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**THORLABS**

## MAX341/M - OCT 31, 2018

Item # MAX341/M was discontinued on OCT 31, 2018. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

### 3-AXIS NANOMAX FLEXURE STAGES

- ▶ 4 mm of Travel Per Axis
- ▶ Modular High-Resolution Drive Options
- ▶ Open- and Closed-Loop Piezo Versions
- ▶ Thermally Stable Design Minimizes Drift



**MAX313D**  
Differential Micrometers  
No Built-In Piezos

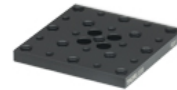
US Patents 6,186,016 and 6,467,762



**MAX341**  
Stepper Motor Actuators  
Closed-Loop Piezos



**MAX302**  
No Actuators  
Open-Loop Piezos



**RB13P1**  
Additional Top Plate for  
Off-Center and General  
Optics Mounting

OVERVIEW

Features

- 4 mm of X, Y, and Z Travel
- Flexure Design Ensures Smooth Continuous Motion and Long-Term Stability
- Grooved Top Plate Ensures Alignment of Multi-Axis Stage Accessories
- Compact Size Measuring 112.0 mm x 112.0 mm (4.41" x 4.41") Without Drives
- All Adjusters Coupled to the Base to Minimize Crosstalk
- Piezo Options Provide up to 5 nm Resolution in Closed Loop
- Modular Design for Interchanging Actuators

Thorlabs' 3-axis NanoMax Flexure Stages are ideal for use in fiber launch systems or applications that require sub-micron resolution. The parallel flexure design ensures precise, smooth, continuous motions with negligible friction. Each unit provides 4 mm (0.16") of X, Y, and Z travel with a maximum load capacity of 1 kg (2.2 lbs). The nominal deck height of the stage is 62.5 mm (2.46"), which matches that of our 3-Axis MicroBlock compact flexure stages and RollerBlock long travel stages. Adapter plates are available for mounting our NanoMax stages to a wide range of other Thorlabs rotation and long travel linear stages.

Precision Drives

The modular design of our 3-axis NanoMax stages allows the drives to be removed and replaced at any time. For all of our compatible drive options, please see the *Drives* tab. Pre-configured stages are also offered that have differential micrometers or stepper motor actuators for out-of-the-box manual or motorized operation, respectively. All drives are coupled directly to the base to minimize any unwanted motion in the system. This feature is ideal for any application requiring sub-micron resolution. For nanopositioning applications we have versions with internal piezoelectric actuators.



Enlarge  
HCS013 Objective Mount and HFF001 Quick-Release Fiber Clamp Accessories Attached to the Top Plate Using AM010 Cleats for Fiber Launch Applications

displacement sensors that provide a feedback voltage signal that is linearly proportional to the displacement of the piezoelectric element. This feedback signal increases the resolution to 5 nm and can be used to compensate for the hysteresis, creep, and thermal drift that is inherent in all piezoelectric elements, making these stages an excellent choice for applications requiring nanometer resolution.

Please note that the piezo mechanism uses contact with the micrometer drives in order to move the top platform. If for any reason the stage is operated with the micrometer drives removed, blanking plugs must be fitted before the piezo actuators can function. To order blanking plugs, please contact Tech Support.

Easy Alignment of Accessories

Two central keyways in the top platform allow for rapid system reconfiguration while maintaining accessory alignment (see the image above and to the left). The crossed pattern allows for changing the orientation of the stage for right- and left-handed use. A wide range of accessories is available to mount items such as microscope objectives, collimation packages, wave guides, fiber, and much more. If options are required for off-center mounting of components, the grooved top plate can be replaced with the RB13P1 adapter plate (sold at the bottom of this page), which has an array of 1/4"-20 (M6) and 8-32 (M4) mounting holes.



Enlarge  
APY002 Pitch & Yaw Stage Shown Mounted on a 3-Axis Flexure Stage, Thereby Enabling 5-Axis Control



Enlarge  
3-Axis Flexure Stage Mounted Directly to a PY004 High-Load Pitch and Yaw Stage for 5-Axis Control

Common Specifications <sup>a</sup>		
Travel		4 mm
Travel Mechanism		Parallel Flexure
Deck Height (Nominal)		62.5 mm (2.46")
Optical Axis Height (Nominal)		75 mm (2.95")
Load Capacity (Max)		1 kg (2.2 lbs)
Thermal Stability		1 µm/°C
Parallelism of Top Plate		<100 µm
Top Plate Mounting Holes	Imperial Plate (Item # MMP1)	
	Metric Plate (Item # MMP1/M)	

- Please see the *Specs* Tab for Complete Specifications

Piezo Options

The option for open- or closed-loop piezos allows these stages to achieve nanometer resolution. The piezoelectric actuators are built into the stage, have 20 µm of travel, and can be controlled using many of our open- or closed-loop piezo controllers (see the *Specs* tab for all compatible controllers). When these stages are coupled with a NanoTrak controller (BNT001/IR, MNA601/IR, or TNA001/IR), the system becomes a powerful auto-alignment solution that maintains optical throughput and eliminates coupling efficiency loss due to thermal drift or other external forces. These piezo stages include three PAA100 Drive Cables and, in the case of closed-loop systems, three PAA622 Feedback Converter Cables.



Click to Enlarge  
Piezo and Feedback Connections

Multi-Axis Stage Accessories

Fiber Mounts	Fiber Rotators	Waveguide Mounts	Diode Mounts	Fixed Mounts	Kinematic Mounts	Top Plates	Extension Platforms	Fiber Chucks	Slide Holders	Kinematic Platforms



Stage Specifications												
Item #	MAX313D(/M)	MAX312D(/M)	MAX311D(/M)	MAX343(/M)	MAX341(/M)	MAX303(/M)	MAX302(/M)	MAX301(/M)				
Included Drives	DRV3 Differential Micrometer Drives			Legacy DRV001 Stepper Motor Actuators		N/A						
Travel	4 mm											
Deck Height (Nominal)	62.5 mm (2.46")											
Optical Axis Height (Nominal)	75 mm (2.95")											
Load Capacity (Max)	1 kg (2.2 lbs)											
Thermal Stability	1 µm/°C											
Parallelism of Top Plate	<100 µm											
Piezo Specifications												
Control	N/A	Open Loop		Closed Loop		N/A	Open Loop		Closed Loop			
Drive Voltage Range		0 - 75 V			0 - 75 V		0 - 75 V					
Range		20 µm			20 µm		20 µm					
Capacitance		3.6 µF			3.6 µF		3.6 µF					
Theoretical Resolution		20 nm		5 nm			5 nm		20 nm		5 nm	
Bidirectional Repeatability		0.2 µm		0.05 µm			0.05 µm		0.2 µm		0.05 µm	
Absolute On-Axis Accuracy		1.0 µm			1.0 µm		1.0 µm					
Resonant Frequency (No Load)		375 Hz			375 Hz		375 Hz					
Resonant Frequency with 275 g (9.7oz) Load		200 Hz			200 Hz		200 Hz					
Resonant Frequency with 575 g (20.3oz) Load	150 Hz			150 Hz		150 Hz						
Compatible Piezo Controllers	BPC303 MDT693B MPZ601 KPZ101 MNA601/IR BNT001/IR		BPC303 MPZ601 KPZ101 with KSG101 MNA601/IR BNT001/IR		BPC303 MPZ601 KPZ101 with KSG101 MNA601/IR BNT001/IR		BPC303 MDT693B MPZ601 KPZ101 MNA601/IR BNT001/IR		BPC303 MPZ601 KPZ101 with KSG101 MNA601/IR BNT001/IR			

Stepper Motor Specifications	
Item #	DRV001 <sup>a</sup>
Backlash	<7 µm
Max Acceleration	4 mm/s <sup>2</sup>
Velocity Range	40 µm/sec - 4 mm/s
Min Achievable Incremental Movement	60 nm
Bidirectional Repeatability	500 nm
Home Location Accuracy	± 1.5 µm
Pitch	X-Axis: 0.015°
	Y-Axis: 0.015°
	Z-Axis: 0.0047°
Yaw	X-Axis: 0.0034°
	Y-Axis: 0.0034°
	Z-Axis: 0.0032°
Limit Switches	Ceramic Tip Mechanical
Manual Over Ride	Yes
Compatible Stepper Motor Controllers	BSC203 MST602

<sup>a</sup> This legacy item has been superseded by the DRV208.

Differential Micrometer Specifications	
Item #	DRV3
Travel Range	8 mm (0.31") Coarse, 300 µm Fine
Coarse Adjustment (with Vernier Scale)	500 µm/rev
Fine Adjustment (with Vernier Scale)	50 µm/rev

**Arcuate Cross Talk Specifications**  
The measured maximum cross talk to the Z axis, when a movement is demanded in X or Y is <88 µm.  
The table below shows the theoretical amount of cross talk to the Z axis, for movement at various X positions (Y axis at zero). Cross talk at Y axis positions (with X at zero) would be the same.

X Axis Position (mm)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Arcuate Motion in Z Axis (µm)	80.0	45.0	20.0	5.0	0.0	5.0	20.0	45.0	80.0

The measured maximum cross talk to the X and Y axes, when a movement is demanded in Z is <66 µm.  
The table below shows the typical amount of cross talk to the X axis, for movement at various Z axis positions (Y axis at zero). Cross talk to Y axis positions (with X axis at zero) would be the same.

Z Axis Position (mm)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Arcuate Motion in X Axis (µm)	57.1	32.1	14.3	3.6	0.0	3.6	14.3	32.1	57.1

DRIVES

Modular Drive Options

All 3-Axis NanoMax system have a modular design that allows the drives to be removed and replaced at any time. This allows for mix-and-match customization of actuators depending on the amount of automation or resolution needed on each axis.

Replacing a drive is simple and can be done in three steps. First, retract the leadscrew of the actuator until it is no longer engaging the moving body of the stage. Then unscrew the knurled knob attaching the existing drive to the stage. Finally, attach the new drive to the stage using the same knurled knob.

The drives compatible with our 3-axis NanoMax stages are summarized below. Some drives have limited travel range when used with the NanoMax 3-axis flexure stages; see the table for more details. For more detailed information on each drive, please see the full presentation for our Stepper Motor Drive, Differential Micrometers and Thumbscrew Drives, or In-line Piezo Actuators.

Removing the Actuators



Click to Enlarge  
Step 2

Unscrew the Knurled Knob and Remove the Actuator



Click to Enlarge  
Step 1

Rotate the Actuator Counterclockwise to Disengage the Actuator from the Platform

Item #	DRV004	DRV3	DRV208	DRV120
Click Image to Enlarge				
Actuator Type	Thumbscrew	Differential Micrometer <sup>a</sup>	Stepper Motor <sup>b</sup>	Piezoelectric with Feedback
Travel Range	8 mm (0.31") <sup>c</sup>	Coarse: 8 mm (0.31") <sup>c</sup> Fine: 300 µm	8 mm (0.31") <sup>c</sup>	20 µm
Adjustment	500 µm/revolution	Coarse: 500 µm/revolution Fine: 50 µm/revolution	-	-
Resolution	-	-	3.2 µm/step 200 steps/rev of Leadscrew	5 nm <sup>d</sup>
Compatible Controllers	-	-	Benchtop: BSC200 Series Rack Module: MST602	Benchtop: BPC300 Series Rack Mount: MPZ601 K- and T-Cubes: KPZ101 with KSG101

- Included with MAX311D(/M), MAX312D(/M), and MAX313D(/M) Stages
- The legacy DRV001 is included with the MAX341(/M) and MAX343(/M) stepper-motor-actuated stages.
- Range Limited to 4 mm (0.16") by the NanoMax Stage
- Closed Loop

PIN DIAGRAMS

Displacement Sensor  
7-Pin LEMO Male  
MAX311D, MAX341, MAX301



Pin	Designation
1	+15 V
2	Oscillator +
3	0 V
4	Signal Out -
5	Signal Out +
6	-15 V
7	Travel

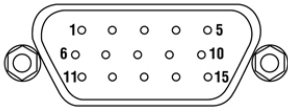
Piezo Drive Input  
SMC Male

MAX311D, MAX312D, MAX341, MAX301, MAX302



Nominal Maximum Input Voltage: 75 V  
Absolute Maximum Input Voltage: 100 V

DRV001 Stepper Motor Connector Pins  
D-Type Male  
MAX341, MAX343



Pin	Description	Pin	Description
1	Limit Switch Ground	6	Motor Phase A-
2	Not Connected	7	Motor Phase A+
3	CW Limit Switch	8 to 14	Reserved for Future Use
4	Motor Phase B-		
5	Motor Phase B+	15	Earth GND

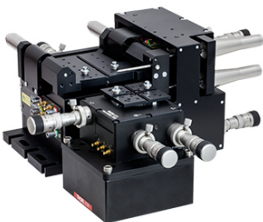


MULTI-AXIS STAGES

Multi-Axis Stage Selection Guide

3-Axis Stages

Thorlabs offers three different 3-Axis Stage variations: NanoMax flexure stages, MicroBlock compact flexure stages, and RollerBlock long-travel stages. Each stage features a 62.5 mm nominal deck height. Our NanoMax line of 3-axis stages offers built-in closed- and open-loop piezos as well as modular drive options that include stepper motors, differential drives, or additional piezos. The MicroBlock stages are available with differential micrometer drives or fine thread thumbscrews; these drives are not removable. Finally, our RollerBlock stage drivers can be switched out for any actuator that has a Ø3/8" (9.5 mm) mounting barrel.



Click to Enlarge

In the above application, a 3-Axis NanoMax flexure stage is aligned in front of a 6-axis stage at the proper 112.5 mm deck height using an AMA554 Height Adapter.

4- and 5-Axis Stages

Our 4- and 5-axis stages are ideal for the static positioning of waveguides or complex optical elements with respect to our 3-axis or 6-axis high-performance alignment stages. Thorlabs' 5-axis stages have nominal heights of 62.5 mm or 112.5 mm. The AMA554 Height Adapter can be used to raise the deck height of the 3-axis or 4-axis stages to 112.5 mm for compatibility with our 5-axis MicroBlock or 6-Axis NanoMax Stages.

6-Axis Stages

Thorlabs' 6-Axis NanoMax Nanopositioners are ideal for complex, multi-axis positioning and have a nominal deck height of 112.5 mm. These stages offer a common point of rotation and a patented parallel flexure design that allows all actuators to be coupled directly to the base to minimize any unwanted motion in the system. Built-in closed- and open-loop piezo options are available. A selection of modular drive options allows any axis to be manual or motorized with the option for external piezos. Our units without included actuators are also available in right- or left-handed configurations. To increase the stage height of the 3-axis stages to 112.5 mm, we recommend our AMA554 Height Adapter, shown in the image to the right.

A complete selection and comparison of our multi-axis stages is available below.

3-Axis Stages

Item #	MAX313D	MAX312D	MAX311D	MAX343	MAX341	MAX303	MAX302	MAX301	MBT602	MBT616D	RB13M	RBL13D
Stage Type	NanoMax Flexure Stages								MicroBlock Compact Flexure Stages		RollerBlock Long Travel Stages	
Included Drives	DRV3 Differential Micrometers			Legacy DRV001 Stepper Motor Actuators <sup>a</sup>		N/A			Fine Thread Thumbscrews	Differential Micrometers	148-801ST Micrometer Drives	DRV304 Differential Micrometers
Built-in Piezos	N/A	Open Loop	Closed Loop	N/A	Closed Loop	N/A	Open Loop	Closed Loop	N/A		N/A	
Travel (X, Y, Z)	4 mm (0.16")										13 mm (0.51")	
Deck Height (Nominal)	62.5 mm (2.46")											
Optical Axis Height (Nominal)	75 mm (2.95")											
Load Capacity (Max)	1 kg (2.2 lbs)										4.4 kg (9.7 lbs)	
Thermal Stability	1 μm/°C										-	
Weight	1.00 kg (2.20 lbs)								0.64 kg (1.40 lbs)		0.59 kg (1.30 lbs)	

- This legacy item has been superseded by the DRV208 actuator.

4-Axis Stages

Item #		MBT401D MBT401D/M	MBT402D MBT402D/M
Stage Type		4-Axis Thin-Profile MicroBlock Device Stage	4-Axis Low-Profile MicroBlock Device Stage
Included Drives		Differential Micrometers	
Built-in Piezos		N/A	
Travel	Horizontal Axis (Y) <sup>a</sup>	13 mm (0.51")	
	Vertical Axis (Z)	6 mm (0.24")	
	Pitch (θ <sub>y</sub> )	±5°	
	Yaw (θ <sub>z</sub> )	±5°	
Deck Height (Nominal)		62.5 mm (2.46")	
Optical Axis Height (Nominal)		75 mm (2.95")	
Load Capacity (Max)		0.5 kg (1.1 lbs)	

- Perpendicular to the Optical Axis (X)

5-Axis Stages



Item #		MBT401D (MBT401D/M) or MBT402D (MBT402D/M) with MBT501	PY005
Stage Type		5-Axis MicroBlock Stage System	Compact 5-Axis Stage
Included Drives		Differential Micrometers	100 TPI Actuators
Built-in Piezos		N/A	
Travel	Optical Axis (X)	13 mm (0.51")	3 mm (0.12")
	Horizontal Axis (Y)	13 mm (0.51")	3 mm (0.12")
	Vertical Axis (Z)	6 mm (0.24")	3 mm (0.12")
	Pitch ( $\theta_y$ )	$\pm 5^\circ$	$\pm 3.5^\circ$
	Yaw ( $\theta_z$ )	$\pm 5^\circ$	$\pm 5^\circ$
Deck Height (Nominal)		112.5 mm (4.43")	62.5 mm (2.46") <sup>a</sup>
Optical Axis Height (Nominal)		125 mm (4.92")	75 mm (2.95") <sup>a</sup>
Load Capacity (Max)		0.5 kg (1.1 lbs)	0.23 kg (0.5 lbs)

- Nominal deck height of 62.5 mm and optical axis height of 75 mm can only be achieved using the PY005A2 Height Adapter and MMP1 Mounting Plate.

### 6-Axis Stages

Item #		MAX601D MAX601D/M	MAX602D MAX602D/M	MAX603D MAX603D/M	MAX604 MAX604/M	MAX605 MAX605/M	MAX606 MAX606/M	MAX607 MAX607/M MAX607L <sup>a</sup> MAX607L/M <sup>a</sup>	MAX608 MAX608/M MAX608L <sup>a</sup> MAX608L/M <sup>a</sup>	MAX609 MAX609/M MAX609L <sup>a</sup> MAX609L/M <sup>a</sup>
Stage Type		6-Axis NanoMax Flexure Stage								
Included Drives		DRV3 Differential Micrometers			Legacy DRV001 Stepper Motor Actuators <sup>b</sup>			N/A		
Built-in Piezos		N/A	Open Loop	Closed Loop	N/A	Open Loop	Closed Loop	N/A	Open Loop	Closed Loop
Travel	X, Y, Z	4 mm (0.16")								
	$\theta_x, \theta_y, \theta_z$	$6^\circ$								
Deck Height (Nominal)		112.5 mm (4.43")								
Optical Axis Height (Nominal)		125 mm (4.92")								
Load Capacity (Max)		1.0 kg (2.2 lbs)								

- Left-Handed Version
- This legacy item has been superseded by the DRV208 actuator.

3-Axis NanoMax Stage with Differential Adjusters

- ▶ Preconfigured with DRV3 Differential Micrometers for Manual Adjustments
- ▶ Available With or Without Internal Closed- or Open-Loop Piezos
- ▶ Piezo Actuators Offer 20 μm of Travel
- ▶ Modular Design Allows Drives to be Removed and Replaced
- ▶ All Adjusters Tied to a Common Ground and Side Mounted
- ▶ Ideal for Use in Professional Fiber Launch Systems
- ▶ PAA622 Piezo Feedback Cables are Included with the MAX311D(M) Stage

Thorlabs' NanoMax Stages with Differential Adjusters provide 4 mm (0.16") of coarse travel and 300 μm of fine travel. The coarse adjuster has a Vernier scale with 10 μm graduations while the fine adjuster has a Vernier scale with 1 μm graduations. This resolution and travel range make these stages ideal for optimizing the coupling efficiency in a fiber alignment or waveguide positioning system. The graduations also allow for a clear reference point for absolute positioning within a system. The modular design of the included drives allows them to be replaced at any time; please see the *Drives* tab for more details and our full selection of compatible actuators.



Click to Enlarge  
MAX311D 3-Axis Stage with a PY005 5-Axis Stage, PY005A2 Base, and MMP1 Top Plate for Fiber Coupling

In addition to the features above, the MAX312D and MAX311D NanoMax Stages incorporate open- and closed-loop piezoelectric actuators, respectively, with 20 μm of travel. The open-loop design does not contain an internal strain gauge sensor, limiting the resolution to 20 nm. The addition of a strain gauge sensor in the closed-loop

feedback design increases the resolution to 5 nm. This feedback loop is ideal for compensating for the hysteresis, creep, and thermal drift that is inherent to all piezoelectric elements. These piezo stages include three PAA100 Drive Cables and, in the case of closed-loop systems, three PAA622 Feedback Converter Cables.

Imperial stages come with an MMP1 Top Plate, while metric stages come with an MMP1/M Top Plate. These mounting plates contain a central keyway that allows for easy and repeatable alignment of all of the accessories listed in the overview. If off-center or breadboard mounting is necessary, we also offer the RB13P1 Top Plate.

Item #	MAX313D(/M)		MAX312D(/M)	MAX311D(/M)
Manual Drive Specifications				
Item #		DRV3		
Travel Range	Coarse <sup>a</sup>	4 mm (0.16")		
	Fine	300 μm Fine		
Coarse Adjustment (with Vernier Scale)		500 μm/rev		
Fine Adjustment (with Vernier Scale)		50 μm/rev		
Piezo Specifications <sup>b</sup>				
Control	N/A	Open Loop	Closed Loop	
Voltage Range		0 - 75 V		
Travel Range		20 μm		
Theoretical Resolution		20 nm	5 nm	
Bidirectional Repeatability		200 nm	50 nm	
Absolute On-Axis Accuracy		1.0 μm		
Compatible Piezo Controllers <sup>c</sup>		BPC303 MDT693B MPZ601 KPZ101 MNA601/IR BNT001/IR	BPC303 MPZ601 KPZ101 with KSG101 MNA601/IR BNT001/IR	

- Full coarse travel range of the DRV3 Differential Actuator is 8 mm (0.31"). This range is limited to 4 mm by the Stage.
- Please see the *Specs* Tab for Complete Piezo Specifications
- Note that for the open-loop and closed-loop piezo-actuated stages, a separate open-loop or closed-loop piezo controller, respectively, is necessary for operation.

Part Number	Description	Price	Availability
MAX313D/M	3-Axis NanoMax Stage, Differential Drives, No Piezos, Metric	\$1,668.72	Today
MAX312D/M	3-Axis NanoMax Stage, Differential Drives, Open-Loop Piezos, Metric	\$2,190.96	Today
MAX311D/M	3-Axis NanoMax Stage, Differential Drives, Closed-Loop Piezos, Metric	\$3,025.32	Today
MAX313D	3-Axis NanoMax Stage, Differential Drives, No Piezos	\$1,668.72	Today
MAX312D	3-Axis NanoMax Stage, Differential Drives, Open-Loop Piezos	\$2,190.96	Today
MAX311D	3-Axis NanoMax Stage, Differential Drives, Closed-Loop Piezos	\$3,025.32	Today

3-Axis NanoMax Stage with Stepper Motor Actuators

- ▶ Preconfigured with DRV001 Stepper Motor Actuators for Automated Alignments
- ▶ Available with or Without Internal Closed-Loop Piezos
- ▶ Piezo Actuators Offer 20 μm of Travel
- ▶ Modular Design Allows Drives to be Removed and Replaced
- ▶ All Adjusters Tied to a Common Ground and Side Mounted
- ▶ PAA622 Piezo Feedback Cables and PAA100 Drive Cables are Included with the MAX341(/M) Stage

Thorlabs' NanoMax Stages with Stepper Motor Actuators provide 4 mm (0.16") of travel and are capable of 60 nm step increments with a minimum incremental movement of 60 nm. They also provide bidirectional repeatability of 500 nm. Ceramic-tipped high-precision limit switches provide a high repeatability ideal for homing the motors. This is critical for auto alignment applications that rely on a highly repeatable zero point. The high repeatability and small step size make these stages ideal for any high-precision automated fiber launch system or general application. The modular design of the included drives allows them to be replaced at any time; please see the *Drives* tab for more details and our full selection of compatible actuators.

In addition to the features above, the MAX341 NanoMax Stage offers closed-loop piezoelectric actuators that have a 20 μm travel range. The closed-loop piezo actuators have strain gauge displacement sensors that provide a feedback signal allowing for a resolution up to 5 nm. This feedback loop is ideal for compensating for the hysteresis, creep, and thermal drift that is inherent to all piezoelectric elements. These piezo stages include three PAA100 Drive Cables and three PAA622 Feedback Converter Cables.

Imperial stages come with an MMP1 Top Plate, while metric stages come with an MMP1/M Top Plate. These mounting plates contain a central keyway that allows for easy and repeatable alignment of all of the accessories listed in the overview. If off-center or breadboard mounting is necessary, we also offer the RB13P1 Top Plate.

Item #	MAX343(/M)	MAX341(/M)
Stepper Motor Drive Specifications <sup>a</sup>		
Item #	DRV001	
Travel Range <sup>b</sup>	4 mm (0.16")	
Min Incremental Movement	60 nm	
Velocity Range	40.0 μm/s to 4 mm/s	
Max Acceleration	4 mm/s <sup>2</sup>	
Compatible Stepper Motor Controllers <sup>c</sup>	BSC203 and MST602	
Piezo Specifications <sup>a</sup>		
Control	N/A	Closed Loop
Voltage Range		0 - 75 V
Travel Range		20 μm
Theoretical Resolution		5 nm
Bidirectional Repeatability		50 nm
Absolute On-Axis Accuracy		1.0 μm
Compatible Piezo Controllers <sup>c</sup>		BPC303 MPZ601 KPZ101 with KSG101 MNA601/IR BNT001/IR

- Please see the *Specs* Tab for Complete Stepper Motor and Piezo Specifications
- Full travel range of the DRV001 Stepper Motors is 8 mm (0.31"). This range is limited to 4 mm by the Stage.
- Note that for the MAX343, a separate controller is required to operate the stepper motor actuators. For the MAX341, both a separate stepper motor controller and a closed-loop piezo controller are necessary for operation.

Part Number	Description	Price	Availability
MAX343/M	3-Axis NanoMax Stage, Stepper Motors, Metric	\$2,534.70	Today
MAX341/M	3-Axis NanoMax Stage, Stepper Motors, Closed-Loop Piezos, Metric	\$3,807.66	Today
MAX343	3-Axis NanoMax Stage, Stepper Motors	\$2,534.70	Lead Time
MAX341	3-Axis NanoMax Stage, Stepper Motors, Closed-Loop Piezos	\$3,807.66	Lead Time

3-Axis NanoMax Stage

- ▶ No Preinstalled Actuators
- ▶ Available With or Without Internal Closed- or Open-Loop Piezos
- ▶ Piezo Actuators Offer 20 µm of Travel
- ▶ Modular Design Allows for a Variety of Drive Options (See *Drives* Tab for Details)
- ▶ All Adjusters Tied to a Common Ground and Side Mounted
- ▶ PAA622 Piezo Feedback Cables and PAA100 Drive Cables are Included with the MAX301(M) Stage



Thorlabs' NanoMax Stages Without Included Actuators are ideal for customizing the type of drive that will be installed on each axis. This allows each axis to be configured depending on the precision or automation needed. Whether the application is a multimode fiber launch system using thumbscrews or an automated alignment setup using stepper motor actuators, each axis can be configured to meet the demand. For a list of all compatible actuators, please see the *Drives* tab.

In addition to the features above, the MAX302 and MAX301 NanoMax Stages offer open- and closed-loop piezoelectric actuators, respectively, with 20 µm of travel. The open-loop design does not contain an internal strain gauge sensor, limiting the resolution to 20 nm. The addition of a strain gauge sensor in the closed-loop feedback design increases the resolution to 5 nm. This feedback loop is ideal for compensating for the hysteresis, creep, and thermal drift that is inherent to all piezoelectric elements. These piezo stages include three PAA100 Drive Cables and, in the case of closed-loop systems, three PAA622 Feedback Converter Cables.

Item #	MAX303(M)	MAX302(M)	MAX301(M)
Internal Piezo Actuators <sup>a</sup>			
Control	N/A	Open Loop	Closed Loop
Voltage Range		0 - 75 V	
Travel Range		20 µm	
Theoretical Resolution		20 nm	5 nm
Bidirectional Repeatability		200 nm	50 nm
Absolute On-Axis Accuracy		1.0 µm	
Compatible Piezo Controllers <sup>b</sup>		BPC303 MDT693B MPZ601 KPZ101 MNA601/IR BNT001/IR	BPC303 MPZ601 KPZ101 with KSG101 MNA601/IR BNT001/IR

- Please see the *Specs* Tab for Complete Piezo Specifications
- Note that for the open-loop and closed-loop piezo-actuated stages, a separate open-loop or closed-loop piezo controller, respectively, is necessary for operation.

Imperial stages come with an MMP1 Top Plate, while metric stages come with an MMP1/M Top Plate. These mounting plates contain a central keyway that allows for easy and repeatable alignment of all of the accessories listed in the overview. If off-center or breadboard mounting is necessary, we also offer the RB13P1 Top Plate.

Part Number	Description	Price	Availability
MAX303/M	3-Axis NanoMax Stage, Actuators Not Included, Metric	\$947.58	Today
MAX302/M	3-Axis NanoMax Stage, Actuators Not Included, Open-Loop Piezos, Metric	\$1,314.78	Today
MAX301/M	3-Axis NanoMax Stage, Actuators Not Included, Closed-Loop Piezos, Metric	\$2,242.98	Today
MAX303	3-Axis NanoMax Stage, Actuators Not Included	\$947.58	Today
MAX302	3-Axis NanoMax Stage, Actuators Not Included, Open-Loop Piezos	\$1,314.78	Today
MAX301	3-Axis NanoMax Stage, Actuators Not Included, Closed-Loop Piezos	\$2,242.98	Today

Tapped Top Plates

- ▶ RB13P1 Adapter Plate for General Purpose Accessories and Components
  - ▶ Array of Thirteen 1/4"-20 (M6) and Twelve 8-32 (M4) Tapped Mounting Holes
- ▶ MMP1 Standard 3-Axis Stage Top Plate (Included with All 3-Axis Stages)
  - Two 3 mm Wide Central Keyways for Aligning Multi-Axis Stage Accessories
  - Sixteen 6-32 (M3) Taps for Mounting Cleats
  - Four 4-40 (M2) Taps
  - Nine 8-32 (M4) Taps



The RB13P1(M) Adapter Plate is designed as a replacement option for the standard MMP1(M) grooved top plate sold with the stages above. Four counterbores that accept 6-32 (M3) screws allow it to be attached to the above stages. The 2.36" x 2.36" (60 mm x 60 mm) mounting surface is the same as the MMP1(M) top plate that is included with the above stages. For complete details on the dimensions and tap locations of this top plate, please see the mechanical drawings below.

Item #	RB13P1	RB13P1/M	MMP1	MMP1/M
Mechanical Drawing				

The MMP1(M) Top Plate is included with the stages sold above but can be purchased separately as well. This plate features two 3 mm wide central keyways in a crossed pattern to allow for rapid configuration while maintaining accessory alignment, making this plate ideal for fiber launch applications. This "crossed groove" design allows for the NanoMax stages to be used in a left- or right-handed configuration. The plate also contains an array of 4-40 (M2), 6-32 (M3), and 8-32 (M4) tapped mounting holes for securing and mounting various components. For complete details on the dimensions and tap locations of this plate, please see the mechanical drawings below.

Part Number	Description	Price	Availability
RB13P1/M	Adapter Plate with M6 and M4 Taps	\$52.02	Today
MMP1/M	Replacement Mounting Plate for Flexure Stages with M4, M3, and M2 Taps	\$60.00	Today
RB13P1	Adapter Plate with 1/4"-20 and 8-32 Taps	\$52.02	Today
MMP1	Replacement Mounting Plate for Flexure Stages with 8-32, 6-32, and 4-40 Taps	\$60.00	Today

Visit the *3-Axis NanoMax Flexure Stages* page for pricing and availability information:  
[https://www.thorlabs.com/newgrouppage9.cfm?objectgroup\\_id=2386](https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=2386)