

COR-RS CORRECTIVE ROTARY PIEZO STAGE

ABSTRACT

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

Author(s): De Sanctis O.
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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 – $\pm 360^\circ$
- High precision
- No backlash
- No need for lubricant
- High load capability – Up to 5 kg
- High dynamic range
- Sub-nanometric resolution – Step 60-700 μrad
- 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-RS corrective rotary piezo stage can rotate to extremely precise angles. 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.

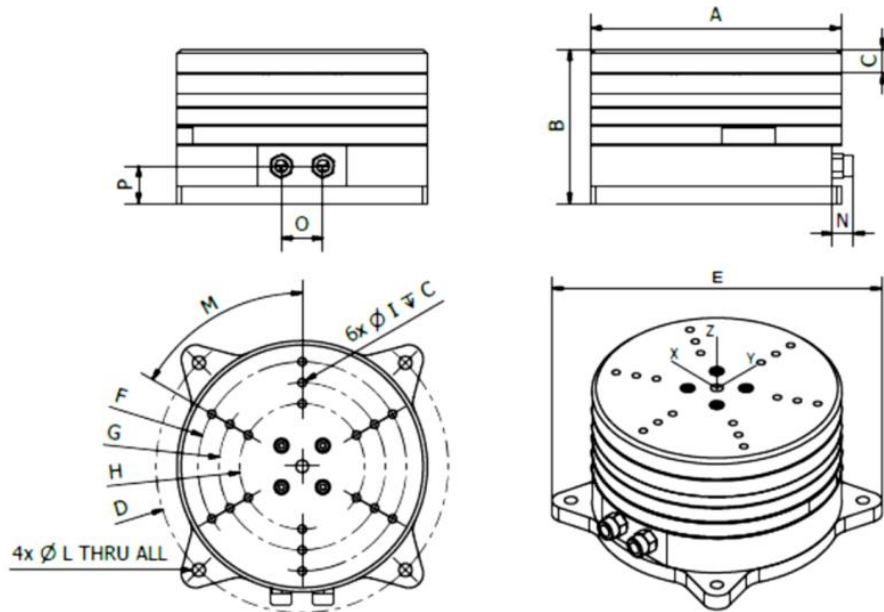
The COR-RS system can be customized:

- 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-RS piezo stage



Tab. 1: Main dimensions of the COR-RS piezo stage (0 encoder option)

A	B	C	D	E	F	G	H	I	L	M	N	O	P
120	36	11	38	160	50	40	30	M4	6	30	10	20	18

Tab. 2: Main dimensions of the COR-RS piezo stage (M encoder option)

A	B	C	D	E	F	G	H	I	L	M	N	O	P
120	58	11	38	160	50	40	30	M4	6	30	10	20	18

5. Variants

5.1. Stage type

5.1.1. SS option

The Stick-Slip stage type (SS) grants a complete rotation of $\pm 360^\circ$.

5.1.2. FS option

The flexure mechanism stage type (FS) can provide only small angular corrections.

5.1.3. CS option

The full Stick-Slip and flexure mechanism stage type (CS) includes both a SS stage and a FS stage.

5.2. Encoder

There exist five different possibilities for the encoder.

5.2.1. A option

In the A option the encoder is located on both the SS (Stick-Slip) mechanism and the rotary flexure mechanism. The stage type must be CS.

5.2.2. B option

In the B option the encoder is located on the SS mechanism only. The stage type must be CS or SS.

5.2.3. C option

In the C option the encoder is located on the rotary flexure mechanism only. The stage type must be CS or FS.

5.2.4. 0 option

In the 0 option there is no encoder.

5.2.5. M option

In the M option the encoder is external and chosen from the market.

5.3. Stage resolution

The stage resolution can be chosen between two possibilities.

5.3.1. 1 option

The 1 option provides higher accuracy.

5.3.2. 2 option

The 2 option provides lower accuracy.

6. Technical data

6.1. 1 option

Tab. 3: Mechanical data, 1 option

	SS 0 1 variant	SS M 1 variant	Unit
Axis of rotation	Z	Z	
Travel range	±360	±360	deg
Step ^[1]	60-400	60-400	μrad
Angular speed ^[2]	1.7	1.7	RPM
Repeatability/accuracy (closed-loop)	-	±180	μrad
Wobble ^[3]	±5	±5	μrad
Straightness/flatness ^[3]	±5	±5	μm
Rotating plane inertia ^[4]	834	834	kg·mm ²
Maximum load	5	5	kg
Stall torque ^[5]	0.28	0.28	Nm
Holding torque	0.30	0.30	Nm
Maximum imbalance of mass/torque (horizontal)	2000	2000	g·cm
Materials ^[6]	Body	Steel	Steel
	Actuator	PZT ceramic	PZT ceramic
	Case	Aluminum	Aluminum
Stage dimensions	Footprint	160	160
	Height	58	58
Operating temperature range	+18 to +25	+18 to +25	°C
Recommended operating temperature	+20	+20	°C
Storage temperature range	+10 to +40	+10 to +40	°C

Tab. 4: Command law, 1 option

^[7]	SS 0 1 variant	SS M 1 variant	Unit
Wave shape	Sawtooth	Sawtooth	
Operating frequency range	0 to 450	0 to 450	Hz
Rise time	0 to 0.5	0 to 0.5	% of the period
Maximum voltage	150	150	V

Tab. 5: Electrical data, 1 option

	SS 0 1 variant	SS M 1 variant	Unit
Sensor type	-	Encoder ^[8]	
Capacitance of piezo stack	0.540	0.540	μF
Sensor accuracy	-	±180	μrad
Power supply	24 VDC (stabilized), driver for voltage 0 to +150 V		
Drive type	ACME-2		

^[1] Limited by electronic noise and measurement system, adjustable by tuning voltage

^[2] Maximum angular speed with no load when driving stage at frequency 450 Hz, rising time <10% of the period, max. voltage 150 V

^[3] To be defined by customer

^[4] Can change according to customer's load

^[5] Stall torque with no load when driving stage at frequency 450 Hz, rising time <10% of the period, max. voltage 150 V

^[6] Design with other materials on request

^[7] The chosen command law parameters modify speed and torque. Performances are calculated basing on the electronics by Phi Drive

^[8] HEIDENHAIN AKECA4410, TTR ECA4400 absolute encoder

6.2. 2 option

Tab. 6: Mechanical data, 2 option

	SS 0 2 variant	SS M 2 variant	Unit
Axis of rotation	Z	Z	
Travel range	±360	±360	deg
Step ^[1]	200-700	200-700	μrad
Angular speed ^[2]	1.6	1.6	RPM
Repeatability/accuracy (closed-loop)	-	±180	μrad
Wobble ^[3]	±5	±5	μrad
Straightness/flatness ^[3]	±5	±5	μm
Rotating plane inertia ^[4]	834	834	kg·mm ²
Maximum load	5	5	kg
Stall torque ^[5]	0.15 to 0.30	0.15 to 0.30	Nm
Holding torque	0.30	0.30	Nm
Maximum imbalance of mass/torque (horizontal)	3000	3000	g·cm
Materials ^[6]	Body	Steel	Steel
	Actuator	PZT ceramic	PZT ceramic
	Case	Aluminum	Aluminum
Stage dimensions	Footprint	160	160
	Height	58	58
Operating temperature range	+18 to +25	+18 to +25	°C
Recommended operating temperature	+20	+20	°C
Storage temperature range	+10 to +40	+10 to +40	°C

Tab. 7: Command law, 2 option

^[7]	SS 0 2 variant	SS M 2 variant	Unit
Wave shape	Sawtooth	Sawtooth	
Operating frequency range	1 to 150	1 to 150	Hz
Rise time	0 to 5	0 to 5	% of the period
Maximum voltage	150	150	V

Tab. 8: Electrical data, 2 option

	SS 0 2 variant	SS M 2 variant	Unit
Sensor type	-	Encoder ^[8]	
Capacitance of piezo stack	0.540	0.540	μF
Sensor accuracy	-	±180	μrad
Power supply	24 VDC (stabilized), driver for voltage 0 to +150 V		
Drive type	ACME-2		

^[1] Limited by electronic noise and measurement system, adjustable by tuning voltage

^[2] Maximum angular speed with no load when driving stage at frequency 310 Hz, rising time <10% of the period, max. voltage 150 V

^[3] To be defined by customer

^[4] Can change according to customer's load

^[5] Stall torque with no load when driving stage at frequency 310 Hz, rising time <10% of the period, max. voltage 150 V

^[6] Design with other materials on request

^[7] The chosen command law parameters modify speed and torque. Performances are calculated basing on the electronics by Phi Drive

^[8] HEIDENHAIN AKECA4410, TTR ECA4400 absolute encoder

NOTES:

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