

PRM1-Z7 Series Motorized Rotation Stages

Model Numbers PRM1-Z7

PRM1/M-Z7

THORLABS

About the Company

Thorlabs has been an active member of the Photonics community for over 15 years.

We strive to be the ultimate resource for the photonics community—a place to find the products you need to enable your experiments, as well as the information you need to get your application working.

Thorlabs designs, develops, and manufactures building blocks for the photonics industry including equipment for opto-mechanics, motion control, nano-positioning, alignment, optical components, laser diodes, tunable lasers and vibration isolation systems. In addition to core photonics building blocks, we now provide system level solutions including complete OCT and imaging systems.

Trademarks

THORLABS is a registered trademark of Thorlabs Inc.

Product Warranty

Opto-Electronics, Control Electronics, Optics, and Nano-Positioning Product Lines.

Thorlabs offers a two year warranty on the above mentioned product lines, provided normal use and maintenance of the products and when properly handled and correctly installed.

Thorlabs shall repair or replace any defective or nonconforming product as detailed above. We ask that buyer contact Thorlabs for a Return Material Authorization number (RMA #) from our Customer Service>Returns department in order to most efficiently process the return and/or repair.

Products returned for repair that are not covered under warranty, a Thorlabs standard repair charge shall be applicable in addition to all shipping expenses. This repair charge will be quoted to the customer before the work is performed.

Revision History

Issue No.	Date	Summary
1	040907	Initial Issue
2	140508	Reformat
3	130808	Specs Changed

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For Your Safety

1.1 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 handbook and, where visible, on the product itself.

The following safety symbols may be used on the equipment:



Warning, risk of danger. Refer to the handbook for details on this hazard.



Warning, risk of electric shock. High voltages present



Functional (EMC) earth/ground terminal.



The following safety symbols may be used throughout the handbook:



Warning. An instruction which draws attention to the risk of injury or death.



Caution. An instruction which draws attention to the risks of damage to the product, process or surroundings.



Note. Clarification of an instruction or additional information.

1.2 Warnings

- The equipment has been designed to operate normally under the following environmental conditions :-

Location	Indoor use only.
Max altitude	2000m
Temperature range	5°C to 40°C
Maximum humidity	Less than 75%
- When siting the equipment, care should be taken to ensure that proper airflow is maintained to the motor.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Do not operate the instrument outside its rated supply voltages or environmental range. In particular, excessive moisture may impair safety.
- Translation stages can be made to move without warning. Ensure that the stages can move their full travel range without risk of fouling on external objects. All cables should be routed to avoid the risk of them becoming entangled.

1.3 Declarations Of Conformity

1.3.1 For Customers in Europe

This equipment has been tested and found to comply with the EC Directives 89/336/EEC 'EMC Directive' and 73/23/EEC 'Low Voltage Directive' as amended by 93/68/EEC.

Compliance was demonstrated by conformance to the following specifications which have been listed in the Official Journal of the European Communities:

Safety	EN61010: 2001 Installation Category II, Pollution Degree II.
EMC	EN61326: 1997

1.3.2 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 Thorlabs Ltd could void the user's authority to operate the equipment.

1.4 Waste Electrical and Electronic Equipment (WEEE) Directive

1.4.1 Compliance

As required by the Waste Electrical and Electronic Equipment (WEEE) 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

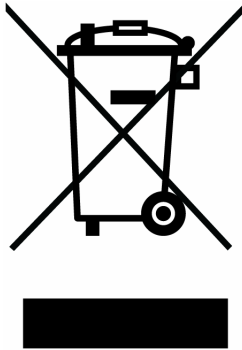


Fig. 1.1 Crossed out "wheelie bin" symbol

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.

1.4.2 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.

1.4.3 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 life products will thereby avoid negative impacts on the environment.

2.1 Introduction

The PRM1-Z7 is a precision motorized rotation mount for 1" optics.

Rotation is driven via a DC servo motor equipped with high ratio gearbox (256:1) and rotary encoder for accurate closed loop position control. The TDC001 DC servo controller is the ideal companion for achieving smooth continuous motion which can be measured both through the software interfaces and by using the Vernier dial and 1° engraved graduation marks on the rotating plate. The precision DC motor actuator provides 1 arcsecond resolution over the 360° rotation. This rotation stage is also equipped with a precision home limit switch to facilitate automated rotation to the zero datum position, allowing absolute angular positioning thereafter.

The limit switch is designed to allow continuous rotation of the stage over multiple 360° cycles. For complete flexibility the stage can be mounted either vertically on a post or horizontally using an adapter plate - see Section 3.2

For attachment to other stages or fittings, please contact Tech Support..



Fig. 2.1 Typical PRM1-Z7 stage

3.1 Unpacking



Note. Retain the packing in which the unit was shipped, for use in future transportation.



Caution. Once removed from its packaging, the stage is easily damaged by mishandling. The unit should only be handled by its base, not by the motor or any attachments to the moving platform.

3.2 Mounting

The stage can be mounted to a standard 1/2" post, with an option to mount in a vertical or an inclined orientation (as shown in Fig. 2.1.). The stage can also be fixed directly to the worksurface in a horizontal (flat) orientation using the counter-bored holes in the main body.

The rotating platform features several options for mounting accessories. The central aperture has a standard SM1 internal thread, for compatibility with a range of optics. Accessories can also be fixed using the series of threaded mounting holes (see Fig. 3.3).

Standard 'tongue and groove' accessories can be mounted using the PRM1SP1/(M) grooved adapter plate, which raises the deck height to 29mm (1.14").

Adapter plates are available which allow more stable installation and raise the deck height to 34mm (1.34") (PRM1SP2), or 62.5mm (2.46") (PRM1SP3).



Caution. When mounting components, or fitting the stage within an application, do not apply excessive pressure to the moving platform.

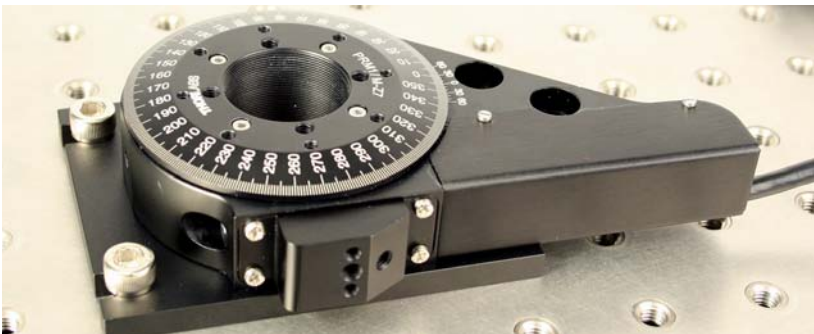


Fig. 3.1 PRM1-Z7 mounted on a PRM1SP2 Adapter Plate

3.2.1 Connecting The Motor Driver



Caution. It is recommended that the PRM1-Z7 series stages be driven by the Thorlabs TDC001 DC Servo Motor Driver. If the stage is being driven by any other driver or controller, consult Section A.1. for motor pin out details and Chapter 5 for details of the motor specification.

The stage is supplied with 2.8m (9 ft) of cable and is terminated in a 15 pin D-Type connector. This is compatible with the MOTOR drive terminal of the TDC001 T-Cube DC driver unit - see Fig. 3.2 below.

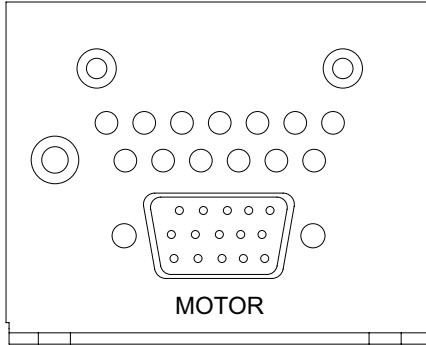


Fig. 3.2 TDC001 rear panel

3.3 Transportation



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

3.4 Dimensions

3.4.1 PRM1-Z7 Dimensions

all dimensions in inches (mm)

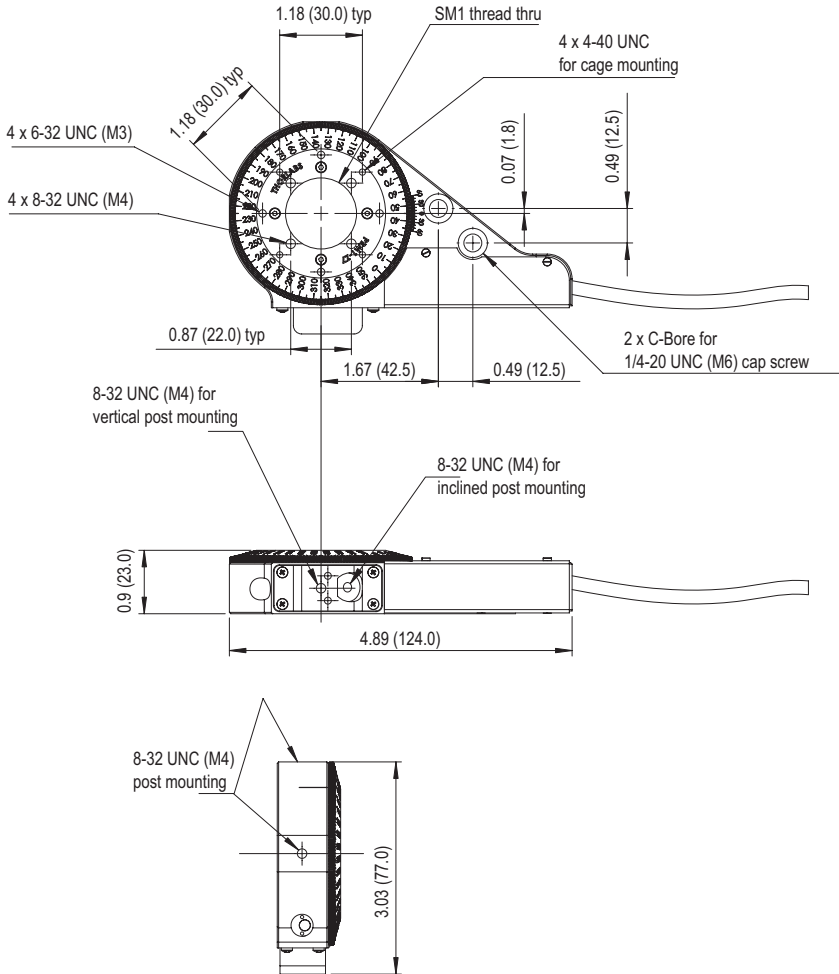


Fig. 3.3 Dimensions

4.1 Introduction



Caution. The PRM1-Z7 series stages form part of the Thorlabs Nanopositioning system. We recommend they are driven by the Thorlabs TDC001 T-Cube DC Servo Motor Driver. If the stage is being driven by any other driver or controller, consult the Section A.1. for motor pin out details.

The stages are connected to the controller via a flying lead terminated in a D-type connector.



Warning. The controller must be switched OFF before the stages are plugged in or unplugged. Failure to switch the controller off may result in damage to either the controller, the stage, or both.

4.2 Associating the Stage Type

To ensure that a particular stage is driven properly by the system, a number of parameters must first be set. These parameters relate to the physical characteristics of the stage being driven (e.g. min and max positions, leadscrew pitch, homing direction etc.).

To assist in setting these parameters correctly, it is possible, using the APT Config utility, to associate a specific stage type and axis with the motor controller. Once this association has been made, the APT server applies automatically, suitable default parameter values on boot up of the software.



Caution.

- By default, the software associates a Z706 type actuator, unless the user has used the APTConfig utility to associate a particular stage.
 - When the PRM1-Z7 stage is associated with the driver, default settings applicable to the PRM1-Z7 will be loaded. These settings are incompatible with linear type stages and actuators (e.g. MST25X, Z706). Before the TDC001 unit can be used to drive a stage other than the PRM1-Z7, it must be associated with the new stage type. If this is not done, damage could be caused to the motor limit switches.
-



Note .

- Even if a stage type and axis has been associated with the controller, it is still possible to alter these parameters if required, (e.g. for a custom stage type not selectable using the APT Config utility).

To associate the PRM1-Z7 stage with the TDC001 controller, proceed as follows:



Note. For a complete instructions regarding the mechanical and electrical installation, see the handbook supplied with the stage.

- 1) Connect the stage to the DC motor driver and power up the unit.

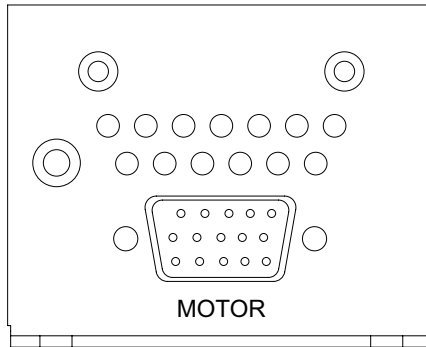


Fig. 4.1 TDC001 Rear Panel

- 2) Connect the driver to the control PC.
- 3) Shut down all applications using the APT server (e.g. APT User or your own custom application).
- 4) Run the APT Config utility - Start/Programs/Thorlabs/APT Config/APT Config.

5) From the 'APT Configuration Utility' window, click the 'Stage' tab.

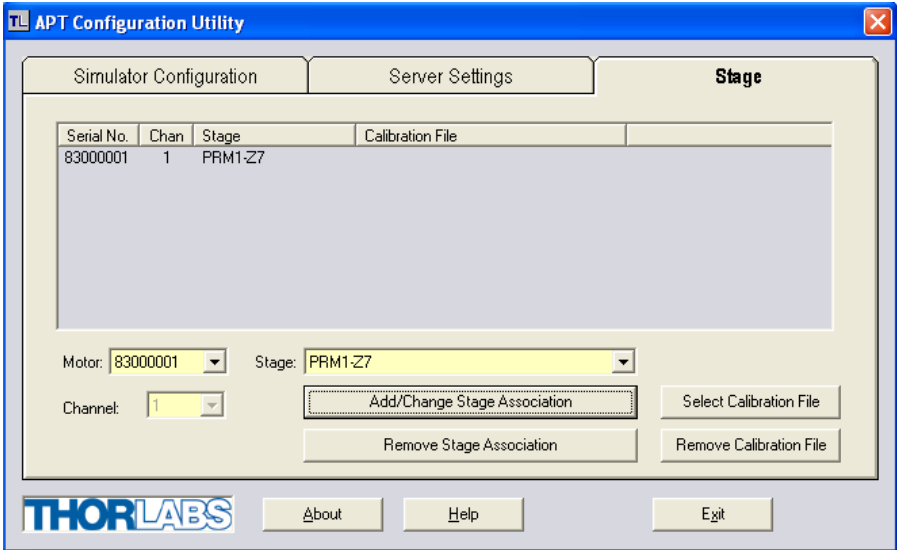


Fig. 4.1 APT Configuration Utility - Stage Tab

- 6) In the 'Motor' field, select the serial number of the TDC001 motor driver to be configured (this number can be found on the rear panel of the TDC001 unit).
- 7) Ignore the 'Channel' field. For the TDC001 DC motor driver, the 'Channel' field defaults to '1'.
- 8) In the 'Stage' field, select the 'PRM1-Z7 stage from the list displayed.
- 9) Click the 'Add Stage Association' button. The PRM1-Z7 stage and driver unit serial number are added to the list in the main window as shown in Fig. 4.1 above.
- 10) Click 'Exit' to shut down the APTConfig utility.

- Start the APTUser utility - Start/Programs/Thorlabs/APT User/APT User
The APT server reads in the stage and controller information on boot up and the settings made above are displayed in the 'Setting' window as shown in Fig. 4.2.



Fig. 4.2 APTUser GUI screen

- Click the 'Settings' button to display the 'Motor Driver Settings' panel.

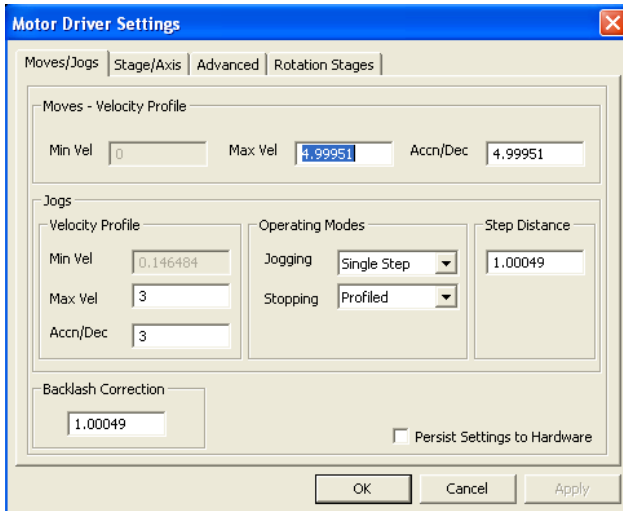


Fig. 4.3 Motor Driver Settings Panel

When the stage was associated with the driver, various default settings applicable to the PRM1-Z7 stage were loaded. These settings can now be tailored to your particular application.

- 13) Click each tab in turn, and make parameter changes as necessary. If in doubt, run your application with the default settings unchanged until performance data is available.
- 14) After the parameter changes have been performed, click the 'Persist Settings to Hardware' box on each tab, then click 'OK'. This will ensure that the same parameter settings will be loaded next time the unit is powered up - even in the absence of a PC.
- 15) On the GUI panel, click the 'HOME" button to move the stage to its home position. This will establish a zero datum from which future moves can be measured.

Specifications

5.1 Stage Specifications

Resolution: 1arcsec

Travel Range: 360° Continuous

Max Velocity: 14°/s

Backlash: <100arcsec

Software Compatibility: APT Server CDM621 V1.1.10

5.2 Motor Specification

Motor Type: DC Servo

Motor Drive Voltage: 12V

Feedback: Hall Effect Encoder

Encoder Counts per Revolution of the Leadscrew: 12,288

Terminal Resistance: 95Ω

Output Power: 0.36W

Efficiency: 68%

No Load Speed: 16,500rpm

No Load Current: 0.004A

Stall Torque: 0.82mNm

Friction Torque: 0.03mNm

Speed Constant: 1419 rpm/V

Back EMF Constant: 0.705 mV/rpm

Torque Constant: 6.73 mNm/A

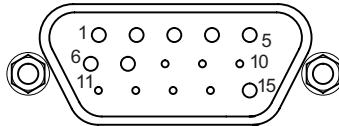
Current Constant: 0.149 A/mNm

Rotor Inductance: 310μH

Motor Pin Out Details & Associated Products

A.1 Motor Connector Pin Out

The Motor cable is terminated in a 15 way D-type connector, which provides connection to the DC motor controller. The pin functions are detailed in Fig. A.1.



Pin	Description	Pin	Description
1	Ground/Return	9	
2	Reverse Limit Switch	10	Vcc
3	Forward Limit Switch	11	Encoder B
4		12	
5	Motor +	13	Encoder A
6		14	
7	Motor -	15	Braid/Screen
8			

Fig. A.1 Motor Connector Pin Descriptions

A.2 Associated Products

Product Name	Part Number
Grooved Adapter Plate Imperial	PRM1SP1
Grooved Adapter Plate Metric	PRM1SP1/M
Raiser plate (34mm (1.34") deck height)	PRM1SP2
Raiser plate (62.5mm (2.46") deck height)	PRM1SP3

Products and Customer Support

Optical and Opto-mechanical Components

Optical mounts and rails
Lenses, prisms and filters
Polarization-optics
Laser diodes
Standard and specialized optical fibers
Optics, laser & fiber accessories

Test- and Measurement Systems

High precision current and TEC controllers for laser diodes
Highly stable, tunable laser diodes with integrated electronics
Optical powermeters
Fabry-Perot interferometer and spectrum analyzers
Polarization analyzer and controller systems

Optical Tables and Vibration Control

Optical tables and protection systems
Vibration damping systems
Optical breadboards and vibration isolated workstations

Nanopositioning Systems

Manual, motor- and piezo-driven translators, stages and mounts
Electronic stepper motor and piezo controllers
Integrated multi-axis positioning systems at sub-micron to nanometer scale

Laser Systems

External cavity laser sources
Ultra broadband laser sources
Femtosecond laser sources
Optical amplifiers
HeNe lasers

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Technical Support

Thorlabs provide a comprehensive after sales service. Contact us through your local representative, or at the address below:

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Customer Feedback

It is always helpful to have detailed and accurate information about any problems encountered by customers
We welcome comments or suggestions about any aspect of the equipment and instruction handbooks.

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