queensgate
a brand of Elektron Technology

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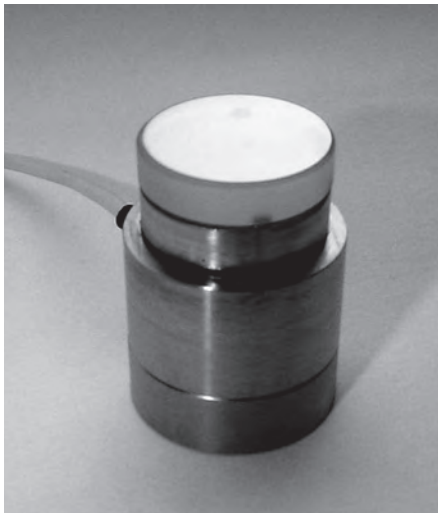
Nano mechanisms

NPS-θ-2A

The Queensgate NPS-θ-2A has been developed for applications requiring ultra-high precision positioning of mirrors in optical inspection and imaging systems.

The mirror is simply fixed onto the tilting platform of the stage to provide >2mrad of travel with sub-μrad resolution. Low moving masses and optimised closed-loop control offer exceptional response times for high speed application. Flexible digital closed loop electronics allow response optimisation to be performed *in-situ*.



NPS-θ-2A

Key features

- >2mrad range with sub-μrad resolution
- Enclosed mechanism for high stability and reliability
- Bandwidth >750Hz
- Small signal settle times <1ms
- Simple flexure design for low cost/high volume applications
- Low noise and low drift electronics options

Applications

- Precision beam steering
- Image jitter correction

Suggested controller

NPC-A-1110DS or NPC-D-5110DS closed loop controller. The NPC-D-5110DS controller is designed specifically to control Queensgate's Nanometer Precision Mechanisms. They use modern DSP techniques and combine piezo drive amplifiers, capacitance position sensing circuitry and servo control capability.

Use of PID (proportional integral differential) feedback terms greatly improves settle times and minimizes the effect of mechanical resonances. Advanced control techniques developed by Queensgate allow-24 bit resolution, providing 0.006nm steps in a 100μm range. The virtual front panel software facilitates user control of all operating parameters, including PID loop set up.

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Nano mechanisms NPS-θ-2A

Specification

Parameter		Symbol	Value			Units	Comments
Static physical							
			Minimum	Typical	Maximum		
Material			Stainless steel				Note 1
Size			35 (high) by 30 (diameter)			mm	
Range		$d_{\theta p.max}$		± 1		mrad	
Resonant frequency:	0g load	$f_{0.0}$		5		KHz	
	10g load	$f_{0.10}$		4.3		KHz	
Dynamic physical (Typical values)							
Loop setting			Fast	Medium	Slow		Note 2
Bandwidth		$B_{z.p}$	1000	500		Hz	
Slew rate		$u_{\theta p.max}$		0.9		mrads/ms	Note 5
Settle time		$t_{\theta s.s}$	0.6			ms	Note 3
Position noise		$\delta_{\theta p.n}$	0.05			μrad	Note 4
Error terms							
Hysteresis (peak to peak)		$\delta_{\theta p.hyst}$	0.2			%	Note 6
Linearity error (peak)		$\delta_{\theta p.lin}$	0.2			%	Note 7

Notes

*These parameters are measured and supplied with each mechanism

1. Clean finish, not plated.
2. 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 g load. Medium means the maximum speed for loads up to 200 g. Slow means the speed at which the servo loop is stable for all masses up to 500 g – equivalent to low noise setting.
3. This is the 2% settle time. It is a function of the servo loop parameters which are user controllable. The test step size is 100 μrad.
4. The actual position noise of the stage.
5. The highest rate of change of true position with time that can be achieved. It is limited by the closed loop parameters.
6. Percent of the displacement. The hysteresis specification for a displacement of less than 1 mrad is less than 1 μrad.
7. Percent error over the full range of motion.

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