Operation Manual

Thorlabs Instrumentation

Optical Power Meter System

PM50-3
PM50-10
PM50-30

2006

THORLABS

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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 come up to your expectations and develop 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

☝Attention☝

This manual contains "WARNINGS" and "ATTENTION" label in this form, to indicate danger for persons or possible damage of equipment.

Please read these advises carefully!

NOTE

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

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.

Use only the power cord specified for the unit.

Do not operate the power meter if its panels are removed or any of the interior circuitry is exposed

Do not operate the power meter in wet or damp conditions, or in an explosive atmosphere.

Operate the power meter only within the specified voltage range

Do not apply voltage outside the specified range of the input connections

Do not operate the power meter if there are suspected failures. Refer damaged units to qualified Thorlabs service personnel

☝ Attention ☝

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.

Standard shielding and filtering measures have to be undertaken to avoid interferences with other electronic equipment!

NOTE

Please check prior to operation, if the line voltage range, indicated on the power supply agrees with your local supply

2 Description

The Thorlabs PM50 Power Meter system is an easy to use, flexible optical power measurement system with thermal sensor. Its mechanical analog needle display features best readability and real time response for fast laser tuning. All operating elements are designed for easiest use.
The Thorlabs' thermal power meter sensors feature a broad wavelength range with a flat spectral response from 0.25 to 10.6µm. Please refer to www.thorlabs.com for new sensors that will enhance the PM50 system.

The console 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.

2.1 Parts List – Accessories

The power meter system consists of the following items:

- **PM50** power meter console
- Operation manual
- Power supply (12V, 0.85A), 90 .. 264V line voltage, line adaptor for US, EU, UK.

Depending on the order code the power meter system comes with one of the sensors given below:

PM50-3: S210A – Thermal Power Head; 20mW – 3W; 250nm – 10.6µm
PM50-10: S212A – Thermal Power Head; 20mW – 10W; 250nm – 10.6µm
PM50-30: S213A – Thermal Power Head; 100mW – 30W; 250nm – 10.6µm

When unpacking the PM50 system the first time, please check if all items are present and in good condition. If any items are missing or damaged please advise Thorlabs immediately for issuing a Returned Material Authorization (RMA) for this instrument.

2.2 Operating Elements

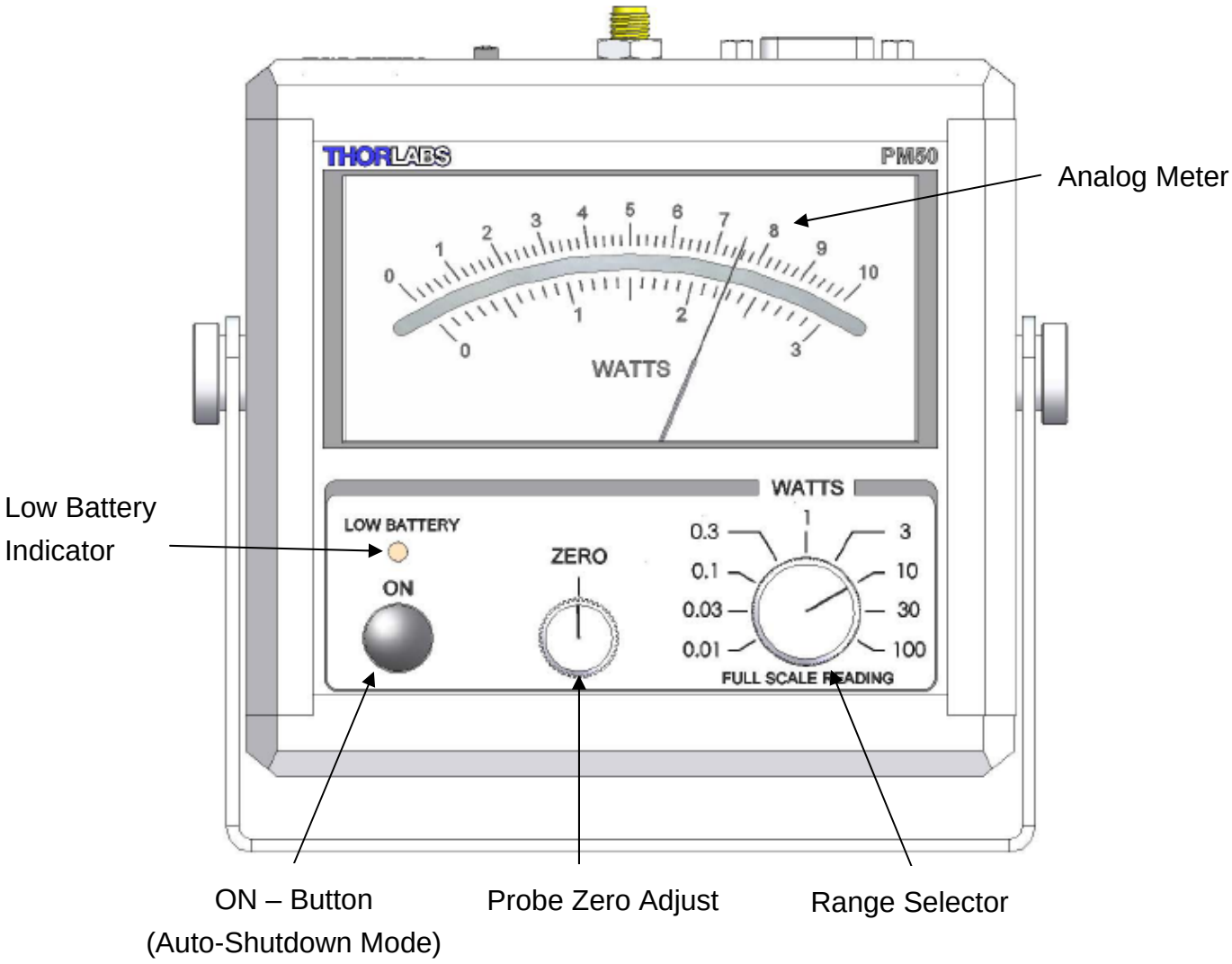


Figure 1 PM50 Front Panel

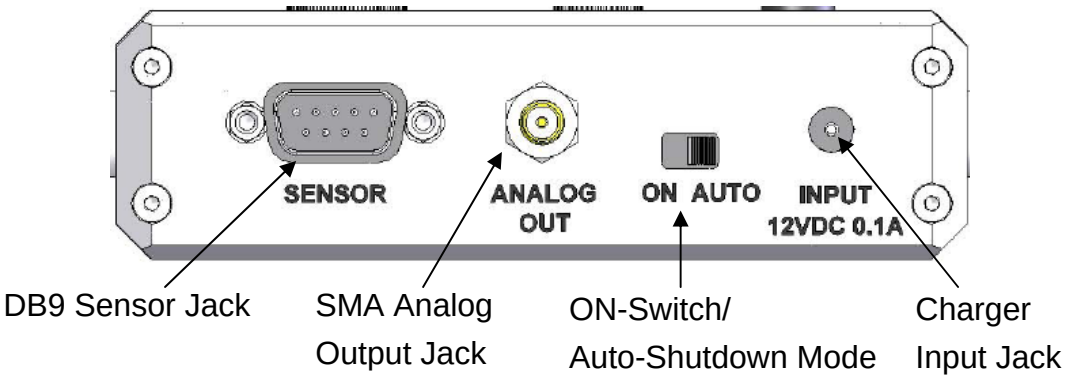


Figure 2 PM50 Top Plate

Front Panel

Analog Meter

Shows the measured power level on the scale that corresponds to the selected power range.

Range Selector

The rotary switch selects the power range from 10mW to 100W. Note that each detector operates only at 5 positions within the specified accuracy and speed. (see table)

Console		Sensor		
Power Range (Watt)	**Meter Scale**	**S210A 3W**	**S212A 10W**	**S213A 30W**
0.01	**10**			
0.03	**3**			
0.1	**10**			
0.3	**3**			
1	**10**			
3	**3**			
10	**10**			
30	**3**			
100	**10**			

Probe Zero Adjust

Is used to compensate ambient thermal effects by adjusting the meter to zero. Further this feature can be used for relative measurements.
The adjusting range is about +/- 65 % of each power range.

ON Button

When the unit is in the Auto-Shutdown-Mode (selectable by sliding switch in top plate to ‘AUTO’-position) the unit will be activated for approximately 6 minutes. After this time the unit automatically powers down. When the Auto-Shutdown Mode is deactivated (sliding switch in ‘ON’-position) the ON button has no function.

Low Battery Indicator

The red LED lights up when the battery voltage gets under a level where the measurement gets influenced. When the LED is flashing it is time to charge the battery by plugging the included power supply to the DC input.

Top Plate

DB9 Sensor Jack Accepts all Thorlabs S2xxA series detectors.

Analog Output This SMA connector outputs a voltage from 0.0 to 1.0V corresponding to the selected power range.

ON – AUTO switch In **ON** position the instrument is permanently activated.
In **AUTO** position the instrument can be activated for approximately 6 minutes by pressing the ON button in the front panel. After this time the unit will automatically power down.
To power down the unit when operating in ON position switch to the AUTO position, the PM50 will power down after 6 minutes operation.

Charger Input To charge the battery plug-in the 12VDC power supply that ships with the instrument. The batteries will recharge within 2.5 hours.

Rear Panel

Meter Zero Adjust Is used to adjust the mechanical offset of the meter to zero. This value is factory set but may need readjustment after mechanical shock.
The unit must be turned off before zeroing the meter.

Meter Stand

The unit comes with a pivoting stand that allows to continuously adjust the meter to the ideal viewing position.

2.3 Operating Instruction

1. Connect the Thermal Sensor

Plug the DB-9 connector of the optical head into the jack located on the top of the console and secure the two screws. This can be also be done while the power meter is switched on. The display unit will automatically recognize the sensor.

2. Switch on the PM50

If the unit is not already switched on, press the ON-button in the front panel (Auto-Shutdown Mode) or push the sliding switch in the top panel into the ON-position (permanent ON Mode)

3. Zero the Meter

Turn the range selector to the highest range to be measured and zero the meter with the Probe Zero Adjust potentiometer.
NOTE: The zero adjustment is only valid for the selected range.

4. Measure the Optical Power

Place the sensor in the path of the laser beam and read the optical power on the range corresponding scale.

☝ Attention ☝

Refer to the sensor data sheet and pay attention to the optical damage threshold!

Exceeding these values will permanently destroy the sensor!

2.4 Technical Data

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

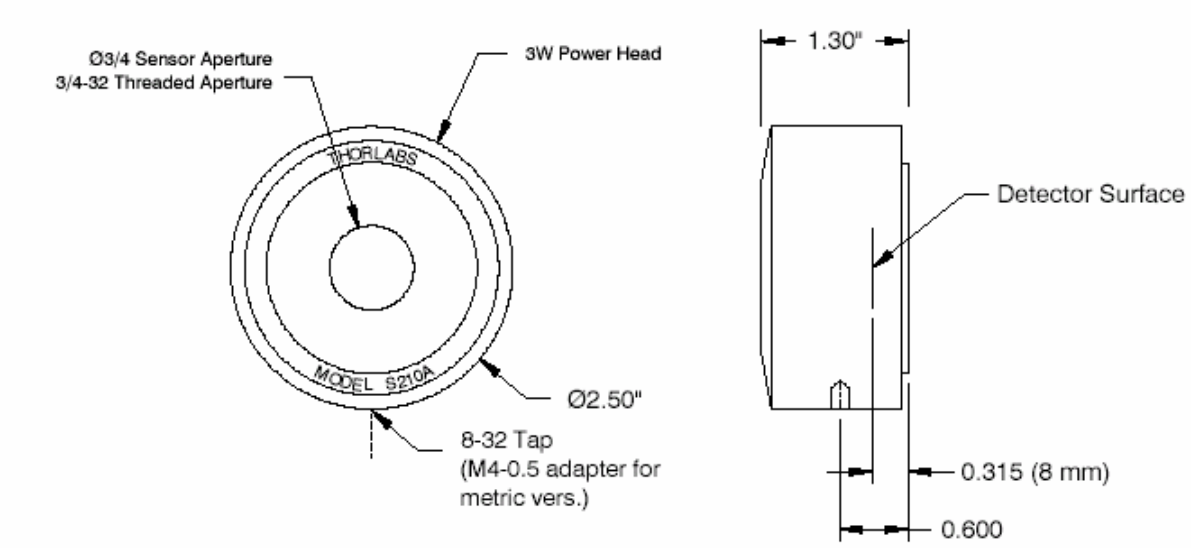
2.4.1 PM50 Display Unit

General		
Dimensions (H x W x D)	120 x 112 x 45 mm³ (4.7" x 4.4" x 1.8")	135 x 143 x 45 mm³ with stand (5.3" x 5.6" x 1.8")
Weight	0.6 kg	1.33 lbs
Operating Temperature	5°C – 40°C	
Storage Temperature	-20°C – 70°C	
Meter Specifications		
Measurement Range	1mW to 100W	
Power Scales	9 scales	0.01W, 0.03W, 0.1W, 0.3W, 1W, 3W, 10W, 30W, 100W
Power Resolution	1% full scale	
Power Units	W	
Analog Meter	90 x 42 mm (3.54" x 1.65")	
Meter Response Time	< 1 sec	Within 2% of final value
Accuracy Analog Meter	+/- 3%	
Meter Scales	0 to 3 (30 divisions) 0 to 10 (50 divisions)	Mirrored Scale
Analog Output	0 to 1V	Corresponding to Range Setting
Accuracy Analog Output	+/- 1%	
Power Supply		
Battery Operation	6V built-in rechargeable battery	Battery charger included 6' Auto Shutdown (detachable)
Low Battery indicator	LED in front panel	Battery voltage < 5.5V
Battery Life time	150 + hrs	
AC Operation	90 to 260V 50/60Hz 12VDC isolated adaptor	Included
Charging time	2.5 hrs to full charge	
Safety	CE compliant	

2.4.2 S210A 3W Thermal Sensor

Part of PM50-3 optical power meter system

Mechanical Drawing:



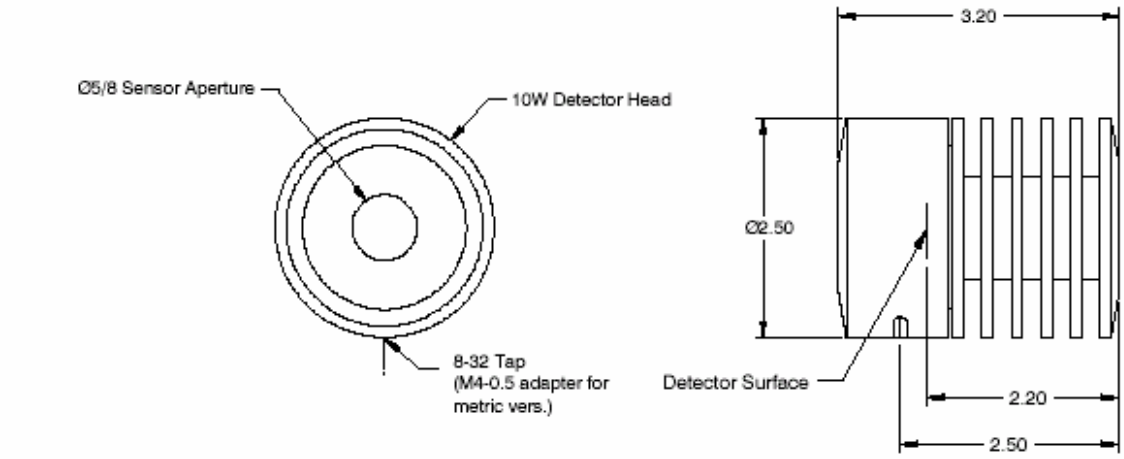
Specifications:

Spectra range:	250nm – 10.6µm	
Sensor:	Thermal	
Input aperture:	∅ 19mm (3/4”)	
Distance to detector:	8.0mm (0.315”)	
Aperture thread:	3/4”-32	
Optical power range:	20mW – 3W	
Resolution:	1mW	
Measurement Standard:	NIST traceable	
Measurement uncertainty:	+/- 5%	
Optical damage threshold:	200W/cm²	CW
	3.3J/cm²	(1ms pulse @ 1064nm)
	50mJ/cm²	(20ns pulse @ 1064nm)
Size:	33.0mm x ∅63.5mm (1.3” x ∅2.5”)	
Weight:	0.51kg (1.13lbs)	

2.4.3 S212A 10W Thermal Sensor

Part of PM50-10 optical power meter system

Mechanical Drawing:



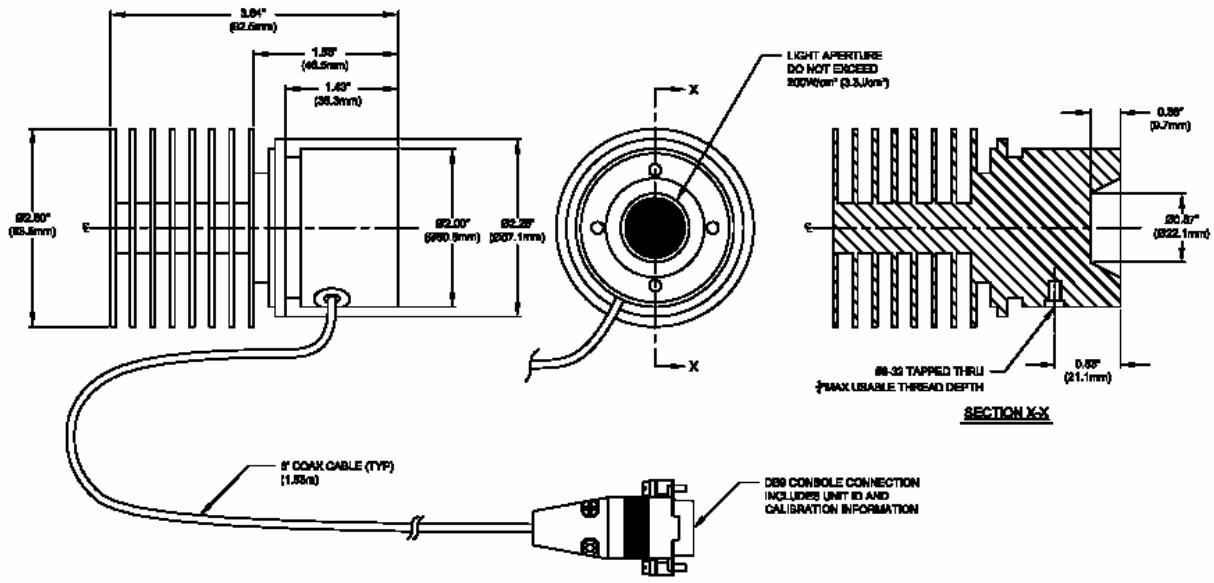
Specifications:

Spectra range:	250nm – 10.6µm	
Sensor:	Thermal	
Input aperture:	∅ 12.7mm (1/2”)	
Distance to detector:	55.9mm (2.20”)	
Aperture thread:	none	
Optical power range:	20mW – 10W	
Resolution:	1mW	
Measurement Standard:	NIST traceable	
Measurement uncertainty:	+/- 5%	
Optical damage threshold:	200W/cm²	CW
	3.3J/cm²	(1ms pulse @ 1064nm)
	50mJ/cm²	(20ns pulse @ 1064nm)
Size:	81.3mm x ∅63.5mm (3.2” x ∅2.5”)	
Weight:	0.51kg (1.13lbs)	

2.4.4 S213A 30W Thermal Sensor

Part of PM50-30 optical power meter system

Mechanical Drawing:



Specifications:

Spectra range:	250nm – 10.6µm
Sensor:	Thermal
Input aperture:	∅ 15.8mm (5/8”)
Distance to detector:	9.7mm (0.38”)
Aperture thread:	none
Optical power range:	100mW – 30W
Resolution:	3mW
Measurement Standard:	NIST traceable
Measurement uncertainty:	+/- 5%
Optical damage threshold:	200W/cm² CW
	3.3J/cm² (1ms pulse @ 1064nm)
	50mJ/cm² (20ns pulse @ 1064nm)
Size:	92.5mm x ∅63.5mm (3.64” x ∅2.5”)
Weight:	0.51kg (1.13lbs)

3 Calibration and Warranty

3.1 Calibration

Thorlabs 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.
Thorlabs will service and recalibrate the power meter and sensor head for a nominal fee. Please contact Thorlabs customer service to make the appropriate arrangements.

3.2 Warranty

Thorlabs warrants material and production of the PM50 power meter system 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 (Germany)* or to a place determined by *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 faulty free and uninterrupted operation of the unit, of the soft- 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 conditions 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 Service and maintenance

☝ Attention ☝

Do not try to open the power supply! Dangerous or even lethal voltages inside.

4.1 General Care

Protect the PM50 from adverse weather conditions. The PM50 is not water resistant.

☝ Attention ☝

To avoid damage to the PM50, do not expose it to spray, liquids or solvents!

4.2 Cleaning

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

The sensors on the thermal heads cannot be cleaned. Gently blow off any debris using compressed air. If any scratches or other signs of damage remain on the sensor area, contact Thorlabs service department for repair or replacement.

4.3 Line Voltage

The power supply of the PM50 operates at line voltages of 100 V … 240 V ± 10% and line frequencies of 50 and 60Hz. Prior to starting operation check that your local supply agrees with this line voltage range.

4.4 Repair

The power meter system does not contain any components to be repaired by the user. If any disturbances in function should occur, please contact Thorlabs prior to sending the respective unit to *Thorlabs Germany* for repair.

4.5 Certifications and Compliances

Category	Standards or description	
EC Declaration of Conformity - EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance to the following specifications as listed in the Official Journal of the European Communities is given:	
	EN 61326	EMC requirements for Class A electrical equipment for measurement, control and laboratory use, including Class A Radiated and Conducted Emissions and Immunity.[1,2]
	IEC 61000-4-2	Electrostatic Discharge Immunity (Performance criterion C) [1]
	IEC 61000-4-3	Radiated RF Electromagnetic Field Immunity (Performance criterion A) [1]
	IEC 61000-4-4	Electrical Fast Transient / Burst Immunity (Performance criterion C) [1]
		[1] For full compliance with these standards this unit must be operated in a grounded and shielded housing. The power supply must be propperly filtered!
		[2] Emissions which exceed the levels required by these standards, may occur when this equipment is connected to a test object.

4.6 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 fig. 1)
- 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.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

4.6.1 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.

4.6.2 Ecological background

It is well known that WEEE 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 live products will thereby avoid negative impacts on the environment.

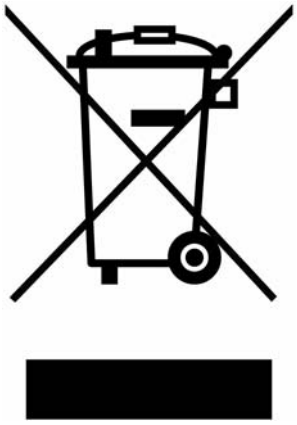


Figure 3 Crossed out “wheelie bin” symbol

4.7 Addresses

Thorlabs GmbH

Gauss-Strasse 11
D-85757 Karlsfeld
Fed. Rep. of Germany
Phone: +49 (0)81 31 / 5956-0
Fax: +49 (0)81 31 / 5956 99
Email: **europe@thorlabs.com**
Internet: **http://www.thorlabs.com**

Thorlabs Inc.

435 Route 206
Newton, NJ 07860
Phone: 973-579-7227
Fax: 973-383-8406
Email: **sales@thorlabs.com**
Internet: **http://www.thorlabs.com**

Thorlabs Japan Inc.

435 Route 206
Newton, NJ 07860
Phone: +81-3-5977-8401
Fax: +81-3-5977-8402
Email: **sales@thorlabs.com**
Internet: **http://www.thorlabs.jp**

Our company is also represented by several distributors and sales offices throughout the world.
Please call our hotline, send an E-mail to ask for your nearest distributor or just visit our homepage **http://www.thorlabs.com**