



MBT401D(/M) and MBT402D(/M) 4-Axis Axis Translation Stages

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.



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. In particular, excessive moisture may impair operation.

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.

Chapter 2 Introduction

2.1 Description of the MicroBlock Four-Axis Waveguide Manipulator

The MBT401D waveguide manipulator is a compact, multi-axis positioner designed for precise orientation of integrated optics requiring four independent degrees of freedom: y , z , $\varnothing y$ (pitch), and $\varnothing z$ (yaw). The two rotations $\varnothing y$ and $\varnothing z$ gimbal about a point located at the system optical-axis height of 75 mm, 12.5 mm above the platform surface. An optical component can be translated in the y - z plane and then gimballed about a point in the plane.

The four-axis waveguide manipulator is equipped with differential drives on all axes, which provide $\pm 5^\circ$ degrees of backlash-free flexure rotational adjustment in both $\varnothing y$ and $\varnothing z$ with a setting sensitivity of 1 arc second. The vertical (z) flexure adjustment range is 6 mm, and the horizontal (y) fine ballbearing stage adjustment range is 13 mm. The longer horizontal range allows easy adjustment across the full width of a waveguide device.

The MicroBlock has been developed as a cost-effective auxiliary device manipulator for end-fire and butt-coupling applications where relatively large translations are required for prepositioning components while maintaining very precise control of the rotational adjustment about a point in free space.

The MBT402D low-profile manipulator has been designed for applications where the saddle configuration of the MBT401D may restrict the device positioning.

2.2 Axis Identification

2.2.1 MBT401D Microblock Waveguide Manipulator

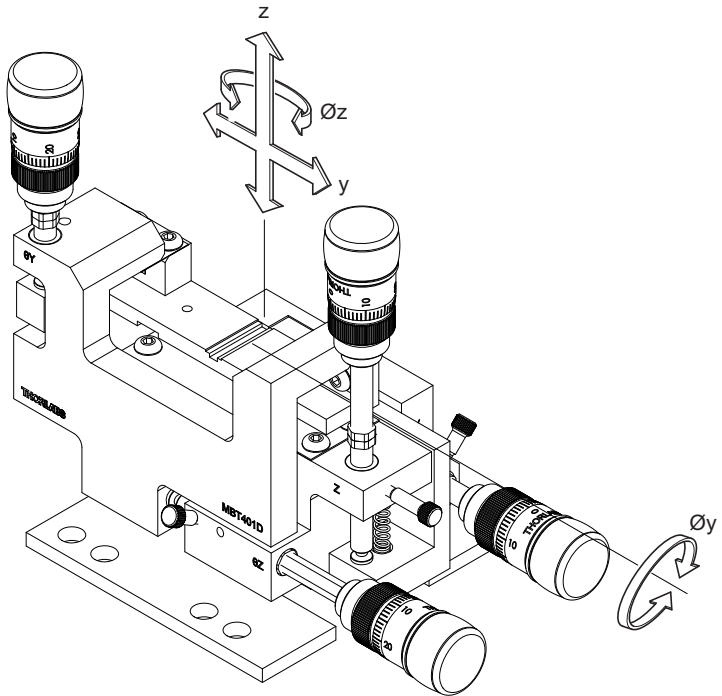


Fig. 2.1 Standard waveguide manipulator

2.2.2 MBT402D MicroBlock Low Profile Waveguide Manipulator

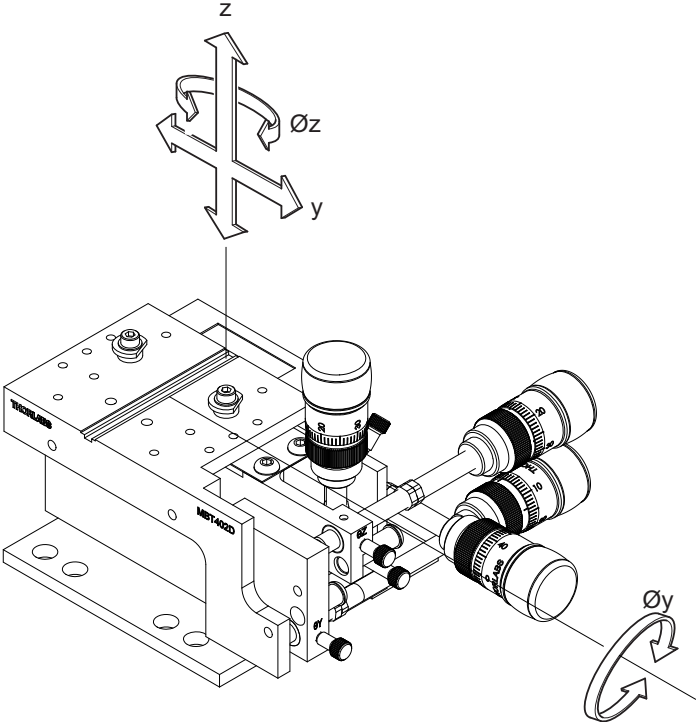


Fig. 2.2 Low profile waveguide manipulator

Chapter 3 Operation

3.1 Reading Micrometer Drives

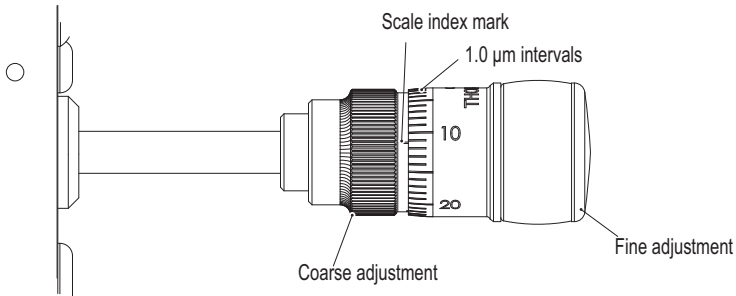


Fig. 3.1 Reading micrometer drives

The micrometer has a $1.0\ \mu\text{m}$ graduated scale. The travel per revolution is not the same for each axis, see Section 5.1. for more details.

3.2 Typical Application

For applications such as waveguide end-fire coupling or butt-coupling, the system in Fig. 3.2 could be used. In these types of application, it is common to configure a three-axis stage to orient the fiber array in the orthogonal axes, with a four-axis manipulator between them to orient the integrated optical device in the rotational axes.

The MBT401D is shown as an example, but for applications where the saddle configuration could restrict the device positioning, the MBT402D should be used instead.

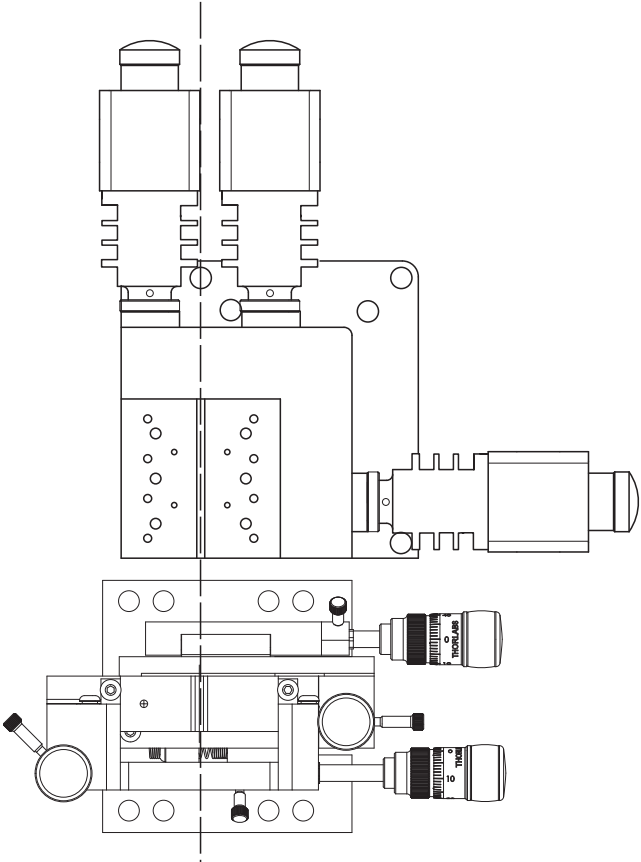


Fig. 3.2 Typical system configuration

Chapter 4 Installation

4.1 Unpacking



Caution



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

Note

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

4.2 Attaching to a Work Surface

The base of each MicroBlock manipulator 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 manipulator 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, internal damage could occur. The range of travel on the orthogonal axes is 13mm horizontal (i.e. ± 6.5 mm about the nominal position) and 6 mm vertical (i.e. ± 3.0 mm about the nominal position). The range of travel on each rotational axis is 10 degrees, that is ± 5 degrees about the nominal position.

4.3 Mounting Equipment to the Moving Platform



Caution



To avoid damaging the internal mechanism, the weight attached to the moving platform must not exceed 0.5 kg.

Do not apply excessive forces to the moving platform.

Thorlabs manufacture a variety of fibre chucks, holders and fixtures to fit the stage, which are mounted on the top platform - see www.thorlabs.com for more details.

4.4 Transportation



Caution



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

Chapter 5 Specifications and Parts List

5.1 Specifications

Parameter	MBT401D(/M)		MBT402D(/M)	
Travel (Coarse)	Horizontal Axis (y)	13 mm	Horizontal Axis (y)	13 mm
	Vertical Axis (z)	6 mm	Vertical Axis (z)	6 mm
	Pitch Axis ($\emptyset y$)	$\pm 5^\circ$	Pitch Axis ($\emptyset y$)	$\pm 5^\circ$
	Yaw Axis ($\emptyset z$)	$\pm 5^\circ$	Yaw Axis ($\emptyset z$)	$\pm 5^\circ$
Coarse Drive Adjustment	500 μm per revolution			
Travel (Differential)	Horizontal Axis	300 μm	Horizontal Axis	300 μm
	Vertical Axis	300 μm	Vertical Axis	300 μm
	Pitch Axis	30 arc min	Pitch Axis	12 arc min
	Yaw Axis	30 arc min	Yaw Axis	30 arc min
Differential Drive Adjustment	50 μm per revolution			
Theoretical Resolution (Coarse)	Horizontal Axis	1 μm	Horizontal Axis	1 μm
	Vertical Axis	1 μm	Vertical Axis	1 μm
	Pitch Axis	10 arc sec	Pitch Axis	10 arc sec
	Yaw Axis	10 arc sec	Yaw Axis	10 arc sec
Theoretical Resolution (Differential)	Horizontal Axis	50 nm	Horizontal Axis	50 nm
	Vertical Axis	50 nm	Vertical Axis	50 nm
	Pitch Axis	1 arc sec	Pitch Axis	1 arc sec
	Yaw Axis	1 arc sec	Yaw Axis	1 arc sec
Deck Height	62.5 mm to the mounting surface of the moving platform. The accessory beam height is 75 mm measured from the bottom surface of the stage.			
Load Capacity	500 g (1.1 lbs)		500 g (1.1 lbs)	
Weight	950 g (2.09 lbs)		900 g (1.98 lbs)	

5.2 Parts and Consumables

Description	Part Number
Standard 4-axis manipulator	MBT401D(/M)
Low profile 4-axis manipulator	MBT402D(/M)
Short L bracket	AMA007(/M)
Long L bracket	AMA009(/M)

Chapter 6

Thorlabs Worldwide Contacts

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



USA, Canada, and South America

Thorlabs, Inc.
sales@thorlabs.com
techsupport@thorlabs.com

UK and Ireland

Thorlabs Ltd.
sales.uk@thorlabs.com
techsupport.uk@thorlabs.com

Europe

Thorlabs GmbH
europe@thorlabs.com

Scandinavia

Thorlabs Sweden AB
scandinavia@thorlabs.com

France

Thorlabs SAS
sales.fr@thorlabs.com

Brazil

Thorlabs Vendas de Fotônicos Ltda.
brasil@thorlabs.com

Japan

Thorlabs Japan, Inc.
sales@thorlabs.jp

China

Thorlabs China
chinasales@thorlabs.com

