

S-330

High-Speed Piezo Tip/Tilt Platforms

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S-330 Tip/Tilt Platform

- Fixed Orthogonal Axes with a Common Pivot Point
- 4 mrad Optical Beam Deflection
- Sub- μ rad Resolution
- For Mirrors up to 50 mm \varnothing
- Closed-Loop Versions for Better Linearity
- Differential Design for Excellent Temperature Stability
- Zero Friction Flexure Guides
- Single-Moving-Platform, Parallel-Kinematics Design: Equal Dynamics for all Axes, Better Linearity & Temperature Stability

S-330 piezo tip/tilt platforms are fast and compact tilt units,

providing precise angular movements of the top platform in two orthogonal axes. The tip/tilt range is 2 mrad (equivalent to 4 mrad optical beam deflection) with sub- μ rad resolution. Closed-loop versions are available for highest accuracy and repeatability. S-330 systems are designed for mirrors up to 50 mm diameter and have outstanding angular stability over a wide temperature range. To match the CTE (coefficient of thermal expansion) of Zerodur glass, the S-330 is equipped with an invar top platform.

Application Examples

- Image stabilization
- Laser beam stabilization
- Beam switching
- Adaptive optics systems
- Laser beam steering & scanning
- Correction of polygon scanner errors
- Interlacing, dithering

Open / Closed-Loop Operation

In open-loop operation, the platform angle roughly corresponds to the drive voltage (see page 4-17 in the "Tutorial" section for behavior of open-loop piezos).

The open-loop model is ideal for applications where the position is controlled by an external loop, based on data provided by a sensor (e.g. PSD, quad cell, CCD chip, etc.).

The closed-loop version is equipped with two pairs (one per axis) of strain gauge sensors operated in a bridge circuit for ultra-high resolution and angular stability. They provide sub- μ rad resolution and repeatability.

Higher Performance Through Parallel Kinematics

S-330 tip/tilt platforms feature a single moving platform, parallel-kinematics design with a

Ordering Information

S-330.2SL

Θ_x, Θ_y Piezo Tip/Tilt Platform
2 mrad (4 mrad optical), Closed-Loop

S-330.30

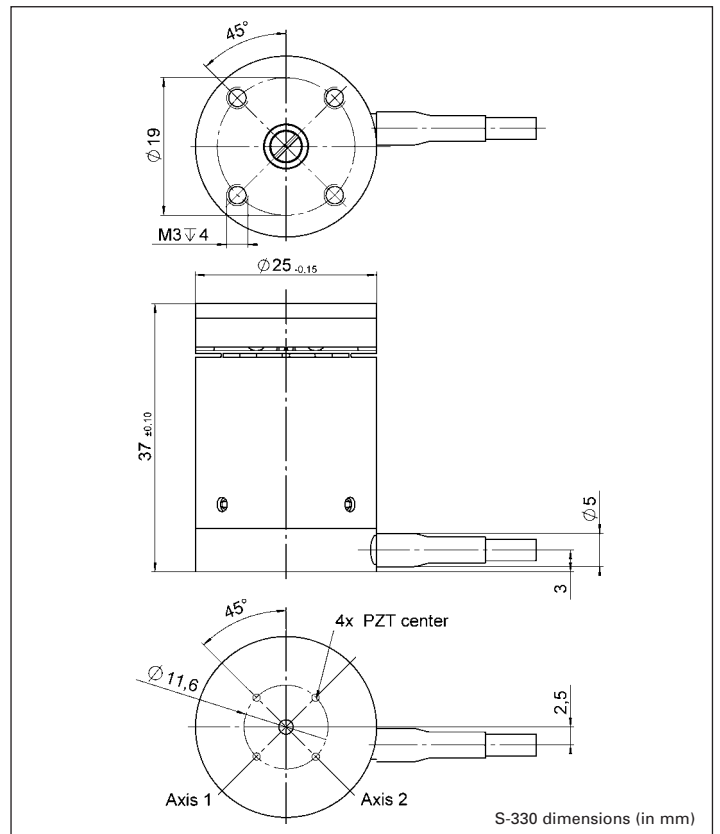
Piezo Tip/Tilt Platform 2 mrad
(4 mrad optical), Open Loop

Ask about custom designs!

common pivot point. Compared to stacked, multi-axis systems, the parallel-kinematics design provides faster response and better linearity with equal dynamics for all axes in a smaller package.

Working Principle / Lifetime

S-330 platforms are equipped with two pairs of long-life, ceramic-encapsulated, high-performance PICMA[®] piezo drives operating as a unit in push/pull mode. The stainless steel case is equipped with an



integrated, FEA-modeled (finite element analysis) circular flexure featuring zero stiction, zero friction and exceptional guiding precision.

Since drives and guides are frictionless and not subject to wear and tear, these units offer

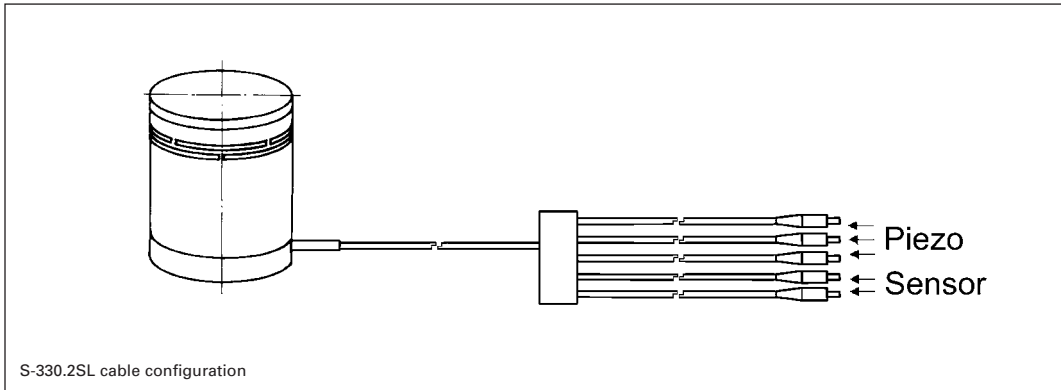
an exceptionally high level of reliability.

Notes

See the “Selection Guide” on p. 3-8 for comparison with other steering mirrors.

See the “Piezo Drivers & Nanopositioning Controllers” sec-

tion for our comprehensive line of low-noise modular and OEM control electronics for computer and manual control.



Technical Data

Models	S-330.30	S-330.2SL	Units	Notes see page 3-26
Active axes	Θ_x, Θ_y	Θ_x, Θ_y		
Open-loop tilt angle @ 0 to 100 V	2*	2*	mrad $\pm 20\%$	A2
Closed-loop tilt angle	-	2*	mrad	A3
Integrated feedback sensor	-	4 x strain gauge		B
** Closed-loop / open-loop resolution	- / 0.05	0.1 / 0.05	μrad	C1
Closed-loop linearity (typ.)	-	± 0.2	%	
Full-range repeatability (typ.)	-	± 2	μrad	C3
Electrical capacitance	3.0 / axis	3.0 / axis	$\mu\text{F} \pm 20\%$	F1
*** Dynamic operating current coefficient (DOCC)	0.2 / axis	0.2 / axis	$\mu\text{A}/(\text{Hz} \times \mu\text{rad})$	F2
Resonant frequency (f_0) without mirror	3.3	3.3	$\text{kHz} \pm 20\%$	G2
Resonant frequency w/ $\varnothing 25 \times 8$ mm glass mirror	2.4	2.4	$\text{kHz} \pm 20\%$	G3
Distance, pivot point to platform surface (T)	6	6	mm	
Platform moment of inertia	1530	1530	$\text{g} \cdot \text{mm}^2$	
Operating temperature range	- 20 to 80	- 20 to 80	$^{\circ}\text{C}$	H2
Voltage connection	3 x VL	3 x VL		J1
Sensor connection	-	2 x L, 2 m cable		J2
Weight (w/o cables)	200	200	$\text{g} \pm 5\%$	
Material (case / platform)	N-S / I	N-S / I		L
Recommended amplifier / controller (codes explained page 3-9)	G ^o , C	H ^o , D		

* Mechanical tilt, optical beam deflection is twice as large. Special version with 10 mrad available on request.

** For calibration information see p. 3-7.

Resolution of PZT tip/tilt platforms is not limited by friction or stiction. Noise equivalent motion with E-503 amplifier.

*** Dynamic Operating Current Coefficient in μA per Hz and μrad . Example: Sinusoidal scan of 100 μrad at 10 Hz requires approximately 0.2 mA drive current.

With (1 x E-505.00S + 2 x E-505.00) or 1 x E-503.00S

Piezo Actuators

Nanopositioning & Scanning Systems

Active Optics / Steering Mirrors

Tutorial: Piezo-electrics in Positioning

Capacitive Position Sensors

Piezo Drivers & Nanopositioning Controllers

Hexapods / Micropositioning

Photonics Alignment Solutions

Motion Controllers

Ceramic Linear Motors & Stages

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