XLS-3 series

Precise linear piezo stage with high force output

The XLS-3 series are precise linear stages driven by an ultrasonic piezo motor. These stages combine high-speed positioning with nanometre precision and generate a high force output within a small volume. Xeryon's ultrasonic piezo motor ensures you a long lifetime, noiseless and vibration-free operation. In addition, the self-locking piezo motor holds the position of the stage when powered off. The reduced heat dissipation leads to a very stable nano-positioning system. The XLS-3 is used in metrology applications, e.g. for part alignment or sample manipulation. The XLS-3 series is available in different lengths and are easily stacked into an XY- or XYZ-assembly.

Key features

drive principle	patented Crossfixx™ ultrasonic piezo technology
bearings	precision crossed-roller
lifetime	> 1000 km / typ. 20 million cycles
control principle	closed-loop or open-loop position control
input voltage	48 V

Model code structure

<table>
<tr><th rowspan="2">stage type</th><th rowspan="2">stage length (mm)</th><th rowspan="2">encoder resolution (nm)</th><th colspan="3">optional</th></tr>
<tr><th>vacuum compatibility</th><th>low- or non-magnetic bearings</th><th>short cage for increased stroke</th></tr>
<tr><td rowspan="10">XLS-3</td><td rowspan="6">-40</td><td>-OPEN</td><td rowspan="10">-HV (10^{-6} mbar)
-UHV (10^{-9} mbar)</td><td rowspan="10">-LM / -NM</td><td rowspan="10">-SC</td></tr>
<tr><td>-1250</td></tr>
<tr><td>-312</td></tr>
<tr><td>-78</td></tr>
<tr><td>-5</td></tr>
<tr><td>-1</td></tr>
<tr><td>-60</td><td rowspan="4">same as for XLS-3-40</td></tr>
<tr><td>-80</td></tr>
<tr><td>-100</td></tr>
<tr><td>-120</td></tr>
</table>

Environmental compatibility

temperature range	-30°C to +70°C
humidity range	20% to 90% RH (non-condensing)
heat dissipation (motor only)	< 5 W
mounting surface flatness	< flatness specification of stage
internal operation voltage	< 48 V

Motion performance

			XLS-3 all lengths						unit	tole-rance
		resolution	-OPEN	-1250	-312	-78	-5	-1		
ENCODER		type	NA[1]	optical, incremental						
		grating period	NA[1]	79.8		20			µm	
		resolution	NA[1]	1250	312	78	5	1	nm	
		index	NA[1]	1 per full stroke						
		accuracy	NA[1]	± 10	± 5	± 1			µm	typ.
STAGE	positioning	resolution = min. step size = min. incremental motion (MIM)	50000[2]	1250	350	80	25		nm	typ.
		unidirectional repeatability	± 50000[2]	± 1250	± 350	± 80	± 25		nm	typ.
		bidirectional repeatability	± 50000[2]	± 2500	± 700	± 160	± 50		nm	typ.
	speed	max. speed (for -HV/-UHV)	500	50			50	25	mm/s	typ.
		max. speed	1000	200			150	25	mm/s	typ.
		min. speed	5000[3]	5			2	1	µm/s	typ.
		stability (at typical speed of 10 mm/s)	± 10	± 1					%	typ.
		point-to-point positioning time for a 1 mm step[4] 0 g load 100 g load	NA	25 40		80 120	250 450		msec msec	typ.
		point-to-point positioning time 10 mm 1 mm 100 µm	NA	130 25 20		170 80 50	500 250 150		msec msec msec	typ.
		operation duty cycle (for -HV/-UHV only)	50						%	max.
			120						sec	max.

[1] a closed-loop control can be achieved by connecting an external position encoder to the controller

[2] when using stage in burst mode (50µs bursts)

[3] lower average speeds can be achieved when using burst mode

[4] settling within bidirectional repeatability range

Note: a detailed description of the technical terms used in this datasheet can be found on the Terminology page of our website.

Mechanical properties

		XLS-3 -40	XLS-3 -60	XLS-3 -80	XLS-3 -100	XLS-3 -120	unit	tolerance
dimensions	length	40	60	80	100	120	mm	± 0.1
	width	47.6						
	height	16.8						
stroke/ travel range	standard cage	25	40	50	75	100	mm	± 0.1
	short cage (-SC)	30	48	69	85	109		
max. acceleration		60	45	35	30	25	m/s²	typ.
mass (w/o connector)		81	120	161	201	241	g	± 5%
load capacity (payload limitation)		1.5					kg	max.
load capacity* (bearing force limitation)	vertical	396	633	792	990	1188	N	max.
	lateral	396	633	792	990	1188		
	tilt around pitch axis	1.50	2.25	3.00	3.75	4.50	Nm	
	tilt around yaw axis	1.50	2.25	3.00	3.75	4.50		
	tilt around roll axis	7.74	12.38	15.48	19.35	23.23		

Last updated: 26/02/2024. All specifications are subject to change without prior notice.

driving force		3	N	min.
holding force		3	N	min.
passive holding stiffness		1	N/µm	typ.
stage material	slider/base bearings	aluminium stainless steel		
cable length**		1.5	m	± 0.1
connector (stage to controller)		1x 15-pin D-sub HD male (standard) 1x 15-pin D-sub female (-HV)		

* valid for stages with standard cage

** extension cables available or shorter cable on request

Error Motion

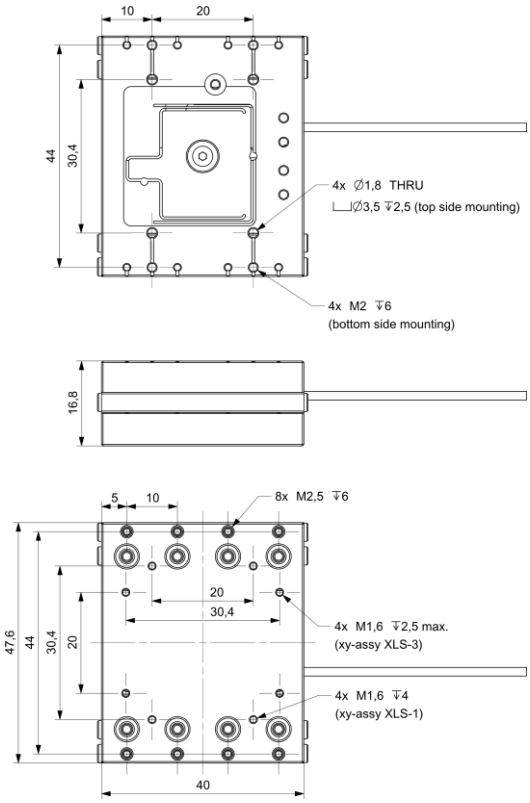
		XLS-3 length 40 to 70		XLS-3 length 80 to 120		unit	tolerance
resolution		**-1250 -312**	**-78 -5 -1**	**-1250 -312**	**-78 -5 -1**		
error motion	straightness	± 5	± 1	± 10	± 2	µm	max.
	flatness	± 5	± 1	± 10	± 2	µm	max.
	pitch	120 25	24 5	120 25	24 5	µrad arcsec	max.
	roll	120 25	24 5	120 25	24 5	µrad arcsec	max.
	yaw	60 12.5	12 2.5	60 12.5	12 2.5	µrad arcsec	max.

Controller/software

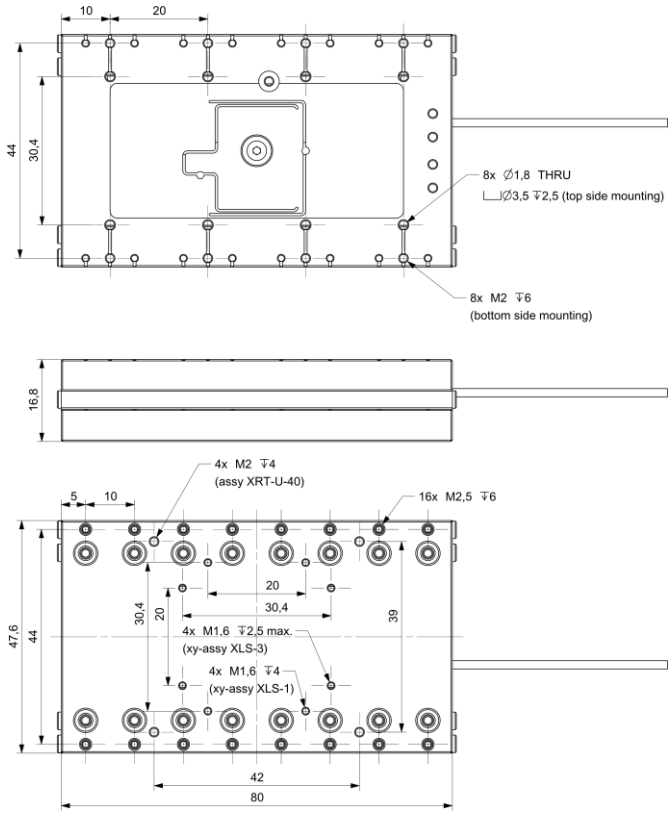
The XLS-3 series linear stages are compatible with all Xeryon controllers. Controlling of the stage is done with:

- easy-to-use Windows interface
- LabVIEW interface program (compiled program or source)
- MATLAB interface script
- C++ and Python libraries

Drawings (STEP-files are available on our website)



XLS-3-40



XLS-3-80

Note: stages XLS-3-50, XLS-3-60, XLS-3-70, XLS-3-100 and XLS-3-120 have similar mounting holes as shown in the drawings above.

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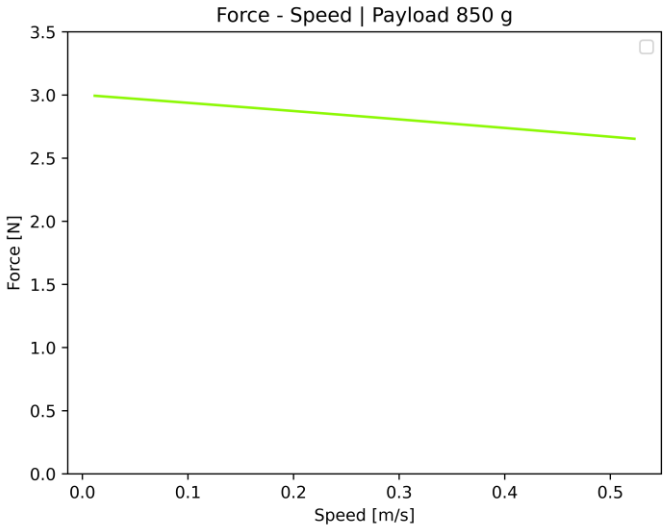
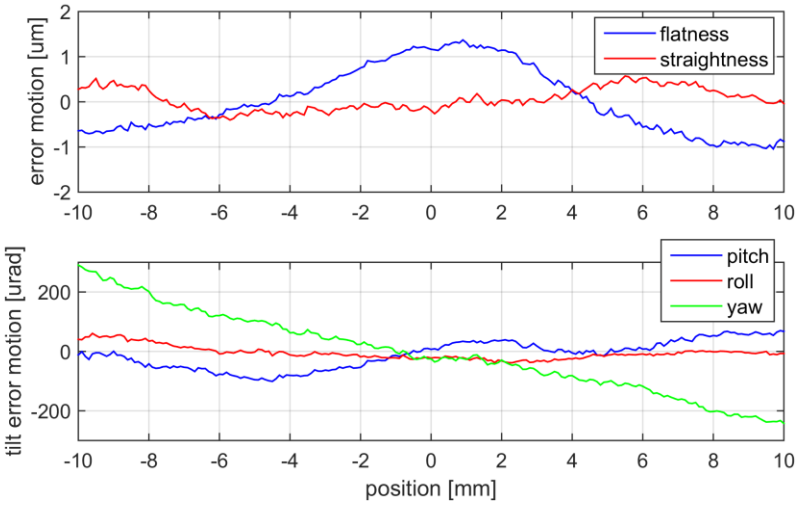
Measurement data



Typical force-speed diagram of an XLS-3 stage with a payload of 850g.s



Typical error motion values measured on an XLS-3-40 stage.