

Objective NanoFocusing Stages

NPO SERIES



- Sub-nm resolution focusing for objectives with RMS thread
- Up to 250 μm focusing range
- High resonant frequency for highly dynamic applications
- Precision parallelogram design minimizes beam offsets

The NPO Series Objective NanoFocusing stages are high-speed, piezo-driven devices. They provide fast focusing and scanning over long travel ranges of up to 250 μm and are compatible with most microscopes and objective lenses. Typical applications include surface profilometry, high-resolution imaging, auto-focusing, scanning interferometry, and confocal microscopy.

NPO stages feature highly reliable, multi-layer, low-voltage, piezoelectric transducer (PZT) stacks, which are optimized for high-duty cycle operations. Image shifts and tilt are minimized by an FEA-modeled and precision EDM-cut parallelogram, solid-state flexure that ensures perfectly straight motion. The sophisticated guide also provides the highest possible stiffness for superior focus stability, higher frequency auto-focusing, shorter settling times and faster scans. NPO stages are maintenance-free and are not subject to wear.

NPO NanoFocusing stages are available as open-loop (no position feedback) or closed-loop versions with integrated position feedback. All NPO Objective NanoFocusing Stages are also available in vacuum versions to $10\text{e-}6$ torr. In open-loop, the resolution is only limited by the noise of the control electronics, but repeatability and stability are compromised due to the hysteresis and creep of the piezo ceramic material. The closed-loop systems (model numbers ending in SG) feature high resolution strain-gauge position sensors for highly accurate and repeatable motion. Also, the position feedback compensates for actuator creep. For highest position stability and highest temperature-insensitive performance, the sensors are assembled in a full Wheatstone bridge design. The closed-loop devices can be operated in open or closed-loop control.

The NPO NanoFocusing stages mount between the turret and the microscope objective and add only 11.5 mm to the optical path length. All NPO Objective NanoFocusing Stages are also available in vacuum versions to $10\text{e-}6$ torr. All models can be used for standard and inverted microscopes. The standard thread size is W0.8x1/36" and is compatible with all Newport objective lenses. For other thread sizes, please contact Newport.

NPO Objective NanoFocusing stages can be controlled with the 3-axis NPC3 Controller or NPC3SG for strain gage sensors or with the XPS Universal Controller. The XPS-DRVP1 driver module enables combining the -D versions of the NPO with other Nanopositioning products or motorized stages in the XPS controller.

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Specifications

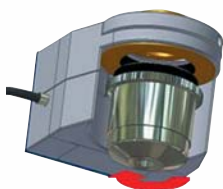
	NPO140 (-D) NPO140SG (-D)	NPO250 (-D) NPO250SG (-D)
Open loop travel ($\pm 10\%$), (μm) ⁽¹⁾	140	250
Closed loop travel (μm) ^(1, 2)	100	200
Open loop resolution (nm) ⁽³⁾	0.3	0.5
Closed loop resolution (nm) ⁽²⁾	3	5
Typ. Repeatability (nm) ⁽²⁾	30	46
Capacitance ($\pm 20\%$) (μF)	3.4	10.2
Resonant frequency, unloaded (Hz)	370	310
With 80 g load (Hz)	300	270
With 105 g load (Hz)	270	250
With 300 g load (Hz)	210	155
Axial stiffness (N/ μm)	1.4	0.4
Max lens weight (g)	500	500
Typ. Tilt, full travel (μrad)	<4	<10
Weight (g)	150	255

1) Typical value measured with NPC3 and NPC3SG, (-20 V to +130 VDC range).

2) Applies to devices with ending SG in closed-loop control only.

3) Equal to rms noise value measured with NPC3 and NPC3SG controller.

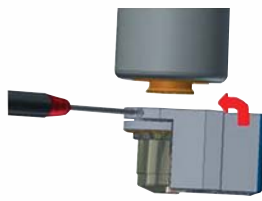
Mount to Microscope



- 1) Screw the microscope objective into the NPO NanoFocusing stage.



- 2) Screw the adapter into the microscope.



- 3) Clamp to NPO NanoFocusing stage on the adapter.

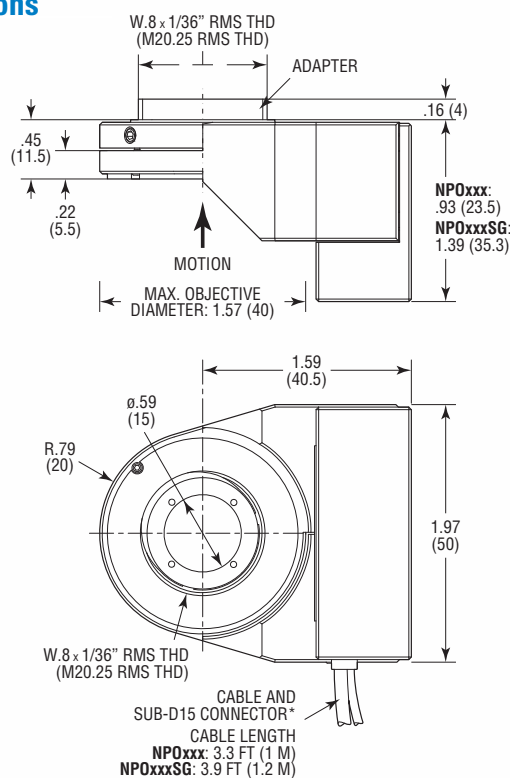


Microscope objective mounted on a NPO100 stage.

Ordering Information

Model	Description
NPO140	Nanofocusing objective stage, 140 μm , open-loop
NPO140SG	Nanofocusing objective stage, 140 μm , with strain gauge sensor
NPO250	Nanofocusing objective stage, 250 μm , open-loop
NPO250SG	Nanofocusing objective stage, 250 μm , with strain gauge sensor
NPO140-D	NanoFocusing Objective Stage, 140 μm , open loop, XPS compatible
NPO140SG-D	NanoFocusing Objective Stage, 140 μm , with strain gage sensor, XPS compatible
NPO250-D	NanoFocusing Objective Stage, 250 μm , with strain gage sensor, vacuum, XPS comp
NPO250SG-D	NanoFocusing Objective Stage, 250 μm , with strain gage sensor, vacuum, XPS compatible

Dimensions



MODEL SHOWN: NPOXXXSG
DIMENSIONS IN INCHES (MILLIMETERS)

* For -D version with Sub-D25 connector



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