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PM20C - June 20, 2024

Item # PM20C was discontinued on June 20, 2024. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

FIBER OPTIC POWER METERS WITH INTERNAL SENSOR

- **Wavelength Range: 400 - 1700 nm**
- **Power Range: -60 dBm to 23 dBm**
- **Interchangeable Fiber Connector**

PM20A
Fiber Optic
Power Meter

PM20 Power Meter with
Fiber Adapter Removed

Easy-to-Read Large Digital Display

Additional SM05-Threaded Fiber Adapters Available Separately

PM20-SMA

PM20-ST

PM20-LC

OVERVIEW

Fiber Optic Power Meter Features

- InGaAs (PM20C or PM20CH) or Si (PM20A) Sensors
- Wavelength Range:
  - 400 nm - 1100 nm (Si)
  - 800 nm - 1700 nm (InGaAs)
- Power Ranges:
  - -60 dBm to 16 dBm (1 nW - 40 mW) for PM20A
  - -60 dBm to 13 dBm (1 nW - 20 mW) for PM20C
  - -50 dBm to 23 dBm (10 nW - 200 mW) for PM20CH
- Interchangeable Fiber Connectors:
  - PM20-FC Wide-Key FC/PC Adapter Included
  - FC/APC, SC, ST®, LC, SMA, or Ø2.5 mm Ferrule Adapters Can be Ordered Separately
- Absolute and Relative Measurements Displayed in W, dBm, dB
- NIST-Traceable Wavelength Calibration in 5 nm Steps
- 50 Hours of Operation Between Charges

The PM20 Series of Fiber Optic Power Meters are robust, full-featured, handheld instruments, which together cover the full range of optical fiber applications within the 400 - 1700 nm range with optical powers ranging from -60 dBm to +23 dBm (1 nW - 200 mW). A rugged enclosure, internal sensors, and kickstand make these models ideal for field or lab applications.

Power Meter Selection Guide
Sensors
Photodiode Power Sensors
Thermal Power Sensors
Thermal Position & Power Sensors
Pyroelectric Energy Sensors
Power Meter Consoles
Digital Handheld Console
Analog Handheld Console
Touchscreen Handheld Console
Dual-Channel Benchtop Console
Complete Power Meters
Power Meter Bundles
Wireless Power Meters with Sensors
Compact USB Power Meters
Field Power Meters for Terminated Fibers
USB Interfaces, External Readout

Functionality
Efficient, low-power circuitry provides long battery operation. The alphanumeric 8-digit LCD display allows easy power read-outs. The operation of the device is intuitive due to the clearly labeled key pad. All common features like wavelength setting, relative measurements, power read-out, and auto-shutdown are included.

The PM20 is powered by a built-in rechargeable NiMH battery or by the included AC adapter that also recharges the battery. The unit comes with an FC fiber adapter that works with both FC/PC and FC/APC. Most industry standard fiber adapters (i.e. FC/APC, SMA, SC, ST, FC, and LC) are available for purchase and can be easily installed. The PM20-25 ferrule adapter (sold separately) can be used to directly insert 2.5 mm ferrules without a connector. Please note that we do not recommend removing the FC adapter for free-space applications due to difficulty aligning the beam onto the sensor's 2 mm active area.

Each console comes with the following: the console with built-in sensor, FC fiber adapter (for FC/PC or FC/APC), 12 VDC power supply (PMPS12), Certificate of Calibration, and operating manual.

*ST® is a registered trademark of Lucent Technologies, Inc.

SPECS

Power Meter Item #	PM20A	PM20C	PM20CH
Sensor Specifications			
Optical Power Range	-60 dBm to 16 dBm (1 nW - 40 mW)	-65 dBm to 13 dBm (1 nW - 20 mW)	-50 dBm to 23 dBm (10 nW - 200 mW)
Spectral Range	400 - 1100 nm	800 - 1700 nm	
Detector Type	Silicon	InGaAs	
Sensor Size	3.6 x 3.6 mm	Ø2 mm	
Input Aperture	3.6 x 3.6 mm	Ø2 mm	
Aperture Thread	SM05 Thread (0.535"-40) for Fiber Adapters Fiber Adapter Included for FC Connectors (FC/PC or FC/APC)		
Measurement Uncertainty	±0.25 dB		
Measurement Standard	NIST Traceable		
Optical Damage Threshold	50 W/cm²		
General Console Specifications			
Detector Compatibility	-		
Display Type	Alphanumeric 8-Digits LCD		
Display Format	4 Digit Read Out with Units and Symbols		
Power Units	dBm, dB, nW, µW, mW		
Resolution	14 bit		
Sample Rate	10 Hz		
Dimensions (H x W x D) w/ Holster	125 x 80 x 39 mm (4.9" x 3.1" x 1.5")		
Weight	0.2 kg (0.44 lbs)		
Operating Temperature	5 °C to 40 °C (Non-Condensing)		
Storage Temperature	-20 °C to 70 °C		
Power Management			
Battery Operation	Internal NiMH Battery Pack, 150 mAh, 6 V		
Operating Time	50+ Hours		
Shutdown	Manual, Auto 5 Minutes, or Auto 60 Minutes		
Charger	3-Hour Battery Charger Included		
Charger Power Supply	Input: 90 - 264 VAC, 50 - 60 Hz; Output: 12 VDC @ 0.85 A		

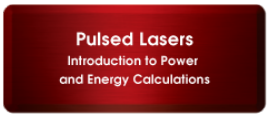
All technical data are valid at 23 ± 5 °C and 45 ± 15% relative humidity (non-condensing).

PULSE CALCULATIONS

Pulsed Laser Emission: Power and Energy Calculations

Determining whether emission from a pulsed laser is compatible with a device or application can require

referencing parameters that are not supplied by the laser's manufacturer. When this is the case, the necessary parameters can typically be calculated from the available information. Calculating peak pulse power, average power, pulse energy, and related parameters can be necessary to achieve desired outcomes including:



Click above to download the full report.

- Protecting biological samples from harm.
- Measuring the pulsed laser emission without damaging photodetectors and other sensors.
- Exciting fluorescence and non-linear effects in materials.

Pulsed laser radiation parameters are illustrated in Figure 1 and described in the table. For quick reference, a list of equations are provided below. The document available for download provides this information, as well as an introduction to pulsed laser emission, an overview of relationships among the different parameters, and guidance for applying the calculations.

Equations:

***Period* and *repetition rate* are reciprocal:** $\Delta t = \frac{1}{f_{rep}}$ and $f_{rep} = \frac{1}{\Delta t}$

***Pulse energy* calculated from *average power*:** $E = \frac{P_{avg}}{f_{rep}} = P_{avg} \cdot \Delta t$

***Average power* calculated from *pulse energy*:** $P_{avg} = \frac{E}{\Delta t} = E \cdot f_{rep}$

***Peak pulse power* estimated from *pulse energy*:** $P_{peak} \approx \frac{E}{\tau}$

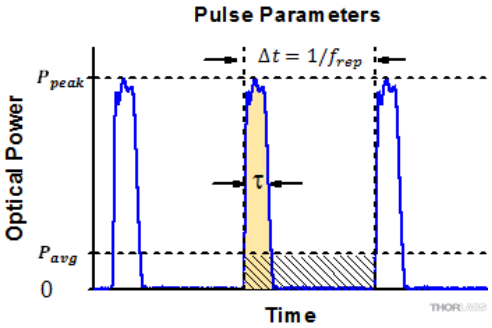
***Peak power* and *average power* calculated from each other:**

$$P_{peak} = \frac{P_{avg}}{f_{rep} \cdot \tau} = \frac{P_{avg} \cdot \Delta t}{\tau} \quad \text{and} \quad P_{avg} = P_{peak} \cdot f_{rep} \cdot \tau = \frac{P_{peak} \cdot \tau}{\Delta t}$$

***Peak power* calculated from *average power* and *duty cycle**:**

$$P_{peak} = \frac{P_{avg}}{\tau/\Delta t} = \frac{P_{avg}}{duty\ cycle}$$

*Duty cycle ($\tau/\Delta t$) is the fraction of time during which there is laser pulse emission.



Click to Enlarge

Figure 1: Parameters used to describe pulsed laser emission are indicated in the plot (above) and described in the table (below). **Pulse energy** (**E**) is the shaded area under the pulse curve. Pulse energy is, equivalently, the area of the diagonally hashed region.

Parameter	Symbol	Units	Description
Pulse Energy	**E**	Joules [J]	A measure of one pulse's total emission, which is the only light emitted by the laser over the entire period. The pulse energy equals the shaded area, which is equivalent to the area covered by diagonal hash marks.
Period	**Δt**	Seconds [s]	The amount of time between the start of one pulse and the start of the next.
Average Power	**P_{avg}**	Watts [W]	The height on the optical power axis, if the energy emitted by the pulse were uniformly spread over the entire period.
Instantaneous Power	**P**	Watts [W]	The optical power at a single, specific point in time.
Peak Power	**P_{peak}**	Watts [W]	The maximum instantaneous optical power output by the laser.
Pulse Width	**τ**	Seconds [s]	A measure of the time between the beginning and end of the pulse, typically based on the full width half maximum (FWHM) of the pulse shape. Also called **pulse duration**.
Repetition Rate	**f_{rep}**	Hertz [Hz]	The frequency with which pulses are emitted. Equal to the reciprocal of the period.

Example Calculation:

Is it safe to use a detector with a specified maximum peak optical input power of **75 mW** to measure the following pulsed laser emission?

- Average Power: 1 mW
- Repetition Rate: 85 MHz
- Pulse Width: 10 fs

The energy per pulse:

$$E = \frac{P_{avg}}{f_{rep}} = \frac{1\ mW}{85\ MHz} = \frac{1\ x\ 10^{-3} W}{85\ x\ 10^{6} Hz} = 1.18\ x\ 10^{-11} J = 11.8\ pJ$$

seems low, but the peak pulse power is:

$$P_{peak} = \frac{P_{avg}}{f_{rep} \cdot \tau} = \frac{1\ mW}{85\ MHz\ \cdot 10\ fs} = 1.18\ x\ 10^{3}\ W = \mathbf{1.18\ kW}$$

It is ***not safe*** to use the detector to measure this pulsed laser emission, since the peak power of the pulses is >5 orders of magnitude higher than the detector's maximum peak optical input power.

Fiber Optic Power Meters with Internal Sensor

Part Number	Description	Price	Availability
PM20A	Fiber Optic Power Meter, 400 nm - 1100 nm, -60 dBm to +16 dBm (1 nW - 40 mW)	$636.72	Today
PM20C	Fiber Optic Power Meter, 800 nm - 1700 nm, -60 dBm to +13 dBm (1 nW - 20 mW)	$761.45	Today
PM20CH	Fiber Optic Power Meter, 800 nm - 1700 nm, -50 to +23 dBm (10 nW - 200 mW)	$774.53	Today

Fiber and Ferrule Adapters for PM20 Power Meters

These adapters are compatible with devices that feature external SM05 threading such as our S15xC Series Fiber Power Meter Sensors, PM160 wireless power meter, and the Fiber Optic Power Meters above. One PM20-FC wide-key FC/PC fiber adapter is included with each of the power meters sold above. For details on narrow versus wide key connectors, please see our Intro to Fiber tutorial.

The PM20-25 ferrule adapter is designed without a locking connector mechanism and accepts fiber patch cables with Ø2.5 mm ferrules for quick power meter measurements.

Item #	PM20-FC2	PM20-FC	PM20-APC2[a]	PM20-APC[a]	PM20-SMA	PM20-ST	PM20-SC	PM20-LC	PM20-25
Adapter Image (Click the Image to Enlarge)									
Connector Type	FC/PC, 2.0 mm Narrow Key	FC/PC, 2.2 mm Wide Key	FC/APC, 2.0 mm Narrow Key	FC/APC, 2.2 mm Wide Key	SMA	ST®[b]/PC	SC/PC[c]	LC/PC	Ø2.5 mm Ferrule
Threading	Internal SM05 (0.535"-40)								

a. The PM20-APC and PM20-APC2 are designed with a 4° mechanical angle to compensate for the refraction angle of the output beam.

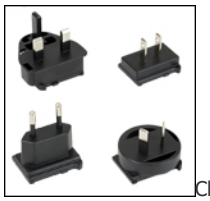
b. ST® is a registered trademark of Lucent Technologies, Inc.

c. In certain angle-independent applications, this adapter may also be used with SC/APC connectors.

Part Number	Description	Price	Availability
PM20-FC2	FC/PC Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads, Narrow Key (2.0 mm)	$37.72	Today
PM20-FC	FC/PC Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads, Wide Key (2.2 mm)	$37.72	7-10 Days
PM20-APC2	FC/APC Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads, Narrow Key (2.0 mm)	$37.27	Today
PM20-APC	Customer Inspired! FC/APC Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads, Wide Key (2.2 mm)	$37.27	Today
PM20-SMA	SMA Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads	$37.72	Today
PM20-ST	ST/PC Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads	$52.28	Today
PM20-SC	SC/PC Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads	$52.28	7-10 Days
PM20-LC	Customer Inspired! LC/PC Fiber Adapter Cap with Internal SM05 (0.535"-40) Threads	$52.28	Today
PM20-25	Customer Inspired! Ø2.5 mm Ferrule Adapter Cap with Internal SM05 (0.535"-40) Threads	$37.72	Today

12 VDC Replacement Power Supply

- Replacement Power Supply for the PM20 Series Power Meters Sold Above
- 12 VDC Power Supply
- 90 - 264 VAC Input Voltage
- Region-Specific Adapters Included
- UL and CE Compliant


Click for Details
Region-Specific Adapters for the PMPS12

The PMPS12 is a 12 VDC power supply with a 1.8 m cable and 5.5 mm outer diameter DC connector. It operates at an input voltage of 90 - 264 VAC, and has a maximum current of 850 mA. This power supply ships with region-specific adapters included, shown in the image to the right.

Part Number	Description	Price	Availability
PMPS12	12 VDC Power Supply for PM20 Series Power Meters	$77.53	Today