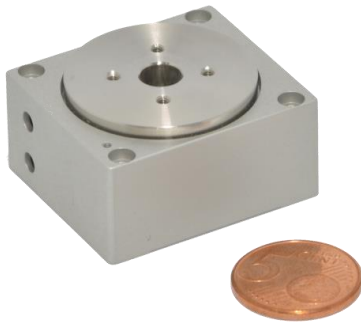# XRT-U series

Compact rotation stage with a small error motion

The XRT-U is a compact and precise rotation stage driven by an ultrasonic piezo motor. Xeryon's ultrasonic piezo motor ensures you high speeds, long lifetime and noiseless operation. This makes the XRT-U a state-of-the-art rotary stage for a broad range of precision positioning applications or metrology applications such as micro-CT, optical microscopy, electron microscopy (vacuum and non-magnetic). The precision ball bearings allow you to achieve error motion values close to air bearing stages, but in a smaller volume and at a lower cost. The XRT-U is available in three sizes and with different options. Stacking onto a Xeryon linear stage is easily done with available interface plates.

Key features

drive principle	patented Crossfixx™ ultrasonic piezo technology
bearings	precision ball bearings
lifetime	>1000 km / typ. 10 million rev.
control principle	closed-loop position control
input voltage	12 to 48 V

Model code structure

stage type	approx. rotor diameter (mm)	encoder resolution (µrad)	optional	
			vacuum compatibility	non-magnetic materials*
XRT-U	-30	-109		
	-40	-49	-HV (10^{-6} mbar)	-NM
		-19	-UHV (10^{-9} mbar)	
	-60	-3		

* full ceramic bearings and stainless steel bolts (A4)

Environmental compatibility

temperature range	-30°C to +70°C
humidity range	20% to 90% RH (non-condensing)
heat dissipation (motor only)	< 1 W
mounting surface flatness	< 5 µm
internal operation voltage	< 48 V

Disclaimer: The product images shown may be for illustration purposes only and may not be an exact representation of the product.

Motion performance

1. Specifications dependant on the encoder resolution (x = diameter)

		XRT-U-x-109	XRT-U-x-49	XRT-U-x-19	XRT-U-x-3	unit	tolerance
ENCODER	type	optical, incremental					
	resolution	109 22.5 6250	49 10.1 2810	19 3.92 1090	3 0.62 170	µrad arcsec µ°	
	index	1 per rev.					
	accuracy	± 0.017				%	typ.
STAGE positioning	resolution = min. step size = min incremental motion (MIM)	125 25 7100	50 10 2800	25 5 1400	15 3 860	µrad arcsec µ°	typ.
	unidirectional repeatability	± 125 ± 25 ± 7100	± 50 ± 10 ± 2800	± 25 ± 5 ± 1400	± 15 ± 3 ± 860	µrad arcsec µ°	typ.
	bidirectional repeatability	± 250 ± 50 ± 14200	± 100 ± 20 ± 5600	± 50 ± 10 ± 2800	± 30 ± 6 ± 1720	µrad arcsec µ°	typ.

2. Specifications dependant on the diameter

			XRT-U-30-series	XRT-U-40-series	XRT-U-60-series	unit	tolerance
STAGE	speed	max. speed	720	540	360	°/s	typ.
		min. speed	0.008	0.006	0.004	°/s	typ.
		stability	1			%	typ.
		point-to-point positioning time · 0 kgmm² inertia / 65 kgmm² inertia	30 150			msec msec	typ.
	error motion (p-p)	radial at 7 mm above top surface	1	2	5	µm	max.
		axial in centre	0.5	1	2.5	µm	max.
		tilt (wobble)	50	100	250	µrad	max.
		operation duty cycle (for -HV/-UHV only)	50			%	max.
			120			sec	max.

* for a 1° step and 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.

3. Exact counts per revolution in function of encoder resolution and rotor diameter

		rotor diameter (mm)		
		30	**40**	**60**
Resolution (µrad)	**109**	57600	86400	64800
	49	144000	135000	129600
	19	360000	345600	324000
	3	1843200	2764800	2073600

Last updated: 09/04/2024. All specifications are subject to change without prior notice.

www.xeryon.com

Mechanical properties

		XRT-U-30-series	XRT-U-40-series	XRT-U-60-series	unit	tolerance
dimensions		40 x 35 x 21	50 x 46 x 21	70 x 70 x 34	mm	± 0.1
rotor diameter		32	43	65	mm	± 0.1
aperture		7	12.7	25.4	mm	± 0.1
mass (w/o connector)		82	130	450	g	± 5%
load capacity (payload limitation)	inertia	300	400	2500	$kgmm^2$	max.
	mass*	0.5	1	5	kg	
load capacity (bearing force limitation)	axial	25	35	100	N	max.
	radial	25	35	100	N	
	tilt	0.15	0.2	1	Nm	
holding torque		7	10	45	mNm	min.
driving torque		14	20	90	mNm	min.
stage material	rotor	stainless steel AISI316				
	housing	anodised aluminium				
cable length**		1.5			m	± 0.1
connector (stage to controller)		1x 15-pin D-sub HD male				

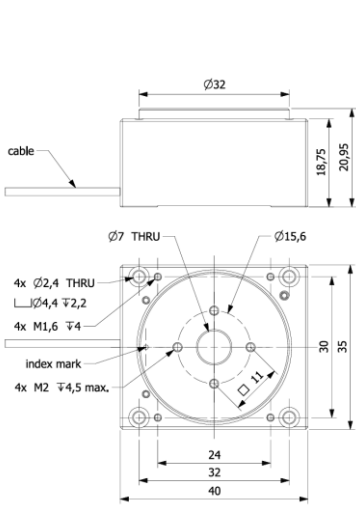* assuming a solid cylindrical payload of dia. 40 mm

** extension cables available or shorter cable on request

Controller/software

The XRT-U series rotation 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
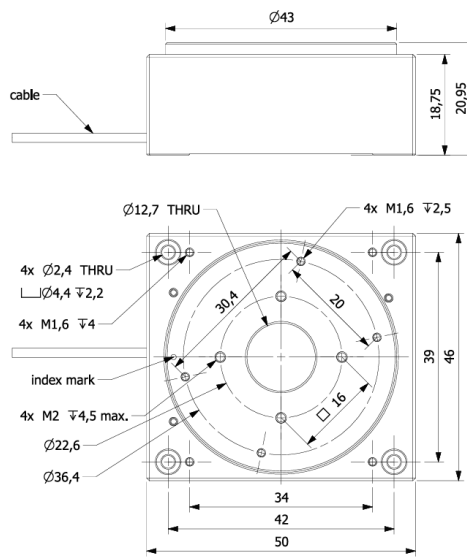- C++ and Python libraries

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Drawings

XRT-U-30-series

XRT-U-40-series

XRT-U-60-series

	max. tightening torque
M1,6	16 cNm
M2	34 cNm

recommended flatness of
mounting surfaces: 20 µm max.

	max. tightening torque
M1,6	16 cNm
M2	34 cNm

recommended flatness of
mounting surfaces: 20 µm max.

	max. tightening torque
M1,6	16 cNm
M2,5	60 cNm
M3	120 cNm

recommended flatness of
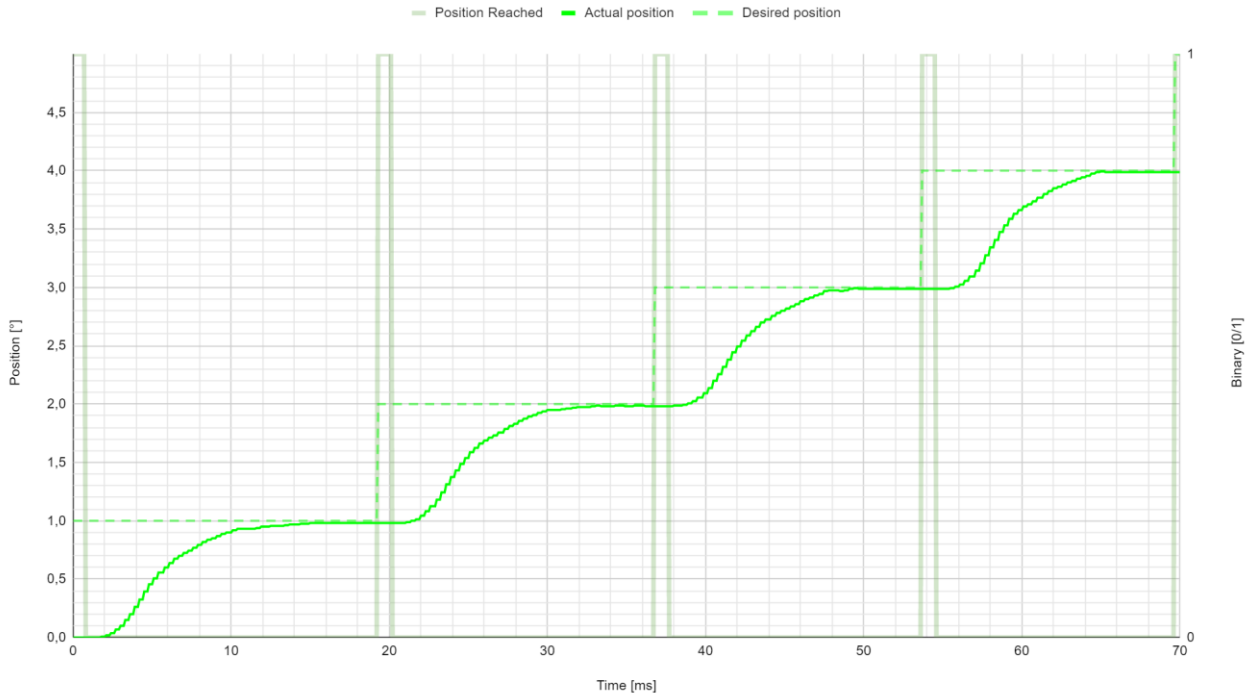mounting surfaces: 20 µm max.

Measurement data
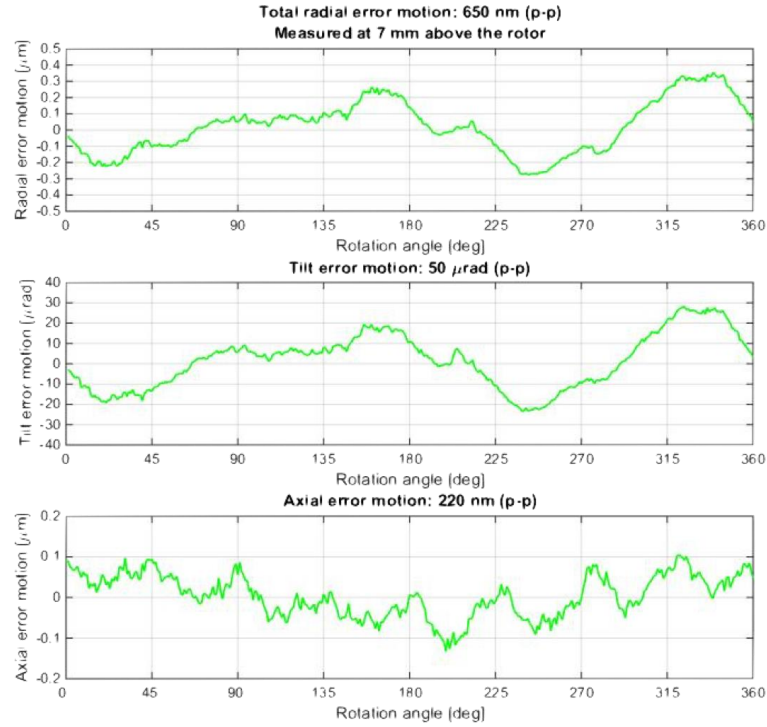
Typical measurement of the error motion of an XRT-U-30 rotation stage.
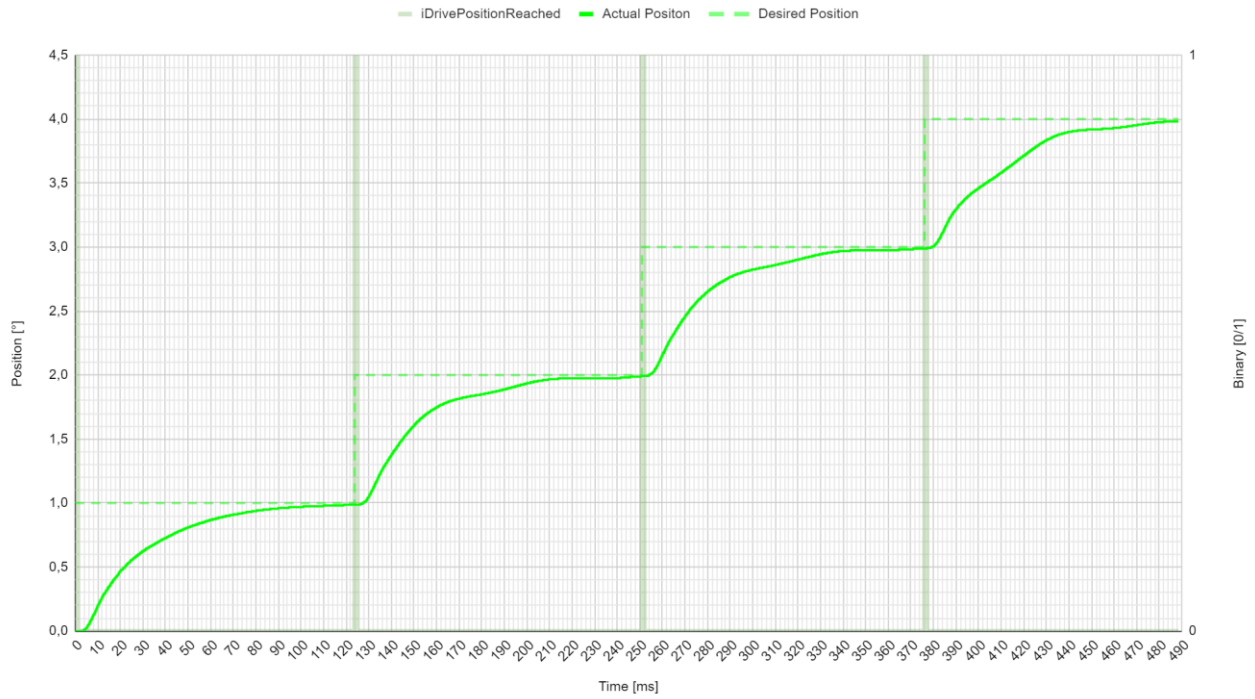
4 steps of 1° on a XRT-U-30-109 (no load). DLAY=5 ms

Example of an XRT-U-30-109 rotation stage without load taking steps of 1°.

A delay of 5 ms is added between reaching the target position and taking the next step.

4 steps of 1° on a XRT-U-30-109 (load: inertia 65 kgmm^2, mass 240 g)　　　　　　　　　　**DLAY=5 ms**

Example of an XRT-U-30-109 rotation stage with a load taking steps of 1°.

A delay of 5 ms is added between reaching the target position and taking the next step.