

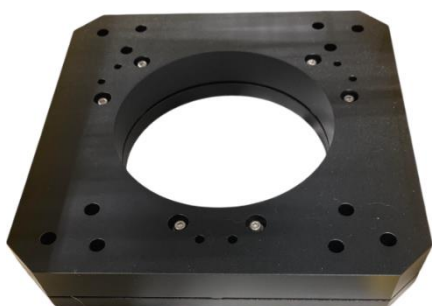
Piezo Phase Shifters for Optics

High-Resolution Piezo Z / Z-Tip-Tilt Stages for Interferometry, Nanopositioning & Scanning Applications

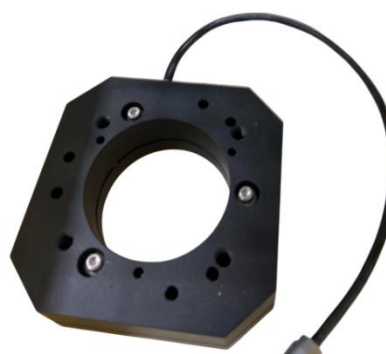
S-312

- Piezo Z- and Z-Tip-Tilt Stage for Horizontally or Vertically Mounted Optics
- 5 Clear Apertures to Choose from: 53mm (2in) to 311mm (12in)
- Low Profile, from 28mm
- Tripod Piezo Design provides High Stiffness Z-Travel with optional Tip/Tilt Correction
- Analog Voltage-Driven (0-100 V; 10V $\triangleq$ ~1.5 μ m, 100V $\triangleq$ ~15 μ m)
- Custom Versions Available, i.e. Closed Loop, or Different Sizes / Apertures

Preliminary
Datasheet



S-312.04, Ø4" piezo phase shifter stage



S-312.02-L, Ø2" piezo phase shifter stage with Lemo connector

Product Overview

The S-312 piezo stages are designed for optical phase-shifting applications, where nanometer-level motion alters the phase of light waves traveling through a lens mounted on the stage. These stages are typically integrated into interferometers but are also suitable for use in a variety of optical circuits. Thanks to their high-stiffness design, they enable sub-nanometer steps with millisecond response times—ideal for rapid fringe shifting.

Operation

S-312 nanopositioning stages utilize three open-loop, long-life [PICMA® piezo actuators](#), driven in parallel via an external analog amplifier. Displacement is proportional to the analog drive voltage—for example, a 10V signal provides approximately 10% of the maximum travel achieved at 100V. Custom phase shifters are available with closed-loop control (integrated position sensors) and in different form factors. The 0.5 m cable is offered with both connector and pigtail options to maximize configuration flexibility.

Available Sizes / Apertures

Part Number	Clear Aperture Diameter	Description
S-312.02	Ø2" (53mm)	Piezo Stage, Phase Shifter, 15 μ m, Ø2" (53mm) Clear Aperture
S-312.04	Ø4" (108mm)	Piezo Stage, Phase Shifter, 15 μ m, Ø4" (108mm) Clear Aperture
S-312.06	Ø6" (158mm)	Piezo Stage, Phase Shifter, 15 μ m, Ø6" (158mm) Clear Aperture
S-312.08	Ø8" (208mm)	Piezo Stage, Phase Shifter, 15 μ m, Ø8" (208mm) Clear Aperture
S-312.12	Ø12" (311mm)	Piezo Stage, Phase Shifter, 15 μ m, Ø12" (311mm) Clear Aperture
*-L	All sizes	For Lemo Connector
-	All sizes	Pigtail Cable Endings for Direct Control of all 3 Piezo Actuators (Z-Tip-Tilt)

Accessories and options

- LEMO 1-Pin Electrical connector included for Z-motion (LEMO FFA.00.250.CTAC22)
- Pigtails for individual actuator control (Z with Tip-Tilt correction configuration)
- Compatible with the [E-836](#) amplifier (not included)
- Optional cables include P-890 for pigtail to LEMO and P-891 for extension cables

Application fields

The stage is ideally suited for interferometer or optical circuit applications where small nanometer steps and/or high dynamics are needed. The solid state piezo and flexure design provides billions of cycles of lifetime and can be configured for both vacuum and clean room applications.

Specifications

Models	S-312.04	S-312.06	Unit	Tolerance
Active axes	Z, in the direction of the optical axis with Tip-Tilt Correction			
Nominal Clear Aperture	4	6	inches	
Clear Aperture	108	158	mm	
Nominal Open Loop Travel at 0 to 100V		15	μm	±15%
Resolution, open loop ¹		0.5	nm	
Maximum Payload ²	15	15	kg	
Payload Max Offset ³	50	75	mm	Max.
Natural Frequency with Max. Payload ⁴	70	45	Hz	
Natural Frequency with No Payload ⁴	560	320	Hz	
Electrical Capacitance ⁵	4.5 (1.5 per Piezo)		μF	±20%
Maximum Voltage Range	-20 to +120		Volt	
Operating Temperature Range	-20 to +80		°C	
Mass (without cable)	1.8	2.5	kg	
Body Material	Aluminum			
Recommended Amplifier	E-836			
Cable Length	0.5		m	

Footnotes:

¹Resolution is limited by the noise floor of the amplifier. Value shown assumes typical PI amplifier.

²With the optical axis in any direction relative to gravity.

³With optical axis horizontal, the max distance the Payload CG may be from the mounting face.

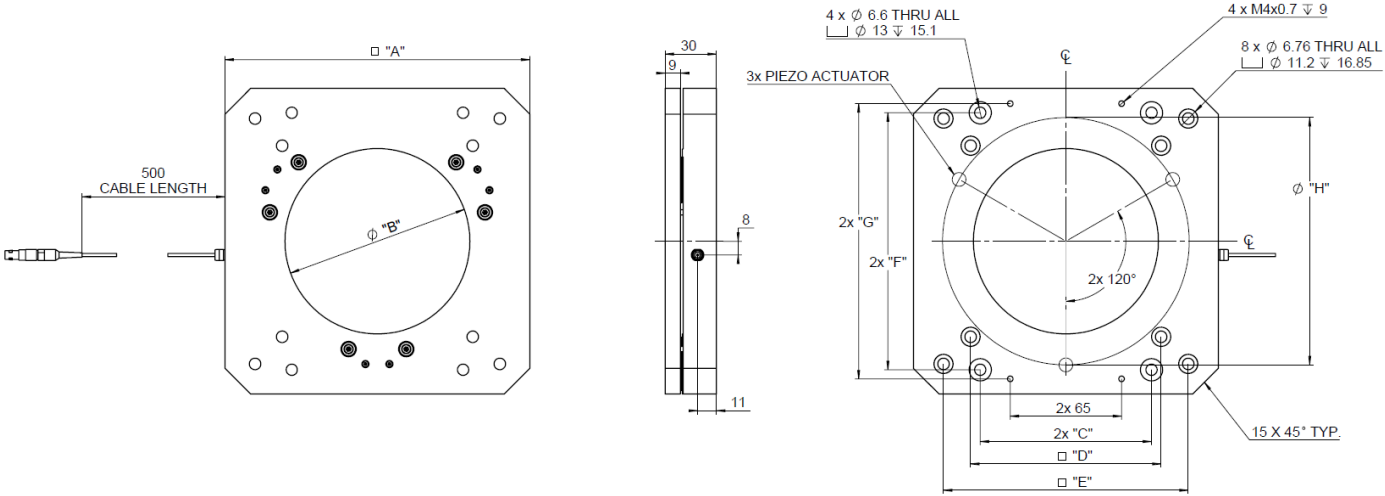
⁴Engineering FEA estimate.

⁵Small signal electrical capacitance: Measured at 1 Vpp, 1 kHz, RT, tolerance ±20 %.

Specifications are continuously updated and are subject to change without notice.

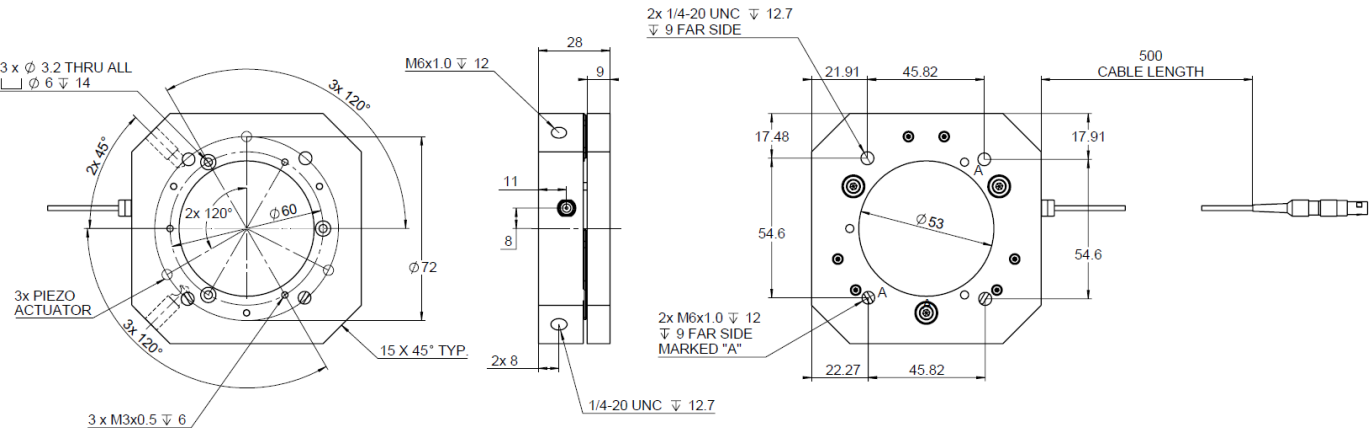
Open loop piezos typically have 15% hysteresis and 3% creep over the first 100s. The stage is design for temporary steps

Drawings and Images

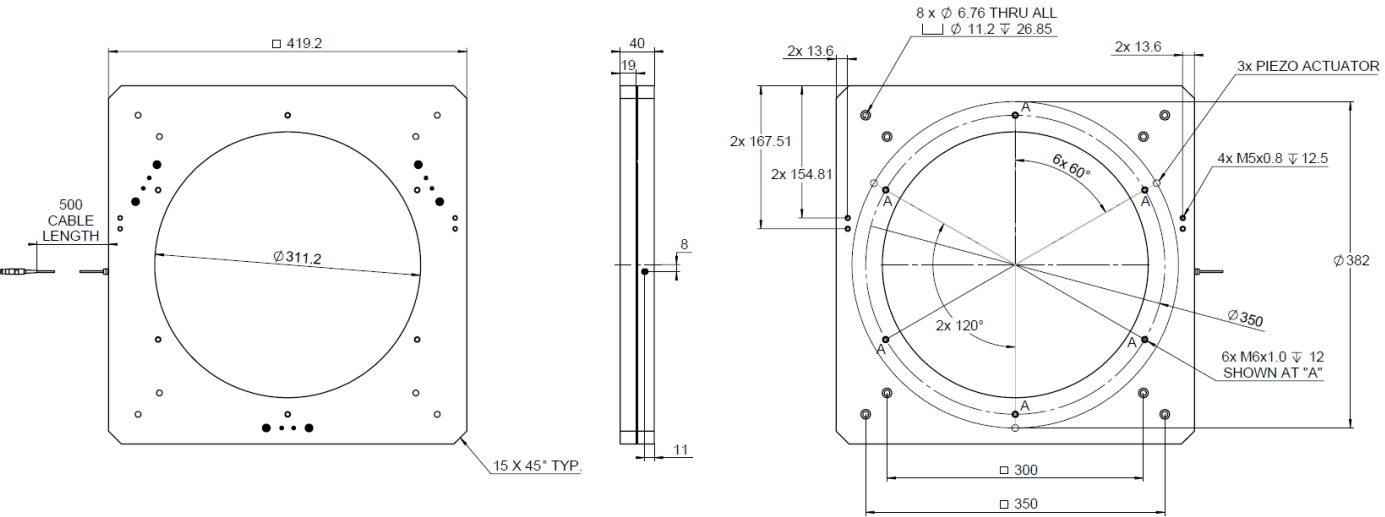


ASSEMBLY	APERTURE	A	B	C	D	E	F	G	H
S-312.04	4 IN	178 MM	108 MM	100 MM	111.25 MM	142.88 MM	149.66 MM	160.27 MM	143 MM
S-312.06	6 IN	228 MM	158 MM	127.78 MM	146.61 MM	178.23 MM	191.24 MM	210.27 MM	193 MM
S-312.08	8 IN	278 MM	208 MM	155.56 MM	181.96 MM	213.59 MM	232.81 MM	260.27 MM	243 MM

Dimensions of the S-312.04, S-312.06, and S-312.08 Piezo Phase Shifters



Dimensions of the S-312.02 Piezo Phase Shifters



Dimensions of the S-312.12 Piezo Phase Shifters

Ordering Information

Variants with Pigtails for Z-Tip-Tilt Motion (Individual Control of all 3 Piezo Stacks)

S-312.02

Piezo stage, phase shifter, 15µm, Ø2" (53mm) Aperture, Pigtail Cable Ends, Control of each Piezo Stack (Z-Tip-Tilt)

S-312.04

Piezo Stage, Phase Shifter, 15µm, Ø4" (108mm) Aperture, Pigtail Cable Ends, Control of each Piezo Stack (Z-Tip-Tilt)

S-312.06

Piezo Stage, Phase Shifter, 15µm, Ø6" (158mm) Aperture, Pigtail Cable Ends, Control of each Piezo Stack (Z-Tip-Tilt)

S-312.08

Piezo Stage, Phase Shifter, 15µm, Ø8" (208mm) Aperture, Pigtail Cable Ends, Control of each Piezo Stack (Z-Tip-Tilt)

S-312.12

Piezo Stage, Phase Shifter, 15µm, Ø12" (311mm) Aperture, Pigtail Cable Ends, Control of each Piezo Stack (Z-Tip-Tilt)

Variants with Lemo Connectors and Z-only Motion

S-312.02-L

Piezo Stage, Phase Shifter, 15µm, Ø2" (53mm) Aperture, LEMO connector

S-312.04-L

Piezo Stage, Phase Shifter, 15µm, Ø4" (108mm) Aperture, LEMO connector

S-312.06-L

Piezo Stage, Phase Shifter, 15µm, Ø6" (158mm) Aperture, LEMO connector

S-312.08-L

Piezo Stage, Phase Shifter, 15µm, Ø8" (208mm) Aperture, LEMO connector

S-312.12-L

Piezo Stage, Phase Shifter, 15µm, Ø12" (311mm) Aperture, LEMO connector

Accessories

Compatible Open Loop Amplifiers

- [E-836](#) Compact Benchtop Piezo Amplifier or OEM Board Module
- [E-663](#) 3-Channel Piezo Amplifier

Extension Cables

- [P-890](#) LEMO/Solderable End Cable (Pigtail to LEMO)
- [P-891](#) Extension Cable LEMO/LEMO



E-836 Piezo Amplifier



E-836 OEM Piezo Amplifier



P-890 Cable LEMO / Solderable End

For the pigtail configuration, the three items that are typically bought together are as follows: S-312.xx + [E-836](#) + [P-890](#). For individual piezo control and Tip-Tilt correction, three E-836 amplifiers (or one [E-663 amplifier](#)) and three cables are required.

Custom phase shifters are available, please contact us with what you need. Here are a few examples:



Compact 5 μ m piezo phase shifter with integrated sensor for closed-loop position control



3 μ m open or closed loop phase shifters



S-316 [Closed-loop piezo phase shifter](#), up to 12 μ m linear displacement; 1200 $\times$ 1200 μ rad angular range



Compact OEM controller for closed loop piezo stages and phase shifters