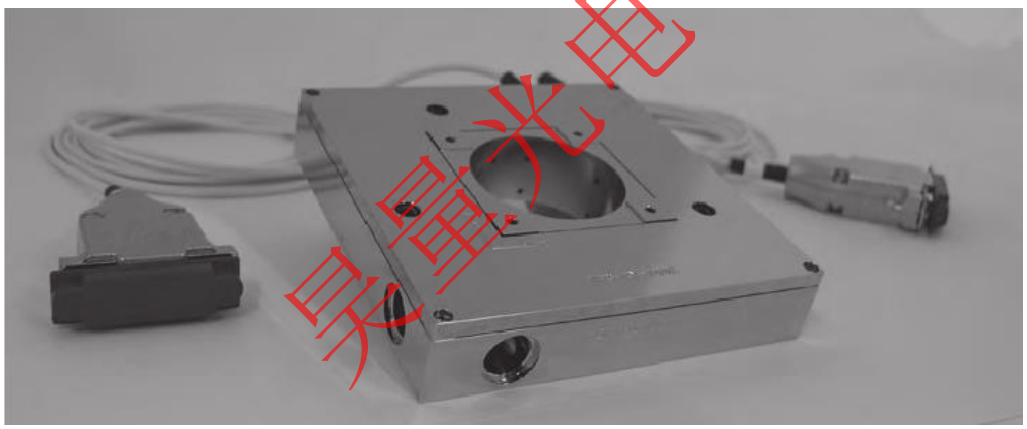
二维亚纳米定位工作台

AU-NPS-XY-100 系列纳米二维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。

利用有限元分析对柔性铰链结构进行分析，使其在整个行程中产生的角位移低于 25 微弧度。在整个行程中可以保持更好的直线性。线性误差小于 0.01%，滞后小于 0.005%。

上海昊量光电设备公司推出的亚纳米二维微动台主要包括 AU-NPS-XY-100A 和 AU-NPS-XY-100B 两款产品。产品性能大体相似。材质有所差异。



其中 **AU-NPS-XY-100A** 采用超级不胀钢（因瓦合金）材质，其热膨胀系数极小达到 0.3ppm K^{-1}，使热漂移达到最小，这对于纳米级的工作台来说是极其重要的。

AU-NPS-XY-100B 采用铝合金结构，虽然相对于因瓦合金来说有较高的热膨胀系数（23ppm K^{-1}），但是由于其拥有较轻的移动质量，因此具有更高的速度。

◆主要特点

- 亚纳米级的分辨率
- 高的带宽
- 高速响应
- 高的可靠性
- 结构紧凑
- 压电陶瓷驱动

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- 柔性铰链设计
- 电容位移传感器闭环反馈

◆主要应用

高精度显微镜、原子力显微镜、扫描探针纤维镜、近场扫描光学显微镜等。

◆产品主要参数

AU-NPS-XY-100A

Specification

Parameter		Symbol	Value			Units	Comments
Static physical							
			Minimum	Typical	Maximum		
Material			Super Invar (Bright nickel plated)				
Size			100 x 100 x 23			mm	Note 1
*Range		$d_{xp\text{-}max}$	± 50	± 55		μm	
Scale factor		b_{x1}		1		μm	Note 2
*Scale factor error (1σ)		δb_{x1}			0.1	%	
Static stiffness		k_z		1		$N{\cdot}\mu m^{-1}$	
Resonant frequency:	0g load	$f_{0\text{-}0}$		350		Hz	
	50g load	$f_{0\text{-}50}$		260		Hz	
	1000g load	$f_{0\text{-}1000}$		120		Hz	
Maximum load					1	Kg	Note 3
Dynamic physical (Typical values)							
			Fast	Medium	Slow		Note 4
3dB Bandwidth		$B_{x\text{-}p}$	53	20	4	Hz	
*Small signal settle time		$t_{xs\text{-}s}$	15	30	130	ms	Note 5
*Position noise (1σ)		$\delta x_{p\text{-}n}$	0.7	0.5	0.25	nm_{rms}	Note 6
Slew rate		$u_{xp\text{-}max}$	3	2	0.5	$\mu m/ms$	Note 7
Error terms							
			Minimum	Typical	Maximum		
*Hysteresis (peak to peak)		$\delta_{xp\text{-}hyst}$		0.005	0.01	%	Note 8
*Linearity error (peak)		$\delta_{xp\text{-}lin}$		0.01	0.02	%	Note 9
*Rotational error		$\delta\phi_x$		10	25	μradians	Note 10
*Rotational error		$\delta\theta_x$		5	10	μradians	Note 10
*Rotational error		$\delta\gamma_x$		5	10	μradians	Note 10
Orthogonality		$\delta\theta_{orth}$		8		mradians	

Notes

*These parameters are measured and supplied with each mechanism

1. With 40mm diameter central aperture.
2. All position commands are given in micrometers with seven digit resolution.
3. Depends on orientation. 1 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 5 kg can cause damage to the flexure mechanism.
4. 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 50 grams load. Medium means the maximum stable speed for loads up to 200 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.
5. This is the 2% settle time. It is a function of the servo loop parameters which are user controllable. The test step size is 2000 nm.
6. The actual position noise of the stage.
7. The highest rate of change of true position with time that can be achieved. It is limited by the closed loop parameters.
8. Percent of the displacement. The hysteresis specification for a displacement of less than 1μm amplitude is 0.1 nm.
9. Percent error over the full range of motion.
10. Angular motion over the full range of the stage. These rotational errors are rotational errors around the Z, Y and X axes respectively.

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AUNION TECH
昊量光电

AU-NPS-XY-100B

Specification

Parameter		Symbol	Value			Units	Comments
Static physical							
			Minimum	Typical	Maximum		
Material			Aluminium (Bright nickel plated)				
Size			100 x 100 x 23 mm				Note 1
*Range		$d_{xp\cdot max}$	± 50	± 55		μm	
Scale factor		b_{x1}		1		μm	Note 2
*Scale factor error (1σ)		δb_{x1}			0.1	%	
Static stiffness		k_z		1		N·μm^{-1}	
Resonant frequency:	0g load	$f_{0\cdot0}$	450	500		Hz	
	50g load	$f_{0\cdot50}$		300		Hz	
Maximum load				1	Kg	Note 3	
Dynamic physical (Typical values)							
			Fast	Medium	Slow		Note 4
3dB Bandwidth		$B_{x\cdot p}$	90	30	4	Hz	
*Small signal settle time		$t_{xs\cdot s}$	10	20	130	ms	Note 5
*Position noise (1σ)		$\delta x_{p\cdot n}$	0.7	0.5	0.25	nm$_{rms}$	Note 6
Slew rate		$u_{xp\cdot max}$	3	[illegible]	0.5	μm/ms	Note 7
Error terms							
			Minimum	Typical	Maximum		
*Hysteresis (peak to peak)		$\delta_{xp\cdot hyst}$		0.005	0.01	%	Note 8
*Linearity error (peak)		$\delta_{xp\cdot lin}$		0.01	0.02	%	Note 9
*Rotational error		$\delta\varphi_x$		10	25	μradians	Note 10
*Rotational error		$\delta\theta_x$		2	10	μradians	Note 10
*Rotational error		$\delta\gamma_x$		2	10	μradians	Note 10

Notes

*These parameters are measured and supplied with each mechanism

1. With 40mm diameter central aperture.
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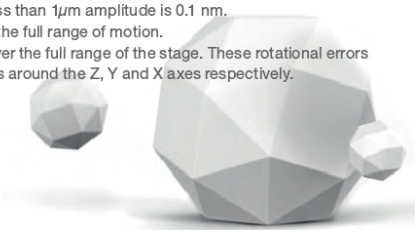

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