OPEN LOOP OBJECTIVE LENS NANOPOSITIONING SYSTEM

INSTALLATION AND OPERATION MANUAL

Edmund optics | worldwide

IMPORTANT SAFETY INFORMATION

The high voltage drivers can produce hazardous voltages and currents. Use caution when operating the drivers and when handling the nanopositioning stage.

Piezoactuators have large capacitance and are capable of storing hazardous amounts of electrical energy over long periods of time. Various conditions such as load and temperature changes can also cause piezoactuators to accumulate charge.

Before disconnecting the DB-9 connector from the EO-Drive® disconnect the AC power to the EO-Drive® and wait one minute before disconnecting.

The nanopositioning system has no user serviceable parts. Only trained service personnel should perform service.

Engineering Technical Support
If you require additional information, contact our technical experts for help.
24 Hour Phone Support
1-800-363-1992 or +1 856-547-3488
Sunday 8:00pm – Friday 6:00pm
Send e-mail to techsup@edmundoptics.com (during business hours)

IMPORTANT

All Technical Information, recommendations, and examples related to products made in this manual are based on information believed to be correct. The purchaser or user should determine the suitability of each product before using. The purchaser or user assumes all risks and liability whatsoever in connection with the use of these products or services. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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1 INTRODUCTION

The Objective Lens Nanopositioning System is a piezo driven, flexure guided nanopositioner focusing element combined with the EO-Drive open loop electronic controller. The system is designed to operate at room temperature and in a low humidity, low vibration environment. The 3-point quick mount system allows for simple installation. The lens positioner does not screw down onto the microscope, it simply locks into place on the quick-mount adapter which is first screwed onto the microscope (see section 1.3). Using the 3-point quick mount system the lens positioner can be locked into place at any angle and can be used on upright or inverted microscopes. The lens positioner is shipped with RMS, M25 and M26 x 36tpi threaded adapters. The lens positioner is connected to the EO-Drive electronic controller via a DB-9 connector.

	Specifications	
Translation (μm)	100 ± 20%	
Max. Resolution (nm)	1.5nm (1 LSB of 16 bit digital control)	
Step Response Time (200g)	20ms ± 20%	
Runout (θ_x)	6 μrad	
Runout (θ_y)	10 μrad	
Position Creep	5% of commanded motion over 1 minute	
Optical Path	Adds 0.5” (12.7mm) to optical path	
Recommended Max. Load	300g	
Body Material	Aluminum and Brass	
Connector	DB9	
Threaded Adapters	RMS, M25, M26 x 36tpi	
Controller	EO-Drive with 16 bit USB interface	
Switching Power Supply (multi-blade adapter)	***Input***	100-240V ac, 50/60Hz, 1A
	Output	24V dc, 1.67A, 40W
Edmund Optics Part Numbers	85008,85009, 85010, 85011, 85012	

1.1 Unpacking the Objective Lens Nanopositioning System.

Before unpacking the Objective Lens Nanopositioning System read this entire operation manual, paying special attention to the following section on **“Handling the Objective Lens Nanopositioner”**. Check the contents of the package

against the shipping list and notify Edmund Optics immediately if any items are missing.

1.2 Handling the Objective Lens Nanopositioner.

The Objective Lens Nanopositioner is a high precision scientific instrument and therefore requires special handling in order to ensure proper operation. Mishandling can cause permanent damage to the nanopositioning stage. To ensure a long and useful life the following guidelines should be strictly followed.

a) **Never insert anything into the EDM grooves**. The EDM grooves are the cuts that form the flexure hinges and separate the moving portion of the stage from the stage frame. Severe damage may result if objects are inserted into these grooves.

b) Do not move the translation stage by pushing on it with your hands or any other object.

c) Avoid applying a torque between sections of the nanopositioning stage.

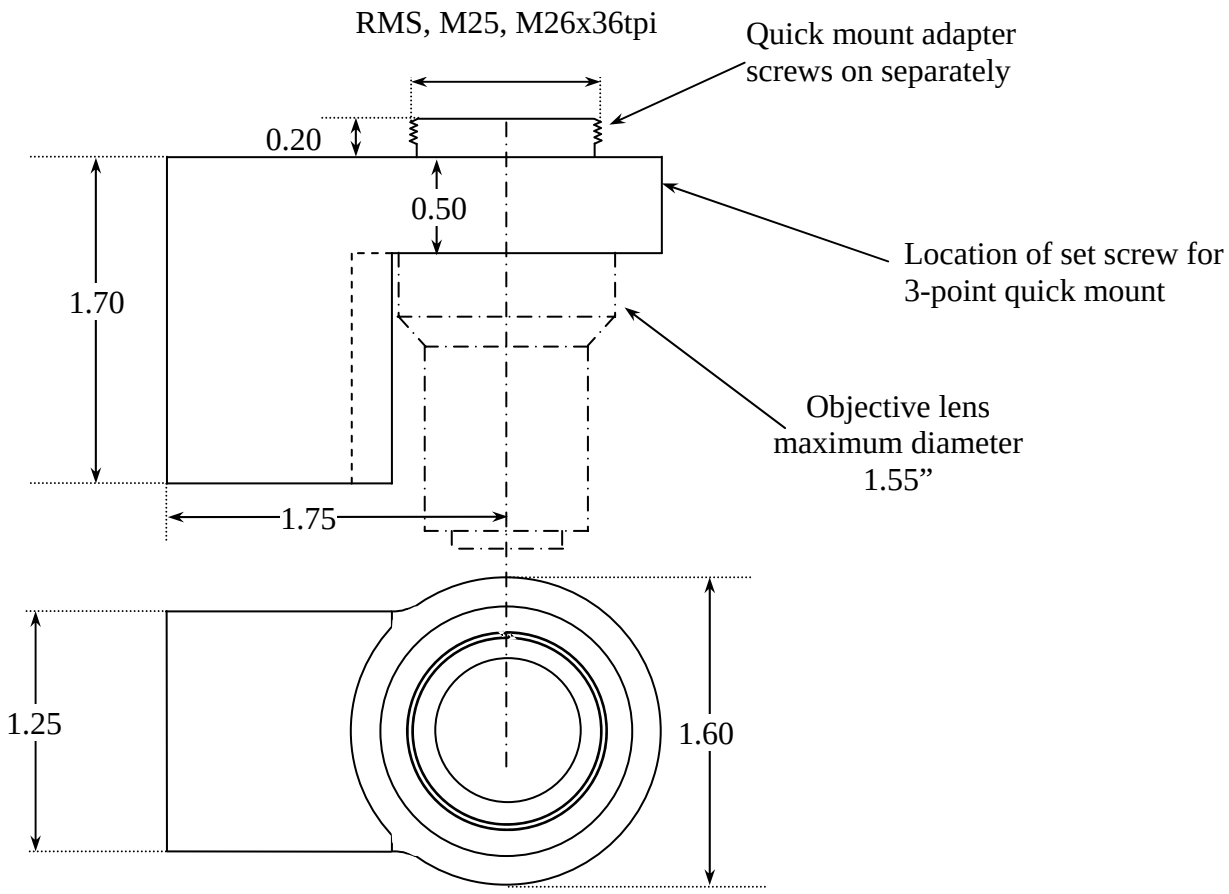
d) Do not drop, treat roughly, or physically shock the Nanopositioning stage.

e) Do not lift by the cable.

f) Do not immerse in any liquid. If the Objective Lens Nanopositioner requires cleaning slightly dampen a lint free cloth with iso-propanol or ethanol and lightly wipe the surface. Do not get any liquid or lint into the EDM grooves.

g) Never disassemble the nanopositioner, there are no serviceable parts inside.

1.3 Objective Lens Nanopositioner



The Objective Lens Nanopositioner is manufactured from a high performance Al alloy. PZT actuators are preloaded within the nanopositioner and supply the driving force for stage movement. The flexure hinges, which form the guidance mechanism, are cut into the stage using electric discharge machining (EDM). There are no serviceable parts in the nanopositioner.

The Objective Lens Nanopositioner is shipped with brass inserts for RMS, M25, M26 x 36tpi threads. The female threaded brass insert is screwed onto the Objective Lens Nanopositioner using two 2-56 flat head screws. The nanopositioner was delivered with one female threaded brass insert in place.

The male threaded brass insert forms the base of the 3-point quick mount system. The male threaded brass insert is first screwed into the objective lens

holder of the microscope. Next, the 0.035" hex wrench is used to loosen the brass tipped 2-56 set screw located on the nanopositioner. The nanopositioner is then placed onto the male threaded brass insert at the appropriate angle and the setscrew is tightened.

Figure 1: Bottom view of stage showing the male brass insert. Do not adjust the side set screws. Only the front set screw is adjustable.

1.4 EO-Drive Digital Controller

Figure 2: Objective lens nanopositioning system showing the piezo stage connected to the bench top EO-Drive controller.

The EO-Drive controller is an open loop amplifier that supplies high voltages to the objective lens nanopositioner. The EO-Drive controller connects directly to any USB port on a Windows XP, Vista, 7 (32 bit or 64 bit) compatible computer, and provides high resolution, 16 bit control of the lens z-axis motion. Software drivers, LabVIEW examples, a LabVIEW tutorial, and C# graphic user interface are all included. LabVIEW and C# examples are open source and can be used as a starting point for user written software routines.

The EO-Drive controller is designed to for bench top use only. Four rubber feet are placed on each corner of the underside of the controller enclosure. The controller should be placed on a level surface near the location of the nanopositioning stage. The user should ensure that there is not stress or strain on the cables connecting the stage to the EO-Drive controller.

The lens positioning stage is connected to the EO-Drive controller via a DB-9 connector. The DB-9 connector should be secured to the EO-Drive controller by plugging in the connector and securing the screws on the connector hood. Never disconnect the 9-Pin connector with the power on. To disconnect the stage from the EO-Drive, disconnect the AC power to the controller and wait one minute to allow the piezoactuators to discharge before unplugging the 9 pin connector.

The EO-Drive controller mains adaptor is supplied with multiple mains plugs (UK, US, EU, AU, CC). The user should select the suitable plug for their country and simply slide it into place. The mains adaptor should be fitted to a mains outlet which is easily accessible to allow for the disconnection of the system.

2 OPERATING THE OBJECTIVE LENS NANOPOSITIONING SYSTEM

The Objective Lens Nanopositioning System includes a lens nanopositioning stage and the EO-Drive digital controller. The motion of the Objective Lens Nanopositioning stage is controlled via the EO-Drive USB interface.

2.1 Installation

a) Run the installation program on the EO Installation disk that came with your objective lens nanopositioning system. The installation must be completed before connecting the EO-Drive to the host computer. The software is compatible with Windows XP, Vista and Windows 7 (32 bit or 64 bit). The installation program also installs the manuals and example software for interfacing to the EO-Drive.

b) Be certain the EO-Drive is unplugged from the AC power.

c) Install the Nanopositioning stage as described in section 1.3

d) Connect the lens positioning stage to the EO-Drive controller.

e) Confirm that you have run the software installation disk and USB driver.

f) Plug in the EO-Drive. Ensure that the mains plug is readily accessible to allow the system to be disconnected.

g) The EO-Drive may now be connected to your host computer with the provided USB cable (standard USB cables may also be used).

h) Windows will now recognize that a new USB device has been attached to your computer and launch the Found New Hardware Wizard shown above. Do not let Windows search for software, click the “No, not this time” button as shown above, then click Next.

i) Next the Hardware Wizard will display the message box shown below and it will ask you if you wish to have Windows automatically install the software (may be a different name than indicated in the figure below). Select the “Recommended” button shown below to have the USB driver automatically installed, then click next.

j) The final message box should tell you that the software has been successfully installed. You simply need to click Finish.

k) The system is now ready for operation. Commands from the installed software now control the motion of the objective lens nanopositioners.

2.2 Care during operation

The Objective Lens Nanopositioner is a high precision scientific instrument and should be handled with care during operation. Failure to do so may result in permanent damage. Never disconnect the lens nanopositioner during operation.

a) During operation ensure that there are no physical constraints on the moving stage or anything fixtured to the moving stage.

b) Ensure that the cable is not constrained or unduly stressed during operation. Before use, check that the cable is in good condition without any worn areas or damaged areas.

c) Maintain a clean working environment to reduce the chance of particles or other substances from gathering in the EDM grooves.

d) Dust or wipe the controller with damp cloth. Do not allow moisture to penetrate the case.