

COR-PS CORRECTIVE LINEAR PIEZO STAGE

ABSTRACT

The DS describes the main features of the COR-PS corrective linear piezo stage. It includes technical data and drawings.

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REVISION HISTORY

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NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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1. Features

- Travel range – 10-300 μm
- High precision
- No backlash
- No need for lubricant
- High load capability – Up to 5 kg
- High dynamic range
- Sub-nanometric resolution – Step 0.18-15 nm
- High Vacuum (HV) version available
- Closed-loop control – Available on request

2. Applications

- Manipulation of micro-optics
- Components positioning
- Assembly and precise adjustments
- Manipulation of biological samples
- High-dynamics applications

3. Description

The COR-PS corrective linear piezo stage grants extremely accurate positioning along its axis. It is specifically designed to withstand external noise and to offer robust positioning. The hybrid layout with steel and aluminum provides high inertia and stability to mechanical vibrations. The electronics as well can provide additional robustness by minimizing the effect of the external noises and disturbances.

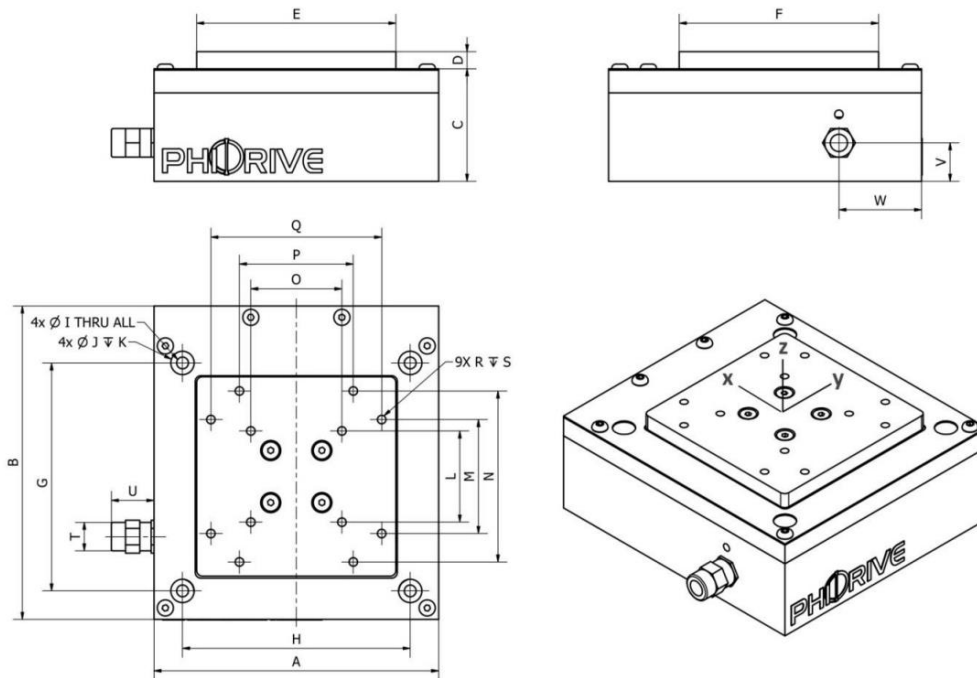
The COR-PS system can be customized:

- The travel range can change
- The stage can be integrated in multi-axis solutions
- The resolution can be tuned on request
- The encumbrance can be changed
- Flanges for mounting the stage and loads on top of it can be added as desired

Calibration is performed by Phi Drive. Calibration provides a way to minimize linearity errors basing on requests from the customer.

4. Dimensions

Fig. 1: Main dimensions of the COR-PS piezo stage



Tab. 1: Main dimensions of the COR-PS piezo stage

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
100	*	**	6	70	70	80	80	4.1	8.2	8.5	32	40	60	32	40	60	M3	5.5	10	15	***	29

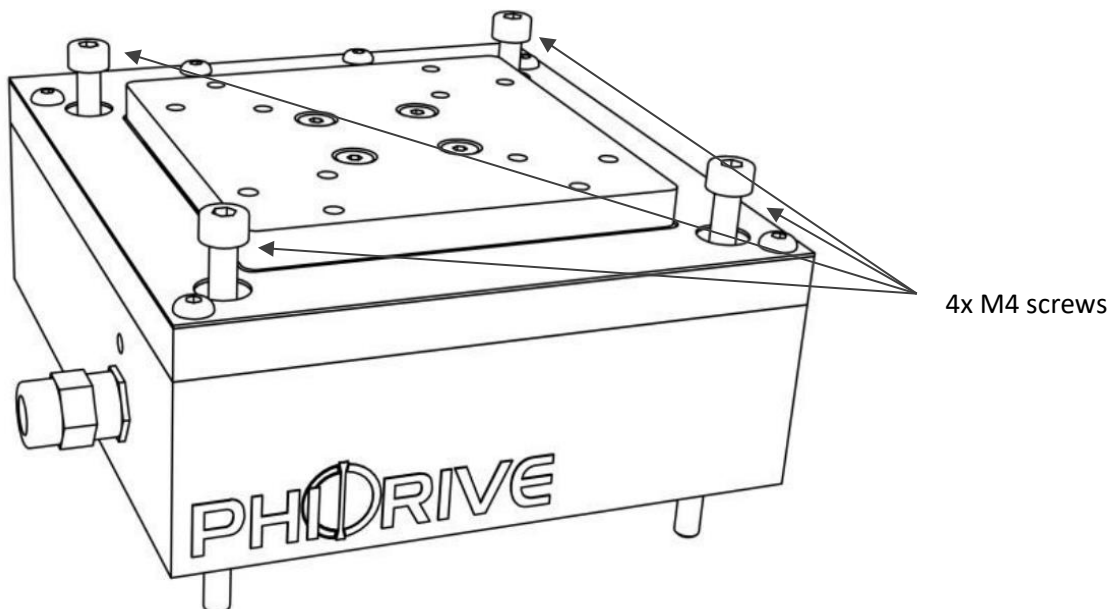
*Equal to 100 in the SA.1, SA.2, SC.1, SC.2, SC.3 variants, to 110 in the HC.1 and HC.2 variants

**Equal to 17 in the SA.1 and SA.2 variants, to 23 in the SC.1, SC.2, SC.3 variants, to 40 in the HC.1 and HC.2 variants

***Equal to 6.5 in the SA.1, SA.2, SC.1, SC.2, SC.3 variants, to 13.5 in the HC.1 and HC.2 variants

5. Mounting

Fig. 2: Mechanical interfaces



6. Variants

6.1. Travel range

6.1.1. 1 option

In the 1 option, the travel range is equal to 140 μm for the S option and to 125 μm for the H option.

6.1.2. 2 option

In the 2 option, the travel range is equal to 150 μm for the S option and to 135 μm for the H option.

6.1.3. 3 option

In the 3 option, the travel range is equal to 145 μm for the S option.

6.2. Sensor

There exist two different possibilities for the sensor.

6.2.1. A option

In the A option there is no sensor. Since there is no feedback, the COR-PS systems operates in open-loop control.

6.2.2. C option

In the C option there is a feedback sensor with appropriate driving electronics. This makes it possible to have closed-loop control in addition to open-loop control.

6.3. Stage resolution

The stage resolution can be chosen between two possibilities.

6.3.1. S option

The S option provides standard resolution.

6.3.2. H option

The H option provides higher resolution. The 3 option for travel range cannot be applied to the H variant.

7. Technical data

The following data were obtained with measurements performed with high precision lasers at room temperature. The specifications can change on request.

7.1. Electronics

The electronics can be used to implement closed-loop control in the C option (COR-PS stage with a sensor).

Tab. 2: Electronics data

Sensor type	Eddy-current
Connector	BNC
Power supply	230 V, 50 Hz

7.2. A option

Tab. 3: A option mechanical data

	SA.1 variant	SA.2 variant	Unit	
Axis of motion	X	X		
Travel range	140	150	µm	
Resolution ^[1]	10	0.22	nm	
Pitch	±3	±3	µrad	
Yaw	±10	±10	µrad	
Straightness/Flatness	1	1	µm	
Stiffness along X	1	1	N/ µm	
Maximum load	5	5	kg	
Push/Pull load ^[2]	8	10	N	
Resonant frequency ^[3]	Unloaded	400	700	Hz
	Load 0.5 kg ^[4]	300	380	Hz
	Load 1 kg ^[4]	200	370	Hz
Materials ^[5]	Body	Steel	Steel	
	Actuator	PZT ceramic	PZT ceramic	
	Case	Aluminum	Aluminum	
Stage dimensions	Footprint	100 x 110	100 x 110	mm
	Height	23	23	mm
Stage mass	<1.2	<1.2	kg	
Moving plate dimensions	70 x 70 x 6	70 x 70 x 6		
Moving plate mass	0.120	0.120	kg	
Operating temperature range	-10 to +60	-10 to +60	°C	
Storage temperature range	+10 to +40	+10 to +40	°C	

^[1] Limited by electronic noise and measurement system

^[2] For a 10% attenuation of the maximum travel

^[3] Free-free first resonant frequency, mode along X axis in specified loaded and unloaded conditions

^[4] Resonant frequency in loaded conditions depends on the inertia matrix of the used load

^[5] Different materials available on request

Tab. 4: A option electrical data

	SA.1 variant	SA.2 variant	Unit
Input power	10	10	W
Drive type	Piezo stack	Piezo stack	
Piezo stack capacitance	2.74	5.86	µF
Input voltage	-20 to +150	-20 to +150	V

7.3. C option

Tab. 5: C option mechanical data

		SC.1 variant	SC.2 variant	SC.3 variant	HC.1 variant	HC.2 variant	Unit
Axis of motion		X	X	X	X	X	
Travel range		140	150	145	125	135	µm
Resolution ^[1]	Open-loop	10.0	0.22	0.22	0.19	0.20	nm
	Closed-loop ^[2]	15	15	15	1.5	1.5	nm
Linearity error (closed-loop) ^[3]		0.027	0.019	0.025	0.0025	0.0022	%
Repeatability (closed-loop)		15	15	15	1.5	1.5	nm
Pitch		±3	±3	±3	±3	±3	µrad
Yaw		±10	±10	±10	±10	±10	µrad
Straightness/Flatness		1	1	1	1	1	µm
Stiffness along X		1	1	1	1	1	N/µm
Maximum load		5	5	5	5	5	kg
Push/Pull load ^[4]		8	10	8	8	10	N
Resonant frequency ^[5]	Unloaded	400	700	700	100	100	Hz
	Load 0.5 kg ^[6]	300	380	380	100	100	Hz
	Load 1 kg ^[6]	200	370	370	100	100	Hz
Settle time ^[2]	Unloaded	0.1	0.1	0.1	0.1	0.1	ms
	Load 0.5 kg	0.2	0.2	0.2	0.2	0.2	ms
	Load 1 kg	0.4	0.4	0.4	0.4	0.4	ms
Materials ^[7]	Body	Steel	Steel	Steel	Steel	Steel	
	Actuator	PZT ceramic	PZT ceramic	PZT ceramic	PZT ceramic	PZT ceramic	
	Case	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	
Stage dimensions	Footprint	100 x 110	100 x 110	100 x 110	100 x 110	100 x 110	mm
	Height	29	29	46	46	46	mm
Stage mass		<1.2	<1.2	1.2	1.2	1.2	kg
Moving plate dimensions		70 x 70 x 6	70 x 70 x 6	70 x 70 x 6	70 x 70 x 6	70 x 70 x 6	
Moving plate mass		0.120	0.120	0.120	0.120	0.120	kg
Operating temperature range		-10 to +60	-10 to +60	-10 to +60	-10 to +60	-10 to +60	°C
Storage temperature range		+10 to +40	+10 to +40	+10 to +40	+10 to +40	+10 to +40	°C

^[1] Limited by electronic noise and measurement system

^[2] Depends on the closed-loop bandwidth. Closed-loop control can be tuned for different performances

^[3] Percent value of full-scale travel can be customized on request by choosing the calibration procedure

^[4] For a 10% attenuation of the maximum travel

^[5] Free-free first resonant frequency, mode along X axis in specified loaded and unloaded conditions

^[6] Resonant frequency in loaded conditions depends on the inertia matrix of the used load

^[7] Different materials available on request

Tab. 6: C option electrical data

	SC.1 variant	SC.2 variant	SC.3 variant	HC.1 variant	HC.2 variant	Unit
Input power	10	10	10	10	10	W
Drive type	Piezo stack	Piezo stack	Piezo stack	Piezo stack	Piezo stack	
Piezo stack capacitance	2.74	5.86	3.26	3.26	5.86	µF
Input voltage	-20 to +150	-20 to +150	-20 to +150	-20 to +150	-20 to +150	V

NOTES:

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