



# MPM250

## Motorized Vertical Rigid Stand

### User Guide



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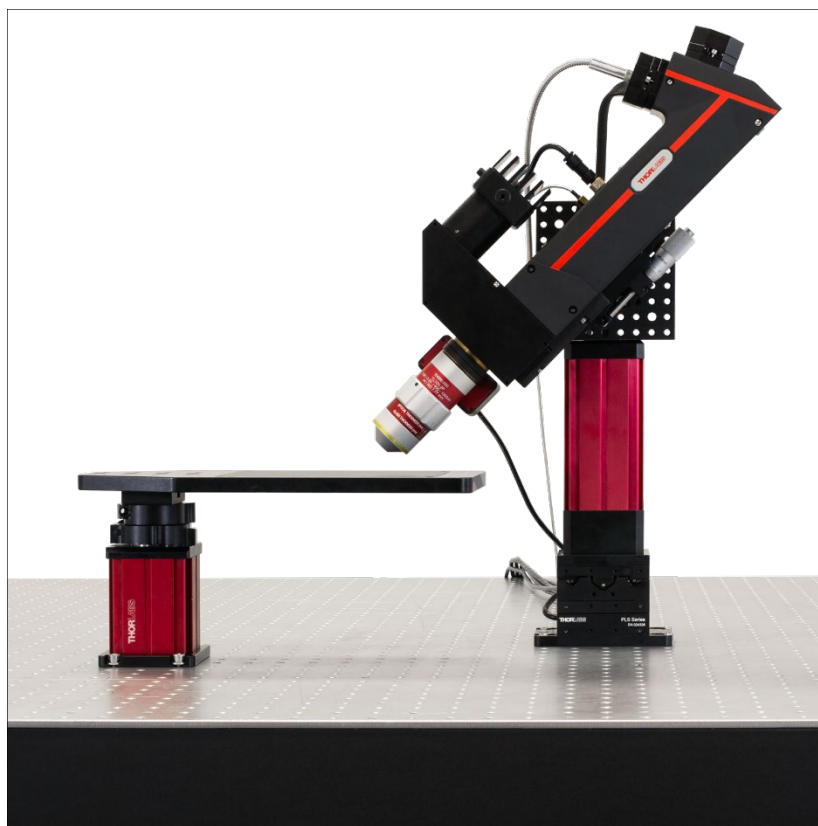
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## Chapter 1 Overview

The **MPM250 vertical rigid stand** has been designed to integrate seamlessly into various Thorlabs microscopy platforms. These stands are designed for use with slide holders, petri dish holders, recording chamber holders, platforms, and post holders. They can be used to mount imaging systems such as the **PRELUDE** (shown in Figure 1) and can be controlled using an MCM301 controller (sold separately).

The MPM250 vertical rigid stand provides linear travel along one axis and can be combined with the PLSXY (sold separately) to provide linear travel along all three axes as shown in Figure 1. The vertical range of travel is 1”.

The MPM250 stand can be secured to a tabletop via four counter bore slots that accept 1/4"-20 (M6 x 1.0) cap screws as shown in Figure 3. It is offered with an imperial or metric top mounting platform which can be used to mount a variety of accessories designed for slides, petri dishes, recording chambers, micromanipulators, well plates, and general electrophysiology applications.



**Figure 1** *PRELUDE imaging system using an MPM250 mounted on top of a PLSXY stage*

## Chapter 2 Safety

### 2.1 Safety Information

For the continuing safety of the operators of this equipment, and the protection of the equipment itself, the operator should take note of the **Warnings**, **Cautions** and **Notes** throughout this manual and, where visible, on the product itself.

The following safety symbols may be used throughout the manual and on the equipment itself.



**Warning: Risk of Electrical Shock**

Given when there is a risk of injury from electrical shock.

**Warning**

Given when there is a risk of injury to users.

**Caution**

Given when there is a risk of damage to the product.

**Note**

Clarification of an instruction or additional information.

## 2.2 General Warnings

**Warning**

These motorized actuators can generate high forces. If handled improperly, they may cause injury. Be aware that failure of the motor controller may drive the unit into a hard stop and cause damage to the unit. To avoid injury never put anything in the gap between the actuator and any rigid structure.

Because it can be software controlled, it should be noted that this device could begin to move unexpectedly for a person within its envelope of operation, who had not programmed the move.

**Warning**

If this equipment is used in a manner not specified in the manual, the protection provided by the equipment may be impaired. Excessive moisture may impair operation.

Spillage of fluid, such as sample solutions, should be avoided. If spillage does occur, clean up immediately using absorbent tissue. Do not allow spilled fluid to enter the internal mechanism. The equipment is for indoor use only.

**Caution**

If the actuator encounters a hard stop while still in the middle of its range (i.e. a translation stag at the end of its travel range), the motor should be stopped as soon as possible to prevent damage and to keep the unit from overheating.

**Caution**

When storing these units, be sure to fully retract the lead screw to protect the threads from damage. Improper connection of the motor will result in permanent damage. All power supplied to the motor should be turned off before altering any connections to the motor. Check all connections before supplying power to the motor.

## Chapter 3 Installation

### 3.1 Unpacking

**Caution**

Once removed from its packaging, the stage is easily damaged by mishandling.

**Note**

Retain the packaging in which the unit was shipped for use in future transportation.

### 3.2 Environmental Conditions

**Warning**

Operation outside the following environmental limits may adversely affect operator safety.

Location: Indoor use only

Temperature Range: 5 °C to 40 °C

Maximum Humidity: <80% RH at 31 °C

To ensure reliable operation the unit should not be exposed to corrosive agents, excessive moisture, heat, or dust.

If the unit has been stored at a low temperature or in an environment of high humidity, it must be allowed to reach ambient conditions before being powered up.

The unit must not be used in an explosive environment.

### 3.3 Mounting

#### 3.3.1 General

The MPM250 motorized rigid stand is mounted to the work surface/ tabletop using a base plate. For additional versatility, the MPM250 can also be mounted on top of an XY translation stage such as Thorlabs' **PLSXY stages** (sold separately) using four 4-40 cap screws. When mounting the stage close to other equipment, ensure that the travel of the moving platform is not obstructed. If equipment mounted on the moving platform is driven against a solid object, damage to the internal mechanism could occur.

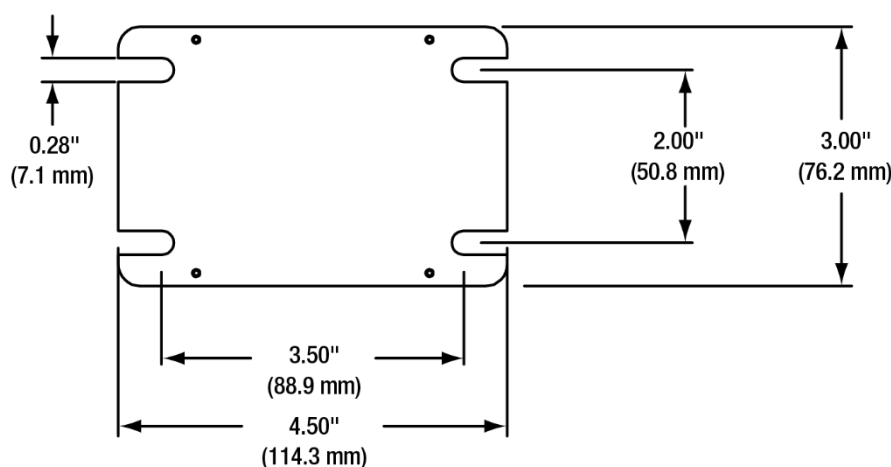


#### Caution

When mounting components or fitting the stand within an application, do not apply excessive pressure to the moving platform as this may damage the bearing mechanism.

#### 3.3.2 Mounting to the Work Surface

Use four bolts (1/4"-20 or M6, not included) through each end of the base plate to fix the stand to the work surface as shown in Figure 2 and Figure 3.



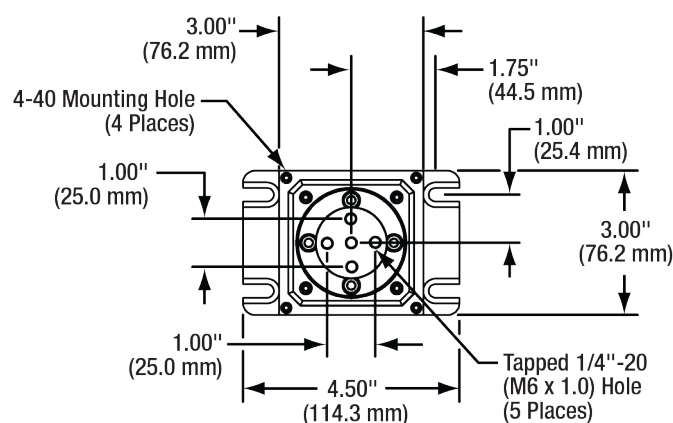
**Figure 2** Mechanical drawing of an MPM250 base plate. Dimensions for the MPM250/M base plate are given in parentheses.



**Figure 3**      **Mounting an MPM250 rigid stand to tabletop using base plate**

### 3.3.3 Mounting the Motorized Vertical Rigid Stand to Linear Translation Stages

The MPM250 rigid stand can also be mounted to other translation stages, such as Thorlabs' PLS Series stages, to achieve precise motion along two or three axes. To mount, first detach the base plate included with the stand by removing the four 4-40 cap screws. Then use the two included  $\varnothing 3$  mm dowel pins to align the stand to the top of the PLS stage and use a 3/32" balldriver to secure four 4-40 cap screws at the corners as shown in Figure 5.



**Figure 4**      **Mechanical drawing showing holes for mounting an MPM250 to a PLSXY stage. Dimensions for the MPM250/M mounting plate are given in parentheses.**



**Figure 5** MPM250 rigid stand mounted to PLSXY stage.

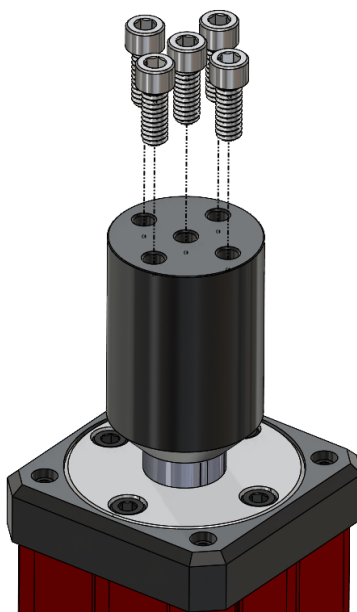
### 3.4 Mounting Equipment to the Stage



#### Caution

The weight attached to the moving platform must not exceed 15.0 kg (33.1 lbs).  
Do not apply excessive force to the moving platform.

Thorlabs manufactures a variety of accessories designed for slides, petri dishes, recording chambers, micromanipulators, well plates, and general electrophysiology applications to fit the MPM250. All of our **Ø1.5" post accessories** and **Ø1.5" post clamps** are also compatible with the MPM250. The stand can also be used to mount some of the microscopy platforms such as the PRELUDE. All of these parts can be mounted to the stage via the top platform as shown in Figure 6. To mount accessories to the top of the translation stage, 1/4"-20 or M6 screws (not supplied) can be used to attach accessories such as a 66 mm Rail Clamp which allows the user to hold the single dovetail rails and insert holder arms, sold separately within the rigid stands product family.



**Figure 6** Schematic of MPM250 top platform.

### 3.5 Transportation


**Caution**

When packing the unit for shipping, use the original packaging. If this is not available, use a strong box and surround the stage with at least 100 mm of shock absorbent material.

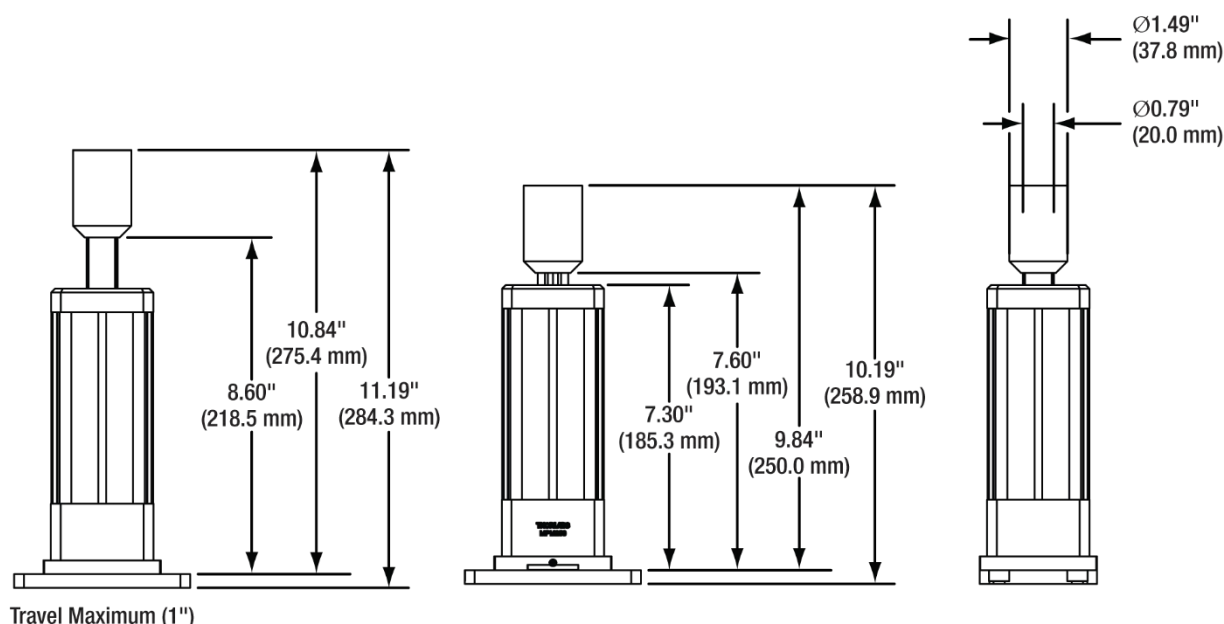
### 3.6 Preventive Maintenance


**Warning**

The equipment contains no user-serviceable parts. There is a risk of severe electrical shock if the equipment is operated with the covers removed. Only personnel authorized by Thorlabs Ltd. and trained in the maintenance of this equipment should attempt any repairs or adjustments. Use maintenance is limited only to the procedure described in Section 4.2.

### 3.7 Dimensions

A mechanical drawing of the MPM250(/M) vertical rigid post is shown below in Figure 7.



**Figure 7** Dimensions of the MPM250 rigid stand. Dimensions for the MPM250/M rigid stand are given in parentheses.

## Chapter 4 Operation

### 4.1 Selecting the Device Type

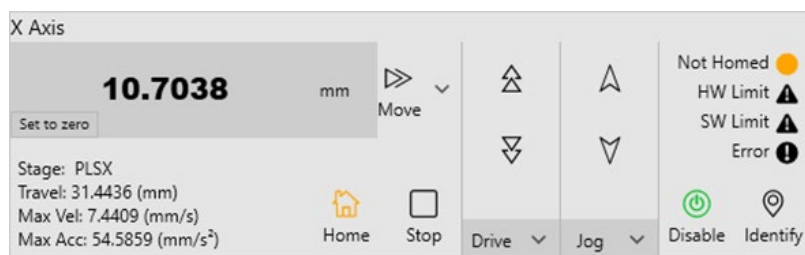
The MPM250 is integrated into MCM series controllers (i.e. MCM301), therefore the unit should automatically configure when connected to the device. No additional setup is necessary for control of the stage via software.

#### Using MCM301 GUI Application Software:

1. Install the electronic hardware and connect the modules to the relevant axes of the associated stages (see the manual for the associated controller).
2. Ensure that the device is connected to the PC and powered up.



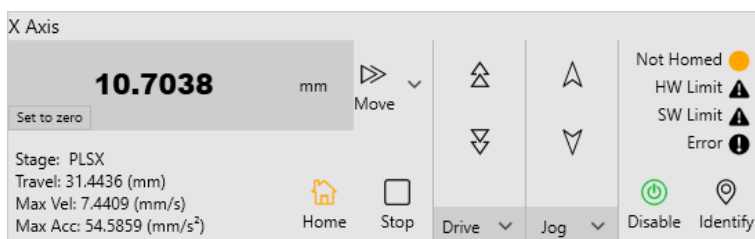
- Run the MCM301 GUI application.
- The MCM301 GUI Controller display will show all active stages connected to all available connected MCM301 controllers. By default, the main window fits one controller. To access the other controller's displays, the main window can be scrolled and/or resized vertically.



- The server reads in the stage and controller information automatically. The custom slot name can be changed to a user-defined name. The position box displays the position of the connected stage in user-defined units.
- Clicking the “Set to Zero” button will set the current position as 0.

Below is an explanation of common information displayed in the slot window:

**Slot Display:** Displays the status of the stage (if connected) to the slot on the controller. Each controller has three stage displays in the left-to-right order for slots 1, 2, and 3.



X Axis

**Custom Slot Name:** Displays the user-defined name of the slot.



**Position Box:** Displays the position of the connected stage in user-defined units. Clicking the “Set to zero” button will set the current position as 0 and unhome the stepper if homed.

Stage: PLSX

**Stage Identifier:** Shows the part number of the connected stage.

Travel: 31.4436 (mm)

**Travel Range:** Displays the connected stage's range of travel in user-defined units.

Max Vel: 7.4409 (mm/s)

**Maximum Velocity:** Displays the maximum velocity of the connected stage in user-defined units.

Max Acc: 54.5859 (mm/s²)

**Maximum Acceleration:** Displays the maximum acceleration of the connected stage in user-defined units.



**Home Button:** Moves the stage to its homed position. While amber, the stage is not homed and its reported position is not absolute. While homing, the button will fade in and out. After successful homing, the homing button will turn green and the reported position will be absolute with respect to the homed position.

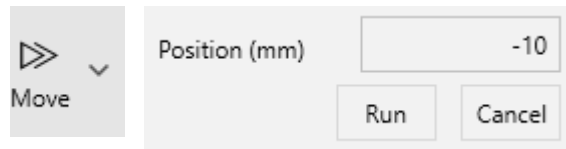
#### Note

If any soft limits are set, the connected stage cannot be homed.



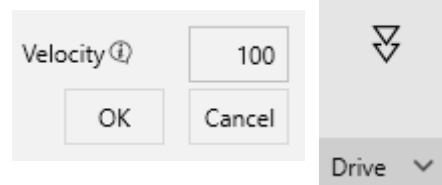
**Stop Button:** Clicking this button will stop the connected stage's motion.

**Move:** Opens the “Move” submenu to set the parameters for a move command. The value in the “Position” field is the position the stage will move to when “Run” is clicked. The “Cancel” button will close the menu.



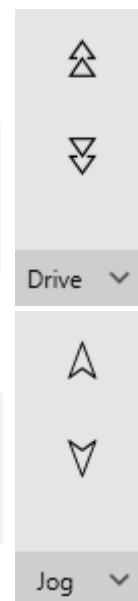
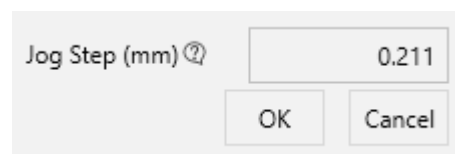
**Drive Controls:** The up and down arrows (▲/▼) will move the stage in the positive or negative direction while held down. When released, the stage will stop moving. Clicking “Drive” will open up a submenu.



**Drive Submenu:** The “Drive” submenu changes the speed at which the controller moves. Clicking “OK” will save the value and “Cancel” will discard the value.




**Jog Controls:** The up and down arrows (▲/▼) will move the stage by a fixed amount in the positive or negative direction when clicked. Clicking “Jog” will open up a submenu.

**Jog Submenu:** The “Jog” submenu changes the distance the stage travels each jog. Clicking “OK” will save the value and “Cancel” will discard the value.



  **Enable/Disable Button:** Enables or disables motion on the connected stage. While disabled, the stage immediately stops and all motion controls to the stage are ignored. A green button indicates an enabled stage and a red button indicates a disabled stage.

 **Identify Button:** Blinks the power switch LED for a few seconds on the connected controller as well as any joystick LED controlling the connected stage.

The right-most part of the slot display houses LED indicators for different stage conditions.

Not Homed ●	<b>Not Homed:</b> Indicator is lit when the stage has not been homed.
HW Limit ⚠	<b>Hardware Limit:</b> Indicator is lit when the stage is at a hardware limit. Hovering over the indicator will display if the stage is at a positive or negative limit.
SW Limit ⚠	<b>Software Limit:</b> Indicator is lit when the stage is at a software limit. Hovering over the indicator will display if the stage is at a positive or negative limit.
Error !	<b>Error:</b> Indicates that an error in the configuration of the device prevented the controller from controlling the stage. Seek support if this is lit.

**Please refer to the manual for the associated controller for more information on driving the actuator/stage.**

## 4.2 Maintenance

### Note

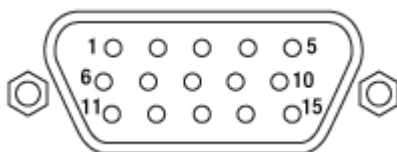
No customer-serviceable parts. Return to manufacturer for service.

After prolonged use, and particularly in applications requiring repeated small movements, the grease on the drive shaft may build up. This may cause rough or noisy movement, vibration, and excessive heating.

It is good practice to run the motor periodically from one end of travel to the other several times in order to redistribute the grease.

### 4.3 Pin Assignments

Pin assignments for the male D-type connector on the motor flying lead are described below.



Pin	Description	Pin	Description
1	Ground	9	Reserved for Future Use
2	CCW Limit Switch	10	5 V
3	CW Limit Switch	11	Encoder, A+
4	Motor Phase B -	12	Encoder, A-
5	Motor Phase B +	13	Encoder, B+
6	Motor Phase A -	14	Encoder, B-
7	Motor Phase A +	15	Reserved for Future Use
8	Reserved for Future Use		

**Figure 8** Output connector pin assignments for the MPM250(/M) stands.

## Chapter 5 Specifications

Specification	MPM250, MPM250/M
Travel Range	1" (25.4 mm)
Backlash	<22 $\mu\text{m}$
Lead Screw Pitch	609.6 $\mu\text{m}$
Bidirectional Repeatability	$\pm 5 \mu\text{m}$
Accuracy	$\pm 25 \mu\text{m}$
Minimum Achievable Incremental Motion	424 nm
Minimum Repeatable Incremental Motion	1.06 $\mu\text{m}$
Full Step Angle	1.8°
Linear Travel per Step	3.048 $\mu\text{m}$ /step
Rated Phase Current	1.5 A
Resistance/ Phase	2.7 Ohms
Inductance / Phase	3.2 mH
Max Load Capacity (On-Axis)	33.1 lbs (15.0 kg)
Recommended Load (On-Axis)	<15.0 lbs (6.8 kg)
Recommended Torque (Off-Axis Load)	< 5 N•m
Max Speed <sup>a</sup>	2 mm/sec
Max Acceleration	12 mm/sec <sup>2</sup>
Motor Type	NEMA Size 14 Hybrid Stepper Motor
Insulation Class	B
Limit Switches	Hall Effect
Cable Length	6' (1.8 m)
Weight	5.3 lbs (2.4 kg)
Compatible Controller	MCM301
Dimensions (W x D x H) <sup>b</sup>	3.00" x 3.00" x 10.84" (76.2 mm x 76.2 mm x 275.4 mm)
Dimensions (W x D x H) <sup>b</sup> – at Homed Position	3.00" x 3.00" x 9.84" (76.2 mm x 76.2 mm x 250 mm)


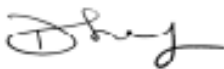

a. If driven at greater speed than the value defined here, the stage is no longer guaranteed to meet the specifications above.

b. Dimensions do not include included base plate.

## Chapter 6 Regulatory

### 6.1 Declarations of Conformity

#### 6.1.1 For Customers in Europe

 <b>THORLABS</b> <a href="http://www.thorlabs.com">www.thorlabs.com</a>	
<b>EU Declaration of Conformity</b> <small>in accordance with EN ISO 17050-1:2010</small>	
We:	Thorlabs Inc.
Of:	56 Sparta Avenue, Newton, New Jersey, 07860, USA
in accordance with the following Directive(s):	
2006/42/EC	Machinery Directive (MD)
2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2011/65/EU + 2015/86	Restriction of Use of Certain Hazardous Substances (RoHS)
hereby declare that:	
Model:	<b>MPM250 and MPM250/M</b>
Equipment:	<b>Motorized Vertical Translation Stage</b>
is/are in conformity with the applicable requirements of the following documents:	
EN ISO 12100	Safety of Machinery. General Principles for Design. Risk Assessment and Risk Reduction 2010
Authorised to compile the technical file:	Thorlabs GmbH Münchener Weg 1, 85232 Bergkirchen, Deutschland
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements 2013
EN 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances 2018
and which, issued under the sole responsibility of Thorlabs, is/are 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:	
contains no 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: 18 May 2023
	
Name:	Danielle Strong
Position:	Director of Quality and Compliance
EDC - MPM250 and MPM250/M -21 	

### 6.1.2 For Customers in the USA

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.

Changes or modifications not expressly approved by the company could void the user's authority to operate the equipment.

## Chapter 7 Disposal (Required if Relevant)

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 [REDACTED] 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. It is the user's responsibility to delete all private data stored on the device prior to disposal.



## Chapter 8 Thorlabs Worldwide Contacts (Required)

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.



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