单轴（Z 轴）压电扫描台

AU-NPS-Z 系列纳米定位工作台采用压电陶瓷直推驱动，以柔性铰链为运动副，使其结构紧凑、拥有小的体积、无摩擦、无间隙、定位分辨率高等优点。

全行程采用电容位移传感器闭环反馈控制系统设计，电容位移传感器是将位移变化转换为电容电量信号的变化。电容位移传感器简单易用，而且拥有极高的精度，可达到亚纳米量级。结合数字闭环控制器，纳米定位工作台的响应时间和稳定时间可达到毫秒量级。低的移动质量和高的刚度结合可以提供非常高的带宽。

该产品可以单独作为微动台，其前参考面可以使活动面定位接近甚至于安装面共线。其拥有亚纳米的重复性和高的重复性而且在整个行程中平台几乎没有离轴角度偏差。此外该产品其前安装面可以与 AU-NPS-XY-100A 相结合，提供三维的定位控制。

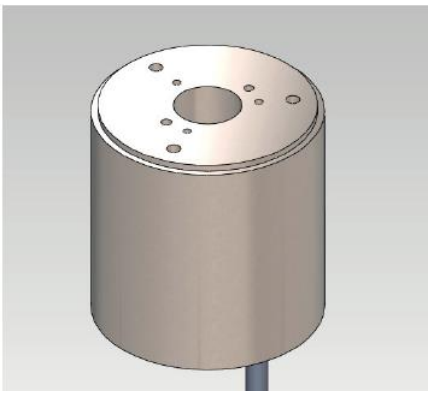
对于大行程的纳米定位台，采用目前业内最尖端的双传感技术与以往相比可以提供更快的响应速度，提高有效载荷出现变化时的稳定性和更高的带宽。这项突破性的技术能够应用于各种袖珍模拟和数字控制器，其操作简便，为用户提供顶尖性能。

上海昊量光电设备有限公司推出的单轴压电扫描台主要分为两类

①超低热漂移的单轴压电扫描台

该系列的 Z 轴扫描台主要包括 AU-NPS-Z-15A 和 AU-NPS-Z-15H 两种产品，这两款产品材质均采用不胀钢，因此具有极地的热漂移。不胀钢具有更高的刚度，因此具有较高的带宽，极短的响应时间。拥有极高的线性度和极低的迟滞现象。两款产品均可与 AU-NPS-XY-100A 相结合，提供三维的定位控制台。两者也有不同之处。

AU-NPS-Z-15H 平台是中空的，主要是在高分辨率的显微镜中用于搬运光纤和微小样品。



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AU-NPS-Z-15A 压电平台为普通的平台，相比于 AU-NPS-Z-15H，拥有更高的自振频率可达到 3500HZ。

②大行程 Z 轴压电扫描台

AU-NPS-Z-500A 为一款大行程的 Z 轴压电扫描台，行程可达到 500μm。在且在整个行程中采用电容位移传感器闭环设计和对柔性铰链先进的设计，使其具有较高分辨率，较好的线性度(0.01%)和重复性（<3nm）以及较低的迟滞（0.02%）。并采用双传感技术，可提供更快的响应速度（小于 20ms）。此外该产品可以按照客户需求进行定制，并提供用于真空和低温条件使用版本的设备。

◆主要特点

- 亚纳米的分辨率
- 高的带宽
- 高速响应

- 高的可靠性
- 压电陶瓷驱动
- 柔性铰链设计
- 电容位移传感器闭环反馈

◆主要应用

扫描探针显微镜、计量学、干涉度量学、扫描光学显微镜、原子力显微镜、精密工程等。

◆主要参数

AU-NPS-Z-15A

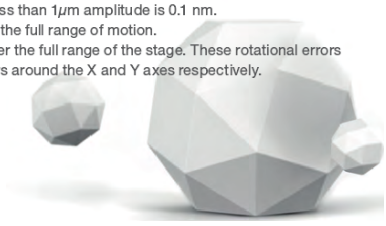
Specification

Parameter	Symbol	Value			Units	Comments
Static physical						
		Minimum	Typical	Maximum		
Material		Super Invar (Bright nickel plated)				
Size		51 long x 37 diameter			mm	
*Range	$d_{zp\cdot max}$	± 7.5	± 8.0		μm	
Scale factor	B_{z1}		1		μm	Note 1
*Scale factor error (1σ)	δb_{z1}		0.05	0.1	%	
Static stiffness	k_z		20		N·μm $^{-1}$	
Resonant frequency: 0g load	$f_{0\cdot0}$		3500		Hz	
20g load	$f_{0\cdot20}$		2800		Hz	
100g load	$f_{0\cdot100}$		1650		Hz	
Maximum Load				0.5	Kg	Note 2
Dynamic physical (Typical values)						
		Fast	Medium	Slow		Note 3
3dB Bandwidth	B_{zp}	340	240	36	Hz	
*Small signal settle time	$t_{zs\cdot s}$	1.5	2.5	21	ms	Note 4
*Position noise (1σ)	$\delta z_{p\cdot n}$	0.2	0.15	0.05	nmrms	Note 5
Slew rate	$u_{zp\cdot max}$	2	1	0.5	μm/ms	Note 6
Error terms						
		Minimum	Typical	Maximum		
*Hysteresis (peak to peak)	$\delta_{zp\cdot hyst}$		0.005	0.01	%	Note 7
*Linearity error (peak)	$\delta_{zp\cdot lin}$		0.01	0.02	%	Note 8
*Rotational error	$\delta\varphi_z$		2	10	μradians	Note 9
*Rotational error	$\delta\gamma_z$		2	10	μradians	Note 9

Notes

*These parameters are measured and supplied with each mechanism

1. All position commands are given in micrometers with seven digit resolution.
2. Depends on orientation. 0.5 Kg is the maximum load for gravity acting in the Z-direction. 0.5 Kg is the maximum load for gravity acting in the X or Y axes. Loads greater than 0.2 Kg can cause damage to the flexure mechanism.
3. For dynamic operation the servo-loop parameters are preset for different performances; the parameters are user settable via software control. Fast means the fastest the stage can stably move with less than 20 grams load. Medium means the maximum stable speed for loads up to 100 grams. Slow means the speed at which the servo loop is stable for all masses up to the maximum allowed mass – equivalent to low noise setting.
4. This is the 2% settle time. It is a function of the servo loop parameters which are user controllable. The test step size is 500 nm.
5. The actual position noise of the stage.
6. The highest rate of change of true position with time that can be achieved. It is limited by the closed loop parameters.
7. Percent of the displacement. The hysteresis specification for a displacement of less than 1μm amplitude is 0.1 nm.
8. Percent error over the full range of motion.
9. Angular motion over the full range of the stage. These rotational errors are rotational errors around the X and Y axes respectively.



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AUNION TECH
昊量光电

AU-NPS-Z-15H

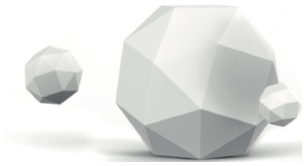
Specification

Parameter	Symbol	Value			Units	Comments
Static physical						
		Minimum	Typical	Maximum		
Material		Super Invar (Electroless nickel plated)				
Size		35 long x 34 diameter			mm	10 mm clear central aperture
*Range	$d_{zp\text{-}max}$	± 7.5	± 8		μm	
Scale factor	b_{z1}		1		μm	Note 1
*Scale factor error (1σ)	δb_{z1}			0.1	%	
Static stiffness	k_z		20		N·μm^{-1}	
Resonant frequency: 0g load	$f_{0\text{-}0}$		900		Hz	
Maximum load				0.5	Kg	Note 2
Dynamic physical (Typical values)						
		Fast	Medium	Slow		Note 3
3dB Bandwidth	$b_{z.p}$	80	40	10	Hz	
*Small signal settle time	$t_{zs\text{-}s}$	5	10	30	ms	Note 4
*Position noise (1σ)	$\delta z_{p\text{-}n}$	0.50	0.20	0.10	nm$_{rms}$	Note 5
Slew rate	$u_{zp\text{-}max}$	2	1	0.5	μm/ms	Note 6
Error terms						
		Minimum	Typical	Maximum		
*Hysteresis (peak to peak)	$\delta_{zp\text{-}hyst}$		0.005	0.02	%	Note 7
*Linearity error (peak)	$\delta_{zp\text{-}lin}$		0.01	0.02	%	Note 8
*Rotational error	$\delta\varphi_z$			10	μradians	Note 9
*Rotational error	$\delta\gamma'_z$			10	μradians	Note 9

Notes

*These parameters are measured and supplied with each mechanism

1. All position commands are given in micrometers with seven digit resolution.
2. Depends on orientation. 0.5 Kg is the maximum load for gravity acting in the Z-direction. 0.1 Kg is the maximum load for gravity acting in the X or Y axes. Loads greater than 2 Kg can cause damage to the flexure mechanism.
3. For dynamic operation the servo-loop parameters are preset for different performances; the parameters are user settable via software control. Fast means the fastest the stage can stably move with less than 20 grams load. Medium means the maximum stable speed for loads up to 100 grams. Slow means the speed at which the servo loop is stable for all masses up to the maximum allowed mass – equivalent to low noise setting.
4. This is the 2% settle time. It is a function of the servo loop parameters which are user controllable. The test step size is 500 nm.
5. The actual position noise of the stage.
6. The highest rate of change of true position with time that can be achieved. It is limited by the closed loop parameters.
7. Percent of the displacement. The hysteresis specification for a displacement of less than 1μm amplitude is 0.1 nm.
8. Percent error over the full range of motion.
9. Angular motion over the full range of the stage. These rotational errors are rotational errors around the X and Y axes respectively.



AU-NPS-Z-500A

Specification

Parameter	Symbol	Value			Units	Comments
Static physical						
		Minimum	Typical	Maximum		
Material		Titanium and Aluminium Alloy				
Size		60 x 49.5 x 30 mm				
*Range	$d_{zp\text{-}max}$		>500		μm	Note 1
Resonant frequency	$f_{0\text{-}0}$		200		Hz	Note 2
Actuating force			20		N	
Holding force			30		N	
Max lateral force			10		N	
Dynamic physical (typical values)						
*Small signal settle time	$t_{zs\text{-}s}$		15		ms	Note 3
*Position noise (1σ)	$\delta z_{p\text{-}n}$		3		nm	Note 4
Error terms						
		Minimum	Typical	Maximum		
*Hysteresis (peak to peak)	$\delta_{zp\text{-}hyst}$			0.02	%	Note 5
*Linearity error (peak)	$\delta_{zp\text{-}lin}$		0.01	0.1	%	Note 6
*Rotational error	$\delta\varphi_z$		10	50	μradians	Note 7
*Rotational error	$\delta\gamma'_z$		20	100	μradians	Note 7

Notes

*These parameters are measured and supplied with each mechanism

1. This is the measured range for ±250μm command input; the maximum closed loop range is greater than 500μm.
2. This is the first resonant frequency for the unloaded NPS-Z-500A.
3. 2% step and settle time. Dynamic operation is a function of the servo loop parameters that are user settable via software in our digital controllers.
4. The actual position noise of the stage measured with a laser interferometer.
5. Per cent of the displacement. The hysteresis specification for a displacement of less than 1μm amplitude is 0.2nm. NPS-Z-500A requires external preload to achieve this.
6. Per cent error over the full range motion, using NPS3000 4th order linearization (typical) and using NPC-A-1110DS 2nd order linearization (maximum).
7. Angular motion over the full range of the stage. These rotational errors are rotational errors around the X and Y axes respectively.

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