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THORLABS

DRV014 - DEC 19, 2019

Item # DRV014 was discontinued on DEC 19, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

2" (50 MM) MOTORIZED ACTUATORS

- ▶ Piezo Inertia or Stepper Actuators with 50 mm of Travel
- ▶ High Load Capacities
- ▶ No Backlash



Piezo Inertia Actuator with 50 mm Travel

OVERVIEW

Features

- ▶ Compact Design, 31.5 mm x 17.0 mm (W x H)
- ▶ Piezo Inertia Actuator Offers 20 nm Typical Step Size
- ▶ Manual Adjustment via Rear-Located Thumbscrew
- ▶ 125 V Maximum Operating Voltage
- ▶ Compatible with Translation Stages using 3/8"-40 Thread or 3/8" Mounting Block
- ▶ Also Available in 10 mm, 13 mm, and 25 mm Travel Versions
- ▶ Ideal for Set-and-Hold Applications that Require Relative Positioning with High Resolution
- ▶ Control Cable can be Adjusted up to 110° for Space-Constrained Applications

Required Controller KIM101

- Four Output Channels, Single- or Dual-Channel Operation
- Standalone Control via Top Panel or PC-Control via USB Plug and Play
- Voltage Output from 85 V to 125 V



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Thorlabs' PIA50 Piezoelectric Inertia Actuator provides high-resolution linear motion control with a long piezo-controlled translation range in a compact package. It can support loads up to 2.5 kg (5.51 lbs) and preloads up to 30 N with typical movements of 20 nm and no backlash. The step size can be adjusted up to 30% to a maximum of approximately 30 nm using the KIM101 Controller and Kinesis® software. However, due to the open-loop design, hysteresis, and application conditions, the achieved step size of the system can vary over 20%. An external feedback system will need to be used to overcome this variance.

This actuator has a 3/8" (9.5 mm) mounting barrel with a 3/8"-40 thread on the front of the barrel for compatibility with our wide range of translation and rotation stages. For compatibility with 1/4"-80 threaded mirror mounts see our 10 mm travel piezo inertia actuator. The actuator is self-locking when at rest and when there is no power supplied to the piezo, making the actuator ideal for set-and-hold applications that require nanometer resolution and long-term alignment stability. Manual adjustments can be made at any time, as long as the piezo is not actively translating the screw, by using the rear-located thumbscrew or with a 5/64" (2 mm) hex key.

Powered by a 10 mm (0.39") long discrete piezo stack, the actuator can operate at speeds of up to 3.5 mm/min. The design of the piezo motor will rotate the tip of the lead screw during translation. As shown in the image to the right, the control cable for each actuator can be rotated up to 110° for space-constrained applications.



Click for Details
The Control Cable Can
be Adjusted up to 110°
for Space-Constrained
Applications

For information on the design of our piezo inertia "slip-stick" motor actuators, please see the complete presentation here.

Required Controller

The KIM101 Controller is required to operate our PIA50 Piezo Inertia Actuator; the actuator cannot be operated using a standard piezo controller. The KIM101 has an internal sawtooth voltage signal generator capable of sending sub-millisecond pulses (steps) with controllable amplitudes from 85 V to 125 V. The driver features four channels and is capable of single- or dual-channel operation, making the controller ideal for applications involving multiple motorized actuators, such as beam steering.

For more information, please see the full web presentation.

Item #	PIA50
Travel	50 mm
Typical Step Size ^a	20 nm
Maximum Step Size ^b	<30 nm
Step Size Adjustability ^c	≤30%
Maximum Step Frequency ^d	2000 Hz
Backlash	None
Maximum Axial Preload ^e	25 N
Recommended Maximum Axial Load Capacity ^f	2.5 kg (5.51 lbs)
Velocity	2 mm/min (Typical) <3.5 mm/min (Maximum)
Drive Screw	1/4"-80 Thread, Hard PVD Coated
Motor Type	Piezoelectric Inertia
Mounting Options	Ø3/8" (9.5 mm) Barrel
	3/8"-40 Threaded Barrel
Operating Temperature	10 to 40 °C (50 to 104 °F)
Dimensions	3.80" x 1.24" x 0.67" (96.6 mm x 31.5 mm x 17.0 mm)
Cable Length	1.0 m (3.28')
Connector	SMC, Female
Compatible Controller	KIM101

- This value can vary over 20% due to component variance, change of direction, and application condition.
- This can be adjusted up to 30% in both directions using the KIM101 Controller and Kinesis Software.
- This can be adjusted using the KIM101 Controller and Kinesis Software.
- Using the KIM101 Inertia Piezo Controller
- The axial force applied to the drive tip to achieve the specified step size. A minimum of 5 N is recommended to enhance stepping behavior.
- A higher maximum load is possible but it may adversely affect the typical step size.

Part Number	Description	Price	Availability

PIA50	Piezo Inertia Actuator, 50 mm Travel, Mounting: 3/8"-40 Thread and 3/8" Barrel	\$550.80	Today
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Stepper Motor Actuator with 50 mm Travel

OVERVIEW

Features

- ▶ Specifically Designed to be Used with the LNR50 TravelMax™ Stage
- ▶ <1 μm Bidirectional Repeatability
- ▶ Maximum Load Capacity: 48 lbs (22 kg)
- ▶ Preload to Eliminate Backlash
- ▶ Non-Rotating Tip
- ▶ 25 mm Travel Version also Available

The DRV014 offers 50 mm (1.97") of travel and a bidirectional repeatability better than 1 μm . When used with one of our Stepper Motor Controllers, such as our Benchtop Controllers, the DRV014 can achieve a minimum incremental movement better than 50 nm, and a 20 mm per second maximum speed.

The hybrid stepper motor, with its rotor that consists of 50 individual magnetic teeth, is ideally suited for micro-stepping applications. Aside from the obvious increase in resolution resulting from increasing the steps per revolution from 200 to 409,600, micro-stepping also ensures smoother low speed motion by allowing the discrete 1.8° step size which produces mechanical noise to be reduced to much smaller steps with inherently lower resultant vibrational noise.

The DRV014 Stepper Motor drive has been equipped with a trapezoidal screw thread for a cleaner, more wear resistant operation than is available from standard threading. It is capable of driving loads as high as 55 lbs (25 kg). The use of a trapezoidal lead screw in the DRV014 provides a number of benefits over the more common Acme style thread. The benefits are an improved durability, a lower friction due to improved surface quality, and nearly no back-drive.

This actuator is compatible with our 2" TravelMax manual stages. To use the DRV014 with these stages, mount the motor to the side of the stage using two M4 x 40 cap screws (included).



Click to Enlarge
A 3-axis LNR50DD 2" travel stage shown with the manual adjusters replaced by DRV014 actuators.

Recommended Controllers BSC201 or BSC203

- 409,600 Microsteps per Revolution
- 48 V Output at 25 W
- Trapezoidal and 'S-Curve' Velocity Profiles



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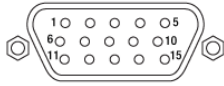
Item #	DRV014
Travel	50 mm (1.97")
Bidirectional Repeatability	<1 μm
Maximum Load Capacity	48 lbs (22 kg)
Maximum Speed (Default) ^a	20.0 mm/s
Full Step Angle	1.8°
Step Angle Accuracy	5%
Rated Phase Current	1 A
Phase Resistance	3.6 Ω
Phase Inductance	4.6 mH
Holding Torque	23.1 N•cm
Detent Torque	1.7 N•cm
Rotor Inertia	32 g•cm ²
Insulation Class	B
Limit Switches	Ceramic Tipped, Electro-Mechanical
Leadscrew Pitch	1 mm Pitch, Trapezoidal
Motor Type	2-Phase Stepper
Microsteps per Revolution	409,600
Min Incremental Movement ^b	50.0 nm
Mounting Barrel	\varnothing 1/2" (12.5 mm)
Weight (Actuator)	1.8 lbs (0.8 kg)
Compatible Controllers	BSC201, BSC202, BSC203, or MST602

- This is the maximum speed set by default when the actuator is used with one of our stepper motor controllers. By adjusting settings on the controller, the maximum speed may be increased to a maximum 50 mm/s.
- Valid if used with a Thorlabs stepper motor controller.

PIN DIAGRAM

15-Pin D-Sub Connector Pin Out

Pin Diagram



High-Density D-Type Male 15 Pin Connector

Pin	Description	Pin	Description
1	Limit Ground/Return ^a	9	Reserved for Future Use
2	CCW Limit Switch	10	Reserved for Future Use
3	CW Limit Switch	11	Reserved for Future Use
4	Motor Phase B-	12	Reserved for Future Use
5	Motor Phase B+	13	Reserved for Future Use
6	Motor Phase A-	14	Reserved for Future Use
7	Motor Phase A+	15	Braid/Screen Ground
8	Reserved for Future Use	-	-

- The limit ground wire is connected to the motor body.



Click to Enlarge
High-Density D-Type Male 15 Pin Connector

Part Number	Description	Price	Availability
DRV014	50 mm Trapezoidal Stepper Motor Drive	\$1,140.55	Today

Visit the *2" (50 mm) Motorized Actuators* page for pricing and availability information:
https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=3039