



Fiber Optic Power Meter

# PM20 Series Operation Manual



2020

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We aim to develop and produce the best solution for your application in the field of optical measurement technique. To help us to live up to your expectations and constantly improve our products we need your ideas and suggestions. Therefore, please let us know about possible criticism or ideas. We and our international partners are looking forward to hearing from you.

*Thorlabs GmbH*

## **Warning**

Sections marked by this symbol explain dangers that might result in personal injury or death. Always read the associated information carefully, before performing the indicated procedure.

## **Attention**

Paragraphs preceded by this symbol explain hazards that could damage the instrument and the connected equipment or may cause loss of data.

## **Note**

This manual also contains "NOTES" and "HINTS" written in this form.

Please read this advice carefully!

# 1 General Information

The Thorlabs PM20 Fiber-optic Power Meters is an easy to use, robust and flexible fiber-optic power measurement system with built-in optical sensor.

The PM20 Power Meters feature NIST traceable wavelength calibration over the specified wavelength range. Please refer to [www.thorlabs.com](http://www.thorlabs.com)<sup>3</sup> for new accessories that will enhance the PM20 product line.

The instrument is powered by a 6V, 150mAh nickel-metal-hybrid (NiMH) battery for long life operation and fast recharging times. The included external power supply is provided to recharge the battery pack as well as to operate the unit.

## 1.1 Safety

### **Attention**

**All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly as it was designed for.**

**Use only the power supply that is specified for the PM20 Series.**

**The PM20 Series must not be operated in wet, damp or explosion endangered environments!**

**Do not remove covers!**

**Do not open the cabinet, there are no parts serviceable by the operator inside!**

**Refer servicing to qualified personnel!**

**Only with written consent from Thorlabs may changes to single components be made or components not supplied by Thorlabs be used.**

**This precision device is only serviceable if properly packed into the complete original packaging. If necessary, ask for a replacement package prior to return.**

### **Attention**

**The following statement applies to the products covered in this manual, unless otherwise specified herein. The statement for other products will appear in the accompanying documentation.**

**This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment**

in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Thorlabs is not responsible for any radio television interference caused by modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Thorlabs. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

The use of shielded I/O cables is required when connecting this equipment to any and all optional peripheral or host devices. Failure to do so may violate FCC and ICES rules.

### **Attention**

Mobile telephones, cellular phones or other radio transmitters are not to be used within the range of three meters of this unit since the electromagnetic field intensity may then exceed the maximum allowed disturbance values according to IEC 61326-1.

This product has been tested and found to comply with the limits according to IEC 61326-1 for using connection cables shorter than 3 meters (9.8 feet).

## 1.2 Ordering Codes and Accessories

<b>PM20A</b>	Silicon Sensor; size 3.6 x 3.6 mm Power Range -60 dBm to +16 dBm Wavelength Calibration: 400 to 1100 nm
<b>PM20C</b>	InGaAs Sensor, size $\varnothing$ 2mm Power Range: -65 dBm to +13dBm Wavelength Calibration: 800 to 1700 nm
<b>PM20CH</b>	InGaAs Sensor, size $\varnothing$ 2mm Power Range: -50 dBm to +23 dBm Wavelength Calibration: 800 to 1700 nm
<b>PMPS12</b>	Power Supply 90 to 264 V AC line voltage to 12 V DC, 0.85 A with Line Adapters for US, EU, UK
<b>PM20-SC</b>	SC/PC Fiber Adapter Cap with Internal SM05 Thread
<b>PM20-LC</b>	LC/PC Fiber Adapter Cap with Internal SM05 Thread
<b>PM20-SMA</b>	SMA Fiber Adapter Cap with Internal SM05 Thread
<b>PM20-ST</b>	ST/PC Fiber Adapter Cap with Internal SM05 Thread

## 1.3 Parts List

Inspect the shipping container for damage.

If the shipping container seems to be damaged, keep it until you have inspected the contents and you have inspected the PM20 Series mechanically and electrically.

Verify that you have received the following items within the package:

1. **PM20 Series** fiber-optic power meter with FC-PC fiber connector
2. **PMPS12** Power Supply 90 to 264 V AC line voltage to 12 V DC, 0.85 A with Line Adapters for US, EU, UK
3. Operation Manual

If any items are missing or damaged please contact Thorlabs  immediately for return instructions.

## 2 Operating Instruction

### 2.1 Operating Elements

The 8 digit LC Display allows precise 3 digit logarithmic and 4 digit linear power readings along with units and additional system information.



Figure 1: PM20 Series Front Panel

### Operating Keys

#### Power

The power button switches the instrument on and off. After powering up the wavelength set value is displayed for 2 seconds.

#### Auto Shut-Down

Press the **Power** and the **Display** buttons simultaneously to enter the shut-down mode selection. The **Display** button toggles subsequently 5 minutes auto shut-down, 60 minutes auto shut-down and manual shut-down mode. Press the **Power** button twice to confirm the selection.

## Display

The **Display** button sets the power reading to linear or logarithmic representation. If **Zero** is activated (explanation see **Delta** button), the **Display** button toggles between relative value [dBr] and the absolute values in dBm and W.

## Delta

The **Delta** button enables relative power measurements. The first tap on this button shows the currently saved offset level. If no offset level is saved, the display indicates “**NO ZERO**”. A second tap on this button sets the current power reading to zero, with **dBr** unit, and saves the current power value as (new) offset value. The **Display** button now toggles between relative value [dBr] and the absolute values in dBm and W.

## Lambda

The **Lambda** buttons display and set the measurement wavelength.

### Note

For accurate power reading it is mandatory to enter the correct wavelength value, as the optical power is calculated from the wavelength and the appropriate individual sensor responsivity at this wavelength that is stored in the non-volatile memory of the power meter.

Press the up or down button to display the current wavelength setting. Keep an arrow button pressed or toggle it to set a new wavelength.

After releasing the up or down button, the display automatically jumps back to the power reading and the new wavelength is stored and also present after a new power up.

## 2.2 Fiber Connection



*Figure 2: PM20 Series Top Panel*

Fibers with connectors of most available industry standards can be connected to the optical input on top of the PM20 Series. The unit comes with a FC adapter. The threaded fiber adapters are easily changeable; please refer to our website ([https://www.thorlabs.com/newgrouppage9.cfm?objectgroup\\_id=906](https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=906)) for the complete range of available fiber adapters <sup>5</sup>.

## 2.3 Battery Charging

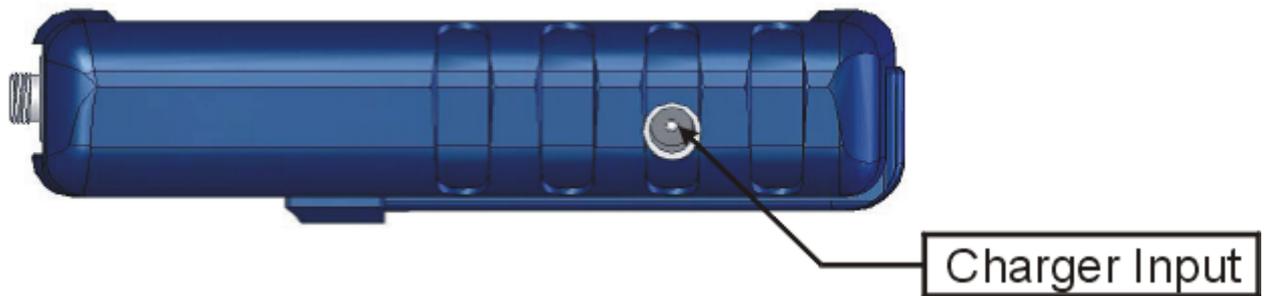


Figure 3: PM20 Series Side Panel

To charge the battery, plug-in the 12 V DC power supply **PMPS** that is delivered with the instrument. The batteries will recharge within 3 hours.

The PM20 Series has a built-in NiMH rechargeable battery for an operation up to 50hrs. When the batteries need recharging, a “**LOW BATT**” warning appears in the display.

The batteries are not fully charged when shipping. A new or not being used for longer time battery does not have its full capacity until after approximately 3 hours of charging.

Plug in the included 12 V DC power supply to the input connector on the side panel and connect the power supply to a suitable AC outlet, using the suitable for your local mains outlet line adapter. Line adapters for the US, Europe and UK are included with the power supply. If the adapter is lost, contact Thorlabs<sup>[15]</sup> for replacement.

“**CHARGING**” in the LC display indicates that the charger works in “full-charge” mode. After when the batteries are fully charged, the charging electronics switches automatically to the “trickle-charge” mode. The charger works independently of the switched ON or OFF state of the PM20 Series.

Do not exceed the line voltage that is stated on the power supply. After an extended operation, the power supply warms up - this is normal and not dangerous.

The PM20 Series can be operated with the 12 V DC adapter plugged in.

### 3 Maintenance and Calibration

Protect the PM20 Series from adverse weather conditions. The PM20 Series is not water resistant.

#### **Attention**

**To avoid damage to the instrument, do not expose it to spray, liquids or solvents!**

**Do not attempt to open the power supply!**

The unit does not need a regular maintenance by the user. It does not contain any modules and/or components that could be repaired by the user himself. If a malfunction occurs, please contact Thorlabs [\[15\]](#) for return instructions.

Do not remove covers!

#### **Cleaning**

To clean the console, use a mild detergent and damp cloth. Do not soak the unit in water or use solvent base cleaners.

#### **Line Voltage**

The **PMPS** power supply of the PM20 Series operates at line voltages of 100 V to 240 V  $\pm$  10% and line frequencies of 50 and 60Hz. Prior to starting operation check that your local supply corresponds to this line voltage range.

#### **Calibration**

PM20 Series optical power meters and sensors are precise instruments that are designed to deliver very accurate measurements and provide useful service over a long period of time. For maintaining this high level of performance, Thorlabs recommends to have the measurement system serviced and recalibrated once a year.

PM20 Series will service and recalibrate the power meter and sensor head for a nominal fee. Please contact Thorlabs [\[15\]](#) to make the appropriate arrangements.

## 4 Appendix

### 4.1 Technical Data

Model	PM20A	PM20C	PM20CH
<b>Sensor Specifications</b>			
Optical Power Range	-60 dBm to +16 dBm	-65 dBm to +13 dBm	-50 dBm to +23 dBm
Spectral Range	400 to 1100 nm	800 to 1700 nm	
Detector Type	Si	InGaAs	InGaAs
Sensor Size	3.6 x 3.6 mm	Ø 2 mm	
Input Aperture	3.6 x 3.6 mm	Ø 2 mm	
Aperture Thread	0.535-40 (SM05 Compatible) for PM20 Fiber Adapters FC Fiber Adapter Included		
Measurement Uncertainty	± 0.25 dB		
Measurement Standard	NIST Traceable		
Optical Damage Threshold	50 W/cm <sup>2</sup>		
<b>General Specifications</b>			
Display Type	Alphanumeric 8-Digits LCD		
Display Format	4 Digit Read Out with Units and Symbols		
Power Units	dBm, dB, nW, µW, mW		
Resolution	14bit		
Sample Rate	10Hz		
Dimensions (H x W x D)	125 x 80 x 39 mm (4.9" x 3.1" x 1.5"), with Holster		
Weight	0.2kg (0.44 lbs)		
Operating Temperature	5 °C - 40 °C <sup>1)</sup>		
Storage Temperature	-20 °C - 70 °C		
<b>Power Management</b>			
Battery Operation	Internal NiMH Battery Pack, 150 mAh, 6 V		
Operating Time	≥ 50 hours		
Shutdown	Manual / Auto 5 minutes / Auto 60 minutes		
Charger	3 hours Battery Charger Included		
Charger Power Supply	In: 90 to 264 V AC, 50 - 60 Hz; Out: 12 V DC @ 0.85 A		
Safety	CE Compliant		

<sup>1)</sup> non-condensing

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

## 4.2 Certifications and Compliances

### *EU Declaration of Conformity*

*in accordance with EN ISO 17050-1:2010*

**We:** Thorlabs GmbH

**Of:** Münchner Weg 1, 85232 Bergkirchen, Deutschland

*in accordance with the following Directive(s):*

2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)

*hereby declare that:*

**Model:** *PM20A, PM20C, PM20CH*

**Equipment:** *Fiber Optic Power Meter*

*is in conformity with the applicable requirements of the following documents:*

EN 61010-1	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use.	2010
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013

*and which, issued under the sole responsibility of Thorlabs, is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:*

*does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive*

*I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.*

**Signed:**



**On:** 20 November 2019

**Name:** Bruno Gross

**Position:** General Manager

EDC - PM20A, PM20C, PM20CH -2019-11-...



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## 4.3 Manufacturer Address

### Manufacturer Address Europe

Thorlabs GmbH  
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Fax: +49-8131-5956-99  
www.thorlabs.de  
Email: europe@thorlabs.com

### EU-Importer Address

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Fax: +49-8131-5956-99  
www.thorlabs.de  
Email: europe@thorlabs.com

## 4.4 Warranty

Thorlabs warrants material and production of the PM20 Series for a period of 24 months starting with the date of shipment. During this warranty period Thorlabs will see to defaults by repair or by exchange if these are entitled to warranty.

For warranty repairs or service the unit must be sent back to Thorlabs. The customer will carry the shipping costs to Thorlabs, in case of warranty repairs Thorlabs will carry the shipping costs back to the customer.

If no warranty repair is applicable the customer also has to carry the costs for back shipment.

In case of shipment from outside EU duties, taxes etc. which should arise have to be carried by the customer.

Thorlabs warrants the hard- and software determined by Thorlabs for this unit to operate fault-free provided that they are handled according to our requirements. However, Thorlabs does not warrant a fault free and uninterrupted operation of the unit, of the software or firmware for special applications nor this instruction manual to be error free. Thorlabs is not liable for consequential damages.

### Restriction of warranty

The warranty mentioned before does not cover errors and defects being the result of improper treatment, software or interface not supplied by us, modification, misuse or operation outside the defined ambient stated by us or unauthorized maintenance.

Further claims will not be consented to and will not be acknowledged. Thorlabs does explicitly not warrant the usability or the economical use for certain cases of application.

Thorlabs reserves the right to change this instruction manual or the technical data of the described unit at any time.

## 4.5 Copyright and Exclusion of Liability

*Thorlabs* has taken every possible care in preparing this document. We however assume no liability for the content, completeness or quality of the information contained therein. The content of this document is regularly updated and adapted to reflect the current status of the hardware and/or software. We furthermore do not guarantee that this product will function without errors, even if the stated specifications are adhered to.

Under no circumstances can we guarantee that a particular objective can be achieved with the purchase of this product.

Insofar as permitted under statutory regulations, we assume no liability for direct damage, indirect damage or damages suffered by third parties resulting from the purchase of this product. In no event shall any liability exceed the purchase price of the product.

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## 4.6 Thorlabs Worldwide Contacts and WEEE policy

For technical support or sales inquiries, please visit us at [www.thorlabs.com/contact](http://www.thorlabs.com/contact) for our most up-to-date contact information.



### USA, Canada, and South America

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### China

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## Thorlabs 'End of Life' Policy (WEEE)

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return “end of life” Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out “wheelie bin” logo (see right), were sold to and are currently owned by a company or institute within the EC, and are not disassembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. “End of life” units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

