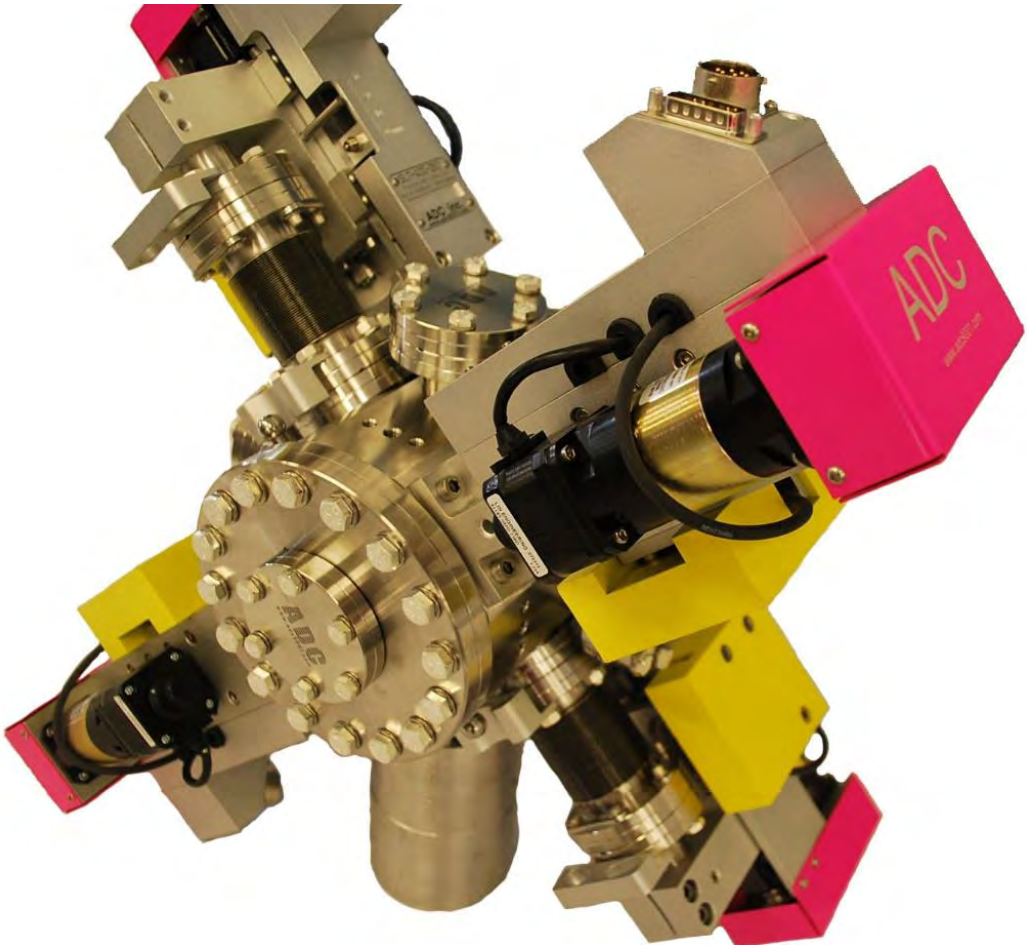
High Precision Slits

Custom and Standard Slit Designs



2019

www.adc9001.com

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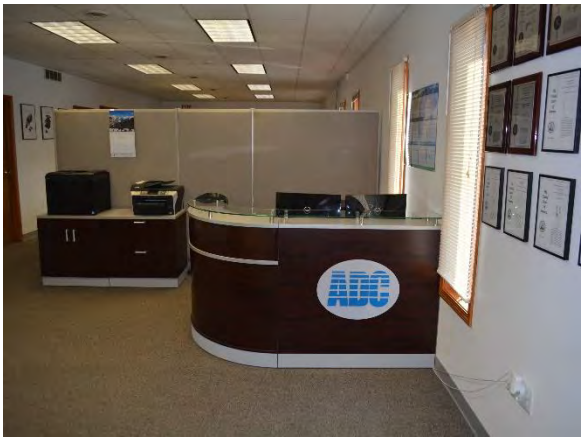
ADC USA, Inc.

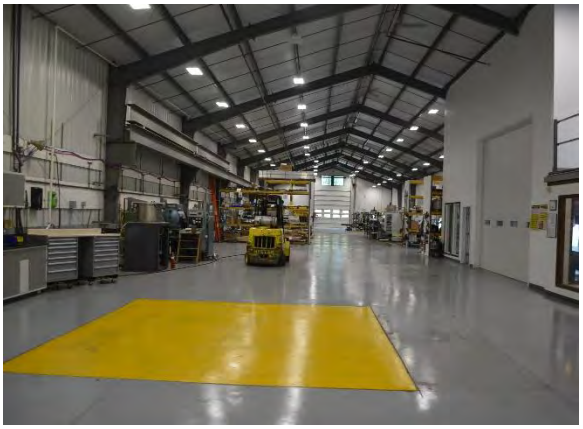
Advanced Design Consulting USA, Inc. (ADC) is a leading developer and supplier of complex scientific components and instruments for large government laboratories and corporations around the world.



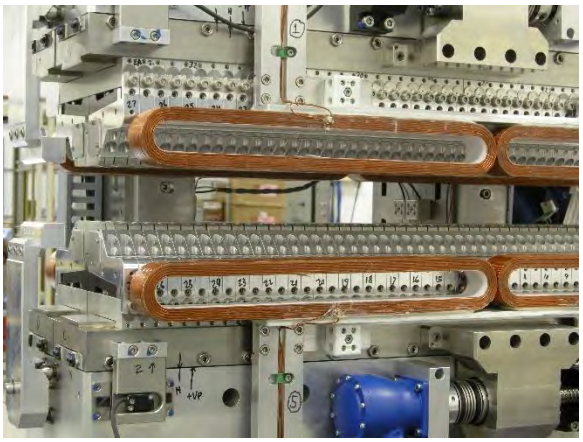
ADC, like many successful companies (and rock bands), got its start in a garage in 1995. Our garage was in Ithaca, NY on the banks of Cayuga Lake and home of Cornell University. ADC has since grown into a worldwide leader in the field of design and manufacturing of complex research instrumentation.

ADC provides machining systems and products to our diverse customers from structural metal fabrication to turn key design products with complex control systems.

We specialize in engineered experimental tables and beamline components.



ADC occupies over 22,000 square feet of space. This includes our in-house machine shop. We use precision equipment to verify each order and are committed to delivering precision machined parts. We are very proud of our shop and the capabilities we can offer because of our state-of-the-art precision CNC milling and CNC turning machines.



Our engineering department works closely with our customers to realize designs that meet their technical requirements. Through an iterative process, we have developed standard designs that can be optimally customized for each new project. Our engineers provide incisive trouble shooting and technical recommendations to our customers resulting in high performing cutting-edge instruments.

Company History

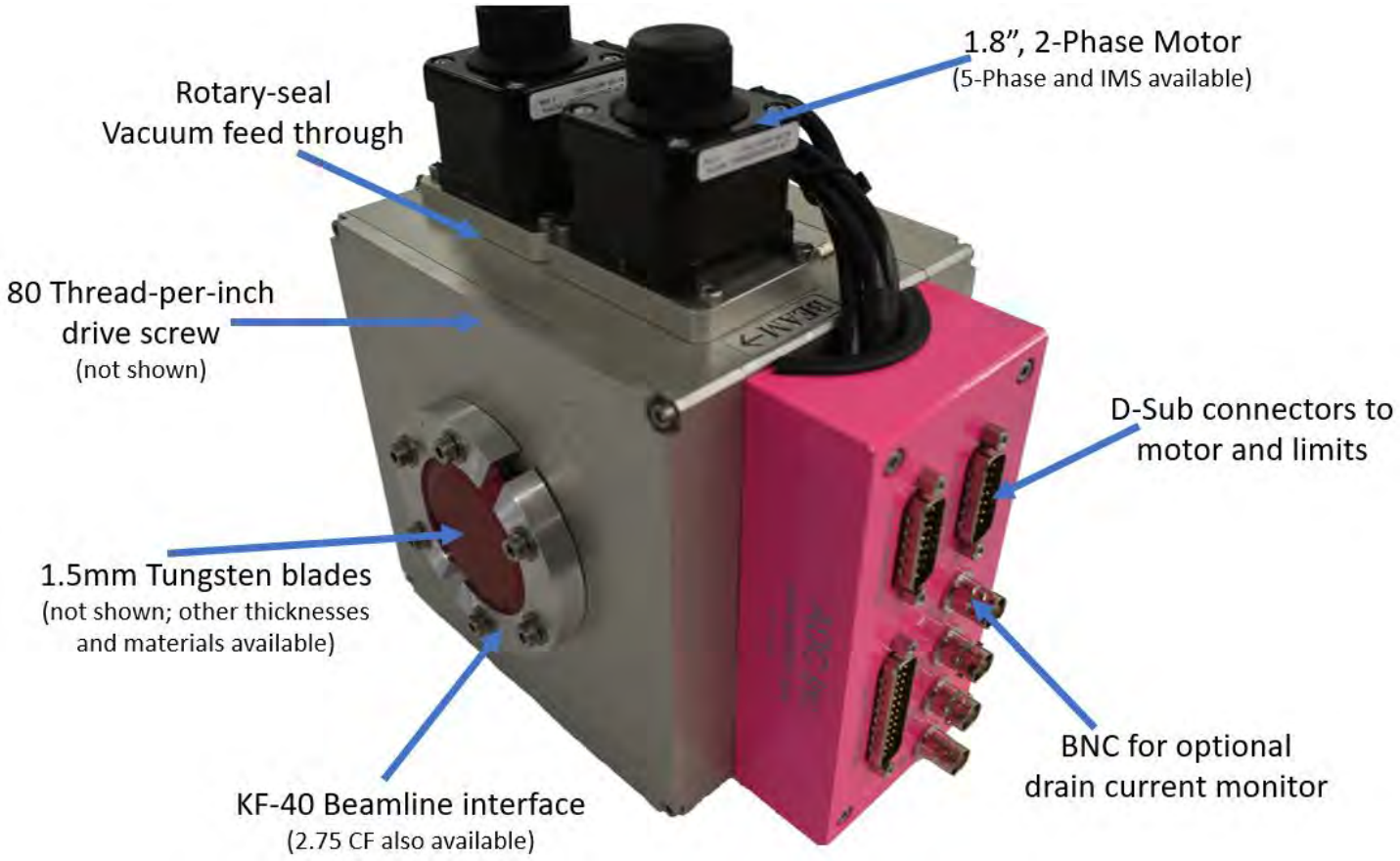
ADC was incorporated in 1995, starting in a small office at Cornell Business and Technology Park. ADC established itself as a custom design manufacturing prime contractor. In 1995, ADC won its first contract for $10,700 working with Crouse-Hinds-Cooper Industries. By 1998, ADC had expanded enough to occupy its first building with 3,000 square feet of office and workshop space. The company grew steadily throughout the next decade, always reinvesting in the people and new engineering design, manufacturing and assembly equipment to provide the most cost-effective solutions to our customers.

We have come a long way from our modest beginnings by developing our expertise and capabilities while continuing to provide excellence in products and service. ADC now consists of different departments to make up the framework of our operations: Engineering Design and Analysis, Manufacturing and Planning, Temperature Control/Clean Room Assembly/Testing Facility, Ultra-High Vacuum (UHV) Facility, Metrology Laboratory, Magnetic Measurement Facility (Undulator Testing Facility), and Electronics and Instrumentation. Our comprehensive facilities give our engineers the capacity and freedom to innovate.

Today, ADC has a worldwide reach. ADC's vision is to be a global leader in the development and manufacturing of innovative products for scientific and research markets.

Standard Slits

X-Ray Slits SLT-100-P



SLT-100-P belongs to a new family of X-Ray slits ADC has introduced. The SLT-100-P incorporates many improvements derived from in-house experience and feedback we have received from many of our customers who have been using the last generation SLT-100 X-Ray Slits (Blue Slits).

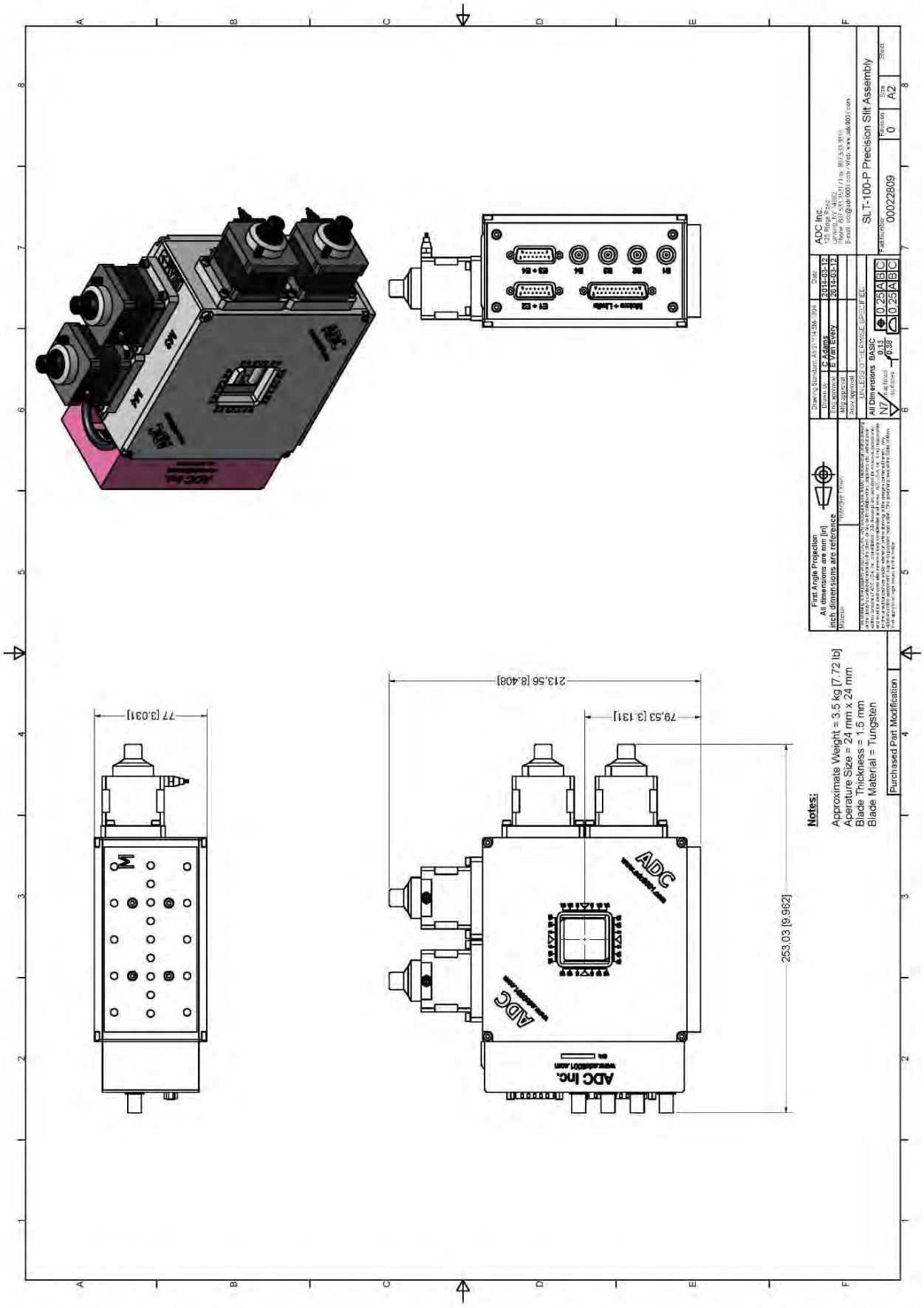
These improvements include:

- Better O-ring design resulting in a better and long-term consistent vacuum (eliminating any binding)
- Higher quality bearing and simpler assembly
- Bigger micro-stepper motor resulting in smoother operation
- Bigger and better-quality drive screw mechanism for higher precision and better accuracy

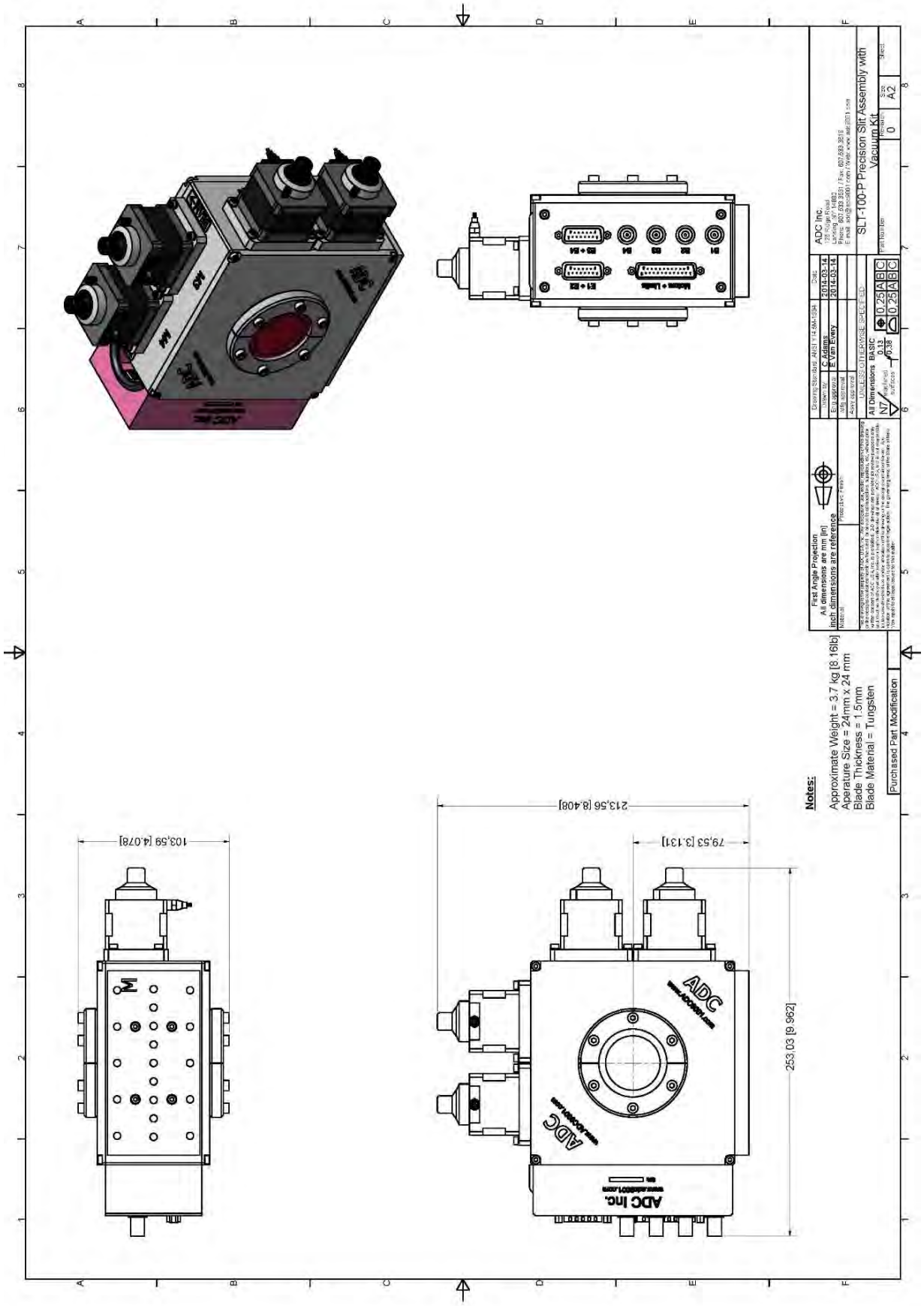
These high-precision slits systems consist of four blades that are housed in an aluminum body. These slits use standard micro-stepped stepper motors that can be controlled with a wide array of controllers/drivers available on the market. The design incorporates mechanical limit switches.

Characteristic	**Typical Values**
Aperture Size (Fully Open)	24 mm
Blade Overlap (Fully Closed)	Complete
Blade Thickness	1.5 mm (5, 7, 10 mm on Request)
Blade Material	Tungsten Heavy Alloy (90%W, 95%W), Tantalum, Copper
Housing Axial Length	77 mm (112 mm with Thick Blades)
Beamline Interface	NW (QF) 40 for Inert Gas or Vacuum
Internal Environment	Air, Inert Gas, Vacuum (10^{-6} mbar)
Beam Monitoring	Available
Water Cooling	Consider SLT-400 or SLT-600 Series
Encoders	Differential Rotary Encoders
Motors	2-Phase Stepper Motors (5-Phase on Request)
Mechanical Resolution	1.6 µm / step (or finer with gearbox and/or micro-stepping)

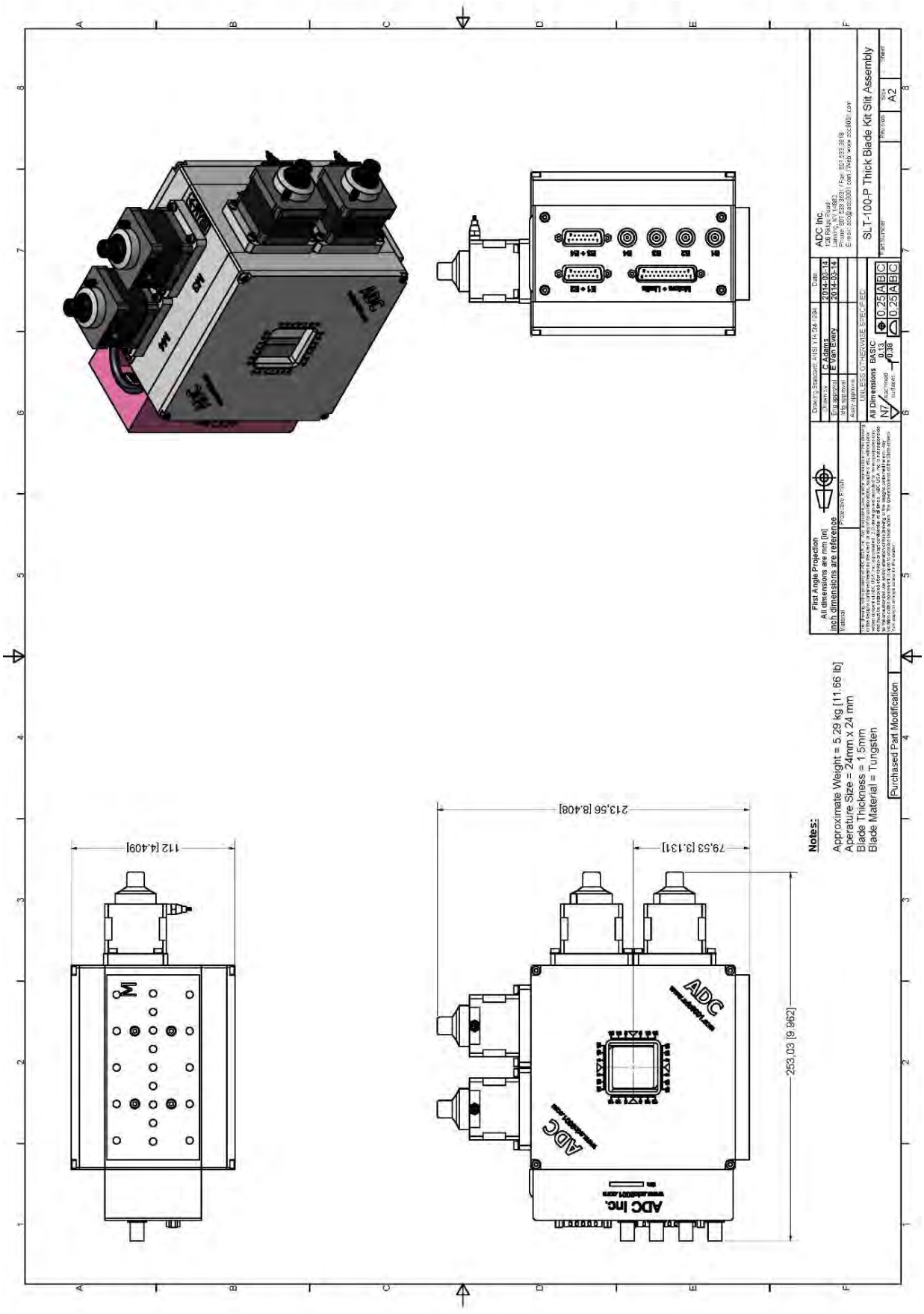
Air Assembly



Vacuum Assembly

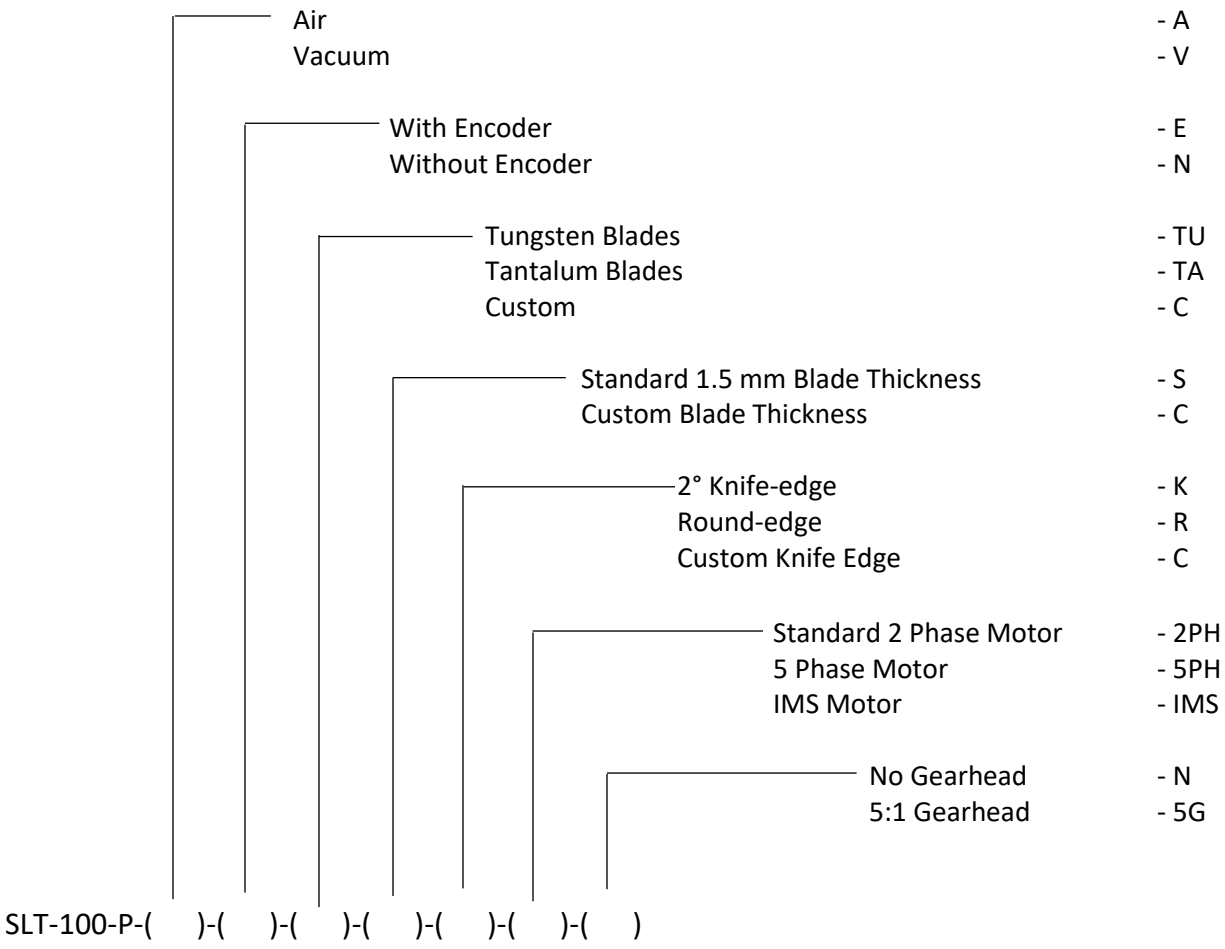


Thick Blade Assembly



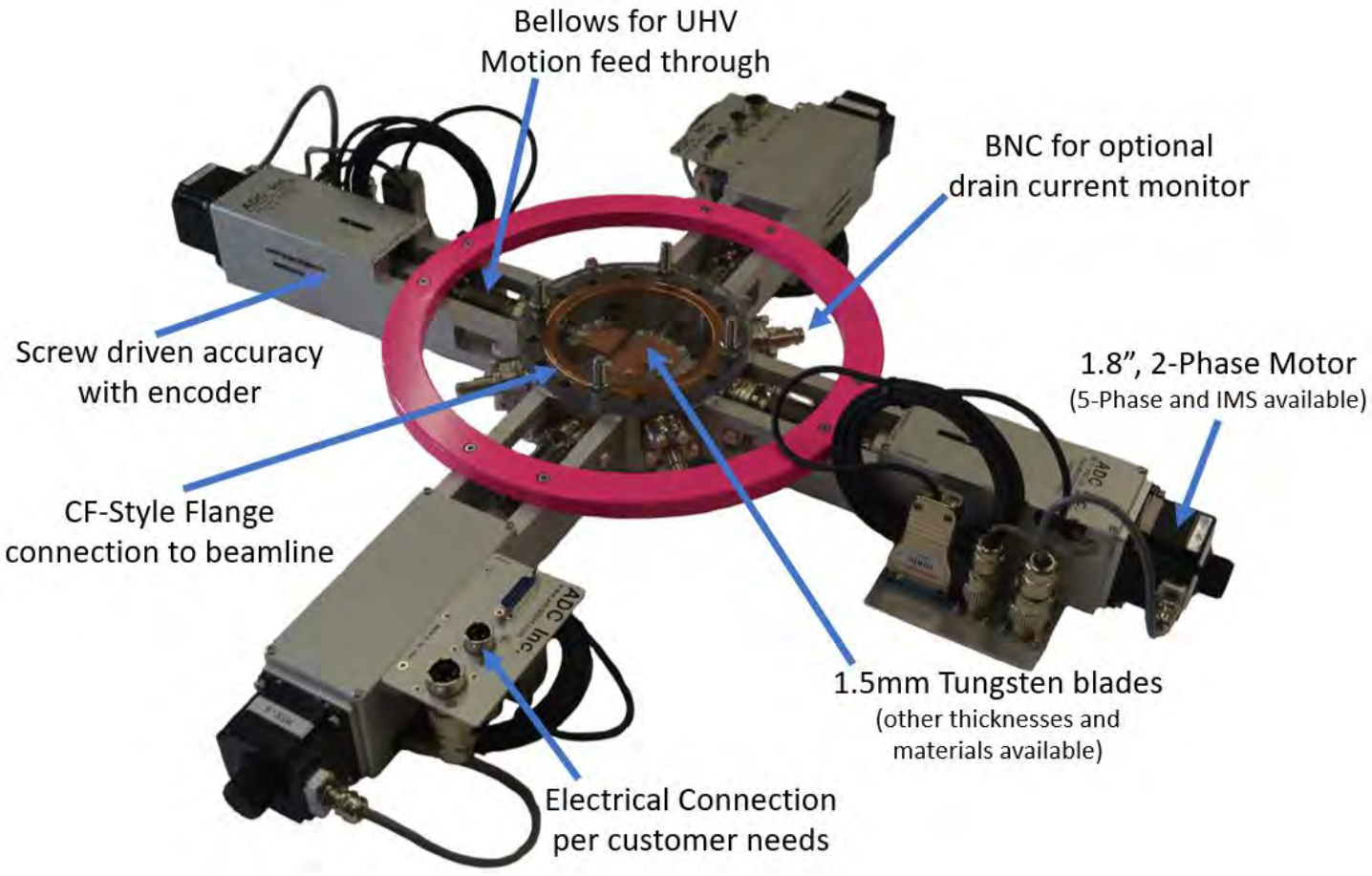
Ordering Information

The SLT-100-P can be ordered with different configurations. Please use the codes provided below when ordering. Please call or e-mail to ask about customization if your application requires it.

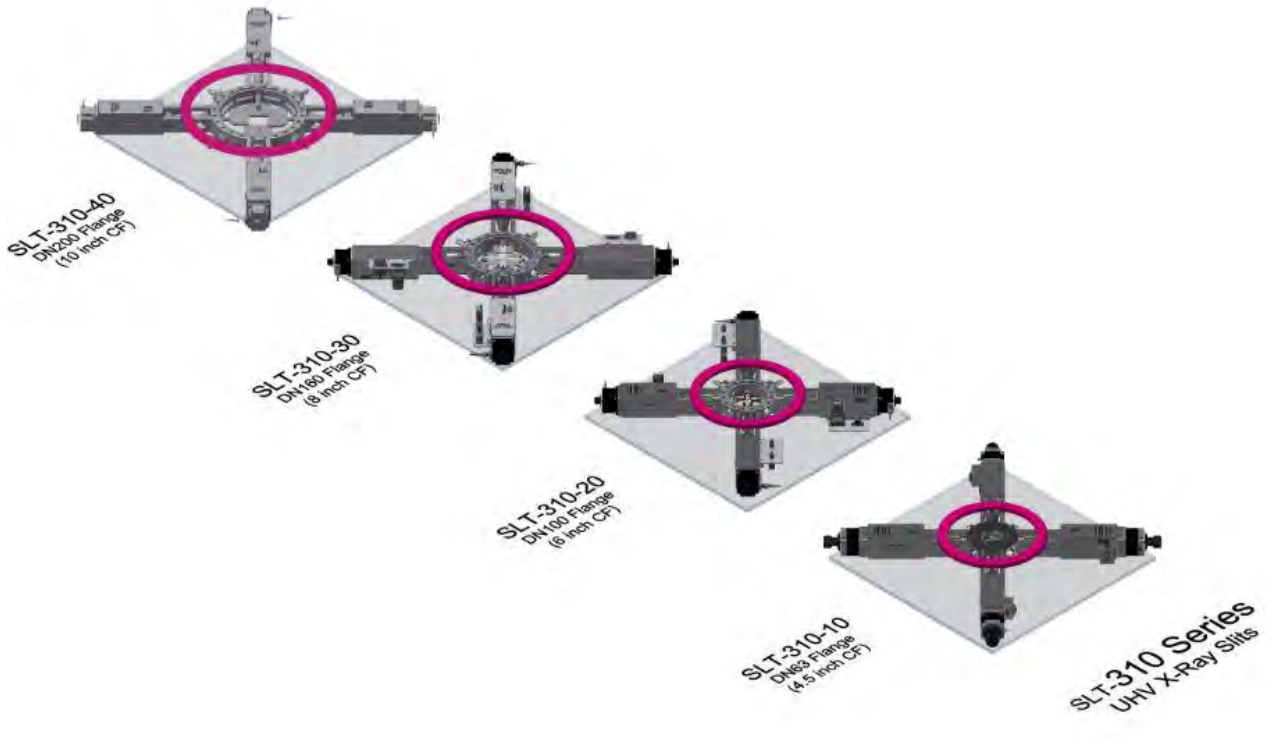


For example, a chamber configured for Air, No Encoder, Tungsten Blades, Standard Thickness, No Beam Monitoring, Standard 2 Phase Motor, with no gearhead would be denoted by: SLT-100-P-A-N-TU-S-K-2PH-N.

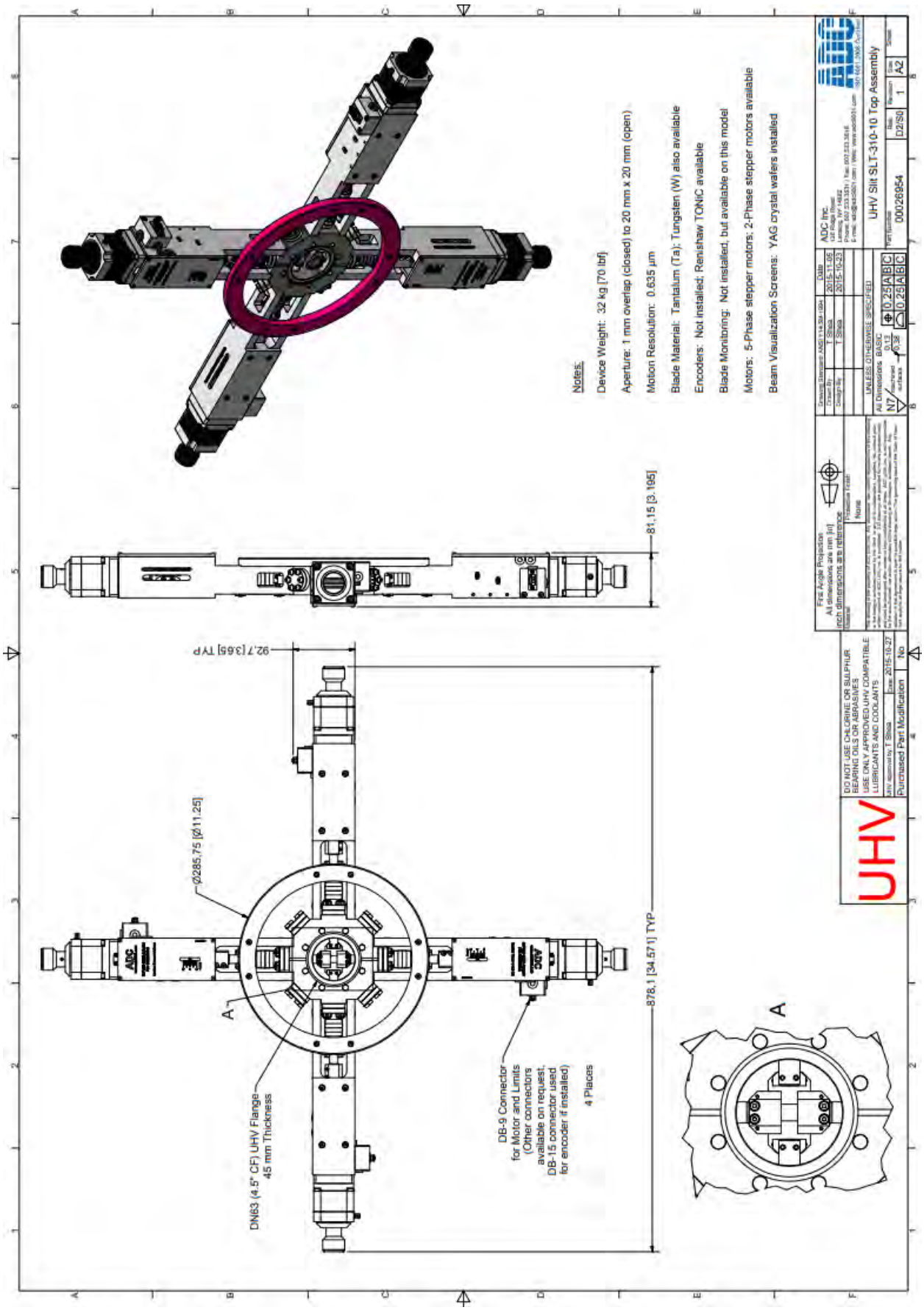
SLT-310 X-Ray UHV Slit System

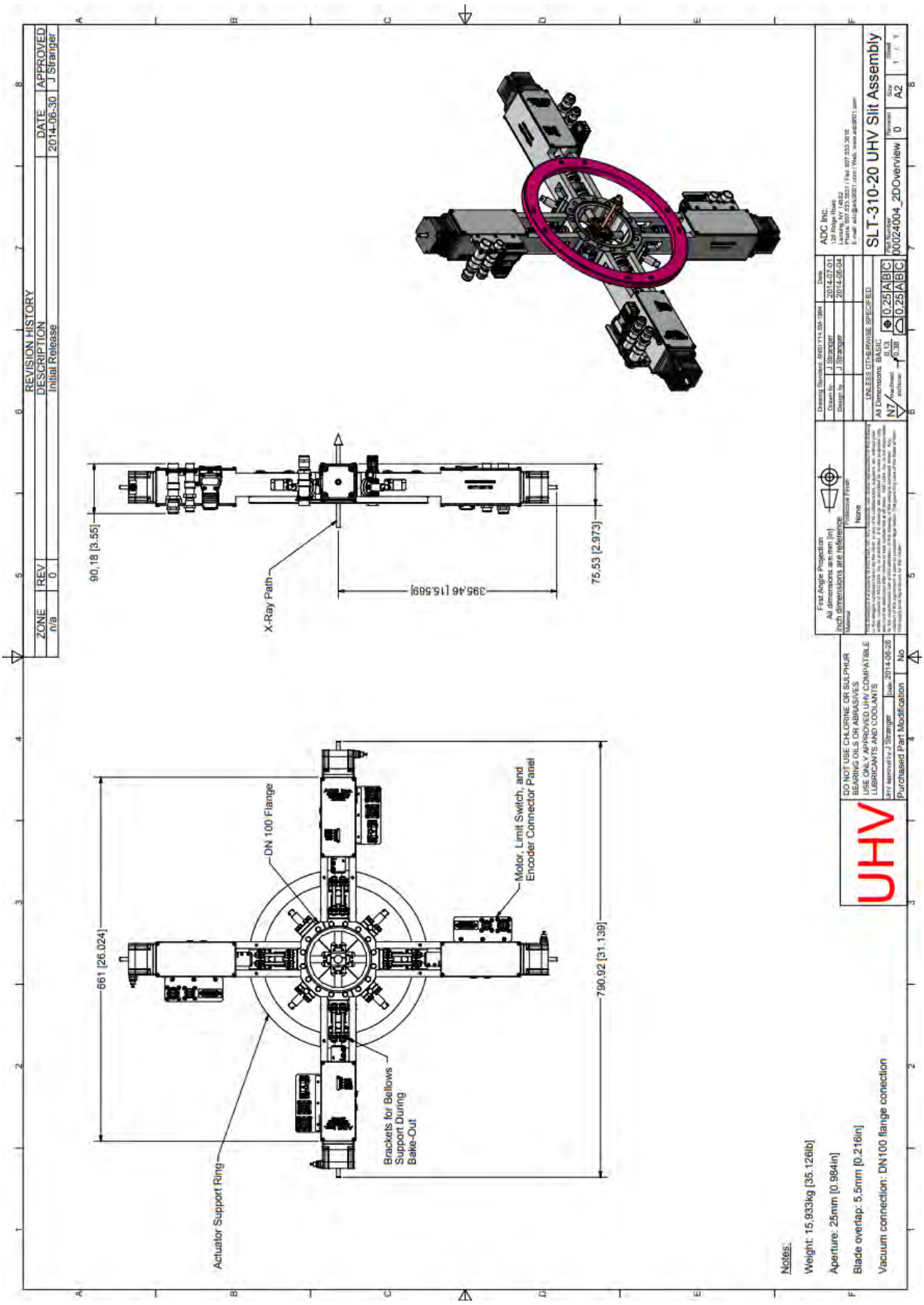


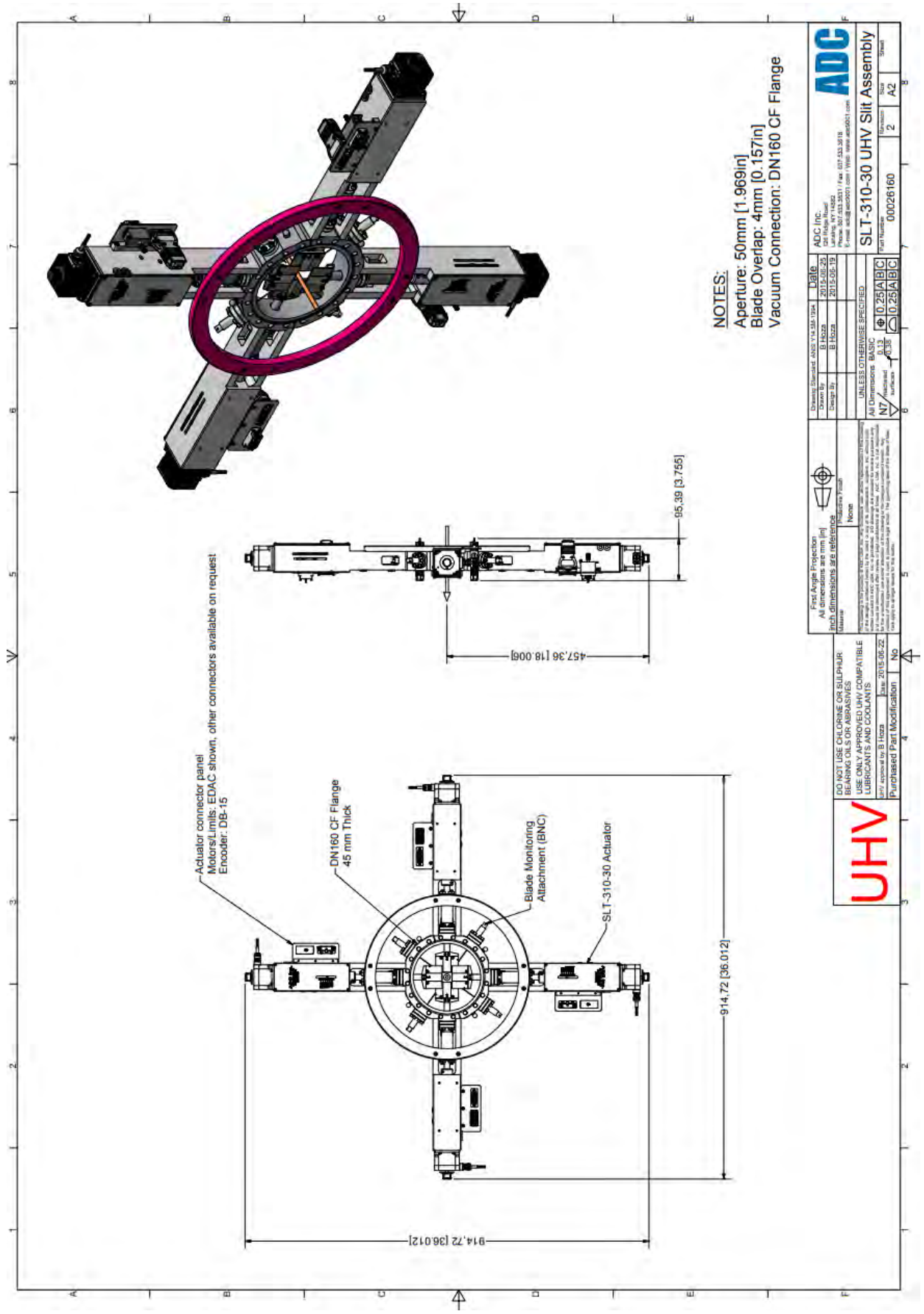
SLT-310 belongs to a new family of slits ADC has introduced and is based on ADC's previous SLT-300 slits design. The SLT-310 incorporates many improvements derived from the feedback we have received from our customers who have been using the last generation SLT-300 (UHV).

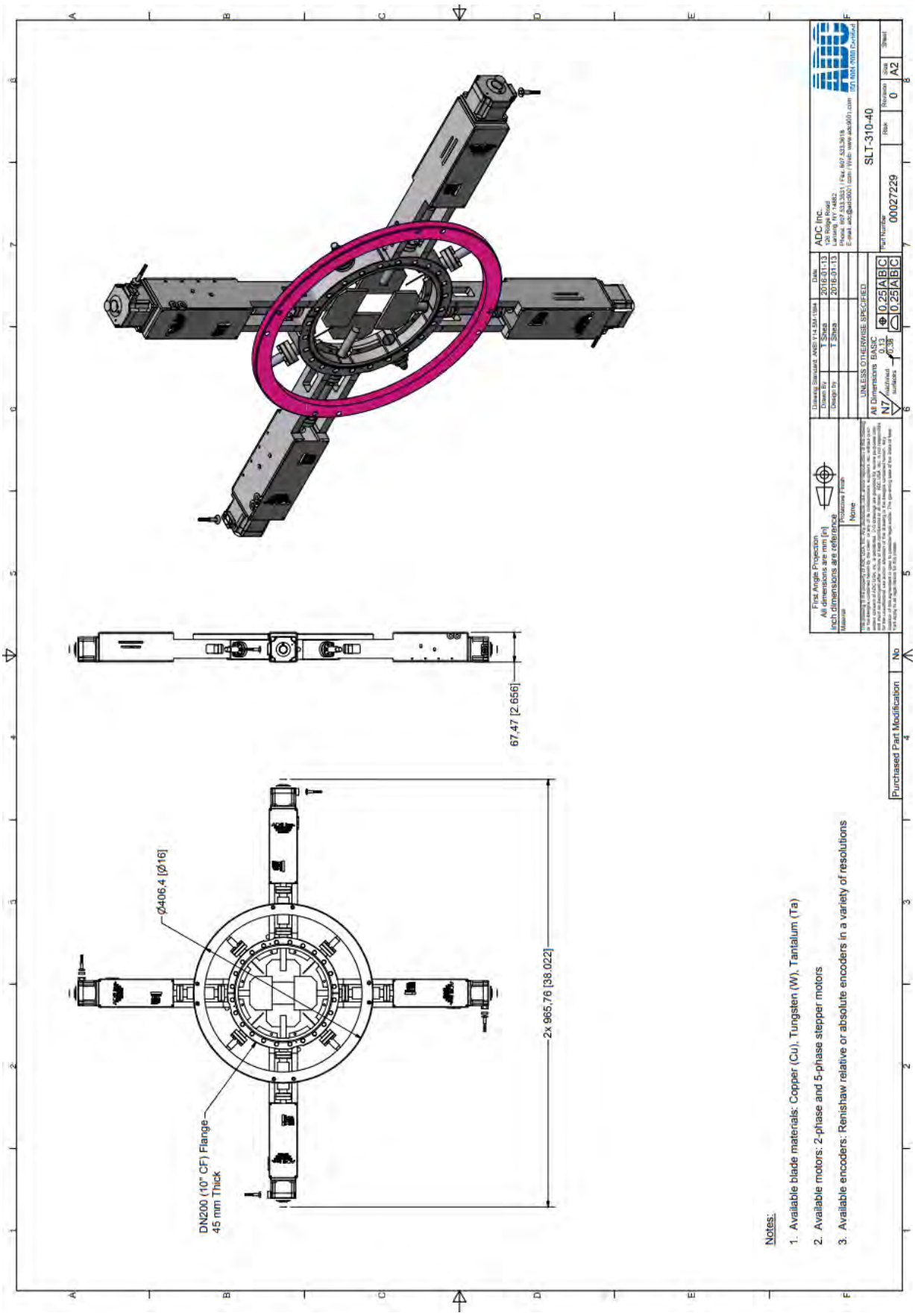


Characteristic	**Typical Values**
Aperture Size (Fully Open)	20, 25, 50, 60 mm
Blade Overlap (Fully Closed)	> 2 mm
Blade Thickness	1.5 mm (5, 7, 10 mm on Request)
Blade Material	Tungsten Heavy Alloy (90%W, 95%W), Tantalum, Copper
Housing Axial Length	45 mm
Beamline Interface	DN63, DN100, DN160, DN200
Internal Environment	UHV (<10^{-9} mbar)
Beam Monitoring	Available
Water Cooling	Consider SLT-400 or SLT-600 Series
Encoders	Renishaw Incremental or Absolute Linear Encoders
Motors	2-Phase Stepper Motors (5-Phase on Request)
Mechanical Resolution	1.6 µm / step (or finer with gearbox and/or micro-stepping)
Other	Maximum aperture size is a function of flange size


Notes:
Device Weight: 32 kg [70 lbf]
Aperture: 1 mm overlap (closed) to 20 mm x 20 mm (open)
Motion Resolution: 0.635 µm
Blade Material: Tantalum (Ta); Tungsten (W) also available
Encoders: Not installed; Renishaw TONiC available
Blade Monitoring: Not installed, but available on this model
Motors: 5-Phase stepper motors; 2-Phase stepper motors available
Beam Visualization Screens: YAG crystal wafers installed
81.15 [3.195]
92.7 [3.65] TYP
Ø285.75 [Ø11.25]
878.1 [34.571] TYP
DN63 (4.5" CF) UHV Flange
45 mm Thickness
DB-9 Connector
for Motor and Limits
(Other connectors
available on request.
DB-15 connector used
for encoder if installed)
4 Places
A
A
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Purchased Part Modification
ADC Inc.
UHV Slit SLT-310-10 Top Assembly
00026954
D2/S0
A2

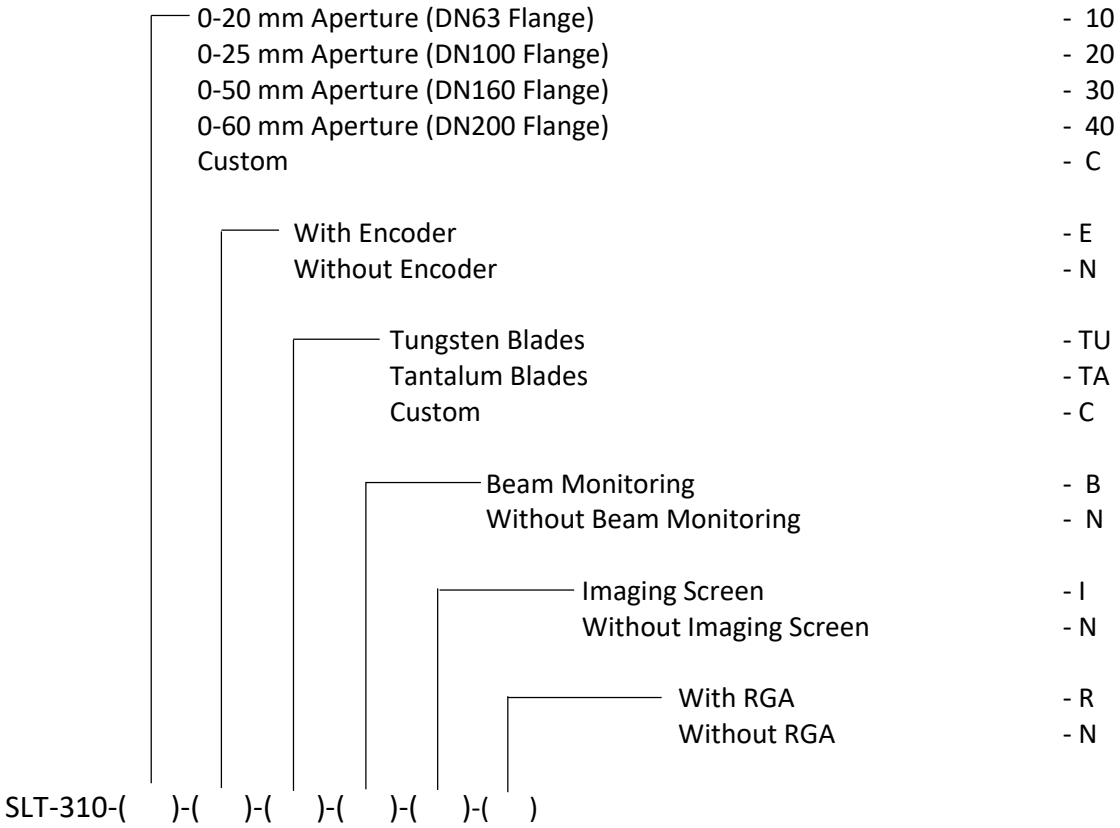

REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Initial Release | 2014-06-30 | J Stranger
90,18 [3.55]
X-Ray Path
395,46 [15.569]
75,53 [2.973]
661 [26.024]
DN 100 Flange
Motor, Limit Switch, and Encoder Connector Panel
790,92 [31.139]
Actuator Support Ring
Brackets for Bellows Support During Bake-Out
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Purchased Part Modification
No
Notes:
Weight: 15,933kg [35.126lb]
Aperture: 25mm [0.984in]
Blade overlap: 5,5mm [0.216in]
Vacuum connection: DN100 flange conection
ADC Inc.
SLT-310-20 UHV Slit Assembly
00024004_2DOverview
A2


NOTES:
Aperture: 50mm [1.969in]
Blade Overlap: 4mm [0.157in]
Vacuum Connection: DN160 CF Flange
SLT-310-30 UHV Slit Assembly
ADC
UHV
Actuator connector panel
Motors/Limits: EDAC shown, other connectors available on request
Encoder: DB-15
DN160 CF Flange
45 mm Thick
Blade Monitoring
Attachment (BNC)
SLT-310-30 Actuator
914.72 [36.012]
457.36 [18.006]
95.39 [3.755]


67.47 [2.656]
Ø406.4 [Ø16]
DN200 (10" CF) Flange
45 mm Thick
2x 965.76 [38.022]
Notes:
1. Available blade materials: Copper (Cu), Tungsten (W), Tantalum (Ta)
2. Available motors: 2-phase and 5-phase stepper motors
3. Available encoders: Renishaw relative or absolute encoders in a variety of resolutions
SLT-310-40
ADC Inc.
00027229
Purchased Part Modification
UNLESS OTHERWISE SPECIFIED

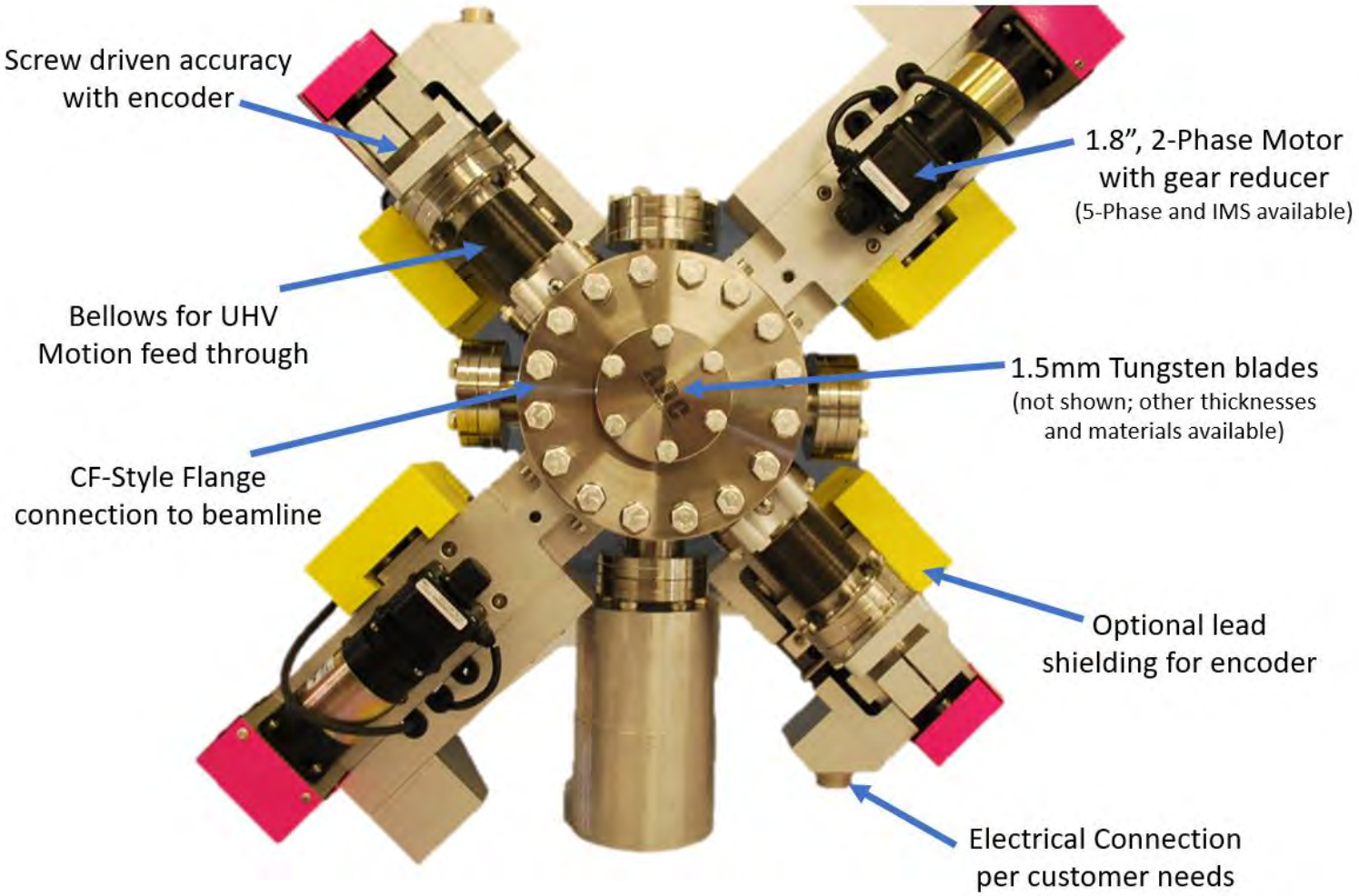
Ordering Information

The SLT-310 can be ordered with different configurations. Please use the codes provided below when ordering. Please call or e-mail to ask about customization if your application requires it.

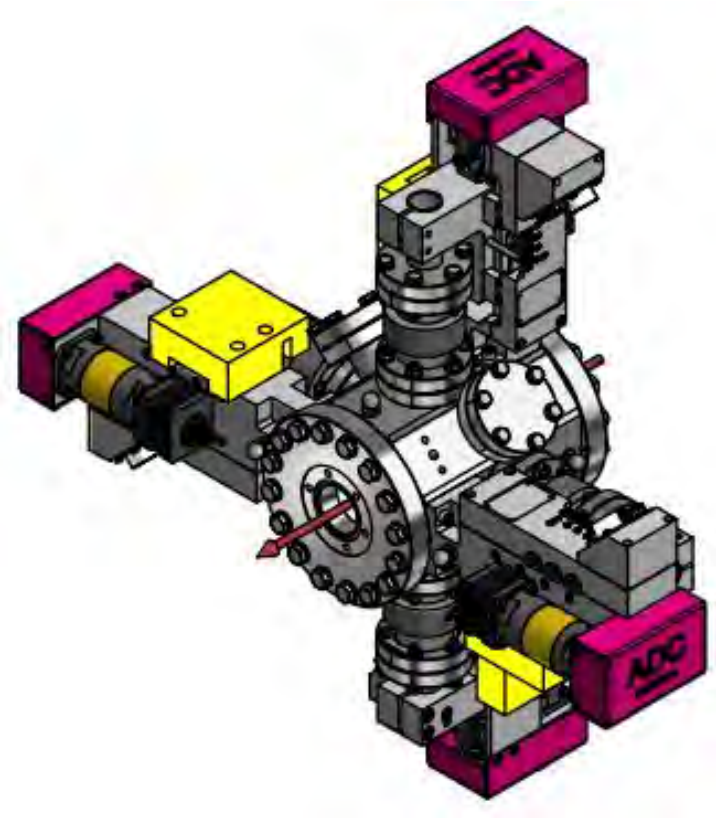


For example, a slit configured for a DN100 flanges, With Encoder, Tungsten Blades, without an Imaging Screen, and without RGA would be denoted by:
SLT-310-20-E-TU-N-N.

SLT-400-250 UHV High Precision Slit System

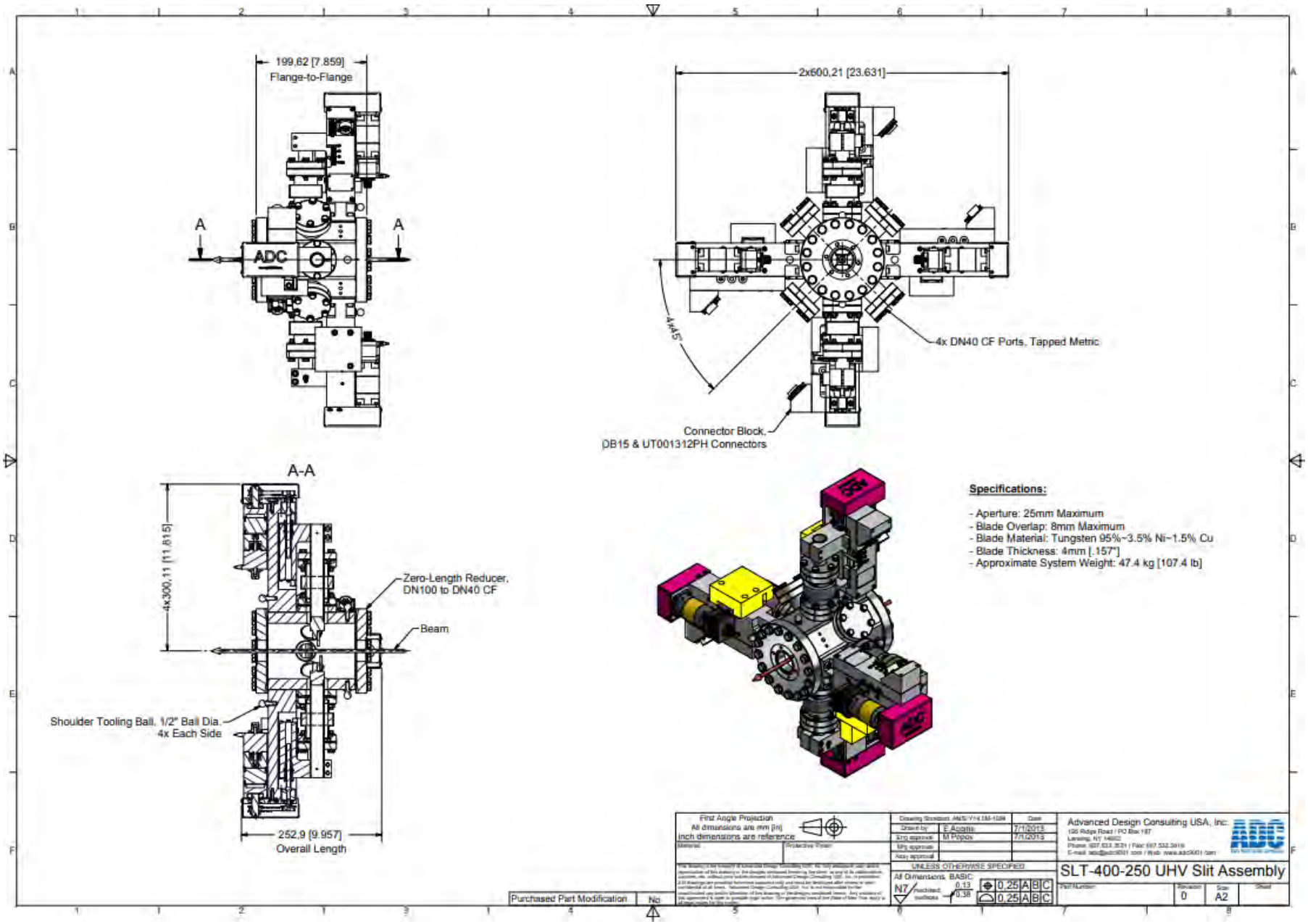


The SLT 400-250 slit system is designed for UHV and can be used for apertures up to 25 mm x 25 mm.



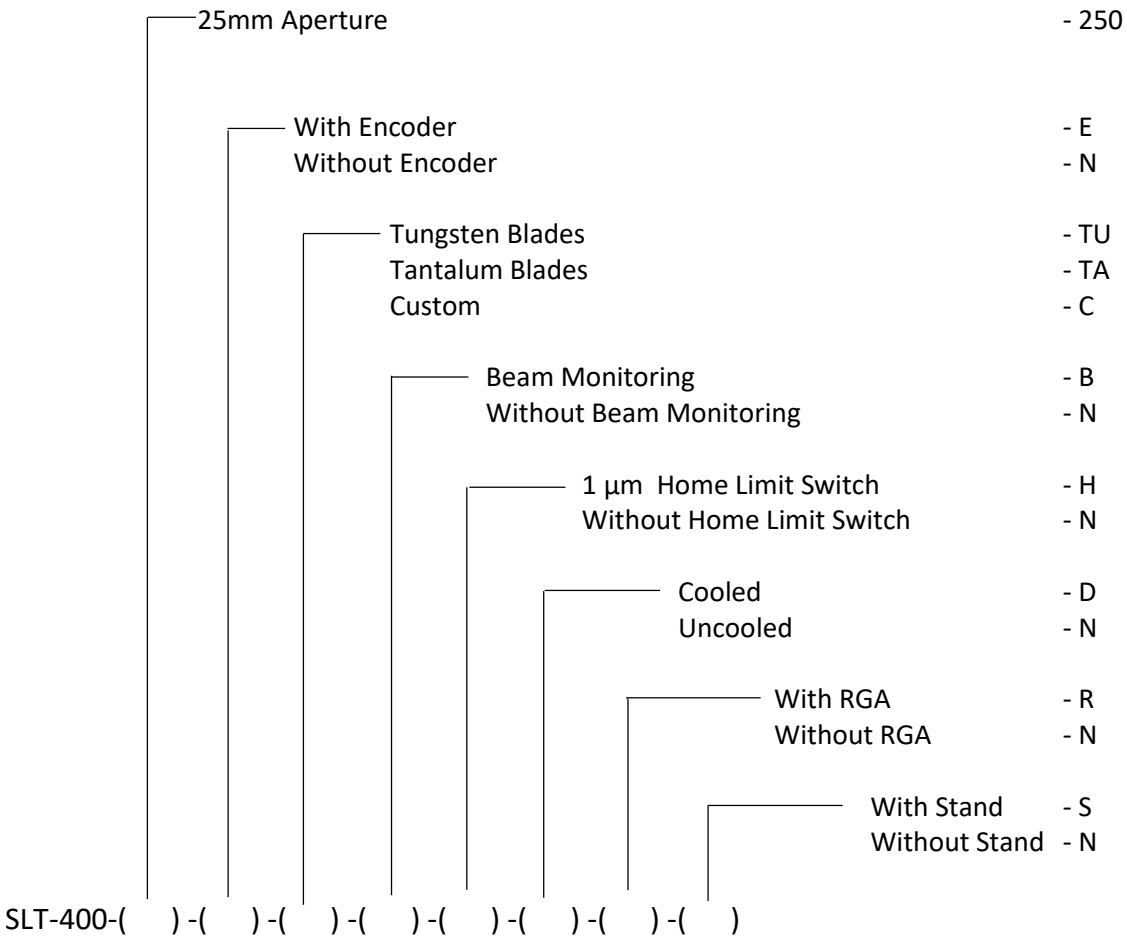
Blades are actuated independently by 4 actuators mounted on the slit body. This slit system was designed to be robust and easily serviceable.

Characteristic	**Typical Values**
Aperture Size (Fully Open)	25 mm
Blade Overlap (Fully Closed)	8 mm
Blade Thickness	4 mm
Blade Material	Tungsten Heavy Alloy (90%W, 95%W) Tantalum, Copper
Housing Axial Length	200 mm
Beamline Interface	DN100
Internal Environment	UHV ($<10^{-9}$ mbar)
Beam Monitoring	Available
Water Cooling	Available (Consult with ADC with Heat Loads)
Encoders	Renishaw Incremental or Absolute Linear Encoders
Motors	2-Phase Stepper Motors (5-Phase on Request)
Mechanical Resolution	0.17 µm / step
Other	-

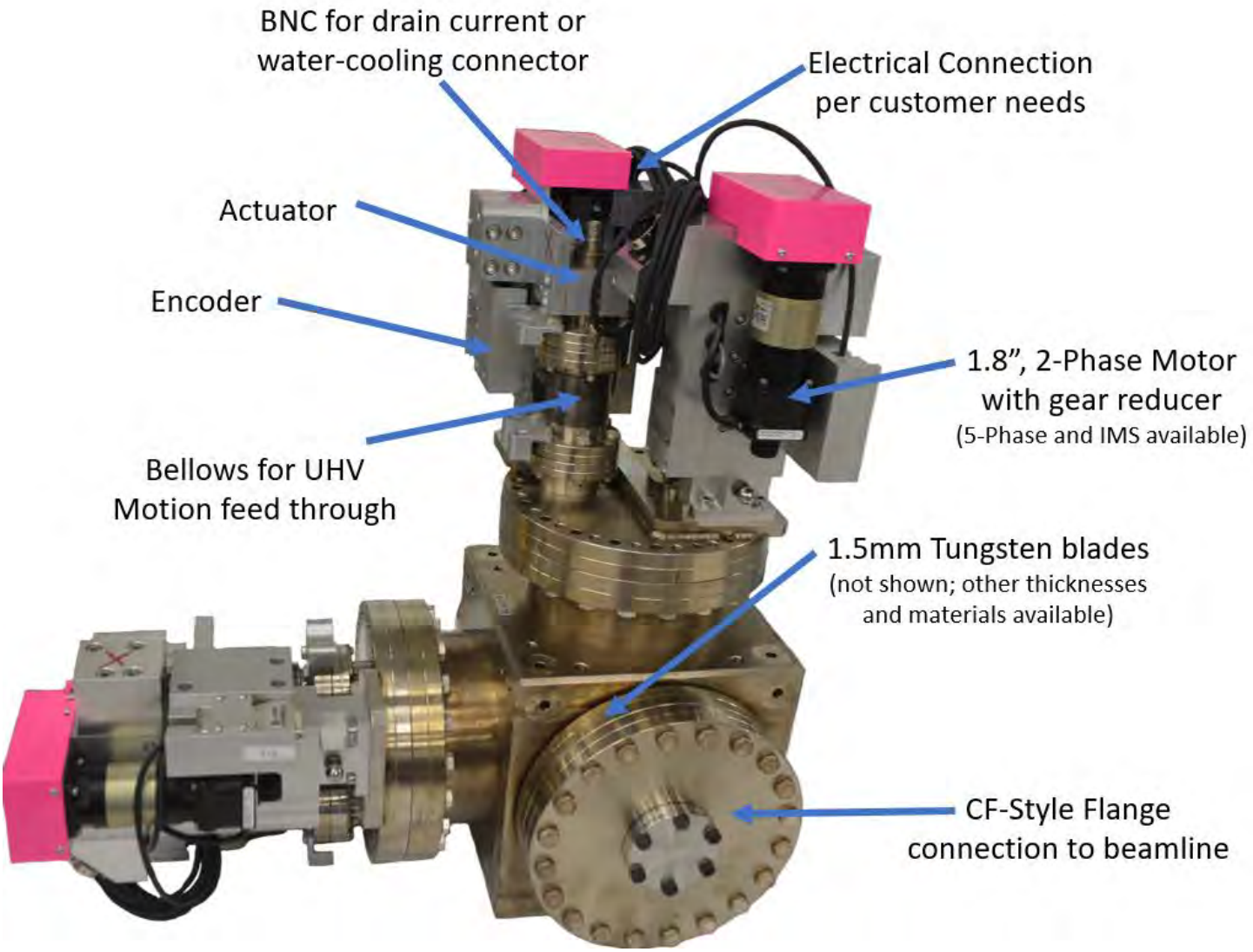

199,62 [7.859]
Flange-to-Flange
A
A
ADC
2x600,21 [23.631]
44,45°
4x DN40 CF Ports, Tapped Metric
Connector Block,
DB15 & UT001312PH Connectors
A-A
4x300,11 [11.815]
Zero-Length Reducer,
DN100 to DN40 CF
Beam
Shoulder Tooling Ball, 1/2" Ball Dia.
4x Each Side
252,9 [9.957]
Overall Length
Specifications:
- Aperture: 25mm Maximum
- Blade Overlap: 8mm Maximum
- Blade Material: Tungsten 95%~3.5% Ni~1.5% Cu
- Blade Thickness: 4mm [.157"]
- Approximate System Weight: 47.4 kg [107.4 lb]
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Drawn by: E.Acaito 7/1/2013
ENG approval: M.Popov 7/1/2013
MFG approval:
Assy approval:
UNLESS OTHERWISE SPECIFIED
All Dimensions: BASIC
Purchased Part Modification: No
Advanced Design Consulting USA, Inc.
SLT-400-250 UHV Slit Assembly
Revision: 0
Size: A2

Ordering Information

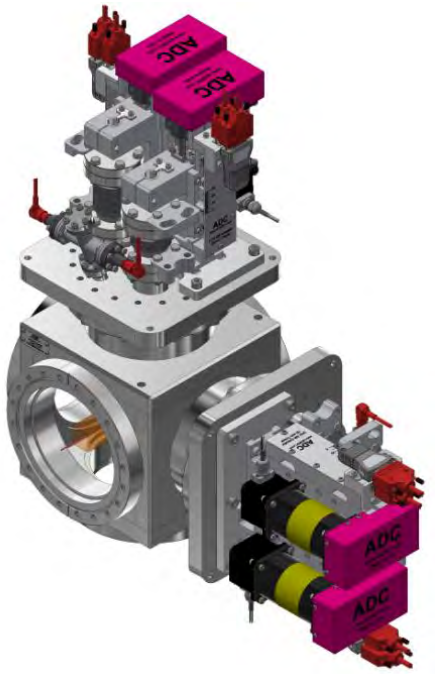
The SLT-400 can be ordered with different configurations. Please use the codes provided below when ordering. Please call or e-mail to ask about customization if your application requires it.



For example, a chamber configured with 25mm Apperture, with an Encoder, Tungsten Blades, without beam monitoring, 1 µm Home Limit Switch, Cooled, without RGA and a Stand would be denoted by:
SLT-400-250-E-T-N-H-D-N-S


BNC for drain current or
water-cooling connector
Electrical Connection
per customer needs
Actuator
Encoder
1.8”, 2-Phase Motor
with gear reducer
(5-Phase and IMS available)
Bellows for UHV
Motion feed through
1.5mm Tungsten blades
(not shown; other thicknesses
and materials available)
CF-Style Flange
connection to beamline

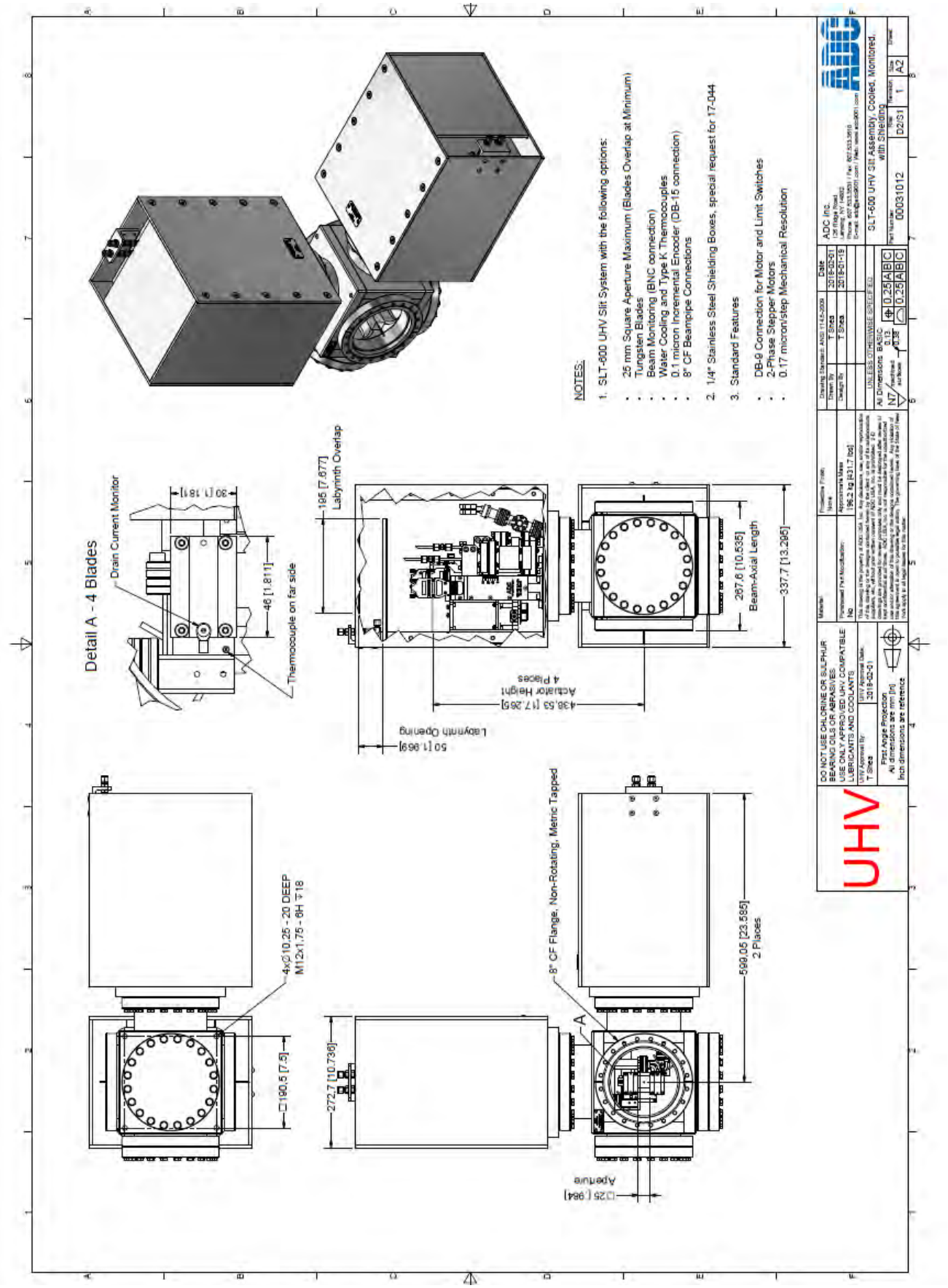
The SLT-600 slit system is designed for UHV and can be used for apertures from 25 mm x 25 mm all the way up to 100 mm x 100 mm. Blades are actuated independently by 4 actuators mounted on the slit body. This slit system was designed to be robust and easily serviceable.



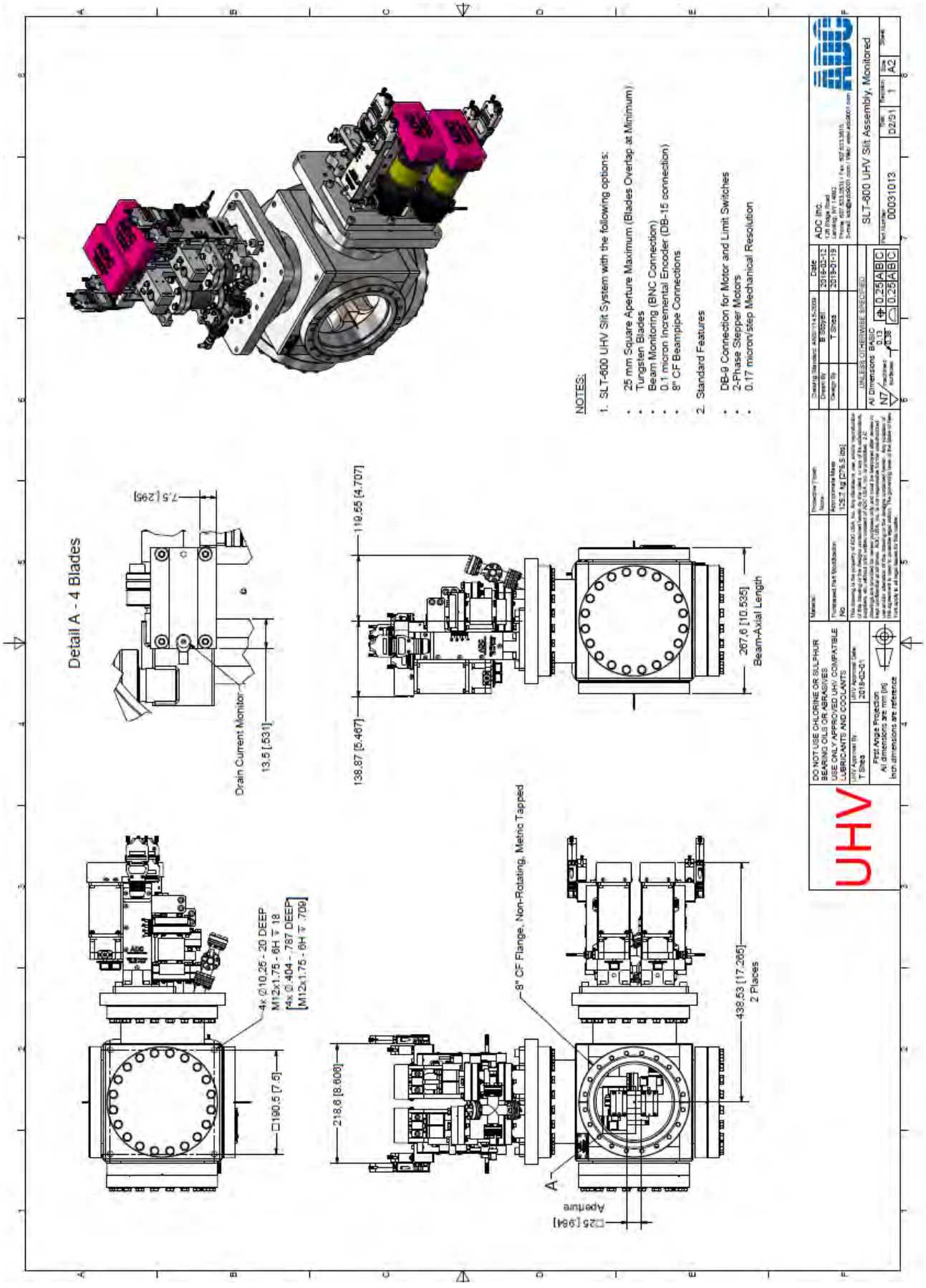
NOTE: ADC draws from an array of standard components to rapidly develop a reliable solution to each beamline's particular needs.

Characteristic	**Typical Values**
Aperture Size (Fully Open)	25, 50, 100 mm
Blade Overlap (Fully Closed)	20, 30, 50 mm
Blade Thickness	5, 10 mm
Blade Material	Tungsten Heavy Alloy (90%W, 95%W), Tantalum, Copper
Housing Axial Length	270, 318 mm
Beamline Interface	DN160, DN200 (or smaller with adapter)
Internal Environment	UHV ($<10^{-9}$ mbar)
Beam Monitoring	Available
Water Cooling	Available (Consult with ADC with Heat Loads)
Encoders	Renishaw Incremental or Absolute Linear Encoders
Motors	2-Phase Stepper Motors (5-Phase on Request)
Mechanical Resolution	0.17 µm / step
Other	-

Cooled

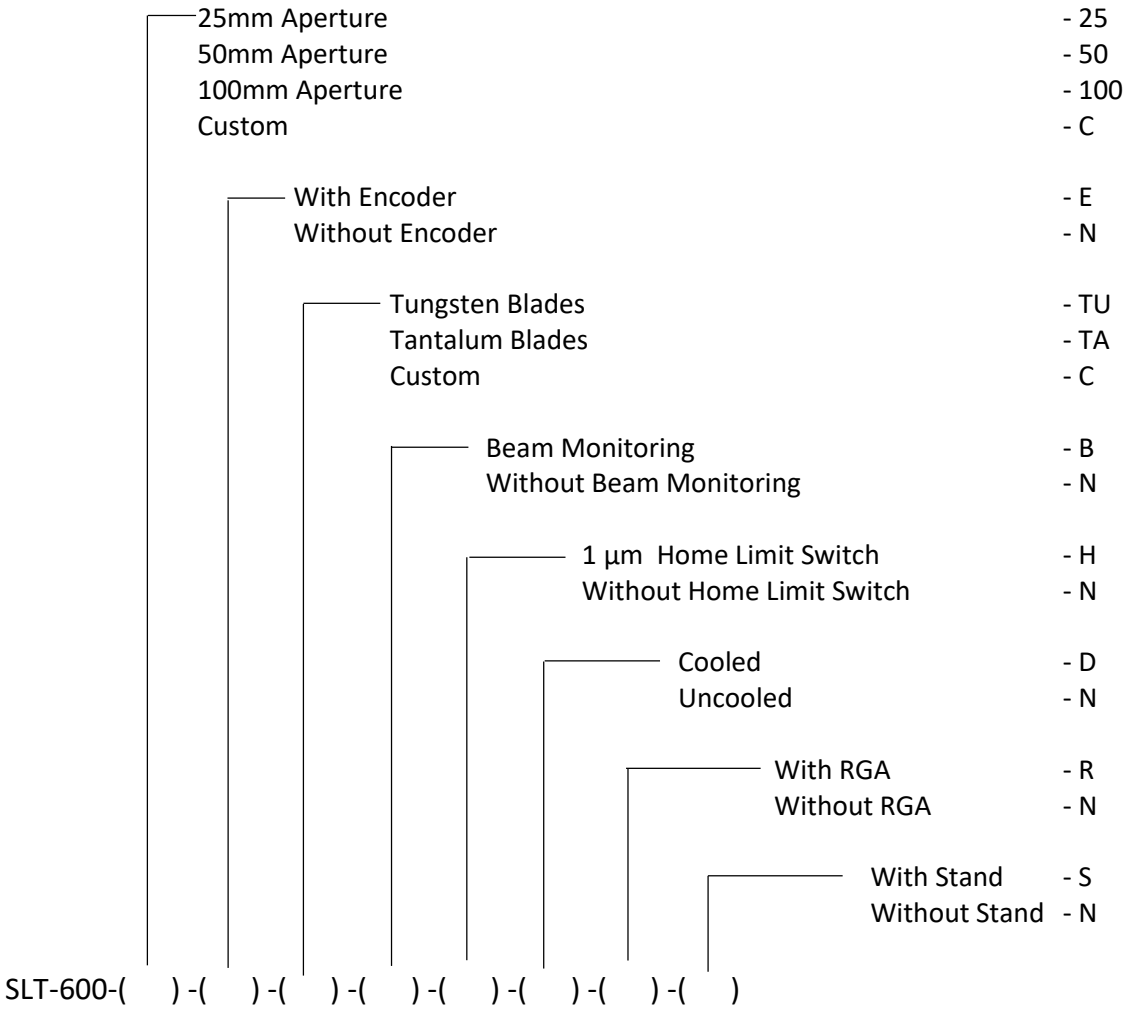

NOTES:
1. SLT-600 UHV Slit System with the following options:
• 25 mm Square Aperture Maximum (Blades Overlap at Minimum)
• Tungsten Blades
• Beam Monitoring (BNC connection)
• Water Cooling and Type K Thermocouples
• 0.1 micron Incremental Encoder (DB-15 connection)
• 8" CF Beamline Connections
2. 1/4" Stainless Steel Shielding Boxes, special request for 17-044
3. Standard Features
• DB-9 Connection for Motor and Limit Switches
• 2-Phase Stepper Motors
• 0.17 micron/step Mechanical Resolution
Detail A - 4 Blades
Drain Current Monitor
Thermocouple on far side
Labyrinth Overlap
Actuator Height
4 Places
Labyrinth Opening
Beam-Axial Length
4xØ10.25 - 20 DEEP
M12x1.75 - 6H ↧18
8" CF Flange, Non-Rotating, Metric Tapped
2 Places
Aperture
UHV
ADC Inc.
SLT-600 UHV Slit Assembly, Cooled, Monitored, with Shielding
000310I2

Uncooled


NOTES:
1. SLT-600 UHV Slit System with the following options:
• 25 mm Square Aperture Maximum (Blades Overlap at Minimum)
• Tungsten Blades
• Beam Monitoring (BNC Connection)
• 0.1 micron Incremental Encoder (DB-15 connection)
• 8" CF Beampipe Connections
2. Standard Features
• DB-9 Connection for Motor and Limit Switches
• 2-Phase Stepper Motors
• 0.17 micron/step Mechanical Resolution
Detail A - 4 Blades
Drain Current Monitor
7.5 [.295]
13.5 [.531]
119.55 [4.707]
138.87 [5.467]
267.6 [10.535]
Beam-Axial Length
4x Ø10.25 - 20 DEEP
M12x1.75 - 6H ∓ 18
[4x Ø.404 - .787 DEEP
[M12x1.75 - 6H ∓ .709]
□190.5 [7.5]
218.6 [8.606]
8" CF Flange, Non-Rotating, Metric Tapped
438.53 [17.265]
2 Places
A
□25 [.984]
Aperture
UHV
SLT-600 UHV Slit Assembly, Monitored
00031013
ADC Inc.

Ordering Information

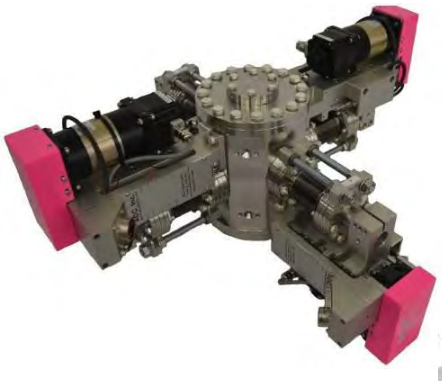
The SLT-600 can be ordered with different configurations. Please use the codes provided below when ordering. Please call or e-mail to ask about customization if your application requires it.



For example, a chamber configured with 25mm Apperture, with an Encoder, Tungsten Blades, 1 µm Home Limit Switch, Uncooled, without RGA and a Stand would be denoted by:
SLT-600-25-E-T-H-U-N-S

Custom Slit Projects

LSU-CAMD Water Cooled

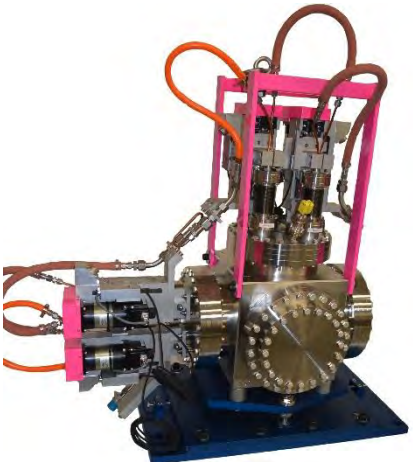


SwissFEL High Precision Slits – 45 Degree

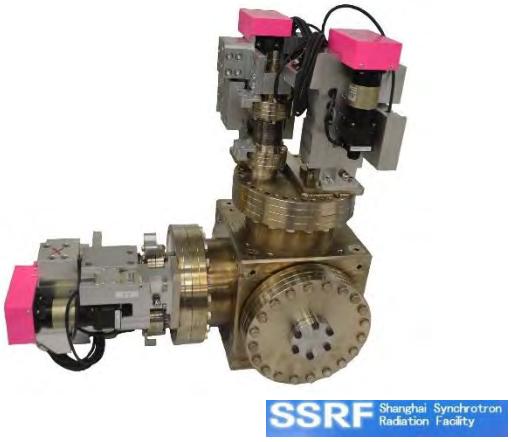
SwissFEL High Precision Slits – Curtain Design

Max IV Lab-Custom UHV Slit

ESRF-High Heat Load Slit



ESRF-High Heat Load UHV Slit System



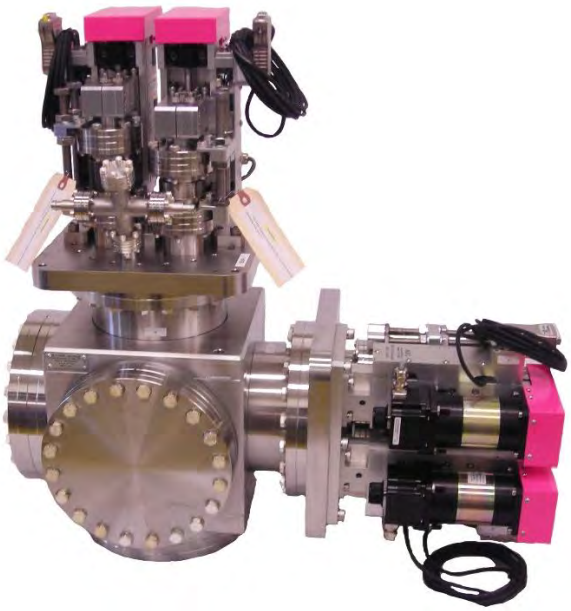
SSRF-Monochromatic UHV Slits

Berkley Lab-UHV Slit Cooled

Berkley Lab-UHV Slit Uncooled

Berkeley SLT-600 UHV Slit System

Customer:
Lawrence Berkeley National Laboratory
US Department of Energy
One Cyclotron Road
Berkeley, CA 94720

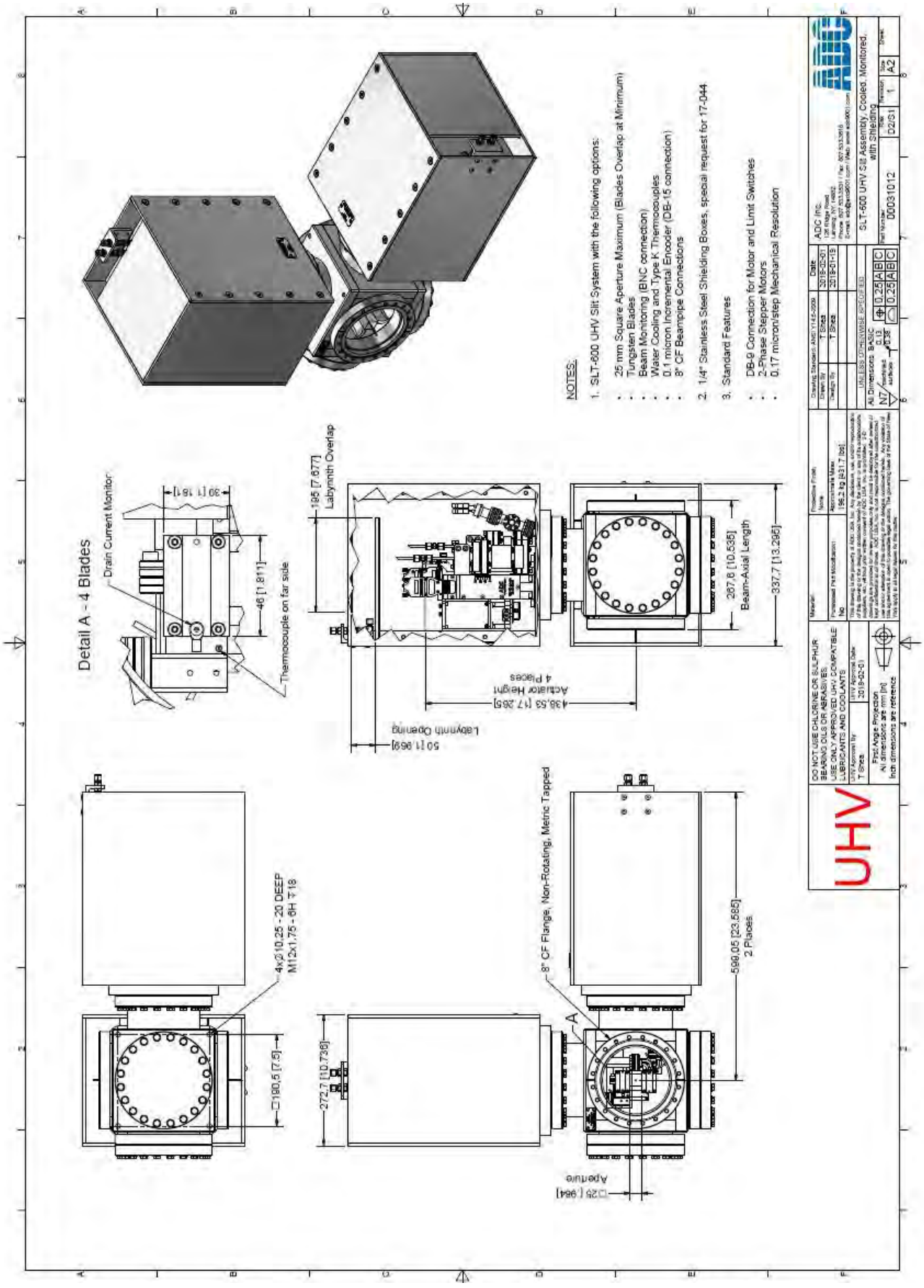


Two of ADC's SLT-600 UHV X-ray Slits were delivered to researchers at Lawrence Berkeley National Laboratory (LBNL) for adjustment of X-ray beam spot size and spot edge clarity in the Advanced Light Source (ALS) synchrotron. One slit system was equipped with water cooling, while the other was not. Both systems were equipped with drain current monitoring from the electrically isolated blades, allowing the position of the X-ray beam to be monitored from the intensity of radiation striking each of the four slit blades.

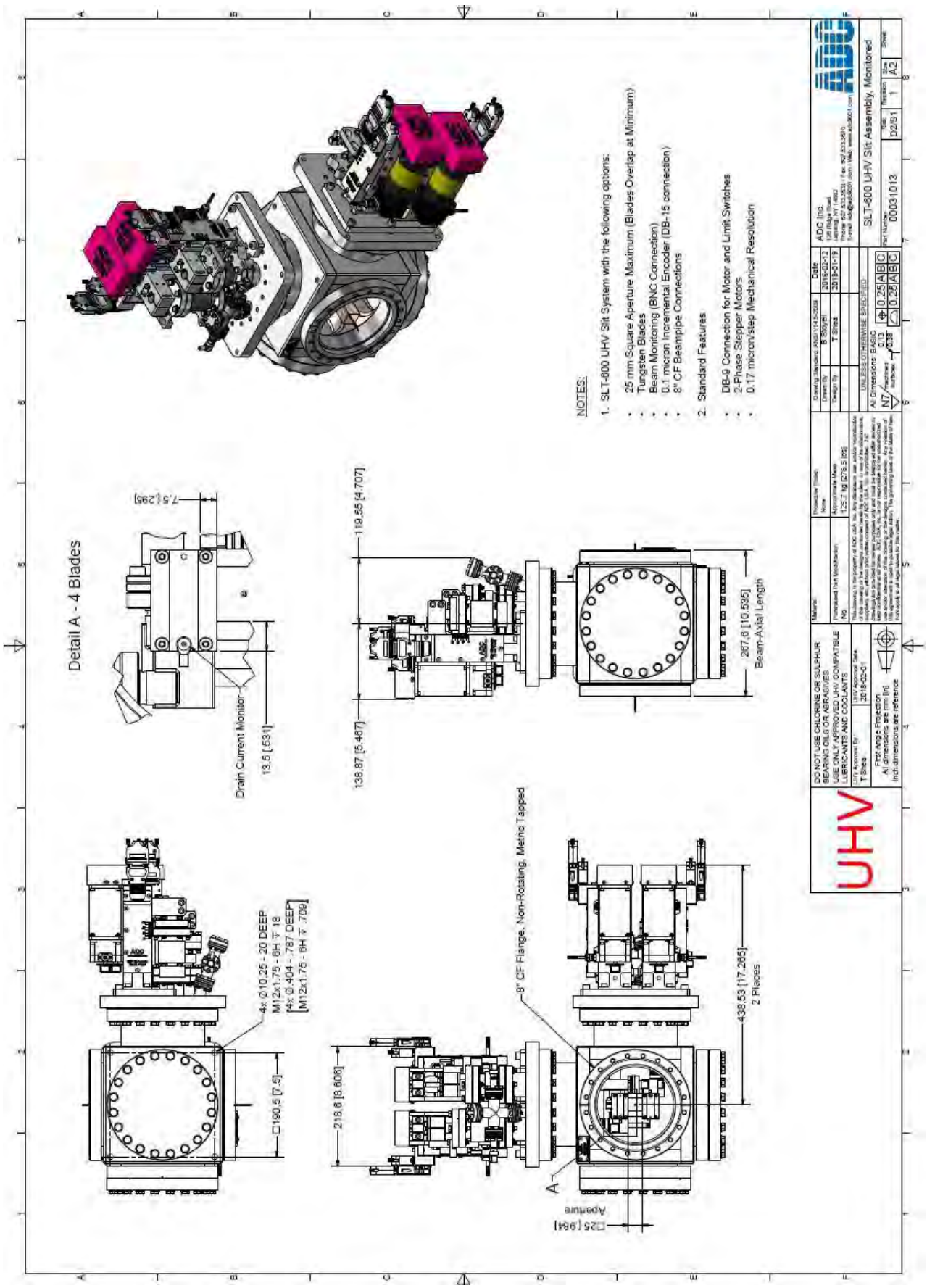
Key Specifications:

Description	Value
Aperture Maximum	25 mm Square
Aperture Minimum	Full Overlap
Encoder Resolution	0.1 µm
System Mass (Each)	180 kg
Flange Connection	8" CF (DN150)

Cooled


NOTES:
1. SLT-600 UHV Slit System with the following options:
• 25 mm Square Aperture Maximum (Blades Overlap at Minimum)
• Tungsten Blades
• Beam Monitoring (BNC connection)
• Water Cooling and Type K Thermocouples
• 0.1 micron Incremental Encoder (DB-15 connection)
• 8" CF Beamline Connections
2. 1/4" Stainless Steel Shielding Boxes, special request for 17-044
3. Standard Features
• DB-9 Connection for Motor and Limit Switches
• 2-Phase Stepper Motors
• 0.17 micron/step Mechanical Resolution
Detail A - 4 Blades
Drain Current Monitor
Thermocouple on far side
30 [1.181]
46 [1.811]
185 [7.677]
Labyrinth Overlap
287,8 [10.535]
Beam-Axial Length
337,7 [13.295]
Actuator Height
4 Places
Labyrinth Opening
4xØ10.25 - 20 DEEP
M12x1.75 - 6H ↧18
□180,5 [7.5]
272,7 [10.736]
8" CF Flange, Non-Rotating, Metric Tapped
596,05 [23.585]
2 Places
Aperture
UHV
SLT-600 UHV Slit Assembly, Cooled. Monitored. with Shielding
ADC Inc.
Part Number
00031012
Size
A2
Sheet
1/1

Uncooled

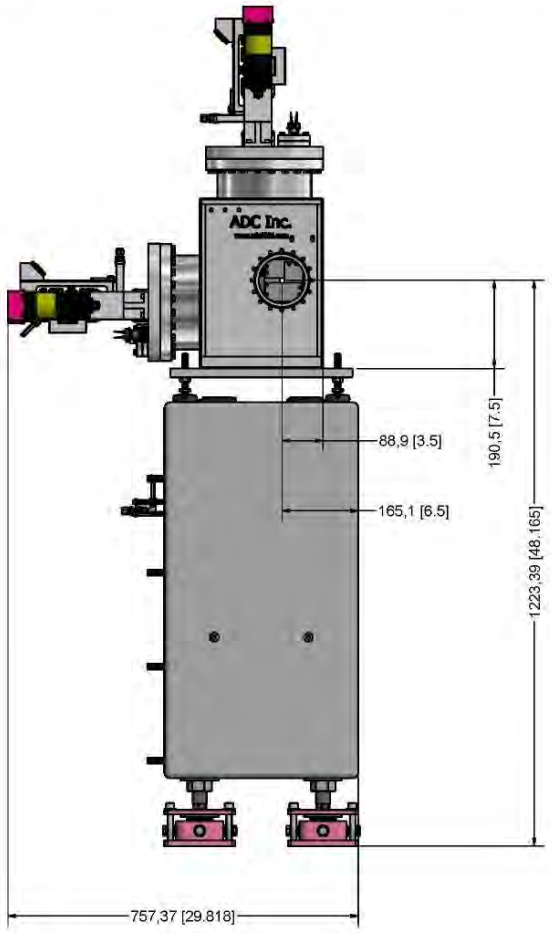

NOTES:
1. SLT-800 UHV Slit System with the following options:
• 25 mm Square Aperture Maximum (Blades Overlap at Minimum)
• Tungsten Blades
• Beam Monitoring (BNC Connection)
• 0.1 micron Incremental Encoder (DB-15 connection)
• 8" CF Beampipe Connections
2. Standard Features
• DB-9 Connection for Motor and Limit Switches
• 2-Phase Stepper Motors
• 0.17 micron/step Mechanical Resolution
Detail A - 4 Blades
Drain Current Monitor
13.6 [.531]
7.5 [.295]
119.55 [4.707]
138.87 [5.467]
267.6 [10.535]
Beam-Axial Length
4x Ø10.26 - 20 DEEP
M12x1.75 - 6H ↧ 18
[4x Ø.404 - .787 DEEP
M12x1.75 - 6H ↧ .709]
□190.5 [7.5]
8" CF Flange, Non-Rotating, Metric Tapped
438.53 [17.265]
2 Places
218.6 [8.606]
Aperture
□25 [.984]
UHV
SLT-800 UHV Slit Assembly, Monitored
ADC (Inc.)
00031013

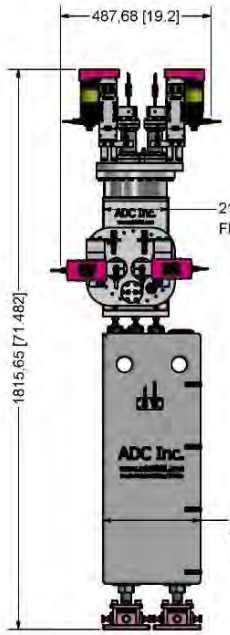
LSU/CAMD Water Cooled UHV Slit

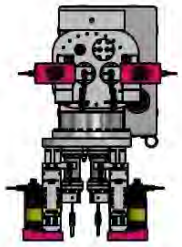
Customer:
LSU/CAMD
Kyungmin Ham
6980 Jefferson Hwy
Baton Rouge, LA 70806

ADC designed a custom UHV, high precision, and water-cooled slit for LSU CAMD. The slit has 4 independent blades with a maximum aperture of 50 mm x 50 mm. The cooling system is designed to handle a 1.5 kW heat load when supplied with 20˚C water. The slit also features 0.2 µm resolution, a 1 µm home limit switch, absolute encoders, and beam monitoring. Finally, the slit features a custom chamber, actuator system, and stand that allow the slit to fit into the tight space constraints where it will be installed at CAMD. The most challenging aspect of the design was to fit the slit into the required space constraints. For this reason, the chamber and the blades were designed first to create a chamber that was large enough to fit the blades over the entire range of motion and small enough to fit into the available space. Once, these components were designed, an actuator system was developed to control the motion of the blades. Finally, the stand, controller, and connectors were added to finish the design.

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2015-10-05	B Hoza







Specifications:

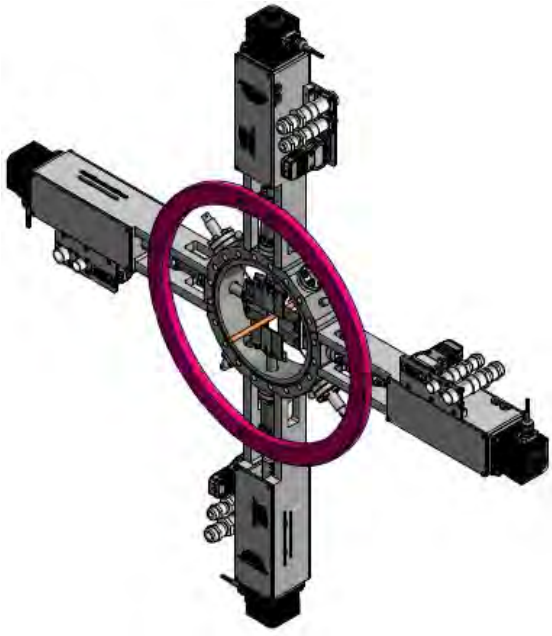
1. Maximum Aperture: 50mm x 50mm
2. Maximum Blade Overlap: 40mm
3. Approximate Weight: 500kg [1100 lbs]
4. Designed Heat Load: 1.5kW

First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date	ADC Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3619 E-mail: adc@adc9001.com / Web: www.adc9001.com
	Drawn By: brian.hoza	10/5/2015	
	Design by: B Hoza	9/15/2015	
Material:	Protective Finish: None		LSU SLT-600-C Assembly
UNLESS OTHERWISE SPECIFIED: All Dimensions BASIC; N7 machined surfaces; 0,13 / 0,38; 0,25 A B C; 0,25 A B C			Part Number: 2D Overview; Risk: D2/S1; Revision: 0; Size: A2; Sheet: 1 / 1

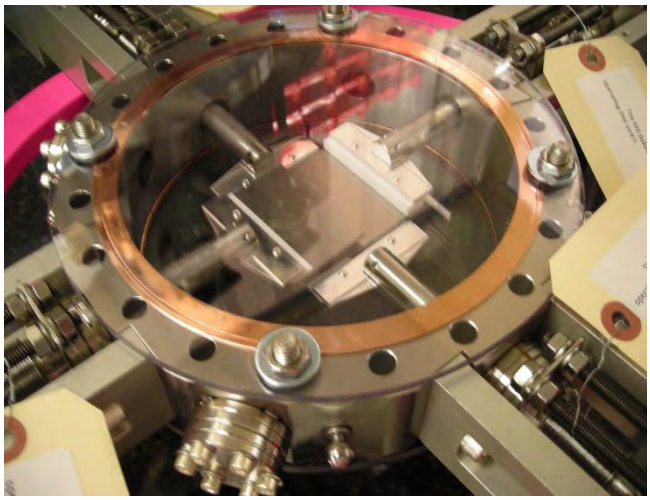
Purchased Part Modification: No

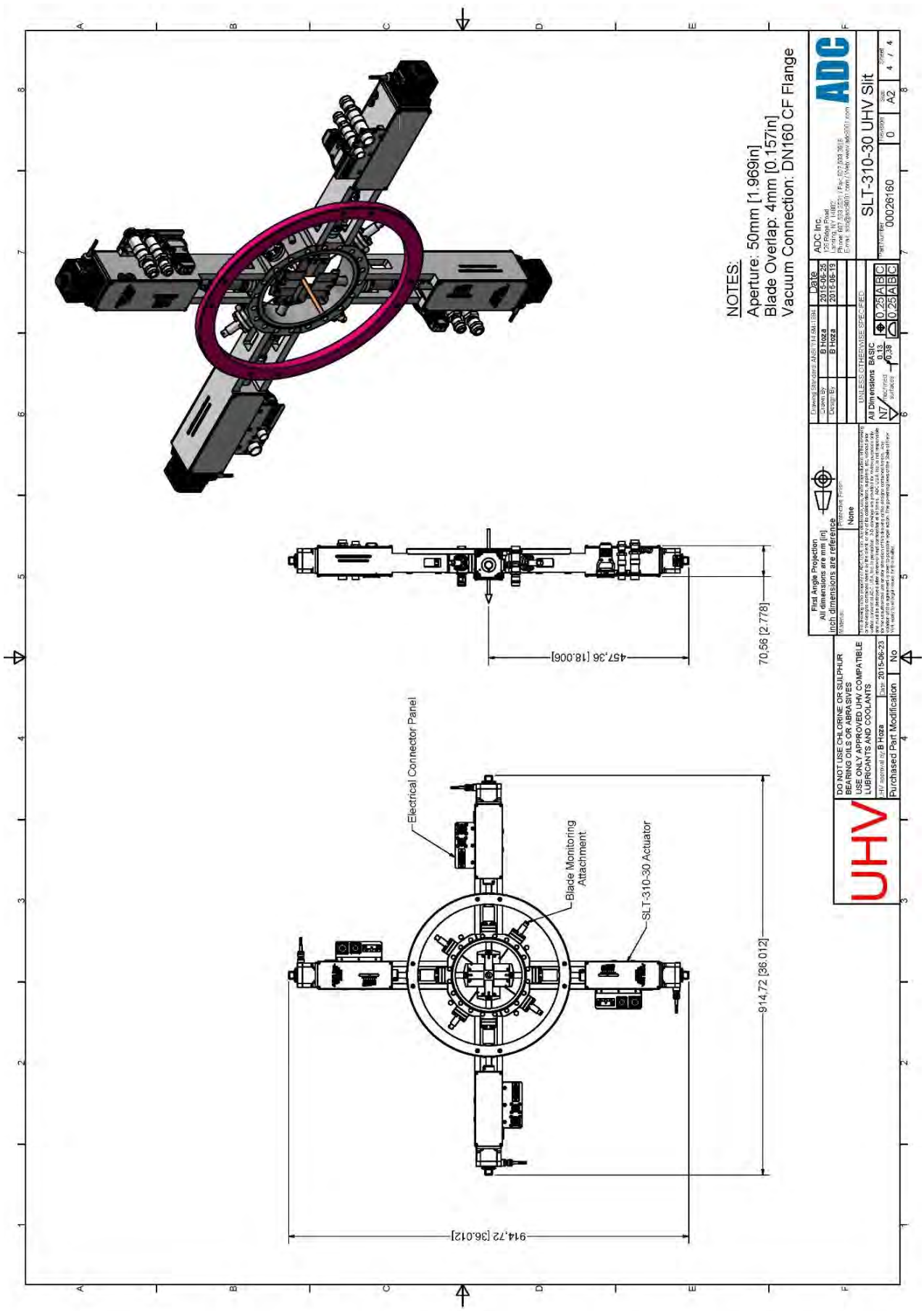
APS UHV High Precision Slit

Customer:
Argonne National Laboratory
9700 S. Cass Ave
Lemont, IIL 60439



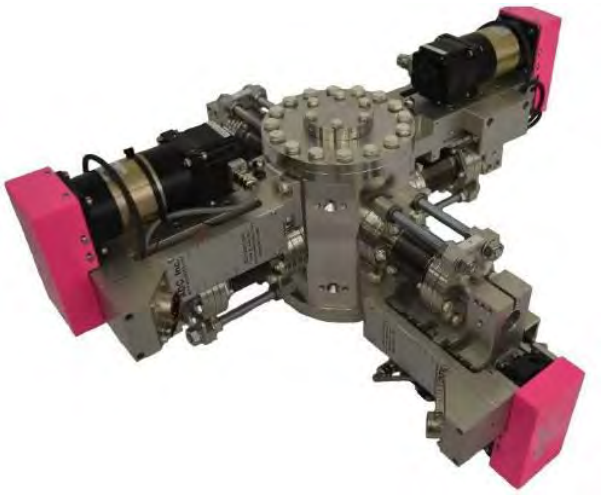
This slit system was designed for UHV and can be used for apertures up to 50 mm x 50 mm. Blades are actuated independently by 4 actuators mounted on the slit body. This slit system was designed to be robust and easily serviceable. The slits unit consists of vertical and horizontal slit mechanisms, a vacuum vessel which houses them, connected to the individual blades, micro-stepper motors with linear encoders, mechanical limit switches, and electrical connections including internal wiring for drain current measurement system. Scintillation crystals processed to a thin flat surface plate are used to create excellent imaging screens with high spatial resolution. There are four fiducial marks provided per slit unit. All UHV sections are vacuum rated for better than $5x10^{-10}$ mbar and have a leak rate of less than $1x10^{-9}$ mbar-l/s.

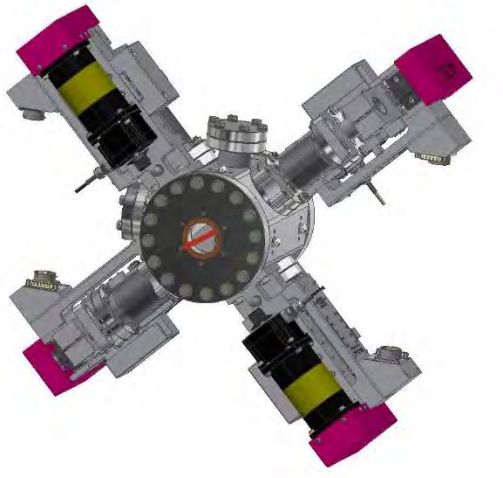



NOTES:
Aperture: 50mm [1.969in]
Blade Overlap: 4mm [0.157in]
Vacuum Connection: DN160 CF Flange
457,36 [18.006]
70,56 [2.778]
Electrical Connector Panel
Blade Monitoring Attachment
SLT-310-30 Actuator
914,72 [36.012]
914,72 [36.012]
SLT-310-30 UHV Slit
00026160
ADC Inc.
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Purchased Part Modification
B Hoza
2015-06-23
No

SwissFEL High Precision Slits – 45 Degree

Customer:
Paul Scherrer Institut
Warenannahme Ost
CH-5232 Villigen; Switzerland





This SwissFEL design produces FEL pulses covering the wavelength range 1 Å to 70 Å (0.1–7 nm) with a compact and economic design. The restrictions on installation space for the slit required the actuators to be oriented at a 45° angle from vertical with concomitant 45° angled aperture blades. This custom high precision slit was designed for UHV that can be used for apertures up to 25 mm x 25 mm. The allowable gap for the slit is 25 mm max with 5 mm allowable blade overlap. Both the gap and scan axes feature burgess limit switches. Each axis is also encoded using a Renishaw incremental encoder. All actuator components (bearing rails, ball screws, limit switches, encoders) are located outside of the UHV chamber. This eliminates the need for special lubricants on the actuator bearings. It also allows for the actuators to be adjusted, aligned, and serviced with the system installed on the beamline. A rigid connection between the slit blade and the actuator guarantees that encoder readings at the actuator are accurate.

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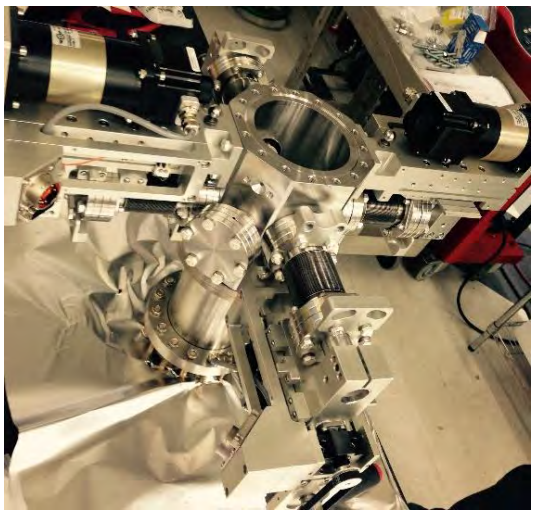
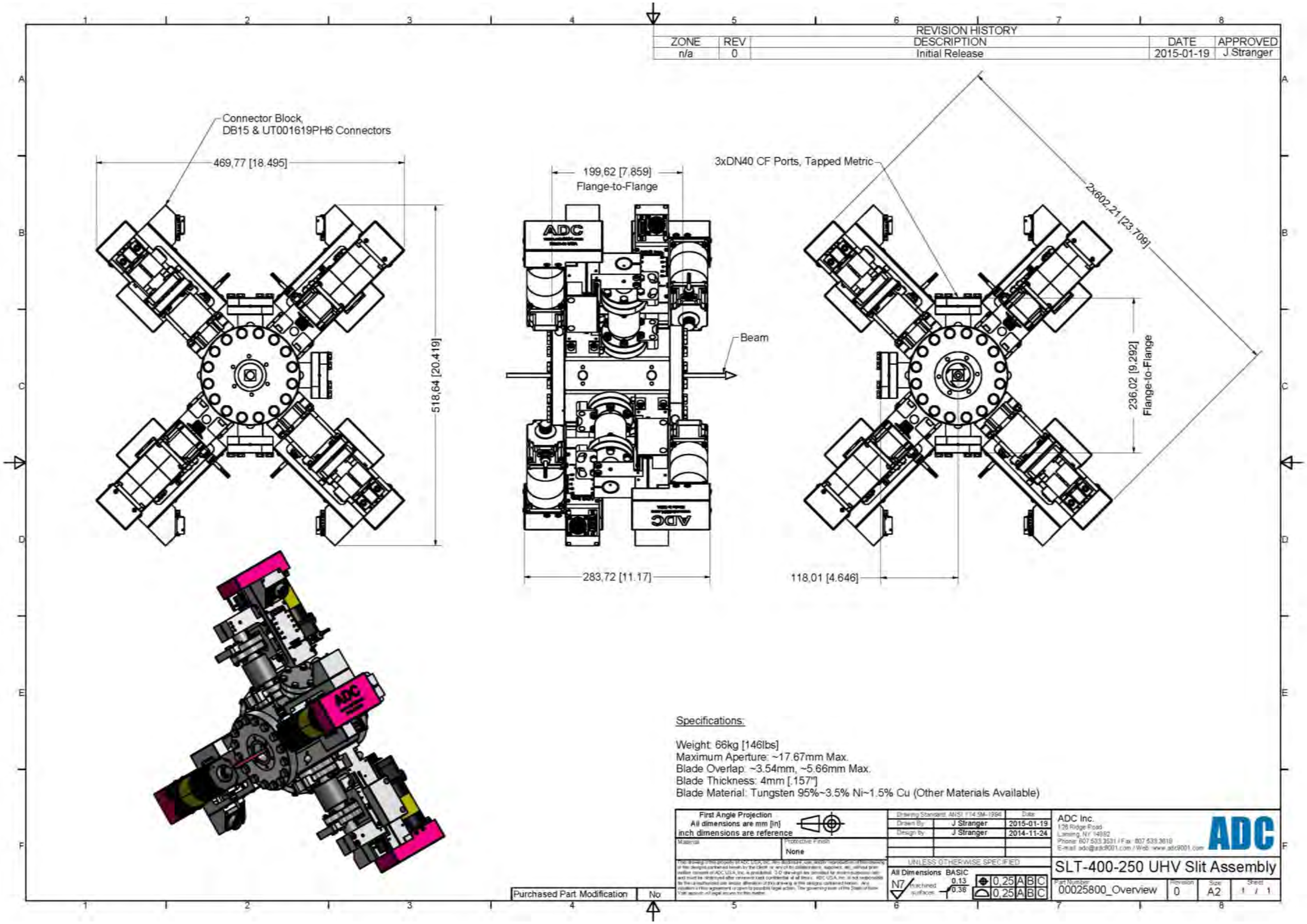
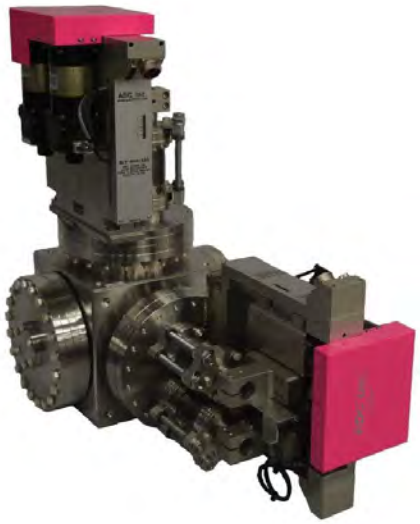
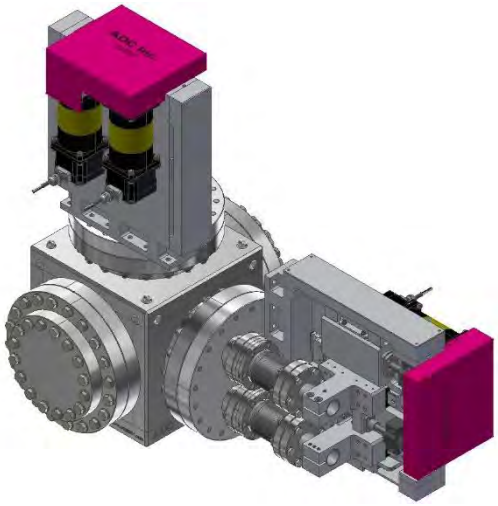



REVISION HISTORY
ZONE REV DESCRIPTION DATE APPROVED
n/a 0 Initial Release 2015-01-19 J Stranger
Connector Block,
DB15 & UT001619PH6 Connectors
469,77 [18.495]
518,64 [20.419]
199,62 [7.859]
Flange-to-Flange
3xDN40 CF Ports, Tapped Metric
2x602,21 [23.709]
Beam
236,02 [9.292]
Flange-to-Flange
283,72 [11.17]
118,01 [4.646]
Specifications:
Weight: 66kg [146lbs]
Maximum Aperture: ~17.67mm Max.
Blade Overlap: ~3.54mm, ~5.66mm Max.
Blade Thickness: 4mm [.157"]
Blade Material: Tungsten 95%~3.5% Ni~1.5% Cu (Other Materials Available)
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
None
Drawn By J Stranger 2015-01-19
Design By J Stranger 2014-11-24
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
ADC Inc.
SLT-400-250 UHV Slit Assembly
00025800_Overview
0
A2
1 / 1
Purchased Part Modification
No

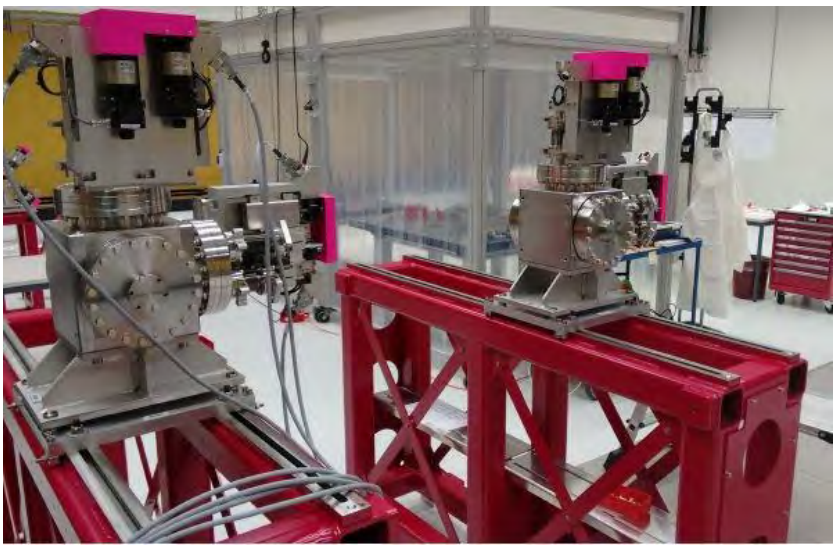
SwissFEL High Precision Slits – Curtain Design

Customer:
Paul Scherrer Institut
Warenannahme Ost
CH-5232 Villigen; Switzerland

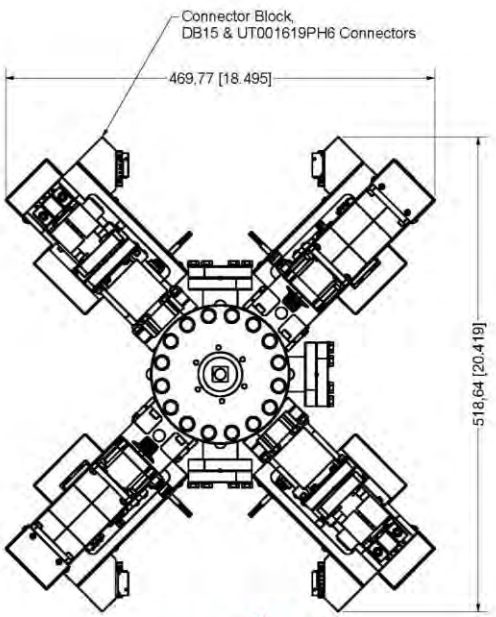


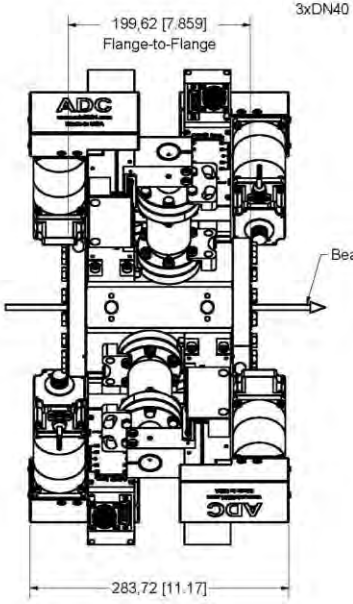


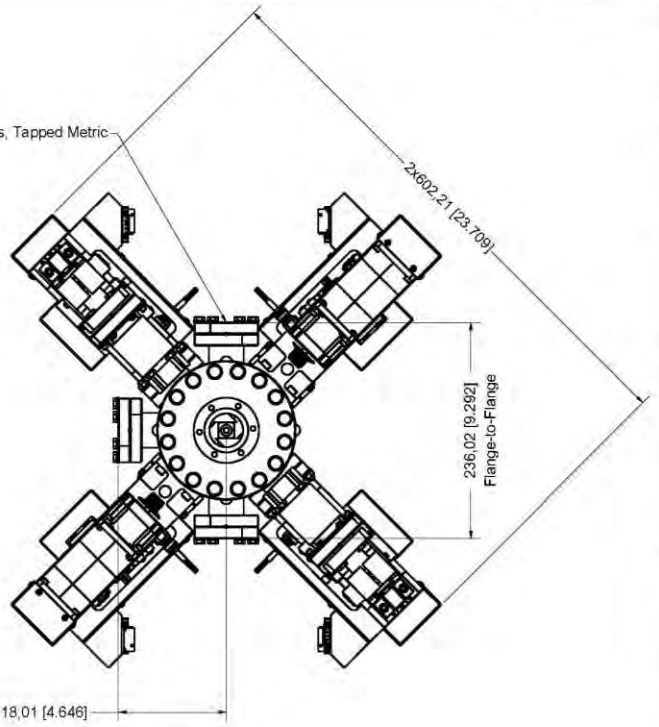
This SwissFEL design produces FEL pulses covering the wavelength range 1 Å to 70 Å (0.1–7 nm) with a compact and economic design. This custom high precision slit was designed for UHV that can be used for apertures up to 25 mm x 25 mm. The allowable gap for the slit is 25 mm max with 5 mm allowable blade overlap. Both the gap and scan axes feature burgess limit switches. Each axis is also encoded using a Renishaw incremental encoder. All actuator components (bearing rails, ball screws, limit switches, encoders) are located outside of the UHV chamber. This eliminates the need for special lubricants on the actuator bearings. It also allows for the actuators to be adjusted, aligned, and serviced with the system installed on the beamline. A rigid connection between the slit blade and the actuator guarantees that encoder readings at the actuator are accurate.

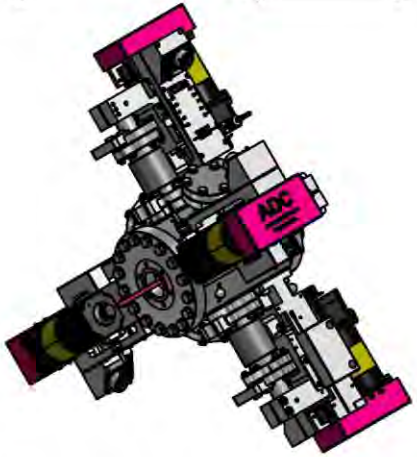


REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2015-01-19	J Stranger









Specifications:

Weight: 66kg [146lbs]
Maximum Aperture: ~17.67mm Max.
Blade Overlap: ~3.54mm, ~5.66mm Max.
Blade Thickness: 4mm [.157"]
Blade Material: Tungsten 95%~3.5% Ni~1.5% Cu (Other Materials Available)

First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date	ADC Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3631 / Fax: 607.533.3818 E-mail: adc@adc9001.com / Web: www.adc9001.com
	Drawn By: J Stranger	2015-01-19	
	Design by: J Stranger	2014-11-24	
Material:	Protective Finish: None		
This drawing is the property of ADC USA, Inc. Any disclosure, use, and/or reproduction of this drawing or the designs contained herein by the client or any of its collaborators, suppliers, etc., without prior written consent of ADC USA, Inc. is prohibited. 2-D drawings are provided for review purposes only and must be destroyed after review or kept confidential at all times. ADC USA, Inc. is not responsible for the unauthorized use and/or alteration of this drawing, or the designs contained herein. Any violation of this agreement is subject to possible legal action. The governing laws of the State of New York apply to all legal issues for this matter.	UNLESS OTHERWISE SPECIFIED All Dimensions BASIC N7 machined surfaces 0.13 / 0.38 0,25 A B C 0,25 A B C		SLT-400-250 UHV Slit Assembly Part Number: 00025800_Overview Revision: 0 Size: A2 Sheet: 1 / 1

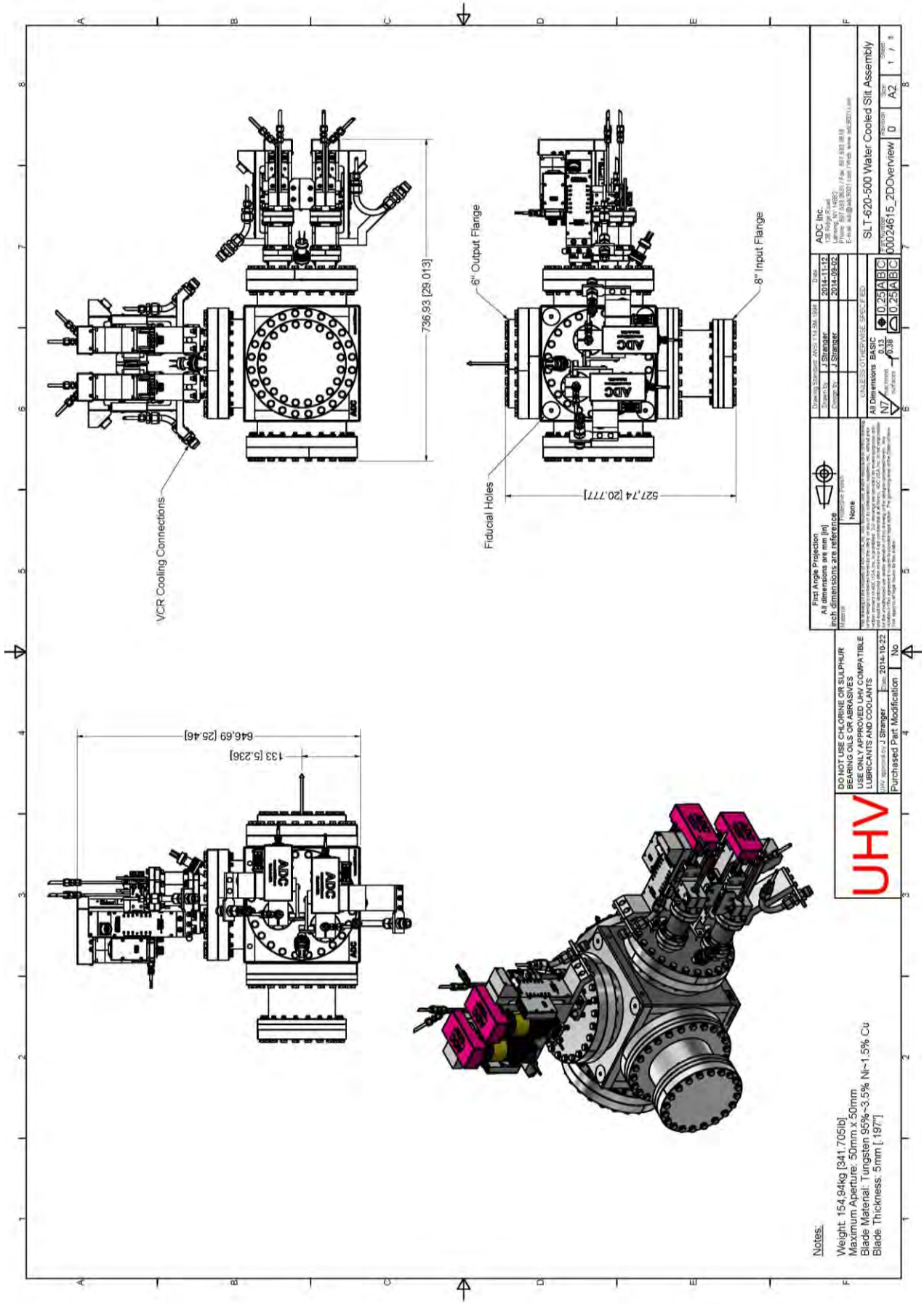
Purchased Part Modification	No

High Heat Load Slit for ESRF

Customer:
European Synchrotron Radiation Facility
71 Avenue des Martyrs, 38000
Grenoble, France

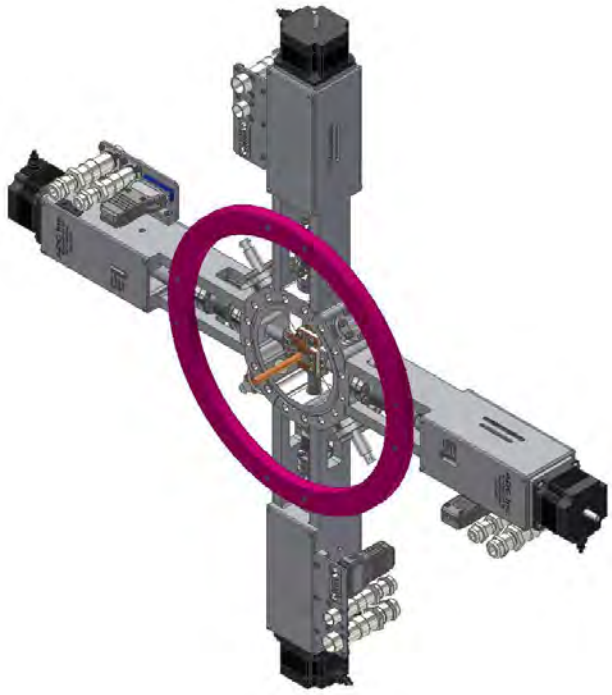
The high precision slit system is designed for UHV and can be used for apertures up to 25 mm x 25 mm. Blades are actuated independently by 4 actuators mounted on the slit body. This slit system was designed to be robust and easily serviceable. All actuator components (bearing rails, limit switches, encoders, and ball screws) are located outside of the UHV chamber. This eliminates the need for special lubricants on the actuator bearings. It also allows for the actuators to be adjusted, aligned, and serviced with the system installed on the beamline. A rigid connection between the slit blade and the actuator guarantees that encoder readings at the actuator are accurate.

Description	Value
Aperture Maximum	25 mm Square
Aperture Minimum	8 mm Square
Flange Connection	2 ¾” CF (DN40)

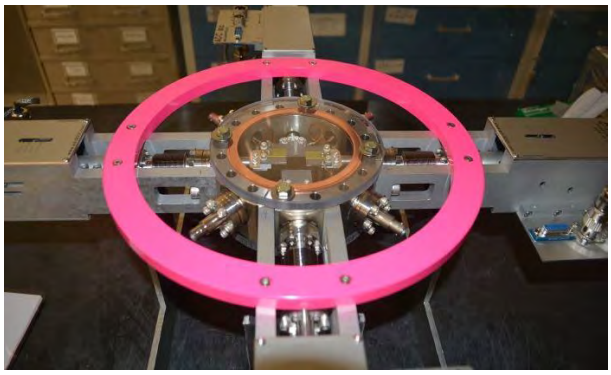

736.93 [29.013]
VCR Cooling Connections
6" Output Flange
8" Input Flange
Fiducial Holes
527.74 [20.777]
646.69 [25.46]
133 [5.236]
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Purchased Part Modification
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
ADC Inc.
All Dimensions BASIC
SLT-620-500 Water Cooled Slit Assembly
00024615_2DOverview
Notes:
Weight: 154.94Kg [341.705lb]
Maximum Aperture: 50mm x 50mm
Blade Material: Tungsten 95%~3.5% Ni~1.5% Cu
Blade Thickness: 5mm [.197"]

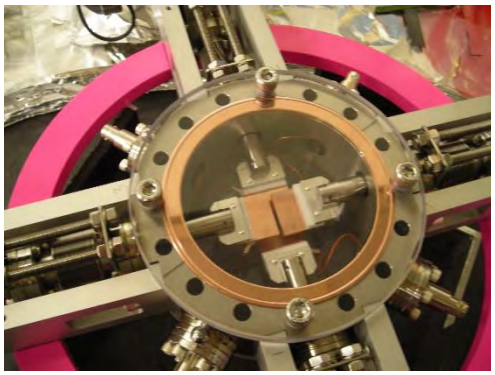
DLS UHV Slit System with YAG Crystal

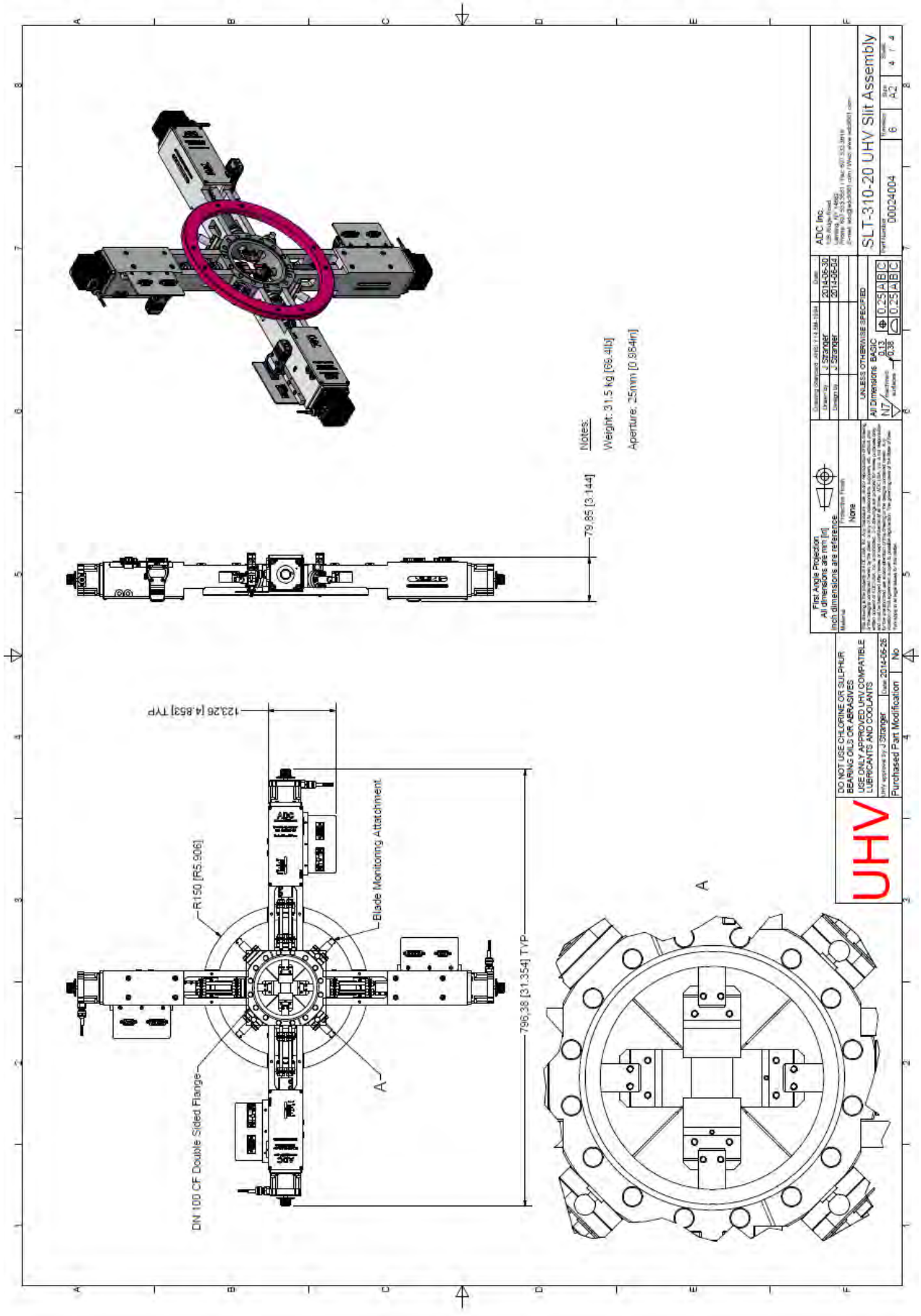
Customer:
Diamond Light Source Limited
Harwell Science & Innovation Campus
DIDCOT, Oxon OX11 0DE; UK



This high precision slit system is designed for apertures up to 25 mm x 25 mm. Each blade is actuated independently by the 4 actuators mounted to the slit body. This slit system is designed to be especially easy to service. There are no bearing rails, limit switches, encoders, or drive screws within the slit chamber. This eliminates the need for special lubricants and allows the actuators to be adjusted, aligned, and serviced with the system installed in the beamline. This slit application required using a fluorescent screen consisting of a single crystal YAG (Yttrium Aluminum Garnet) fixed to the vertical upper and lower blades. Each slit unit has 4 fiducial marks provided. All UHV sections are vacuum tested to better than $5x10^{-10}$ torr and have a leak rate of less than $2x10^{-10}$ mbar-l/s. Blades are available in Tungsten, Tantalum, and Copper.

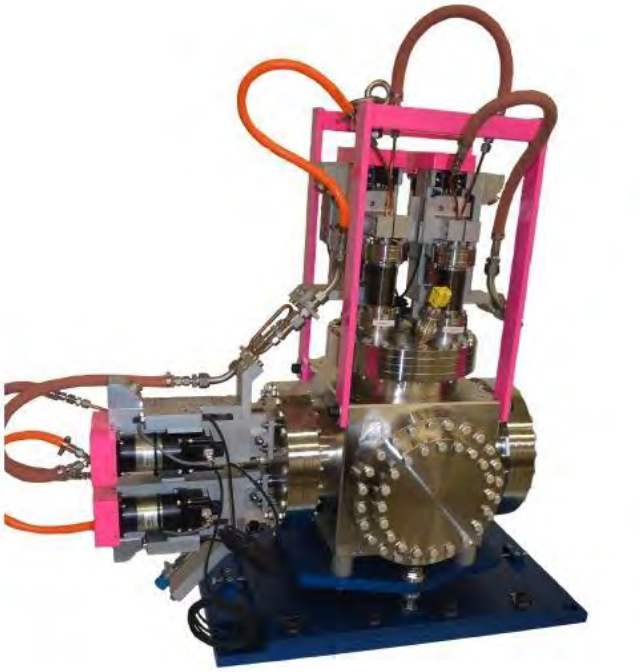




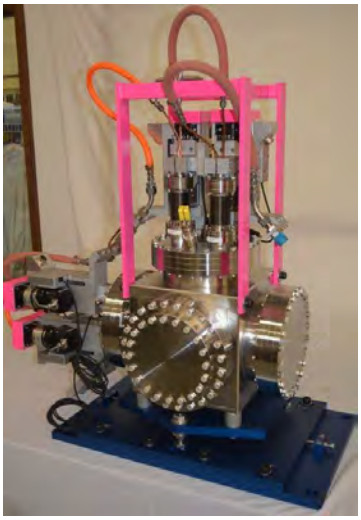

SLT-310-20 UHV Slit Assembly
ADC Inc.
00024004
Notes:
Weight: 31.5 kg [69.4lb]
Aperture: 25mm [0.954in]
79.85 [3.144]
123.26 [4.853] TYP
R150 [R5.906]
Blade Monitoring Attatchment
DN 100 CF Double Sided Flange
796.38 [31.354] TYP
A
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Purchased Part Modification
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
First Angle Projection
All dimensions are mm [in]
Inch dimensions are reference

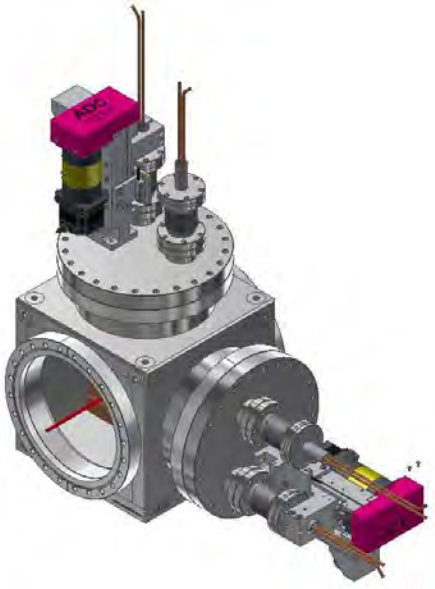
High Heat Load UHV Slit System for ESRF ID11 Pinhole Monochromator

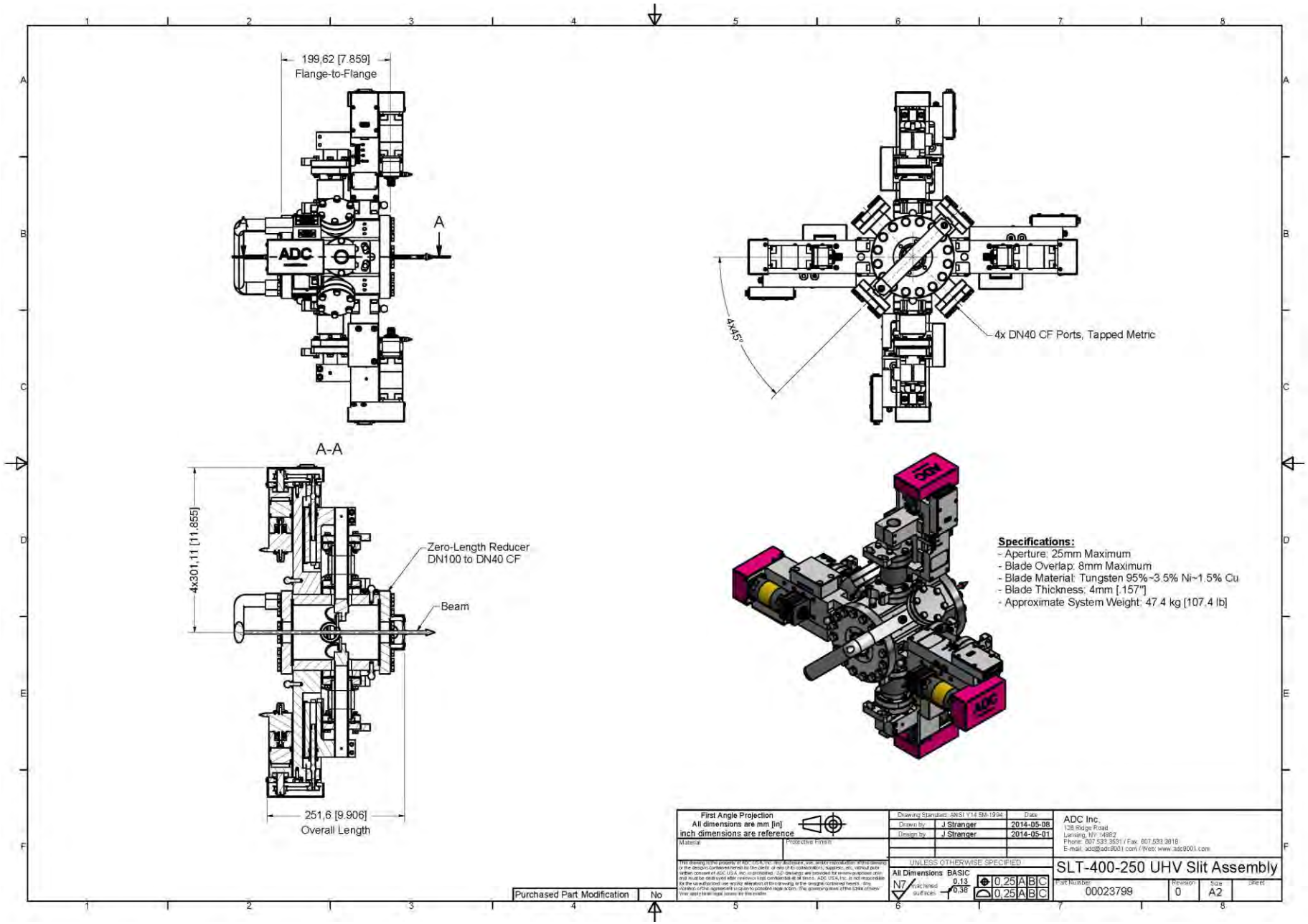
Customer:
European Synchrotron Radiation Facility
71 Avenue des Martyrs, 38000
Grenoble, France



The high heat load precision UHV slit system was designed and built for ID11 beamline at the ESRF. The white beam from the undulator source is collimated by a fixed aperture and then focused by compound refractive lenses (transfocator: variable number of refractive lenses according to the beam energy to be focused). The slit used as “Pinhole monochromator” is located at the beam focus point which is about 10 microns in size for the chosen X-ray energy. ID11 is a beamline dedicated to moderate to high energy diffraction imaging studies of a variety of systems of interest for their physical, mechanical, or chemical properties. Very high spatial (<100 nm) and time (1 ms) resolution are achieved.



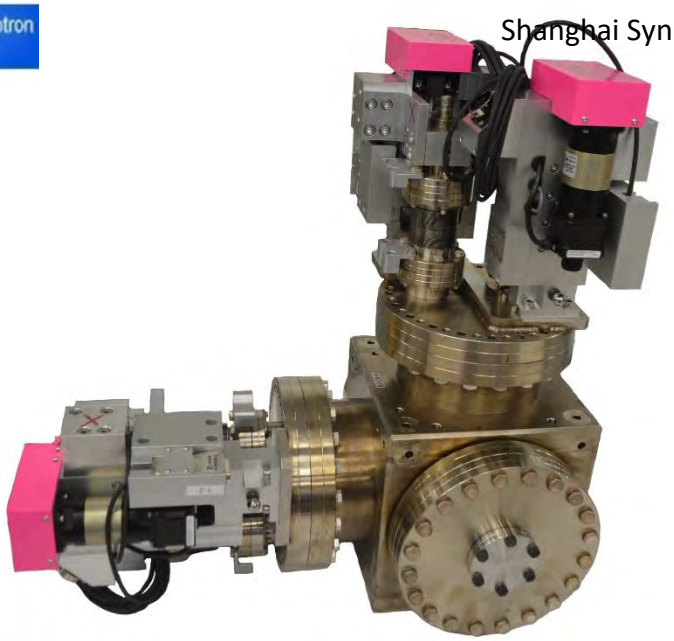




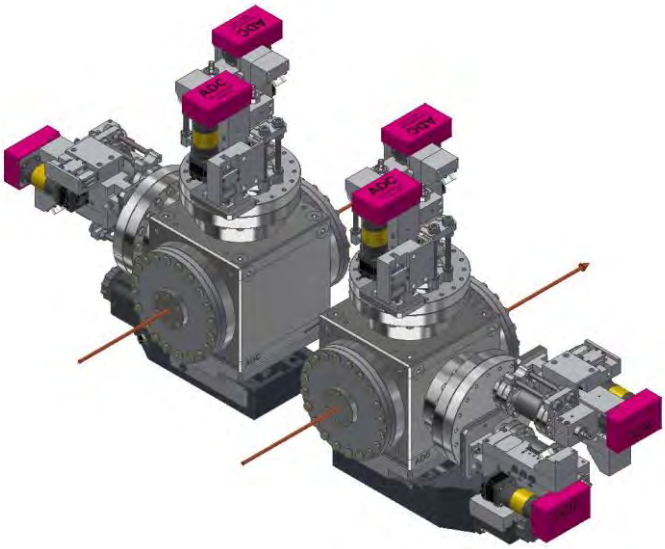
www.adc9001.com

SSRF Monochromatic UHV Slits for BL02B

Customer:
Shanghai Synchrotron Radiation Facility
239 Zhangheng Rd
Xinqu at Pudong, China
201203, China



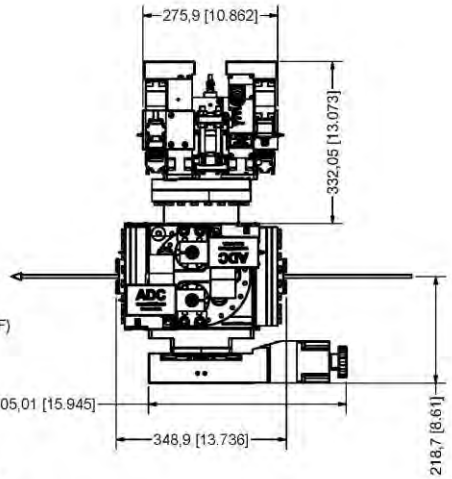
This slit system designed for BL02B at SSRF in China consists of two copies of a reversible slit (new standard product SLT-610-250) and two horizontal linear translation stages (DS-400-50 stages). The slits are reversible to allow for the required 400 mm spacing between the x-ray beams where the slits will be installed. Each slit contains four electrically isolated tantalum blades moved independently by four of ADC's rugged external actuators originally developed for a project for MAX IV in Sweden. The blade monitoring wires run through the support structure holding each blade and up to a BNC connection near the top of the actuator. The actuator itself uses a size 16, 12-pinavionics connector (other connectors available on request) for the motor, limit switches, and home switch. The relative encoder uses the Renishaw TONiC interface on a DB-15 connector (other encoders available on request). The chamber is made of welded inch thick stainless-steel plates and has two rotating DN150 flanges for the blade units and two non-rotating DN150 flanges for beamline connections. For BL02B, a zero-length reducer is used to convert the DN150 down to a DN35 connection into the beamline. Each pair of actuators and blades, one horizontal and one vertical, is mounted on a DN150 (8" CF) rotating flange which allows for the beam direction to be changed easily and facilitates maintenance since the actuator and blade unit can be removed while the chamber remains in the beamline.

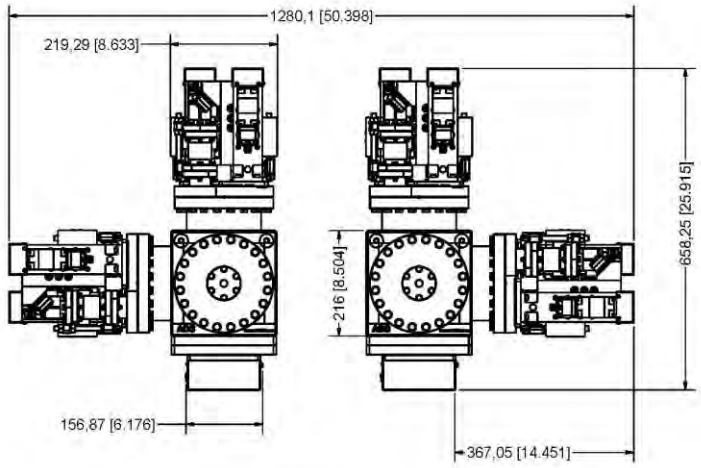


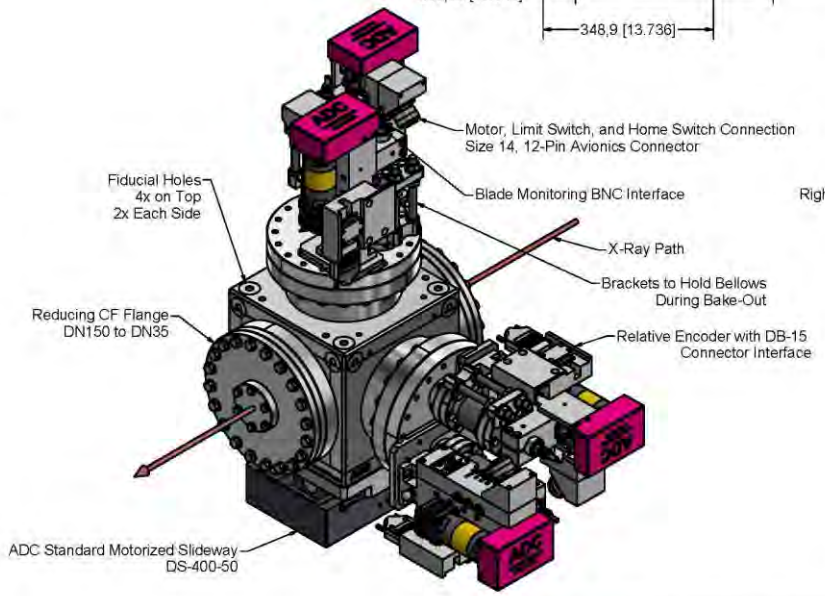
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2014-07-07	T.Shea

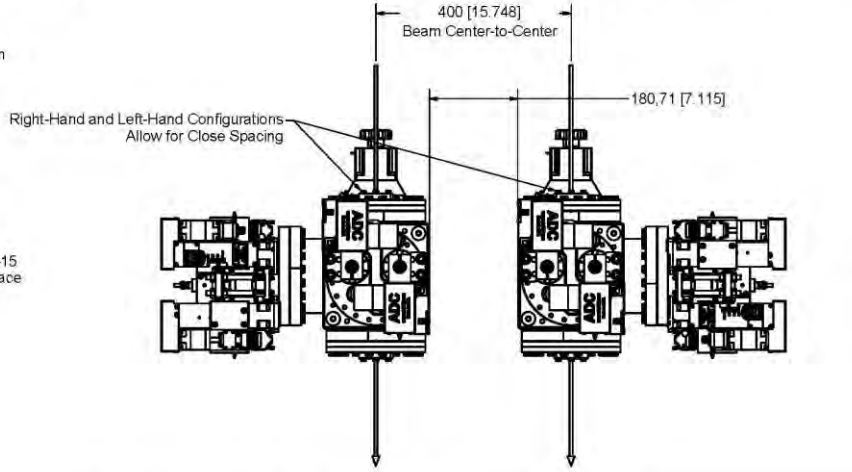
Notes:

1. Slits consist of identical parts, but are easily configured to right-hand or left-hand arrangements
2. Aperture:
   25 mm open to 20 mm overlap Horizontal
   25 mm open to 20 mm overlap Vertical
   0.1 μm resolution
   0.02 μm encoder resolution (Relative Encoder)
   Tantalum Blades
3. System mass/weight:
   90 kg (198 lb) per slit
   9 kg (20 lb) per slide
   198 kg (436 lb) total
4. Vacuum connection:
   2 non-rotating DN150 (8" CF) flanges on chamber
   2 zero-length reducers, DN150 to DN35 (8" CF to 2 3/4" CF)









UHV

DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS

UHV approval by: T.Shea Date: 2014-07-07

Purchased Part Modification: No

First Angle Projection
All dimensions are mm [in]
inch dimensions are reference

Material: | Protective Finish: None

Drawing Standard: ANSI Y14.5M-1994

		Date
Drawn by	T.Shea	2014-07-07
Design by	T.Shea	2014-07-03

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0.13 / 0.38
0.25 A B C
0.25 A B C

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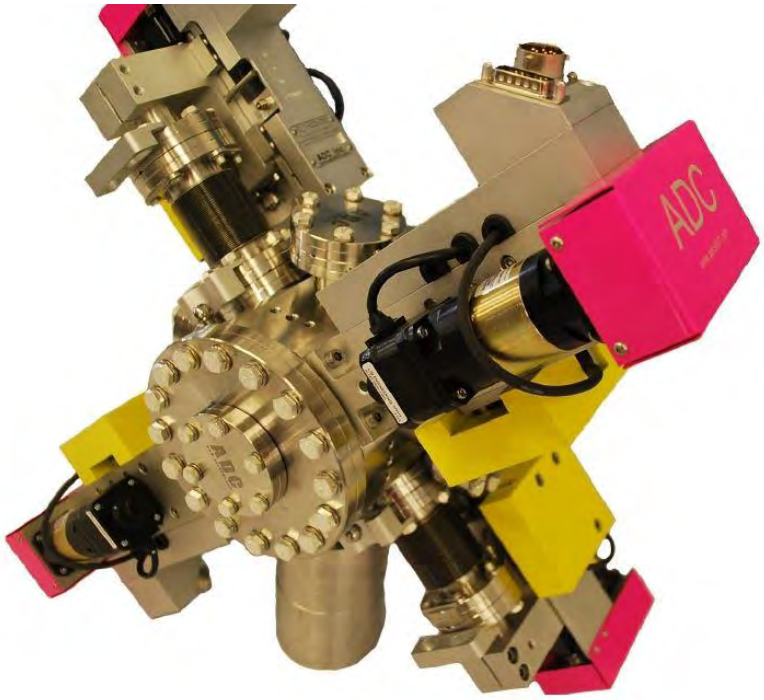
ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607 533 3531 / Fax: 607 533 3818
E-mail: adc@adc9001.com / Web: www.adc9001.com

UHV Monochromatic Mounted Slit Pair Assembly

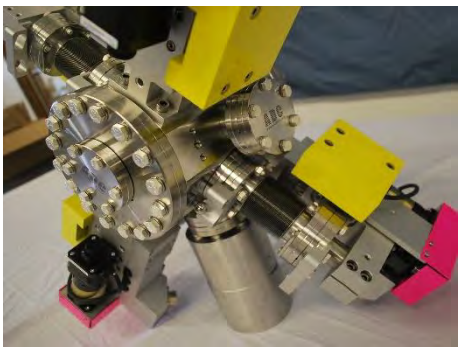
Part Number	Revision	Size	Sheet
00024051	0	A2	1 / 1

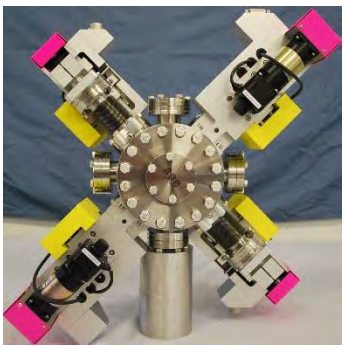
Max IV Lab Custom UHV Slit

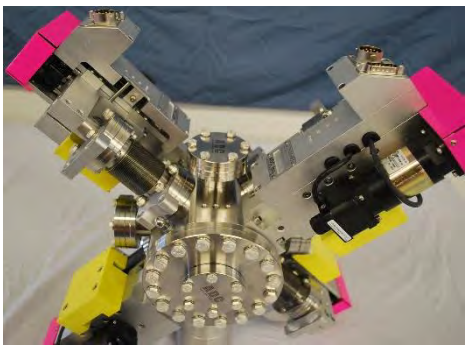
Customer:
MAX IV Laboratory (Lund University)
Ole Römers väg 1
SE-223 63 Lund; Sweden

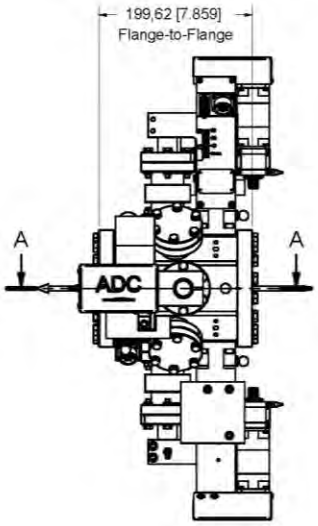


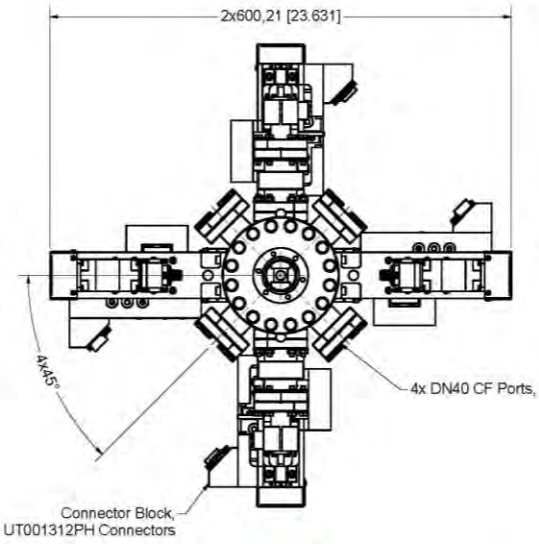
This slit system was designed for UHV and can be used for apertures up to 25mm x 25mm. Blades are actuated independently by 4 actuators mounted on the slit body. This slit system was designed to be robust and easily serviceable. All actuator components (bearing rails, ball screws, limit switches, encoders, and ball screws) are located outside of the UHV chamber. This eliminates the need for special lubricants on the actuator bearings. It also allows for the actuators to be adjusted, aligned, and serviced with the system installed on the beamline. A rigid connection between the slit blade and the actuator guarantees that encoder readings at the actuator are accurate. Modal analysis with FEA and physical tests were done during the design to make sure there are no resonant frequencies below 200 Hz at the blade. The UHV chamber has 4 spare DN40 CF ports for connecting pumping and diagnostics. Edge-welded UHV bellows connect the chamber to the blade actuator. Blades can be removed through the inside diameter of the bellows. The bellows themselves can be removed with the unit still installed on the beamline.

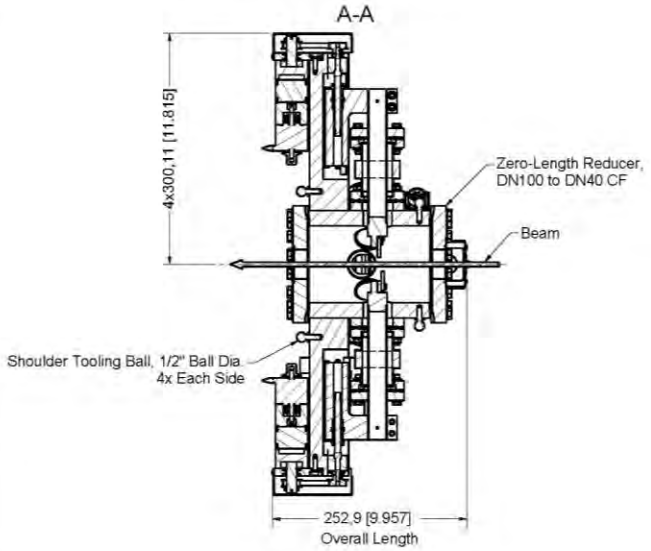


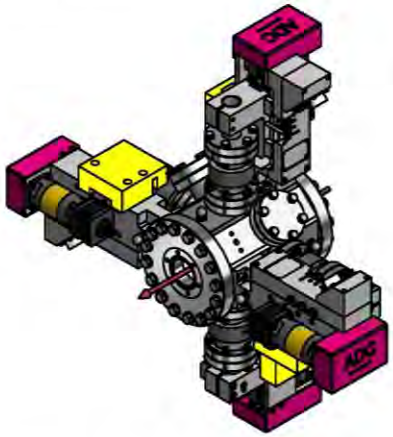












Specifications:

- Aperture: 25mm Maximum
- Blade Overlap: 8mm Maximum
- Blade Material: Tungsten 95%~3.5% Ni~1.5% Cu
- Blade Thickness: 4mm [.157"]
- Approximate System Weight: 47.4 kg [107.4 lb]

First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date
Material / Protective Finish	Drawn by: E Acome	7/1/2013
	Eng approval: M Popov	7/1/2013
	Mfg approval	
	Assy approval	
Purchased Part Modification: No	UNLESS OTHERWISE SPECIFIED: All Dimensions BASIC N7 Flat/Twist surfaces 0.13 0.38 0.25 A B C 0.25 A B C	Advanced Design Consulting USA, Inc. 109 Ridge Road / PO Box 187 Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3616 E-mail: adc@adc9001.com / Web: www.adc9001.com SLT-400-250 UHV Slit Assembly Part Number / Revision: 0 / Size: A2 / Sheet

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Ultra High Precision Slits for Neutron

ADC has been a leading supplier of slits to the synchrotron and neutron source scientific community for over 18 years. All of these slits use standard micro-stepper motors that can be controlled with a wide array of controllers/drivers available on the market. Our standard slits run the range from in-air monochrome beam to UHV high heat load white beam.

Key Features:

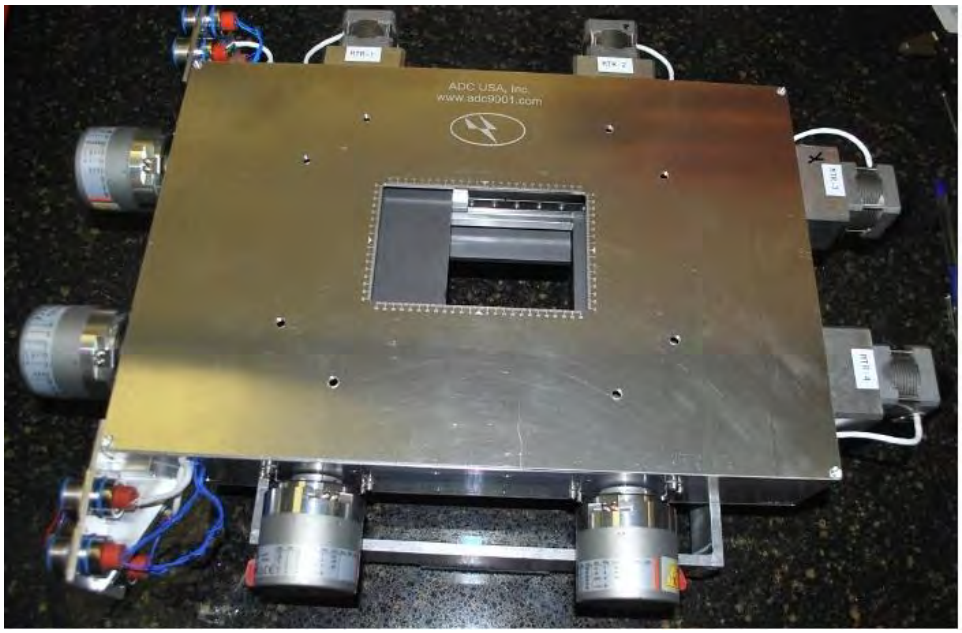
- Micron precision
- High radiation resistance components such as motors, brake, and encoders
- Blade material:
    - Cadmium, Boron Nitride, Boron Carbide and/or composite structure consisting of several materials.
- Blades can go "past closed" without clashing (Overlapping/Zero beam).
- Customized to Customer Specifications; size, blade material, etc.
- Air or Vacuum

Standard sizes:

- (12 mm X 12 mm aperture)
- (25 mm X 25 mm aperture)
- (60 mm X 60 mm aperture)
- (100 mm X 100 mm aperture)
- (150 mm X 150 mm aperture)

ANSTO SANS Instrument Vacuum Slits

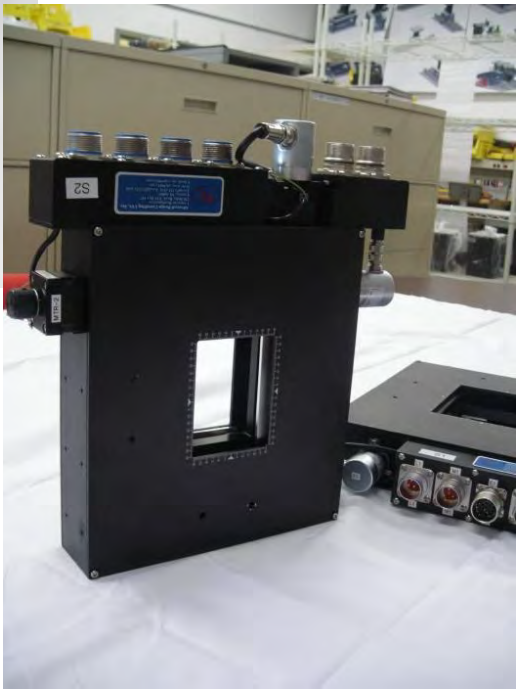
Customer:
ANSTO
New Illawarra Road
Lucas Heights, NSW Australia



ADC custom designed and built two slits for the SANS instrument located at ANSTO Neutron facility. The ANSTO Neutron Beam Slit is a standard XY Slit. This slit uses a single NEMA 17 motor coupled to a screw for each blade to open and close the aperture. The blades are made from 5 mm Thick Boron Carbide; are fully scannable, and the maximum aperture size is 70 mm x 115 mm. A Kubler Absolute Multiturn Rotary Encoder is used to track the position of the blades. The limits are lever style snap-action switches. Connectors are circular MIL Spec Metal Connectors as specified by the customer. This slit was designed for use in a rough vacuum environment.

ANSTO PELICAN Instrument Slits

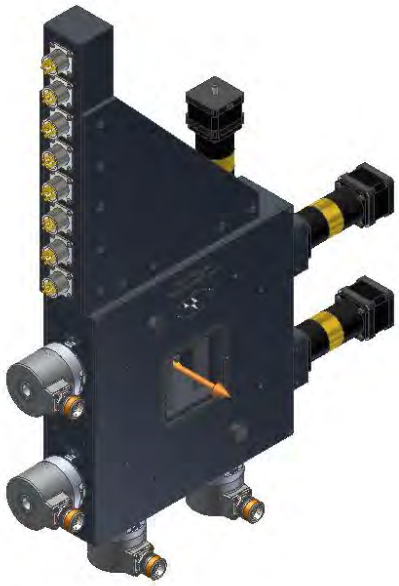
Customer:
ANSTO
New Illawarra Road
Lucas Heights, NSW Australia



ADC custom designed and built two slits for PELICAN instrument located at ANSTO Neutron facility. The blades are mounted on preloaded carriages that are guided by miniature ball guide rails. The blades are fully scannable. A Kubler Absolute Multiturn Rotary Encoder is used to track the position of the blades. The limits are lever style snap-action switches. Connectors are circular MIL Spec Metal Connectors as specified by the customer.

ANSTO KOOKABURRA Instrument Slits

Customer:
ANSTO
New Illawarra Road
Lucas Heights, NSW Australia

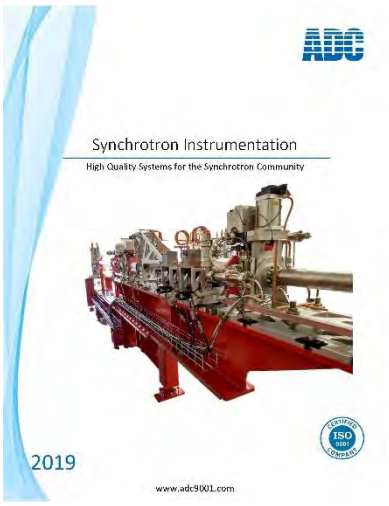


The NIST Neutron Beam Slit is a “curtain style” XY Slit. This slit uses a single NEMA 17 motor on each axis coupled to a screw with both right- and left-hand threads to move two blades simultaneously to open and close the aperture. The blades are mounted on preloaded carriages that are guided by miniature ball guide rails. The blades are made from Cadmium, Boron-aluminum, and Lithium Polymer. The blades can go from a 2 mm overlap to a maximum aperture size of 60 mm x 140 mm. A Renishaw Tonic Linear Encoder is used to track the position of the blades. The limits are lever style snap-action switches. Connectors are black AMP CPC type as specified by the customer. This slit was designed for use in a rough vacuum environment.

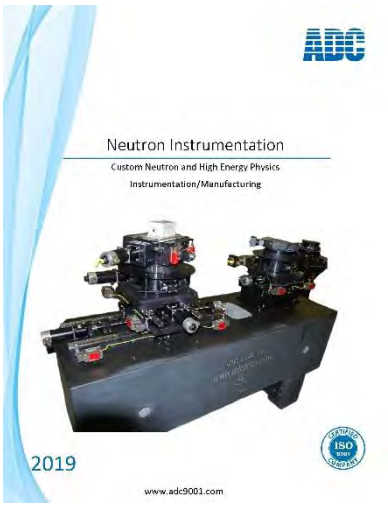
Key Specifications:

- Weight: 7.6 kg [16.75 lb]
- “Curtain Style Blades” (2 blades one motor)
- Max Aperture: 140 mm x 60 mm
- Blade Material: 6Li-Poly (~3 mm), Aluminum-Boron (~1.5 mm), & Cadmium (~0.5 mm)
- Internal Linear Renishaw Encoder
- Rough Vacuum Compatible (10^{-3} Torr)
- Full step (without Gearbox) 0.005 mm
- Full step (with Gearbox) 0.001 mm
- Average of 3µm unidirectional repeatability

For more information on ADC's products, go to adc9001.com to download all of ADC's catalogs.

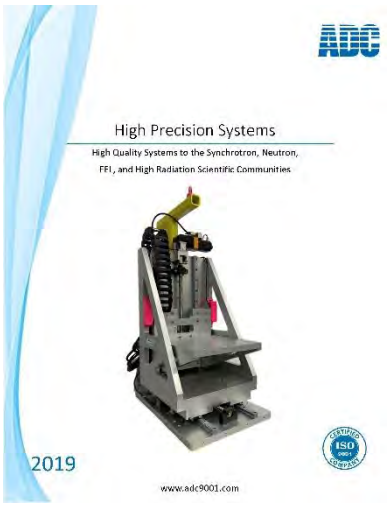


Synchrotron Instrumentation



Neutron Instrumentation

Motion Stages



High Precision Systems

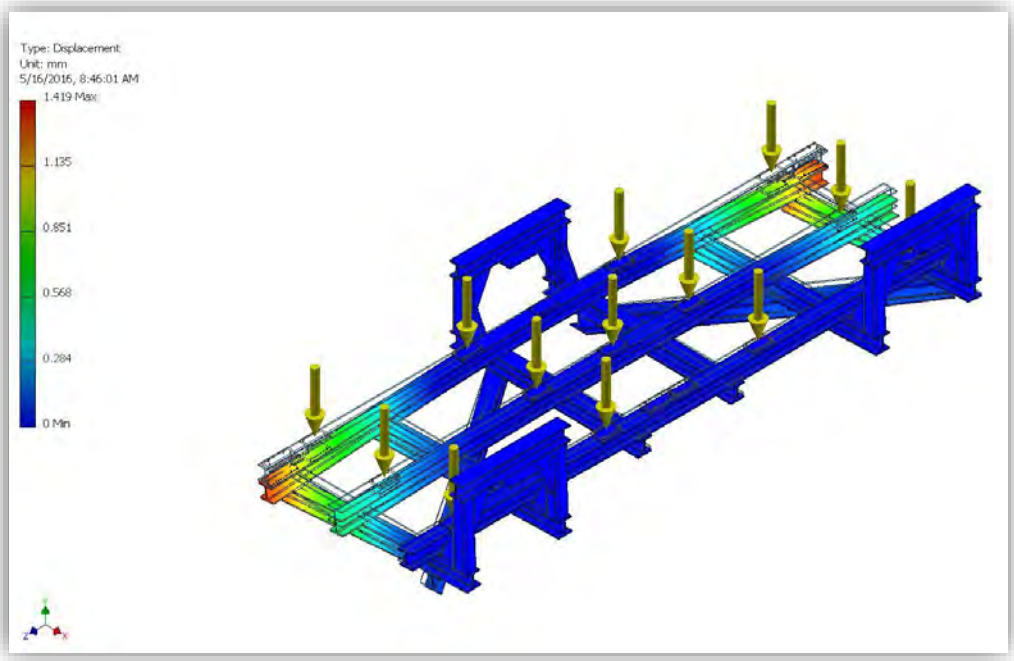
High Precision Engineered Experimental Tables

Company Capabilities

Engineering Design and Analysis

The Engineering Design and Analysis group is a multi-disciplinary team of engineers with unique training and creativity, and dedication to meeting the needs of our customers. ADC uses the latest computational and graphics software and hardware to approach the most challenging problems in the Aerospace, Automotive, Nuclear, Ultra-High Vacuum, Automated Machinery, Electro-Optical Products, synchrotron, high energy physics, and neutron diffraction communities.

- Finite Element Analysis
- Magnetic Design
- Optics Design
- Conceptual Design
- Materials Selection
- Tooling Design
- Fabrication Specifications
- Virtual Prototyping
- Design Analysis and Optimization
- Detailed Design
- Component Design



Electronics, Instrumentation and Software

ADC has several electrical/software engineers and techs capable of providing custom circuit design and complete turn-key control systems. Some of our skills include integrated PLC design and programming, analog and digital circuit design, logic design (including PLA and FPGA programming), stepper and servo motor applications, microprocessor, RFID, serial and RF communications, and system controllers. The standard motor controls and driver that we offer is the Aerotech Ensemble™ series controllers. However, many of our customers have requirements for custom integration of these components into a functioning system, fully debugged, documented, and ready for operation. Software skills and development platforms include Microsoft Visual C++, LabView, EPICS, Visual Basic, CNC, and generic PLC (AB, NAIS, GE-Fanuc, Schneider, etc.) and Parker ACR and Accroloop. Our primary skill, however, is the integration of these components into a functioning system, fully debugged, documented, and ready for operation.

Vacuum Assembly & Testing

ADC is well equipped to handle any stand-alone fabrication and machining requirement. It is often the integration of these talents, combined with higher level assembly and testing, that brings the value added our customers demand. We have developed processes and employ qualified personnel and systems that allow ADC to assemble and test to challenging requirements. Examples include state-of-the-art, high-resolution, extreme-ultraviolet-light (EUV) microscope making measurements in Nano range for Lawrence Berkeley National Laboratory (LBNL); 26 tone, 20-meter-long, 2.3 meter in diameter complex Time-of-Flight Small Angle Neutron Scattering (ToF SANS) instrument for ANSTO, Australia; and Jefferson Lab 12 GeV Upgrade Cavity Parts Project.

ADC utilizes some of the most advanced measurement equipment available to control the requirements that our customer's complex projects require. This is accomplished through the use of Coordinate Measuring Machines (CMM's) equipped with model-based inspection software, providing us with the ability to verify results using customer supplied CAD models, Elcomat 3000 Autocolimator, and Keyence Optical non-contact Micrometer.

Advanced Manufacturing

ADC provides machining systems and products to our diverse customers from structural metal fabrication to turn key design products with complex control systems. ADC is fully equipped with a CNC precision machine shop; and over the past 4 years our unique ability to fabricate/provide parts for precision vacuum machining equipment has grown immensely. Our process begins with providing quotes, which we prepare, based on specific drawing requirements given to us by the customer.

The following are views of ADC manufacturing and major assembly areas.

Equipment

We use precision equipment to verify each order and are committed to delivering precision machined parts. We are very proud of our shop and the capabilities we can offer because of our state-of-the-art precision CNC milling and CNC turning machines. Equipment used for inspections include a Brown & Sharpe CMM, a Jones & Lamson Optical Comparator, and an extensive selection of gauges. We ensure calibrations are performed and are traceable to meet our standards. Our inspection room is temperature controlled to enable the utmost accuracy and consistency in measurements. We can provide a Certificate of Conformance for all processes as required. These are stored electronically and attached to each job for future reference.

CLAUSING CSG-1224 ASDII SURFACE GRINDER, s/n E1TAJ0079, w/PLC Control, Magnetic Chuck

ADC's precision grinder CSG-1224 is especially suitable for heavy duty grinding. The large spindle is supported by four ball bearings to allow for durability.

Welding Capabilities

At ADC, we offer full service custom metal fabrication which includes welding services for short and long production run jobs. Our extensive welding capabilities utilize both robotic welding and manual welding in MIG and TIG and mesh welding for wire products. We are experienced in welding aluminum, carbon steel, and stainless-steel materials. We also have complete resistance welding, also known as spot welding capabilities. Our unique welding shop supports our custom metal fabrication process.

The welding services at ADC support our full-service fabrication process with capabilities including:

- Resistance Welding / Spot Welding
- Gas Metal Arc Welding (GMAW) / Metal Inert Gas (MIG Welding) - This semi-automatic or automatic process uses a continuous wire feed.
- Gas Tungsten Arc Welding (GTAW) / Tungsten Inert Gas (TIG Welding) - A manual welding process that is extremely precise, especially useful for welding thin materials.
- Mesh Welding - electric flash butt welding where the two wires are pressed together, and the electric current is activated

Benefits of TIG Welding

- Superior quality welds
- Welds can be made with or without filler metal
- Precise control of welding variables (heat)
- Free of spatter
- Low distortion

Benefits of MIG Welding

- All position capability
- Higher deposition rates than SMAW
- Less operator skill required
- Long welds can be made without starts and stops
- Minimal post weld cleaning is required

Benefits of Mesh Welding

- wires resist movement
- it is much faster than traditional welding
- it is a high-quality low-cost spot-welding solution

ADC's Service and Support

ADC takes new approaches to shorten assembly and commissioning times. We create modular construction units which can be installed cost-effectively and extended easily when needed. Our customers can count-on ADC's continued service support after the commissioning stage.

Through intensive technical training sessions and our policy of involving customer personnel at an early stage, we can assure seamless and rapid familiarization with our new technologies. This approach has meant that, in many major projects, our customers have been able to operate their equipment independently and to their satisfaction within a very short period.

ADC Customer Service team provides installation, installation supervision, after sales support and service, troubleshooting and remote diagnostics. We believe that success is in the details and this philosophy delivers high customer satisfaction and instills a strong sense of loyalty. Our friendly and courteous customer service staff is always available for questions and order placement for the key replacement parts to keep ADCs systems running at peak efficiency. Whether it is a small replacement part or a new component, we are committed to the fastest resolution to customer needs.

ADC is uniquely positioned and invested in providing exceptional after-sales support. Available support and services including:

- Installation and start-up
- Service and repair – factory / service center / or onboard
- Service contracts
- Troubleshooting assistance over the phone
- Engineering and technical sales assistance
- Upgrade and retrofit parts and programs
- Spare and replacement parts
- Tailored factory and on-board training
- On-board system and spares analysis

ISO 9001:2015

BUREAU VERITAS
Certification

ADVANCED DESIGN CONSULTING USA, INC.

126 RIDGE RD
LANSING, NY 14882 USA

Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above organization has been audited and found to be in accordance with the requirements of the management system standards detailed below

ISO 9001:2015

Scope of certification

DESIGN, MANUFACTURE, AND DELIVERY OF DEVICES, INTEGRATED SYSTEMS, COMPONENTS AND INSTRUMENTS FOR COMMERCIAL, ACADEMIC, AND GOVERNMENT AGENCIES

Original cycle start date: **31 December 2014**

Certification / Recertification cycle start date: **31 December 2017**

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **30 December 2020**

Certificate No. ***US010798*** Version: **1**

Signed on behalf BVCH SAS – UK Branch

*Certification body address: **5th Floor, 66 Prescot Street, London E1 8HG, United Kingdom***
*Local office: **16800 Greenspoint Park Drive, Suite 300S, Houston, TX 77060***

*Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization. To check this certificate validity please call: **+(800) 937-9311***

UKAS MANAGEMENT SYSTEMS
0008

Page 1 of 1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adc@adc9001.com ● www.adc9001.com