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THORLABS

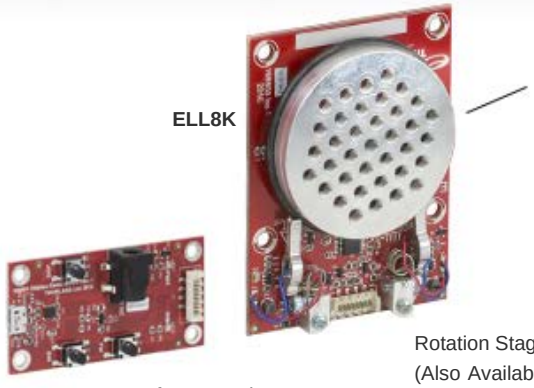
ELL8K - July 23, 2018

Item # ELL8K was discontinued on July 23, 2018. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

ROTATION STAGE WITH RESONANT PIEZOELECTRIC MOTORS

- **Ø50 mm Rotation Stage with Closed-Loop Positioning**
- **Open Frame Design for OEM Applications**
- **Control via Interface Board, GUI, or ASCII Message Calls**
- **Fully Integrated Drive Electronics**

Customization Available



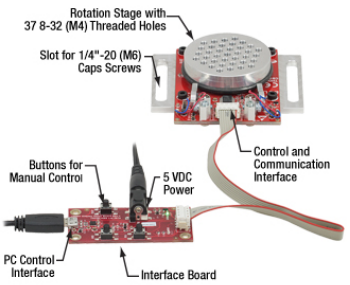
Application Idea
Rotate the diffraction grating to select the wavelengths passing through the slit

Hide Overview

OVERVIEW

Features

- Ideal for OEMs and Applications Requiring Rapid and Precise Positioning
- Micro-B USB and Picoflex® Connectors for Control Signals
- Multi-Drop Serial Communication Protocol Supported
- Ø50.0 mm (Ø1.97") Rotation Stage
- Absolute Home Position Found with IR and Magnetic Sensor Technologies
- Magnetic Incremental Rotary Encoder Used to Position Stage



Click to Enlarge
The components of the ELL8K Rotation Stage bundle are shown connected and with key features indicated.

Thorlabs' Elliptec™ piezoelectric resonant motor technology drives these Rotation Stages, which are available standalone (Item # ELL8) and as part of a complete package that includes an interface board (Item # ELL8K). With a mass of 80 g and maximum dimensions of 81.0 mm x 60.0 mm x 20.2 mm (without brackets), the rotation stage is lightweight and compact. The assembled components of the ELL8K are shown in the image to the right, with key features labeled. The motor is highly dynamic and has no gearing. As the motor includes no magnets, it is compatible with EM-sensitive environments. Please see *The Elliptec™ Motor* tab for more information.

The ELL8 rotation stage achieves closed-loop operation through a design that includes an enclosed optical infrared (IR) sensor and a relative (incremental) magnetic rotary encoder, which provides rotation to specified orientations with a repeatability of 434 µrad. The stage is moved with minimum increments of 288.0 µrad, and it has a homing and positioning accuracy of 288.0 µrad. When power is not applied to the motors, the stage is held in place by an

Key Specifications[a]	
Travel (No Limit Switches)[b]	360° Continuous
Homing/Positioning Accuracy	288.0 µrad (0.0165°)
Repeatability	434 µrad (0.025°)
Velocity (Maximum)	1.4 Hz (504 deg/s) ±0.6 Hz
Maximum Total Load	200 g (7.05 oz)
DC Voltage Input	4.5 to 5.5 V
Weight of Stage and Brackets	90 g (0.198 lbs)

approximately 0.025 N·m combined torque exerted by the stationary arms of the motors.

Minimum Lifetime	100 km (600,600 Revolutions)

. See the *Specs* tab for complete specifications.
. Not Intended for Continuous Operation

The open frame format, versatility, and simplicity of this rotation stage makes it attractive for OEM applications, as it can be customized according to customer requirements and produced in high-volume quantities. Please contact us to discuss your specific requirements so that we may tailor a solution to meet the needs of your application.

Control

There are multiple options for powering, driving, and controlling ELL8 rotation stage, which are detailed in the *Positioning the Rotation Stage* section of the *Operation* tab. Each stage possesses a 3.3 V serial bus and is designed to be operated with or without the interface board; the *Pin Diagram* tab provides pin assignments. Thorlabs offers software for our Elliptec products capable of providing full and independent control of the stage. When the interface board is used as an accessory to change the position of the stage, its status in the software is automatically updated. Please note that the ELL8 rotation stage is not designed for continuous operation. We recommend operation with duty cycles of 40% or less.

The multi-drop communications bus offers the option of connecting the stage to a hybrid network of up to 16 Elliptec resonant motor products and controlling the connected units with a device such as a microprocessor. When multiple units are connected to the same interface board, all can be controlled simultaneously using either the software or the buttons on the interface board.

Application Idea

The rotation stage is well-suited for integration into a variety of applications. In the setup pictured at the top of this page, and detailed below, the rotation stage enables wavelength selection by controlling the angle between a diffraction grating and a slit.

Elliptec Resonant Motor Products			
			
Multi-Position Sliders	25 mm Linear Stage	60 mm Linear Stage	Rotation Stage

Thorlabs' Elliptec Technology for OEM


Robert Capehorn
OEM Project Manager,
Elliptec Systems

Feedback?
Questions?
Product Suggestions?
Custom or OEM Applications?

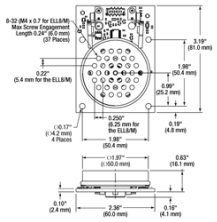
Contact Me

Hide Specs

SPECS


Click to Enlarge
Components of the ELL8K Bundle
(One Region-Specific Power Adapter Included with the Power Supply)

Specifications[a]	
Performance	
Travel[b]	360° Continuous
Minimum Incremental Motion	288.0 µrad (0.0165°)
Repeatability	434 µrad (0.025°)
Homing/Positioning Accuracy[c]	288.0 µrad (0.0165°)
Velocity (Maximum)	1.4 Hz (504 deg/s) ±0.6 Hz
Acceleration (Maximum)	3.25 Hz/s (1170 deg/s^2)
Minimum Holding Torque (Both Motors Engaged)	0.025 N•m
Wobble (Precession, Maximum Axial Error)	35.0 µrad (7.22 arcsec)
Full Scale Nonlinearity Error	<400 µrad
TIR (Total Indicator Reading, or Runout)[d]	17.0 µm



Click to Enlarge
Mechanical Drawings of the
Rotation Stage

As is shown in the above drawing of the rotation stage, the spacing and threading of the 37 mounting holes in the stage differs between the imperial (ELL8K) and metric (ELL8K/M) versions of the stage. All other dimensions, including the 1.97" (50.0 mm) diameter of the stage are the same for both. The board is functionalized with four Ø0.17" (Ø4.2 mm) through holes, which accept the included 6-32 x 1/4" (M3 x 6 mm) screws and are used to attach the mounting brackets.

Encoder Resolution (Relative Magnetic Encoder)	262144 counts/rev (24.0 µrad/count) (0.0014°/count)
Backlash	Zero
Deflection Under Load[e]	8.0 µrad/kg (1.65 arcsec/kg)
Maximum Total Load[f]	0.200 kg (0.441 lbs)
Minimum Lifetime[g]	600,600 Revolutions[h] (100 km)
Electrical	
Motor Type	Elliptec Resonant Piezo
DC Voltage Input	4.5 to 5.5 V
Typical Current Consumption, During Movement	800 mA
Typical Current Consumption, During Standby	50 mA
Communications	
Bus[i]	Multi-Drop 3.3 V/5 V TTL RS232
Connector on Rotation Stage Board	Picoflex®
Connectors on Interface Board	Picoflex® Micro-B USB 5 VDC Power: [For Plug with Ø5.5 mm OD (Ground) and Ø2.1 mm ID (+5 V)]
Speed	9600 baud
Data Length (1 Stop Bit, No Parity)	8 bit
Protocol Data Format	ASCII HEX
Module Address and Command Format	Mnemonic Character
8-Conductor Ribbon Cable Length (Supplied)	0.250 m
8-Conductor Ribbon Cable Length (Maximum)	3 m
Mechanical	
Mounting Threads (On Stage, 37 Places)	8-32 (Imperial Version) M4 x 0.7 (Metric Version) Length: 0.24" (6.0 mm)
Dimensions of the Rotation Stage Board (Without Brackets)	3.19" x 2.36" x 0.80" (81.0 mm x 60.0 mm x 20.2 mm)
Dimensions of the Rotation Stage Board (With Brackets)	3.19" x 3.72" x 0.84" (Imperial Version) 81.0 x 86.4 x 21.4 mm (Metric Version)
Dimensions of the Interface Board	1.26" x 2.60" x 0.49" (32.0 mm x 66.0 mm x 12.5 mm)
Weight of Rotation Stage Board (Without Brackets)	0.176 lbs (0.08 kg)
Weight of Rotation Stage Board (With Brackets)	0.198 lbs (0.09 kg)
Weight of the Brackets and Stage and Interface Boards	0.220 lbs (0.10 kg)
Environmental Operating Conditions	
Temperature Range	15 to 40 °C (59 to 104 °F)
Maximum Relative Humidity (Non-Condensing)	<80% at 31 °C
Maximum Altitude	2000 m

. Performance specifications are given for the case when the rotation stage is mounted as recommended in the *Operation* tab.

.Travel is not limited.

. Homing is performed using a combination of reflecting optical and magnetic sensors. For details, please see the *Operation* tab or Sections 2.1 and 3.1.1 of the manual.

d. For a tip pushed against the vertical side of the stage, the TIR is the total measured displacement during a full rotation.

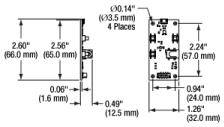
e. Deflection Due to Finite Compliance of Structure and Bearings of the Stage

f. The rotation stage is mounted in the horizontal plane.

. The rotation stage is not designed for continuous operation.

. The number of revolutions is computed using a diameter of 53 mm, which includes the thickness of the track.

i. Use two 10 kΩ pull-up resistors in multi-drop mode for RX/TX.



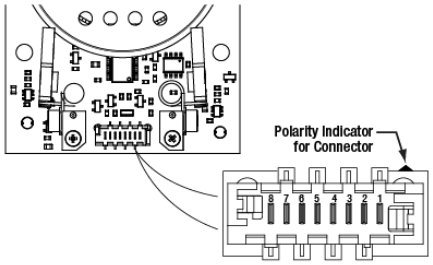
Click to Enlarge
Mechanical Drawings of the Interface Board

Hide Pin Diagram

PIN DIAGRAM

Connector J1 Pinout[a,b]		
Pin	**Type**	**Function**
1	PWR	Ground
2	OUT	OTDX - Open Drain Transmit 3.3 V TTL RS232
3	IN	RX Receive - 3.3 V TTL RS232
4	OUT	In Motion, Open Drain Active Low Max 5 mA
5	IN	JOG/Mode, Active Low Max 5 V
6	IN	BW Backward, Active Low Max 5 V
7	IN	FW Forward, Active Low Max 5 V
8	PWR	VCC +5 V ±10%; 800 mA

. Connector Model Number MOLEX 90814-0808;
Mating Connector Model Number MOLEX 90327-0308
. A polarity indicator is engraved onto each PCB next to the Picoflex connector, as shown in the drawing to the left, to assist with properly connecting the interface board to the main unit. The red wire in the ribbon cable should be adjacent to this indicator. Not doing so can harm the unit.



Click to Enlarge
Pinout diagram of the Picoflex connector is shown referended to a cut-away diagram
of the ELL8(/M) Rotation Stage Board. The polarity indicator on the connector
must be adjacent to the red wire on the supplied 8-connector cable.

Hide Operation

OPERATION

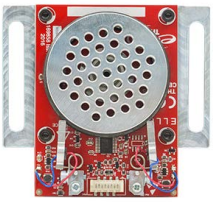
Operation Notes

This tab contains information on handling, mounting, and operating the ELL8K(/M) Rotation Stage Bundle and ELL8(/M) Rotation Stage.

Contents

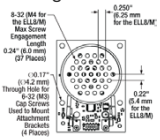
Handling

The ELL8K(/M) rotation stage and interface board components are robust to general handling. To ensure reliable operation, keep the surface of the plastic track contacted by the motors free of oils, dirt, and dust. It is not necessary to wear gloves while handling the rotation stage, but avoid touching the track to keep it free of oils from fingerprints. If it is necessary to clean the track, it may be wiped with isopropyl alcohol or mineral spirits (white spirit). Do not use acetone, as this solvent will damage the plastic track.



Click to Enlarge
The Rotation Stage with Brackets Attached

The open frame format of the ELL8K(/M) can tolerate up to 8 kV of static discharge. ESD precautions should be taken, as an electrostatic discharge can produce an electrical signal that may cause an unintended movement of the stage. A bending load in excess of 500 g applied to the board may cause the PCB to deform, which will degrade the performance of the rotation stage. As readings from a magnetic sensor are used during the homing and positioning of the stage, avoid subjecting the structural PCB to excessive loads or magnetic fields. Limit the strength of magnetic fields in proximity to the magnetic sensor to ±5 mT to avoid negatively affecting the homing and positioning operations.

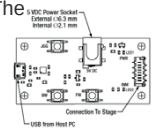


Click to Enlarge
Features of the Rotation Stage

Click to Enlarge
The Rotation Stage with no Brackets Attached

Mounting and Loading the Rotation Stage

The ELL8(/M) rotation stage should be mounted so that the top surface of the stage is in the horizontal plane. There are four Ø0.17" (Ø4.2 mm) through holes located along the edges of the board, which are visible in the image at the center-right of this tab, that may be used to mount the stage with or without the mounting brackets. The two brackets included in the ELL8K(/M) bundle have slots that accommodate 1/4"-20 (M6) cap screws to facilitate mounting the stage to breadboards and optical tables. The brackets possess 6-32 (M3) tapped holes aligned with the four through holes in the board. Attach the brackets on either side of the stage, as pictured at right, so that they extend out from and span the left and right sides of the board. Do not attach the brackets so that they cross the back of the board, as metal brackets in contact with the electronics may cause electrical shorts detrimental to the operation of the stage. When mounting the stage, ensure that the installation does not bend the PCB.



Click to Enlarge
Features of the Interface Board

Click to Enlarge
The Interface Board

Loads may be mounted to the stage using the 37 tapped holes for 8-32 (Imperial Version) or M4 (Metric Version) threaded screws, whose spacing is shown in the diagram below and in the diagrams included in the *Specs* tab. The maximum allowed weight of the mounted components is 200 g. In all cases of mounting and loading, ensure that nothing interferes with the moving parts of the rotation stage.

Supplying Power

When the setup includes the interface board, power may be supplied through the Micro-B USB connector and/or the 5 VDC power socket located on the board. The electronics on the interface board convert the applied DC signal to a sinusoidal signal oscillating at the required resonance frequency.

The ELL8K(/M) bundles include a 5 VDC power supply whose connector mates with the power socket on the interface board. Delivering power through this socket also leaves the Micro-B USB connector available to accept a USB cable connection to a computer, which can be used to control the stage remotely. The power supplied by the computer through the USB 2.0 connection is not sufficient to power the stage. If computer control is not necessary, another option for supplying power to the stage is a portable USB 5 V battery pack connected to the Micro-B USB connector on the interface board.

When the implementation does not include the interface board, the connection with the power source is made using the pins on the Picoflex connector that is included on the rotation stage board. A pinout diagram of this connector is included in the *Pin Diagram* tab, and information on powering and addressing the rotation stage is given in the manual and the communications protocol manual, respectively.

Operation of the Motors

The motion of the ELL8(/M) stage is controlled by forcing the piezoelectric elements to vibrate at specific ultrasonic frequencies. For each motor, there is one ultrasonic resonant frequency that will push the stage forward, and another that will pull the stage backward. Operating a motor at one of its resonance frequencies causes the tip of the motor to continuously cycle in a tight clockwise elliptical path. When the motor is driven at its other resonant frequency, the tip of the motor cycles through that same path in a counterclockwise direction. Both resonant frequencies are around 100 kHz. The total displacement at the tip of motor is a function of the mechanical load it is driving and the voltage supplied to the piezo element. In the case of no loading and a 5 V maximum driving voltage at a resonant frequency, the tip of the motor expands and contracts no more than a few microns while tracing the elliptical path. Please see *The Elliptec™ Motor* tab for more information and an animation illustrating the operational principle of the motors.

Homing the Rotation Stage

To Home the stage, press the BW button on the interface board, click the Home button in the Elliptec software's graphical user interface (GUI), or send the

appropriate ASCII message as is specified in the communications protocol manual.

The default Home position is referenced to a fixed feature on the stage assembly. If desired, the user may redefine the position of Home to be offset from the default position by up to +90° (a quarter turn in the clockwise direction). Being able to customize the Home position can be useful when synchronizing the orientations of two or more stages. When executing the Home command, the stage first finds the approximate location of Home, and then a fine-positioning procedure is used to orient the stage at Home with an accuracy of 288.0 µrad. The user can specify whether the stage rotates in a clockwise or counterclockwise direction (as defined from the perspective of looking down on the surface of the stage) during the first phase of the homing procedure, but the fine-positioning phase is always performed in the counterclockwise direction for repeatability.

The default Home position is found by using first an optical IR sensor and then a relative (incremental) magnetic sensor. The optical sensor is located under the stage, and its 980 nm emission is confined by the underside of the stage and the top surface of the PCB. The magnetic sensor's encoder is connected to a shaft that revolves 64 times for each rotation of the stage. The encoder generates one command pulse for each revolution of the shaft, which results in 64 command pulses being generated for each rotation of the stage, effectively defining 64 sectors within a full rotation. Each sector consists of 4096 individual increments. Using the output of the magnetic sensor alone, it is not possible to uniquely identify any of the 64 sectors defined by the encoder. Accurate positioning of the stage requires referencing the readings from the magnetic sensor to a known location, and the IR sensor signal is used to establish the required reference point. At the start of the procedure to find the default Home position, the stage is rotated and the signal from the IR sensor is monitored. The IR sensor's detection of the fixed feature on the stage assembly triggers the rotation stage assembly to start monitoring the signal from the magnetic sensor. The stage continues to rotate until it detects the first subsequent command pulse generated by the magnetic sensor's encoder. The location corresponding to this command pulse is defined as the default Home position. If the user specifies the position of Home to be offset from the default Home position, the offset is applied in the clockwise direction. After the Home position is found, readings from the magnetic sensor, which can resolve angular increments of 24.0 µrad, are used to position the stage and when executing the Home command.

Positioning the Rotation Stage

Note that the rotation stage is not intended for continuous operation. We recommend operation with duty cycles of less than 40% during general use, while operation with duty cycles greater than 60% should be limited to a few seconds.

Before the stage may be positioned, the Home position of the stage must be found. Please see the previous section for details. The movement of the stage may be controlled by pressing buttons on the interface board, through computer control via the Elliptec™ software package that may be downloaded, or by sending simple signals to digital lines on the stage's board. The buttons on the interface board can be seen in the image of the interface board above. A link to download the software and accompanying documentation can be found in the *Software* tab. The interface board may be used as an accessory while interfacing with the stage through the Elliptec software; all changes in the position of the rotation stage that occur as a result of pressing buttons on the interface board are registered by the software, and the software may independently control the rotation stage while the interface board is connected. It is also possible to effect the simultaneous movement of several rotation stages by connecting all to the communications bus. When this is done, the software can send separate commands to each stage, while commands originating from buttons pressed on the handset will be sent to all connected stages. The communications protocol manual describes how to use the software to individually address each connected stage.

The interface board can be used to move the stage forward and backward in increments by pressing and holding the JOG button while pressing and releasing the FW or BW button, respectively. The default increment is 45°, and a custom increment can be set using the Elliptec software or by sending the appropriate ASCII message(s) as specified in the communications protocol manual. The Elliptec software can be used to move the stage to absolute and relative positions, in addition to jogging the stage forward or backward. The software is also used to set the jog step size, read the position of the stage, and adjust the position of Home, as is described in the previous section.

Readings from the magnetic sensor, which can resolve angular increments of 24.0 µrad, are used to position the stage and when executing the Home command. The travel range of the stage is not limited, but the reported orientation of the stage is always expressed as a value between 0° and 359.99°. The minimum incremental movement of the stage is 288.0 µrad, and it can be positioned with a repeatability of 434 µrad in response to signals from the magnetic sensor.

The stage learns to efficiently position itself precisely using a position error compensation algorithm. After the stage moves into a new position, it detects the error between the requested and actual positions. The position of the stage is then corrected, and an error compensation value is calculated. The algorithm is then updated with the error compensation value, so that it is applied when the stage is move to its next position. Typically, an optimum error compensation value is found after between two and six movements.

Resonance Frequencies

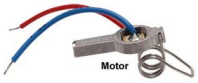
On power-up, the factory default setting instructs each motor driving the rotation stage to search for the resonance frequencies that will deliver the best performance. During this process, the rotation stage will translate a forward and backward by a small amount. If movement on start-up is undesirable, it is possible to disable this calibration procedure by using the serial port to initialize the frequencies on power-up. A new search for optimal resonance frequencies may be performed at any time; to maintain optimal performance, it is recommended that new searches be performed after changes in loading and/or ambient temperature. Please see Section 3.3 of the manual for details.

Hide The Elliptec™ Motor

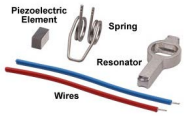
THE ELLIPTEC™ MOTOR

The Elliptec™ Piezoelectric Resonant Motor

Thorlabs' Elliptec™ piezo resonant motor, shown at right, is lightweight, with a mass of 1.2 g, and compact: the dimensions of the resonator housing, excluding the spring, are 8 mm x 4 mm x 20 mm.



Click to Enlarge
The Elliptec Piezoelectric Resonant Motor



Click to Enlarge
The Components of the Elliptec Motor

Components of the Motor

The components that compose the motor are shown at far-right. The piezoelectric element is press fit into the aluminum resonator, which has been precisely designed and machined to produce the desired elliptical motion at the tip and to interface optimally with the driven module. The free ends of the spring are integrated with the resonator housing. The wires, which are soldered to the top and bottom of the piezoelectric element, deliver the voltage signal that induces the piezoelectric element to vibrate at ultrasonic frequencies.

When the motor is built into a system, the open loop of the spring is bolted to a sturdy surface that is stationary with respect to the item to be driven, and the tip of the resonator is placed in contact with the item. The purpose of the spring is to maintain constant contact between the tip of the resonator and the driven item, and the direction of motion is determined by the resonance frequency at which the piezo element is driven.

Elliptical Motion and Comparison with Conventional Motors

Elliptec motors quickly and precisely position stages and mounts while never seeming to move. Their microscopic movements occur at ultrasonic frequencies and are invisible to the naked eye.

The motor is operated by driving it at one of its two resonance frequencies. A voltage signal oscillating at an ultrasonic frequency is applied to the piezoelectric chip, which responds by expanding less than a micron and then contracting back to its original dimensions at the frequency of the driving signal. This rapid-cycling change in the chip's dimensions causes a vibration in the aluminum resonator housing. When the vibration is at one of the housing's resonance frequencies, a pushing motion results at the tip of the motor. When the vibration is at the other resonance frequency a pulling motion results.

As illustrated in the video, the pulling and pushing motions result from the tip of the motor tracing an elliptical path in space when the motor operates at resonance. The selected resonance frequency controls the direction of the cyclical motion. The motor's tip traces one half of the ellipse as it expands and the other half as it contracts. When the motor pushes the driven item, the motor's tip is in contact with the item while the tip expands; the two are not in contact while the tip contracts. The converse is true when the motor pulls the driven item in the opposite direction. The total displacement at the tip of the motor is a function of both the mechanical load it is driving and the voltage supplied to the piezo element. The maximum displacement can be up to a few microns when the peak driving voltage is 5 V.

The motor behaves in many ways like a DC or electromagnetic stepper motor, but it does not suffer from many of the drawbacks of these conventional motors. Unlike conventional electromagnetic motors, which must overcome inertial delays to come to a stop, the highly dynamic Elliptec motor can stop within microseconds. As it has no gears, it does not exhibit backlash. Since it possesses no magnets, it is compatible with use in environments sensitive to electromagnetic interference. The motion of the driven element is continuous and smooth. As the tip of the motor must be in contact with the driven item to induce motion, the motor possesses the safety feature of an inherent friction brake. When in contact with a plastic surface, the motor operates virtually silently.

For OEM applications, the motor can be manufactured in volume at low cost, and it can be driven by inexpensive analog electronics. It does not require microprocessors or software; however it is compatible for use with them.

Hide Software

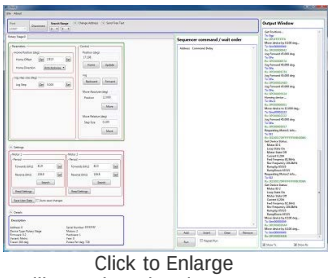
SOFTWARE

Software for Devices Driven by Elliptec™ Piezoelectric Resonant Motors

All devices based on the Elliptec™ resonant piezo motor may be controlled by the Elliptec system software,

which features an intuitive graphical user interface (GUI). The source code, in C# format, is included in software bundle available for download, and custom applications can be created in any language. The image at right shows a screen capture of the GUI, and the button that follows links to the download page.

Commands are entered in the *Sequencer command / wait order* section located at the center-left of the GUI. An example of a sequence of commands that might be sent to the device is "Aho0" to move to the rotation stage at address "A" to the home position in the clockwise direction, and then "Afw" to move the stage at address "A" forward by the jog increment. The command "As1" is used to perform the frequency search that will identify the optimal resonant frequencies, for the current operating conditions, for Motor 1 at adddress "A."



Click to Enlarge
The Elliptec Piezoelectric Resonant Motor Control Software GUI

Software

Version 1.4.3

Includes the Elliptec System Software, with an easy-to-use GUI. Also available for download is the Communications Protocol manual, which details the communication commands for the Elliptec software package.

Software

Hide Rotation Mounts and Stages

ROTATION MOUNTS AND STAGES

Rotation Mount and Stage Selection Guide

Thorlabs offers a wide variety of manual and motorized rotation mounts and stages. Rotation mounts are designed with an inner bore to mount a Ø1/2", Ø1", or Ø2" optic, while rotation stages are designed with mounting taps to attach a variety of components or systems. Motorized options are powered by a DC Servo motor, 2 phase stepper motor, or an Elliptec™ resonant piezo motor. Each offers 360° of continuous rotation.

Manual Rotation Mounts

Rotation Mounts for Ø1/2" Optics						
Item #	**RSP05(/M)**	**CRM05**	**PRM05(/M)[a]**	**SRM05**	**KS05RS**	**CT104**
Click Photo to Enlarge						
Features	Standard	External SM1 (1.035"-40) Threads	Micrometer	16 mm Cage-Compatible	±4° Kinematic Tip/Tilt Adjustment Plus Rotation	Compatible with CT1 Cage Translator Stage and 1/4" Translation Stages[b]
Additional Details						More [+]

. This mount is available in the PRM05GL5 bundle, which includes the PRM05 rotation mount with the SM05PM5 polarizing prism mount.
. The CT104 is complatible with the 1/4" translation stages using our MS103(/M) adapter plate.
. The CT104 is compatible with the CT1 cage translation stage, which is designed for use with 30 mm cage systems.

Rotation Mounts for Ø1" Optics							
Item #	**RSP1(/M)**	**RSP1D(/M)**	**DLM1(/M)**	**CLR1(/M)**	**RSP1X15(/M)**	**RSP1X225(/M)**	**PRM1(/M)[a]**
Click Photo to Enlarge							
Features	Standard	Adjustable Zero	Two Independently	Rotates Optic Within	Continuous 360° Rotation	Continuous 360° Rotation	Micrometer

			Rotating Carriages	Fixed Lens Tube System	or 15° Increments	or 22.5° Increments	
Additional Details							More [+]

. This mount is available in the PRM1GL10 bundle, which includes the PRM1 rotation mount with the SM1PM10 polarizing prism mount.

Rotation Mounts for Ø1" Optics						
Item #	**LM1-A & LM1-B(/M)**	**CRM1(/M)**	**CRM1L(/M)**	**CRM1P**	**KS1RS**	**K6XS**
Click Photo to Enlarge						
Features	Optic Carriage Rotates Within Mounting Ring	30 mm Cage-Compatible[a]	30 mm Cage-Compatible for Thick Optics[a]	30 mm Cage-Compatible with Micrometer[a]	±4° Kinematic Tip/Tilt Adjustment Plus Rotation	Six-Axis Kinematic Mount[a]
Additional Details						More [+]

. This mount also features four 4-40 (M3) holes on the rotation dial for use with the K6A1(/M) prism platform.

Rotation Mounts for Ø2" Optics						
Item #	**RSP2(/M)**	**RSP2D(/M)**	**PRM2(/M)**	**LM2-A & LM2-B(/M)**	**LCRM2(/M)**	**KS2RS**
Click Photo to Enlarge						
Features	Standard	Adjustable Zero	Micrometer	Optic Carriage Rotates Within Mounting Ring	60 mm Cage-Compatible	±4° Kinematic Tip/Tilt Adjustment Plus Rotation
Additional Details						More [+]

Manual Rotation Stages

Manual Rotation Stages								
Item #	**RP005(/M)**	**MSRP01(/M)**	**RP01(/M)**	**RP03(/M)**	**QRP02(/M)**	**PR01(/M)**	**CR1(/M)**	**XYR1(/M)[a]**
Click Photo to Enlarge								
Features	Standard				Two Hard Stops	SM1-Threaded Central Aperture	Fine Pitch Worm Gear	Rotation Plus 1/2" Linear XY Translation
Additional Details								More [+]

. This stage is available in the OCT-XYR1(/M), which includes the XYR1(/M) stage with the XYR1A solid plate platform adapter.

Motorized Rotation Mounts and Stages

Motorized Rotation Mounts and Stages					
Item #	**NR360S(/M)**	**PRMTZ8(/M)[a]**	**ELL8(/M)[b]**	**K10CR1(/M)**	**PRM1Z8(/M)[c]**
Click Photo to Enlarge					
Features	SM2-Threaded Central Aperture	Tapped Mounting Platform for Mounting Prisms or Other Optics	Closed-Loop Positioning; Open Frame Design for OEM Applications	Compatible with SM1 Lens Tubes and 30 mm Cage System	
Additional Details					More [+]

. This stage is available in the KPRMTE(/M), which includes the PRMTZ8(/M) Motorized Rotation Stage with the KDC101 K-Cube DC Servo Motor Controller.

. This stage is available in the ELL8K(/M) bundle, which includes the ELL8(/M) stage, interface board, power supply, brackets, and cables.

. This stage is available in the KPRM1E(/M), which includes the PRMT1Z8(/M) Motorized Rotation Stage with the KDC101 K-Cube DC Servo Motor Controller.

d. See ELL8K(/M) Bundle for Mounting Brackets

Hide Rotation Stage Bundle

Rotation Stage Bundle

- Ideal for OEM Evaluation Testing
- Easily Integrate into a Setup
- Operate using Manual and/or Computer Control
- Included Power Supply is Required for Powering the Stage

Click to Enlarge
[APPLIST]
[APPLIST]
ELL8K Rotation Stage Bundle used to Orient a Grating With Respect to a Variable Slit

Click to Enlarge
Red and blue wires deliver power to the motors, whose aluminum tips contact the black plastic track encircling the rotation stage.

The Rotation Stage Bundle is a complete package that includes the ELL8 rotation stage, which is also sold separately. The ELL8K package facilitates quick integration of the rotation stage into laboratory setups and other experimental applications. It also provides a convenient means to evaluate incorporating this technology into OEM applications.

The tips of both motor housings are in firm contact with the rubber track encircling the rotation stage, as can be seen in the image at the far-right. The motors are installed with opposite orientations and clockwise (and counterclockwise) rotation occurs when one motor pushes the track forward while the other pulls it backward.

Included in the ELL8K Bundle	
ELL8 Rotation Stage	5 V Power Supply
Interface Board	8-Conductor 28 AWG Ribbon Cable and USB Cable
Mounting Brackets	PC-Based Software for Download

Part Number	Description	Price	Availability
ELL8K/M	**Rotation Stage Bundle: ELL8/M Stage, Interface Board, Power Supply, Brackets, Cables**	**$391.68**	**Today**
ELL8K	**Rotation Stage Bundle: ELL8 Stage, Interface Board, Power Supply, Brackets, Cables**	**$391.68**	**Today**

Hide Rotation Stage

Rotation Stage

Metric and imperial versions of the Rotation Stage are offered individually to meet the needs of applications whose designs require multiple networked Elliptec resonant motor products, or applications that do not require the other components included in the ELL8K(/M) bundles.

The ELL8(/M) rotation stage possesses a Ø50.0 mm top surface functionalized with 37 threaded holes [8-32 (M4) with 6 mm deep threads]. Details describing the dimensions, including the spacing of the threaded holes, and other specifications of the stage are given in the *Specs* tab. Please contact us to discuss customizing the rotation stage, or to arrange to purchase mounting brackets with the stage.

One Region-Specific Power Adapter Included