BRIEF INSTRUCTIONS
AT-F7-AIR

JJ X-RAY

Danish Science Design

AT-F7-AIR

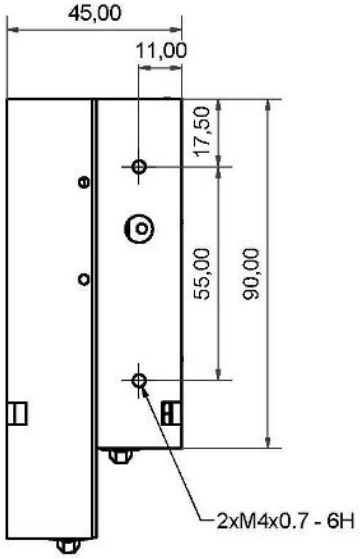
The ESRF-Type X-Ray slits were designed and developed by ESRF engineers and scientists to address the need for compact, reliable, high-precision slits with sub-micron resolution. The design is now licensed to JJ X-Ray.

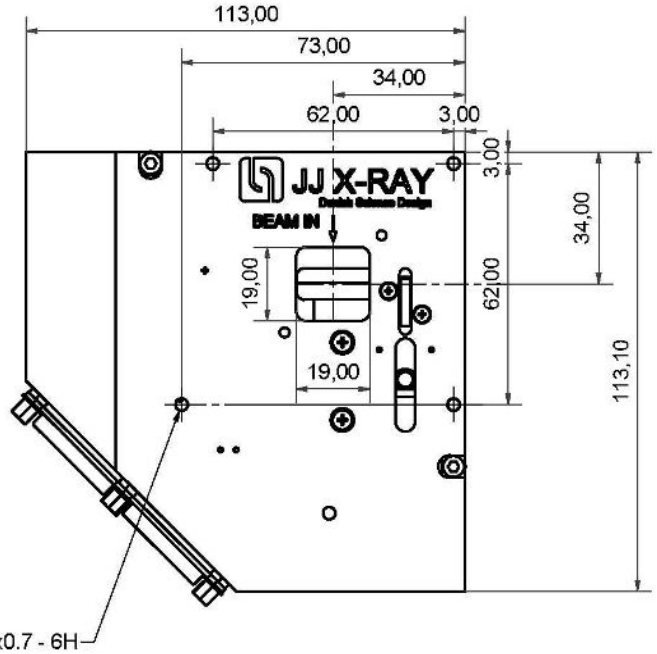
The system contains four motors, setting the position and the opening of the aperture. For each dimension, one motor defines the aperture opening and another determines the aperture's position. For high precision scans with a fixed aperture, this is an advantage since only one motor is moved during a one-dimensional scan.

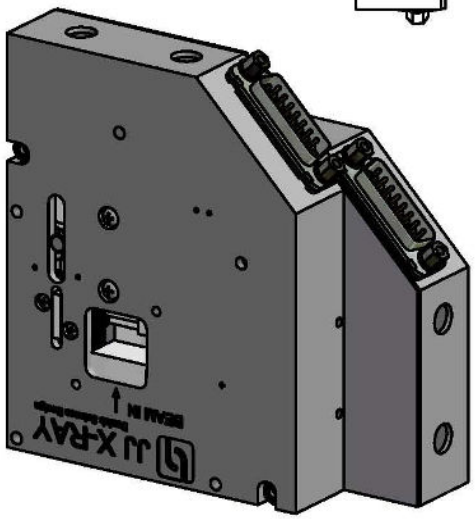
Please make note of the aperture size and the relatively low motor current.

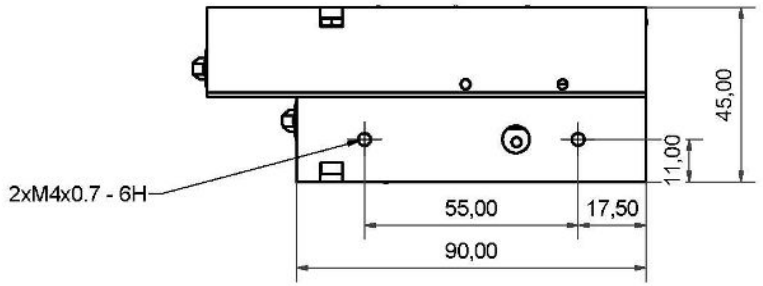
Technical Specifications

AT-F7-AIR	
Aperture size	Maximum: 7 mm x 7 mm
	Minimum: Full overlap
Resolution	Aperture: 0.813 micron per full step
	Translation: 0.322 micron per full step
Repeatability	< 1 micron
Accuracy	± 3 micron (over 3 mm)
Vacuum	Possible down to 10-5 mbar for use inside a larger vacuum chamber
Mechanical dimension	113 mm x 113 mm x 45 mm
Standard blades	2 mm thick tungsten carbide with knife-edge profile (2 degrees slope)
Mechanical connections	4 M4-threaded holes on each front of the houses and 2 M4-threaded holes on each bottom side as shown on the drawing.
Limit switches (end-of-travel)	Included as standard on all motions
Weight	≈ 0.6 kg
Outer surface	Anodized aluminum in color nature
Guiding	High precision internal rails and carriages
Electrical connections	Microswitches coupled to 2 motor connectors (SUB-D 15 pins male)
Motors	2 phase stepping motors

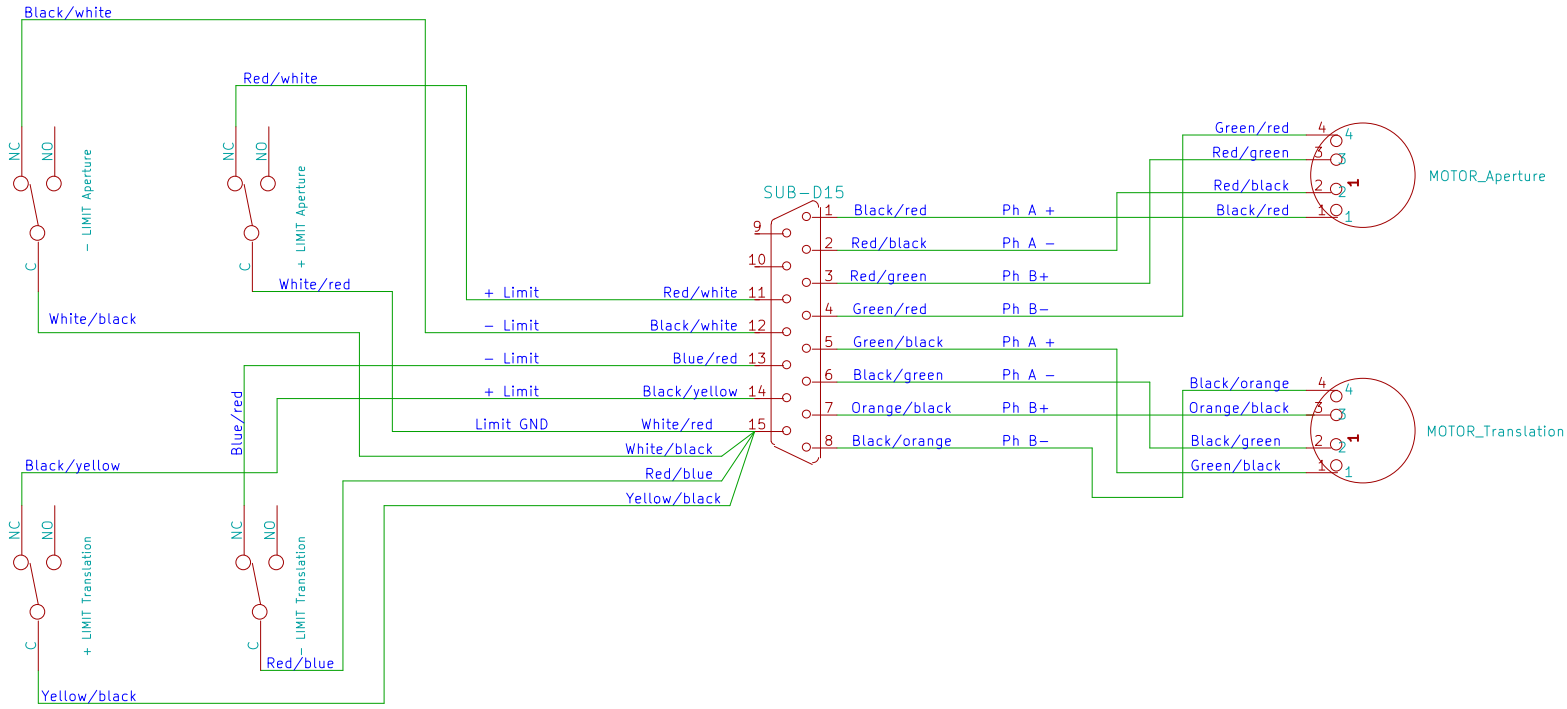








- All dimension are in mm. - All Tolerances are accordance with ISO 2768-1 class f, unless otherwise specified. **Tolerances:** - Internal corners R0.2 max. - Break edges 0,1 - 0,25 - VR2,0 max. - Remove all sharp edges and burs	Date: 01-10-2012	Rev.: 0	QTY: 1	JJ X-RAY Danish Science Design	Remarks:
	Designer: JJ X-RAY A/S	Mass: N/A			
	Surface Treatment:			Project Name: JJ X-RAY AT-F7-Air Slit	Scale:	Drawing Size: A3
	Material:			Title: AT-F7-Air Slit	CAD Drawing Number: Complete AT- F7-AIR



JJ X_RAY Michael Andersen		
File: ATf7airhvV11.sch		
Sheet: /		
Title: AT-F7-AIR/HV		
Size: A4	Date: 19 jan 2018	**Rev: 1.1**
KiCad E.D.A.	eeschema (2013-05-16 BZR 4016)-stable	Id: 1/1

Motor Specifications

Motor Specifications	
Number of motors	4
Motor type	2-phase stepping motor
Step angle	15°
Connection type	Bipolar (Serial)
Current per phase	0.45 A/phase
Resistance	3.6 Ω/phase
Inductance	1.9 mH/phase
Limit switches	'+' and '-' end of travel

Motion Mechanism, Aperture (M1)	
Type of motion	Two translations in opposite directions
Guidance	Linear rails and carriages
Motor step angle	15°/step
Motor gear	41:1
Lead screw pitch	2x0.4 mm/rev (left and right)
Scale factor, aperture	1230 steps/mm (gap)
Mechanical resolution	≈0.813 µm/step
Aperture calibration	≈1230 steps/mm

Motion Mechanism, Translation (M2)	
Type of motion	Translation
Guidance	Linear rails and carriages
Motor step angle	15°/step
Motor gear	41:1
Pitch	0.3175 mm/rev
Scale factor, translation	3099.2 steps/mm
Mechanical resolution	≈0.3227 µm/step
Translation calibration	≈3099.2 steps/mm

Recommended Driver Settings	
The motors should be run at 0.45 A per phase. **The motors have been tested at:**	
Running speeds	**800-1000 steps/second**
Starting speeds	**300-400 steps/second**
Ramp times	**0,1 second**

Always use “backlash correction” if available (i.e. the motor always approaches the final position from the same side). A useful backlash parameter could be 0.1 mm.

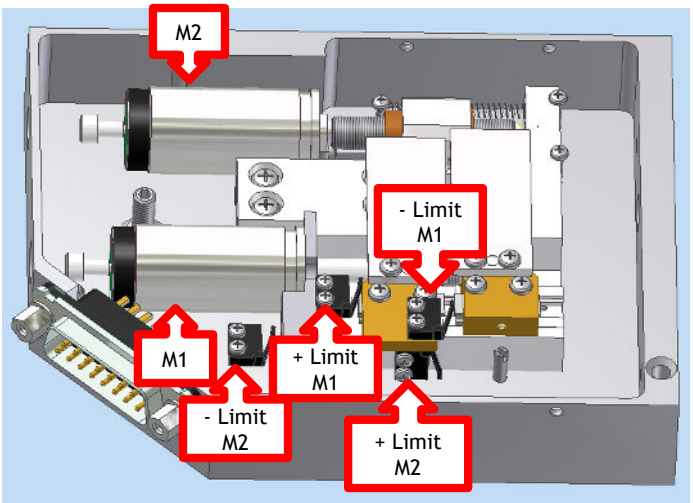
Warning:
If you are using systems/detectors that can be damaged by overexposure, where the slits are used to remove a lot of the intensity, be careful when changing aperture size since the backlash correction may result in the slit being opened significantly more than you anticipated during adjustment.

Manual Control

If for some reason, you need to move the slit blades manually, it is possible to use the screw attached to the back shaft of the motor. This can be done by inserting an M3 Allen wrench into the slit housing to engage the screw. It is probably easiest if this operation is done with an open cover so you can see what is going on (firstly: Switch off the controller). In the vacuum slit versions, you will need to rotate in increments using the Allen wrench.

Limit Switches

The limit switches should be wired up, if at all possible. There is always some ambiguity in the definition of the travel direction. The first time you test the slits and cables you should therefore open up the slit and test the actual functioning of the limit switches. Below we show an image that may help you in determining the appropriate limit switch setup.



Mechanical overview of limit switch position
M1 movement: Aperture
M2 movement: Translation

Trouble Shooting

The most common issues and their resolutions are:

- The motor does not move when it should (it can be silent, be jittering or be making a noise).
  - The motor is not receiving enough current. Try setting the current a bit higher (for example 10%). If problems persist check with an amp-meter to see that your driver is working properly.
  - The wiring is bad. Check cabling.
  - One of the motors' phases is burnt. Check that the resistance on all phases is the same. If not, contact us to have the slit sent for repair.
  - The motor is stuck against a limit switch. Un-stick it, using the scale wheel or, if an AT-slit, open the slit (see manual control), and fix the limit switch issue.
- Restart the controller and the controller program.
- The blade system shows irreproducibility during operation.
  - The rail system may have become loose. Open the slit. Check if the rail-system is tight. Tighten screws if you need to.

Common options

- Blade options: 4, 5, 10 mm, other blade materials.
- Vacuum Preparation: Possible down to 10-5 mbar for use inside a larger vacuum chamber.
- Gimble: For aligning blade angle in beam (relevant for rectangular blades).

The JJ X-Ray Product Range

- Slit Systems (AIR,HV, UHV)
- Complete Beamline Solutions
- Spectrometers
- Refractive Optics (CRL)
- Foil Collimators
- Positioning

Contact JJ X-Ray A/S

If you have any questions, concerns, request for quotations or need general advice, please feel free to contact us:

JJ X-Ray A/S
Scion-DTU, Dr. Neergaards Vej 5D
2970 Hoersholm
Denmark

Telephone: +45 4776 3000
Fax: +45 4776 3001
VAT: DK 29523215

info@jjxray.dk
sales@jjxray.dk
Website: www.jjxray.dk

Revision 1.1, 2018