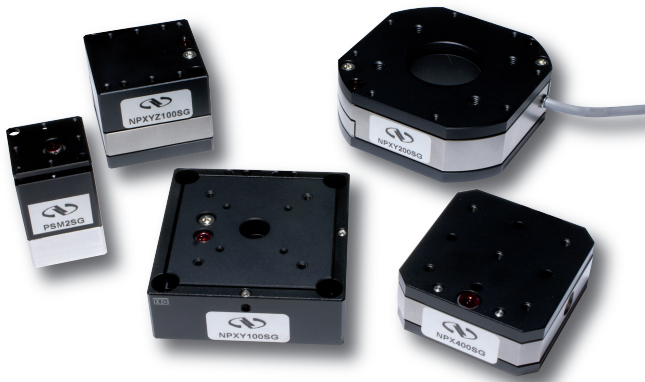


# NanoPositioning Linear Stages



- Sub-nm resolution piezoelectric motion in X, XY, or XYZ
- Up to 400  $\mu\text{m}$  travel range per axis
- Precision parallelogram design for accurate linear displacements
- High resonant frequency for highly dynamic applications

The NPX Series is a family of compact, long travel piezo-based linear stages providing nanometer resolution motion in one, two or three axis. These versatile stages are ideally suited for nm-precise positioning of small components such as mirrors, fibers, laser diodes, micro-optics, sensors, or cellular samples. Applications include optical delay lines, path length changes of interferometers, laser lithography, scanning microscopy, and patch-clamping, among others.

NPX stages feature highly reliable, multi-layer, low-voltage piezoelectric transducer (PZT) stacks for high-duty cycle operations. A sophisticated, FEA-optimized, parallelogram solid state flexure guide system ensures perfect parallel motion and up to 400  $\mu\text{m}$  travel range. Due to the frictionless guide principle, NPX stages are maintenance-free and are not subject to wear. Furthermore, the output motion sensitivity is not affected by mechanical friction.

One of the advantages of the NPX piezo-based linear stages over traditional screw driven stages is the rapid response and fast settling performance. This allows them to be used in dynamic processes such as high-frequency error compensation, tracking, fast stepping or continuous scanning.

NPX linear stages are available as X, XY, and XYZ motion systems. The multi-axis XY and XYZ devices utilize an advanced parallel motion principle, meaning all actuators act directly on the moving platform. Smaller

form factor and lower inertia for faster motion can be achieved as opposed to other PZT systems with serial kinematics such as stacks of individual stages. In addition, the NPXY100 and NPXY200 models feature a large central aperture which makes them particularly suitable for microscopy applications.

All NPX linear stages are available as open-loop (no position feedback) or closed-loop devices with integrated position feedback. 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. The position feedback compensates also for actuator creep. For highest position stability and most temperature insensitive performance, the sensors are built in a full Wheatstone bridge design. The closed-loop devices can be operated in either open or closed-loop control.

Fastening is accomplished by a number of threads and alignment pin holes at the top and bottom plates. For mounting to optical tables or other components with the same hole grid, use adapter plate NPX-BP. Like with all piezo flexure devices, excessive moment loads and side forces acting between the top plate and the housing should be avoided during fastening. These external forces could damage the stage.

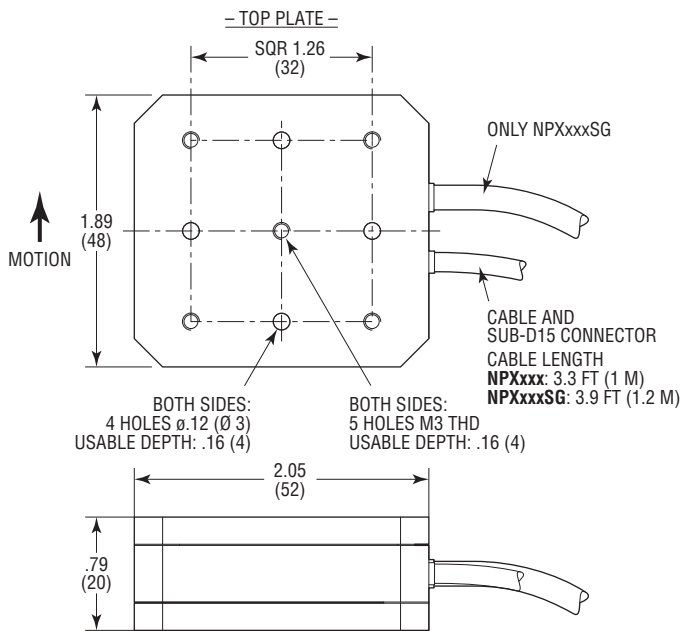
# Specifications

	NPX200 NPX200SG	NPX400 NPX400SG	NPXY100 NPXY100SG	NPXY200 NPXY200SG	NPXYZ100 NPXYZ100SG
Axes	X	X	X, Y	X, Y	X, Y, Z
Open loop travel per axis ( $\pm 10\%$ ), ( $\mu\text{m}$ ) <sup>(1)</sup>	200	400	100	200	100
Closed loop travel per axis ( $\mu\text{m}$ ) <sup>(1,2)</sup>	160	320	80	160	80
Open loop resolution (nm) <sup>(3)</sup>	0.4	0.8	0.2	0.4	0.2
Closed loop resolution (nm) <sup>(2)</sup>	4	8	2	4	2
Typ. Repeatability (nm) <sup>(2)</sup>	36	75	36	45	30
Capacitance ( $\pm 20\%$ ) ( $\mu\text{F}$ )	1.8	5.2	1.8	5.2	1.8
Resonant frequency, unloaded (Hz)	177	200	380/480	350/350	500/550/480
Resonant frequency, with 80 g load (Hz)					210/200/300
Resonant frequency, with 105 g load (Hz)					190/180/250
Resonant frequency, with 300 g load (Hz)					110/110/150
Axial stiffness (N/ $\mu\text{m}$ )	0.08	0.16	1.1/0.95	0.65/0.6520	1/1/1
Max centered load (N)	10	10	75	100	30
Max axial load (N) <sup>(4)</sup>	16	64	110/95	40/40	40/40/32
Weight (g)	180	180	175	350	165

<sup>1)</sup> Typical value measured with NPC3 and NPC3SG, (-20 V to +130 VDC range).  
<sup>2)</sup> Applies to devices with ending SG in closed-loop control only.  
<sup>3)</sup> Equal to rms noise value measured with NPC3 and NPC3SG controller.  
<sup>4)</sup> Maximum load that can be applied in direction of motion. For multi-axis system read as X/Y/Z.

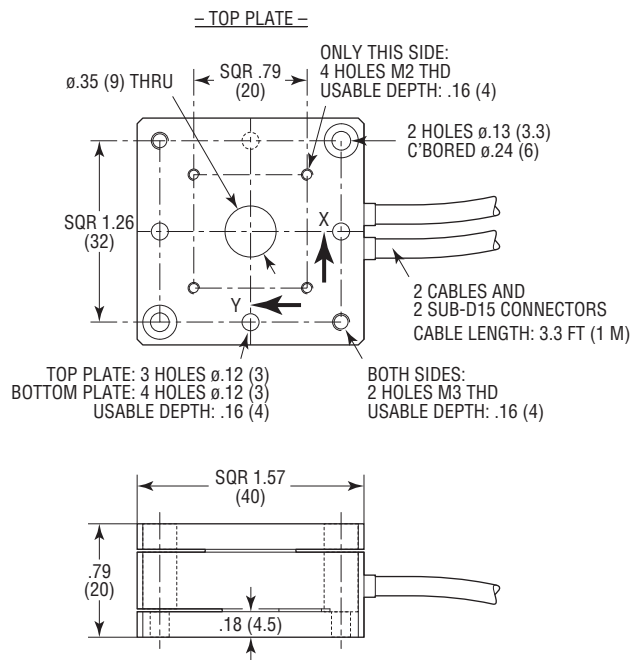
# Dimensions

## NPX200(SG) and NPX400(SG)



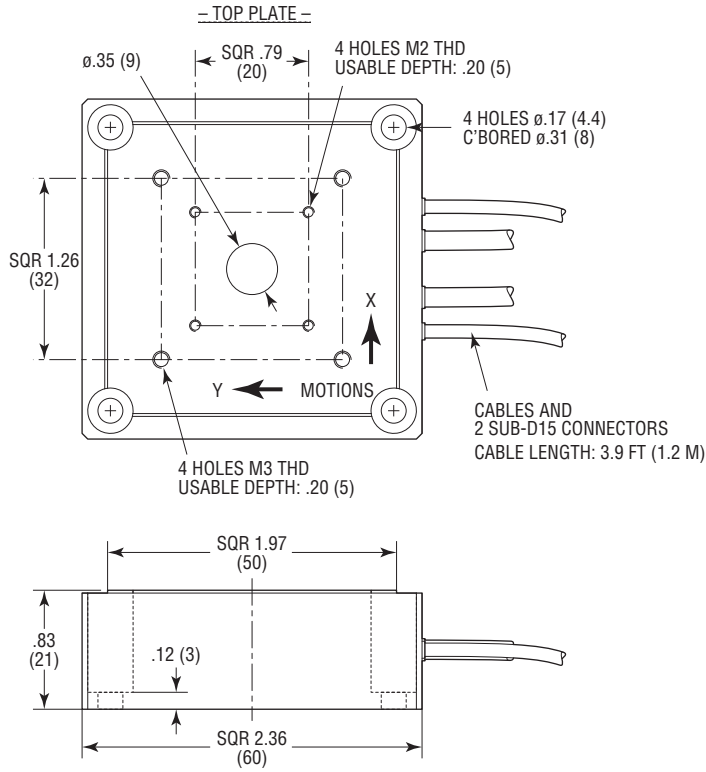
DIMENSIONS IN INCHES (AND MILLIMETERS)

## NPXY100

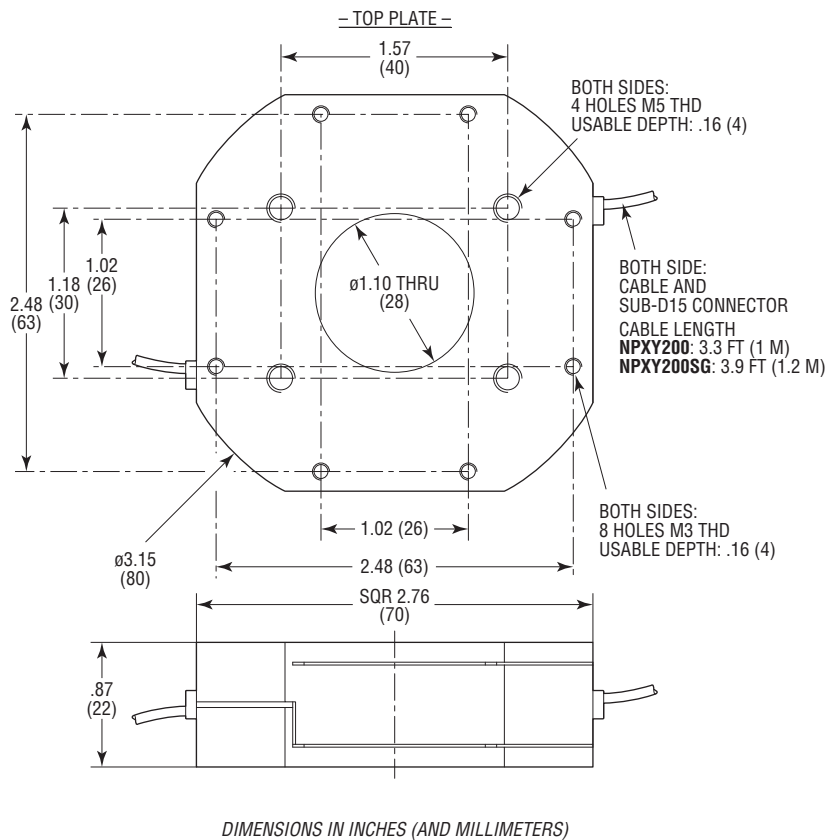


DIMENSIONS IN INCHES (AND MILLIMETERS)

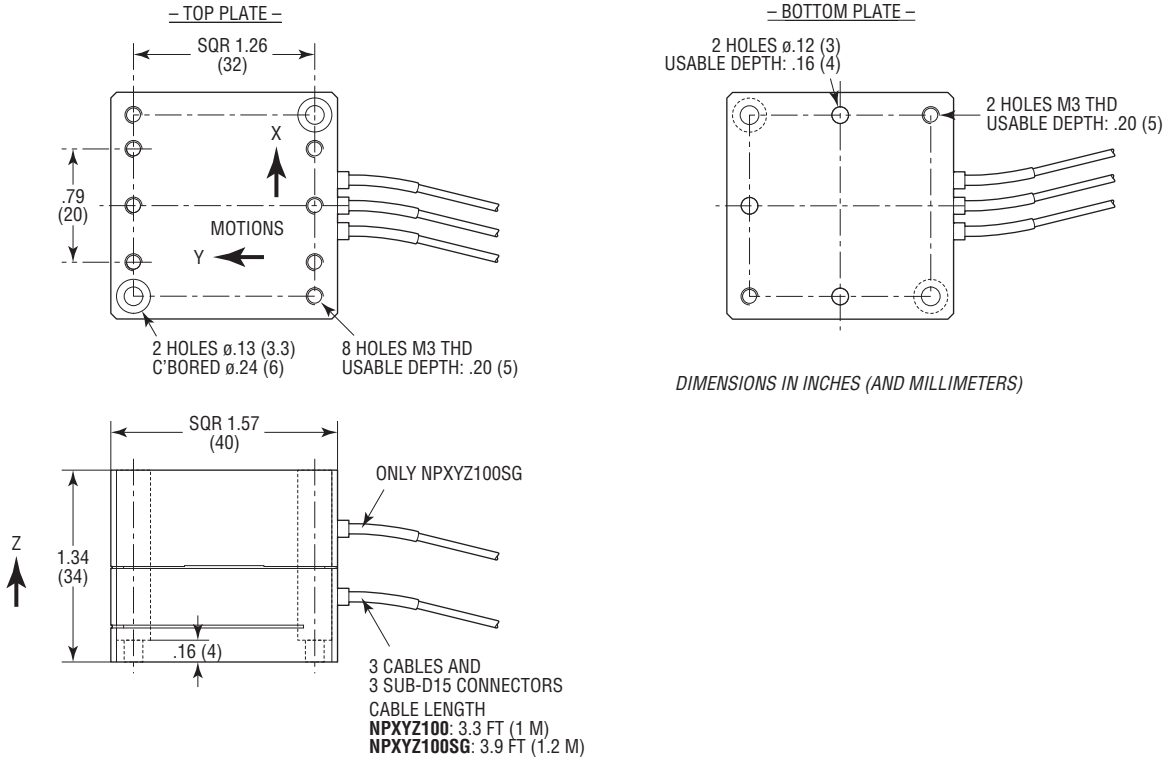
# NPXY100SG



# NPXY200 and NPXY200SG



## NPXYZ100 and NPXYZ100SG



## Ordering Information

Model	Description
NPX200	X NanoPositioning stage, 200 µm, open-loop
NPX200SG	X NanoPositioning stage, 200 µm, with strain gauge sensor
NPX400	X NanoPositioning stage, 400 µm, open-loop
NPX400SG	X NanoPositioning stage, 400 µm, with strain gauge sensor
NPXY100	XY NanoPositioning stage, 100 µm x 100 µm, open-loop
NPXY100SG	XY NanoPositioning stage, 100 µm x 100 µm, with strain gauge sensors
NPXY200	XY NanoPositioning stage, 200 µm x 200 µm, open-loop
NPXY200SG	XY NanoPositioning stage, 200 µm x 200 µm, with strain gauge sensors
NPXYZ100	XYZ NanoPositioning stage, 100 µm x 100 µm x 100 µm, open-loop
NPXYZ100SG	XYZ NanoPositioning stage, 100 µm x 100 µm x 100 µm, with strain gauge sensors
NPX-BP	Universal base plate for mounting NPX stages to optical tables



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