



# RB13 Series 3-Axis Translation Stage

## User Guide



Original Instructions

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# Chapter 1 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 throughout the handbook and on the equipment itself.



### Shock Warning



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.

## 1.2 General Warnings



### Warnings



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.

Spillage of fluid, such as sample solutions, should be avoided. If spillage does occur, clean up immediately using absorbant tissue. Do not allow spilled fluid to enter the internal mechanism.

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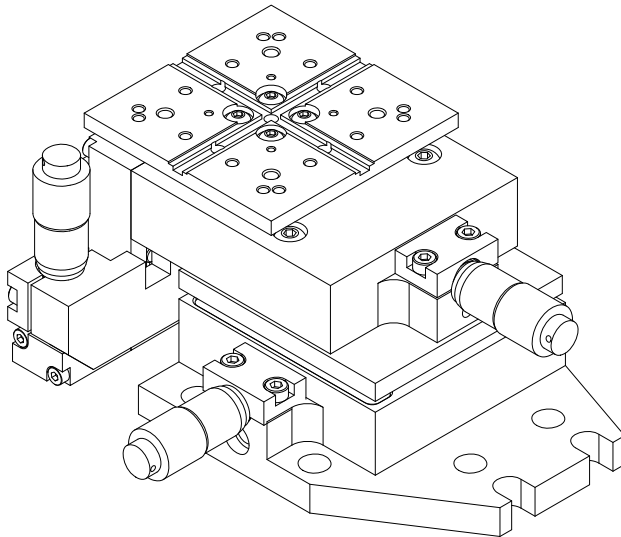
## Chapter 2 Overview

### 2.1 Description

The RollerBlock™ is a 3-axis, cross-roller bearing stage which is ideally suited to a broad range of photonics applications. The integrated X-Y-Z design provides a more compact stage than translation solutions constructed from single axis stacking stages, while the steel construction and enclosed bearings result in improved product lifetime. The moveable deck has a full 13mm of travel in three orthogonal directions, and includes the standard tongue-in-groove fitting common to the full range of Thorlabs optical mounting accessories.

The deck height of this compact stage matches the 62.5mm deck height of our flexure based translation stages. Using this standard deck height allows this longer travel stage to be incorporated into complex optical systems built around our popular MicroBlock™ and NanoMax™ series flexure based stages.

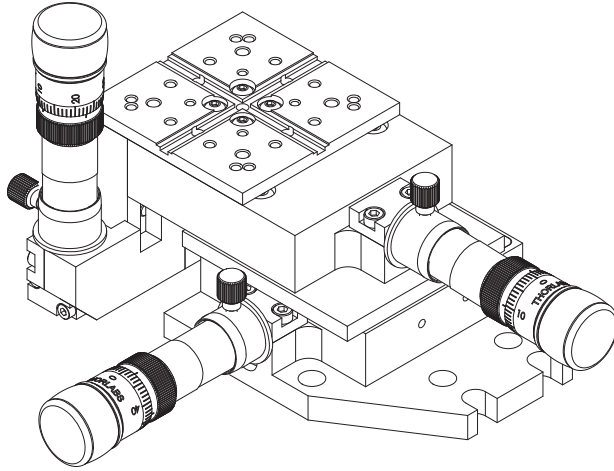
The stage is offered in left or right handed configurations (left hand part numbers are denoted by a L suffix and are available as a custom order), and in imperial or metric versions (metric part numbers are denoted by a /M suffix). A range of drive options is available, including micrometer drives, differential drives and a combined differential micrometers with integral feedback piezo actuator - see Section 2.2.



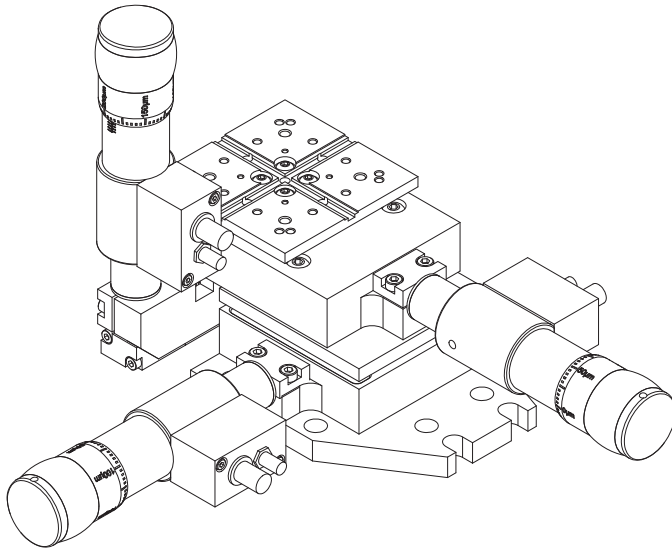
**Fig. 2.1** RB13M RollerBlock with micrometer actuators

## 2.2 Drives

The RollerBlock is available with either a simple micrometer (RB13M - see Fig. 2.1), or a differential micrometer drive (RBL13D - see Fig. 2.2). A piezo assisted micrometer drive (DRV517 - see Fig. 2.3), and a choice of stepper motor drives (ZST213B and ZFS13B) are also available separately..



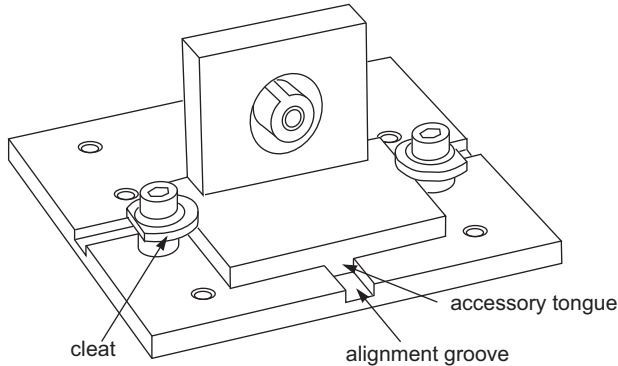
**Fig. 2.2 RBL13D RollerBlock with differential micrometer actuators**



**Fig. 2.3 RollerBlock fitted with piezo assisted differential micrometer actuators**

### 2.3 Accessories

A comprehensive range of accessories is available to allow the RollerBlock to hold and manipulate optical fibers, diode lasers, gradient-index lenses, spherical ball lenses, and other commonly used optical components. The accessories are mounted to the top platform using a tongue-in-groove system and are retained with cleats and capscrews – see Fig. 2.4. Three extended top platforms are also available for use when end-firing or butt-coupling to small lightwave devices - see Section 4.3.



**Fig. 2.4 Tongue-in-groove system**

Two free standing table platforms are available which provides a fixed platform adjacent to the moving world of the RollerBlock. These platforms have a standard slotted top surface and attach directly to the optical table. They are designed to match the platform height of the RollerBlock, which allows accessories to be mounted at the fixed optical axis height of 75mm, adjacent to the accessories being translated.

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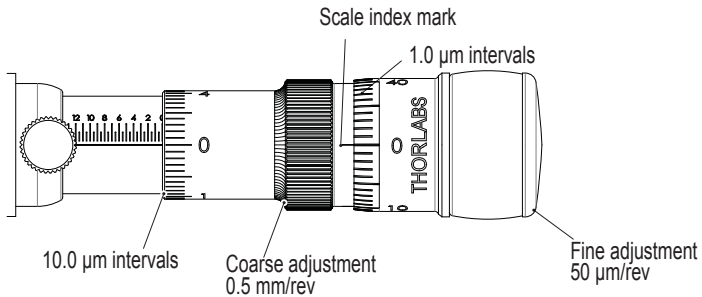
## Chapter 3 Operation

### 3.1 Micrometer Drives

#### 3.1.1 Adjusting Differential Micrometer Drives

Turn the coarse adjustment clockwise until the top platform of the stage begins to move. By use of the fine adjustment, sub-micron resolution is now achievable.

#### 3.1.2 Reading Micrometer Drives



**Fig. 3.1 Reading Differential Micrometer Drives (RB13D)**

### 3.2 Piezo Actuators

Piezo actuators are used to give nanometric positioning of the top platform over a range of 30 microns. They can also modulate the position of the platform at high frequency.

On a piezo-actuated RollerBlock, position feedback may be incorporated to enhance the repeatability and linearity of piezo motion.

The piezo actuators fitted to the RollerBlock should be used together with one of the Thorlabs piezoelectric controllers – see the *relevant piezo controller handbook* for more details on the operation of piezo actuators.

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## Chapter 4 Installation

### 4.1 Unpacking

#### Note

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



#### Caution



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

### 4.2 Attaching to a Work Surface

The base of the RollerBlock is provided with a number of fixing holes and slots for attachment to metric or inch optical tables, as supplied by Thorlabs and other manufacturers.

When mounting the RollerBlock close to other equipment, ensure that the travel of the moving platform is not obstructed. If the moving platform is driven against a solid object, damage to the internal mechanism could occur. The range of travel on each axis is 13 mm total, that is  $\pm 6.5$  mm about the nominal position.



### 4.3 Fitting an Extended Top Platform

The extended top platform is available in three lengths: AMA001 85mm, AMA003 95mm and AMA005 105mm. They are convenient for attaching components or accessories which need to reach into smaller spaces.

To fit an extended top plate:

- 1) Remove the four retaining screws (see Fig. 4.1).
- 2) Remove the top plate and fit the extended top plate.
- 3) Refit the screws removed at item (1).

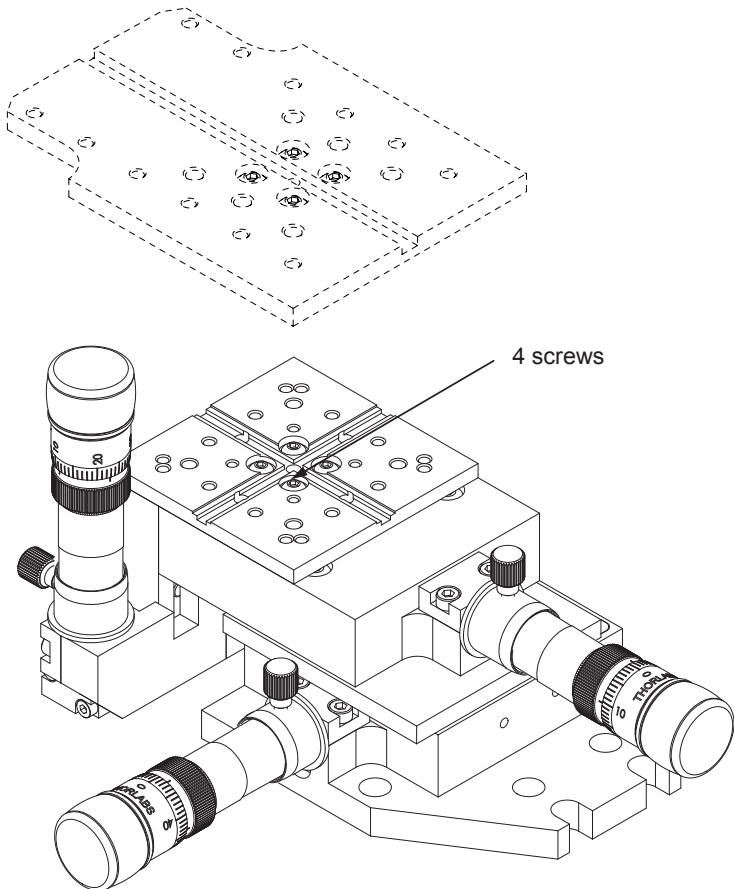


Fig. 4.1 Fitting an extended top platform

#### 4.4 System Stability

The RollerBlock has been designed using traditional precision engineering techniques. Very high resolution is achieved using a combination of precision thread or differential micrometer drives and piezoelectric actuators. Extreme care and precise matching of tolerances and components ensure that the RollerBlock provides the best possible positional resolution and stability.

The threads used for the drive screws are very finely made with the correct clearances and lubrication. In overcoming creep and drift, great care was exercised in the choice and quantity of lubricant used on the threads. The lubricants and choice of material employed in the design and manufacture are critical to the performance and stability of the RollerBlock. Changing the thread lubricant will adversely affect the performance of the whole system.

#### 4.5 Mounting Equipment to the Moving Platform



##### Caution



**To avoid damaging the internal mechanism:**

**The weight attached to the moving platform must not exceed 4 kg (8.8lbs).**

**Do not apply excessive forces to the moving platform.**

Thorlabs manufacture a variety of fibre chucks, holders and fixtures to fit the RollerBlock stage, which are mounted on the top platform - see [www.thorlabs.com](http://www.thorlabs.com) for more details.

#### 4.6 Transportation



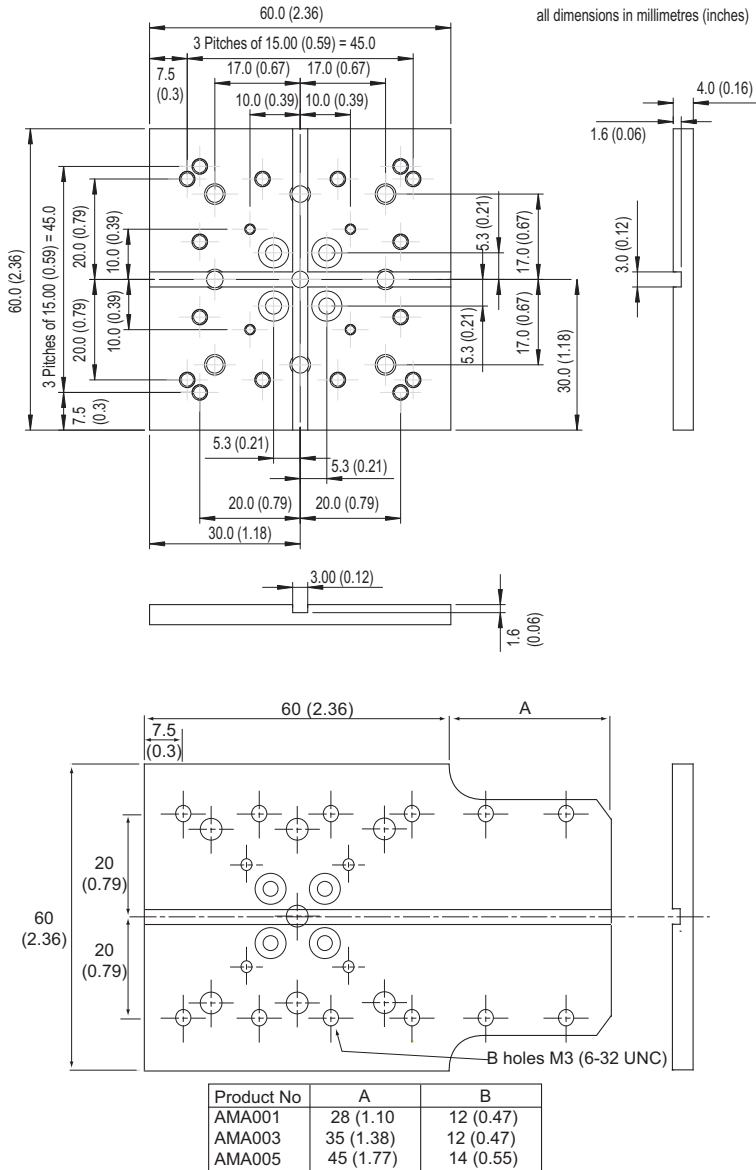
##### Caution



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

## 4.7 Dimensions

### 4.7.1 Top Plate



extended top platform

Fig. 4.2 Top platform

4.7.2 RB13M RollerBlock with Micrometer Drives

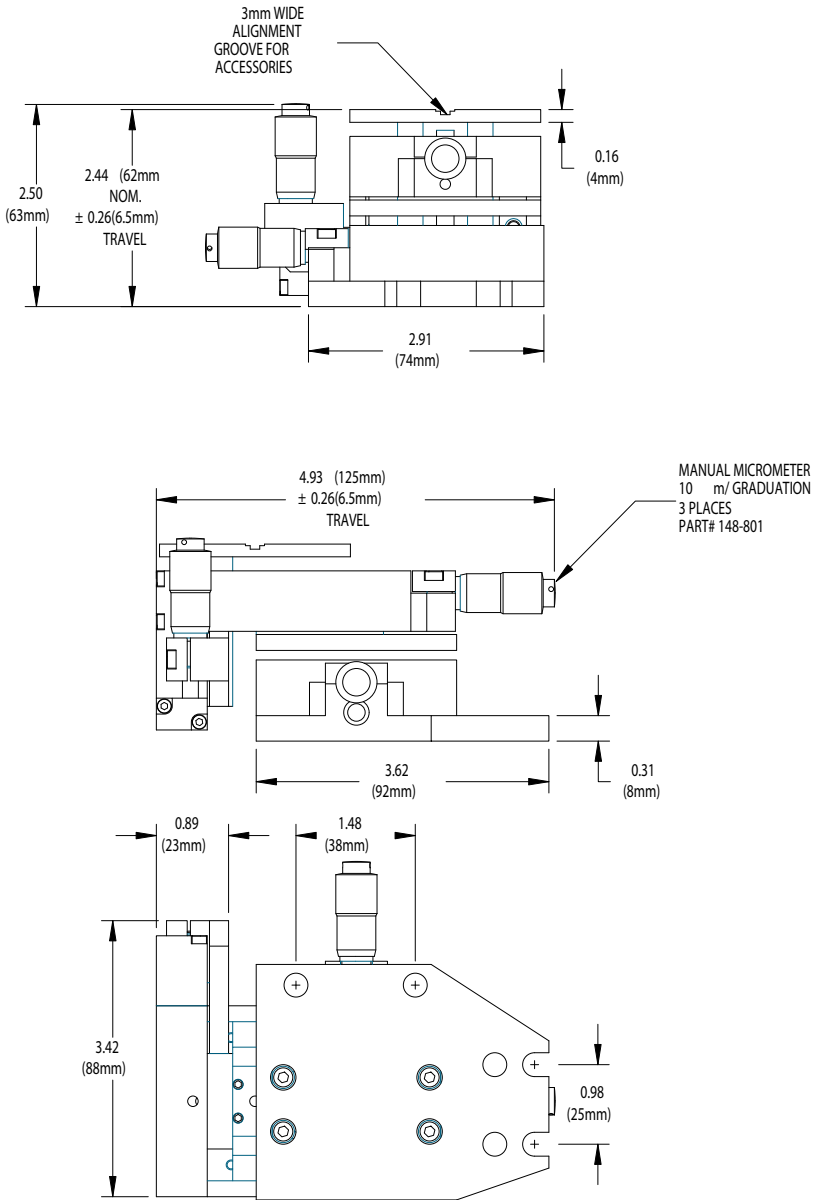


Fig. 4.3 RB13M Micrometer RollerBlock Dimensions

### 4.7.3 RollerBlock with Micrometer and Piezo Drives

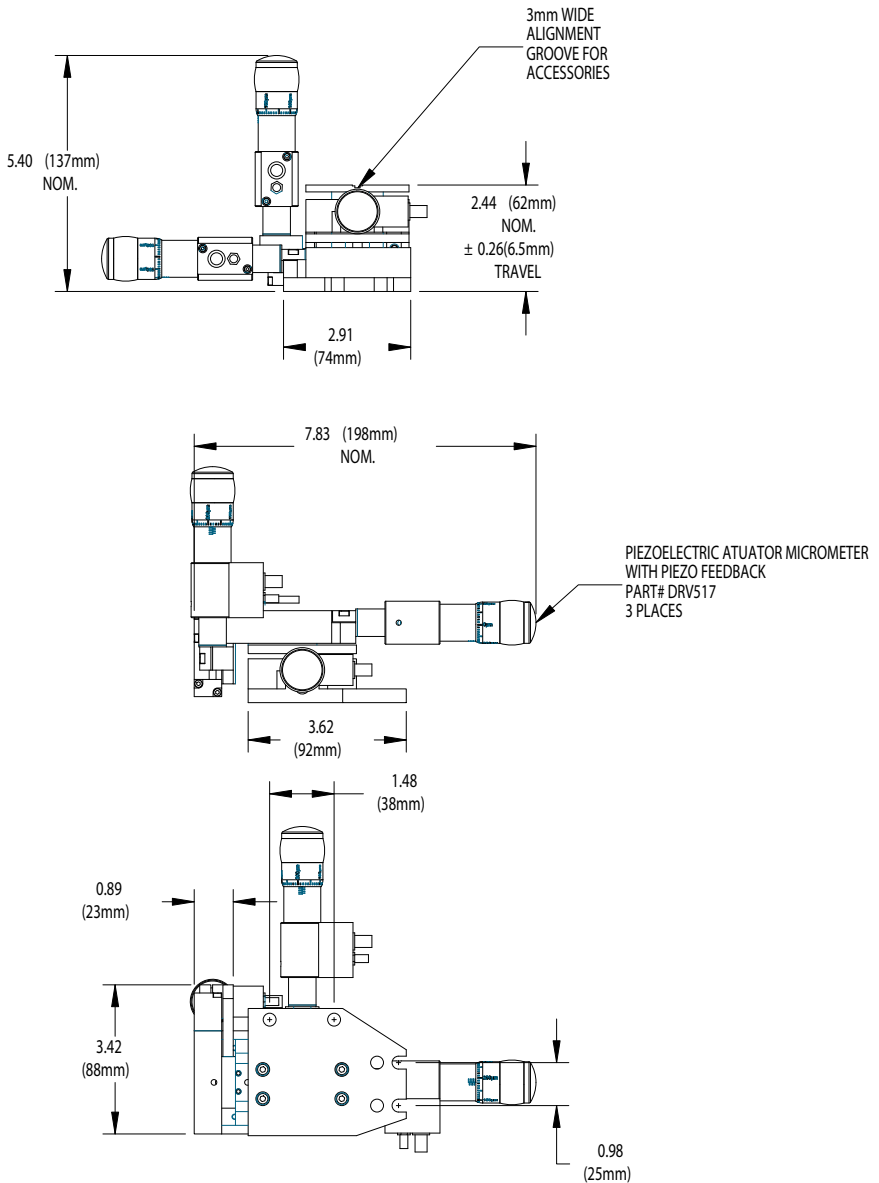


Fig. 4.4 RB13MP Micrometer RollerBlock Dimensions

### 4.7.4 RB13D RollerBlock with Differential Drives

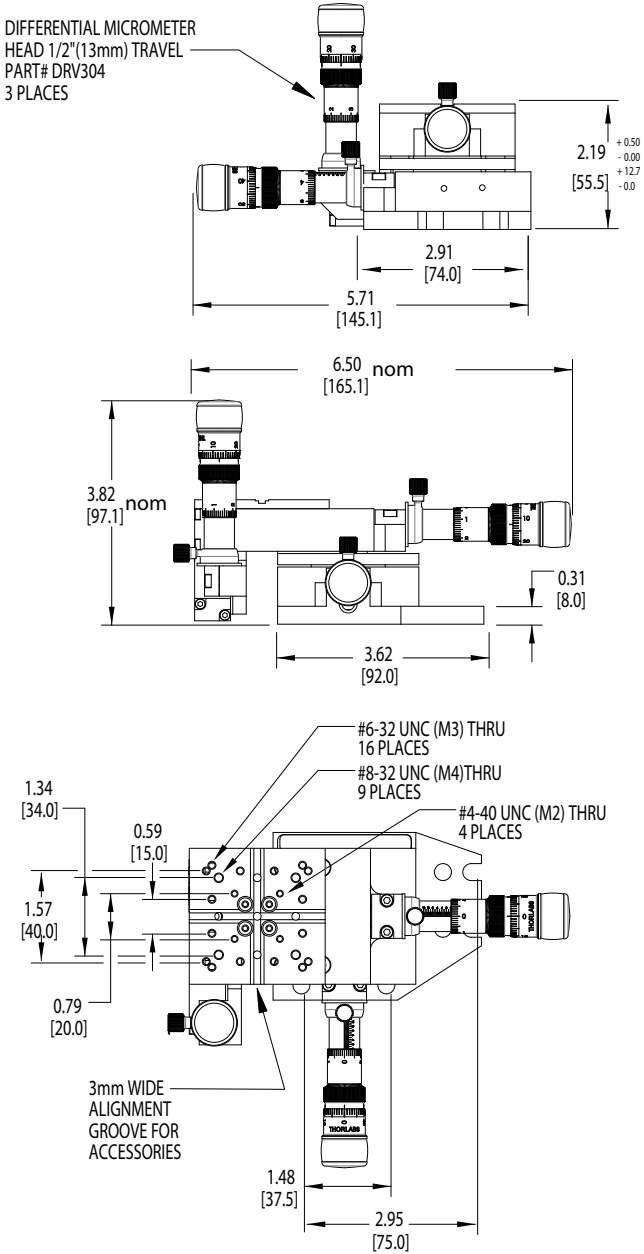


Fig. 4.5 RBL13D Differential Drive RollerBlock Dimensions

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## Chapter 5 Specification

### 5.1 Specification

#### Stage Specifications

Parameter	Value
Travel	13 mm
Travel Mechanism	Crossed Roller Bearings
Deck Height	62.5 mm (2.46")
Optical Axis Height	75 mm (2.95")
Max Load Capacity	4.4 kg (9.7 lbs)
Mounting Barrel	Ø 9.5 mm (Ø 0.38")
Pitch and Yaw	X: ±125 µrad Y: ±75 µrad Z: ±150 µrad
Straightness	± 10 µm

#### Drive Specifications

Parameter	Value
Travel Range	Coarse: 13mm (1/2") Fine: 300 µm
Resolution	Coarse: 5.0 µm Fine: 0.5 µm
Coarse Adjustment (with Vernier Scale)	500 µm per rev
Fine Adjustment (with Vernier Scale)	50 µm per rev.

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## Chapter 6 Accessories List

Part Number	Description
Imperial Extended top platform +28mm	AMA001
Imperial Extended top platform +35mm	AMA003
Imperial Extended top platform +45mm	AMA005
Imperial Fixed platform bracket 62.5mm high, 25mm wide	AMA025
Imperial General Purpose Adapter Plate	RB13P1
Metric Extended top platform +28mm	AMA001/M
Metric Extended top platform +35mm	AMA003/M
Metric Extended top platform +45mm	AMA005/M
Metric Fixed platform bracket 62.5mm high, 25mm wide	AMA025/M
Metric General Purpose Adapter Plate	RB13P1/M
Imperial Micrometer Drive	148-811ST
Metric Micrometer Drive	148-801ST
Piezo Assisted Micrometer Drive	DRV517
Differential Drive	DRV304
Handbook	HA0161T



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# Chapter 7 Regulatory

## 7.1 Declarations Of Conformity

### 7.1.1 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

### 7.1.2 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.

## 7.2 Waste Electrical and Electronic Equipment (WEEE) Directive

### 7.2.1 Compliance

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

This offer is valid for 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. 7.1** 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 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 unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

### **7.2.2 Waste treatment on your own responsibility**

If you do not return an "end of life" unit to the company, 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.

### **7.2.3 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.

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## Chapter 8 Thorlabs Worldwide Contacts

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



### **USA, Canada, and South America**

Thorlabs, Inc.  
[sales@thorlabs.com](mailto:sales@thorlabs.com)  
[techsupport@thorlabs.com](mailto:techsupport@thorlabs.com)

### **Europe**

Thorlabs GmbH  
[europe@thorlabs.com](mailto:europe@thorlabs.com)

### **France**

Thorlabs SAS  
[sales.fr@thorlabs.com](mailto:sales.fr@thorlabs.com)

### **Japan**

Thorlabs Japan, Inc.  
[sales@thorlabs.jp](mailto:sales@thorlabs.jp)

### **UK and Ireland**

Thorlabs Ltd.  
[sales.uk@thorlabs.com](mailto:sales.uk@thorlabs.com)  
[techsupport.uk@thorlabs.com](mailto:techsupport.uk@thorlabs.com)

### **Scandinavia**

Thorlabs Sweden AB  
[scandinavia@thorlabs.com](mailto:scandinavia@thorlabs.com)

### **Brazil**

Thorlabs Vendas de Fotônicos Ltda.  
[brasil@thorlabs.com](mailto:brasil@thorlabs.com)

### **China**

Thorlabs China  
[chinasales@thorlabs.com](mailto:chinasales@thorlabs.com)



**THORLABS**  
[www.thorlabs.com](http://www.thorlabs.com)