

Optical Power and Energy Meter

PM200 Quick Reference



2011



Version: 1.0.0 Date: 29.07.2011

Copyright © 2011 Thorlabs

Contents

F	oreword
1	General Information
	1.1 Safety
2	Installation
	2.1 Parts List
	2.2 Operating Elements
	2.3 Getting Started
3	Operating Instruction
	3.1 Attenuation Correction
	3.2 Wavelength Correction
	3.3 Bandwidth
	3.4 Range Control
	3.5 Measurement Views
	3.5.1 Numeric View
	3.5.1.1 Subpanels
	3.5.2 Needle View
	3.5.3 Graph and Statistics Display
	3.5.4 Calculator
	3.5.5 File Manager
	3.6 Additional Measurement Settings
	3.7 Settings
	3.8 Charging the Battery
4	Computer Interface
5	Appendix
	5.1 Technical Data
	5.2 Certifications and Compliances
	5.3 Warranty
	5.4 Copyright
	5.5 Thorlabs 'End of Life' Policy (WEEE)
	5.6 Listings
	5.6.1 I norlabs Worldwide Contacts

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 improve our products permanently 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



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 preceeded 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 these advices carefully!

1 General Information

The PM200 Handheld Optical Power and Energy Meter is designed to measure the optical power of laser light or other monochromatic or near monochromatic light sources and the energy of pulsed light sources.

The space-saving, battery powered design and compatibility to all Thorlabs "C-Series" Photodiode, Thermal, Pyroelectric sensors, and custom Photodiode, Thermal and Pyroelectric detectors, combined with a fast USB device interface open a wide range of applications in Manufacturing, Quality Control, Quality Assurance, and R&D for stationary and field use.

The provided software, including drivers and applications for LabVIEW and C makes it easy to integrate the instrument in test and measurement systems.

The PM200 can be operated through its auto-detecting position sensor and the rotatable kick-stand in both a bench-top style landscape view and a hand-held style portrait view.

Please refer to the user manual on the data carrier supplied with the unit for detailed function description.

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. The power meter PM200 must not be operated in explosion endangered environments!

All modules, sensors and externally connected devices must only be operated with properly shielded connection cables.

Only with written consent from *Thorlabs* may changes to single components be carried out or components not supplied by *Thorlabs* be used. Do not remove covers!

This precision device is only serviceable if properly packed into the <u>complete</u> original packaging including the plastic foam sleeves. If necessary, ask for a replacement package.

2 Installation

2.1 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 PM200 mechanically and electrically.

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

- 1. PM200 power/energy meter console
- 2. Desktop power supply (5 VDC / 2.4 A)
- 3. Power cord according to local power supply
- 4. USB cable (USB Type A Connector to Mini USB Connector)
- 5. Cable 3.5 mm Audio Connector to Flying Leads for analog output
- 6. Adapter for the auxiliary connector in the top panel
- 7. USB memory stick (Flash Drive 1 GB) with instrument drivers, user application and operation manual
- 8. Quick Reference
- 9. Certificate of Calibration

Optional Accessories

- Environmental Measurement Module (Displays Temperature and Relative Humidity)
- Fiber Inspection Camera Module (Monochrome Fiber Inspection Camera with Power Measurement Capability

2.2 **Operating Elements**



Front Panel

- 1. LED indicators for "Standby" mode and "Charging"
- 2. Touch-pen
- 3. Touch-screen display
- 4. Removable protective silicone rubber boot



Rear Panel

- 5. Four position rotatable and two flap position adjustable stand
- 6. Adaptor for optional fiber inspection camera



Side View

- 7. ON/OFF button
- 8. DC Input (DC 5V/2A)
- 9. USB host (for flash drive and fiber inspection camera)
- 10. Analog Output (0...2V DC)
- 11. Optical head input



Top View

- 12. Auxiliary In/Output (ext. Trigger, 4 x GPIO, 2 x ADC)
- 13. USB Device (PC remote operation)
- 14. Ambient Light Sensor

2.3 Getting Started

For first use, plug in the power supply and allow 4 hours charging the battery. During the charging process the right LED indicator lights up, even when the unit is turned off.

Connect a suitable Thorlabs "C-series" power or energy sensor. The sensors have a self-fixing mechanism. To plug or unplug a sensor slightly press from both sides on the pins in the connector housing. Sensors can be 'hot-swapped' to the console, after recognizing a new valid sensor the type and calibration data will be downloaded to the console in a few seconds and the unit is ready to operate with the new sensor.

Turn on the unit by pressing the power button in the side panel.

After switching on the unit, the touch screen display will come up with a boot screen for about 30 seconds and then jump to the last measurement screen before power down.

3 Operating Instruction

3.1 Attenuation Correction

The attenuation menu can be used to apply an additional, external related correction factor to the power or energy reading (e.g. filter). The handling is similar to the wavelength correction, it is possible to create a list with dedicated attenuation items in dB or loading complete spectral transmission curves in comma separated format.

Note

Attenuation must be entered always as a positive value, e.g., (+)10dB. The software allows to enter negative values as well,but this would be equivalent to an amplification.

Note

If the attenuation curve e.g. of a filter is loaded and selected, it can be easily displayed in the 'Sensor' panel. Comparing the graphics in tab 'curve' with the tab 'eff. curve', the superposition of the sensor's response curve and the filter curve can be seen.

3.2 Wavelength Correction

The PM200 allows the creating and administering of a nearly unlimited number of user wavelengths and spectral curves of light sources that will be used for calculating the spectrally corrected power or energy value.



By clicking to the wavelength value, a drop down list appears with saved wavelength value. The menu item ("**Edit...**") opens the editor panel. The editor panel instantly appears when clicking to the **Wavelength** button:



Wavelength Editor Panel

Left side of the panel

User created wavelength list with scroll arrows. Depending on the connected sensor the list items appear in standard color for a valid value or in red for a value that is out of the sensor wavelength range. The selected wavelength will show in the "edit window".

Right side of the panel

- Wavelength range of the connected sensor.
- Edit Window with selectable units
- Numeric input field.

lcons

- Add item to the list
- Delete item from the list
- ✓ Overwrite item in the list with new value
- Load spectral curve
- Quit editor

A specialty of the PM200 is the possibility to load spectral curves of broadband light sources. These files must be in comma separated format (.csv), can be loaded from the USB drive and will be stored in the user space of the local drive.

3.3 Bandwidth

Depending on the sensor type, the measurement bandwidth can be selected. This can be useful to lower the impact of sensor noise to the measurement result, particularly at low power levels.

3.4 Range Control

Up to 6 current measurement ranges (corresponding to power measurement using photo diode sensors) and 4 voltage measurement ranges (for power measurement using thermal sensors or energy measurement using pyroelectric sensors) can be chosen manually with the \triangle or ∇ buttons near the measurement unit



or by opening a list box when clicking on the measurement range value.



For power measurements an auto-ranging function is available that can be activated by clicking on the **Range** label (toggle function) or via the list box, which appears when clicking on measurement range value.

3.5 Measurement Views

This menu can be reached via the 🍖 button.



The different measurement views can be easily selected after pressing the "views" **button**. For most applications the "numeric 10" and the "needle 14" view will be the best choice for an excellent visible and quickly configurable power or energy readout. The interactive touch areas allow fast access to all settings and the drag and drop box gives up to 6 useful, free configurable extra displays.

From this panel, also graph and statistics measurement panels 14 can be selected. Additionally, the File Manager 17 and the Calculator 16 can be started.

3.5.1 Numeric View



The upper part of the display important measurement settings are displayed.

These settings can be changed either in the Measurement settings menu directly by clicking to the appropriate item.

In the bottom of the display, additional parameters can be displayed (see Subpanels 11)

Precision of the Readout Value

The precision of the power or energy readout can simply be changed by clicking on the power or energy value in the numeric or needle screen. The reading will toggle between 3, 4 or 5 significant digits.

Units of Measure

The units of measure can be selected by clicking on the measurement unit in the numeric or needle display. A list box will open and offer sensor depending choices of the selectable measurement unit in W, dBm, J, A or V.

3.5.1.1 Subpanels

In the numeric display it is possible to configure supplementary displays. Click to

the 🔍 , a choice of available, depending on the connected sensor, subpanels will appear (below shown for a S120C sensor):



Up to 6 subpanels can be enabled by drag and drop to the measurement screen. To remove items, the container needs not to be opened, just pick the item and drag it back to the container.

Frequency

The PM200 can measure and display frequencies of pulsed, modulated or chopped light sources up to 100kHz. The maximum measurable frequency is depending on the sensor type and instrument settings. The measured frequency is displayed in a subpanel.

Alternative Unit

Depending on the sensor type, alternative measurement units are available and can be selected in both the numeric and needle view panels by clicking to the appropriate unit.

Photodiode sensors - they deliver a current, proportional to the incident power, but also wavelength dependent:

- W (nW, µW, mW)
- A (nA, µA, mA)
- dBm (1mW = 0 dBm)

Thermal sensors - they deliver a voltage proportional to the incident power:

- W (nW, µW, mW)
- V (mV)
- dBm (1mW = 0 dBm)

Pyroelectric sensors - they deliver a voltage peak, proportional to the incident pulse energy:

- J (mJ)
- V (mV)

Power / Energy Density

The calculation is based on the beam parameters, entered in Measurement Settings panel (and in the next panel 1):

S120C	Thu Jul 28 2011 11:44:14			0	-	EJ	S
Measurement Settings							
Wavelength:	635nm		Beam parame	ters:	$\overline{\Box}$		
Attenuation:	0dB		5.6		mm		
Units:	W		0.0				
Auto Range:	3.10mW		\otimes	34	.7%		
Line Filter:	50 Hz		Flat-Top	\bigtriangledown			
Bandwidth:	10Hz						
samples							
100							
Interval 0.1s				\sim			

Beam shapes can be selected from a drop-down menu:



To change the beam dimension, click into the numeric field - an editor comes up:



Also, beside the default flat top beam profile, where the power is distributed evenly over the beam area, 2 more typical cases are also considered:



Gaussian: In case, the beam shape has one significant peak, the power density around the peak is much higher than on the periphery. In order to consider that, the calculated average power density value is doubled.

Hotspot: Some lasers have a beam profile shaped like a donut, or 2 or more significant peaks appear in the profile. The power density in these hot spots is much higher than the average across the entire beam diameter. The calculated average power density value is tripled.

Note

Power density is always displayed in W/cm², energy density in J/cm². Density is measured correctly only if the connected sensor is calibrated. In case a customer made sensor is used, please make sure that the correct calibration coefficient is entered.

Min, Max and Ratio

These subpanels show the minimum, maximum value, and the ratio out of both numerically, in addition to the green and red markers on the power bar:

0 20 40 60 80 100 120 140

These values will update permanently. The "Reset Min / Max" **(D** button will reset the displays to zero and restart the measurement sampling.

The ratio value will show "nan" ("No A Number") when a negative reading occurs.

Delta Reference is the reference power value, when the console measures the deviation (Delta measurement)

Actual is the measured value. This display is useful when performing Delta measurements - in this mode the main display shows the deviation from the delta reference value, so in a subpanel the actual power can be displayed.

Sensor temperature: Most of Thorlabs photodiode and thermal sensors are equipped with a NTC Thermistor to control the temperature of the sensor head. To show the sensor temperature, pick the "Sensor Temperature" subpanel and drop it to the main view.

3.5.2 Needle View

In contrast to the numeric view, the needle view offers additionally a needle gauge with min and max indicators. Subpanels are not available.

3.5.3 Graph and Statistics Display

For recording, visualizing and analyzing the measurement data in Watts or Joules over time, the PM200 features a scope view and a statistics analysis with a histogram view. During the record, the data will be stored to an internal temporary file. After the record is finished or has been stopped, the measurement data can be permanently stored to the internal logging drive or the USB drive. The data format is comma separated (.csv) and contains

- measurement value
- time stamp
- additional settings
- sensor information.

The record stopping criteria can be selected to manually, elapsed time or

number of detected samples in the measurement settings page, as well as the interval between two records.

Note

Please note that the temporary file will be overwritten after pressing the start button or when pressing the reset button during record. Some buttons and functions will not be accessible during the record is running. During the record it is possible to quickly swap between the Graph and the Statistic View as in the following screen shots.



Measurement Views Start / Stop Record Save Record Load Record File Info Measurement Settinas Device Settings

Navigation



Graph View

By clicking to the histogram area, the histogram will be displayed in the entire

Statictics View

display area.

3.5.4 Calculator

The calculator can be reached via the Measurement views 10 panel. This tool helps to choose a suitable sensor. Enter the laser type, beam shape and dimensions and laser parameters - the calculator derives beam parameters essential for sensor choice and outputs a list of suitable sensor heads. Below are two examples - for CW and pulsed lasers.

S120C	Wed Jul 1 11:32	3 2011 :02			🚺 🔁 🗉	
Laser			Heads			
CW Beam Shaj	pe	\Box	Sensor Name S121C S130C S140C	Damage Threshold < 5% < 5% < 5%		
Circul	ar	\Box		< 5% < 5% < 5% < 5% < 5% < 5%		
Input Bear	n Parameter		Derived B	eam Paramete	er:	
Diameter [mm]	4.3		Area	14.52	mm²	
Wavelength	635	nm 🗸	Avg.	75.0	mW	
Max Power	75	mW 📿	Power			
	Auto Fill		Density	516.5	mvv/cm ²	

Beam Parameter Calculator for CW Lasers

S120C	Wed Jul 13 11:16:	3 2011 20					
Laser				Heads			
Pulsed Beam Shap	l e	-	\bigtriangledown	Sensor Name S370	Damage Threshold IC < 5%		
Circula	ar		∇				
Input Beam Parameter			Derived	Beam Paramet	ter		
Diameter [mm]	4.3			Area	14.52	mm²	
Wavelength	1550	nm	\Box	Avg. Power	30.0	mW	
Avg. Power	30	mW	∇	Avg. Enerav	375.0	pJ	
Max Energy		J	∇	Power Densitv	206.6	mW/cm ²	
Rep Rate	80	MHz	∇	Peak Power	3.8	kW	
Pulse Width	100	fs	∇	Peak Power	25.8	kW/cm ²	
	Auto Fill			Energy Densitv	2.6	nJ/cm²	

Beam Parameter Calculator for Pulsed Lasers

3.5.5 File Manager

The file manager gives access to the LOCAL system drive, the user space and - if connected - to an external USB flash drive.

The following folders in the local drive are pre-configured and cannot be changed:

- **light-sources**: Tables of spectral curves of broadband light sources that can be loaded to the wavelength list and selected for the wavelength correction of the power or energy readout.
- logging: Administer data records.
- **response-curves**: Tables of spectral response curves for custom detectors.
- **temp**: Temporary file for data logging. This folder contains the latest record file.
- **transmissions**: Tables of transmission curves that can be loaded to the attenuation menu to use for the spectral correction of the power or energy readout.

All files can be copied to and from the USB drive. To remove a custom folder, the folder must be selected (opened). The rename, copy and paste function is only available for files, not for directories.

Note

Above default folders cannot be deleted nor renamed.



File manager

3.6 Additional Measurement Settings

The measurement settings page can beached via the settings page [18] ([4]),

then press 🕰.

There are listed various sensor dependent configuration items:

Common for all sensors:

- wave length correction
- attenuation
- measurement units
- ranging
- line filter for anti-aliasing

Photo diode sensors: bandwidth Pyroelectric sensors: trigger level Thermal Sensors: accelerator (speed-up circuitry) settings

Also, in this panel the following settings can be made:

- Beam characteristic parameters for calculating the power or energy density
- Configuration of the PM200 for customer built sensors
- Long-term logging control

3.7 Settings

To access the settings page press the cog-wheel button 4 in the operating bar. The Settings panel comes up:



Settings page

Measurement 18	Gives an overview about all relevant measurement parameters and beam settings, the logging control parameters and the remote state.		
Application 10	Opens the Measurement Settings and Tools panel		
File Manager	Gives access to the user space on the local drive for administering logging files and user defined correction curves.		
Display Settings	Controls display brightness, display orientation and operation, and display color schemes.		
Language	Sets the dialog language between English, French, German, Spanish, Italian and simplified Chinese.		
Date/Time	Sets the time and date.		
Power Options:	Configures power saving schemes for both battery and mains operation.		
System Info:	Shows system relevant data and triggers the software update via USB stick.		
Sensor Info:	Shows sensor relevant data and the spectral response curve		
To return to the managerement view, prove the arrow button A in the exerction			

To return to the measurement view, press the arrow button <a>() in the operating bar.

3.8 Charging the Battery

The PM200 is powered by a 2 cell LiPo+ battery that needs to be recharged intermittently by plugging the AC adapter. To fully charge the battery it takes approximately 4 hours. A built in charging circuit automatically regulates and terminates the charging.

Note

Charging via the USB cable to a computer might not sufficiently compensate the power consumption of the PM200.

Following battery icons in the display header show the charging state from empty to full battery and line operation



The empty battery symbol starts blinking one minute prior to the automatic shutdown of the PM200..

When an external power supply is connected, the symbols above change sequentially until the battery is fully charged; after then the power cord icon will appear.

4 Computer Interface

The PM200 optical power meter contains a USB 2.0 interface for remote controlling the unit with an external PC. Connect the unit via the Mini-USB connector in the top panel to a free USB port of your PC. When connecting the PM200 first time, a new hardware will be found. For proper installing the PM200 it requires a NI-VISA runtime version on the PC (available on the National Instruments website www.ni.com) or from the data carrier that comes with the instrument. Allow installing and follow the dialog instructions.

The PM200 comes with an utility software that easily enables remote operation of the PM200 (and also PM100D, PM100A and PM100USB) and visualizing and logging measurement data. Perform the setup.exe and follow the installing instructions.

The LabVIEW source code of this application is included on the data carrier as well and can be used to build own applications or to modify the utility program to specific requirements (LabVIEW 8.5.1 or higher required).

5 Appendix

5.1 Technical Data

Features

i editires	
Detector Compatibility	Photodiode Sensors S100C Series Thermal Sensors S300C Series Pyroelectric Sensors ES100C/ES200C Series Photodiodes (Max 5 mA) Thermopiles (Max 1 V) Pyros (Max 100 V)
Display Type	5.7" TFT, 640 x 480 Pixels, 18 bit Color
Viewing Area	118 mm x 88 mm
Display Update Rate (max)	100 Hz
Display Format	Numerical, Bargraph, Trendgraph, Statistics, Simulated Analog Needle
Backlight Display	LED, Adjustable
Features	Rotatable Two Position Kickstand, Removable Rubberboot, Touch-Pen, Fixture for Optional Fiber Inspection Camera
Current Input (Photodiode Sensor	s)
Connector	DB9F, Left Side
Units	W, dBm, W/cm², 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% f.s. (5 μA - 5 mA) ±0.5% f.s. (50 nA)
Bandwidth	DC - 100 kHz, Dependent on Sensor and Settings
Wavelength Correction	nm (A/W)
Beam Area Setting	Diameter 1/e ² or Rectangular x,y
Voltage Input (Thermopile Sensor	s)
Connector	DB9F, Left Side
Units	W, dBm, W/cm², 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 s - 30 s
Wavelength Correction	Sensor Dependent; nm, (V/W)
Beam Area Setting	Diameter 1/e ² or Rectangular x,y

Voltage Input (Pyro Sensors)	
Connector	DB9F, Left Side
Units	J, J/cm², W, W/cm², 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% f.s.
Trigger Threshold	0.1% - 99.9% f.s.
Max. Repetition Rate	3 kHz
Wavelength Correction	Sensor Dependent [nm, V/J]
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
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	
Туре	Speaker 300 Hz - 5 kHz
Function	Laser Tuning Support, Console Function Support
Memory	
Туре	Nand Flash
Size	128 MB
Interfaces	
Туре	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

PM200

Power Connector	Center Hole		
General			
Operating Temperature Range ¹)	0 - 40 °C		
Storage Temperature Range	-40 to 70 °C		
Dimensions (W x H x D)	170 mm x 125 mm x 38 mm		
Weight	0.57 kg		

¹) non-condensing

All technical data are valid at $23 \pm 5^{\circ}$ C and $45 \pm 15^{\circ}$ rel. humidity (non condensing)

Certifications and Compliances 5.2

Category	Standards or description		
EC Declaration of Conformity - EMC	Meets intent of Directive 2004/108/EC ¹) for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:		
EN 61326:2006	EMC requirements for Class A electrical equipment for measurement, control and laboratory use, including Class A Radiated and Conducted Emissions ^{2,3,4}) and Immunity. ^{2,3,4})		
IEC 61000-4-2	Electrostatic Discharge Immunity (Performance criterion B)		
IEC 61000-4-3	Radiated RF Electromagnetic Field Immunity (Performance criterion A)		
IEC 61000-4-4	Electrical Fast Transient / Burst immunity (Performance criterion B)		
FCC EMC Compliance	Emissions comply with the Class A Limits of FCC Code of Federal Regulations 47, Part 15, Subpart B ^{2,3,4}).		
EC Declaration of Conformity - Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 2006/95/EC ⁵)		
EN 61010-1:2001	Safety requirements for electrical equipment for measurement, control and laboratory use.		
UL 61010-1 2 nd ed.	Safety requirements for electrical equipment for measurement, control and laboratory use.		
CAN/CSA C22.2 No. 61010-1 2 nd ed.	Safety requirements for electrical equipment for measurement, control and laboratory use.		
IEC 61010-1:2001	Safety requirements for electrical equipment for measurement, control and laboratory use.		
Equipment Type	Test and measuring		
Safety Class	Class I equipment (as defined in IEC 60950-1:2001)		

Replaces 89/336/EEC
Compliance demonstrated using high-quality shielded interface cables.

³) Emissions, which exceed the levels required by these standards, may occur when this equipment is connected to a test object.

⁴) Minimum Immunity Test requirement.

⁵) Replaces 73/23/EEC, amended by 93/68/EEC.

5.3 Warranty

Thorlabs warrants material and production of the PM200 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.

5.4 Copyright

Thorlabs GmbH has taken every possible care in preparing this Operation Manual. We however assume no liability for the content, completeness or quality of the information contained therein. The content of this manual is regularly updated and adapted to reflect the current status of the 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.

Please note that the content of this User Manual is neither part of any previous or existing agreement, promise, representation or legal relationship, nor an alteration or amendment thereof. All obligations of *Thorlabs GmbH* result from the respective contract of sale, which also includes the complete and exclusively applicable warranty regulations. These contractual warranty regulations are neither extended nor limited by the information contained in this User Manual. Should you require further information on this product, or encounter specific problems that are not discussed in sufficient detail in the User Manual, please contact your local *Thorlabs* dealer or system installer.

All rights reserved. This manual may not be reproduced, transmitted or translated to another language, either as a whole or in parts, without the prior written permission of *Thorlabs GmbH*.

Status: 2011

Copyright © Thorlabs GmbH. All rights reserved.

5.5 Thorlabs 'End of Life' Policy (WEEE)

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return "end of life" units without incurring disposal charges.

This offer is valid for Thorlabs electrical and electronic equipment

- sold after August 13th 2005
- marked correspondingly with the crossed out "wheelie bin" logo (see Figure 58)
- sold to a company or institute within the EC
- currently owned by a company or institute within the EC
- still complete, not disassembled and not contaminated

As the WEEE directive applies to self contained operational electrical and electronic products, this "end of life" take back service does not refer to other Thorlabs products, such as

- pure OEM products, that means assemblies to be built into a unit by the user (e. g. OEM laser driver cards)
- components
- mechanics and optics
- left over parts of units disassembled by the user (PCB's, housings etc.).

Waste treatment on your own responsibility

If you do not return an "end of life" unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

WEEE Number (Germany) : DE97581288

Ecological background

It is well known that waste treatment pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS Directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE Directive is to enforce the recycling of WEEE. A controlled recycling of end-of-life products will thereby avoid negative impacts on the environment.



Crossed out "Wheelie Bin" symbol

5.6 Listings

5.6.1 Thorlabs Worldwide Contacts

USA, Canada, and South America

Thorlabs, Inc. 435 Route 206 Newton, NJ 07860 USA Tel: 973-579-7227 Fax: 973-300-3600 www.thorlabs.com www.thorlabs.us (West Coast) Email: sales@thorlabs.com Support: techsupport@thorlabs.com

Europe

Thorlabs GmbH Hans-Böckler-Str. 6 85221 Dachau Germany Tel: +49-8131-5956-0 Fax: +49-8131-5956-99 www.thorlabs.de Email: europe@thorlabs.com

France

Thorlabs SAS 109, rue des Côtes 78600 Maisons-Laffitte France Tel: +33-970 444 844 Fax: +33-811 381 748 www.thorlabs.com Email: sales.fr@thorlabs.com

Japan

Thorlabs Japan, Inc. Higashi Ikebukuro Q Building 1st Floor 2-23-2 Toshima-ku, Tokyo 170-0013 Japan Tel: +81-3-5979-8889 Fax: +81-3-5979-7285 www.thorlabs.jp Email: sales@thorlabs.jp

UK and Ireland

Thorlabs Ltd. 1 Saint Thomas Place, Ely Cambridgeshire CB7 4EX Great Britain Tel: +44-1353-654440 Fax: +44-1353-654444 www.thorlabs.com Email: sales.uk@thorlabs.com Support: techsupport.uk@thorlabs.com

Scandinavia

Thorlabs Sweden AB Box 141 94 400 20 Göteborg Sweden Tel: +46-31-733-30-00 Fax: +46-31-703-40-45 www.thorlabs.com Email: scandinavia@thorlabs.com

China

Thorlabs China Oasis Middlering Centre 3 Building 712 Room 915 Zhen Bei Road Shanghai China Tel: +86-21-32513486 Fax: +86-21-32513480 www.thorlabs.hk Email: chinasales@thorlabs.com