

S-330

High-Dynamics Large-Angle Piezo Tip/Tilt Platforms



- Resolution to 20 nrad, Excellent Position Stability
- Optical Beam Deflection to 20 mrad (>1°)
- Higher Dynamics, Stability & Linearity Through Parallel-Kinematics Design
- Sub-Millisecond Response
- For Mirrors up to 50 mm Diameter
- Closed-Loop Versions for Better Linearity
- Excellent Temperature Stability

S-330 piezo tip/tilt platforms are fast and compact tip/tilt units, providing precise angular motion of the top platform around two orthogonal axes.

Application Examples

- Image processing / stabilization
- Interlacing, dithering
- Laser scanning / beam steering
- Optics
- Optical filters
- Beam stabilization

These flexure-guided, piezoelectric platforms can provide higher accelerations than other actuators, enabling step response times in the sub-millisecond range.

Closed-loop and open-loop versions with 3 different tilt ranges up to 10 mrad (20 mrad optical deflection) are available.

Parallel-Kinematics Improve Stability, Linearity & Dynamics

PI piezo steering mirrors are based on a parallel-kinematics design with coplanar rotational axes and a single moving plat-

form driven by two pairs of differential actuators. The advantage is jitter-free, multi-axis motion with excellent temperature stability. Compared to stacked, (two-stage), mirror scanners, the parallel-kinematics design provides symmetrical dynamic performance in both axes with faster response and better linearity in a smaller package.

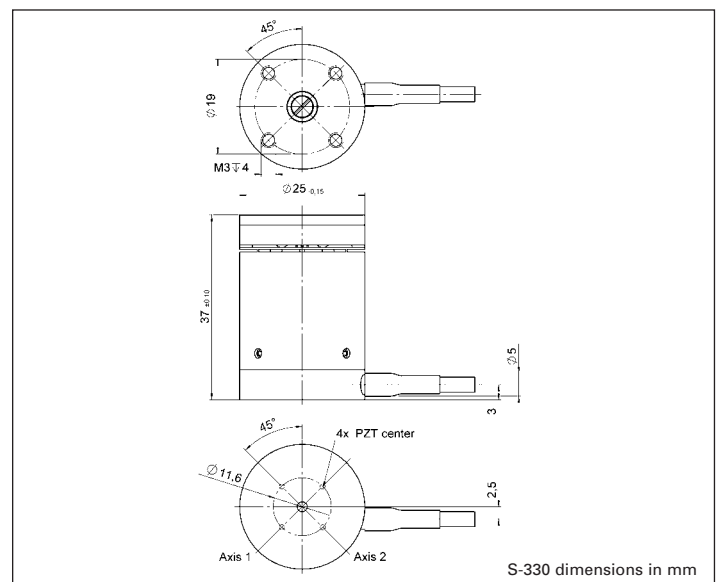
The single pivot-point design also prevents the drawback of polarization rotation, which is common with stacked systems, e. g. galvo scanners.

Closed-Loop Operation

High-resolution, absolute measuring strain gauge sensors (SGS) are applied to appropriate places on the drive train and feed the platform position information back to a piezoelectric controller. The sensors are connected in a full-bridge configuration to eliminate thermal drift, and assure optimal position stability and rapid response with nanometer resolution.

Ordering Information

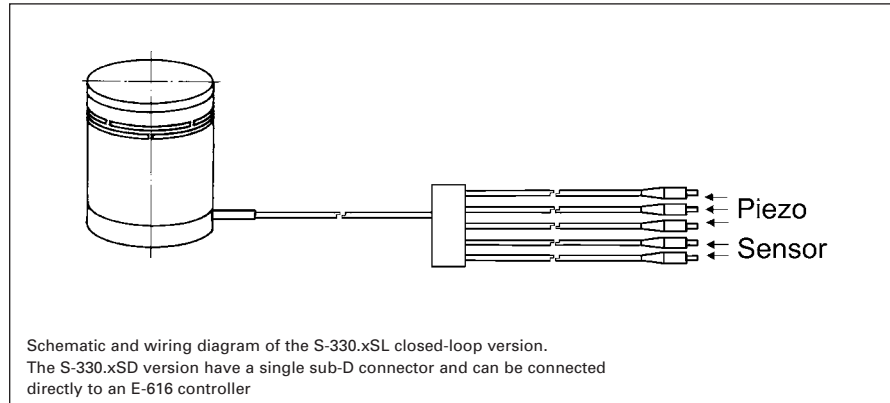
- S-330.2SL**
High-Dynamics Piezo Tip/Tilt Platform, 2 mrad, SGS, LEMO Connector
- S-330.2SD**
High-Dynamics Piezo Tip/Tilt Platform, 2 mrad, SGS, Sub-D Connector
- S-330.20L**
High-Dynamics Piezo Tip/Tilt Platform, 2 mrad, Open-Loop, LEMO Connector
- S-330.4SL**
High-Dynamics Piezo Tip/Tilt Platform, 5 mrad, SGS, LEMO Connector
- S-330.4SD**
High-Dynamics Piezo Tip/Tilt Platform, 5 mrad, SGS, Sub-D Connector
- S-330.40L**
High-Dynamics Piezo Tip/Tilt Platform, 5 mrad, Open-Loop, LEMO Connector
- S-330.8SL**
High-Dynamics Piezo Tip/Tilt Platform, 10 mrad, SGS, LEMO Connector
- S-330.8SD**
High-Dynamics Piezo Tip/Tilt Platform, 10 mrad, SGS, Sub-D Connector
- S-330.80L**
High-Dynamics Piezo Tip/Tilt Platform, 10 mrad, Open-Loop, LEMO Connector



S-330 dimensions in mm

Superior Lifetime with Ceramic-Encapsulated Piezos

Highest possible reliability is assured by the use of award-winning PICMA® multilayer piezo actuators. PICMA® actuators are the only ceramic-encapsulated actuators on the market, which makes them resistant to ambient humidity and leakage-current failures. They are thus far superior to conventional actuators in reliability and lifetime.



Technical Data

	S-330.2SL	S-330.4SL	S-330.8SL	S-330.2SD S-330.4SD S-330.8SD	S-330.20L S-330.40L S-330.80L	Units	Tolerance
Active axes	Θ_x, Θ_y	Θ_x, Θ_y	Θ_x, Θ_y	Θ_x, Θ_y	Θ_x, Θ_y		
Motion and positioning							
Integrated sensor	4x SGS	4x SGS	4x SGS	4x SGS	-		
Open-loop tilt angle Θ_x, Θ_y for -20 to +120 V	3.5	7	15	see SL version	see SL version	mrad	min.
Closed-loop tilt angle Θ_x, Θ_y	2	5	10	see SL version	-	mrad	
Open-loop angular resolution in Θ_x, Θ_y	0.02	0.1	0.2	see SL version	see SL version	μ rad	typ.
Closed-loop angular resolution in Θ_x, Θ_y	0.05	0.25	0.5	see SL version	-	μ rad	typ.
Linearity in Z, Θ_x, Θ_y	± 0.1	± 0.2	± 0.25	see SL version	-	%	typ.
Repeatability in Θ_x, Θ_y	0.15	0.5	1	see SL version	-	μ rad	typ.
Mechanical properties							
Unloaded resonant frequency in Θ_x, Θ_y	3.7	3.3	3.1	see SL version	see SL version	kHz	$\pm 20\%$
Resonant frequency under load in Θ_x	2.6 (with glass mirror, 25 mm diam., 8 mm thick)	1.6 (with glass mirror, 25 mm diam., 8 mm thick)	1.0 (with glass mirror, 25 mm diam., 8 mm thick)	see SL version	see SL version	kHz	$\pm 20\%$
Resonant frequency under load in Θ_y	2.6 (with glass mirror, 25 mm diam., 8 mm thick)	1.6 (with glass mirror, 25 mm diam., 8 mm thick)	1.0 (with glass mirror, 25 mm diam., 8 mm thick)	see SL version	see SL version	kHz	$\pm 20\%$
Distance, pivot point to platform surface	6	6	6	6	6	mm	± 1 mm
Inertia of platform	1530	1530	1530	1530	1530	g x mm ²	$\pm 20\%$
Drive properties							
Ceramic type	PICMA®	PICMA®	PICMA®	PICMA®	PICMA®		
Electrical capacitance	3 per axis	6 per axis	12.5 per axis	see SL version	see SL version	μ F	$\pm 20\%$
Dynamic operating current coefficient	0.22 per axis	0.4 per axis	0.8 per axis	see SL version	see SL version	μ A/Hz x mrad)	$\pm 20\%$
Miscellaneous							
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	°C	
Material case	Stainless steel, non-magnetic	Stainless steel, non-magnetic	Stainless steel, non-magnetic	Stainless steel, non-magnetic	Stainless steel, non-magnetic		
Platform material	Invar	Invar	Invar	Invar	Invar		
Mass	0.2	0.38	0.7	see SL version	see SL version	kg	$\pm 5\%$
Cable length	1.5	1.5	1.5	1.5	1.5	m	± 10 mm
Sensor connection		2x Lemo connector (SGS sensor)		Sub-D connector, 25-pin	-		
Voltage connection		3x Lemo connector (low voltage)		Sub-D connector, 25-pin	3x Lemo connector (low voltage)		
Recommended controller / amplifier		E-500 modular control system E-501.00 chassis, E-503.00S amplifier, E-509.S3 servo-controller and optional E-516 interface module For high-dynamics applications with E-500.00 Chassis and one E-505.00S and two E-505.00 amplifiers		E-616	E-500 modular system: E-501.00 chassis, E-503.00S amplifier and optional E-516 interface module For high-dynamics applications with E-500.00 Chassis and one E-505.00S and two E-505.00 amplifiers E-663 three-channel amplifier		

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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