Development of Reliable Crystallography Sample Shutters

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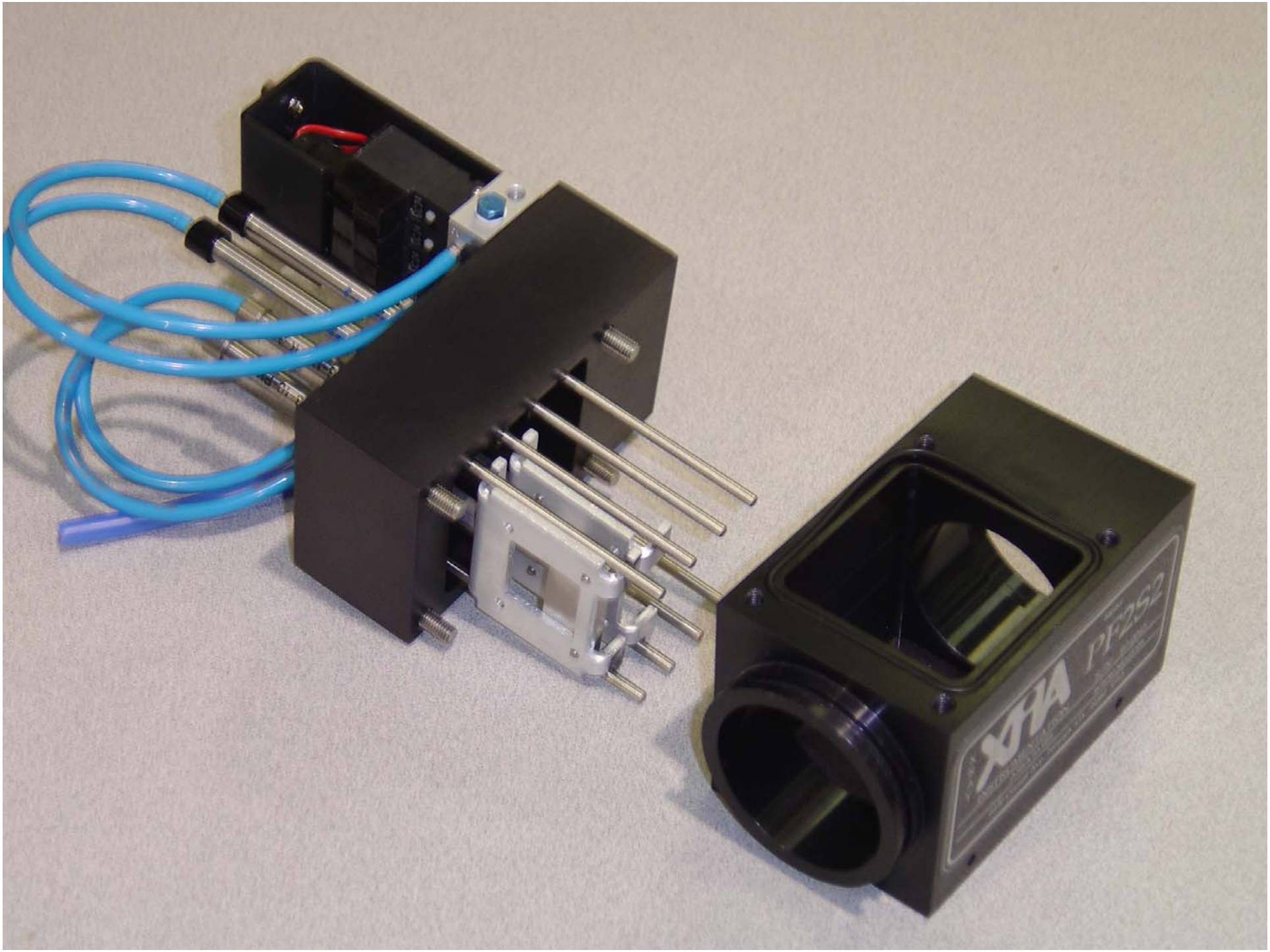
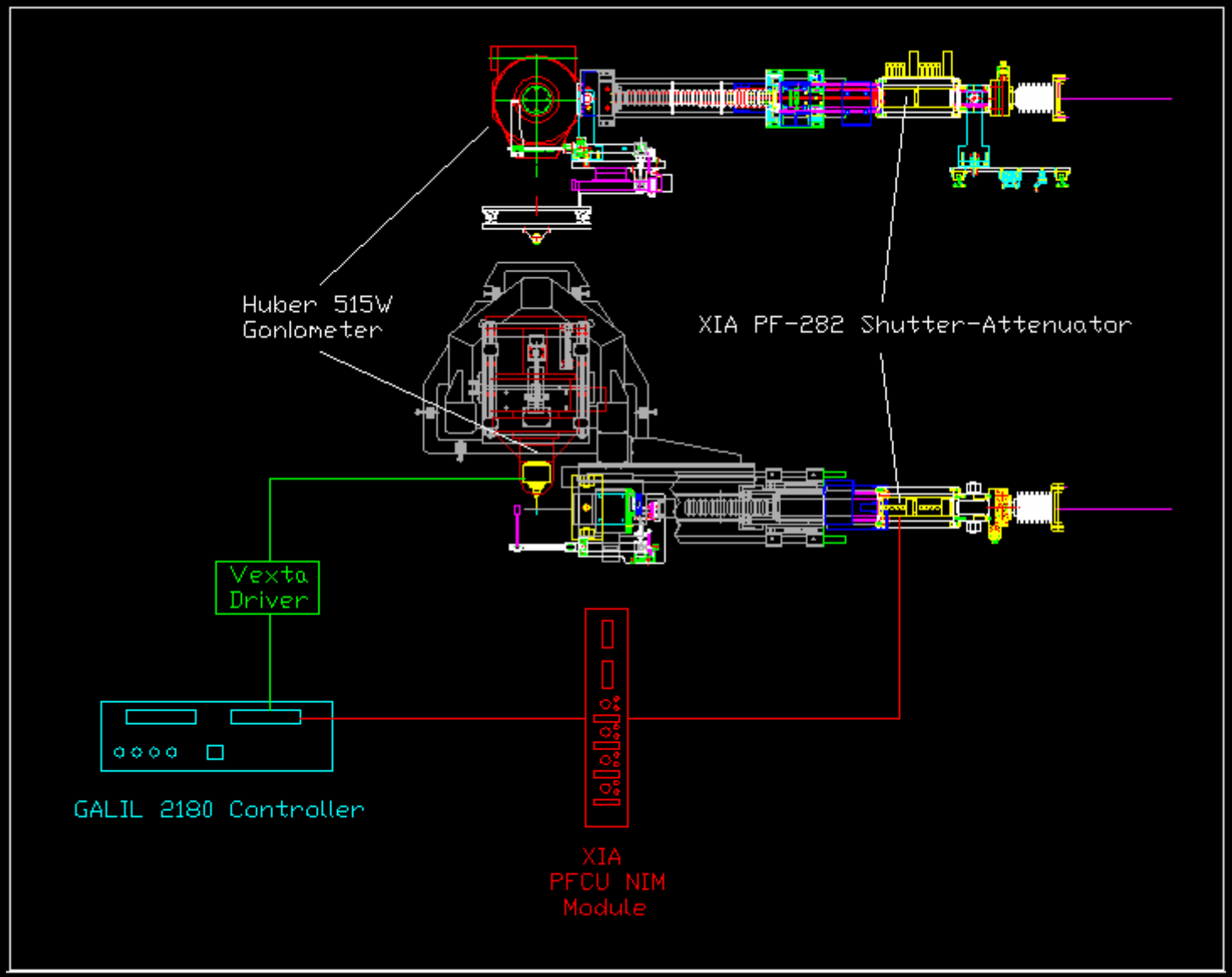
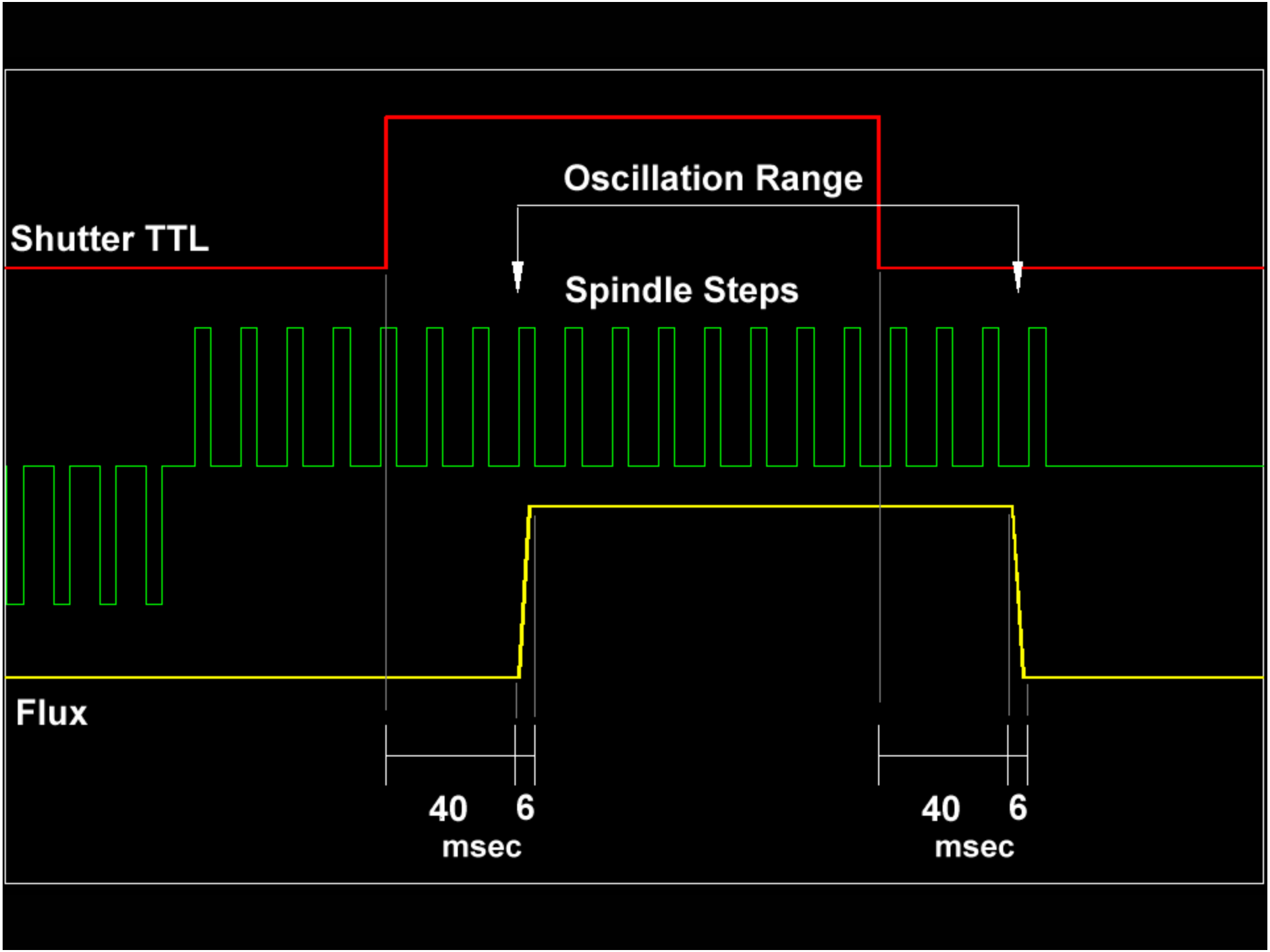
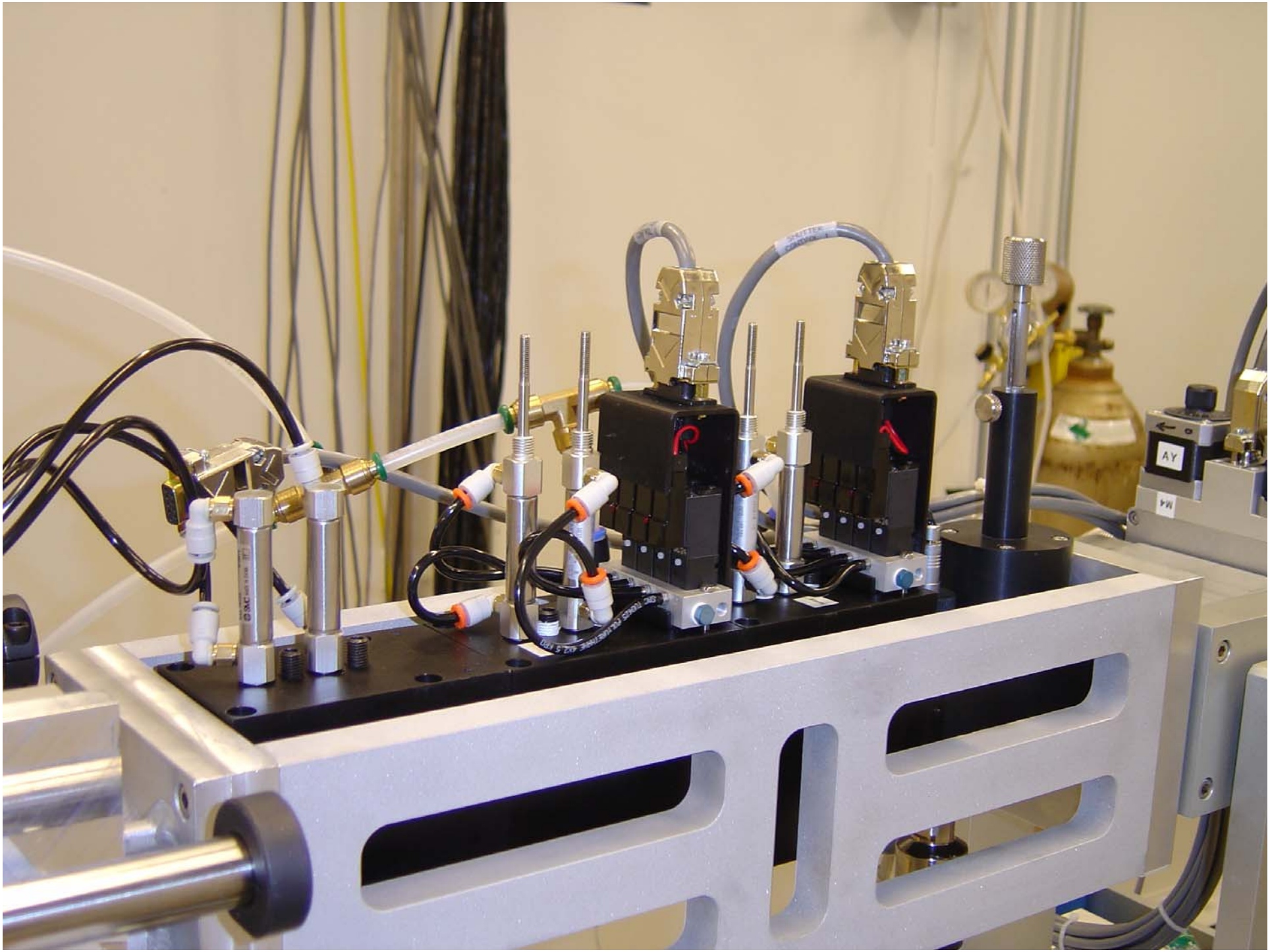

XHA
PP252


Huber 515W
Gonlometer
XIA PF-282 Shutter-Attenuator
Vexta
Driver
GALIL 2180 Controller
XIA
PFCU NIM
Module


Oscillation Range
Shutter TTL
Spindle Steps
Flux
40
6
msec
40
6
msec

Replace Single-Action (spring-return) XIA Pneumatics with Dual-Action Pneumatics

Replace XIA miniature solenoid valves with large-bore fast-acting valves.



Results:

Reasonable performance

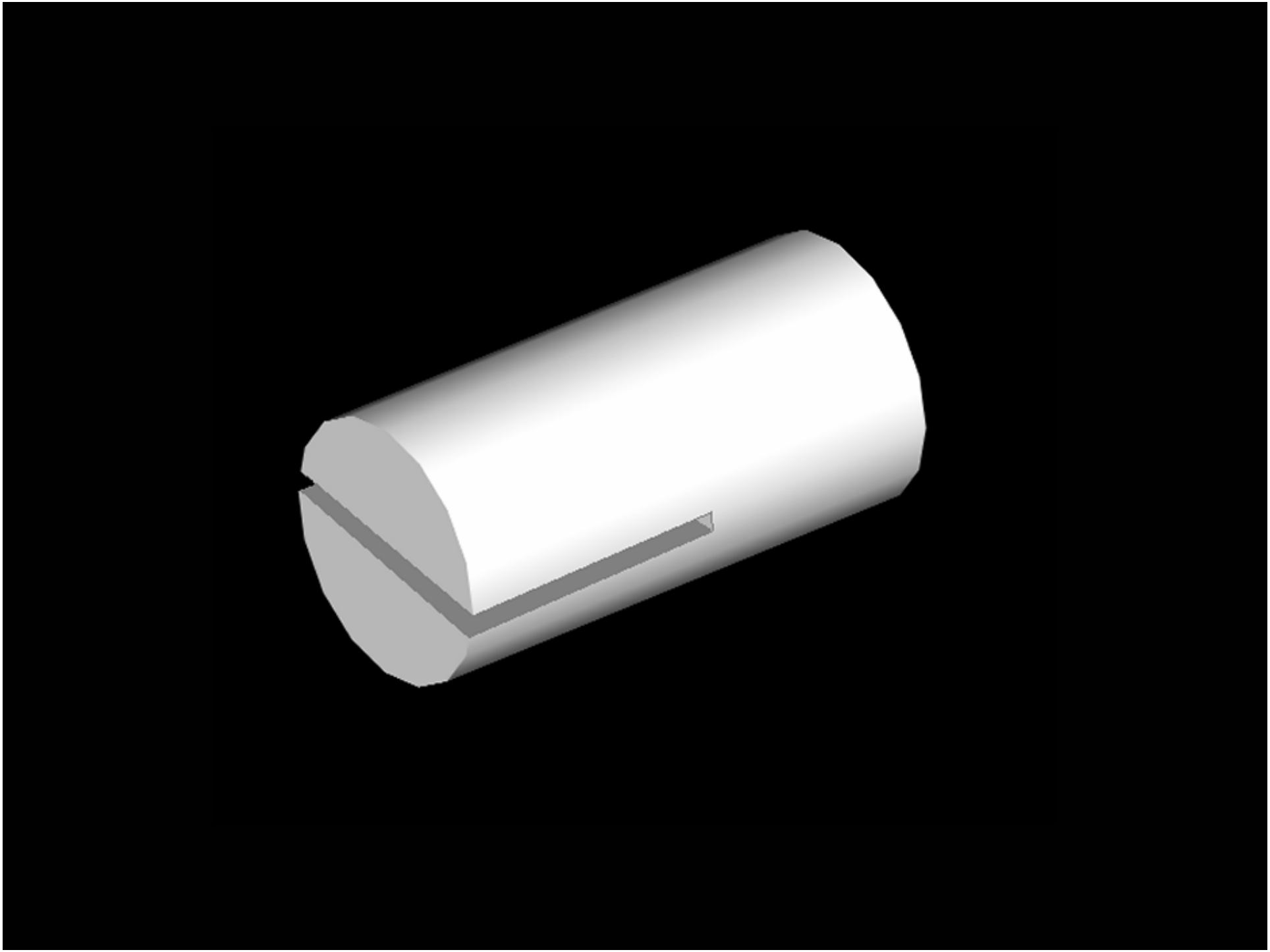
- action times of order 5 msec.
- good reproducibility of action times.
- simple mechanical transition.
- no jams observed.

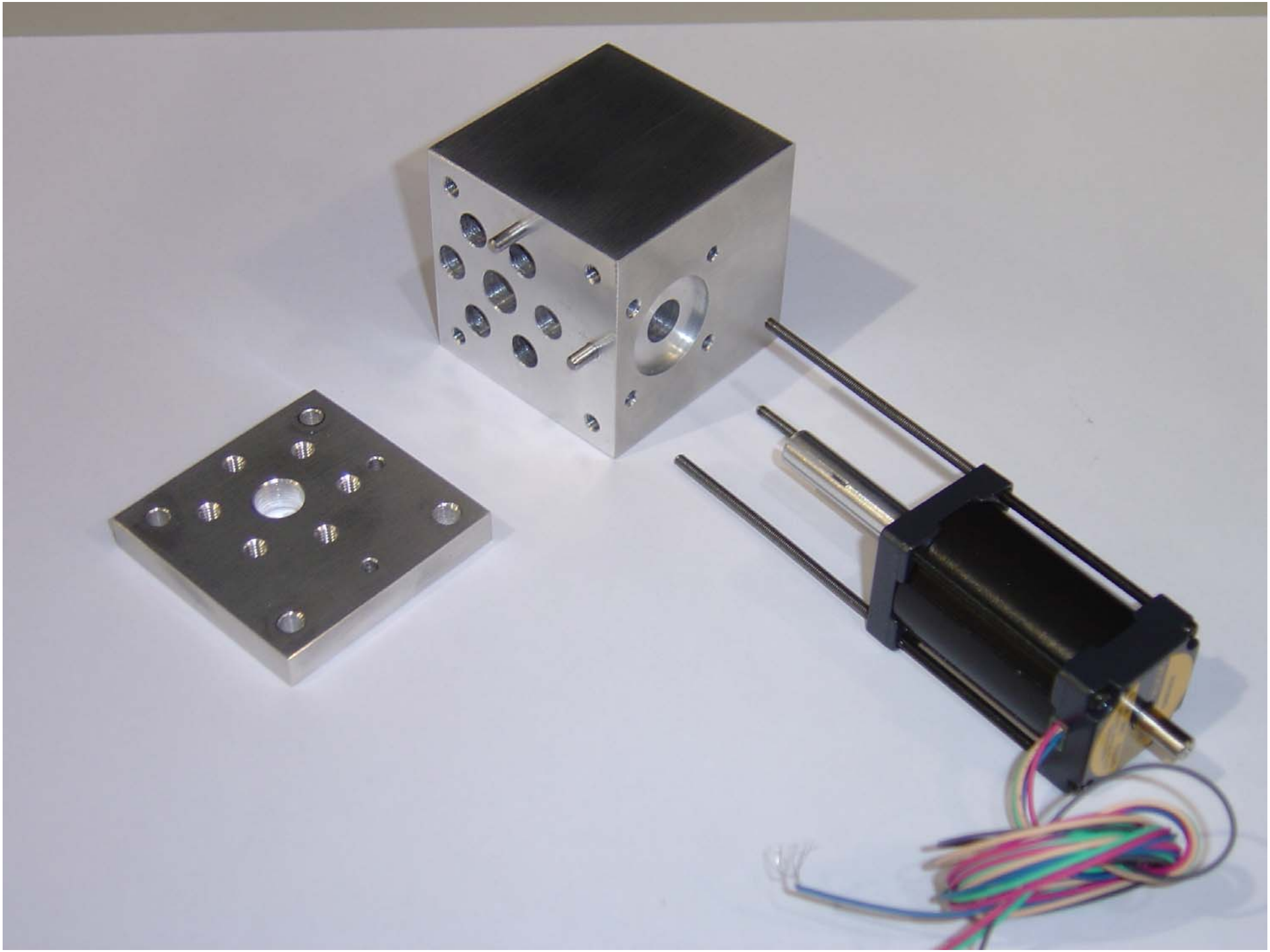
Shock/Vibration transmitted to spindle and sample

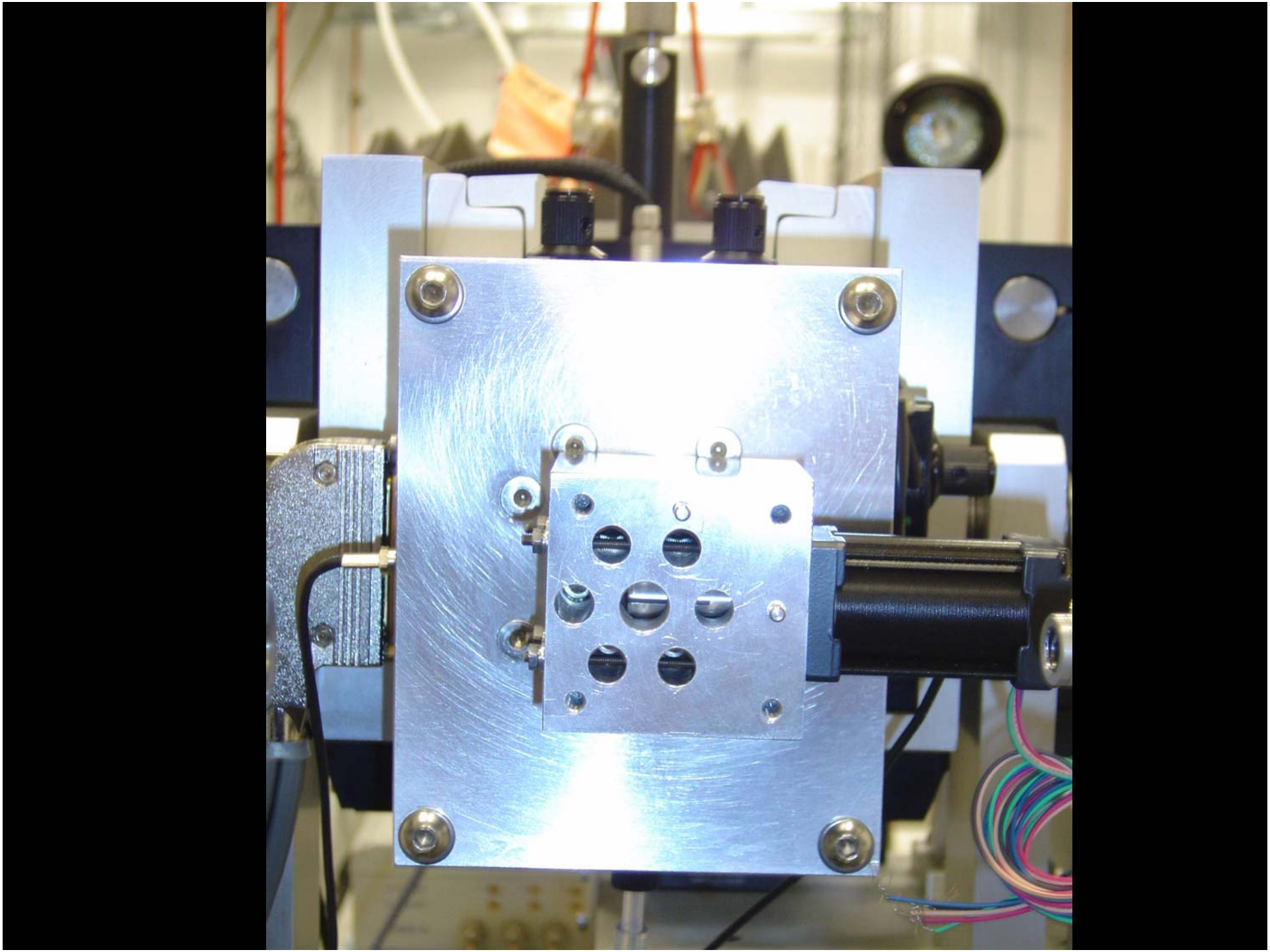
- Perturbation of high resolution diffraction spot morphology.

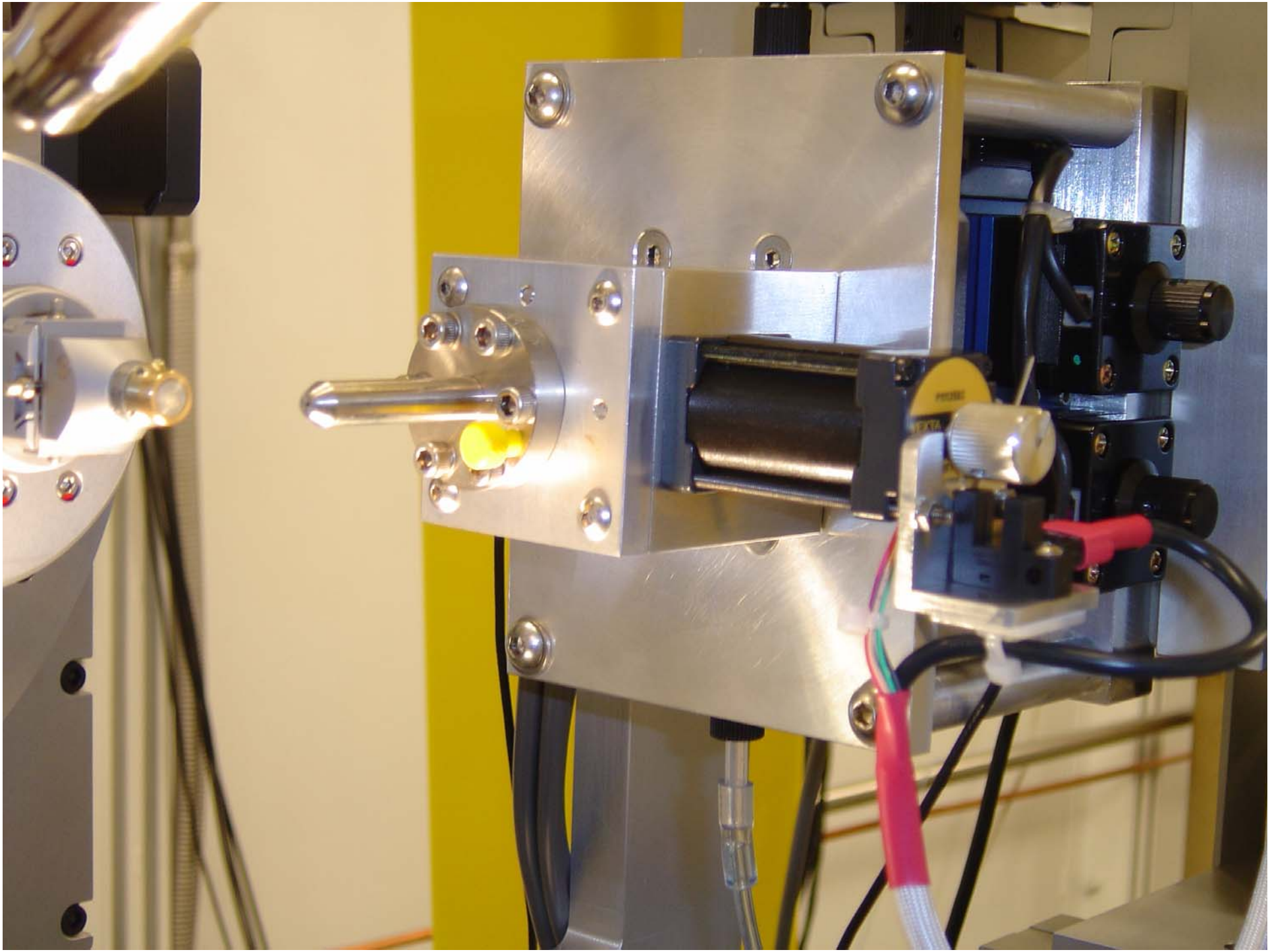
- Large action distance -> big susceptibility to changes in pneumatic performance as seals age or drive pressure altered.

Stepper Motor Driven Rotary Shutter









Pro:

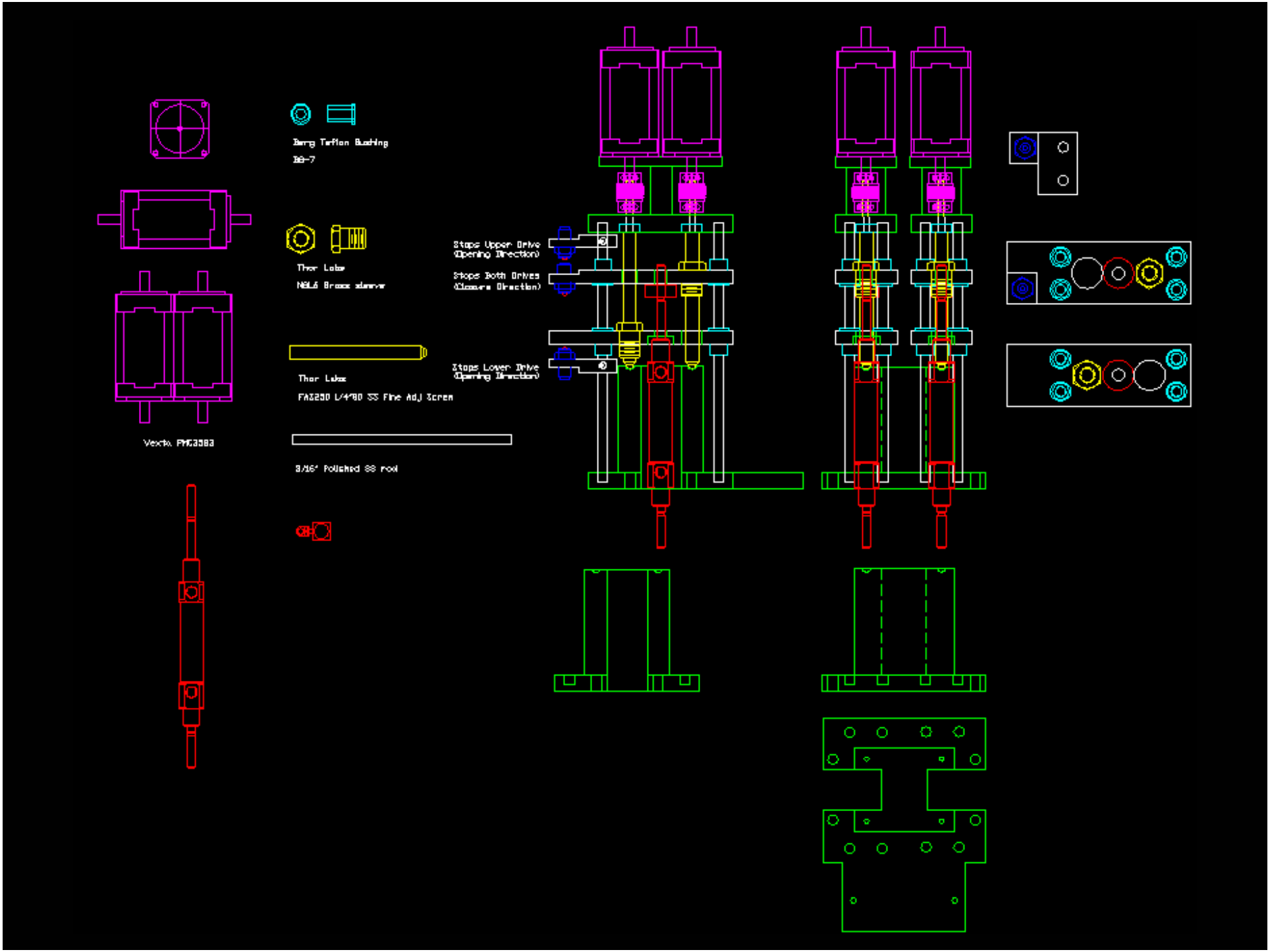
Simplicity == Reliability.
2-3 msec action time.
Constant performance.
Small 3D footprint.

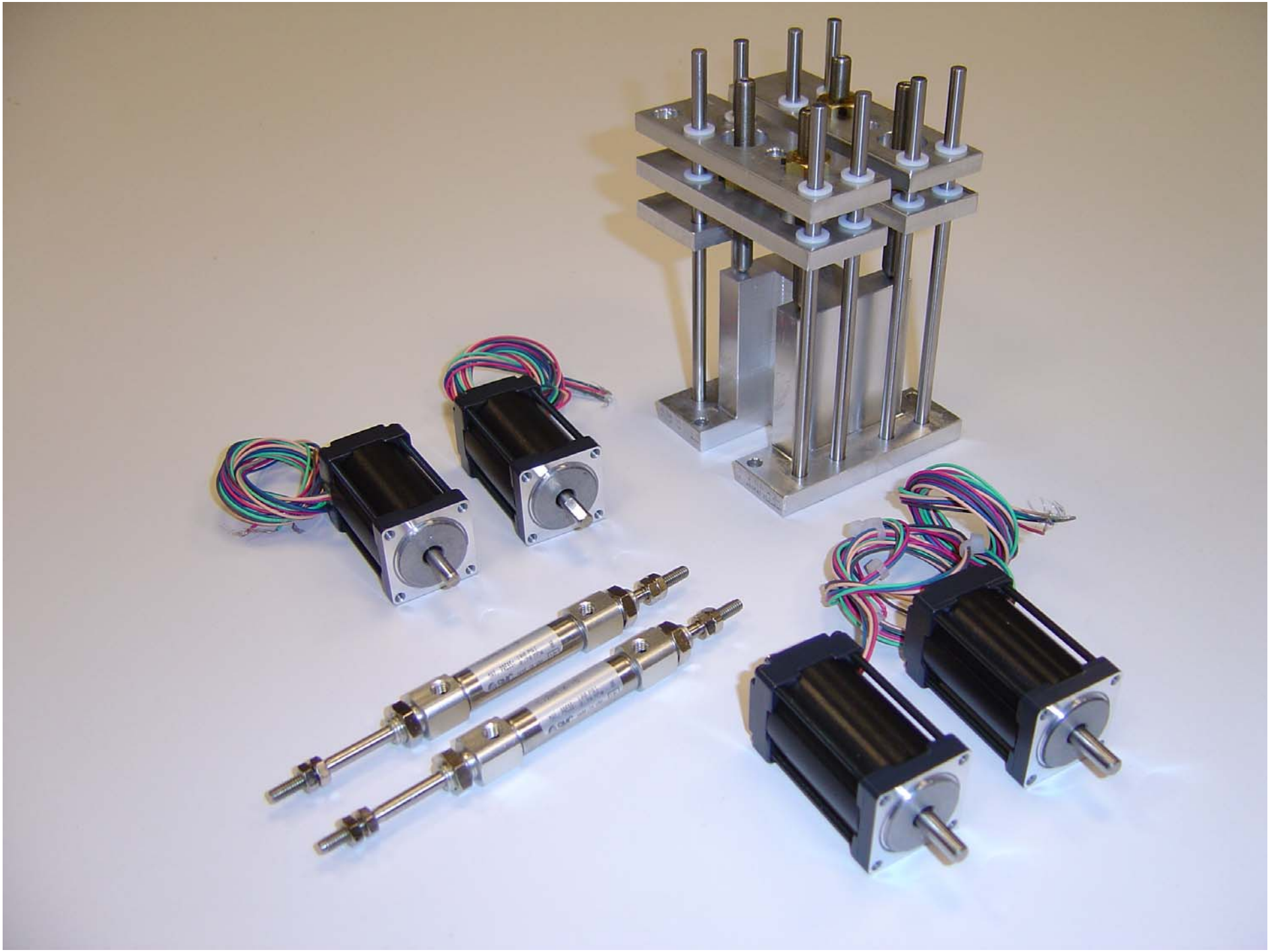
Con:

Scatter from slot surfaces?

Al prototype wont work at higher E.
High Z stop may have longer action time?

Variable Aperture Pneumatic Shutter


Vexta PMC388
Berg Teflon Bushing
BB-7
Thor Labs
Thor Labs
FA3250 1/4"80 SS Fine Adj Screen
3/16" Polished SS rod
Stops Upper Drive
(Opening Direction)
Stops Both Drives
(Closure Direction)
Stops Lower Drive
(Opening Direction)



Pro:

Variable Shutter Aperture – Easily Changed.

Ability to center shutter aperture on beam – both shutter elements actually contribute to reducing action time.

Easy retrofit onto XIA shutter module body.

Action times as low as 2 msec.

Low shock/vibration.

Small action distance -> reduced sensitivity to changes in pneumatic actuator performance.

Con:

Complexity – 4 motor axes.

Large 3D footprint.

Sacrifice of 2 attenuator slots.