

BioPrecision Stages

LEP BioPrecision stages are very well known for reliability, accuracy and precision. Coupled with the MAC 5000 controller system, it is a versatile solution for demanding microscope automation requirements. The BioPrecision stages cover a wide range of applications with stage sizes from 3"x2" (77mm x 51mm) travel up to 10"x4" (406mm x 102mm) travel stages. Specialized stages for specific microscopes including inverted microscopes eliminate compromise.

BioPrecision stages are designed to meet the requirements of the most challenging applications. High precision, high repeatability, high accuracy and high speed specifications enable applications such as image mosaic building, time-lapse studies, tracing and rapid screening.



DC Servo Motors vs. Stepper Motors

“Which is better: DC servo motors or stepper motors?”. The answer is: “it depends”. Stepper motors and DC servo motors have specific technological advantages, and of course, some respective disadvantages.

DC servo motors characteristically provide higher speeds. When used with LEP stages and the MAC 5000 control system, speeds are about double that of the same system using stepper motors. Positional repeatability and control is entirely dependent on the encoder feedback system. Resolution is never greater than the encoder.

Stepper motors don't have the high speed performance of the DC servo motors, but they do have several advantages. The motor is very simple and stepper motors almost never wear out or fail. The stepper motor has excellent slow speed control. This can be useful for scanning areas or strobed image acquisition. Since the motor step resolution can be higher than the stage encoder resolution, quasi closed loop positioning with resolutions higher than the stage encoder resolution is possible.

All BioPrecision stages are available with either stepper motor or DC servo motor drive. While sometimes the decision which to choose is purely based on personal preference, each technology offers an advantage over the other. LEP recognizes the benefits of each drive technology and supports both.

Stepper Motor Encoder Options

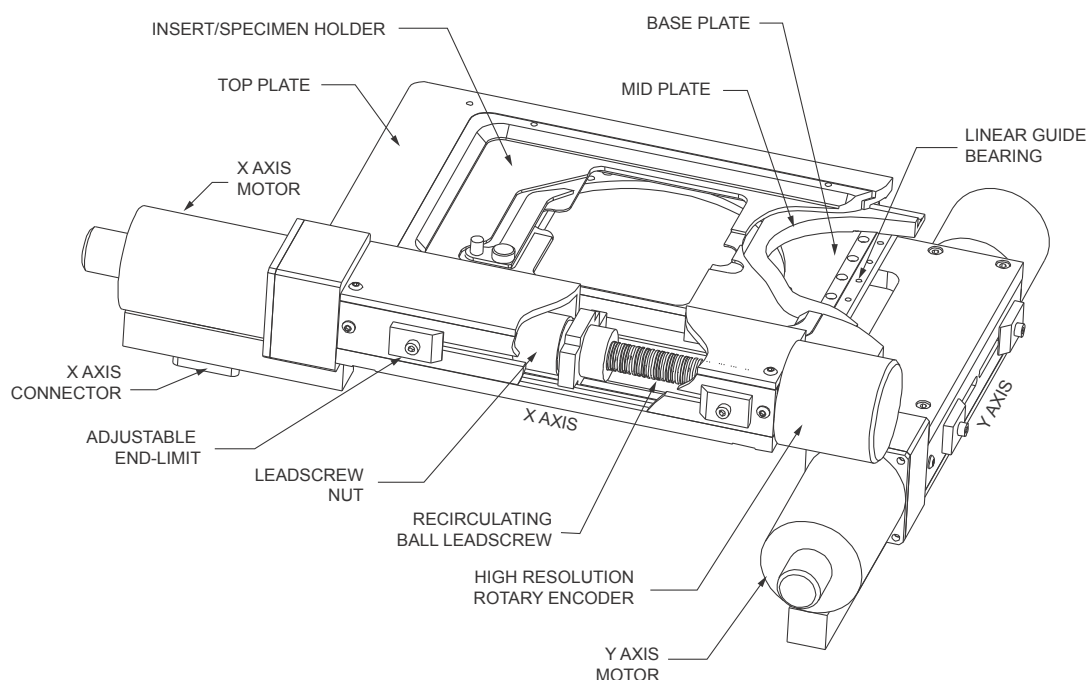
Certain BioPrecision stages are available with or without encoders. With the addition of encoders the stage gives feedback to the controller to enable corrections for errors. The rotary encoder is directly mounted to the leadscrew shaft and compensates for motor step errors. Typically a 10% improvement in positional repeatability is gained using a rotary encoder.

The rotary encoder also adds a degree of robustness to the stage system as well as improved repeatability. In an open loop system, without an encoder, the stage position is determined from counting motor steps. Since a stepper motor is vulnerable to stalling or other external disruptions, the stage may not move the exact distance expected. An encoder simply provides feedback to the controller so that it can compensate for any spurious motor error.

The BioPrecision Difference

BioPrecision stages are designed for the highest performance possible. Design features include precision recirculating ball leadscrews, high resolution rotary encoders, precision ground crossed roller guide bearings and adjustable limits. Each stage is carefully assembled by experienced technicians with careful measurements taken at each step to ensure that the stage performs to expectations.

The quality extends itself to the appearance of the stage also. All aluminum components are anodized to military specifications. In addition, the stages are assembled using stainless steel hardware. This means that over years of use and exposure to solvents and reagents the stage will continue to maintain its performance and appearance.



Adaptability is also a hallmark of the BioPrecision stages. The adjustable end limits allow the working envelope to be enlarged or reduced to provide clearance for different lens configurations or specimen clearance. The removable insert adds the ability to use different interchangeable specimen holders for different applications. Whenever your requirements change, the BioPrecision stage will fill the need.

- 3"x2" (77mm x 51mm) travel range
- 1mm recirculating ball leadscrew
- 0.1µm encoder resolution
- 0.75µm repeatability
- 3µm accuracy over full range of travel
- Stepper motor and DC servo motor versions available
- Modular mount for easy adaptability



*99S000 stage with optional
99A153 Slide holder*

The most popular BioPrecision stage, this stage covers the broadest application range while supplying high performance. The slide holder design increases objective clearance for high magnification and large diameter optics. Improved condenser access accommodates newer motorized condensers.

Many features normally found in large format measuring stages are used to achieve the highest performance possible. Precision zero backlash recirculating ball leadscrews make the stage smooth, accurate and reliable.

A universal mounting ring ensures that this stage will fit perfectly on nearly every popular microscope available. In fact, this stage will fit most microscopes produced in the last 20 years.

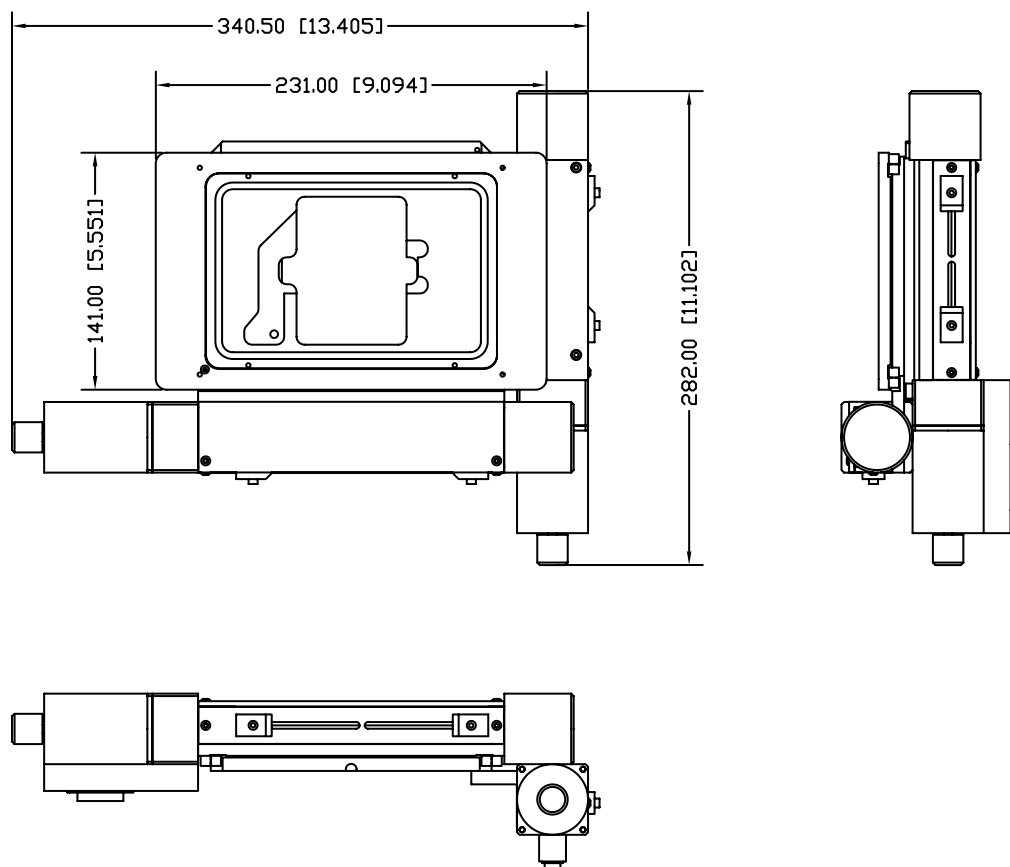
The very low profile of the stage allows it to mount to most microscopes while maintaining proper focus for high aperture condensers and objectives.

Ordering Information

99S000 3"x2" (77mm x 51mm) stepper motor stage
 99S000-NE 3"x2" (77mm x 51mm) stepper motor stage without encoders
 99D000 3"x2" (77mm x 51mm) DC servo motor stage

3"x2" BioPrecision Stage Accessories

99A153 Slide holder for single 1"x3" (25mm x 75mm) slide
 99A154 Slide holder for double 2"x3" slide (50mm x 75mm)
 99A155 Solid aluminum insert for 3"x2" stage
 99A156 Glass insert for 3"x2" stage



Note: Dimensions in mm[inch]

Specifications

Height	18mm**	Travel Range	77mm x 51mm
Weight	3.1kg	Encoder Resolution	0.1μm
Speed with stepper motor	30mm/sec.	Speed with DC servo motor	60mm/sec.
Straightness	0.04ppt	Accuracy	3 μm
Flatness	0.04ppt	Repeatability	0.75 μm
Clear Opening	82mm	Min. Motor Step Resolution	0.025μm

* Applies to stages with rotary encoders installed

** Measured height when using LEP recessed specimen holder

Specifications valid when used with properly configured MAC 5000 controller

- 4"x4" (102mm x 102mm) travel range
- 1mm recirculating ball leadscrew
- 0.1µm encoder resolution
- 0.75µm repeatability
- 5µm accuracy over full range of travel
- Stepper motor and DC servo motor versions available



99S001 stage with optional 99A153 slide holder

For applications requiring more scanning area than the 3"x2" stage, the 4"x4" adds versatility while still being compatible with most laboratory microscopes. The new slide holder design increases objective clearance for high magnification and large diameter optics. Improved condenser access accomodates newer motorized condensers.

This stage has many features that set it apart from others. Precision recirculating ball leadscrews ensure accurate, repeatable position translation. Adjustable end-limits allow for tailoring stage travel to each application. Flexible encoder options provide high accuracy and reliability.

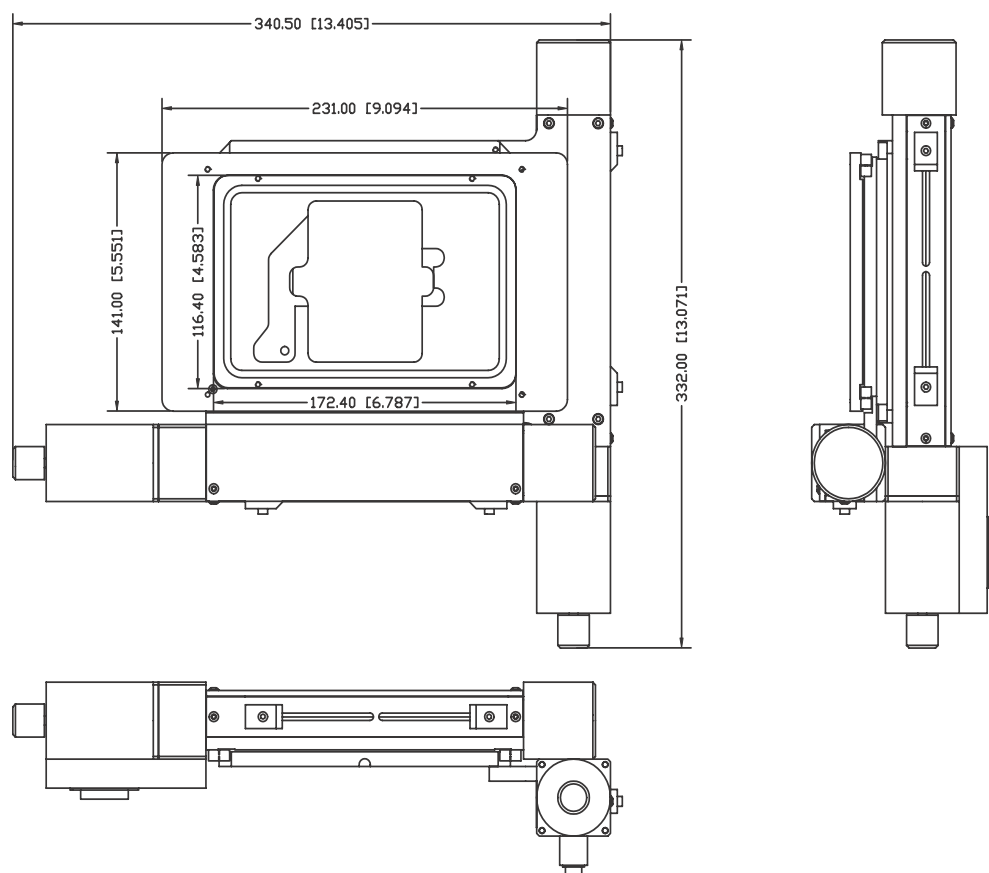
The low profile and high precision of this stage make it the best choice for high precision applications that require scanning a large area. Applications include scanning large thin sections, material analysis, forensic studies and specimen inspection.

Ordering Information

99S001 4"x4" (102mm x 102mm) travel stepper motor stage
 99S001-NE 4"x4" (102mm x 102mm) travel stepper motor stage without encoder
 99D001 4"x4" (102mm x 102mm) travel DC servo motor stage

4"x4" BioPrecision Stage Accessories

99A153 Slide holder for single 1"x3" (25mm x 75mm) slide
 99A154 Slide holder for double 2"x3" slide (50mm x 75mm)
 99A155 Solid aluminum insert for 4"x4" stage. Can be used for custom specimen applications
 99A156 Glass insert for 4"x4" stage



Note: Dimensions in mm[inch]

Specifications

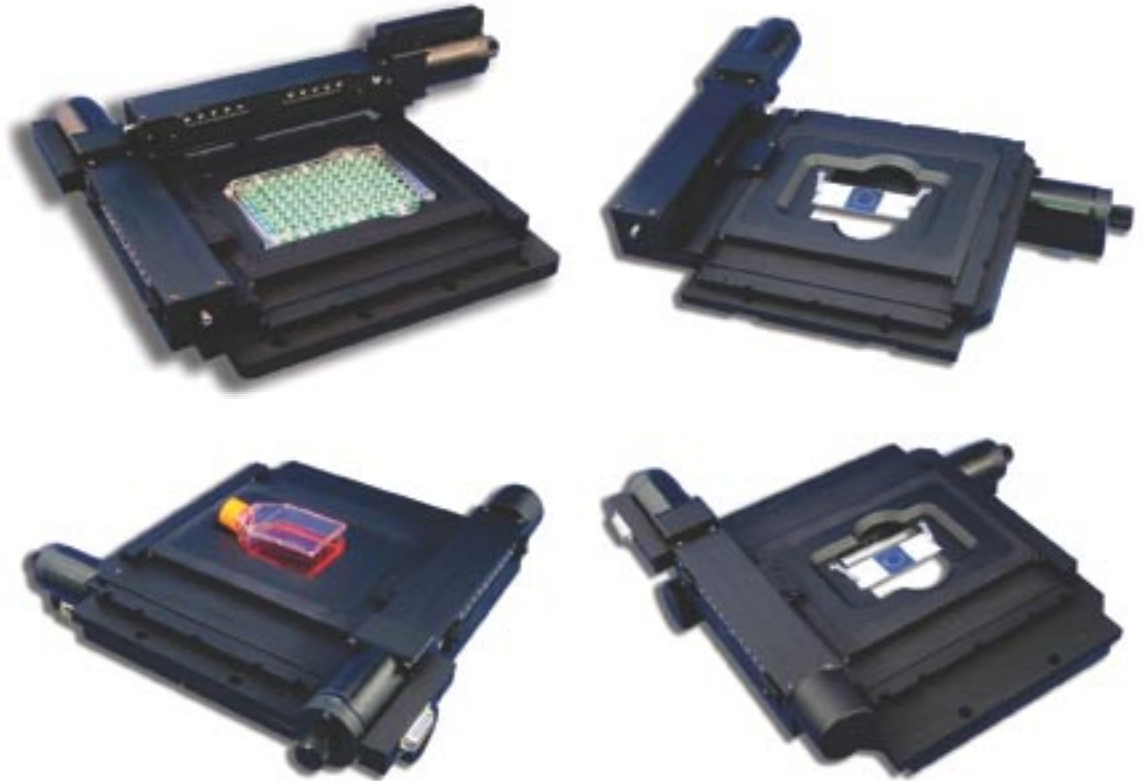
Height	18mm**	Travel Range	102mm x 102mm
Weight	3.1kg	Encoder Resolution	0.1µm
Speed with stepper motor	30mm/sec.	Speed with DC servo motor	60mm/sec.
Straightness	0.04ppt	Accuracy	3 µm
Flatness	0.04ppt	Repeatability	0.75 µm
Clear Opening	82mm	Min. Motor Step Resolution	0.025µm

* Applies to stages with rotary encoders installed

** Measured height when using LEP recessed specimen holder

Specifications valid when used with properly configured MAC 5000 controller

- 4.75"x4" (121mm x 102mm) travel range
- 0.2µm resolution
- 1µm repeatability
- 6µm accuracy
- Maximum speed 60mm/sec. (stepper motor)
- Thermal compliant design is suitable for environmental chambers
- All parts anodized for long lasting finish



The LEP inverted microscope stages are designed to compliment and enhance the capabilities of most research inverted microscopes. The stages are very well suited to the wide array of applications that make the inverted microscope so versatile.

The travel range of 121mm x 102mm coupled with a wide array of specimen holders compliments the versatility of the modern inverted microscope. Utilizing the various specimen holders the stage can be used with multi-well plates, flasks, petri dishes and standard 1"x3" and 2"x3" glass slides.

Each inverted microscope has unique features and configurations. To accommodate this LEP inverted stages are designed individually to fit each microscope. By configuring the leadscrew housings and mounting locations each stage has a minimum of interference with normal microscope functions.

The BioPrecision stages also offer flexibility with drive and encoder options. The standard version includes stepper motors and high resolution rotary encoders. This version is very well suited to most applications and delivers high accuracy. Another stepper motor version is available without encoders. The absence of the encoders sacrifices some accuracy and robustness for price. Higher throughput applications will benefit from the DC servo motor configuration. The DC servo motor can drive the stage with a maximum velocity about twice that of the stepper motor version.

Since the stage is part of the BioPrecision family it features anodized components, precision recirculating ball leadscrews, ground linear guide ways and adjustable limits. In addition, the inverted stages feature a unique floating guide design that makes the stage thermally compliant to eliminate inaccuracies associated with temperature variation.

Ordering Information

99S008 Inverted BioPrecision stepper motor stage
 99S008-NE Inverted BioPrecision stepper motor stage without rotary encoders
 99D008 Inverted BioPrecision DC servo motor stage

*Please specify exact microscope brand and model when making inquiries about this stage.
 The exact stage configuration will vary according to microscope brand and model.*

Inverted BioPrecision Accessories

99A061 Single (1"x3") slide holder for inverted stage
 99A062 Double (2"x3") slide holder for inverted stage
 99A123 Glass insert plate for inverted stage
 99A049 Solid aluminum insert plate for inverted stage
 99A064-36 Petri dish holder for 36mm diameter petri dish
 99A064-54 Petri dish holder for 54mm diameter petri dish
 99A064-65 Petri dish holder for 65mm diameter petri dish
 99A064-88 Petri dish holder for 88mm diameter petri dish
 99A063 96 well plate holder for inverted stage
 99A074 Adjustable slide/petri dish holder (65mm diam. max)
 99A088 Double Terasaki plate holder inverted stage

Please call for special requirements



Specifications

Height	23mm**	Travel Range	121mm x 102mm
Weight	4.2kg (approx.)	Encoder Resolution	0.2μm*
Speed with stepper motor	60mm/sec.	Speed with DC servo motor	120mm/sec.
Straightness	0.04ppt	Accuracy	6 μm
Flatness	0.04ppt	Repeatability	1 μm
Insert Opening	160mm x 110mm	Min. Motor Step Resolution	0.05μm

* Applies to stages with rotary encoders installed

** Measured height when using LEP recessed specimen holder

Specifications valid when used with properly configured MAC 5000 controller

- Adaptable to most standard microscopes
- 0.4µm resolution
- 2µm repeatability
- 20µm accuracy
- Open frame design
- All parts anodized for long lasting finish



The extended travel LEP stages are suitable for applications where either the specimen is too large for a standard stage or there is a requirement for multiple specimens to be placed on the stage at one time.

For automated scanning applications it is frequently more efficient to place multiple specimens on the stage per 'run' so that the impact of specimen exchange time is reduced. For example, multiple position 1"x3" slide holders are available for the 6"x4" and 10"x4" (99S009 and 99S021) stages. The ability to load multiple slides means that an imaging system can be set to process for longer intervals without pausing for reloading. Additionally, some applications may involve time studies where specific points may need to be revisited frequently. The multiple slide holders make this possible without pausing for specimen changes.

The extended travel stages are designed for use in applications requiring maximum throughput. Higher speeds with less wear is achieved with precision 4mm pitch recirculating ball leadscrews. High resolution rotary encoders offer more accuracy and reliability over non-encoded versions.

Ordering Information

99S009	6"x4" (152mm x 102mm) travel stepper motor stage
99D009	6"x4" (152mm x 102mm) travel DC servo motor stage
99S009-NE	6"x4" (152mm x 102mm) travel stepper motor stage w/o encoder
99S021	10"x4" (254mm x 102mm) travel stepper motor stage
99D021	10"x4" (254mm x 102mm) travel DC servo motor stage
99S021-NE	10"x4" (254mm x 102mm) travel stepper motor stage w/o encoder

Extended Travel Stage Accessories

99A108	Four position slide holder for single (1"x3") slides, 6"x4" stage(99S009, 99D009)
99A073	Glass insert plate for 6"x4" stage
99A196	Eight position slide holder for single (1"x3") slides, 10"x4" stage(99S021, 99D021)
99A194	Glass insert plate for 10"x4" stage
99A195	Solid aluminum insert plate for 10"x4" stage

Specimen Holders

99A049	Solid aluminum insert plate for 99S008 inverted stage
99A153	Single (1" x 3") slide holder for 99S000,99S001 (3"x2",4"x4") stage
99A154	Double (2" x 3") slide holder for 99S000,99S001 (3"x2",4"x4") stage
99A061	Single (1" x 3") slide holder for 99S008 inverted stage
99A062	Double (2" x 3") slide holder for 99S008 inverted stage
99A063	Terasaki plate holder (96 well) for 99S008 inverted stage
99A064-36	Petri dish holder, 36mm diameter for 99S008 inverted stage
99A064-51	Petri dish holder, 51mm diameter for 99S008 inverted stage
99A064-54	Petri dish holder, 36mm diameter for 99S008 inverted stage
99A064-60	Petri dish holder, 60mm diameter for 99S008 inverted stage
99A064-65	Petri dish holder, 65mm diameter for 99S008 inverted stage
99A064-88	Petri dish holder, 88mm diameter for 99S008 inverted stage
99A074	Adjustable petri dish/slide holder for inverted stage
99A088	Dual Terasaki plate holder for 99S008 inverted stage
99A108	Four pos. single (1"x3") slide holder for 99S009 (6"x4") stage

Mounting Adapters

Leica Microscopes

99A203	DML series
99A204	DMRXA2
	DMR

Nikon Microscopes

99A202	Optiphot2
	Labophot2
99A205	E800/E1000
99A207	E400/E600 (excluding E600FN)
99A209	E800M/E1000M

Olympus Microscopes

99A202	BH2 (dovetail mount)
99A203	BX, BX2 series (excluding WI)
99A210	AX80

Zeiss Microscopes

99A201	Axioplan 1
	Axioplan 2
	Axioskop 1
	Axioskop 2
	Axioskop 40

The above is only a partial list of compatible microscopes. Please call for more information on specific microscopes.



Ludl Electronic Products designs and manufactures the finest automation products for microscopy. For more than 25 years LEP has been in the forefront of integrating routine microscopy with computer analysis equipment. The result is a thorough understanding and very wide application experience with bio-science and industrial systems.

Ludl Electronic Products has a solution for automation of nearly every aspect of microscopy. This includes XY positioning, focus control, filter changing, objective turret automation, and lamp control. Custom automation applications demand custom solutions and LEP is your solutions provider.



Focus control provides motorized control for the microscope focus motor. Adapters for most microscopes ensure a perfect fit.

Options are available for precision encoders and adjustable end-limits.



Essential for fluorescence imaging, programmable filter wheels provide rapid changing of the excitation and emission wavelengths. Available to accept either 25 or 32mm diameter filters, the 10 position wheel is programmable to respond to computer or ttl commands for intelligent filter positioning.



The MAC 5000 controller system is the heart of any LEP automation system. The stacking modular concept makes expansion and configuration intuitive. By expanding vertically, the system footprint remains the same regardless of how many modules are added. The MAC 5000 controller system has the wide support of commercial and institutional software packages.

