end of the fiber.

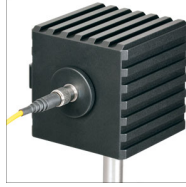
Shown to the right is an S140C Integrating Sphere with S120-FC Fiber Adapter. Also shown is an S140C with a S140-BFA Bare Fiber Adapter. The Bare Fiber adapter features a mounting clamp and light shield to decrease interference from ambient light.

Compact Fiber Photodiode Sensor Mounting Options

Thorlabs' Compact Fiber Photodiodes are the ideal choice for a portable, fiber coupled power meter. The S15xC sensors are compatible with a wide variety of fiber connections. PM20-xx adapters are available to couple FC, PC, SC, LC, SMA, and ST connectors with the sensors. Shown to the right is a S150C Sensor with FC and SMA connector adapters.

Shown to the far right is a PM200 console with S150C sensor connected to a FC connectorized optical fiber. This setup is ideal for portable in the lab and in the field use.

S140C and S120-FC Fiber Adapter



S140C and S140-BFA Fiber Adapter



PM100D with S150C Sensor



S150C Sensor with FC and SMA connectors



Pyroelectric Energy Sensor Mounting Options

Thorlabs' Pyroelectric Energy Sensors are ideal for measuring pulsed sources. These pyroelectric sensors provide direct energy readings for those sources. The sensors are designed to handle medium to high energy pulses from Excimer, YAG, and other high power lasers.

Mounting options include post (with insulating adapter) and cage configurations, shown to the right.

ES220C mounted on 30 mm Cage Rods



SOFTWARE

Compatible Power Meters

- PM100A Analog Power and Energy Meter Console
- PM100D Digital Power and Energy Meter Console
- PM100USB USB Interface Digital Power Meter
- PM200 Touchscreen Power and Energy Meter Console
- PM400 Capacitive Touchscreen Power and Energy Meter Console
- PM160, PM160T, and PM160T-HP Wireless Handheld Power Meters with Bluetooth® Technology
- PM16 Series Compact USB Power Meters

The Optical Power Monitor software is not compatible with the PM320E Benchtop Power Meter.

Optical Power Monitor

The Optical Power Monitor GUI software features power measurement, readout from up to eight power meters, and remote wireless operation.

For details on specific software features, please see the user manual, which can be downloaded here.

Users interested in the legacy Power Meter Software can find it by visiting the software page here.



Optical Power Monitor GUI Software for Touchscreen, Handheld, and USB-Interface Power Meters

Features

- Operate up to Eight Power Meters Simultaneously
- Record and Analyze Measurements in Real Time
- Intuitive Analog Display and Graphing Modes
- Configurable Long-Term Data Logging
- Compatible with USB and Bluetooth® Connections

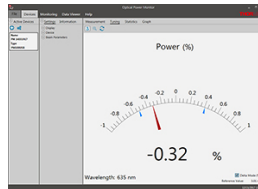
The Optical Power Monitor software GUI enables seamless control of up to eight power meters that are connected via USB or Bluetooth® wireless technology^a. The latest software, firmware, drivers, and utilities for these power meters can be downloaded here.

Multiple data measurement and analysis functions are integrated into the GUI package. The interface offers a user-friendly design with minimal use of color and low brightness that is ideal use in dark lab environments while wearing laser safety glasses. Measured data can be displayed in real time as a simulated analog needle, digital values, line graph, or bar graph. Continuously logged and short-term measurements can be recorded for data viewing and analysis at a later point. A built-in statistics mode analyzes measured data and continuously updates to reflect new measurements within the pre-determined measurement period.

The Optical Power Monitor software package installs the GUI, which then can be used to control the touchscreen, handheld, or USB-interface power meters. Firmware updates for supported power meters are also available. Programming examples and drivers for interfacing with our power and energy meter consoles using LabVIEW, Visual C++, Visual C#, and Visual Basic are installed with the software; refer to the manual for details.

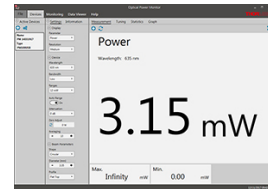
Please note that the Optical Power Monitor Software uses different drivers than the Power Meter Utilities Software and Thorlabs recommends using the new driver TLPM.dll. For users who wish to use the legacy Power Meter Software or use custom software designed using the older PM100D.dll driver, a Power Meter Driver Switcher program is included for easy swapping of the installed driver between the two versions.

a. The PM160, PM160T, and PM160T-HP power meters are equipped with Bluetooth® connections.



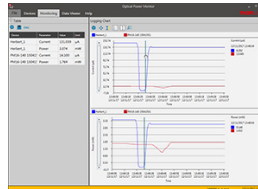
Click to Enlarge

Tuning Mode: Simulated analog needle and digital measurement value provided. Delta Mode, enabled above, shows the fluctuation range during the measurement period.



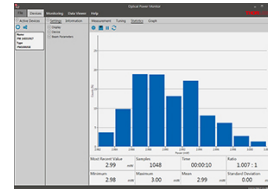
Click to Enlarge

Measurement Mode: Set up and configure up to eight power meters.



Click to Enlarge

Data Logging: Enable long-term measurement and simultaneous recording from up to eight power meters. Save data as .csv files for later processing while measurement results are displayed in a graph in real time.



Click to Enlarge

Statistics Mode: Calculate numerical statistics for a pre-determined measurement period. The panel displays the analyzed values in a bar graph and the results as numerical values.

SENSOR SELECTION

This tab outlines the full selection of Thorlabs' Power and Energy Sensors. Our photodiode and thermal sensors are compatible with all of Thorlabs' current line of power meter consoles, while our pyroelectric sensors are compatible with all of our current power meter consoles except for the PM100A Analog Power Meter Console. In addition to the power and energy sensors listed below, Thorlabs also offers all-in-one, wireless, handheld power meters and compact USB power meter interfaces that contain either a photodiode or a thermal sensor, as well as power meter bundles that include a console, sensor head, and post mounting accessories.



Click to Enlarge
The PM160 wireless power meter, shown here with an iPad mini (not included), can be remotely operated using Apple mobile devices.

Thorlabs offers three types of sensors:

- **Photodiode Sensors:** These sensors are designed for power measurements of monochromatic or near-monochromatic sources, as they have a wavelength dependent responsivity. These sensors deliver a current that depends on the input optical power and the wavelength. The current is fed into a transimpedance amplifier, which outputs a voltage proportional to the input current.
- **Thermal Sensors:** Constructed from material with a relatively flat response function across a wide range of wavelengths, these thermopile sensors are suitable for power measurements of broadband sources such as LEDs and SLDs. Thermal sensors deliver a voltage proportional to the input optical power.
- **Pyroelectric Energy Sensors:** Our pyroelectric sensors produce an output voltage through the pyroelectric effect and are suitable for measuring pulsed sources, with a repetition rate limited by the time constant of the detector. These sensors will output a peak voltage proportional to the incident pulse energy.

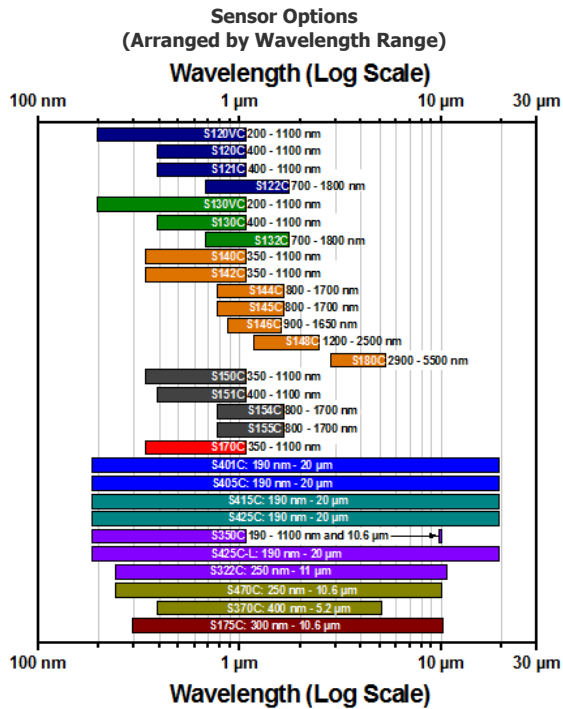
Power and Energy Sensor Selection Guide

There are two options for comparing the specifications of our Power and Energy Sensors. The expandable table below sorts our sensors by type (e.g., photodiode, thermal, or pyroelectric) and provides key specifications.

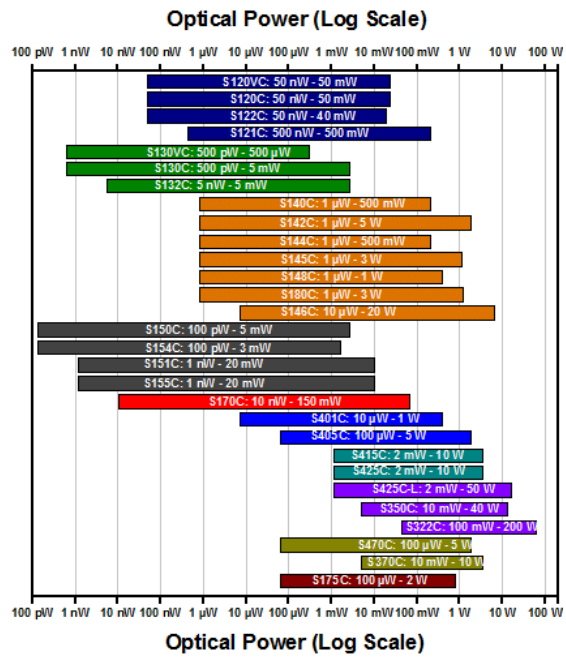
Alternatively, the selection guide graphic further below arranges our entire selection of photodiode and thermal power sensors by wavelength (left) or optical power range (right). Each box contains the item # and specified range of the sensor. These graphs allow for easy identification of the sensor heads available for a specific wavelength or power range.

Photodiode Power Sensors	More [+]
Thermal Power Sensors	More [+]
Pyroelectric Power Sensors (Not Compatible with PM100A)	More [+]

- The response time of the photodiode sensor. The actual response time of a power meter using these sensors will be limited by the update rate of your power meter console.
- Typical natural response time (0 - 95%). Our power consoles can provide estimated measurements of optical power on an accelerated time scale (typically <1 s) when the natural response time is approximately 1 s or greater. As the natural response times of the S415C, S425C, and S425C-L are fast, these do not benefit from accelerated measurements and this function cannot be enabled. For more information, see the *Operation* tab here.
- With intermittent use: maximum exposure time of 20 minutes for the S401C, otherwise maximum exposure time is 2 minutes.
- All pyroelectric sensors have a 20 ms thermal time constant, τ . This value indicates how long it takes the sensor to recover from a single pulse. To detect the correct energy levels, pulses must be shorter than 0.1τ and the repetition rate of your source must be well below $1/\tau$.



**Sensor Options
(Arranged by Power Range)**



Photodiode Sensors		Thermal Sensors	
■	Standard	■	High Resolution
■	Slim	■	Max Power: 5 W to 10 W
■	Integrating Sphere	■	Max Power: 40 W to 200 W
■	Fiber Coupled	■	High Max Power Density
■	Microscope Slide	■	Microscope Slide







CONSOLE SELECTION

Thorlabs offers a wide selection of power and energy meter consoles, ranging from the touch screen PM400 to the analog PM100A. Key specifications of all of our power meter consoles are presented below to help you decide which device is best for your application. We also offer self-contained wireless power meters.

When used with our C-series sensors, Thorlabs' power meter consoles recognize the type of connected sensor and measure the current or voltage as appropriate. Our C-series sensors have responsivity calibration data stored in their connectors. The console will read out the responsivity value for the user-entered wavelength and calculate a power or energy reading.

- Photodiode sensors deliver a current that depends on the input optical power and the wavelength. The current is fed into a transimpedance amplifier, which outputs a voltage proportional to the input current. The photodiode's responsivity is wavelength dependent, so the correct wavelength must be entered into the console for an accurate power reading. The console reads out the responsivity for this wavelength from the connected sensor and calculates the optical power from the measured photocurrent.
- Thermal sensors deliver a voltage proportional to the input optical power. Based on the measured sensor output voltage and the sensor's responsivity, the console will calculate the incident optical power.
- Energy sensors are based on the pyroelectric effect. They deliver a voltage peak proportional to the pulse energy. If an energy sensor is recognized, the console will use a peak voltage detector and the pulse energy will be calculated from the sensor's responsivity.

The sensors are also capable of displaying the current or voltage delivered by the sensor. Alternatively, a current or voltage equivalent to the measured value is provided at the analog output.

Item #	PM100A	PM100D	PM100USB	PM200	PM400	PM320E
(Click Photo to Enlarge)						
Description	Analog Power Meter Console	Digital Power and Energy Meter Console	USB Power and Energy Meter Interface	Touchscreen Power and Energy Meter Console	Touchscreen Power and Energy Meter Console with Multi-Touch	Dual-Channel Benchtop Power and Energy Meter Console
Compatible Sensors	Photodiode and Thermal	Photodiode, Thermal, and Pyroelectric				
Housing Dimensions (H x W x D)	7.24" x 4.29" x 1.61" (184 mm x 109 mm x 41 mm)	7.09" x 4.13" x 1.50" (180 mm x 105 mm x 38 mm)	3.67" x 2.38" x 1.13" (93.1 mm x 60.4 mm x 28.7 mm)	6.70" x 4.93" x 1.48" (170.2 mm x 125.1 mm x 37.5 mm)	5.35" x 3.78" x 1.16" (136.0 mm x 96.0 mm x 29.5 mm)	4.8" x 8.7" x 12.8" (122 mm x 220 mm x 325 mm)
Channels	1					2
External Temperature Sensor Input (Sensor not Included)	-	-	-	-	Instantaneous Readout and Record Temperature Over Time	-
External Humidity Sensor Input (Sensor not Included)	-	-	-	-	Instantaneous Readout and Record Humidity Over Time	-
GPIO Ports	-	-	-	4, Programmable	4, Programmable	-
Source Spectral Correction	-	-	-	✓	✓	-
Attenuation Correction	-	-	-	✓	✓	-
External Trigger Input	-	-	-	✓	-	✓
Display						
Type	Mechanical Needle and LCD Display with Digital Readout	320 x 240 Pixel Backlit Graphical LCD Display	No Built-In Display Controlled via GUI for PC	Resistive Touchscreen with Color Display	Protected Capacitive Touchscreen with Color Display	240 x 128 Pixels Graphical LCD Display
Dimensions	Digital: 1.9" x 0.5" (48.2 mm x 13.2 mm) Analog: 3.54" x 1.65" (90.0 mm x 42.0 mm)	3.17" x 2.36" (81.4 mm x 61.0 mm)	-	4.65" x 3.48" (118.0 mm x 88.5 mm)	3.7" x 2.1" (95 mm x 54 mm)	3.7" x 2.4" (94.0 mm x 61.0 mm)
Refresh Rate	20 Hz		Dependent on PC and Settings ^a	100 Hz	10 Hz (Numerical) 25 Hz (Analog Simulation)	20 Hz
Measurement Views^b						
Numerical	✓	✓	Requires PC ^c	✓	✓	✓
Mechanical Analog Needle	✓	-	-	-	-	-
Simulated Analog Needle	-	✓	Requires PC ^c	✓	✓	✓

Item #	PM100A	PM100D	PM100USB	PM200	PM400	PM320E
Bar Graph	-	✓	Requires PC ^c	✓	✓	✓
Trend Graph	-	✓	Requires PC ^c	✓	✓	✓
Histogram	-	✓	Requires PC ^c	-	-	✓
Statistics	✓	✓	Requires PC ^c	✓	✓	✓
Memory						
Type	-	SD Card	-	NAND Flash	NAND Flash	-
Size	-	2 GB	-	128 MB	4 GB	-
Power						
Battery	LiPo 3.7 V 1300 mAh		-	LiPo 3.7 V 2600 mAh	LiPo 3.7 V 2600 mAh	-
External	5 VDC via USB or Included AC Adapter		5 VDC via USB	5 VDC via Included Power Supply	5 VDC via USB	Selectable Line Voltage: 100 V, 115 V, 230 V (±10%)

- Up to 300 Hz. The refresh rate is limited by the PC used to operate the PM100USB power meter interface, as it does not have a built in display.
- These are the measurement views built into the unit. All of our power meter consoles except the PM320E can be controlled using the Optical Power Monitor software package. The PM320E has its own software package.
- The PM100USB power meter interface does not have a built-in monitor, so all data must be displayed through a PC running the Optical Power Meter Software.

Touch Screen Power Meter Console

Part Number	Description	Price	Availability
PM200	Touch Screen Power and Energy Meter Console, 5.7" Color LCD	\$1,658.52	Lead Time

Standard Photodiode Power Sensors

- ▶ For General Purpose Optical Power Measurements
- ▶ Integrated Viewing Target for Easy Sensor Alignment
- ▶ Ø9.5 mm Sensor Aperture
- ▶ Sensor, Protective Cap, IR Target, and Thread Adapter Included
- ▶ Fiber Adapters Available Separately (See Table Below)
- ▶ See the Full Web Presentation for More Information



Click to Enlarge
S120C and CP90F Quick-Release Mount

These Standard Photodiode Power Sensors are ideal for metering low power coherent and incoherent sources from the UV to the NIR. Each NIST-Traceable, calibrated sensor features an integrated viewing target for easy alignment, enhanced shielding against electromagnetic interference, an over-temperature-alert device, and a large Ø9.5 mm sensor aperture. The sensors are compatible with 30 mm cage systems, Ø1/2" posts, and SM1 (1.035"-40) lens tubes, and are ideal for free-space and fiber-coupled sources.

Thorlabs offers a recalibration service for these photodiode power sensors, which can be ordered below (see Item # CAL1 for Si sensors and Item # CAL2 for Ge sensors).

Item # ^a	S120VC	S120C	S121C	S122C
Sensor Image (Click the Image to Enlarge)				
Aperture Size	Ø9.5 mm			
Wavelength Range	200 - 1100 nm	400 - 1100 nm	400 - 1100 nm	700 - 1800 nm
Power Range	50 nW - 50 mW		500 nW - 500 mW	50 nW - 40 mW
Detector Type	Si Photodiode (UV Extended)	Si Photodiode		Ge Photodiode
Linearity	±0.5%			
Resolution ^b	1 nW		10 nW	2 nW
Measurement Uncertainty ^c	±3% (440 - 980 nm) ±5% (280 - 439 nm) ±7% (200 - 279 nm, 981 - 1100 nm)	±3% (440 - 980 nm) ±5% (400 - 439 nm) ±7% (981 - 1100 nm)		±5%
Responsivity ^d (Click for Plot)	 Raw Data	 Raw Data	 Raw Data	 Raw Data
Coating/Diffuser	Reflective ND (OD1.5) ^e	Reflective ND (OD1) ^f	Reflective ND (OD2) ^g	Absorptive ND (Schott NG9)
Head Temperature Measurement	NTC Thermistor 4.7 kΩ			
Housing Dimensions	Ø30.5 mm x 12.7 mm			
Cable Length	1.5 m			
Post Mounting ^{e,f,g}	Universal 8-32 / M4 Tap, Post Not Included			
Aperture Thread	External SM1 (1.035"-40)			
Compatible Fiber Adapters	S120-FC, S120-SMA, S120-ST, S120-LC, and S120-SC (Not Included)			
Compatible Consoles	PM400, PM200, PM100D, PM100A, PM100USB, and PM320E			

- For complete specifications, please see the Specs tab here.
- Measured with PM100D console in low bandwidth setting.
- Beam diameter > 1 mm.
- All sensor responsivities are calibrated to a NIST-traceable source with measurements taken in 5 nm intervals.
- For the S120VC, these specifications are valid for devices with serial numbers 1203xxx or higher. Older versions had a reflective ND diffuser (OD1). Additionally, they came with an 8-32 tap and M4 adapter. For additional information, please contact technical support.
- For the S120C, these specifications are valid for devices with serial numbers 1203xxx or higher. Older versions had an absorptive ND diffuser (Schott NG3). Additionally, they came with an 8-32 tap and M4 adapter. For additional information, please contact technical support.
- For the S121C, these specifications are valid for devices with serial numbers 1203xxx or higher. Older versions had an absorptive ND diffuser (Schott NG9). Additionally, they came with an 8-32 tap and M4 adapter. For additional information, please contact technical support.

Part Number	Description	Price	Availability
S120VC	Standard Photodiode Power Sensor, Si, 200 - 1100 nm, 50 mW	\$424.32	Today
S120C	Standard Photodiode Power Sensor, Si, 400 - 1100 nm, 50 mW	\$306.00	Today
S121C	Standard Photodiode Power Sensor, Si, 400 - 1100 nm, 500 mW	\$332.52	Today
S122C	Standard Photodiode Power Sensor, Ge, 700 - 1800 nm, 40 mW	\$610.98	5-8 Days

Slim Photodiode Power Sensors

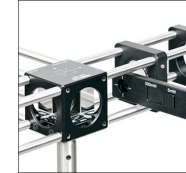
- ▶ For Optical Power Measurements in Confined Spaces
- ▶ Very Slim Design: 5 mm Thin on Sensor Side
- ▶ Ø9.5 mm Sensor Aperture
- ▶ Slideable ND Filter Automatically Changes Sensor Power Range
- ▶ Optional SM1A29 Adapter with VIS/IR Target and External SM1 Threading (More Details)
- ▶ Optional FBSM Mount with VIS/IR Target for FiberBench Systems (More Details)
- ▶ See the Full Web Presentation for More Information



Click for Details [APPLIST]
S130C Photodiode Sensor Mounted in FiberBench System Using FBSM Mount



Click for Details [APPLIST]
SM1A29 SM1 Thread Adapter Mounted on a S130C Sensor



Click to Enlarge [APPLIST]
S130C Sensor in a 30 mm Cage

These Slim Photodiode Power Sensors are designed to take optical source power measurements in locations where space and accessibility are at a premium. The 5 mm thin sensor end can fit between closely spaced optics, cage systems, and other arrangements where standard power meters may not fit. The NIST-Traceable, calibrated sensors also feature a large Ø9.5 mm sensor aperture and slideable neutral density filter for dual power ranges in one compact device.

A separately available SM1A29 adapter can be attached by 2 setscrews to any S130 series power sensor to mount fiber adapters, light shields, filters or any other SM1-threaded (1.035"-40) mechanics or optics. The FBSM Mount allows our S130 series power sensors to be mounted vertically into FiberBench systems for stable mounting with a minimal footprint.

Thorlabs offers a recalibration service for these photodiode power sensors, which can be ordered below (see Item # CAL-S130 for Si sensors and Item # CAL-S132 for Ge sensors).

Item # ^a	S130VC	S130C	S132C
Sensor Image (Click the Image to Enlarge)			
Aperture Size	Ø9.5 mm		
Wavelength Range	200 - 1100 nm	400 - 1100 nm	700 - 1800 nm ^b
Power Range (with Filter)	500 pW - 0.5 mW ^c (Up to 50 mW) ^c	500 pW - 5 mW (Up to 500 mW)	5 nW - 5 mW (Up to 500 mW)
Detector Type	Si Photodiode (UV Extended)	Si Photodiode	Ge Photodiode
Linearity	±0.5%		
Resolution	100 pW ^d		1 nW ^e
Measurement Uncertainty ^f	±3% (440 - 980 nm) ±5% (280 - 439 nm) ±7% (200 - 279 nm, 981 - 1100 nm)	±3% (440 - 980 nm) ±5% (400 - 439 nm) ±7% (981 - 1100 nm)	±5%
Responsivity ^g (Click for Plot)	 Raw Data	 Raw Data	 Raw Data
Coating/Diffuser	Reflective ND (OD1.5) ^c	Reflective ND (OD2) ^h	Absorptive ND (Schott NG9/KG3) ^b
Housing Dimensions	150 mm x 19 mm x 10 mm; 5 mm Thickness on Sensor Side		
Cable Length	1.5 m		
Post Mounting	8-32 and M4 Taps		
Adapters (Not Included)	SM1A29: Add SM1 Thread and Viewing Target to Aperture Fiber Adapters Compatible with SM1A29 Adapter: S120-FC, S120-SMA, S120-ST, S120-LC, and S120-SC FBSM: Integrate Sensor into FiberBench Setups		
Compatible Consoles	PM400, PM200, PM100D, PM100USB, PM100A, and PM320E		

- For complete specifications, please see the Specs tab here.
- For the S132C, these specifications are valid for devices with serial numbers 1203xxx or higher. Older versions had a reflective ND diffuser (OD1), which would decrease the wavelength range from 700 nm to 1800 nm to 1200 nm to 1800 nm. For additional information, please contact technical support.
- For the S130VC, these specifications are valid for devices with serial numbers 1203xxx or higher. Older versions had an optical power range of 5 nW to 5 mW (50 nW to 50 mW with filter) and a reflective ND diffuser (OD1). For additional information, please contact technical support.
- Measured with PM100D console in low bandwidth setting, without filter.
- Measured with PM100D console in low bandwidth setting at 1550 nm, without filter.
- Beam Diameter > 1 mm.
- All sensor responsivities are calibrated to a NIST-traceable source with measurements taken in 5 nm intervals.
- For the S130C, these specifications are valid for devices with serial numbers 1203xxx or higher. Older versions had an absorptive ND diffuser (Schott NG9). For additional information, please contact technical support.

Part Number	Description	Price	Availability
S130VC	Slim Photodiode Power Sensor, Si, 200 - 1100 nm, 50 mW	\$616.08	Today
S130C	Slim Photodiode Power Sensor, Si, 400 - 1100 nm, 500 mW	\$508.98	Today
S132C	Slim Photodiode Power Sensor, Ge, 700 - 1800 nm, 500 mW	\$723.18	5-8 Days
SM1A29	Customer Inspired! SM1 Thread Adapter for Slim Photodiode Sensors	\$42.08	5-8 Days

FBSM	FiberBench Mount for Slim Photodiode Sensors	\$41.82	Today
------	--	---------	-------

Microscope Slide Photodiode Power Sensor

- ▶ Wavelength Range: 350 nm to 1100 nm
- ▶ Sensitive to Optical Powers from 10 nW to 150 mW
- ▶ Designed to Measure Optical Power at the Sample Plane of a Microscope
- ▶ Silicon Photodiode with Large 18 mm x 18 mm Active Area
- ▶ Sensor Housing Dimensions: 76.0 mm x 25.2 mm x 5.0 mm
- ▶ Index Matching Gel Utilized in Design to Prevent Internal Reflections
- ▶ Information Stored in Connector
 - Sensor Data
 - NIST- and PTB-Traceable Calibration Data
- ▶ Post Mountable via 8-32 (M4) Tap



The S170C Microscope Slide Power Sensor Head is a silicon photodiode sensor designed to measure the power at the sample in microscopy setups. The silicon photodiode can detect wavelengths between 350 nm and 1100 nm at optical powers between 10 nW and 150 mW. The sensor head's 76.0 mm x 25.2 mm footprint matches that of a standard microscope slide and is compatible with most standard upright and inverted microscopes.

The photodiode has an 18 mm x 18 mm active area and is contained in a sealed housing behind a neutral density (ND) filter with OD 1.5. A 20 mm x 20 mm indentation around the surface of the ND filter is sized to accept standard microscope cover slips. An immersion medium (water, glycerol, oil) may be placed in this well directly over the ND filter, or a cover slip may be inserted first to simplify clean up. The gap between the photodiode and the neutral density filter has been filled with an index matching gel in order to prevent internal reflections from causing significant measurement errors when using high NA objectives with oil or water.

The bottom of the sensor housing features a laser-engraved grid to aid in aligning and focusing the beam. In standard microscopes, this grid can be used for beam alignment before flipping the sensor head to face the objective for power measurements. In inverted microscopes, turn on the transmitted illuminator to align the grid on the detector housing with the beam, thereby centering the sensor in front of the objective. Alternatively, the diffusive surface of the ND filter can be used as a focusing plane.

Sensor specifications and the NIST- and PTB-traceable calibration data are stored in non-volatile memory in the sensor connector and can be read out by the latest generation of Thorlabs power meters. We recommend yearly recalibration to ensure accuracy and performance. Calibration may be ordered using the CAL1 recalibration service available below. Please contact technical support for more information.

Thorlabs also offers a Microscope Slide Sensor Head with a thermal sensor; for complete specifications, the full presentation can be found here.

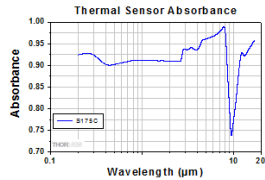
Item # ^a	S170C
Sensor Image (Click Image to Enlarge)	
Overall Dimensions	76.0 mm x 25.2 mm x 5.0 mm (2.99" x 0.99" x 0.20")
Active Detector Area	18 mm x 18 mm
Input Aperture	20 mm x 20 mm
Wavelength Range	350 - 1100 nm
Optical Power Working Range	10 nW - 150 mW
Detector Type	Silicon Photodiode
Linearity	±0.5%
Resolution ^b	1 nW
Calibration Uncertainty ^c	±3% (440 - 980 nm) ±5% (350 - 439 nm) ±7% (981 - 1100 nm)
Responsivity ^d (Click for Plot)	 Raw Data
Neutral Density Filter	Reflective (OD 1.5)
Cable Length	1.5 m
Post Mounting	Universal 8-32 / M4 Tap, Post Not Included
Compatible Consoles	PM400, PM200, PM100D, PM100USB, PM100A, and PM320E

- For complete specifications, please see the *Specs* tab here.
- Measured with PM100D console in low bandwidth setting.
- Beam diameter > 1 mm.
- All sensor responsivities are calibrated to a NIST-traceable source with measurements taken in 5 nm intervals.

Part Number	Description	Price	Availability
S170C	Customer Inspired! Microscope Slide Power Sensor, 350 - 1100 nm, 150 mW	\$1,137.30	Today

Microscope Slide Thermal Power Sensor

- ▶ Wavelength Range: 300 nm - 10.6 μm
- ▶ Sensitive to Optical Powers from 100 μW to 2 W
- ▶ Designed to Measure Optical Power in the Sample Plane of a Microscope
- ▶ Thermal Sensor with 18 mm x 18 mm Active Area
- ▶ 76.0 mm x 25.2 mm Footprint Matches Standard Microscope Slides
- ▶ Information Stored in Connector
 - ▶ Sensor Data
 - ▶ NIST- and PTB-Traceable Calibration Data
- ▶ See the Full Web Presentation for More Information



Click to Enlarge
 Typical absorption curve for the S175C (glass and absorber). Note that this curve is representative, and the actual absorption across the spectrum will vary from unit to unit.



Click to Enlarge
 The back of the S175C housing is engraved with the sensor specifications and a target for centering the beam on the sensor.

The S175C Microscope Slide Thermal Power Sensor Head is designed to measure the power at the sample in microscopy setups. The thermal sensor can detect wavelengths between 300 nm and 10.6 μm at optical powers between 100 μW and 2 W. The sensor head's 76.0 mm x 25.2 mm footprint matches that of a standard microscope slide and is compatible with most standard upright and inverted microscopes.

The thermal sensor has an 18 mm x 18 mm active area and is contained in a sealed housing behind a glass cover. An immersion medium (water, glycerol, oil) may be placed over the glass cover plate.

As seen in the image to the right, the bottom of the sensor housing features a laser-engraved target to aid in aligning and focusing the beam. In standard microscopes, the target can be used for beam alignment before flipping the sensor head to face the objective for power measurements. In inverted microscopes, turn on the trans-illumination lamp and align the target on the detector housing with the beam; this will center the sensor in front of the objective.

Sensor specifications and the NIST- and PTB-traceable calibration data are stored in non-volatile memory in the sensor connector and can be read out by the latest generation of Thorlabs power meters. We recommend yearly recalibration to ensure accuracy and performance. Calibration may be ordered using the CAL-S200 recalibration service available below. Please contact technical support for more information.

Thorlabs also offers a Microscope Slide Sensor Head with a photodiode sensor for low-power, high-resolution measurements; the full presentation may be found here.

Item # ^a	S175C
Sensor Image (Click Image to Enlarge)	
Active Detector Area	18 mm x 18 mm
Wavelength Range	0.3 - 10.6 μm
Power Range	100 μW - 2 W
Detector Type	Thermal Surface Absorber (Thermopile)
Linearity	±0.5%
Resolution ^b	10 μW
Measurement Uncertainty ^c	±3% @ 1064 nm; ±5% @ 300 nm - 10.6 μm
Response Time	3 s (<2 s from 0 to 90%)
Housing Dimensions	76 mm x 25.2 mm x 4.8 mm (2.99" x 0.99" x 0.19")
Cable Length	1.5 m
Housing Features	Integrated Glass Cover Engraved Laser Target on Back
Post Mounting	N/A
Cage Mounting	N/A
Aperture Thread	N/A
Compatible Consoles	PM400, PM200, PM100D, PM100USB, PM100A, and PM320E

- For complete specifications, please see the Specs tab here.
- Measured with PM200 Touch Screen Console
- Beam Diameter: >1 mm

Part Number	Description	Price	Availability
S175C	Customer Inspired! Microscope Slide Thermal Power Sensor, 300 nm - 10.6 μm, 2 W	\$1,137.30	Today

Integrating Sphere Photodiode Power Sensors

- ▶ For Measurements Independent of Beam Shape and Entrance Angle
- ▶ Integrating Sphere Design Acts as a Diffuser with Minimal Power Loss
- ▶ Ø5 mm, Ø7 mm, or Ø12 mm Input Aperture
- ▶ Removable S120-FC Fiber Adapter (FC/PC and FC/APC) Included
- ▶ Compatible Fiber Adapters for Terminated and Bare Fiber (See Table Below)
- ▶ See the Full Web Presentation for More Information



Click to Enlarge
S142C with the S120-FC Fiber Adapter (Included)



Click to Enlarge
S142C and S140-BFA Bare Fiber Adapter (Sold Separately)

These Integrating Sphere Photodiode Power Sensors are the ideal choice for power measurements independent of beam uniformity, divergence angle, beam shape, or entrance angle, making them excellent for use with fiber sources and off-axis free space sources.

Our integrating spheres are designed for wavelength ranges from the visible through the NIR. Sensor heads for use between 350 and 2500 nm use a single Ø1" or Ø2" sphere made from Zenith® PTFE and feature a black housing to minimize reflected light around the entrance aperture. These sensors use either a silicon photodiode for detection in the 350 - 1100 nm range or an InGaAs photodiode for detection in the 800 - 1700 nm, 900 - 1650 nm, or 1200 - 2500 nm wavelength range.

The S180C integrating sphere for 2.9 - 5.5 µm uses two connected, gold-plated Ø20 mm spheres, with an entrance port in the first sphere and a port for the MCT (HgCdTe) detector located in the second sphere. Compared to single-sphere designs, the two-sphere configuration improves device sensitivity by minimizing the internal sphere surface area while still effectively shielding the detector from direct illumination. This design reduces the effect of input angle, divergence, and beam shape on the measurement result by effectively shielding the photodiode without the use of a baffle or other shielding mechanism.

The integrating spheres below feature large Ø5 mm, Ø7 mm, or Ø12 mm apertures, externally SM1-threaded (1.035"-40) front connections, enhanced shielding against electromagnetic interference, and an over-temperature alert sensor. Because of the large active detector areas of these sensors, the included S120-FC fiber adapter can be used with FC/PC- or FC/APC-terminated fiber. The externally SM1-threaded adapter can be removed using a size 1 screwdriver to place components closer to the window. NIST-traceable data is stored in the sensor connector.

Thorlabs offers a recalibration service for these photodiode power sensors, which can be ordered below. See Item # CAL1 for the S140C and S142C Si sensors; Item # CAL2 for the S144C, S145C, and S146C InGaAs sensors; and Item # CAL4 for the S148C InGaAs sensor or S180C MCT sensor.

Item # ^a	S140C	S142C	S144C	S145C	S146C	S148C	S
Sensor Image (Click the Image to Enlarge)							
Aperture	Ø5 mm	Ø12 mm	Ø5 mm	Ø12 mm		Ø5 mm	Ø
Wavelength Range	350 - 1100 nm		800 - 1700 nm		900 - 1650 nm	1200 - 2500 nm	2.9 µm
Power Range	1 µW - 500 mW	1 µW - 5 W	1 µW - 500 mW	1 µW - 3 W	10 µW - 20 W	1 µW - 1 W	1 µ
Detector Type	Si Photodiode			InGaAs Photodiode			MCT Pho
Linearity	±0.5%						
Resolution^b	1 nW				10 nW	1 nW	1
Measurement Uncertainty^c	±3% (440 - 980 nm) ±5% (350 - 439 nm) ±7% (981 - 1100 nm)			±5%			
Responsivity^d (Click for Plot)							Ra
Integrating Sphere Material (Size)	Zenith® PTFE (Ø1")	Zenith® PTFE (Ø2")	Zenith® PTFE (Ø1")	Zenith® PTFE (Ø2")		Zenith® PTFE (Ø1")	Gold (Two Ø20)
Head Temperature Measurement	NTC Thermistor 4.7 kΩ						
Housing Dimensions	Ø45 mm x 30.5 mm	70 mm x 74 mm x 70 mm	Ø45 mm x 30.5 mm	70 mm x 74 mm x 70 mm		Ø45 mm x 30.5 mm	59.0 mm 28
Cable Length	1.5 m						
Post Mounting	8-32 and M4 Taps						
Aperture Thread	Included Adapter with SM1 (1.035"-40) External Thread						
Compatible Fiber Adapters	S120-FC (Included) S120-SMA, S120-ST, S120-SC, S120-LC, and S140-BFA Bare Fiber Adapter (Not Included)						
Compatible Consoles	PM400, PM200, PM100D, PM100USB, PM100A, and PM320E						

- For complete specifications, please see the Specs tab here.
- Measured with PM100D console in low bandwidth setting.
- Beam diameter > 1 mm
- All sensor responsivities are calibrated to a NIST-traceable source with measurements taken in 5 nm intervals except for the S180C. See the S180C responsivity graph to see the NIST-traceable reference points.

Part Number	Description	Price	Availability
S140C	Integrating Sphere Photodiode Power Sensor, Si, 350 - 1100 nm, 500 mW	\$702.78	Today
S142C	Integrating Sphere Photodiode Power Sensor, Si, 350 - 1100 nm, 5 W	\$975.12	5-8 Days
S144C	Integrating Sphere Photodiode Power Sensor, InGaAs, 800 - 1700 nm, 500 mW	\$825.18	Today
S145C	Integrating Sphere Photodiode Power Sensor, InGaAs, 800 - 1700 nm, 3 W	\$1,012.86	5-8 Days

S146C	Integrating Sphere Photodiode Power Sensor, InGaAs, 900 - 1650 nm, 20 W	\$1,012.86	Today
S148C	Customer Inspired! Integrating Sphere Photodiode Power Sensor, InGaAs, 1200 - 2500 nm, 1 W	\$847.62	Today
S180C	Integrating Sphere Photodiode Power Sensor, MCT (HgCdTe), 2.9 - 5.5 μm, 3 W	\$3,685.26	Today

Fiber Photodiode Power Sensors

- ▶ For Fiber-Based Optical Power Measurements
- ▶ Compact Sensor Integrated into the Connector
- ▶ Integrated Design for use in the Field and Lab
- ▶ Includes PM20-FC Fiber Adapter
 - S150C and S151C Sensors also Include PM20-SMA Adapters
 - Compatible LC/PC, SC/PC, and ST Fiber Adapters Also Available (See Table Below)
- ▶ See the Full Web Presentation for More Information



Click to Enlarge
PM100D with S150C Sensor
and FC Cable

The S15xC Compact Fiber Photodiode Power Sensor is designed to take power measurements from a wide variety of fiber coupled sources. The compact sensor, integrated into the power meter connector, features a unique integrated design housing the photodiode sensor, fiber coupling, and NIST-traceable data. Standard FC (and SMA - S150C and S151C) connectors are easily interchanged with a variety of standard fiber connectors.



Thorlabs offers a recalibration service for these photodiode power sensors, which can be ordered below (see Item # CAL1 for Si sensors and Item # CAL2 for InGaAs sensors).

Item # ^a	S150C	S151C	S154C	S155C
Sensor Image (Click the Image to Enlarge)				
Included Connectors	FC ^b & SMA		FC ^b	
Wavelength Range	350 - 1100 nm	400 - 1100 nm	800 - 1700 nm	
Power Range	100 pW to 5 mW (-70 dBm to +7 dBm)	1 nW to 20 mW (-60 dBm to +13 dBm)	100 pW to 3 mW (-70 dBm to +5 dBm)	1 nW to 20 mW (-60 dBm to +13 dBm)
Detector Type	Si Photodiode		InGaAs Photodiode	
Linearity	±0.5%			
Resolution ^c	10 pW (-80 dBm)	100 pW (-70 dBm)	10 pW (-80 dBm)	100 pW (-70 dBm)
Measurement Uncertainty ^d	±3% (440 - 980 nm) ±5% (350 - 439 nm) ±7% (981 - 1100 nm)	±3% (440 - 980 nm) ±5% (400 - 439 nm) ±7% (981 - 1100 nm)	±5%	
Responsivity ^f (Click for Details)				
Coating/Diffuser	N/A	Absorptive ND (Schott NG3)	N/A	
Head Temperature Measurement ^e	NTC Thermistor 3 kΩ			
Aperture Thread	External SM05 (0.535"-40)			
Fiber Adapters	Included: PM20-FC and PM20-SMA Optional: PM20-LC, PM20-SC, and PM20-ST		Included: PM20-FC Optional: PM20-LC, PM20-SC, PM20-ST, and PM20-SMA	
Compatible Consoles	PM400, PM200, PM100D, PM100USB, PM100A, and PM320E			

- For complete specifications, please see the Specs tab here.
- Because of the large active detector area of these sensors, the included PM20-FC fiber adapter can be used with both FC/PC- and FC/APC-connectorized fiber.
- Measured with PM100D console in low bandwidth setting.
- For a beam diameter > 1 mm incident on the active area of the detector (i.e. at the detector surface after the light has exited the fiber and passed through any internal optics).
- This specification is valid for devices with serial numbers 1203xxx and higher. For older versions, please contact technical support.
- All sensor responsivities are calibrated to a NIST-traceable source with measurements taken in 5 nm intervals.

Part Number	Description	Price	Availability
S150C	Compact Fiber Photodiode Power Sensor, Si, 350 - 1100 nm, 5 mW	\$306.00	5-8 Days
S151C	Compact Fiber Photodiode Power Sensor, Si, 400 - 1100 nm, 20 mW	\$348.84	Today
S154C	Compact Fiber Photodiode Power Sensor, InGaAs, 800 - 1700 nm, 3 mW	\$439.62	Today
S155C	Compact Fiber Photodiode Power Sensor, InGaAs, 800 - 1700 nm, 20 mW	\$503.88	Today

High-Resolution Thermal Power Sensors

Item # ^a	S401C	S405C
Sensor Image (Click the Image to Enlarge)		
Wavelength Range	190 nm - 20 μm	190 nm - 20 μm
Optical Power Range	10 μW - 1 W (3 W ^b)	100 μW - 5 W
Input Aperture Size	Ø10 mm	Ø10 mm
Active Detector Area	10 mm x 10 mm	10 mm x 10 mm
Max Optical Power Density	500 W/cm ² (Avg.)	1.5 kW/cm ² (Avg.)
Detector Type	Thermal Surface Absorber (Thermopile) with Background Compensation	Thermal Surface Absorber (Thermopile)
Linearity	±0.5%	±0.5%
Resolution^c	1 μW	5 μW
Measurement Uncertainty^d	±3% @ 1064 nm ±5% @ 190 nm - 10.6 μm	±3% @ 1064 nm ±5% @ 250 nm - 17 μm
Response Time^e	1.1 s	1.1 s
Cooling	Convection (Passive)	
Housing Dimensions (Without Adapter)	33.0 mm x 43.0 mm x 15.0 mm (1.30" x 1.69" x 0.59")	40.6 mm x 40.6 mm x 16.0 mm (1.60" x 1.60" x 0.63")
Temperature Sensor (In Sensor Head)	NTC Thermistor	NTC Thermistor
Cable Length	1.5 m	
Post Mounting	Universal 8-32 / M4 Taps (Post Not Included)	Universal 8-32 / M4 Taps (Post Not Included)
30 mm Cage Mounting	-	Two 4-40 Tapped Holes & Two Ø6 mm Through Holes
Aperture Threads	-	Internal SM05
Accessories	Externally SM1-Threaded Adapter Light Shield with Internal SM05 Threading	Externally SM1-Threaded Adapter
Compatible Consoles	PM400, PM200, PM100D, PM100A, PM100USB, and PM320E	

- ▶ High Resolution of 1 μW or 5 μW
- ▶ S401C and S405C Have Thermistors Used to Monitor Temperature of Sensor Head
- ▶ S401C: Background Compensation for Low-Drift Measurements
- ▶ S405C: Accommodates Average Optical Power Densities up to 1.5 kW/cm²
- ▶ See the Full Web Presentation for More Information

Thorlabs offers two broadband thermal power sensors designed to measure low optical power sources with high resolution. Each thermal sensor's broadband



Click to Enlarge S401C Thermal Sensor with Included Light Shield

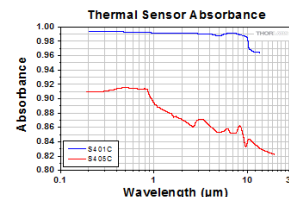
coating has a flat spectral response over a wide wavelength range, as shown in the plot below. An aperture size of Ø10 mm allows for easy alignment and measurement of large-spot-size laser sources. For easy integration with Thorlabs' lens tube systems and SM1-threaded (1.035"-40) fiber adapters, each sensor has either external SM1 threading or includes an externally SM1-threaded adapter.

The S401C uses active thermal background compensation to provide low-drift power measurements. This is implemented through the use of two similar sensor circuits. One sensor circuit is the type all thermal power sensors share: it measures heat flow from light absorber to heat sink. The other sensor circuit monitors the ambient temperature. It is located within the housing and measures heat flow from heat sink towards the absorber. The measurements of the two sensor circuits are subtracted, which minimizes the effect of thermal drift on the laser power measurement. (For information about how the external thermal disturbances can affect thermal power sensor readings, see the *Operation* tab.) The broadband coating used on this thermal sensor offers high absorption at wavelengths between 0.19 and 20 μm (shown in the graph), which makes the sensor ideal for use with aligning and measuring Mid-IR Quantum Cascade Lasers (QCLs). The included, internally SM05-threaded (0.535"-40) light shield is shown in the photo to the right.

The S405C has internal SM05 (0.535"-40) threading that is directly compatible with SM05 lens tubes, and it can also connect directly to Thorlabs' 30 mm Cage Systems.

Thorlabs offers a recalibration service for these sensors, which can be ordered below (see Item # CAL-S200).

- For complete specifications, please see the *Specs* tab.
- For conditions of intermittent use, with a maximum exposure time of 20 minutes for the S401C. The S405C saturates for optical input powers >5 W.
- Measurement taken with the PM200 console for the S401C and the PM400 console for the S405C. In all cases, the acceleration circuit was switched off. Resolution performance will be similar with our other power meter consoles.
- Defined as the measurement uncertainty during calibration at the specified wavelengths for a beam diameter > 1 mm. The ±3% specification was determined by laser calibration, and the ±5% specification was determined through spectral calibration, in which values were interpolated using the laser calibration data and the absorption curve for the absorber. Calibration can be performed at 10.6 μm upon request.
- Typical natural response time (0 - 95%). Our power consoles can provide estimated measurements of optical power on an accelerated time scale (typically <1 s). See the *Operation* tab for additional information.



Click to Enlarge

The S405 shares the same absorption curve with the S415C, S425C, and S245C-L. (All are sold below.)

Part Number	Description	Price	Availability
S401C	Thermal Power Sensor Head, Surface Absorber, 0.19 - 20 μm, 1 W, Ø10 mm	\$740.52	5-8 Days

S405C	Thermal Power Sensor Head, Surface Absorber, 0.19 - 20 μm , 5 W, \varnothing 10 mm	\$704.00	Today
-------	---	----------	-------

Thermal Sensors for Max Powers of 10 W

Item # ^a	S415C	S425C
Sensor Image (Click Image to Enlarge)		
Wavelength Range	190 nm - 20 μm	190 nm - 20 μm
Optical Power Range	2 mW - 10 W (20 W ^b)	2 mW - 10 W (20 W ^b)
Input Aperture Size	\varnothing 15 mm	\varnothing 25.4 mm
Active Detector Area	\varnothing 15 mm	\varnothing 27 mm
Max Optical Power Density	1.5 kW/cm ² (Avg.)	1.5 kW/cm ² (Avg.)
Detector Type	Thermal Surface Absorber (Thermopile)	
Linearity	\pm 0.5%	\pm 0.5%
Resolution ^c	100 μW	100 μW
Measurement Uncertainty ^d	\pm 3% @ 1064 nm \pm 5% @ 250 nm - 17 μm	\pm 3% @ 1064 nm \pm 5% @ 250 nm - 17 μm
Response Time ^e	0.6 s	0.6 s
Cooling	Convection (Passive)	
Housing Dimensions (Without Adapter)	50.8 mm x 50.8 mm x 35.0 mm (2.00" x 2.00" x 1.38")	50.8 mm x 50.8 mm x 35.0 mm (2.00" x 2.00" x 1.38")
Temperature Sensor (In Sensor Head)	NTC Thermistor	
Cable Length	1.5 m	
Post Mounting	Universal 8-32 / M4 Taps (Post Not Included)	Universal 8-32 / M4 Taps (Post Not Included)
30 mm Cage Mounting	-	-
Aperture Threads	Internal SM1	Internal SM1
Removable Heatsink	Yes	Yes
Accessories	Externally SM1-Threaded Adapter	Externally SM1-Threaded Adapter
Compatible Consoles	PM400, PM200, PM100D, PM100USB, PM100A, and PM320E	

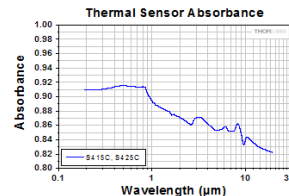
- ▶ 100 μW Optical Power Resolution
- ▶ Thermistors Used to Monitor Temperature of Sensor Head
- ▶ Removable Heat Sinks Included
- ▶ See the Full Web Presentation for More Information

These thermal power sensors are designed for general broadband power measurements of low and medium power light sources. All include an externally SM1-threaded (1.035"-40) adapter, with threading concentric with the input aperture. The adapters are useful for mounting \varnothing 1" Lens Tubes and Fiber Adapters (available below). The apertures of the S415C and S425C have internal SM1 threading.

These sensors operate with fast (<0.6 s) natural response times, and their removable heat sinks provide a high degree of flexibility to those interested in integrating them into custom setups or replacing the included heat sink with one that is water or fan cooled. If replacing the heat sink, please note that the replacement must provide heat dissipation adequate for the application.

Thorlabs offers a recalibration service for these sensors, which can be ordered below (see Item # CAL-S200).

- For complete specifications, please see the *Specs* tab.
- Two Minute Maximum Exposure Time
- Measurement taken with the PM400 with the acceleration circuit switched off. Resolution performance will be similar with our other power meter consoles.
- Defined as the measurement uncertainty during calibration at the specified wavelengths for a beam diameter > 1 mm. The \pm 3% specification was determined by laser calibration, and the \pm 5% specification was determined through spectral calibration, in which values were interpolated using the laser calibration data and the absorption curve for the absorber. Calibration can be performed at 10.6 μm upon request.
- Typical natural response time (0 - 95%). Our power consoles can provide estimated measurements of optical power on an accelerated time scale (typically <1 s). As the natural response times of the S415C and S425C are fast, these do not benefit from accelerated measurements and this function cannot be enabled. See the *Operation* tab for additional information.



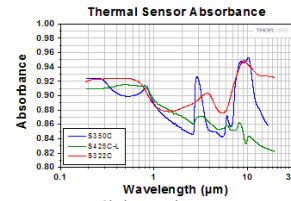
Click to Enlarge

The absorption curves of each of the thermal power sensors designed for use with low and medium power optical sources.

Part Number	Description	Price	Availability
S415C	Thermal Power Sensor Head, Surface Absorber, 0.19 - 20 μm , 10 W, \varnothing 15 mm	\$726.00	5-8 Days
S425C	Thermal Power Sensor Head, Surface Absorber, 0.19 - 20 μm , 10 W, \varnothing 25.4 mm	\$792.00	5-8 Days

Thermal Sensors for Max Powers from 40 W to 200 W

- ▶ Thermistors Used to Monitor Temperature of Sensor Head
- ▶ S322C Has 4-40 Taps for Use with Our 30 mm Cage Systems
- ▶ S350C Has Ø40 mm Aperture Well Suited to Excimer and Other Lasers with Large Spot Sizes
- ▶ S425C-L Features Removable Heat Sink
- ▶ S322C is Fan Cooled with an Optical Power Range up to 200 W
- ▶ See the Full Web Presentation for More Information



Click to Enlarge
The absorbance curves of each of the thermal power sensors designed for use with low and medium power optical sources.

These thermal power sensors are designed for general broadband power measurements of low and medium power light sources. With the exception of the S350C, all include an adapter with external SM1 (1.035"-40) threading concentric with the input aperture. This allows the sensors to be integrated into existing Ø1" lens tube systems in addition to being compatible with fiber adapters (available below). The aperture of the S425C-L has internal SM1 threading.

The S425C-L operates with a fast (<0.6 s) natural response time and has a removable heat sink, which provides a high degree of flexibility to those interested in integrating them into custom setups or replacing the included heat sink with one that is water or fan cooled. If replacing the heat sink, please note that the replacement must provide heat dissipation adequate for the application.

Thorlabs offers a recalibration service for these sensors, which can be ordered below (see Item # CAL-S200).



Item # ^a	S350C	S425C-L	S322C
Sensor Image (Click Image to Enlarge)			
Wavelength Range	190 nm- 1.1 µm, 10.6 µm	190 nm - 20 µm	250 nm - 11 µm
Optical Power Range	10 mW - 40 W (60 W ^b)	2 mW - 50 W (75 W ^b)	100 mW - 200 W (250 W ^b)
Input Aperture Size	Ø40 mm	Ø25.4 mm	Ø25 mm
Active Detector Area	Ø40 mm	Ø27 mm	Ø25 mm
Max Optical Power Density	2 kW/cm ² (Avg.)	1.5 kW/cm ² (Avg.)	4 kW/cm ² (Avg., CO ₂)
Detector Type	Thermal Surface Absorber (Thermopile)		
Linearity	±1%	±0.5%	±1%
Resolution^c	1 mW	100 µW	5 mW
Measurement Uncertainty^d	±3% @ 351 nm ±5% @ 190 nm - 1100 nm	±3% @ 1064 nm ±5% @ 250 nm - 17 µm	±3% @ 1064 nm ±5% @ 266 nm - 1064 nm
Response Time^e	9 s (1 s from 0 to 90%)	0.6 s	5 s (1 s from 0 to 90%)
Cooling	Convection (Passive)		Forced Air with Fan ^f
Housing Dimensions (Without Adapter, if Applicable)	100 mm x 100 mm x 54.2 mm (3.94" x 3.94" x 2.13")	100.0 mm x 100.0 mm x 58.0 mm (3.94" x 3.94" x 2.28")	100 mm x 100 mm x 86.7 mm (3.94" x 3.94" x 3.41")
Temperature Sensor (In Sensor Head)	NTC Thermistor		
Cable Length	1.5 m		
Post Mounting	M6 Threaded Taps, Includes Ø1/2" Post, 75 mm Long	Universal 8-32 / M4 Taps (Post Not Included)	M6 Threaded Taps, Includes Ø1/2" Post, 75 mm Long
30 mm Cage Mounting	-	-	Four 4-40 Tapped Holes
Aperture Threads	-	Internal SM1	-
Removable Heatsink	-	Yes	-
Accessories	-	Externally SM1-Threaded Adapter	Externally SM1-Threaded Adapter
Compatible Consoles	PM400, PM200, PM100D, PM100USB, PM100A, and PM320E		

- For complete specifications, please see the Specs tab.
- Two Minute Maximum Exposure Time
- Measurement taken with the PM100D console, except for the S425C-L in which the PM400 was used. In all cases, the acceleration circuit was switched off. Resolution performance will be similar with our other power meter consoles.
- Defined as the measurement uncertainty during calibration at the specified wavelengths for a beam diameter > 1 mm. The ±3% specification was determined by laser calibration, and the ±5% specification was determined through spectral calibration, in which values were interpolated using the laser calibration data and the absorption curve for the absorber. Calibration can be performed at 10.6 µm upon request.
- Typical natural response time (0 - 95%). Our power consoles can provide estimated measurements of optical power on an accelerated time scale (typically <1 s) for the S350C and S322C. As the natural response time of the S425C-L is fast, the S425C-L does not benefit from acceleration and this function cannot be enabled. See the *Operation* tab for additional information.
- 12 VDC power supply is included.

Part Number	Description	Price	Availability
-------------	-------------	-------	--------------

S350C	Thermal Power Sensor Head, Surface Absorber, 0.19 - 1.1 μm and 10.6 μm , 40 W, \varnothing 40 mm	\$1,095.48	Today
S425C-L	Thermal Power Sensor Head, Surface Absorber, 0.19 - 20 μm , 50 W, \varnothing 25.4 mm	\$858.00	Lead Time
S322C	Thermal Power Sensor Head, Surface Absorber, 0.25 - 11 μm , 200 W, \varnothing 25 mm, Fan Cooled	\$1,356.60	Today

Thermal Sensors for High Max Power Density Laser Pulses

Item # ^a	S370C	S470C
Sensor Image (Click the Image to Enlarge)		
Wavelength Range	400 nm - 5.2 μm	250 nm - 10.6 μm
Optical Power Range	10 mW - 10 W (15 W ^b)	100 μW - 5 W (Pulsed and CW)
Input Aperture Size	Ø25 mm	Ø15 mm
Active Detector Area	Ø25 mm	Ø16 mm
Max Optical Power Density	35 W/cm ² (Avg.); 100 GW/cm ² (Peak)	
Detector Type	Thermal Volume Absorber (Thermopile)	
Linearity	±1%	±0.5%
Resolution ^c	250 μW	10 μW
Measurement Uncertainty ^d	±3% @ 1064 nm ±5% @ 400 nm - 1064 nm	±3% @ 1064 nm ±5% @ 250 nm - 10.6 μm
Response Time ^e	45 s (3 s from 0 to 90%)	6.5 s (<2 s from 0 to 90%)
Cooling	Convection (Passive)	
Housing Dimensions (Without Adapter, if Applicable)	75 mm x 75 mm x 51.2 mm (2.95" x 2.95" x 2.02")	45.0 mm x 45.0 mm x 18.0 mm (1.77" x 1.77" x 0.71")
Temperature Sensor (In Sensor Head)	N/A	N/A
Cable Length	1.5 m	
Post Mounting	M6 Threaded Taps, Includes Ø1/2" Post, 75 mm Long	Universal 8-32 / M4 Tap (Post Not Included)
30 mm Cage Mounting	Four 4-40 Tapped Holes	-
Aperture Threads	-	External SM1
Accessories	Externally SM1-Threaded Adapter	-
Compatible Consoles	PM400, PM200, PM100D, PM100A, PM100USB, and PM320E	

- ▶ Designed for Optical Power Measurements of Nd:YAG Lasers
- ▶ Ideal for Applications with High Peak Pulse Powers
- ▶ S370C: Ø25 mm Aperture for Large-Spot-Size Beams
- ▶ S470C: High-Sensitivity for High-Peak-Power Pulses with Low Average Power
- ▶ See the Full Web Presentation for More Information

The S370C and S470C Thermal Sensors are designed to measure short and highly energetic laser pulses. All of these units are post-mountable for free-space applications and feature NIST-traceable data stored in the sensor connector.

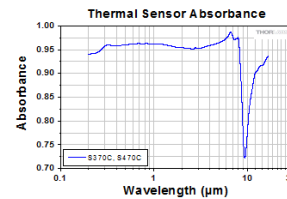
These thermal power sensors are unique in that they have thermal volume absorbers, where our other thermal power sensors have thermal surface absorbers. The volume absorber consists of a Schott glass filter. Incident pulses are absorbed and the heat is distributed throughout the volume. In this way, pulses that would have damaged the absorption coating of a thermal surface absorber are safely measured by these thermal volume absorbers.

The S370C features a large Ø25 mm aperture ideal for large-spot-size beams, and it is compatible with average powers from 10 mW to 10 W (CW).

In comparison, the S470C is faster, as the glass absorber volume is reduced and other design parameters have been optimized for speed. This results in a different optical power range, with the ability to measure powers down to 100 μW. The Ø15 mm aperture of the S470C is smaller, and it has a lower max average power of 5 W. Its 10 μW resolution is better than the 250 μW resolution of the S370C.

Thorlabs offers a recalibration service for these sensors, which can be ordered below (see Item # CAL-S200).

- For complete specifications, please see the *Specs* tab.
- Two Minute Maximum Exposure Time
- Measurement taken with the PM100D console for the S370C and with the PM200 for the S470C. In all cases, the acceleration circuit was switched off. Resolution performance will be similar with our other power meter consoles.
- Defined as the measurement uncertainty during calibration at the specified wavelengths for a beam diameter > 1 mm. The ±3% specification was determined by laser calibration, and the ±5% specification was determined through spectral calibration, in which values were interpolated using the laser calibration data and the absorption curve for the absorber. Calibration can be performed at 10.6 μm upon request.
- Typical natural response time (0 - 95%). Our power consoles can provide estimated measurements of optical power on an accelerated time scale (typically <2 s). See the *Operation* tab for additional information.



Click to Enlarge
This absorption curve is shown over a broader wavelength range than the sensors' operating ranges. See the table for the operating wavelength range of each sensor.

Part Number	Description	Price	Availability
S370C	Thermal Power Sensor Head, Volume Absorber, 0.4 - 5.2 μm, 10 W, Ø25 mm	\$1,137.30	Today
S470C	Thermal Power Sensor Head, Volume Absorber, 0.25 - 10.6 μm, 0.1mW - 5W, Ø15 mm	\$1,157.70	Lead Time

Pyroelectric Energy Sensors

- ▶ For General Purpose and High Energy Optical Pulse Measurements
- ▶ Black Broadband Coating with Flat Response Over a Wide Wavelength Range
- ▶ Ceramic Coating with High Damage Thresholds for High-Energy-Density Lasers
- ▶ Sensor Areas from Ø11 mm to Ø45 mm
- ▶ BNC Connector for Oscilloscope Use
- ▶ C-Series Connector Adapter for Use with Compatible Thorlabs Consoles (See Table Below)
- ▶ See the Full Web Presentation for More Information



Click to Enlarge
ES220C Sensor
Mounted in a 30 mm
Cage System

These Pyroelectric Sensors are designed to measure pulsed coherent and incoherent sources. Pyroelectric sensors are not suited for CW measurements, as they convert energy from light pulses into voltage pulses. A black broadband or ceramic coating is used for low or high power measurements, respectively. Large sensor areas from Ø11 mm - Ø45 mm allow easy alignment. The energy sensors features BNC connectors for use with an oscilloscope, as well as standard power meter connectors which contain NIST and PTB-traceable calibration data.

Thorlabs offers a recalibration service for these energy sensors, which can be ordered below (see Item # CAL-S200).

Item # ^a	ES111C	ES120C	ES145C	ES220C	ES245C
Sensor Image (Click the Image to Enlarge)					
Aperture Size	Ø11 mm	Ø20 mm	Ø45 mm	Ø20 mm	Ø45 mm
Wavelength Range	0.185 - 25 µm				
Energy Range	10 µJ - 150 mJ	100 µJ - 500 mJ	500 µJ - 2 J	500 µJ - 3 J	1 mJ - 15 J
Detector Type	Pyroelectric Energy Sensor with Black Broadband Coating			Pyroelectric Energy Sensor with Ceramic Coating	
Resolution	100 nJ	1 µJ	1 µJ	25 µJ	50 µJ
Linearity	±1%				
Measurement Uncertainty	±5% @ 0.185 - 25 µm				
Housing Dimensions	Ø36 mm x 16 mm	Ø50 mm x 18 mm	Ø75 mm x 21 mm	Ø50 mm x 18 mm	Ø75 mm x 21 mm
Cable Length	1.5 m				
Post Mounting	8-32 Mounting Thread, 8-32 and M4 Insulating Adapters Included				
Cage Mounting	N/A	Four 4-40 Taps for 30 mm Cage Systems	N/A	Four 4-40 Taps for 30 mm Cage Systems	N/A
Compatible Consoles	PM400, PM200, PM100D, PM100USB, and PM320E				

- For complete specifications, please see the Specs tab here.

Part Number	Description	Price	Availability
ES111C	Pyroelectric Energy Sensor, Broadband Coating, 0.185 - 25 µm, 150 mJ	\$1,293.36	Today
ES120C	Pyroelectric Energy Sensor, Broadband Coating, 0.185 - 25 µm, 500 mJ	\$1,346.40	Today
ES145C	Pyroelectric Energy Sensor, Broadband Coating, 0.185 - 25 µm, 2 J	\$1,554.48	Today
ES220C	Pyroelectric Energy Sensor, Ceramic Coating, 0.185 - 25 µm, 3 J	\$1,616.70	Today
ES245C	Pyroelectric Energy Sensor, Ceramic Coating, 0.185 - 25 µm, 15 J	\$1,877.82	Today

Recalibration Service for Photodiode Power Sensors

Thorlabs offers calibration services for our photodiode optical power sensors and consoles. To ensure accurate measurements, we recommend recalibrating the sensors annually. Recalibration of the console is included with the recalibration of a sensor at no additional cost. If you wish to recalibrate only your power meter console, please contact Tech Support for details.

Calibration Service Item #	Compatible Sensors
CAL1	S120VC, S120C, S121C, S170C, S140C, S142C, S150C, S151C
CAL2	S122C, S144C, S145C, S146C, S154C, S155C
CAL-S130	S130VC, S130C
CAL-S132	S132C
CAL4	S148C, S180C

Refer to the table to the right for the appropriate calibration service Item # that corresponds to your power meter sensor. Once the appropriate Item # is selected, enter the Part # and Serial # of the sensor that requires recalibration prior to selecting Add to Cart.

Please

Note: To ensure your item being returned for calibration is routed appropriately once it arrives at our facility, please do not ship it prior to being provided an RMA Number and return instructions by a member of our team.

Part Number	Description	Price	Availability
CAL1	Recalibration Service for Si Power Meter Sensors Except S130 Series	\$143.82	Lead Time
CAL2	Recalibration Service for Ge & InGaAs Power Meter Sensors Except S132 Series and S148C	\$162.18	Lead Time
CAL-S130	Recalibration Service for Si Power Meter Sensors for S130 Series and PM160	\$167.28	Lead Time
CAL-S132	Recalibration Service for Ge Power Meter Sensors for S132 Series only	\$177.48	Lead Time
CAL4	Recalibration Service for MCT and Extended InGaAs Mid-IR Power Sensors (S148C and S180C)	\$289.68	Lead Time

Recalibration Service for Thermal Power and Pyroelectric Energy Sensors

Thorlabs offers recalibration services for our thermal power and pyroelectric energy sensors. To ensure accurate measurements, we recommend recalibrating the sensors annually. Recalibration of the console is included with the recalibration of a sensor at no additional cost. If you wish to recalibrate only your power meter console, please contact Tech Support for details.

Sensor Type	Sensor Item #s
Thermal Power	S175C, S302C ^a , S305C ^a , S310C ^a , S314C ^a , S322C, S350C, S370C, S401C, S405C, S415C, S425C, S425C-L, S470C
Pyroelectric Energy	ES111C, ES120C, ES145C, ES220C, ES245C

- This former catalog item is now offered as a special.

The table to the right lists the sensors for which this calibration service is available. Please enter the Part # and Serial # of the sensor that requires recalibration prior to selecting Add to Cart.

Please

Note: To ensure your item being returned for calibration is routed appropriately once it arrives at our facility, please do not ship it prior to being provided an RMA Number and return instructions by a member of our team.

Part Number	Description	Price	Availability
CAL-S200	Recalibration Service for Thermal Power and Pyroelectric Energy Sensors	\$182.58	Lead Time

Visit the *Touch Screen Handheld Optical Power and Energy Meter Console* page for pricing and availability information:
https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=5386