Fast Piezo Tip/Tilt Platform

Dynamic, with Large Deflection Angles, for Mirrors and Optics

S-330

- Mechanical tip/tilt angle to 10 mrad
- High resonant frequencies to 1.6 kHz (1" mirror) for dynamic motion and fast step-and-settle
- Resolution to 20 nrad
- Excellent position stability
- Sub-ms response time
- For mirrors with a diameter up to 50 mm

Application fields

- Image processing / stabilization
- Optical trapping
- Laser scanning / beam steering
- Laser tuning
- Optical filters / switches
- Optics
- Beam stabilization

Outstanding lifetime thanks to PICMA® piezo actuators

The PICMA® piezo actuators are all-ceramic insulated. This protects them against humidity and failure resulting from an increase in leakage current. PICMA® actuators offer an up to ten times longer lifetime than conventional polymer-insulated actuators. 100 billion cycles without a single failure are proven.

High guiding accuracy due to zero-play flexure guides

Flexure guides are free of maintenance, friction, and wear, and do not require lubrication. Their stiffness allows high load capacity and they are insensitive to shock and vibration. They work in a wide temperature range.

High dynamics multi-axis operation due to parallel kinematics

In a parallel-kinematic multi-axis system, all actuators act on a common platform. The minimum mass inertia and the identical design of all axes allow fast, dynamic, and nevertheless precision motion.

Motion	Unit	Tolerance	S-330.2SH	S-330.2SL	S-330.4SH	S-330.4SL	S-330.8SH	S-330.8SL
Active axes			θX | θY	θX | θY	θX | θY	θX | θY	θX | θY	θX | θY
Rotation range in θX	mrad		2	2	5	5	10	10
Rotation range in θY	mrad		2	2	5	5	10	10
Rotation range in θX, open loop	mrad	±20%	3.5	3.5	7	7	15	15
Rotation range in θY, open loop	mrad	±20%	3.5	3.5	7	7	15	15
Linearity error in θX	%	Typ.	0.05	0.05	0.1	0.1	0.1	0.1
Linearity error in θY	%	Typ.	0.05	0.05	0.1	0.1	0.1	0.1

Positioning	Unit	Tolerance	S-330.2SH	S-330.2SL	S-330.4SH	S-330.4SL	S-330.8SH	S-330.8SL
Unidirectional repeatability in θX	µrad	Typ.	±0.6	±0.6	±0.8	±0.8	±1.5	±1.5
Unidirectional repeatability in θY	µrad	Typ.	±0.6	±0.6	±0.8	±0.8	±1.5	±1.5
Resolution in θX, open loop	µrad	Typ.	0.02	0.02	0.1	0.1	0.2	0.2
Resolution in θY, open loop	µrad	Typ.	0.02	0.02	0.1	0.1	0.2	0.2
Integrated sensor			SGS, indirect position measuring	SGS, indirect position measuring	SGS, indirect position measuring	SGS, indirect position measuring	SGS, indirect position measuring	SGS, indirect position measuring
System resolution in θX	µrad		0.05	0.05	0.25	0.25	0.5	0.5
System resolution in θY	µrad		0.05	0.05	0.25	0.25	0.5	0.5

Drive Properties	Unit	Tolerance	S-330.2SH	S-330.2SL	S-330.4SH	S-330.4SL	S-330.8SH	S-330.8SL
Drive type			PICMA®	PICMA®	PICMA®	PICMA®	PICMA®	PICMA®
Electrical capacitance in θX	µF	±20%	3	3	6	6	12.5	12.5
Electrical capacitance in θY	µF	±20%	3	3	6	6	12.5	12.5

Mechanical Properties	Unit	Tolerance	S-330.2SH	S-330.2SL	S-330.4SH	S-330.4SL	S-330.8SH	S-330.8SL
Resonant frequency in θX, unloaded	kHz	±20%	2.4	2.4	2	2	1	1
Resonant frequency in θX, under load with glass mirror (Ø 25 mm; thickness 8 mm)	kHz	±20%	1.6	1.6	1.5	1.5	1	1
Resonant frequency in θY, unloaded	kHz	±20%	2.4	2.4	2	2	1	1
Resonant frequency in θY, under load with glass mirror (Ø 25 mm; thickness 8 mm)	kHz	±20%	1.6	1.6	1.5	1.5	1	1
Moment of inertia in θX, unloaded	g·mm²	±20%	1530	1530	1530	1530	1530	1530
Moment of inertia in θY, unloaded	g·mm²	±20%	1530	1530	1530	1530	1530	1530
Distance of pivot point to platform surface	mm	±0.1 mm	6.5	6.5	6.5	6.5	6.5	6.5
Guide			Flexure guide with lever amplification	Flexure guide with lever amplification	Flexure guide with lever amplification	Flexure guide with lever amplification	Flexure guide with lever amplification	Flexure guide with lever amplification
Overall mass	g	±5%	200	200	380	380	700	700
Material			Housing: steel. Platform: Invar.	Housing: steel. Platform: Invar.	Housing: steel. Platform: Invar.	Housing: steel. Platform: Invar.	Housing: steel. Platform: Invar.	Housing: steel. Platform: Invar.

Miscellaneous	Unit	Tolerance	S-330.2SH	S-330.2SL	S-330.4SH	S-330.4SL	S-330.8SH	S-330.8SL
Operating temperature range	°C		-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80
Connector			D-sub 37 (m)	LEMO FFS.00.250.CTCE24	D-sub 37 (m)	LEMO FFS.00.250.CTCE24	D-sub 37 (m)	LEMO FFS.00.250.CTCE24
Sensor connector			—	LEMO FFA.0S.304.CLAC32	—	LEMO FFA.0S.304.CLAC32	—	LEMO FFA.0S.304.CLAC32
Cable length	m	+50 / -0 mm	2	2	2	2	2	2
Recommended controllers / drivers			E-727	E-509.S3 + E-505.00 (2×) + E-505.00S + E-500.00	E-727	E-509.S3 + E-505.00 (2×) + E-505.00S + E-500.00	E-727	E-509.S3 + E-505.00 (2×) + E-505.00S + E-500.00

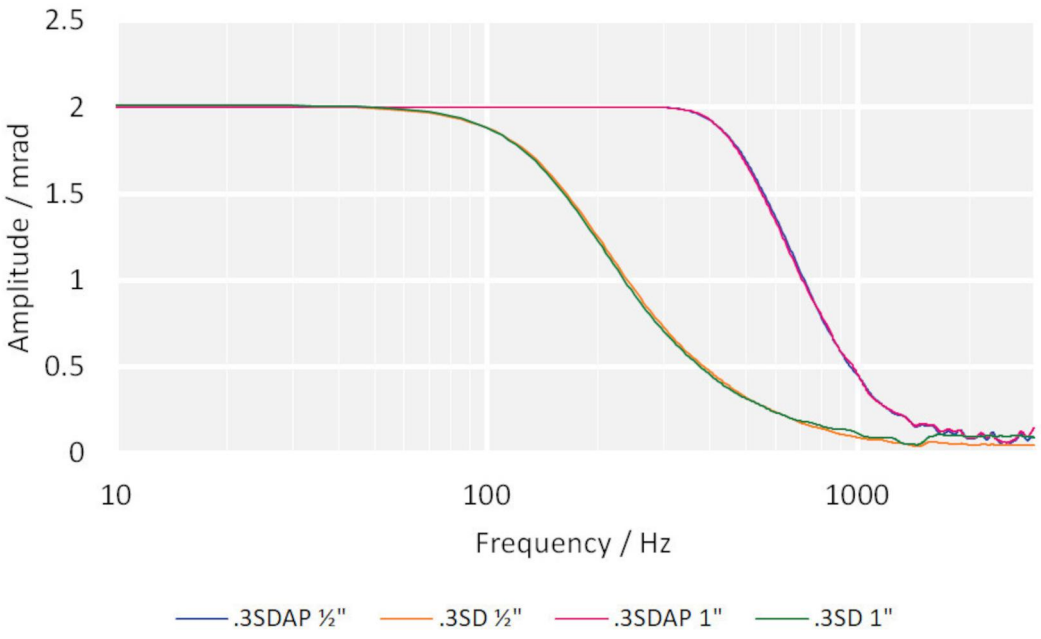
Linearity error: S-330.xSH in conjunction with digital controllers.
Unidirectional repeatability: At 100 % tip/tilt angle. S-330.xSH in conjunction with digital controllers.

The resolution of the system is limited only by the noise of the amplifier and the measuring technology because PI piezo nanopositioning systems are free of friction.

Models without sensor are available on request.

At PI, technical data is specified at 22 ±3 °C. Unless otherwise stated, the values are for unloaded conditions. Some properties are interdependent. The designation "typ." indicates a statistical average for a property; it does not indicate a guaranteed value for every product supplied. During the final inspection of a product, only selected properties are analyzed, not all. Please note that some product characteristics may deteriorate with increasing operating time.

Drawings / Images

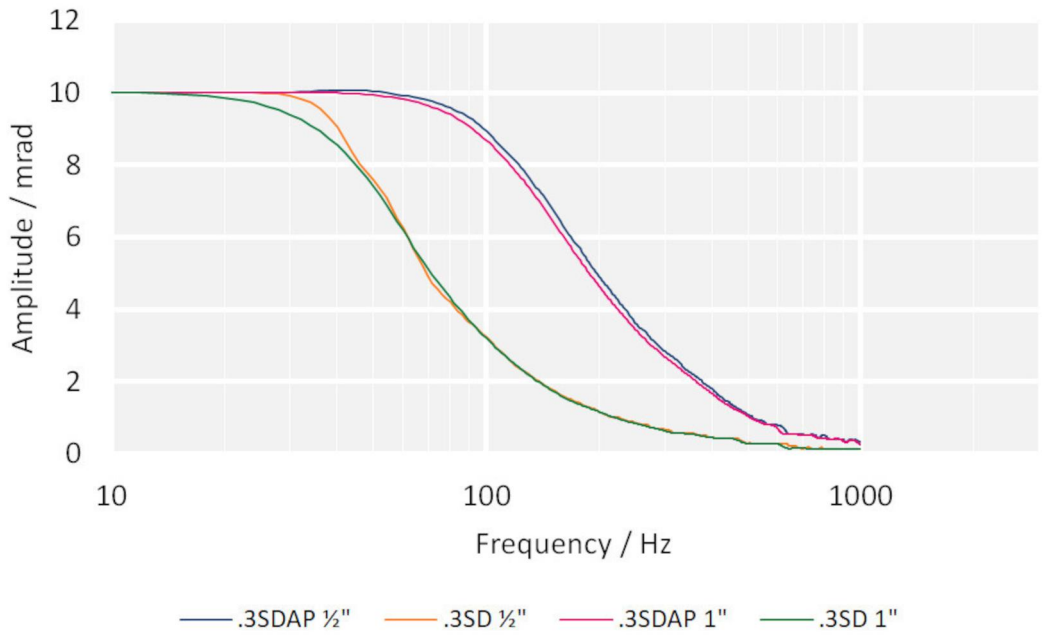


S-330.2SH: System frequency response with different E-727 controllers and mirror sizes.

The different performance level of the E-727 controller variants influences the dynamic properties of the system significantly.

E-727.3SD: 5 mrad, tuning optimized for 50 Hz
E-727.3SDAP: 5 mrad, tuning optimized for 420 Hz

Drawings / Images

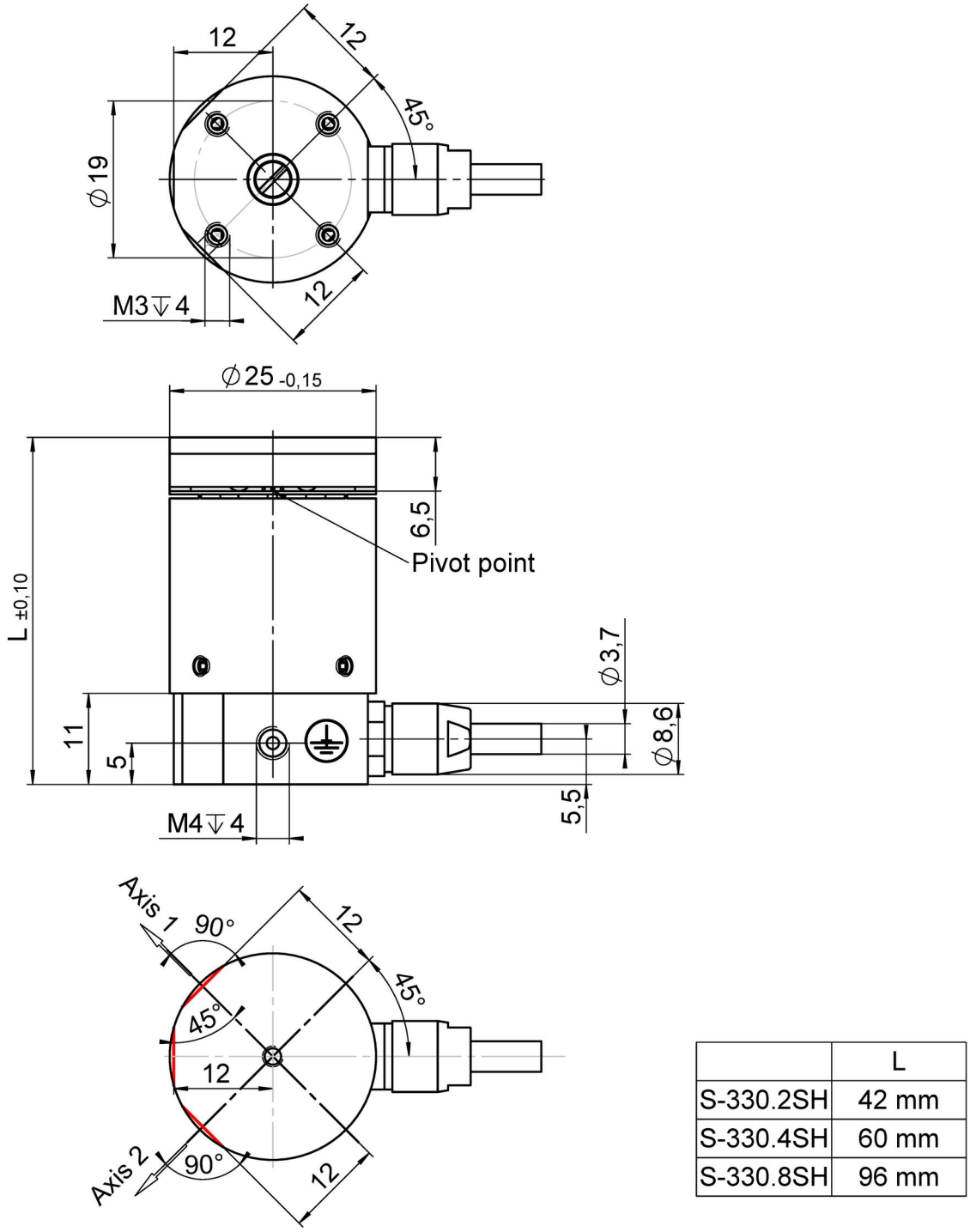


S-330.8SH: System frequency response with different E-727 controllers and mirror sizes.

The different performance level of the E-727 controller variants influences the dynamic properties of the system significantly.

E-727.3SD: 10 mrad, tuning optimized for 10 Hz
E-727.3SDAP: 10 mrad, tuning optimized for 40 Hz

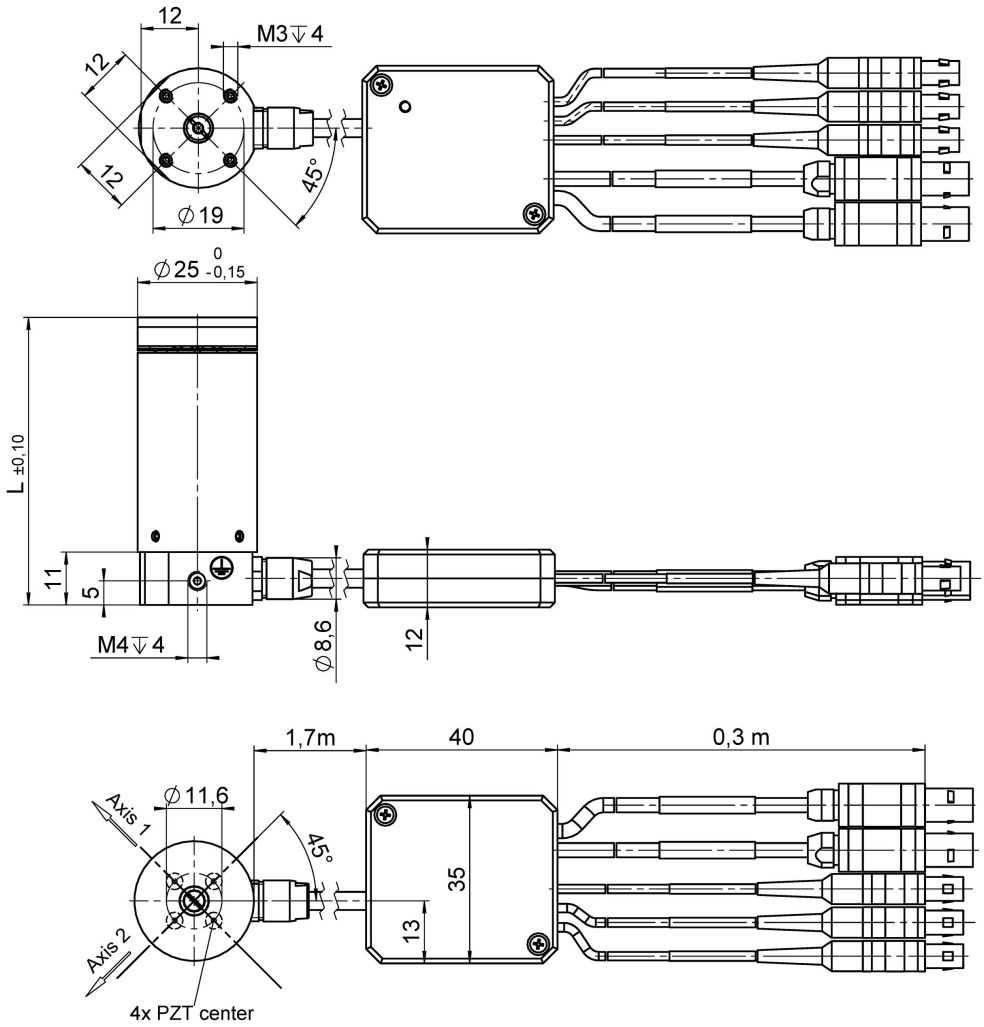
Drawings / Images



	L
S-330.2SH	42 mm
S-330.4SH	60 mm
S-330.8SH	96 mm

S-330.xSH, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Drawings / Images



	L
S-330.2SL	42 mm
S-330.4SL	60 mm
S-330.8SL	96 mm

S-330.xSL with cable splitter box, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Order Information

S-330.2SH
Fast piezo tip/tilt platform; 2 mrad × 2 mrad rotational angle (θX × θY); SGS, indirect position measuring; D-sub 37 (m) connector; 2 m cable length

S-330.2SL
Fast piezo tip/tilt platform; 2 mrad × 2 mrad rotational angle (θX × θY); SGS, indirect position measuring; LEMO connector; 2 m cable length

Order Information

S-330.4SH
Fast piezo tip/tilt platform; 5 mrad × 5 mrad rotational angle (θX × θY); SGS, indirect position measuring; D-sub 37 (m) connector; 2 m cable length

S-330.4SL
Fast piezo tip/tilt platform; 5 mrad × 5 mrad rotational angle (θX × θY); SGS, indirect position measuring; LEMO connector; 2 m cable length

S-330.8SH
Fast piezo tip/tilt platform; 10 mrad × 10 mrad rotational angle (θX × θY); SGS, indirect position measuring; D-sub 37 (m) connector; 2 m cable length

S-330.8SL
Fast piezo tip/tilt platform; 10 mrad × 10 mrad rotational angle (θX × θY); SGS, indirect position measuring; LEMO connector; 2 m cable length