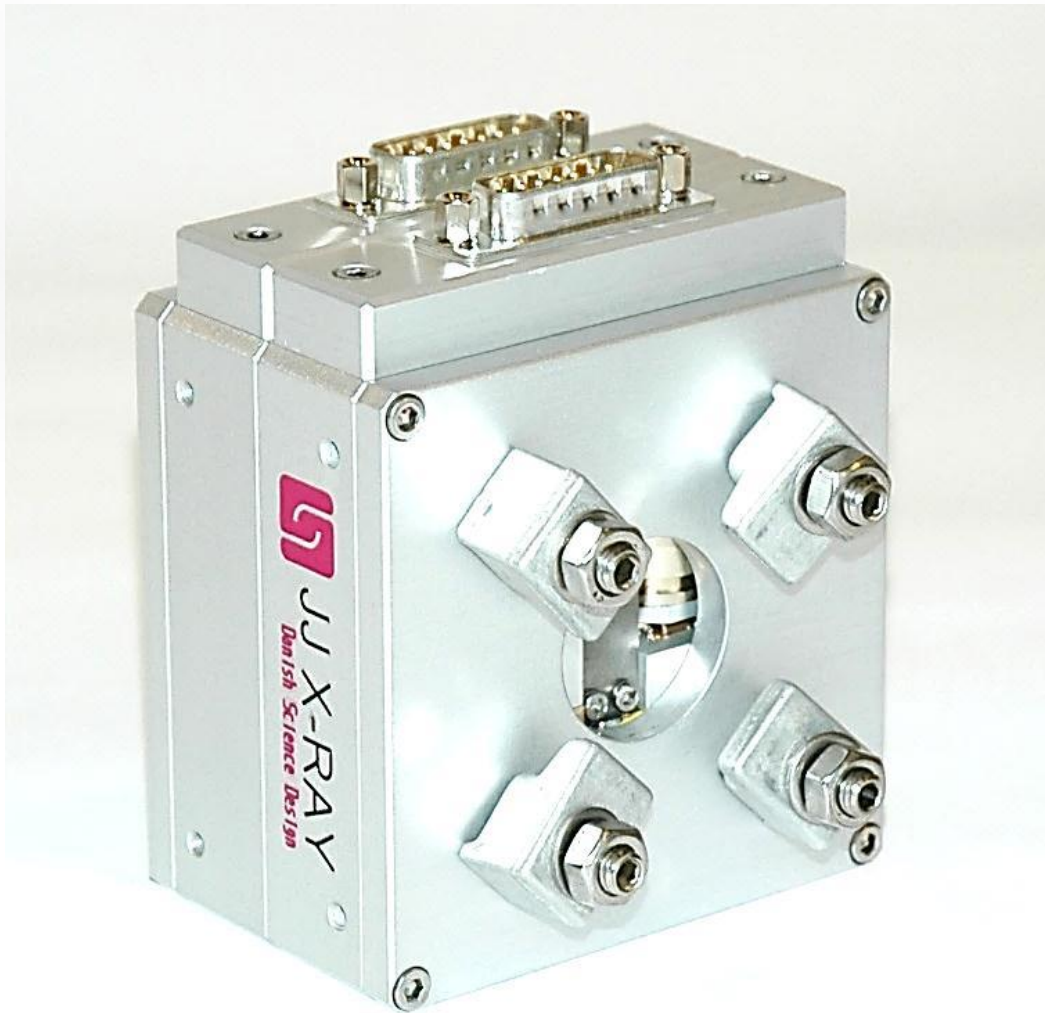


# BRIEF INSTRUCTIONS

## AT-C8-HV



# JJ X-RAY

Danish Science Design



## AT-C8-HV

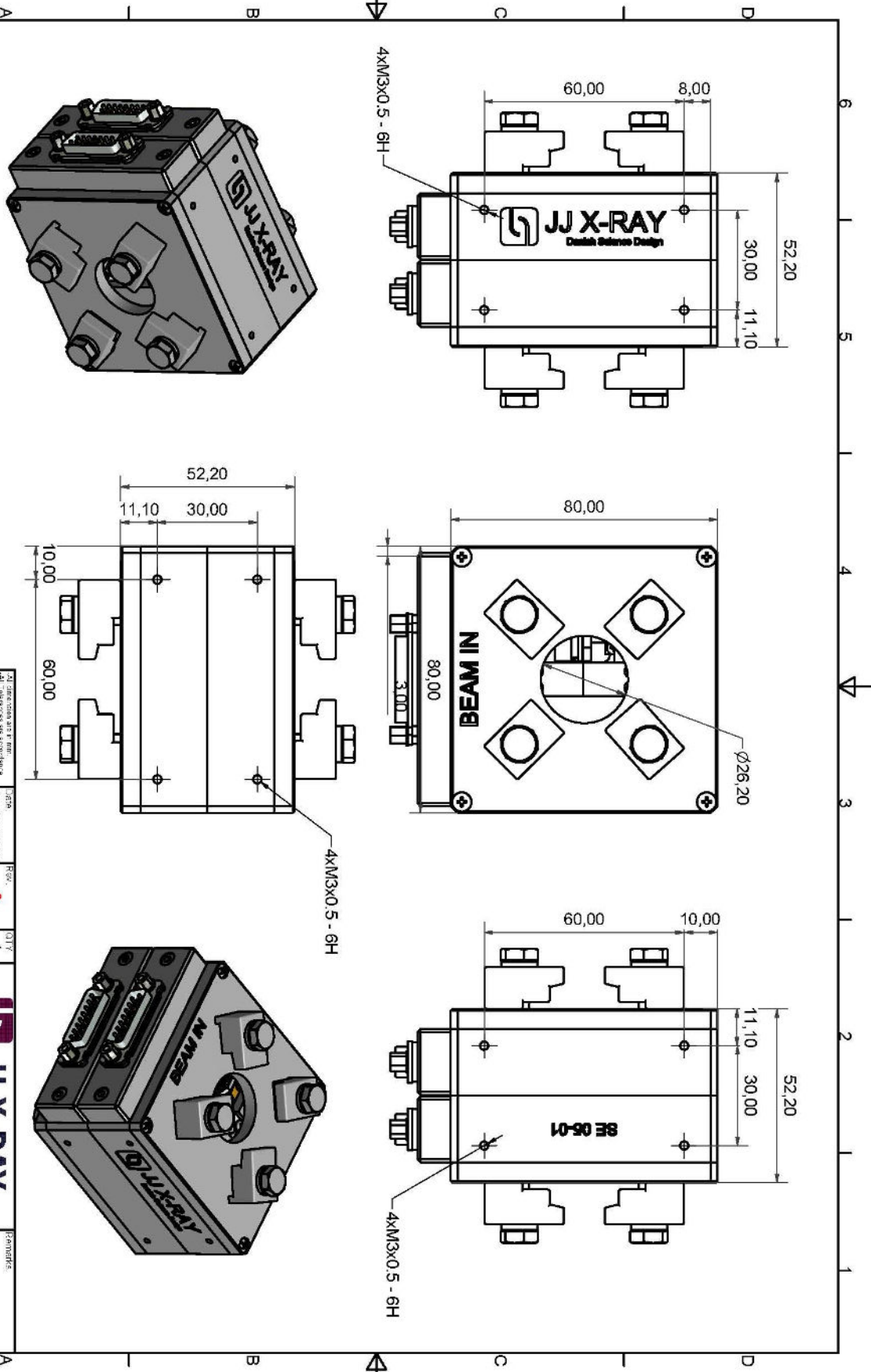
The AT-C8-HV slit was developed for scientists at APS who needed to get a high precision slit into the immediate proximity of the sample while still maintaining vacuum and visibility to several backscattering detectors.

The result is this extremely compact slit system with a centred opening.

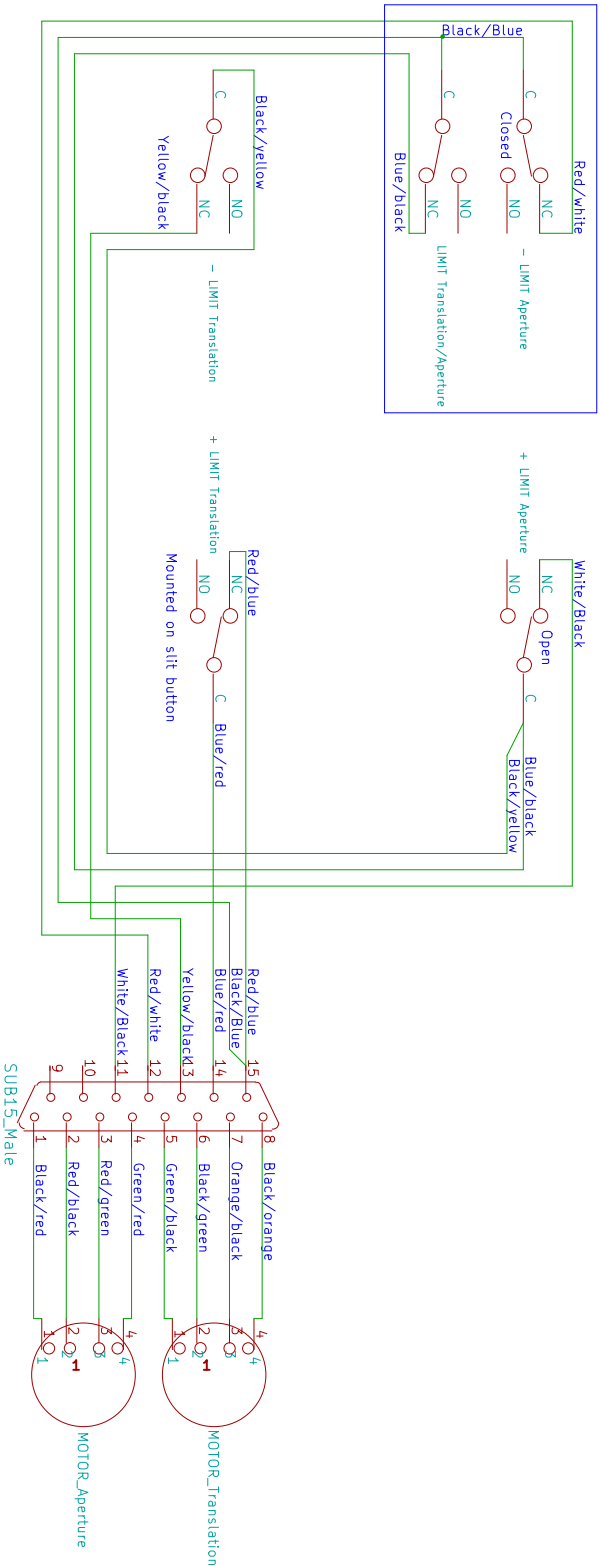
The slit system contains four motors, setting the position and the opening of the aperture. For each dimension, one motor defines the aperture opening and another one determines the aperture's position. For high precision scans with a fixed aperture, this is an advantage since only one motor is moved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

# Technical Specifications

<b>AT-C8-HV</b>	
<b>Aperture size</b>	<b>Maximum: 8 mm x 8 mm</b>
	<b>Minimum: Full overlap</b>
<b>Resolution</b>	<b>Aperture: 1.016 micron per full step</b>
	<b>Translation: 0.508 micron per full step</b>
<b>Repeatability</b>	<b>&lt; 1 micron</b>
<b>Motors</b>	<b>2 phase stepping motors</b>
<b>Vacuum</b>	<b>O-ring sealed, high vacuum 10-5 mbar, low outgassing materials</b>
<b>Mechanical dimension</b>	<b>95 mm x 80 mm x 56 mm</b>
<b>Standard blades</b>	<b>2 mm thick tungsten carbide with knife-edge profile (2 degrees slope)</b>
<b>Mechanical connections</b>	<b>M3-threaded holes on the sides as shown on the drawing. KF-25 flange connections are provided on the body of both sides of the slit</b>
<b>Limit switches (end-of-travel)</b>	<b>Included as standard on all motions</b>
<b>Weight</b>	<b>≈ 1.0 kg</b>
<b>Outer surface</b>	<b>Anodized aluminum in color nature</b>
<b>Guiding</b>	<b>High precision internal rails and carriages</b>
<b>Electrical connections</b>	<b>Microswitches coupled to 2 motor connectors (SUB-D 15 pins male)</b>
<b>Motors</b>	<b>2 phase stepping motors</b>



All dimensions are in mm.		Date		Revision		Drawing	
All dimensions are as indicated unless otherwise specified.		03-10-2012		0		1	
Title:		JJ X-RAY AT-C8-HV Silt		Project:		JJ X-RAY AT-C8-HV Silt	
Internal code:		82,2 mm		Material:		AT-C8-HV Silt	
Weight (kg):		1,28		Scale:		A3	
Remove all sharp edges and burrs		Drawing Number:		Scale:		A3	
		Complete AT-C8HV		Drawing Size:		A3	



<b>JJ X RAY Michael Andersen</b>	
File: AT-C8-HV_V11.sch	
Sheet: /	
<b>Title: AT-C8-HV</b>	
Size: A4	Date: 19 Jan 2018
KiCad E.D.A. eeschema (2013-05-16 BZR 4016)-stable	
	<b>Rev: 1.1</b>
	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	In vacuum linear rails and carriages
Motor step angle	15°/step
Motor gear	41:1
Lead screw pitch	2x0.5 mm/rev (left and right)
Scale factor, aperture 1	984 steps/mm (gap)
Mechanical resolution	≈ 1.016 μm/step
Aperture calibration	984 steps/mm

Motion Mechanism, Translation (M2)	
Type of motion	Translation
Guidance	In vacuum linear rails and carriages
Motor step angle	15°/step
Motor gear	41:1
Pitch	0.5 mm/rev
Scale factor, translation	1968 steps/mm
Mechanical resolution	≈ 0.508 μm/step
Translation calibration	1968 steps/mm

Recommended Driver Settings	
The motors should be run <u>at 0.45 A per phase.</u> 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:

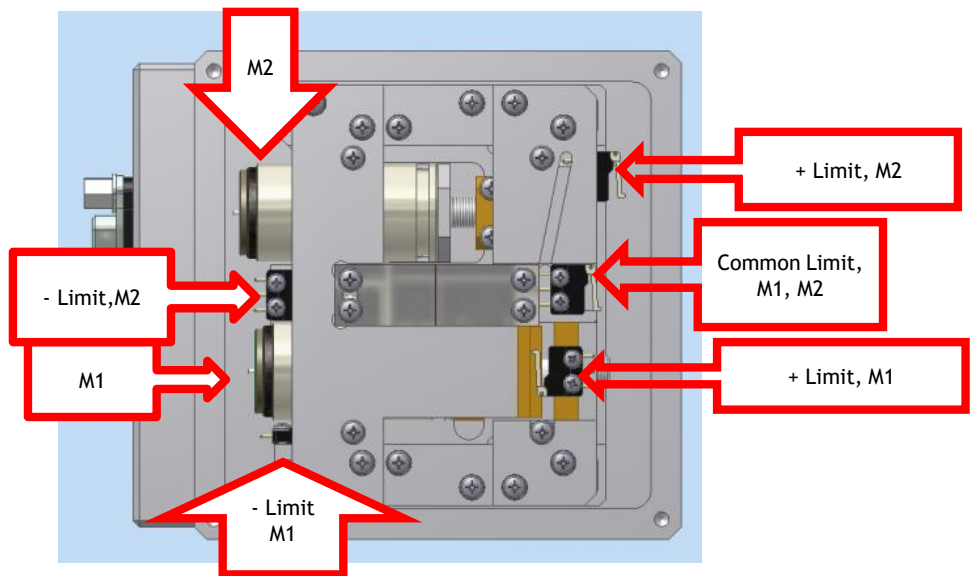
If you are using systems/detectors that can be damaged by overexposure, where the slits are used to remove a lot of the intensity, be careful when changing aperture size since the backlash correction may result in the slit being opened significantly more than you anticipated during adjustment.

## 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

- Electrical Connections: Can be supplied with flying leads.
- Special preparation for enabling vacuum  $<10^{-6}$  mbar.



# The JJ X-Ray Product Range

- ☒ Slit Systems (AIR, HV, UHV)
- ☒ Complete Beamline Solutions
- ☒ Spectrometers
- ☒ Refractive Optics
- ☒ 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

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