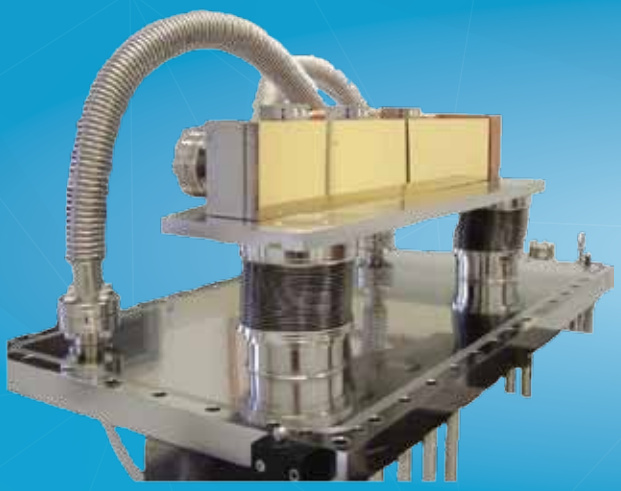
Synchrotron Instrumentation 2016



Ion Chambers, High Precision Slits, Filters, Optics, Precision Engineering System & Precision Optical Tables

CERTIFIED ISO 9001:2008 COMPANY

Registered International Traffic in Arms Regulations ITAR

ADC

ISO 9001:2008 Certified

www.adc9001.com

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INTRODUCTION

ABOUT ADC

ADC an ISO9001 certified company

ADC an ISO9001 certified company, located near Cornell University in Ithaca, New York, is a leading developer and supplier of complex scientific components and instruments for large government laboratories and corporations around the world. Founded as a privately held company in 1995, ADC has grown into one of world's leading technology companies and has enjoyed 18 straight years of business growth and profitability with more than 500 customers located in over 26 countries. ADC's vision is to be a global leader in the development and manufacturing of innovative products for scientific and research markets.

For more information on "ADC" please go to:
http://www.adc9001.com

OVERVIEW

Overview of Custom Neutron and High Energy Physics Instrumentation Manufacturing

ADC (ISO9001:2008 certified) has been a leading supplier of high quality instrumentation to the synchrotron, FEL, and high radiation scientific community for over 18 years. Many of our instruments have been in operation nearly that long in facilities around the world. From slits to undulators, ADC has provided instruments both inside and outside the shield wall. Our product portfolio is too broad to list, please see http://www.adc9001.com/products/show_list/id/114 for more details.

Our engineering design, and build staff are well acquainted with the special requirements of the synchrotron and FEL scientific community such as shielding, stability, precise motion, and UHV. ADC's engineering staff approaches each new application by thoroughly understanding the risks, challenges, and requirements. Our intimate knowledge of synchrotron operations gives us a solid basis for "filling in the blanks" in our customer's specifications. We have developed the art of project management to a high degree; thereby ensuring complex instruments are delivered on time.

Our engineers begin each project with a specification check-list and thorough research of prior designs both by ADC and others as well as input from our customers via the specification and direct communication. We then develop a project plan that is executed by the project manager. A solid 3D model is developed and reviewed with the customer. Calculations and FEAs are then performed for load capacity, deflections, thermal distortion, and application specific requirements. A stack up of tolerances analysis is performed. Motion profiles and motor sizing is also performed to meet specific needs. The design is reviewed at a Preliminary Design Review (PDR) typically at the ADC site and a Final Design Review (FDR) at the customer site where more customer personnel can be in attendance.

The project is then detailed and passed to the ADC Operations Manager who develops the travelers for project. The travelers are then executed in ADC's extensive, State-of-the-Art, machine shop along with critical inspections. Our shop machining philosophy is to machine the parts to the best of our ability even if the tolerance requires less precision. The components are assembled and tested in ADC's various assembly areas according to requirements for clean room (UHV), vibrational stability, and special instrumentation. Each new device is tested according to a factory acceptance plan (FAT) that is developed in conjunction with the customer. The customer is welcomed and encouraged to visit ADC at any time but especially for FAT.

The instrument is not shipped until the customer sign-off. ADC is also extensive experience crating sensitive instruments for shipment around the world with no damage. Site acceptance (SAT), installation, and commissioning options are available. ADC's service after the sale is impeccable.

The attached catalog provides more information on our custom designed synchrotron instruments along with specific applications and references. Additional details are provided for calculations, FEAs, frequency response, repeatability measurements, loading, testing, quality control, electronics instrumentation, and controls are available for each application on request. We hope you find our product line exceeds your needs and our friendly staff willing to satisfy your specific requirements. Please do not hesitate to contact ADC for further details.

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

Standards

ISO 9001:2008

Scope of certification

Design, manufacture, and delivery of devices, integrated systems, components and instruments for commercial, academic and government agencies

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

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **30 December 2017**

Original certification date: **31 December 2014**

Certificate No. US007466-1

Signed on behalf of BVCH SAS – UK Branch

Certification body address: 66 Prescot Street, London, E1 8HG, United Kingdom

Issuing office: Bureau Veritas Certification North America, Inc.
390 Benmar Drive, Houston, Texas, USA
www.us.bureauveritas.com/bvc

UKAS MANAGEMENT SYSTEMS
008

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.**

To view our ISO Certification please use the following link:
http://www.adc9001.com/data/Advanced_Design_-_393699_-_final_cert1.pdf

SYNCHROTRON
Instrumentation Projects

http://www.adc9001.com/products/show_list/id/114

The following section is based on ADC's custom and standard designed synchrotron projects completed over our 18 years of business. For more information on these projects please visit the website link listed above, or feel free to contact ADC at any time.

ION CHAMBERS

http://www.adc9001.com/products/view/91

ADC's ion chambers are designed for precise, low noise x-ray measurement. The electrodes are constructed of nickel plated copper on fiberglass supports, all housed within a nickel plated aluminum frame.

IC-400 Series

IC-500 Series

Micro Ion Chamber

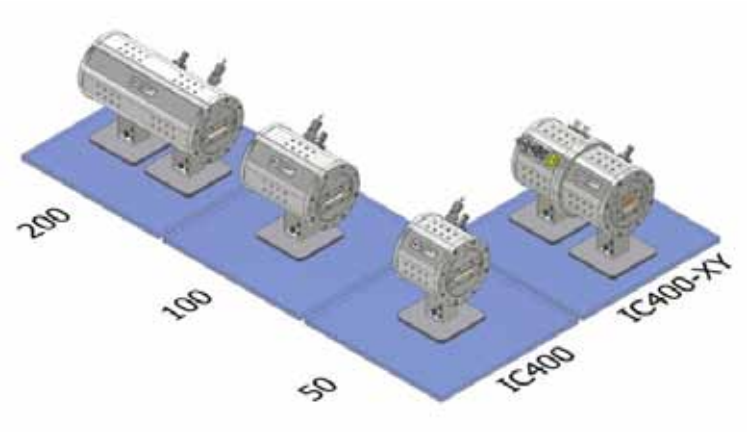
Custom Ion Chambers

ION CHAMBER

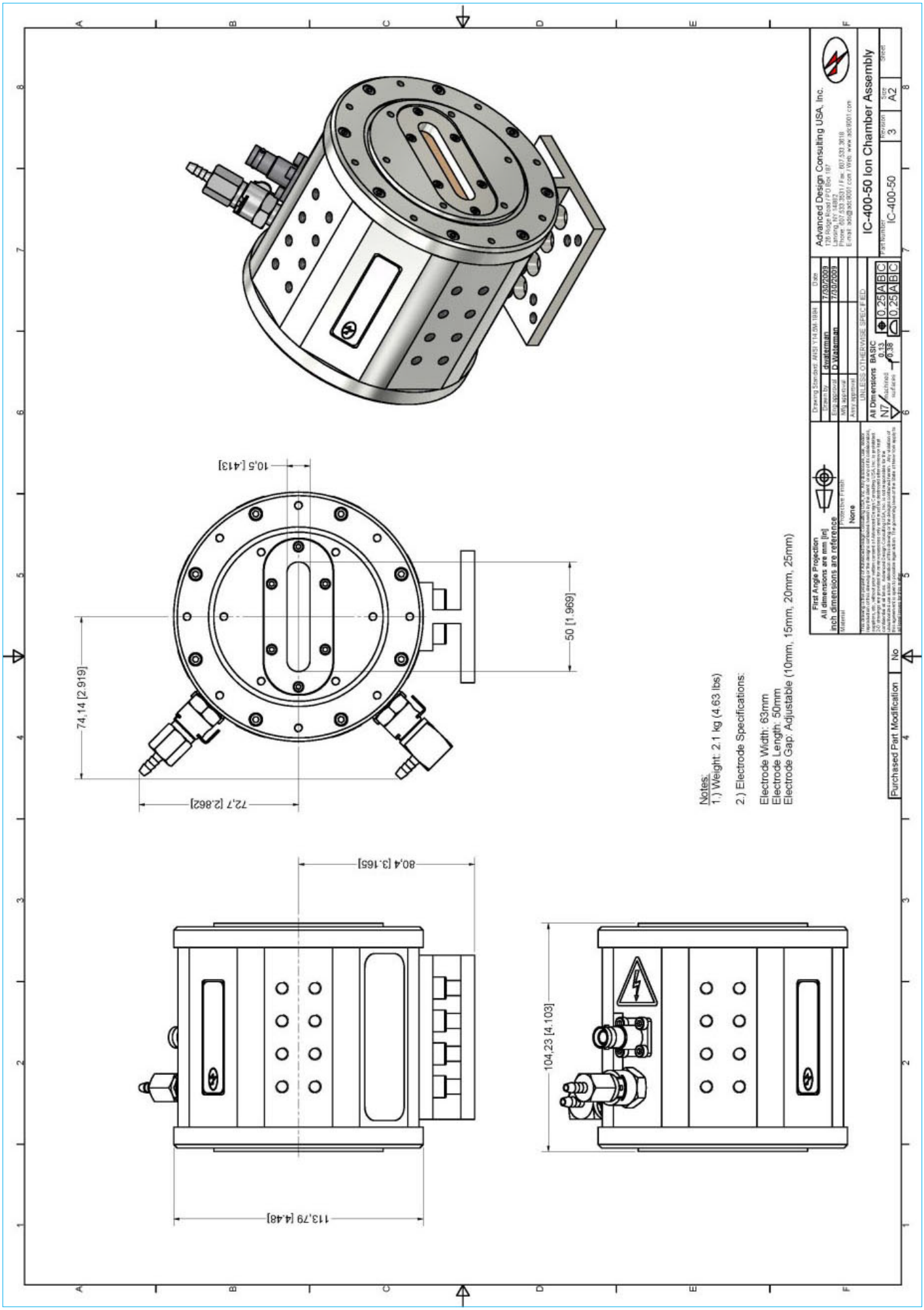
400 series

http://www.adc9001.com/IC-400-Series

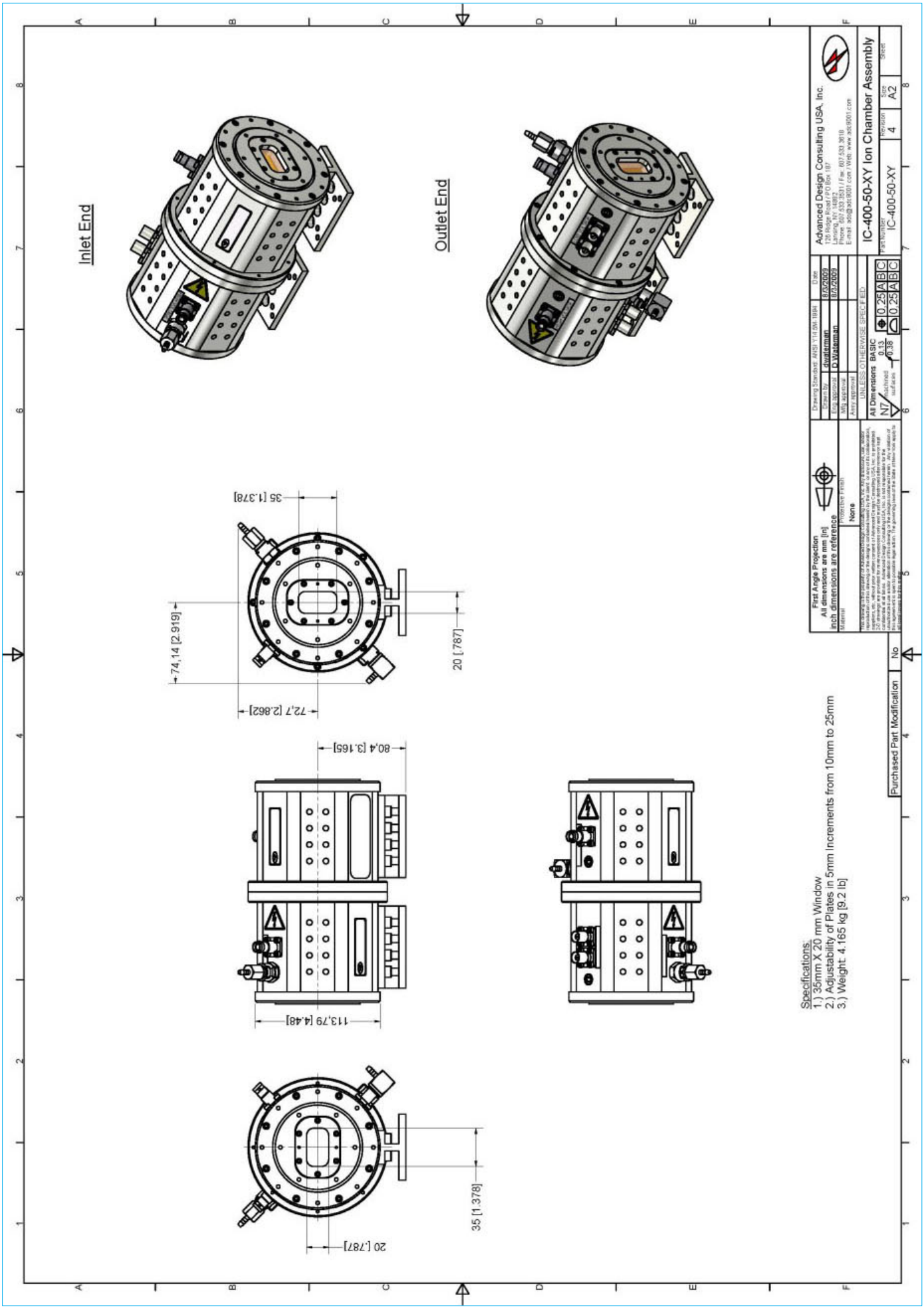
ADC's ion chambers are designed for precise, low noise x-ray measurement. The device allows user to determine the change in beam position in a single axis by comparing two signals that are created as the beam passes through the Ion Chamber. By connecting two Ion Chambers together at 90° you can determine the horizontal and vertical beam position. The system can be configured for air, vacuum, or ultra high vacuum operation through one of three interfaces.
One unique feature of ADC's precision ion chambers is the incorporation of a split collector plate. The electrode is split in a sawtooth configuration with a height of approximately 10mm that, when the differe



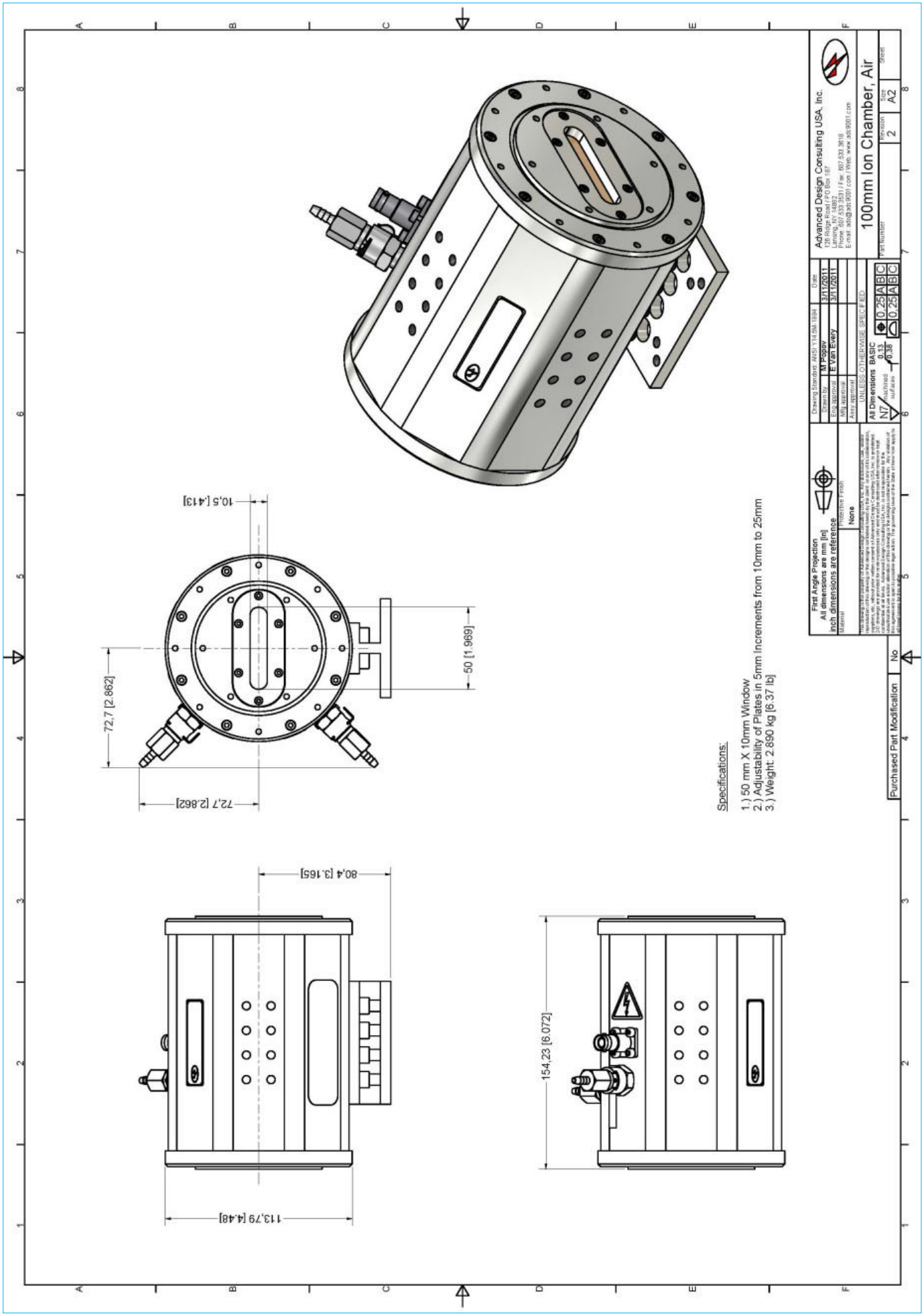
				
	IC-400 – 50	IC-400 – 100	IC-400 – 200	IC-400 – 50-XY
WINDOW APERATURE	25 MM X 40 MM	25 MM X 40 MM	WINDOW APERATURE	WINDOW APERATURE
KAPTON WINDOW	25, 50, AND 125	25, 50, AND 125	KAPTON WINDOW	KAPTON WINDOW
BODY MATERIAL	ALUMINUM 6061	ALUMINUM 6061	BODY MATERIAL	BODY MATERIAL
ELECTRODE GAPS	10, 15, 20, AND 25 MM	10, 15, 20, AND 25 MM	ELECTRODE GAPS	ELECTRODE GAPS
ELECTRODES	GOLD PLATED WITH GUARD RINGS	GOLD PLATED WITH GUARD RINGS	ELECTRODES	ELECTRODES
ELECTRODE LENGTHS	50 MM	100 MM	ELECTRODE LENGTHS	ELECTRODE LENGTHS
WORKING PRESSURE	0.7-1.3 BAR ABSOLUTE PRESSURE	0.7-1.3 BAR ABSOLUTE PRESSURE	WORKING PRESSURE	WORKING PRESSURE
OPERATING POTENTIAL	UPTO 1.7 KV	UPTO 1.7 KV	OPERATING POTENTIAL	OPERATING POTENTIAL
DIMENSIONS (W/O BASE)	113.8(W) X 104.3(L) X 113.8(H) MM	113.8(W) X 154.3(L) X 113.8(H) MM	DIMENSIONS (W/O BASE)	DIMENSIONS (W/O BASE)
LOW VOLTAGE ELECTRODE	FEMALE BNC PANEL MOUNT CONNECTOR	FEMALE BNC PANEL MOUNT CONNECTOR	LOW VOLTAGE ELECTRODE	LOW VOLTAGE ELECTRODE
HIGH VOLTAGE ELECTRODE	SHV RF PANEL MOUNT CONNECTOR	SHV RF PANEL MOUNT CONNECTOR	HIGH VOLTAGE ELECTRODE	HIGH VOLTAGE ELECTRODE


IC-400-50 Ion Chamber Assembly
Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3711 / Fax: 607.533.3818
E-mail: ads@ad-8001.com / Web: www.ad-8001.com
IC-400-50
Revision 3
Size A2
Sheet
Drawing Standard: ANSI / Y14.5M-1994
Drawn by dvaterman 7/30/2009
Eng. approval D.Waterman 7/30/2009
Mfg approval
Appr approval
UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
N7 machined surfaces
0.13
0.38
0.25 A B C
0.25 A B C
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Finish/Coat
None
Purchased Part Modification
No
Notes:
1.) Weight: 2.1 kg (4.63 lbs)
2.) Electrode Specifications:
Electrode Width: 63mm
Electrode Length: 50mm
Electrode Gap: Adjustable (10mm, 15mm, 20mm, 25mm)
10,5 [.413]
74,14 [2.919]
72,7 [2.862]
50 [1.969]
80,4 [3.165]
113,79 [4.48]
104,23 [4.103]

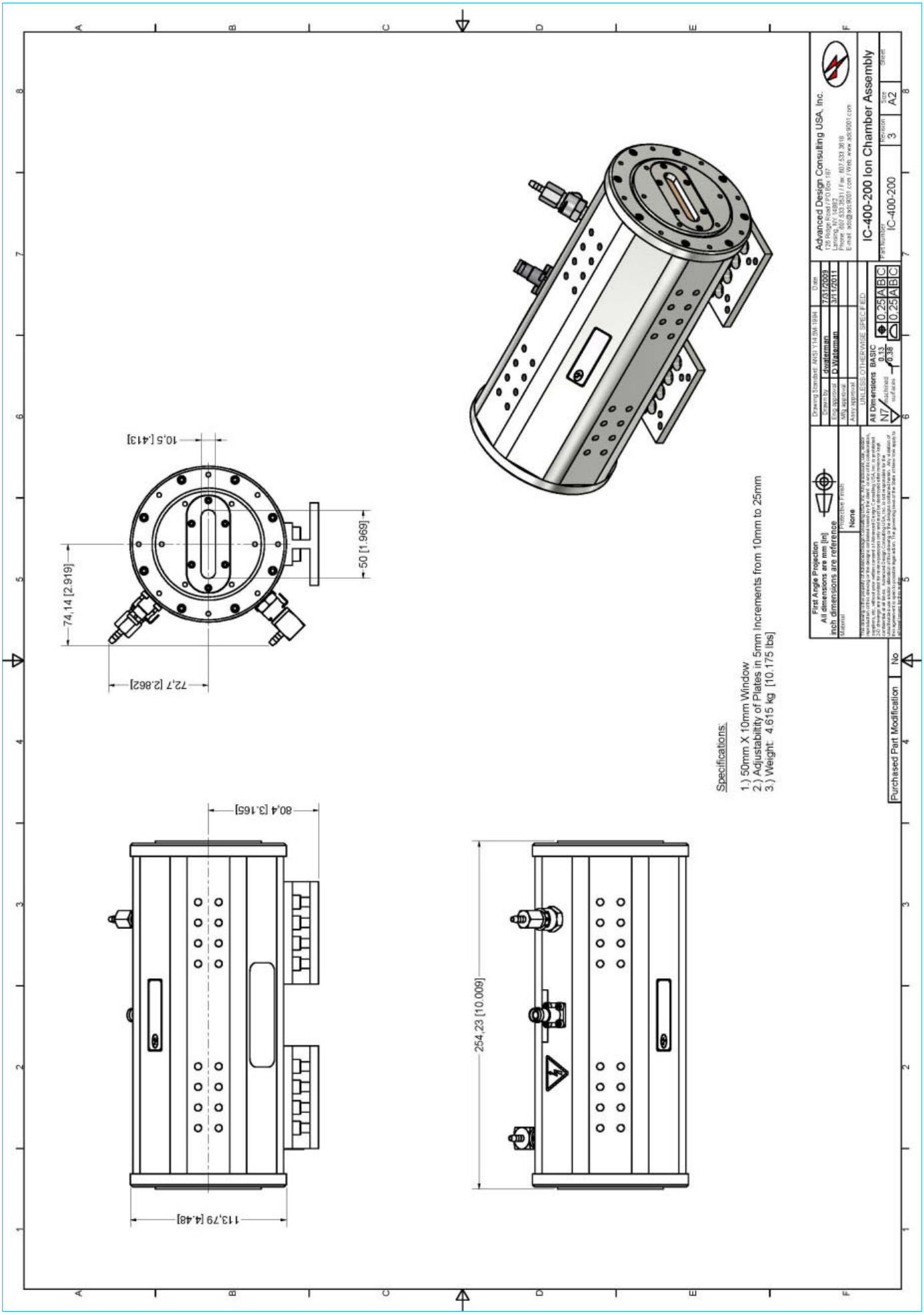
IC-400-50


Inlet End
Outlet End
35 [1.378]
74.14 [2.919]
72.7 [2.862]
20 [.787]
80.4 [3.165]
113.79 [4.48]
35 [1.378]
20 [.787]
Specifications:
1.) 35mm X 20 mm Window
2.) Adjustability of Plates in 5mm Increments from 10mm to 25mm
3.) Weight: 4.165 kg [9.2 lb]
Advanced Design Consulting USA, Inc.
IC-400-50-XY Ion Chamber Assembly
Part Number IC-400-50-XY
Version 4
Size A2
Sheet
Purchased Part Modification No

IC-400-50-XY


100mm Ion Chamber, Air
Advanced Design Consulting USA, Inc.
Specifications:
1.) 50 mm X 10mm Window
2.) Adjustability of Plates in 5mm Increments from 10mm to 25mm
3.) Weight: 2.890 kg [6.37 lb]
10,5 [.413]
72,7 [2.862]
50 [1.969]
72,7 [2.862]
80,4 [3.165]
113,79 [4.48]
154,23 [6.072]

IC-400-100


Advanced Design Consulting USA, Inc.
IC-400-200 Ion Chamber Assembly
IC-400-200
Specifications:
1.) 50mm X 10mm Window
2.) Adjustability of Plates in 5mm Increments from 10mm to 25mm
3.) Weight: 4.615 kg [10.175 lbs]
10.5 [.413]
74.14 [2.919]
72.7 [2.862]
50 [1.969]
80.4 [3.165]
113.79 [4.48]
254.23 [10.009]

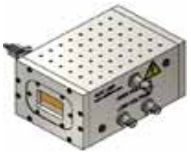
IC-400-200

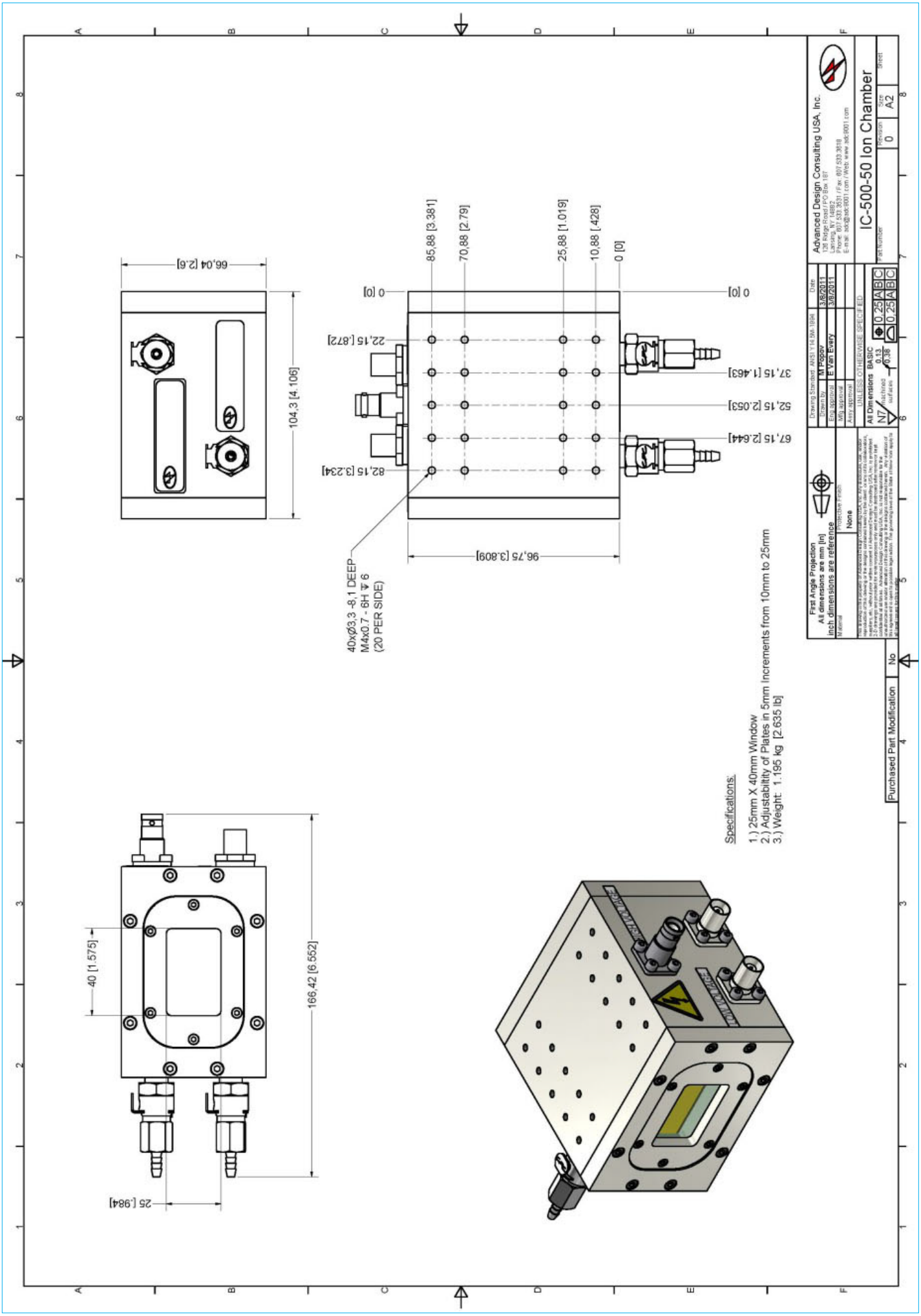
ION CHAMBER

500 series

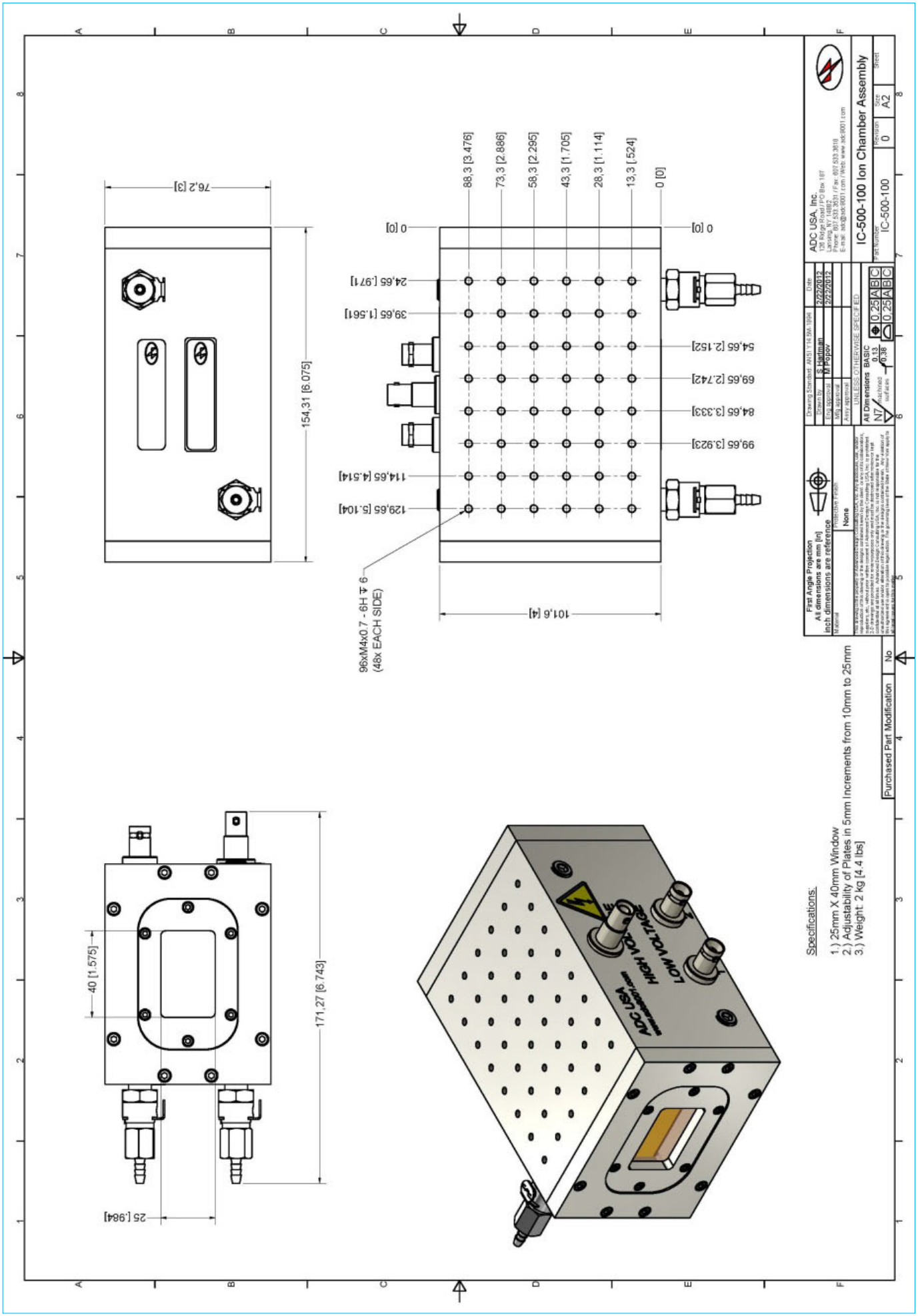
http://www.adc9001.com/IC-500-Series

ADC's ion chambers are designed for precise, low noise x-ray measurement. The electrodes are constructed of nickel plated copper on fiberglass supports, all housed within a nickel plated aluminum frame.

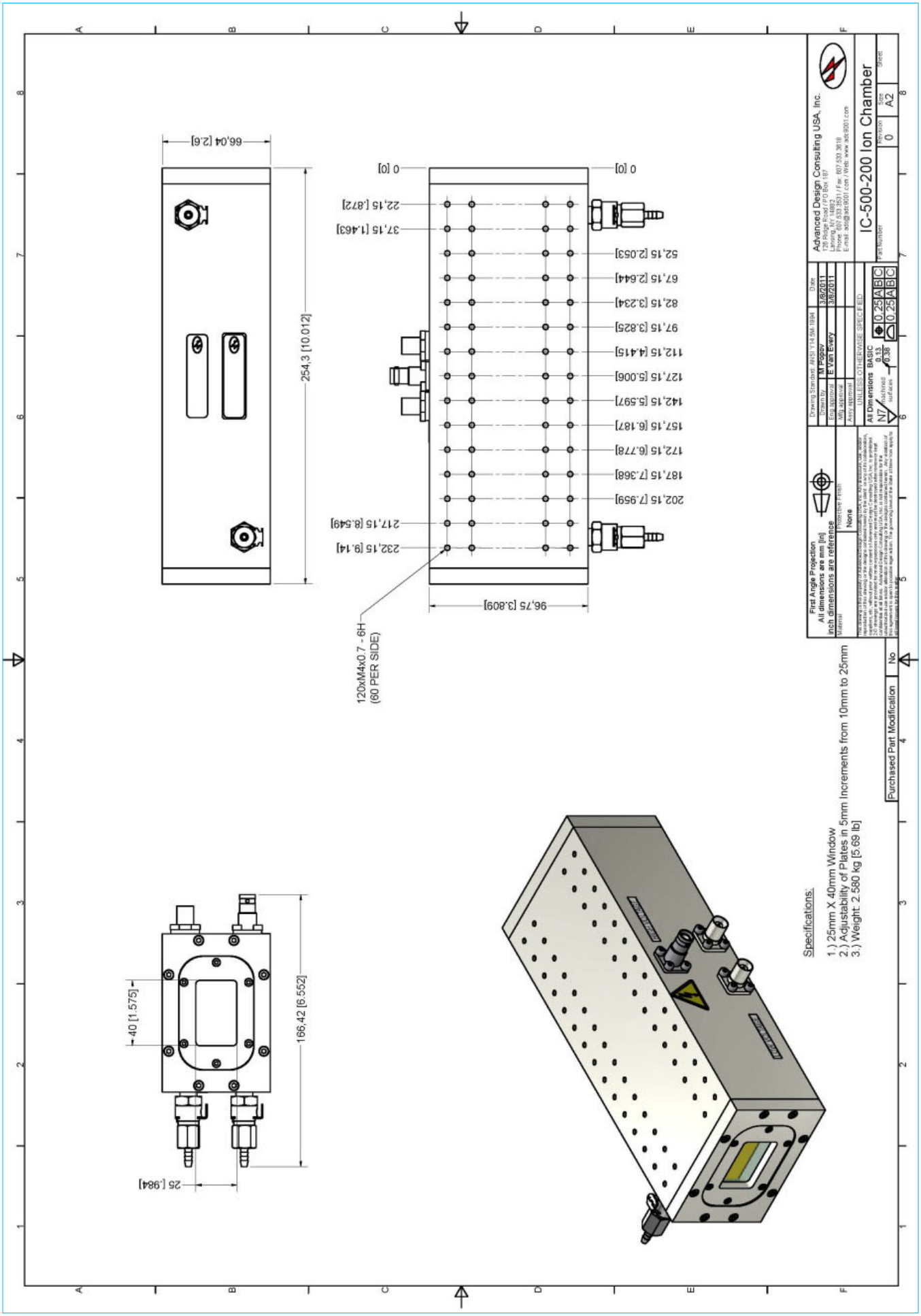
			
	IC-500-50	IC-500-100	IC-500-200
WINDOW APERATURE	25 MM X 40 MM	25 MM X 40 MM	25 MM X 40 MM
KAPTON WINDOW	25, 50, AND 125	25, 50, AND 125	25, 50, AND 125
BODY MATERIAL	ALUMINUM 6061	ALUMINUM 6061	ALUMINUM 6061
ELECTRODE GAPS	10, 15, 20, AND 25 MM	10, 15, 20, AND 25 MM	10, 15, 20, AND 25 MM
ELECTRODES	GOLD PLATED WITH GUARD RINGS	GOLD PLATED WITH GUARD RINGS	GOLD PLATED WITH GUARD RINGS
ELECTRODE LENGTHS	50 MM	100 MM	200 MM
WORKING PRESSURE	0.7-1.3 BAR ABSOLUTE PRESSURE	0.7-1.3 BAR ABSOLUTE PRESSURE	0.7-1.3 BAR ABSOLUTE PRESSURE
OPERATING POTENTIAL	UPTO 1.7 KV	UPTO 1.7 KV	UPTO 1.7 KV
DIMENSIONS (W/O BASE)	96.75(W) X 104.3(L) X 66(H) MM	96.75(W) X 154.3(L) X 66(H) MM	96.75(W) X 254.3(L) X 66(H) MM
LOW VOLTAGE ELECTRODE	FEMALE BNC PANEL MOUNT CONNECTOR	FEMALE BNC PANEL MOUNT CONNECTOR	FEMALE BNC PANEL MOUNT CONNECTOR
HIGH VOLTAGE ELECTRODE	SHV RF PANEL MOUNT CONNECTOR	SHV RF PANEL MOUNT CONNECTOR	SHV RF PANEL MOUNT CONNECTOR


IC-500-50 Ion Chamber
Advanced Design Consulting USA, Inc.
Specifications:
1.) 25mm X 40mm Window
2.) Adjustability of Plates in 5mm Increments from 10mm to 25mm
3.) Weight: 1.195 kg [2.635 lb]
85,88 [3.381]
70,88 [2.79]
25,88 [1.019]
10,88 [.428]
0 [0]
22,15 [.872]
37,15 [1.463]
52,15 [2.053]
67,15 [2.644]
82,15 [3.234]
96,75 [3.809]
66,04 [2.6]
104,3 [4.106]
40 [1.575]
166,42 [6.552]
25 [.984]
40x⌀3,3 -8,1 DEEP
M4x0.7 - 6H ↧ 6
(20 PER SIDE)

IC-500-50


ADC USA, Inc.
IC-500-100 Ion Chamber Assembly
IC-500-100
Specifications:
1.) 25mm X 40mm Window
2.) Adjustability of Plates in 5mm Increments from 10mm to 25mm
3.) Weight: 2 kg [4.4 lbs]
Purchased Part Modification
96xM4x0.7 - 6H ↧ 6
(48x EACH SIDE)
154,31 [6.075]
171,27 [6.743]
40 [1.575]
25 [.984]
101,6 [4]

IC-500-100


66,04 [2.6]
254,3 [10.012]
0 [0]
22,15 [.872]
37,15 [1.463]
52,15 [2.053]
67,15 [2.644]
82,15 [3.234]
97,15 [3.825]
112,15 [4.415]
127,15 [5.006]
142,15 [5.597]
157,15 [6.187]
172,15 [6.778]
187,15 [7.368]
202,15 [7.959]
217,15 [8.549]
232,15 [9.14]
96,75 [3.809]
120xM4x0.7 - 6H
(60 PER SIDE)
40 [1.575]
166,42 [6.552]
25 [.984]
Specifications:
1.) 25mm X 40mm Window
2.) Adjustability of Plates in 5mm Increments from 10mm to 25mm
3.) Weight: 2.580 kg [5.69 lb]
IC-500-200 Ion Chamber
Advanced Design Consulting USA, Inc.
Purchased Part Modification
No

IC-500-200

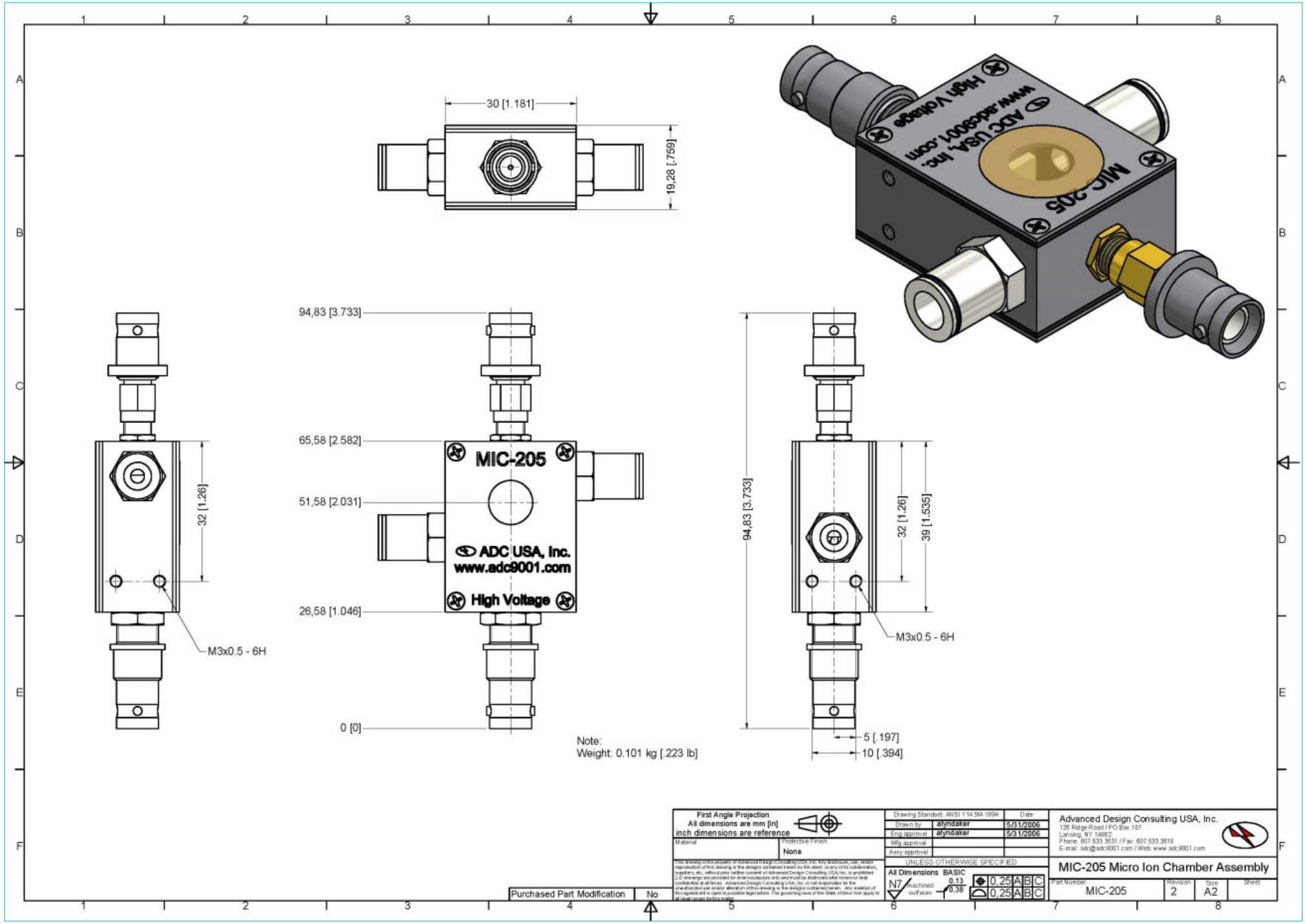
MICRO ION CHAMBER

MIC-205

http://www.adc9001.com/Micro-Ion-Chamber

A small ionization chamber detector has been developed for monitoring the intensity of hard X-ray beam for Synchrotron facilities around the world. The small dimensions of the ionization chamber (20 mm along the beam direction and 30 mm perpendicular to it) make it possible to place it very close to the sample. The housing of the detector is made of stainless steel, nickel-plated copper electrodes, SHV and BNC electrical connectors, and gas connectors. Sparking voltage is approximately 5500V under the atmospheric environment and leakage rate of gas is less than 2 torr/5 minutes under 10 torr vacuum environment.

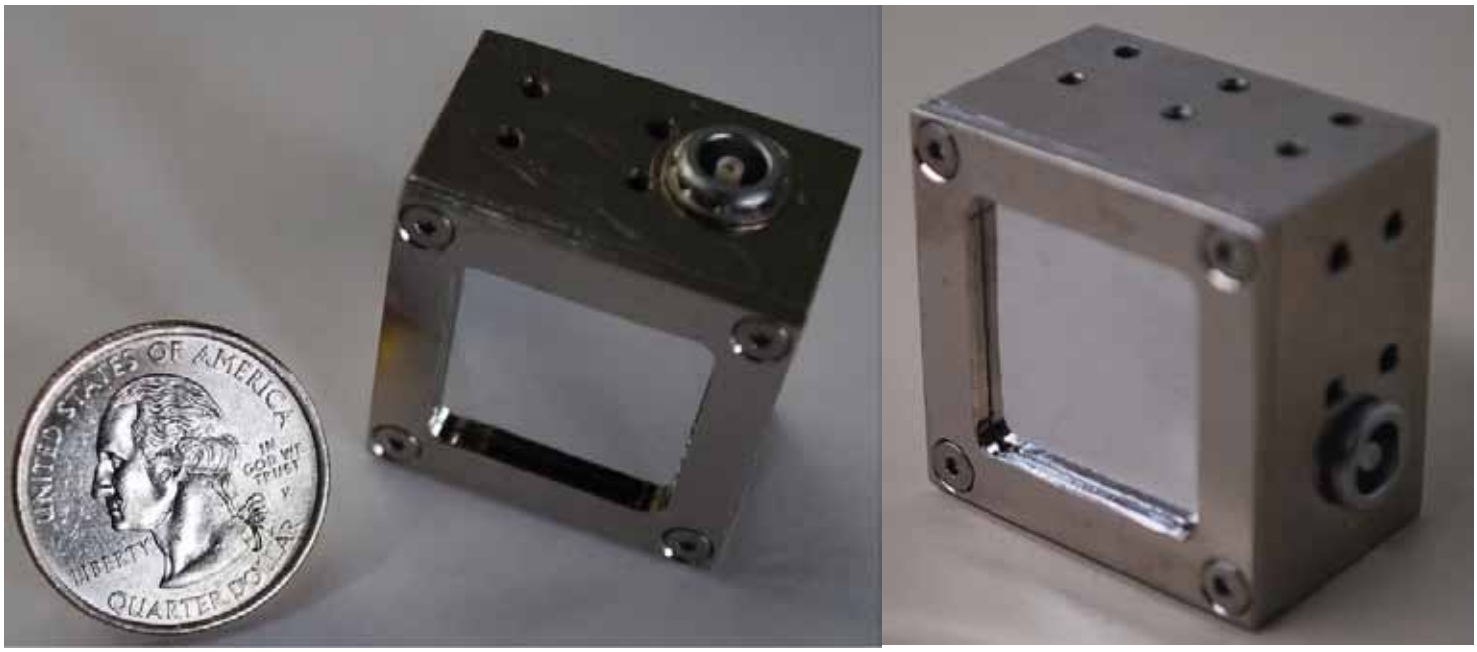
MIC-205	
WINDOW APERATURE	10 MM DIAMETER
DIMENSIONS	19.28(W) X 56.07(L) X 94.83(H) MM
ORDER PART NUMBER	MIC-205


30 [1.181]
19,28 [.759]
94,83 [3.733]
65,58 [2.582]
51,58 [2.031]
26,58 [1.046]
0 [0]
MIC-205
ADC USA, Inc.
www.adc9001.com
High Voltage
32 [1.26]
M3x0.5 - 6H
94,83 [3.733]
32 [1.26]
39 [1.535]
M3x0.5 - 6H
5 [.197]
10 [.394]
Note:
Weight: 0.101 kg [.223 lb]
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
None
Drawing Standard: ANSI Y14.5M-1994
Drawn by alyndaker 5/31/2006
Eng approval alyndaker 5/31/2006
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13 0,36
0.25 A B C
0.25 A B C
Purchased Part Modification No
Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607 533 3531 / Fax: 607 533 3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
MIC-205 Micro Ion Chamber Assembly
Part Number MIC-205
Revision 2
Size A2
Sheet

X-RAY COUNTER AND BEAMSTOP

http://www.adc9001.com/products/view/667

This compact detector is designed for alignment and direct measurement of X-ray beams. The detector system consists of a photodiode and miniature coaxial connector to interface with an electronics package. Three different photodiode sizes are available: 20mm x 20mm, 10mm x 10mm, and 5mm x 5mm. Each size is mounted in aluminum housing. An array of mounting holes on the housing allows for several mounting configurations. A layer of aluminized Mylar film covers the photodiode to absorb visible light. The detector can be provided as UHV-ready with vacuum compatible finishes and components. Connecting the detector to a pre-amplifier electronics package can provide voltage readout, variable signal gain, and frequency output. ADC recommends the use of a low-noise current amplifier such as Stanford Research Systems SR570 unit, which can be purchased and provided with the detector.

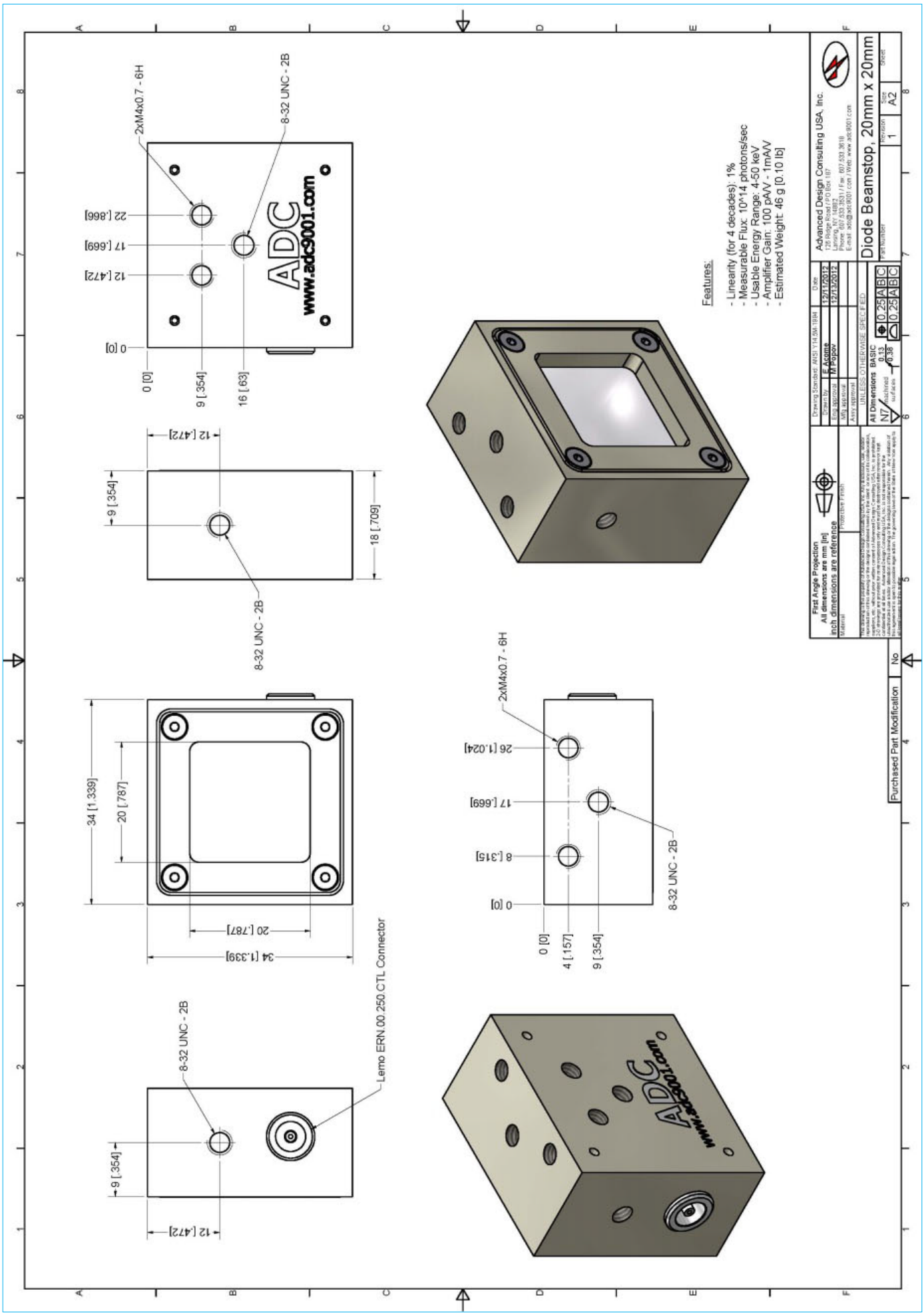


Features

Linearity (for 4 decades)	1%
Dark Current Signal	<0.3 pA
Measurable flux	10^{14} photons/sec
Usable Energy Range	4 - 50 keV
Amplifier Gain	100 pA/V – 1 mA/V

Mechanical Dimensions

Photodiode Active Area	20mm x 20mm; 10mm x 10mm; 5mm x 5mm
Photodiode Thicknesss	0.41mm
Housing Size	28mm x 27mm x 20mm



XBM – DIODE BEAMSTOP 20X20

CUSTOM ION CHAMBERS

http://www.adc9001.com/products/show_list/id/175

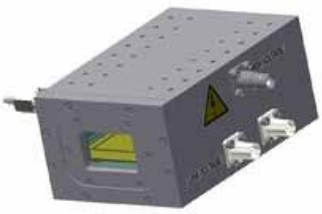
The following section is based on ADC's custom designed Ion Chambers. For more information on these projects please visit the website link listed above, or feel free to contact ADC at any time.

ALBA Ion Chamber

ANKA Custom Ion Chambers

APS-HP-CAT Custom Ion Chambers

CLS Custom Ion Chambers

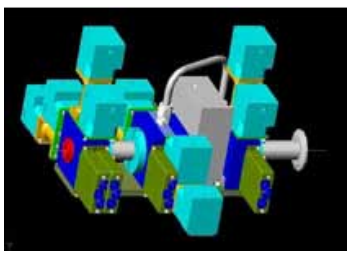


DLS Custom Ion Chambers

APS Custom Ion Chambers-3

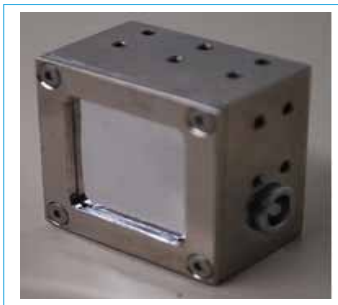
APS Custom Ion Chambers-2

ADC Old Style Ion Chambers



ALS-Slits-Ion Chamber Assembly

Australia Ion Chamber



X-Ray Beam Monitor (XBM)

HIGH PRECISION SLITS

http://www.adc9001.com/products/show_list/id/112

ADC (ISO9001:2008 certified) has been a leading supplier of slits to the synchrotron and neutron source scientific community for over 18 years. Many of our slits have been in operation nearly that long in facilities around the world. Our standard slits run the range from in-air monochrome beam to UHV high heat load white beam. In co-operation with CHESS at Cornell, we have developed the very best blade polishing available in the industry today. We have built an extended family of standard slits in application categories though continuous improvement in our designs - please see http://www.adc9001.com/SLITS. These improvements have come from our custom designs for customers that require improved space constraints, heat load capacity, low reflectance and scatter, blade stability, and precision positioning – for more information please see http://www.adc9001.com/products/show_list/id/142

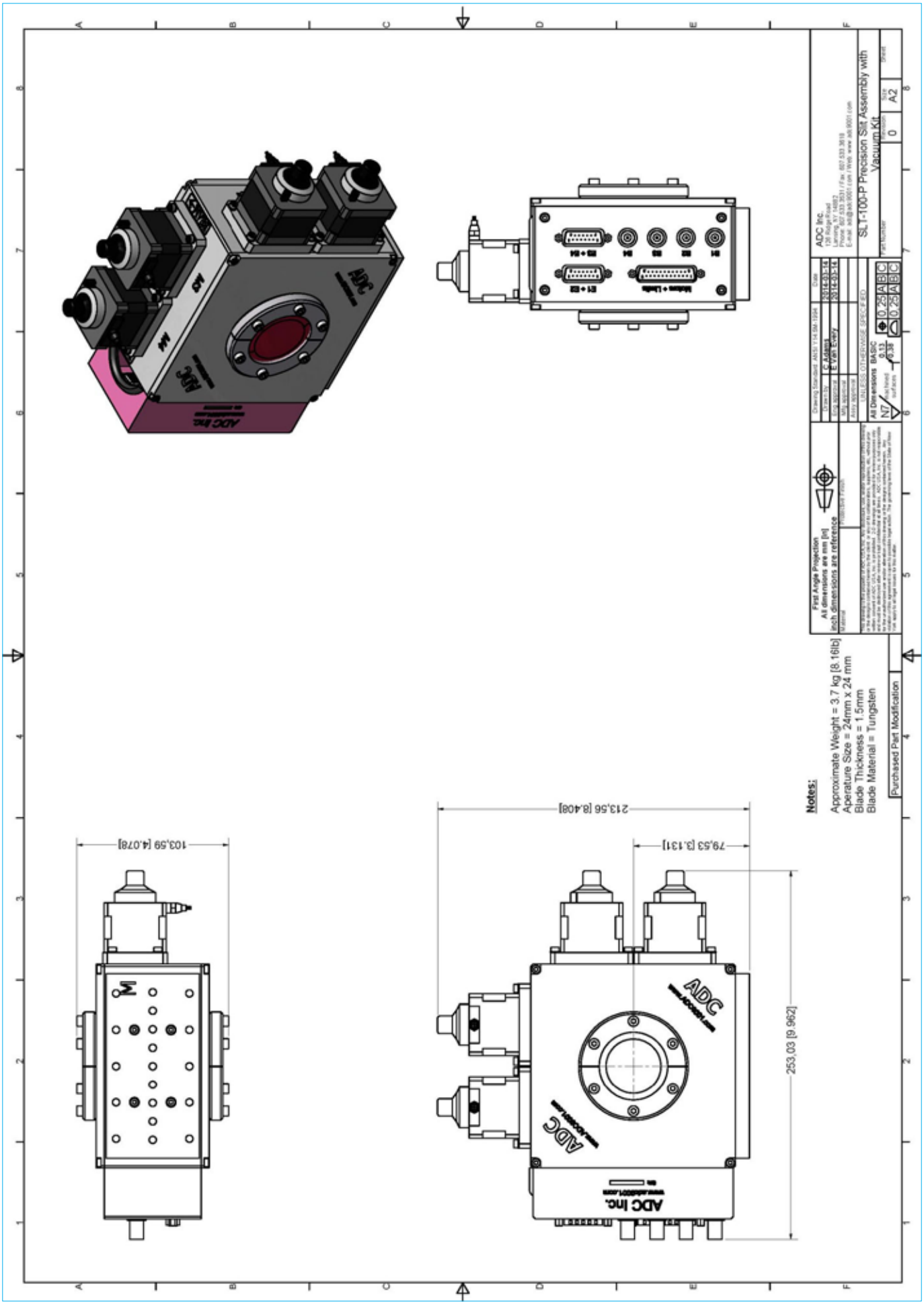
For detailed information regarding ADC's Standard and Custom Slits please refer to our 2016 Slit Catalog or visit the following website:
http://www.adc9001.com/ABOUT-US/Catalogs

X-RAY SLIT

SLT-100-P

For more information please visit the following website:
http://www.adc9001.com/SLT-100-10

SLT-100-P Specifications and Options	
Aperture size	24 mm x 24 mm Blades can go "past closed" without clashing "Fully overlap"
Resolution	<0.16µm precision*
Accuracy	Accuracy ± 2 µm
Blade material	Tungsten or Tantalum, Tungsten Carbide, Cadmium, Boron Nitride
Blade Thickness	Standard 1.5 mm Thicker blade available; 5, 7 and 10 mm thick blade upon request.
Blade Options	Knife-edge profile (2 degrees slope) Or round blade edge Roughness of the jaw edge surface: <0.2µm (rms)
Environmental Options	Air or Vacuum (Tested to 10-6 mbar)
Overall Dimensions	Vacuum: 235 mm x 209 mm x 104 mm Air: 235 mm x 209 mm x 77 mm
Gearhead Options	Motors come with optional gearhead to increase resolution, 5:1, 10:1
Blade Beam Monitoring	Each blade is isolated to have the ability to monitor the current off the blade
Locking Manual Knobs	Each motor comes standard with a manual locking knob with scale
Encoder Options	Standard: Optional differential rotary encoder By request: Internal linear encoder
Motor Options	Bi-polar 2-phase steppers, 5-phase stepper, and IMS motors

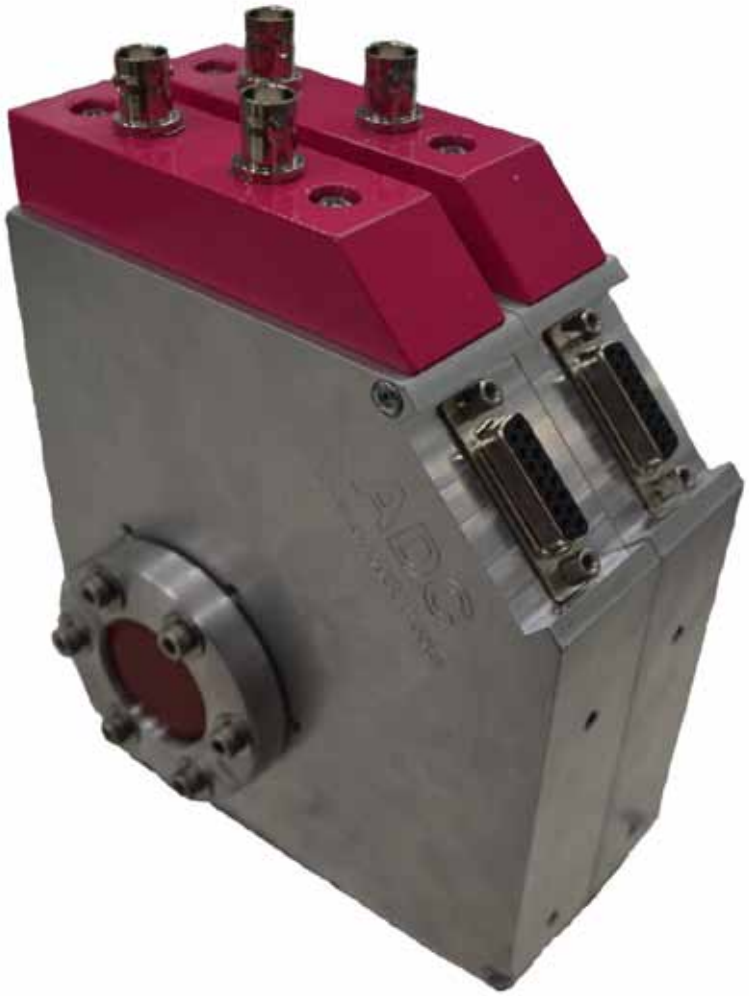

SLT-100-P Precision Slit Assembly with Vacuum Kit
ADC Inc.
Notes:
Approximate Weight = 3.7 kg [8.16lb]
Aperature Size = 24mm x 24 mm
Blade Thickness = 1.5mm
Blade Material = Tungsten
Purchased Part Modification
213,56 [8,408]
79,53 [3,131]
253,03 [9,962]
103,59 [4,078]

SLT-100-P

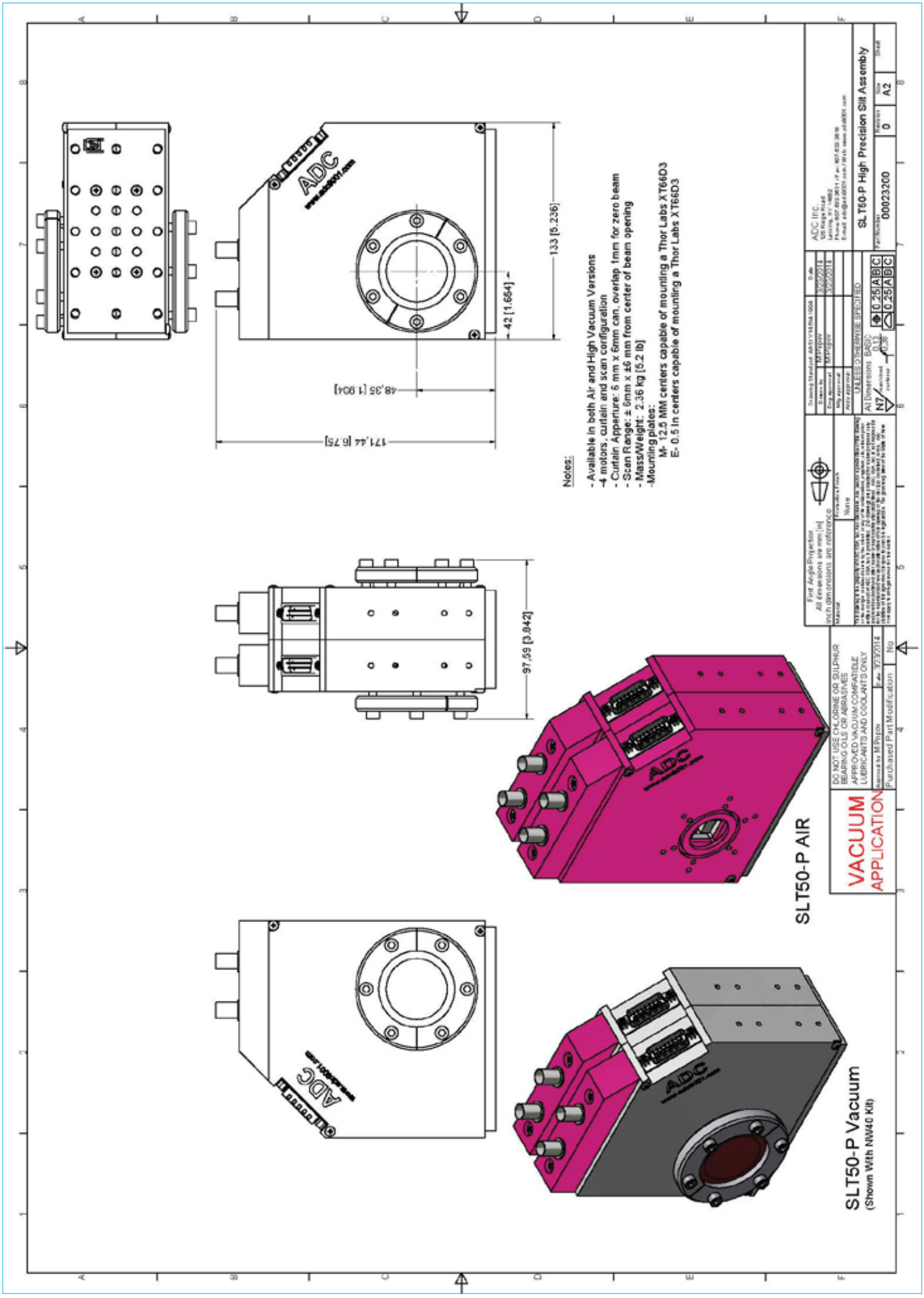
X-RAY SLITS

SLT-50-P

For more information please visit the following website:
http://www.adc9001.com/SLT-200-10



SLT-50-P Specification	
Aperture size	6 mm x 6 mm Blades can go "past closed" without clashing "Fully overlap"
Resolution	~ 50 nm scanning precision & ~160 nm aperture precision
Accuracy	Accuracy ± 2 µm
Blade material	Tungsten or Tantalum, Tungsten Carbide, Cadmium, Boron Nitride
Blade Thickness	Standard 2 mm Thicker blade available; 5, 7 and 10 mm thick blade upon request.
Blade Options	Knife-edge profile (2 degrees slope) Or round blade edge Roughness of the jaw edge surface: <0.2 µm (rms)
Environmental Options	Air or Vacuum (Tested to 10-6 mbar)
Overall Dimensions	Vacuum: 133 mm x 171 mm x 98 mm Air: 133 mm x 171 mm x 70 mm
Blade Beam Monitoring	Each blade is isolated to have the ability to monitor the current off the blade

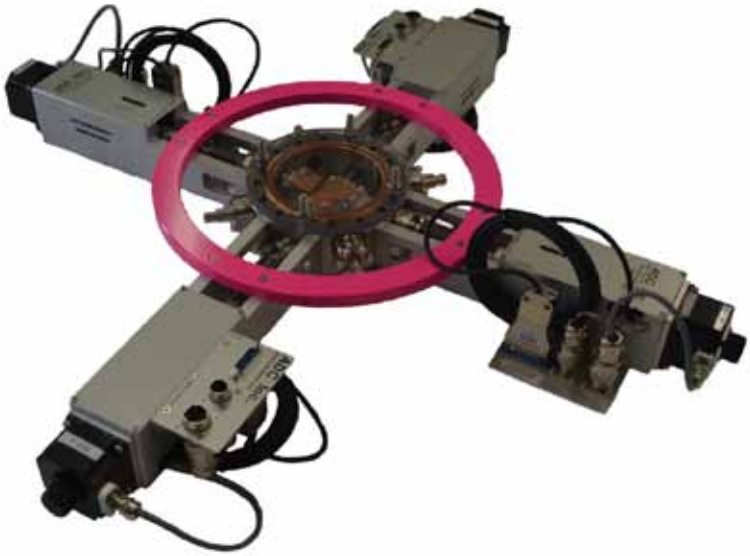

SLT50-P High Precision Slit Assembly
00023200
SLT50-P AIR
SLT50-P Vacuum
(Shown With NW40 Kit)
VACUUM APPLICATION
133 [5.236]
42 [1.654]
48.35 [1.904]
171.44 [6.75]
97.69 [3.842]
Notes:
- Available in both Air and High Vacuum Versions
-4 motors, curtain and scan configuration
- Curtain Apperture: 6 mm x 6mm can, overlap 1mm for zero beam
- Scan Range: ± 6mm x ±6 mm from center of beam opening
- Mass/Weight: 2.36 kg [5.2 lb]
-Mounting plates:
M- 12.5 MM centers capable of mounting a Thor Labs XT66D3
E- 0.5 in centers capable of mounting a Thor Labs XT66D3

SLT-50-P

X-RAY UHV SLIT SYSTEM

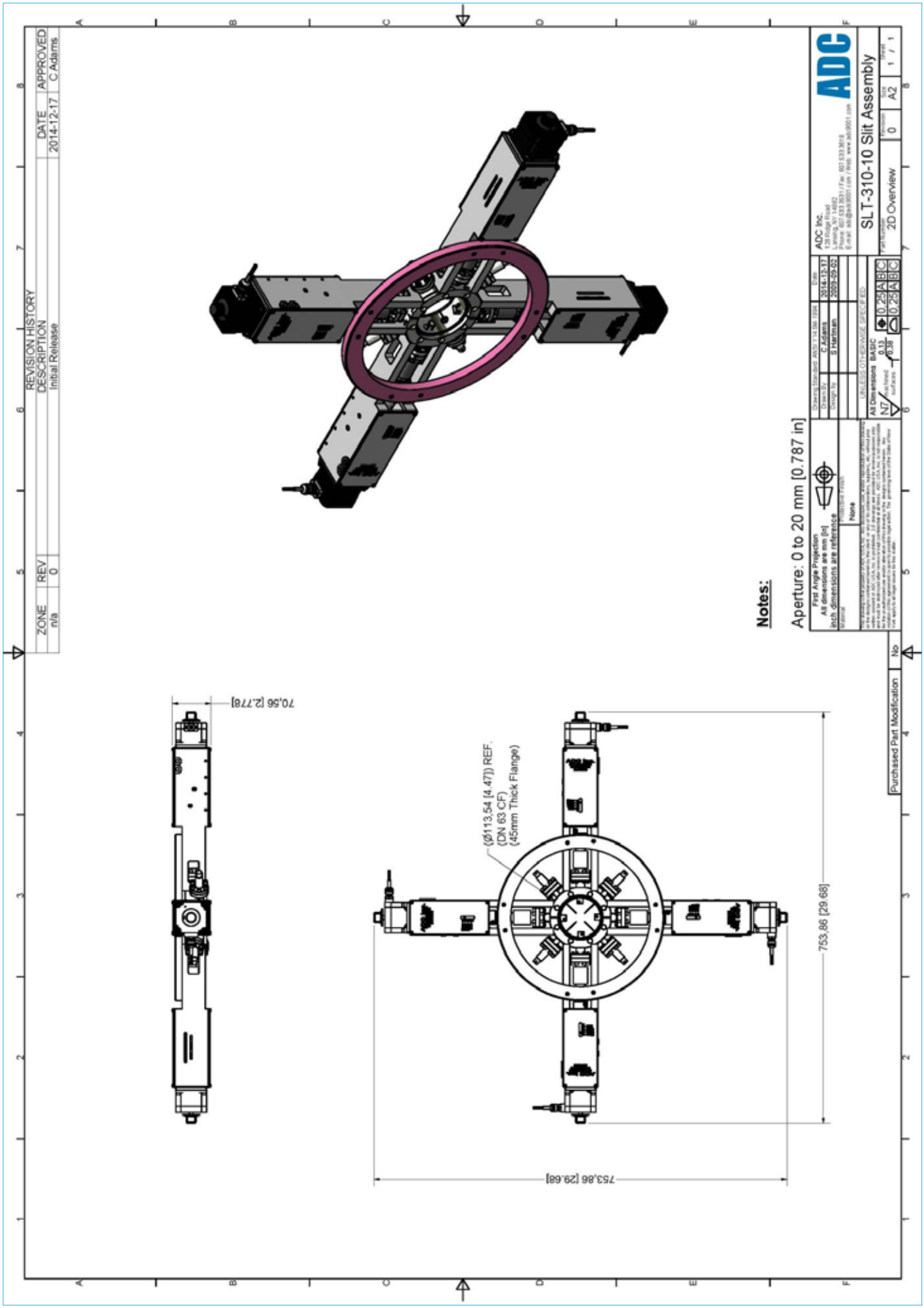
SLT-310

For more information please visit the following website:
http://www.adc9001.com/SLT-300-10



SLT-310 X-Ray UHV Slit System Specification:

Aperture size	20 mm, 25 mm, 50 mm, & 60 mm
Resolution	<0.16µm precision*
Accuracy	± 2 µm
Blade material	Tungsten or Tantalum, Tungsten Carbide, Cadmium, Boron, cupper, Nitride, or custom Blades can go "past closed" without clashing (Overlapping/Zero beam ~6mm)
Blade Thickness	Standard 1.5 mm Thicker blade available; 5, 7 and 10 mm thick blade upon request.
Blade Options	Knife-edge profile (2 degrees slope) Or round blade edge Roughness of the jaw edge surface: <0.2µm (rms)
Vacuum	Vacuum rated to better than $5x10^{-10}$ mbar and have a leak rate of less than $1x10^{-9}$ mbar-l/s.
Gearhead Options	Motors come with optional gearhead to increase resolution, 5:1, 10:1
Blade Beam Monitoring	Each blade is isolated to have the ability to monitor the current off the blade
Encoder Options	Standard: Renishaw (Incremental or Absolute) By request: Heidenhain, Other
Motor Options	Standard: Bi-polar 2-phase steppers By request: 5-phase stepper and IMS motors
Image Screen Options	Using fluorescent screen fixed to vertical upper and lower blade, single crystal YAG (Yttrium Aluminum Garnet)

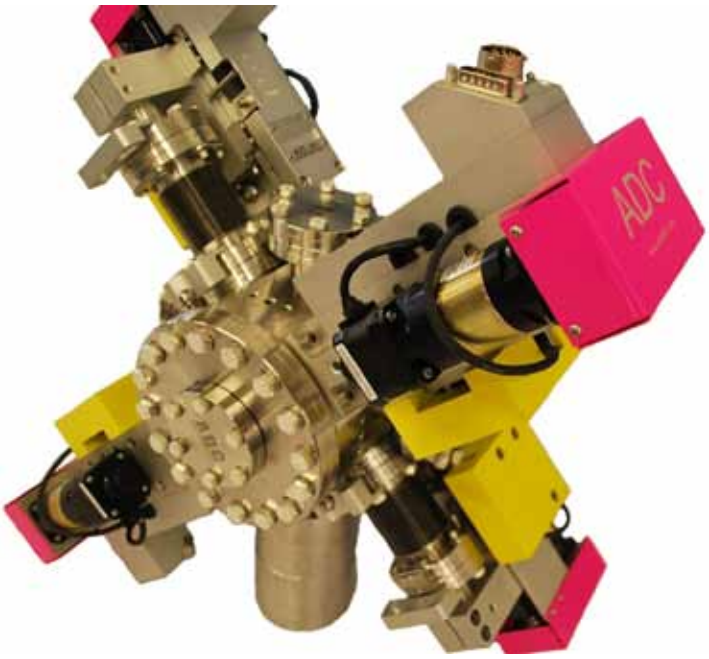

REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Initial Release | 2014-12-17 | C.Adams
Notes:
Aperture: 0 to 20 mm [0.787 in]
SLT-310-10 Slit Assembly
2D Overview
ADC
70,56 [2.778]
(Ø113,54 [4.47]) REF.
(DN 63 CF)
(45mm Thick Flange)
753,86 [29.68]
753,86 [29.68]

SLT-310-10

UHV PRECISION SLIT SYSTEM UNCOOLED

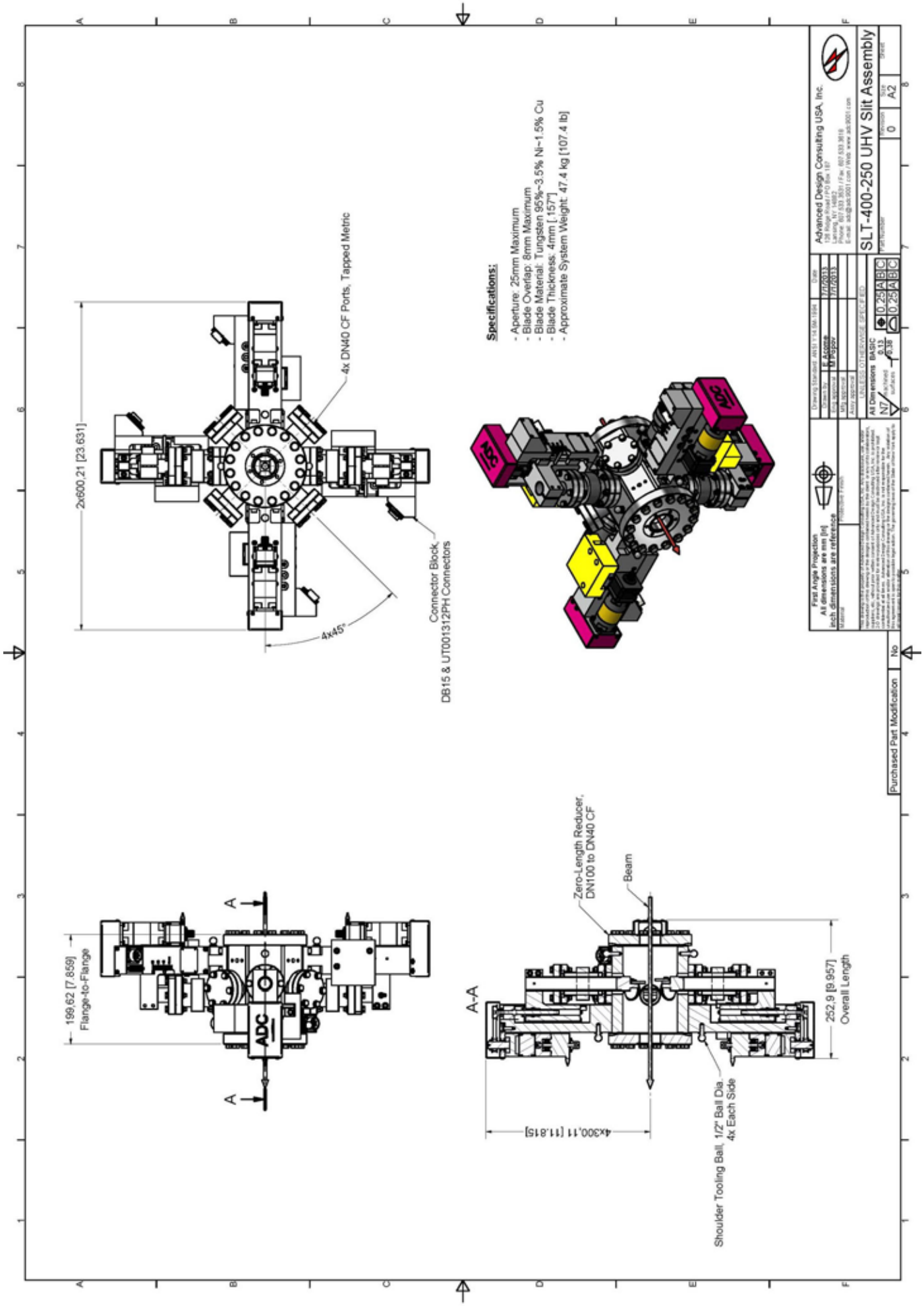
SLT-400-250

For more information please visit the following website:
http://www.adc9001.com/SLT-600-Monochromatic-Slit



SLT-310 X-Ray UHV Slit System Specification:

Aperture size	25 mm
Resolution	<0.16µm precision*
Accuracy	± 2 µm
Blade material	Tungsten or Tantalum, Tungsten Carbide, Cadmium, Boron, cupper, Nitride, or custom Blades can go "past closed" without clashing (Overlapping/Zero beam ~6mm)
Blade Thickness	Standard 2 mm Thicker blade available; 5, 7 and 10 mm thick blade upon request.
Blade Options	Knife-edge profile (2 degrees slope) Or round blade edge Roughness of the jaw edge surface: <0.2µm (rms)
Vacuum	Vacuum rated to better than $5x10^{-10}$ mbar and have a leak rate of less than $1x10^{-9}$ mbar-l/s.
Gearhead Options	Motors come with optional gearhead to increase resolution, 5:1, 10:1
Blade Beam Monitoring	Each blade is isolated to have the ability to monitor the current off
	the blade
Encoder Options	Standard: Renishaw (Incremental or Absolute) By request: Heidenhain, Other
Motor Options	Standard: Bi-polar 2-phase steppers By request: 5-phase stepper and IMS motors
Image Screen Options	Using fluorescent screen fixed to vertical upper and lower blade, single crystal YAG (Yttrium Aluminum Garnet)

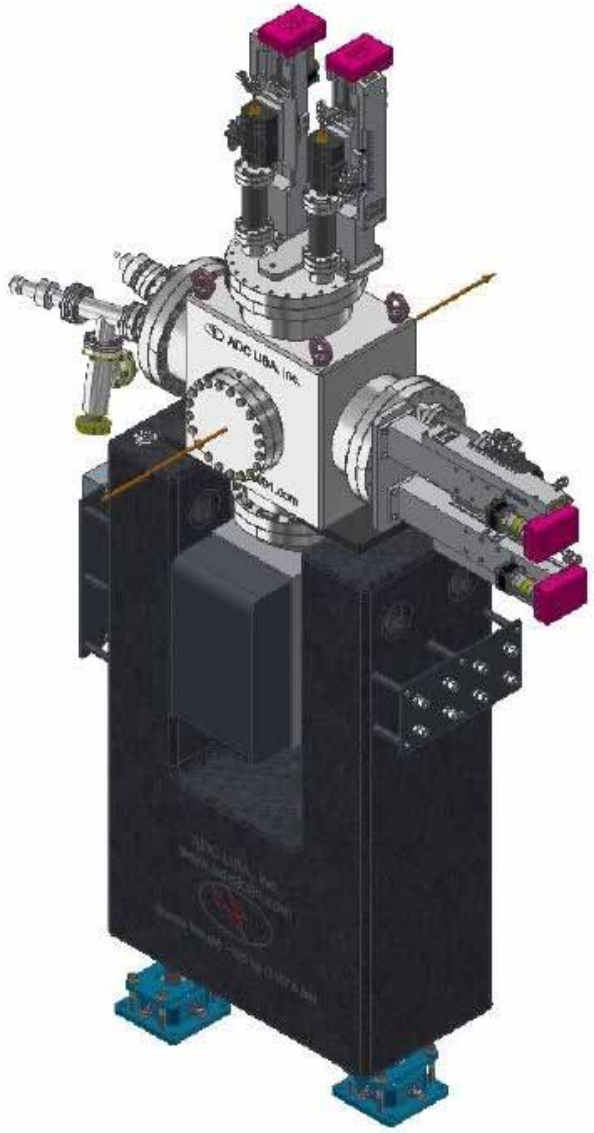

Specifications:
- Aperture: 25mm Maximum
- Blade Overlap: 8mm Maximum
- Blade Material: Tungsten 95%~3.5% Ni~1.5% Cu
- Blade Thickness: 4mm [.157"]
- Approximate System Weight: 47.4 kg [107.4 lb]
4x DN40 CF Ports, Tapped Metric
2x600,21 [23.631]
4x45°
Connector Block
DB15 & UT001312PH Connectors
199,62 [7.859]
Flange-to-Flange
A
A
ADC
A-A
Zero-Length Reducer,
DN100 to DN40 CF
Beam
4x300,11 [11.815]
Shoulder Tooling Ball, 1/2" Ball Dia
4x Each Side
252,9 [9.957]
Overall Length
Advanced Design Consulting USA, Inc.
SLT-400-250 UHV Slit Assembly
Purchased Part Modification
No

SLT-400-250

UHV HIGH PRECISION X-RAY SLIT SYSTEM -COOLED & UNCOOLED

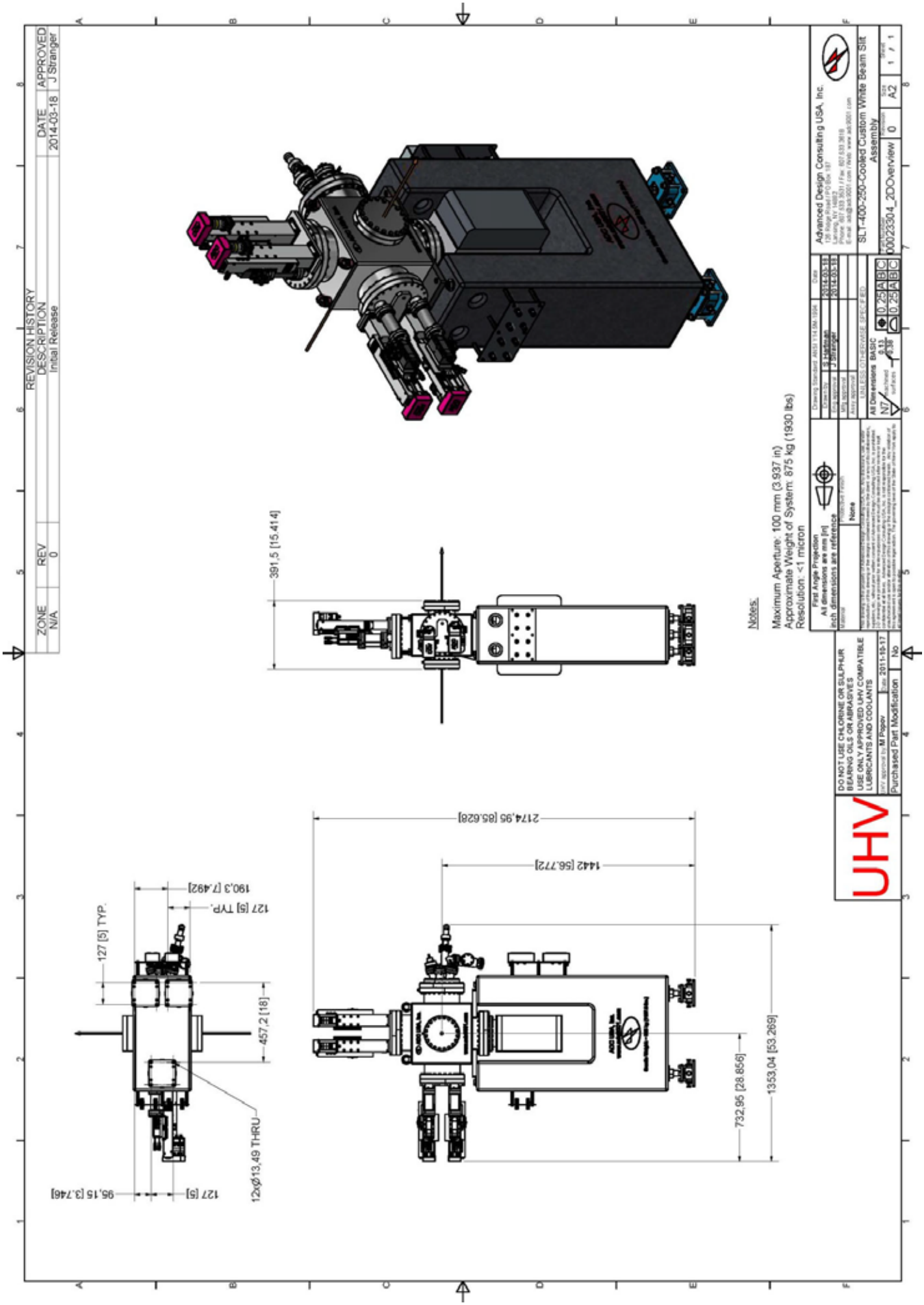
SLT-600

For more information please visit the following website:
http://www.adc9001.com/products/view/650



Standard Key Specifications:

Parameter	Value
Maximum Aperture	25mm, 50mm, 100mm
Blade Overlap	20mm, 30mm, 50mm
Blade Material	Tungsten 95%~3.5% Ni~1.5% Cu*
Blade Thickness	4mm [0.16"]*
Cooling Connection	¼" Swagelok
Total Heat Load	680 W
Maximum Heat Flux	44.85 W/mm^2
Recommended Cooling Flow	1.9 l/m [0.5 g/m]
Flange-to-Flange Length	400mm [15.41"]
Vacuum Level	< 5x10–10 mbar (UHV)
Beamline Connection	DN150, DN100 (6") CF to DN40 (2 ¾") CF*

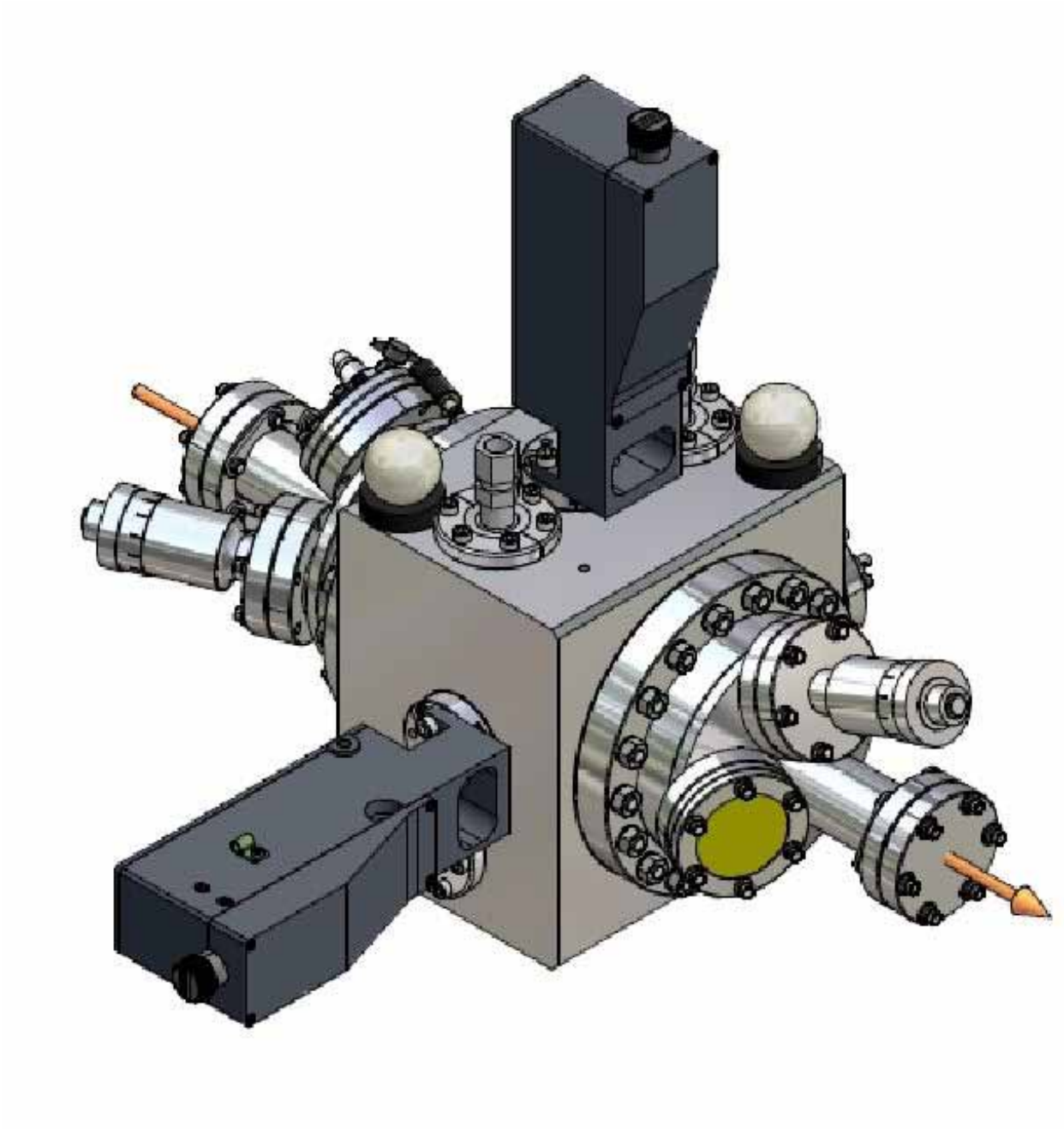

REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
N/A | 0 | Initial Release | 2014-03-18 | J Stranger
391,5 [15.414]
2174,95 [85.628]
1442 [56.772]
1353,04 [53.269]
732,95 [28.856]
190,3 [7.492]
127 [5] TYP.
127 [5] TYP.
457,2 [18]
12xØ13,49 THRU
95,15 [3.746]
127 [5]
Notes:
Maximum Aperture: 100 mm (3.937 in)
Approximate Weight of System: 875 kg (1930 lbs)
Resolution: <1 micron
Advanced Design Consulting USA, Inc.
SLT-400-250-Cooled Custom White Beam Slit Assembly
00023304_2DOverview
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Purchased Part Modification

SLT-600

EXIT SLIT

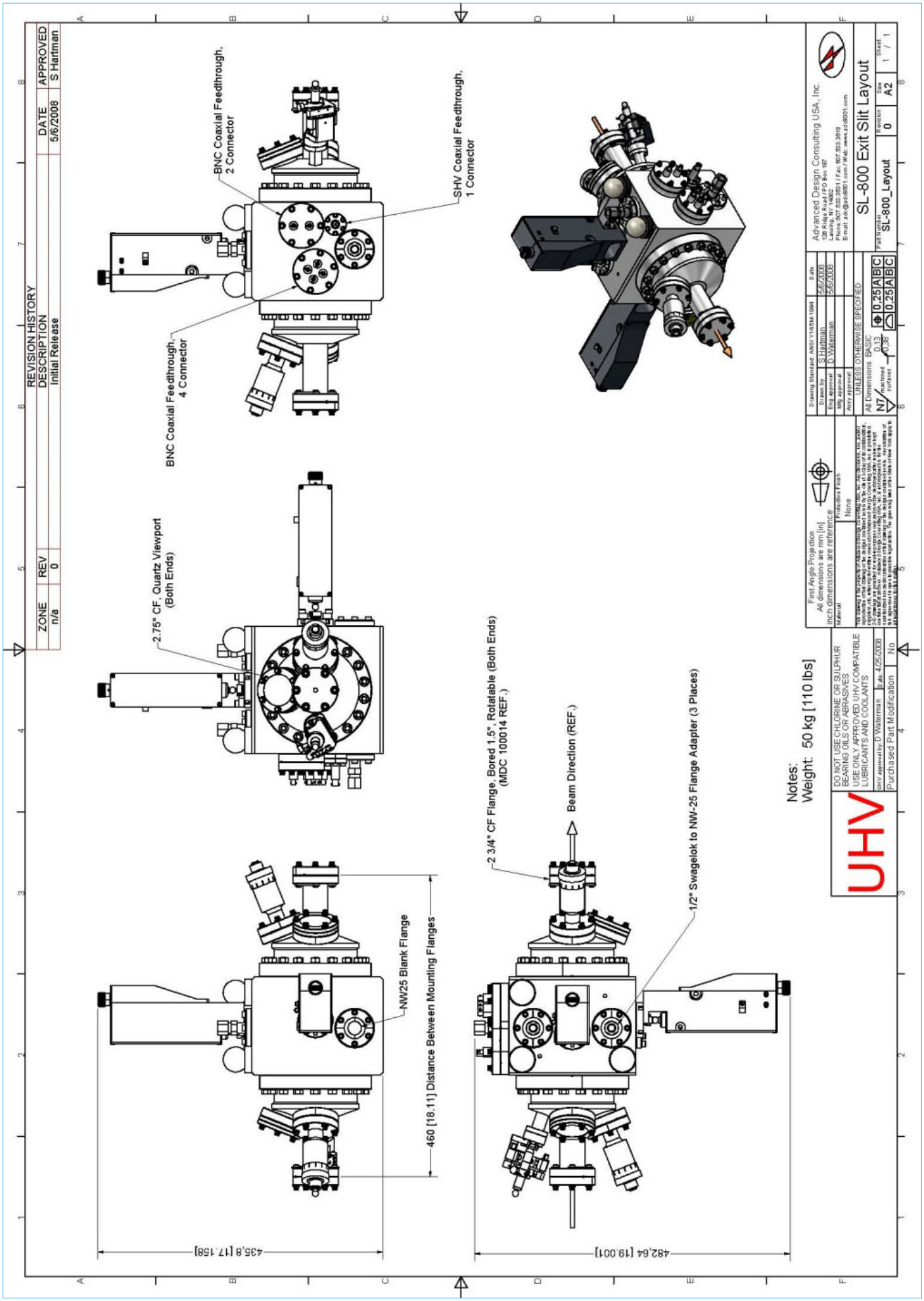
SLT-800

For more information please visit the following website:
http://www.adc9001.com/SLT-800



Stand Motion Specification

	Horizontal Motions	Vertical Motions
Range	-10mm to +10mm	-6mm to +6mm
Resolution	<0.1μm	<0.1μm
Repeatability	<0.4μm	<0.4μm
Accuracy	<1μm	<1μm

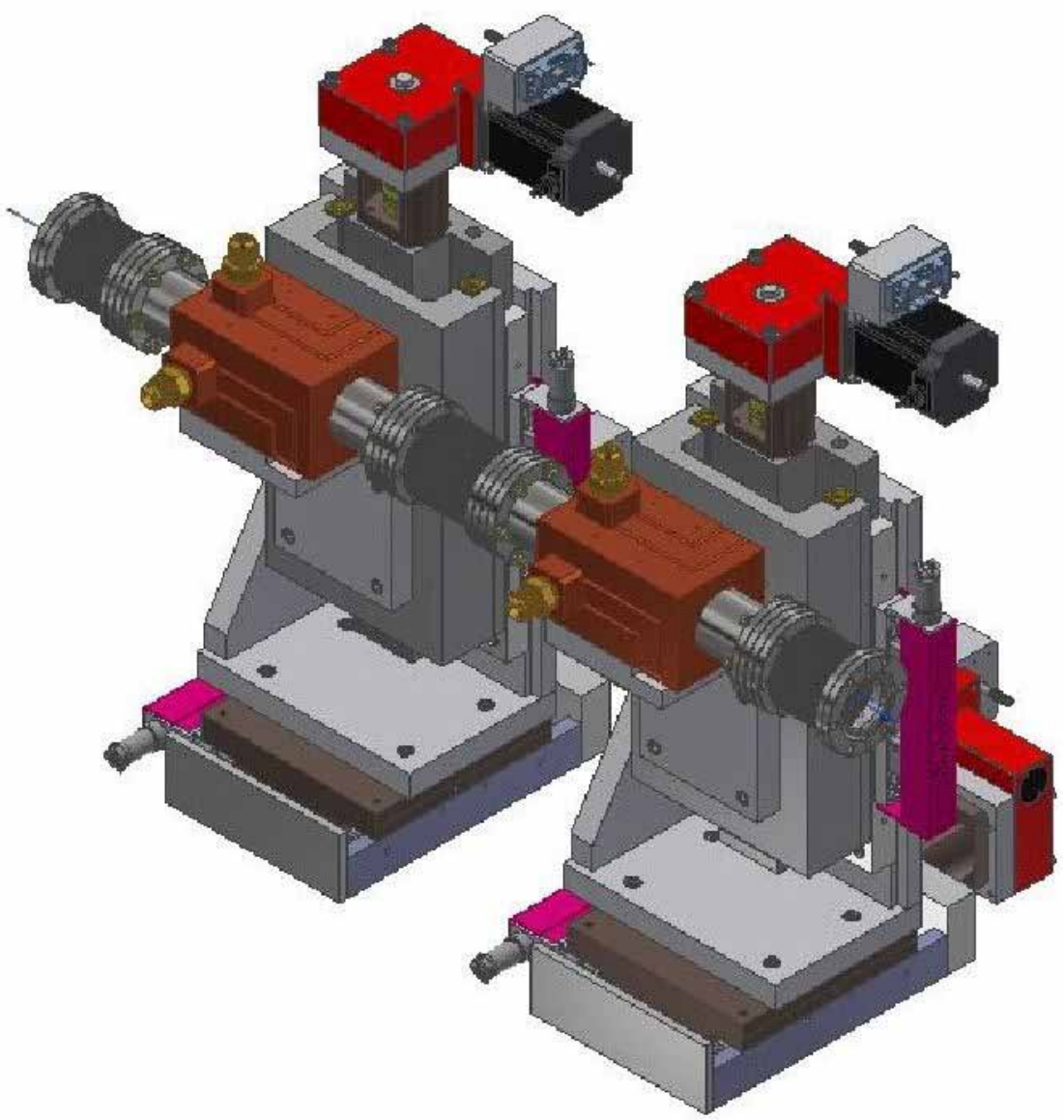

REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Initial Release | 5/6/2008 | S Hartman
BNC Coaxial Feedthrough, 2 Connector
SHV Coaxial Feedthrough, 1 Connector
BNC Coaxial Feedthrough, 4 Connector
2.75" CF, Quartz Viewport (Both Ends)
NW25 Blank Flange
460 [18.11] Distance Between Mounting Flanges
435.8 [17.158]
2 3/4" CF Flange, Bored 1.5", Rotatable (Both Ends) (MDC 100014 REF.)
Beam Direction (REF.)
1/2" Swagelok to NW-25 Flange Adapter (3 Places)
482.64 [19.001]
Notes:
Weight: 50 kg [110 lbs]
UHV
DO NOT USE CHLORINE OR SULPHUR BEARING OILS OR ABRASIVES
USE ONLY APPROVED UHV COMPATIBLE LUBRICANTS AND COOLANTS
Advanced Design Consulting USA, Inc.
SL-800 Exit Slit Layout
SL-800_Layout
Size A2
Sheet 1 / 1

SLT-800

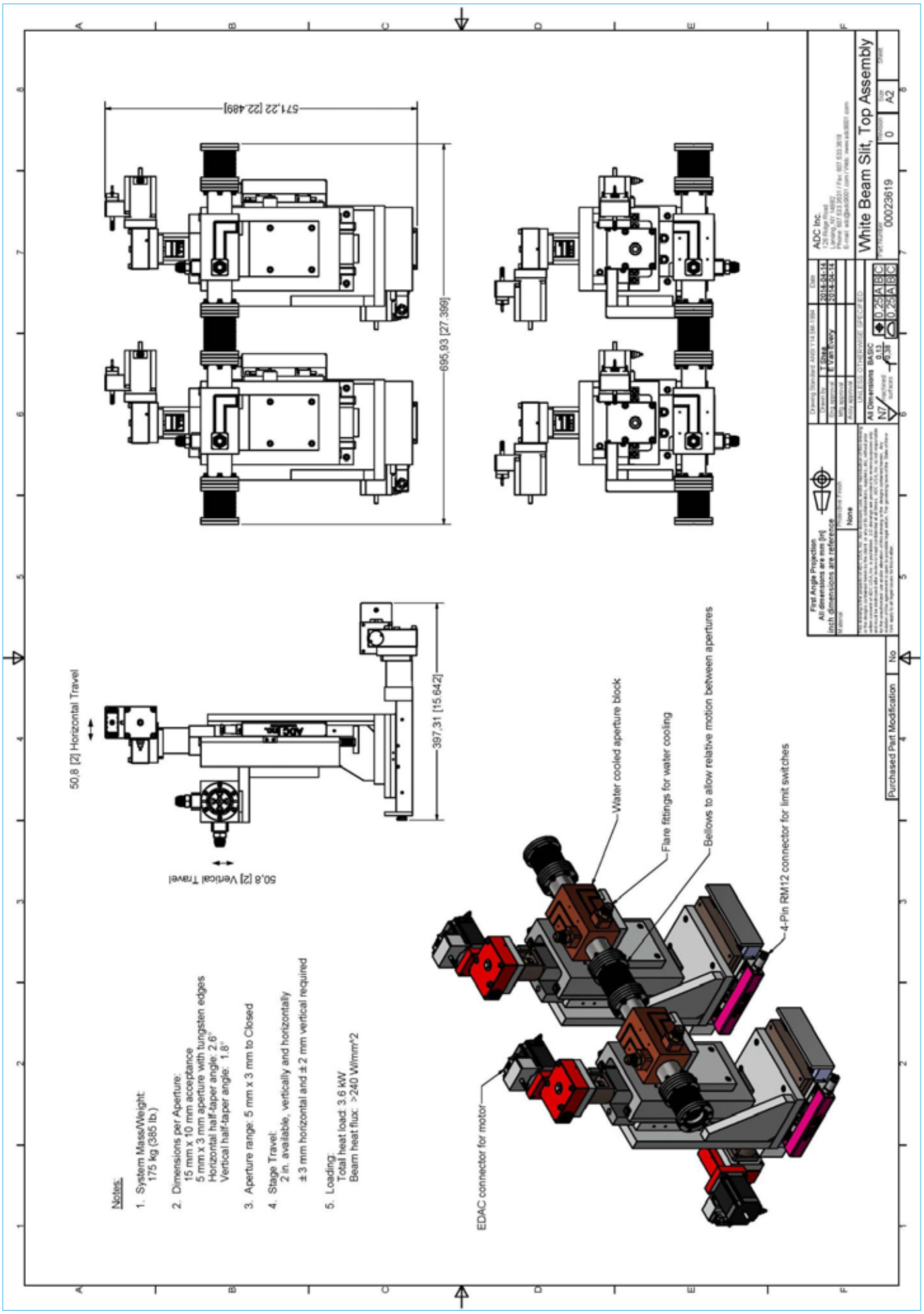
UHV HIGH HEAT LOAD OFHC-GLIDCOP SLIT

SLT-1200

For more information please visit the following website:
http://www.adc9001.com/products/view/649



Aperture Block Dimensions			
Dimension	Nominal	Tolerance per Edge	Units
Acceptance Width	15	+0.127 / -0	[mm]
Acceptance Height	10	+0.127 / -0	[mm]
Aperture Width with Tungsten	5	+0.025 / -0.025	[mm]
Aperture Height with Tungsten	3	+0.025 / -0.025	[mm]
Horizontal Half-Taper Angle	2.6	n/a	[°]
Vertical Half-Taper Angle	1.8	n/a	[°]
Diameter of Cooling Channel	12.7	n/a	[mm]
Length of Block	121.5	n/a	[mm]


571,22 [22.489]
695,93 [27.399]
50,8 [2] Horizontal Travel
50,8 [2] Vertical Travel
397,31 [15.642]
Water cooled aperture block
Flare fittings for water cooling
Bellows to allow relative motion between apertures
4-Pin RM12 connector for limit switches
EDAC connector for motor
Notes:
1. System Mass/Weight:
175 kg (385 lb.)
2. Dimensions per Aperture:
15 mm x 10 mm acceptance
5 mm x 3 mm aperture with tungsten edges
Horizontal half-taper angle: 2.6°
Vertical half-taper angle: 1.8°
3. Aperture range: 5 mm x 3 mm to Closed
4. Stage Travel:
2 in. available, vertically and horizontally
±3 mm horizontal and ± 2 mm vertical required
5. Loading:
Total heat load: 3.6 kW
Beam heat flux: >240 W/mm^2
ADC Inc.
White Beam Slit, Top Assembly
00023619
A2
0
Purchased Part Modification
No

SLT-1200

CUSTOM SLITS

For more information please visit the following website:
http://www.adc9001.com/products/show_list/id/142

SwissFEL High Precision Slits (Curtain Design)

SwissFEL High Precision Slits- 45 Degree

UHV Slit System….with YAG Crystal

Custom Monochromatic UHV Slits BL02B at SSRF

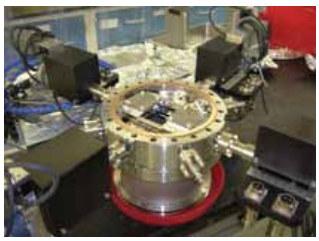
High Heat Load UHV Slit System for ESRF ID11 Pinhole Mono

UHV Slit System for ESRF

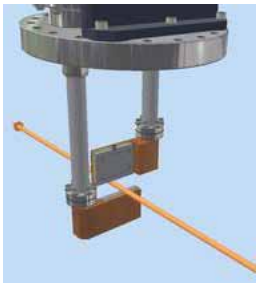
ALS Copper Braided Cooled High Precision Slit

DLS I13 Front End Slit

DLS Custom Water Cooled High Precision Slit

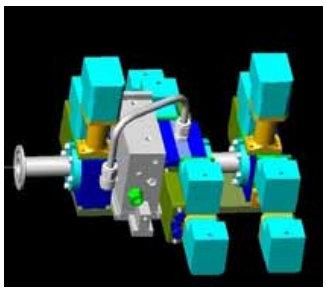


DLS Custom UHV Slit



MAX-Lab Custom Water Cooled Slit

SNS Custom SLT-100-30



ALS-Slits-Ion Chamber Assembly

ANKA- Copper Braided SLT-Slits

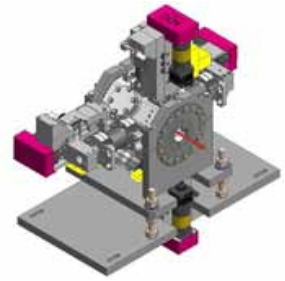
APS Two Slanted 30 Degree Slits

SSRF UHV Slits

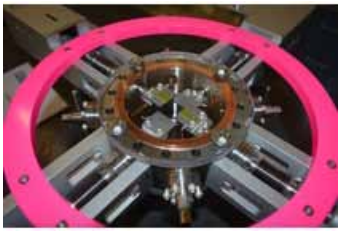
SLT-800-1 UHV Flexure Design White/Pink Beam Exit Slit System

SLT-700 High Heat Load Water Cooled Slit

LSU/CAMD Water Cooled UHV Slits



UHV, high precision, slit for MAX IV



PAL UHV Slit System

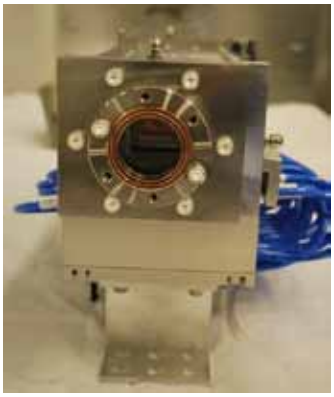
APS UHV, high precision slit

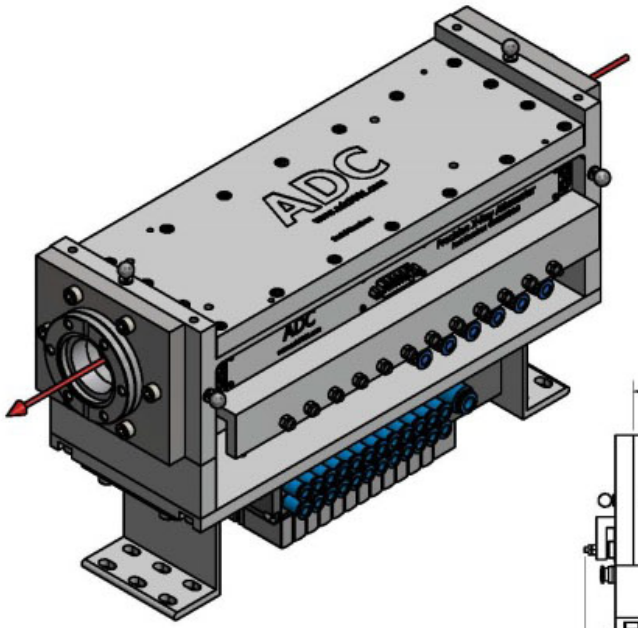
PRECISION ATTENUATOR FOR HARD X-RAYS

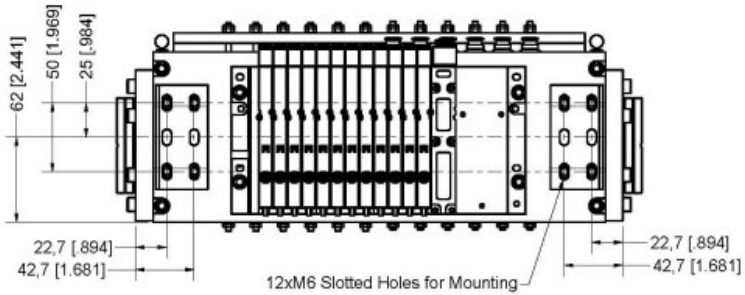
ABS-300

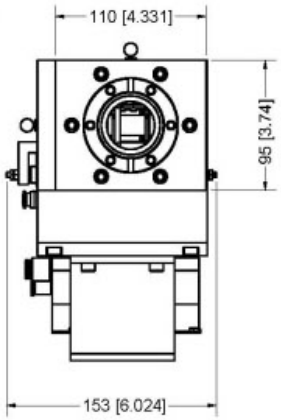
http://www.adc9001.com/products/view/637

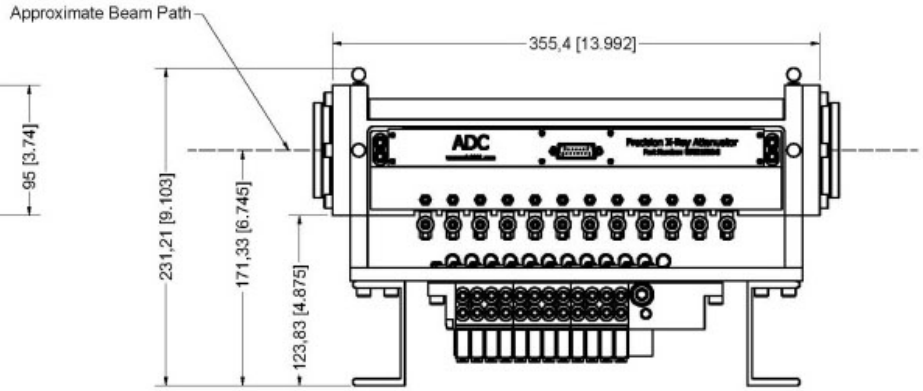
ADC has licensed and is offering a Precision Attenuator for Hard X-Rays (ABS-300) that was developed over many years at the synchrotron radiation source PETRA III at DESY. This system will provide the ability for scientists to reduce the incident x-ray flux to any desired value. For many applications at hard x-ray beamlines at lab sources and synchrotron radiation sources the detected intensity spans more than six orders of magnitude. An integrated flux of more than one million counts per second is far too much for most of the detectors in use, which can even be severely damaged on saturation. For this reason, x-ray beamlines are equipped with socalledattenuators (or absorbers) which reduce the beam load on the detector by blocking the beam with a (for x-rays) semi-transparent material (called filter or foil).

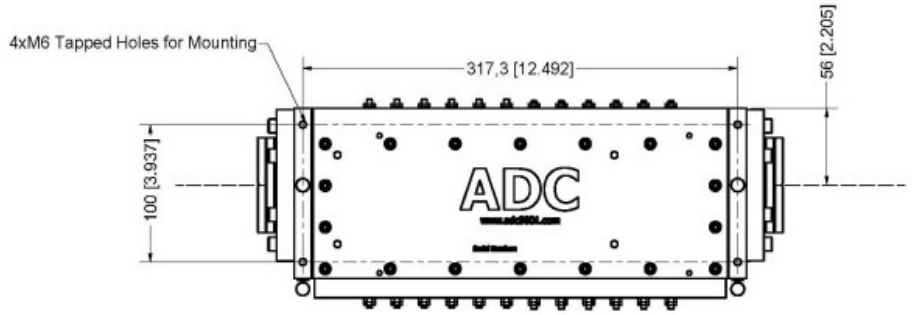












Notes:

1. Product can be equipped with DN40 or NW40 flanges (DN40 flanges shown), or with adapters for Blake Industries' beampath tube.

2. Specifications:
   Mass/Weight: 12.7 kg (28 lbf)
   Vacuum Level: 1e-7 mbar
   Filter Frames: 12 frames with 20 mm x 15 mm effective apperture
   O-Ring Sizes: #143 and #394 (#135 for Male Beamtube Adapter)

3. Tubing for pneumatic actuators ommitted for ease of viewing (Use 6 mm O.D. flexible pneumatic tubing)

VACUUM APPLICATION

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

Approval by: M Popov | Date: 7/17/2013
Purchased Part Modification | No

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

Material | Protective Finish

Drawing Standard: ANSI Y14.5M-1994		Date
Drawn by	Tim Shea	7/17/2013
Eng approval	M Popov	7/17/2013
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 0,13 / 0,38
0,25 A B C
0,25 A B C

ADC USA, Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: ado@adc9001.com / Web: www.adc9001.com

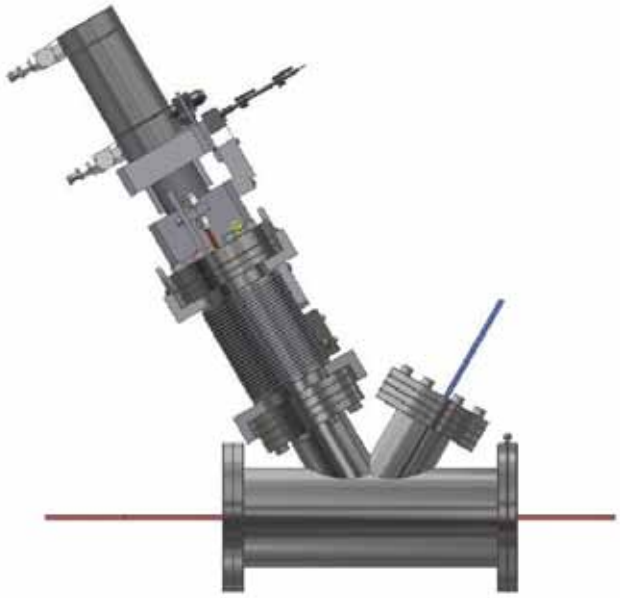
Precision X-Ray Attenuator Assembly

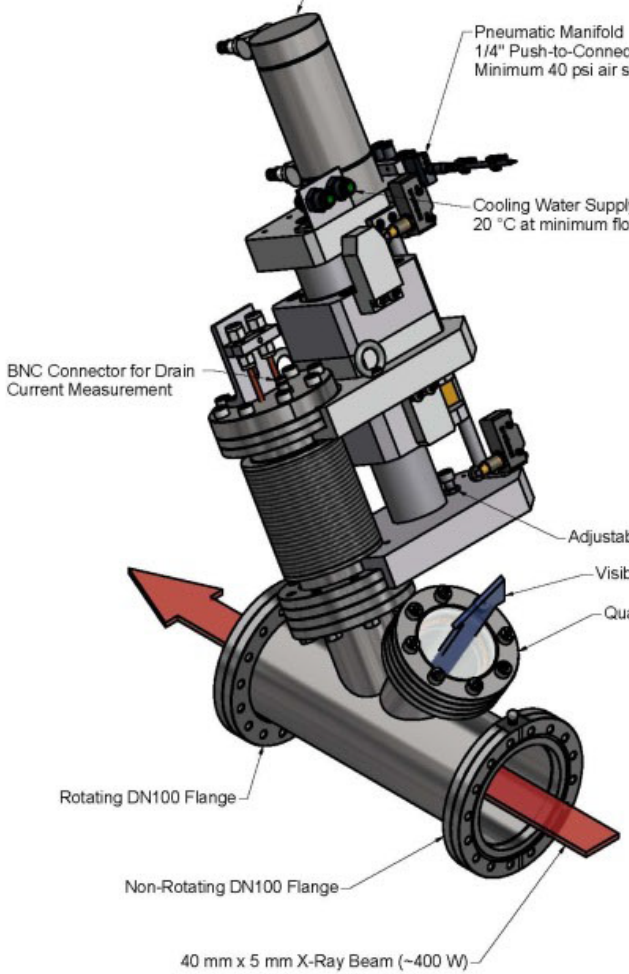
Part Number	Revision	Size	Sheet
00021936	0	A2	

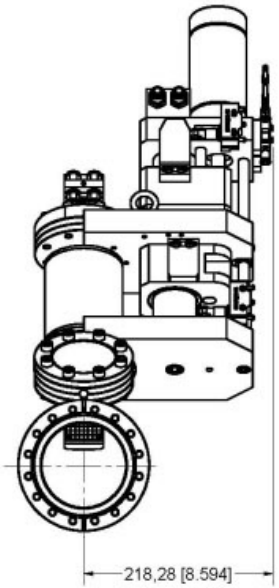
FLUORESCENT SCREEN ASSEMBLY

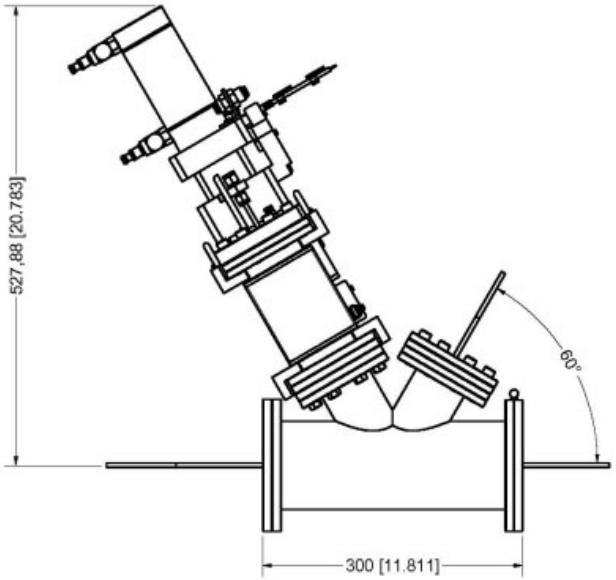
http://www.adc9001.com/products/view/638

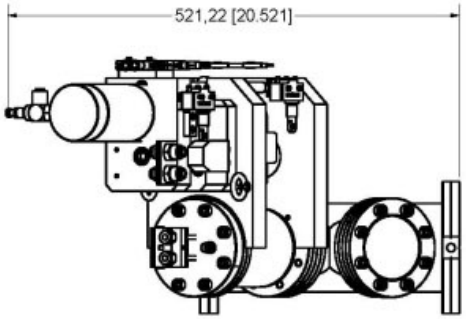
ADC has manufactured the FC-204 unit which allows the user to view the position and profile of an incident X-ray beam. The full assembly of the fluorescent screen consists of three main components: a welded vacuum chamber; a linear actuator mounted to one branch of the chamber; and a water-cooled fluorescent screen. The chamber has 6" CF flanges on the upstream side (non-rotatable) and downstream side (rotatable) for connecting to the CAMD beamline. The upper branches of the chamber have 4½" CF flanges. One branch is capped by a quartz-glass viewport, while the other supports the pneumatic actuator used to position the fluorescent screen. Copper tubes provide water-cooling for the fluorescent screen and have ¼" Swagelok fittings for connecting to the water supply. The tubes are vacuum brazed into the fluorescent screen. A stainless steel bracket provides structural for the screen and cooling tubes. The screen itself is at a 60° angle from the horizontal plane. The face of the screen is coated with P22R phosphor and features equally spaced grooves cut into the surface for imaging from the viewport above. The lower hard stop for the pneumatic actuator allows the screen location to be fine-tuned as needed to place the beam on a flat or a groove in the grid. Inventor Simulation was used to perform steady-state thermal analysis on the fluorescent screen assembly. An average mesh size of 0.6 mm was used for each analysis. A surface heat flux of 2.18 W/mm2 was applied over the 40 mm x 5 mm beam footprint centered on the fluorescent face.











Notes:

1. System Mass/Weight: 30 kg (66.2 lb)
2. Screen Position Stroke: 50 mm Between Hard Stops
   (Lower hard stop adjustable for precise screen location)
3. Fluorescent Screen Specifications:
   - P22R Phosphor
   - Electrically Isolated with Connector for Drain Current
   - 20 mm x 45 mm Open Face with 5.8 mm Tall x 5 mm Wide Grid
4. Required Fluid Supplies:
   - Pressurized Air at 40 psi Minimum (1/4" Push-In Connector)
   - Water at 20 °C and Minimum Flow Rate of 0.29 gal/min
5. End Flanges: DN100 (6" CF) with Clearance Holes
6. Water and Pneumatic Lines Omitted from Drawing

UHV

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

UHV approval by: M Popov | Date: 9/18/2013

Purchased Part Modification: No

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

Material | Protective Finish

		Date
Drawing Standard: ANSI Y14.5M-1994		
Drawn by	T Shea	10/9/2013
Eng approval	M Popov	10/9/2013
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13 / 0,38
0.25 A B C
0.25 A B C

ADC USA, Inc.
120 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

Fluorescent Screen, Electrically Isolated, Top Assembly

Part Number	Revision	Size	Sheet
00022220	0	A2	

RSXS FILTER ARRAY

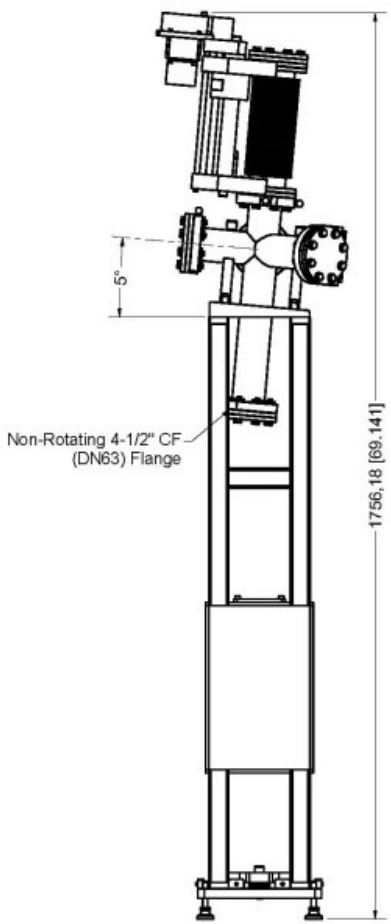
http://www.adc9001.com/products/view/639

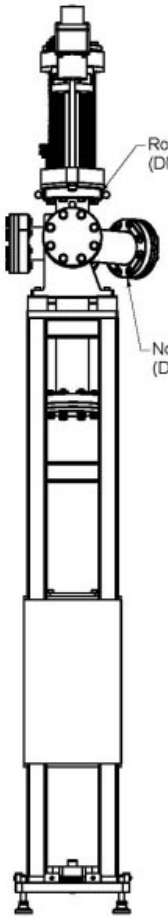
RSXS Filter Array This Filter Array moves 14 x-ray filters into and out of the beam using a stepper motor and ball screw drive unit. The filters are mounted to an arm which moves perpendicular to the beam, allowing an individual filter to be selected for placement in the beam. The array is enclosed in a vacuum chamber which will connect to the customer's beam line. The filters are mounted in easily interchangeable frames so that any desired filter can be installed A stand is provided for the system with horizontal, vertical, and leveling adjustments. This stand is constructed with chambers for ballast to stabilize the system, and the main chamber is made easy to fill with any locally available ballast material by the 2-inch square opening in the top plate.

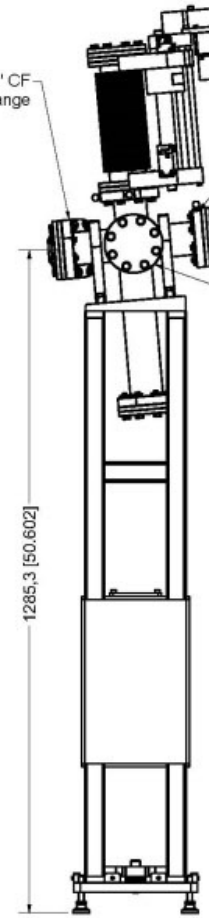
Motion	Product Description	Range of Motion
Vertical	UHV Design Linear Shift	150 mm
Vertical	Swivel Leveling Mounts	+/- 15 mm
Horizontal	2-Axes Set Screw Adjustment	+/- 10 mm

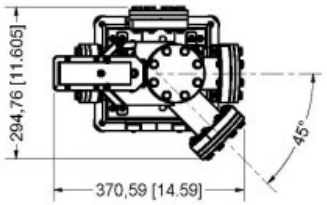
Filter List:

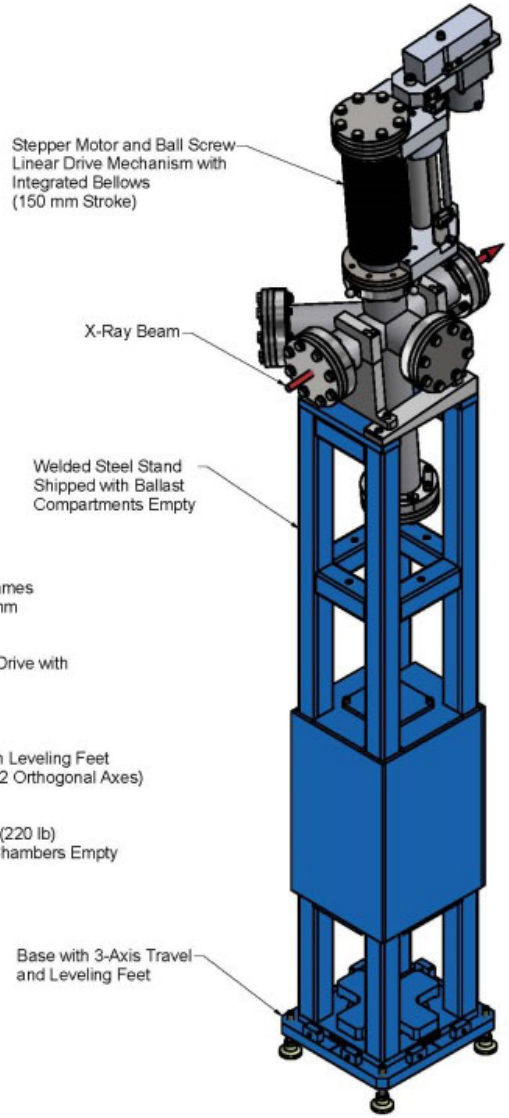
Materials	Thickness (um)
Schott Filter Glass UG 5	1000
Quartz (pure crystals)	500
MgF2 (pure crystals)	500
In	0.16
Sn	0.15
Ge	0.15
Mg	0.3
Si	0.3
B	0.3
C	1
Ti	0.8
Sn	0.5











Notes:

1. Filters:
   - 14 Interchangeable Frames
   - Apperture 30 mm x 5 mm
2. Driven Motion
   - Stepper Motor Linear Drive with Integrated Bellows
   - 150 mm Travel
3. Base Adjustment
   - +/- 15 mm Vertical with Leveling Feet
   - +/- 10 mm Horizontal (2 Orthogonal Axes)
4. System Mass/Weight
   - Approximately 100 kg (220 lb)
   - Shipped with Ballast Chambers Empty

First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date	ADC USA, Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3618 E-mail: adc@adc9001.com / Web: www.adc9001.com
	Drawn by: T. Shea	11/15/2013	
	Eng approval: M Popov	11/15/2013	
Material:	Protective Finish: None	Mfg approval	RSXS Filter Assembly
		Assy approval	
	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: 00022309 · Revision: 0 · Size: A2 · Sheet

Purchased Part Modification: No

http://www.adc9001.com/products/show_list/id/114

Mirror System Optics Beamline mirror systems are typically highly customized to meet individual beamline requirements. However, all mirror systems have fundamental common elements. These are the "optics" which includes the mirror, bender or holder; and associated cooling; and the "mechanics" which includes all the rest of a complete mirror system including the base, out-of-vacuum motions, in-vacuum motions, in-vacuum optics plate, in-vacuum disaster masks, a vacuum chamber with associated ports, a separate vacuum chamber support, and a control system. Mirrors are typically polished for extreme flatness and then bent in cylindrical, elliptical, or toroidal shapes to meet beamline requirements. These mirrors require benders to produce the desired shape. Other mirrors are polished to a specific shape and are simply supported in a holder. In both cases the bender or holder must impart minimal stress to the mirror. Another consideration for the mirror is the heat load. Typically, the mirror has either no heat load (< 1 Watt), medium heat load (1 to 1500 Watts), or high heat load (1000 to several thousand Watts). Mirrors with no heat load require none or passive cooling. Passive cooling may consist of a simple copper braid thermally connecting the holder/bender to a heat sink such as the optics plate or vacuum chamber. Mirrors with medium or high heat load require active water or LN2 cooling. There is considerable overlap between medium and high heat loads. ADC performs a thermal FEA model of each new mirror system to determine the best method of cooling. Disaster masks on the entry or exit sides of the vessel are provided as well.

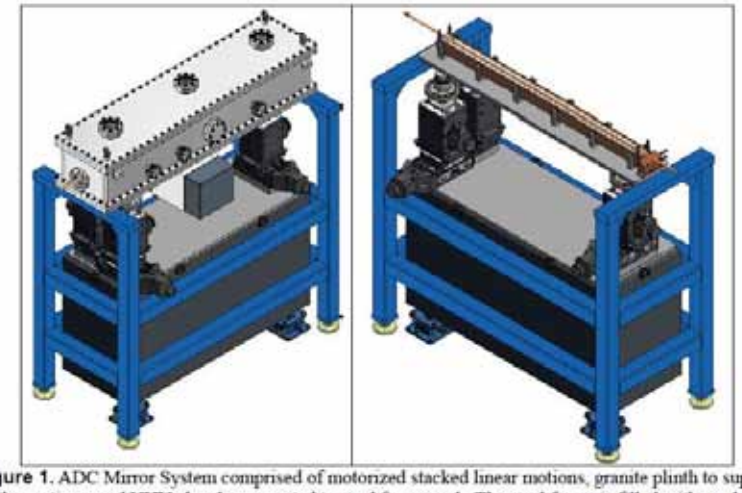
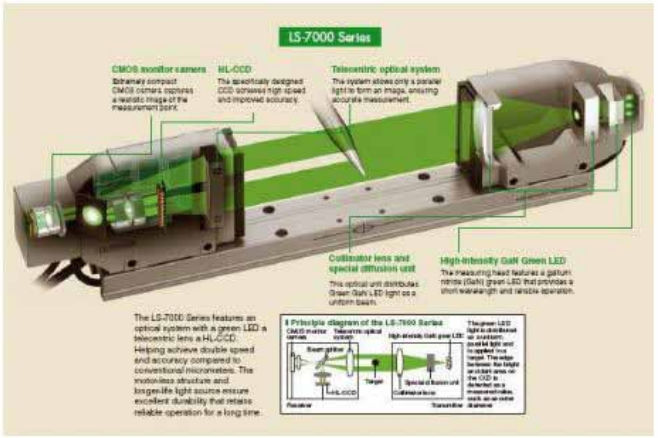


Figure 1. ADC Mirror System comprised of motorized stacked linear motions, granite plinth to support the motions, and UHV chamber mounted to steel framework. The steel frame is filled with sand to dampen floor vibrations. Kinematic feet below the granite plinth allow for adjustment of the mirror to its nominal position.



At ADC, the mirror motions are fully tested for positioning accuracy, repeatability, and resolution, as well as UHV base vacuum pressure, leak rate, and RGA. For minute dimensional and motion tests ADC uses a Keyence LS-7030 non-contact optical micrometer (shown below) to precisely measure blade motions. The high speed LED/CCD optical micrometer is capable of 2400 samples/second high-speed sampling with repeatability of ±0.06 µm and an accuracy of +/- 2 µm. Inspection data is provided in a final report.

20-BM MIRROR

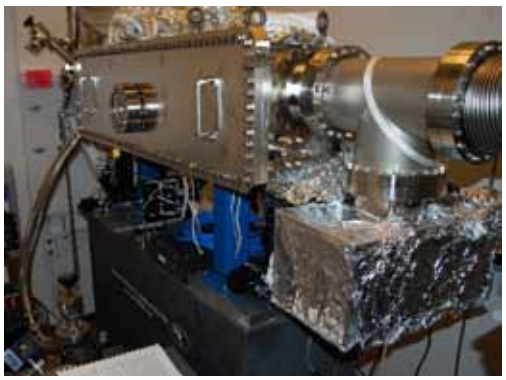
http://www.adc9001.com/APS-20-BM-Mirror

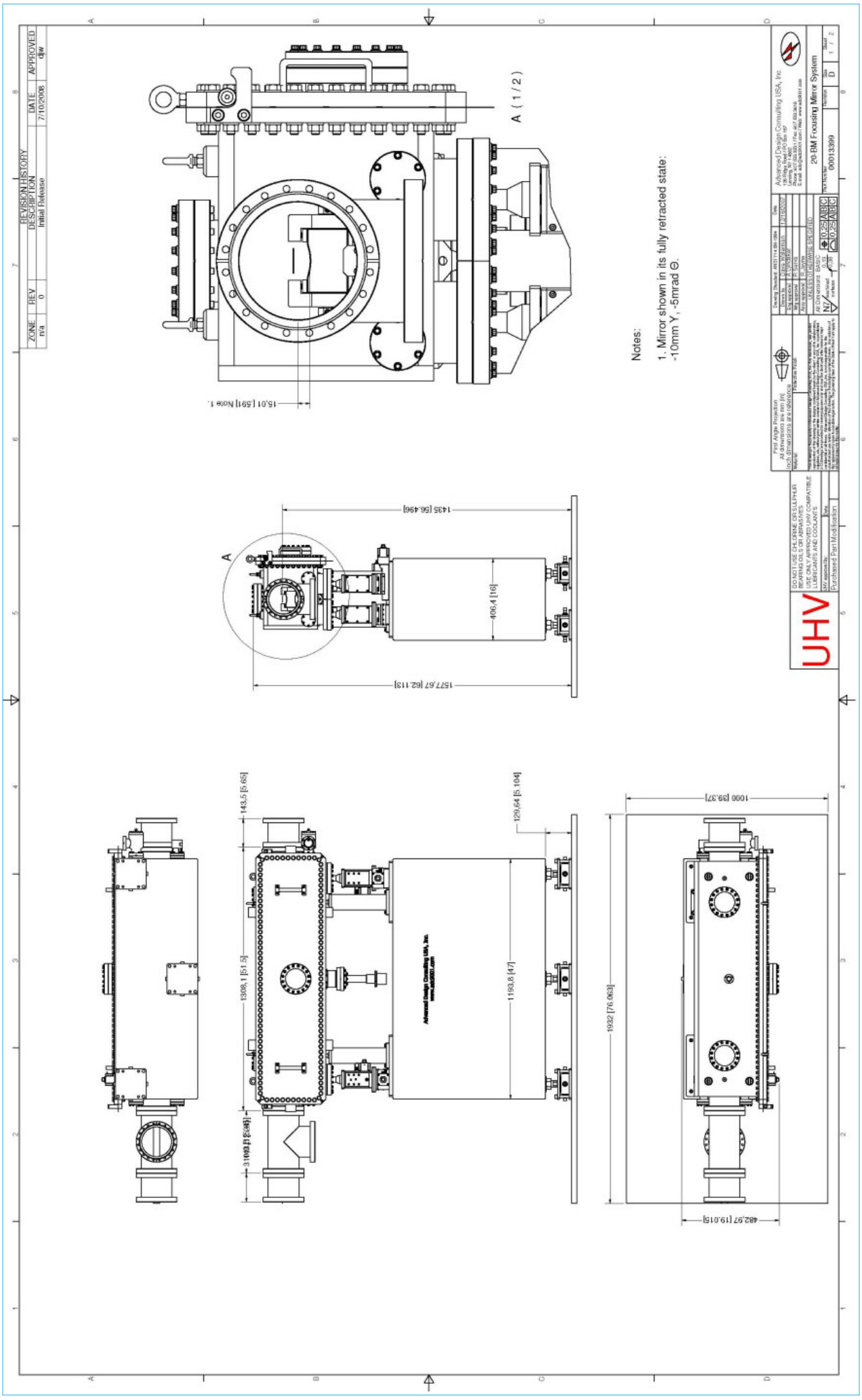
ADC designed and built a 1100 mm long silicon mirror system to install at the Advanced Photon Source (APS). The APS 20-BM mirror system consists of five primary subcomponents: The mirror optic itself, its positioning system, the bending mechanism, a vacuum chamber, and the support structure all provided as an integrated package. All subsystems were designed to provide the highest positional stability and structural rigidity with precision motions on all axes.

20-BM Focusing Mirror and Bender Specifications

Clear Aperture of 40 x 1000mm, beam approx. 31mm wide. Bounce up. •Sagittal radius of 63mm ±1mm (Slope error of 20µrad)
Meridional radius of 8 to 15km (Slope error of 2µrad)
Unbent condition, mirror radius >30km
Material: ULE / Silica / Silicon
Roughness: 4A
Coating: 50nm Pt on 5nm Cr

Argonne NATIONAL LABORATORY




REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Initial Release | 7/10/2008 | dpw
A (1 / 2)
15.01 [.591] Note 1.
Notes:
1. Mirror shown in its fully retracted state:
-10mm Y, -5mrad Θ.
1435 [56.496]
406.4 [16]
1577.67 [62.113]
143.5 [5.65]
1308.1 [51.5]
129.64 [5.104]
1193.8 [47]
1000 [39.37]
1932 [76.063]
482.97 [19.015]
UHV
20-BM Focusing Mirror System
00013899

MOTION SYSTEM

for KB Mirror

http://www.adc9001.com/products/view/641

A system was designed for Argonne National Laboratory that provides 5 degrees of motion for their KB Mirror. The mirror chamber has 50 mm of vertical (z-axis) travel and 75 mm horizontal (x-axis) travel with a resolution of 1 µm. Through the use of stacked precision slides, precision jacks, and free slides the chamber can also be rotated around the x-axis, y-axis, and z-axis to allow for leveling and alignment of the chamber. The slides and jacks use NEMA 34 stepper motors. The jacks are fitted with planetary inline gearboxes, and the slides use right angle gear boxes. This removes the need for a brake while allowing greater precision of motion. The motion system sits on a granite base providing stability and vibration dampening. The granite is leveled precisely with lockable leveling feet and bolted to an aluminum plate grouted to the floor.

Argonne NATIONAL LABORATORY

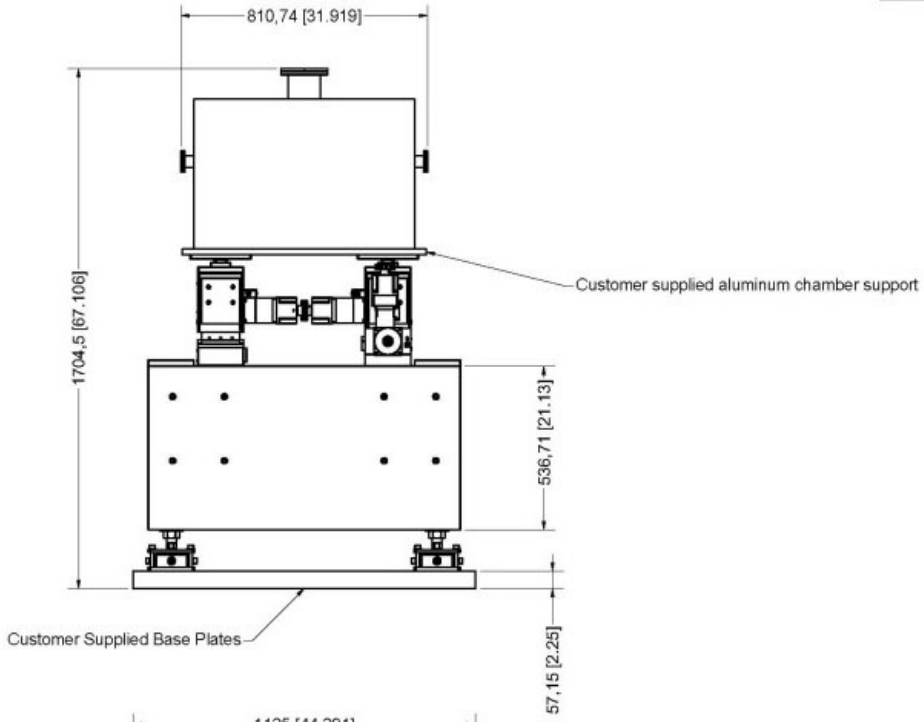
Key Specifications:

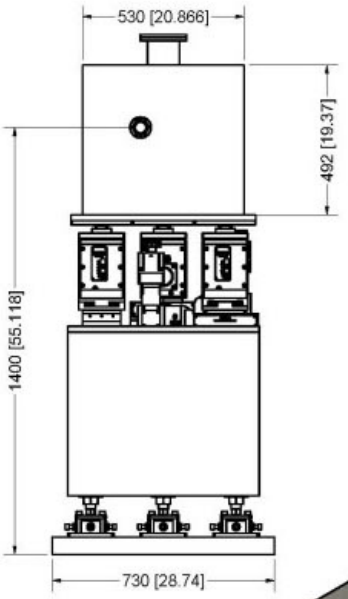
Linear Travel Specifications:

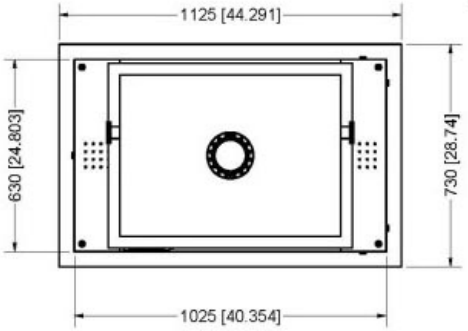
Description	Value	Units
Range of Motion (Z Axis)	50 [~2]	mm [in]
Resolution (unit/step)	~0.001	mm/step
Encoder Manuf.	Renishaw	-
Encoder Resolution	0.1	µm

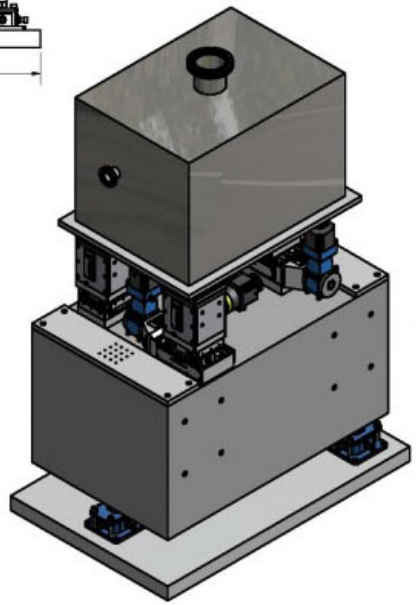
Description	Value	Units
Range of Motion (X Axis)	75 [~3]	mm [in]
Resolution (unit/step)	~0.001	mm/step
Encoder Manuf.	Renishaw	-
Encoder Resolution	0.1	µm

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2014-08-18	C Adams









Notes:

-400 series jacks and slides shown.
-Final design will be submitted for approval before manufacturing begins.

Purchased Part Modification	No

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

Material | Protective Finish

Drawing Standard: ANSI Y14.5M-1994		Date
Drawn by	C Adams	2014-08-18
Design by	C Adams	2014-08-15

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

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

ANL Motion System for KB Mirror Assembly

Part Number	Revision	Size	Sheet
2D Overview	0	A2	1 / 1

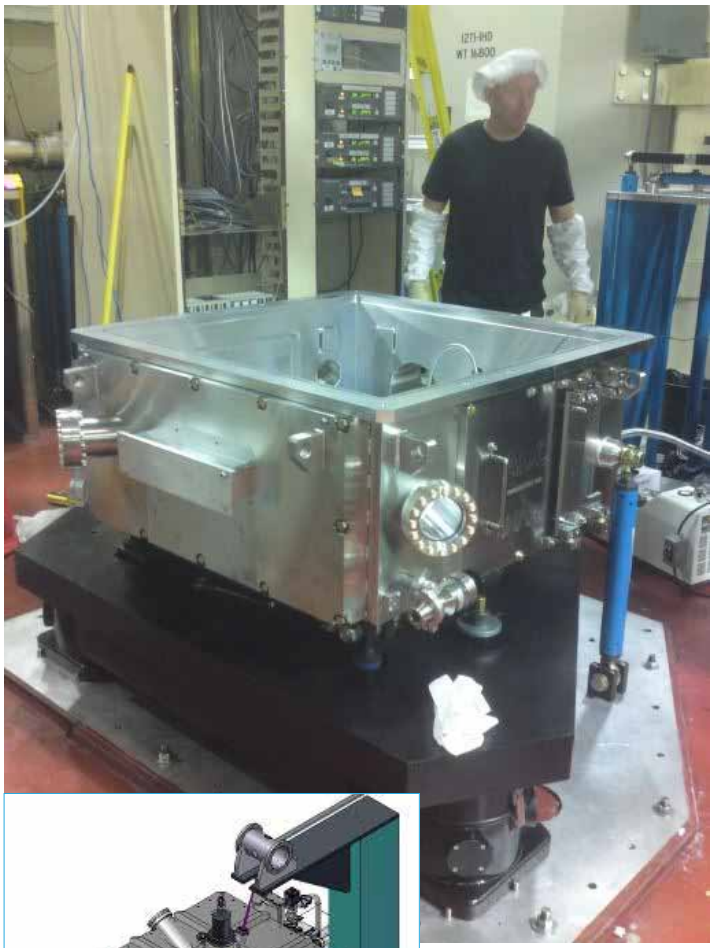
EUV MASK MICROSCOPE

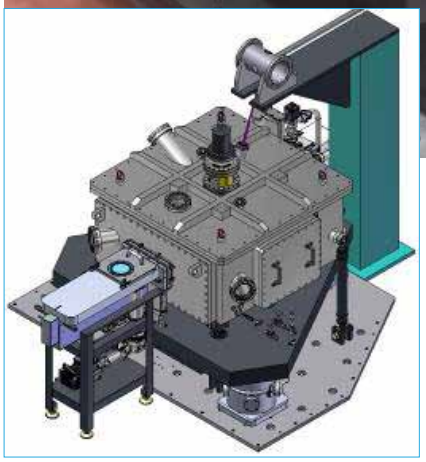
for Lithography Generations Reaching 8 nm

http://www.adc9001.com/products/view/666

ADC designed, built and installed SHARP (the SEMATECH High-NA Actinic Reticle review Project) an actinic, synchrotron-based microscope dedicated to extreme ultraviolet (EUV) photomask research for Lawrence Berkeley National Laboratory. The system demonstrated the addition of complementary imaging modes to the SHARP EUV mask microscope, in an effort to extract additional information from actinic photomask imaging, improve navigation and enhance defect detection.

ADC USA, Inc. is introducing a state-of-the-art high-resolution extreme-ultraviolet-light (EUV) microscope. This system contains a state-of-the-art high-resolution extreme-ultraviolet-light (EUV) microscope for imaging of EUV photomasks. These photomasks are critical components in photolithography—the process used to mass-produce semiconductor electronic devices. Major components of the system include: a large vacuum chamber to house the experimental area; active vibration control system; 3 axis in-vacuum motion stages; and an automated loadlock for inserting the EUV photomasks. The system is designed for nm-scale stability, light exclusion (internal darkness), and ease of maintenance. It operates near ultra-high vacuum (UHV) conditions, requiring a base pressure of 1e-7 Torr, and therefore has a high degree of cleanliness and the exclusive use of compatible materials and components that do not outgas. Owing to the high resolution of the microscope (down to 30-nm), the system is designed for nm-scale relative stability of the critical mask and (zone plate) lens over exposure time periods up to one minute. It is designed so internal components do not radiate light into the chamber, or "glow" from internal heat generation. A mask-transfer system enables masks to be loaded and unloaded from the system chamber. The mask transfer system gently, cleanly, and safely handles the mask loading, installation, unloading and removal. The Mask XYZ stage is the heart of the system and the primary navigation tool in the system. Specifications for the XYZ stages are as follows:



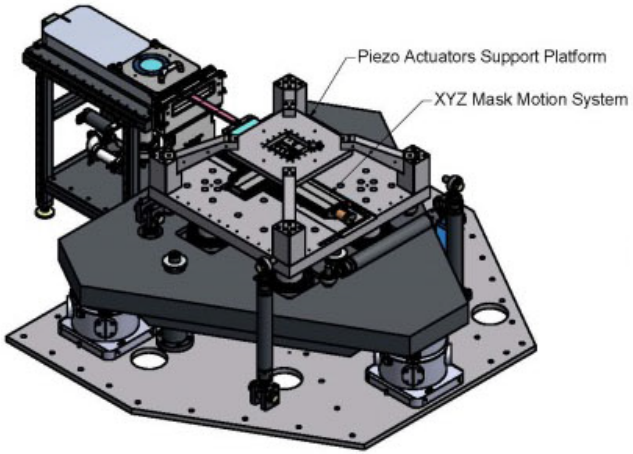


BERKELEY LAB

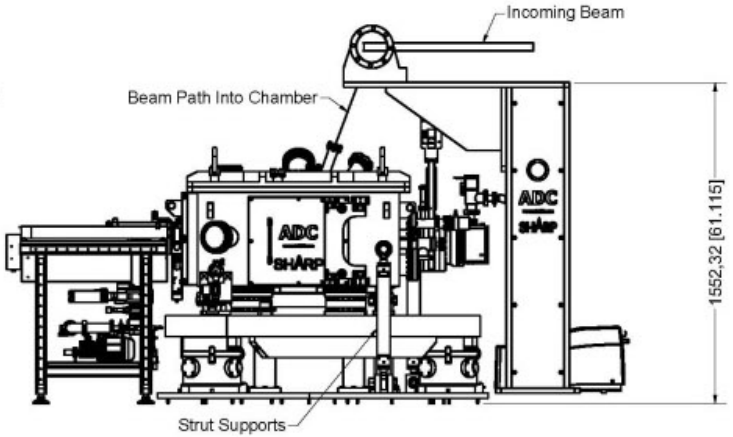
Lawrence Berkeley National Laboratory

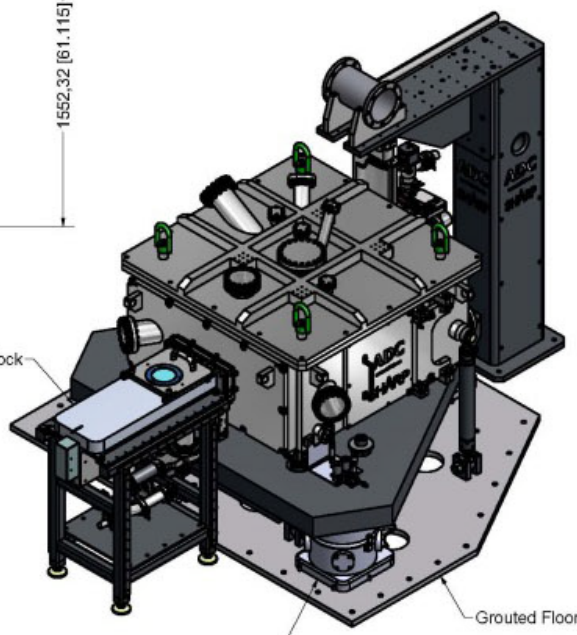
Table 1. Mask stage specifications. Axis	Travel (mm)	Resolution (nm)	Repeatability (µm)
X	250.00	< 100	±0.50
Y	250.00	< 100	±0.50
Z	5.00	< 50	±0.50

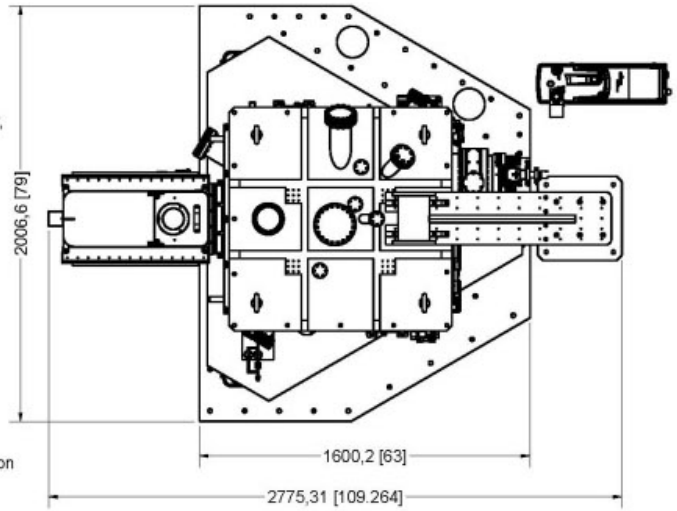
http://sharp.lbl.gov/publications/presentations/
http://ait.lbl.gov/



Internal View







Notes:

The SHARP Instrument is designed for the inspection of EUV photolithography masks. Key features of the system include low particle generation, nm-scale stability, and ease of maintenance. Due to long exposure times of up to 1 minute, relative stability and resolution of the mask and lens components are critical.

System Support Features:
- Grouted Floor Plate
- TMC Stacis 2100 Active Vibration Isolator Pads to Support Internal Motions
- Rigid 6 Strut Support System for Vacuum Chamber

Vacuum Chamber:
- Base Pressure:10E-7 Torr
- 5x Viewports for Tracking the Mask and Optics Location
- Pumping System: Pfeiffer 800M Turbo-Pump, ACP 28 Roughing Pump
- Venting System: Swagelok Bellows Valves, High Purity PALL Filter

Internal Vacuum Assembly:
- Large, Rigid Support Structure for XYZ Motion System
- Upper Platform for Piezo Stages that Manipulate Optical Equipment

XYZ Mask Motions:
- X-Axis (Beam Direction): Micos LS-110 500mm Travel, 0.1 micron Resolution
- Y-Axis (Transverse to Beam): Micos LS-110 300mm Travel, 0.1 micron Resolution
- Z-Axis (Vertical): Micos UPL-120 13mm Travel, 0.1 micron Resolution

Mask Transfer:
- TEAM-Mate Automatic Load Lock for Positioning Mask in the Chamber

Approximate Weight: 3220kg [7081lb]

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

Material | Protective Finish

Drawing Standard: ANSI Y14.5M-1994 | Date

Drawn by	E Acome	7/17/2012
Eng approval	M Popov	7/17/2012
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 0.13 0.38 | 0,25 A B C | 0,25 A B C

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 197
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

SHARP Instrument Assembly

Part Number	Revision	Size	Sheet
	0	A2	

Purchased Part Modification	No

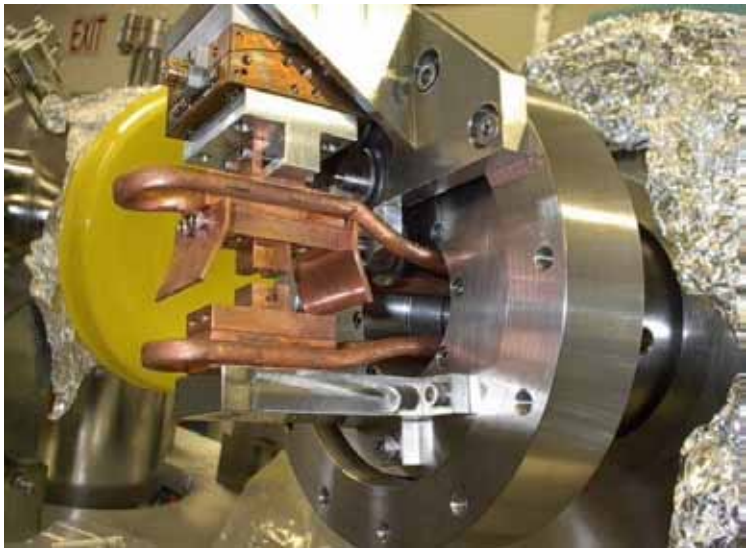
MONOCHROMATOR

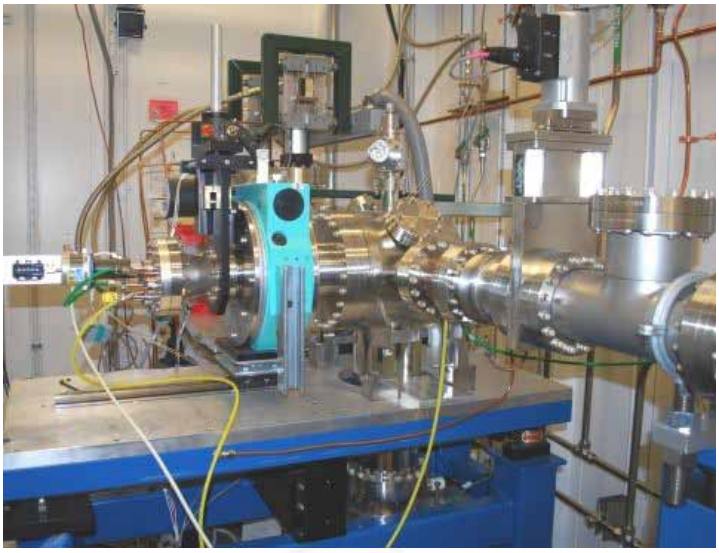
for Advanced Photon Source (APS)

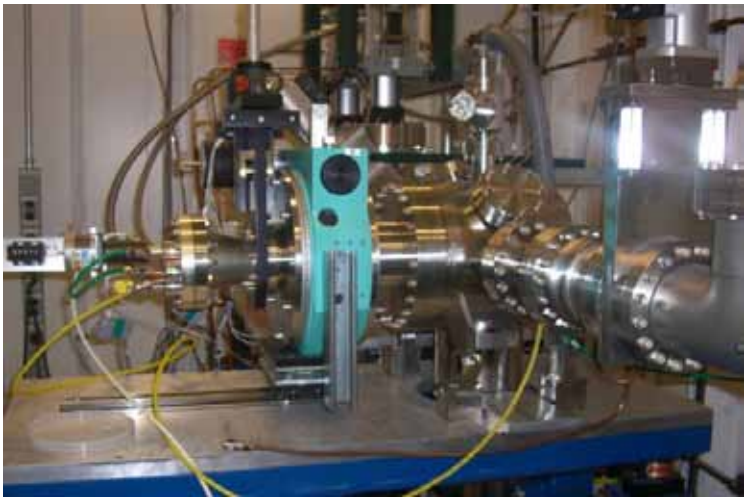
http://www.adc9001.com/APS-Double-Crystal-Monochromator

A high-precision water-cooled, small-offset, double crystal monochromator has been developed for the APS UNICAT (Sector 34) beamline. The design incorporates support and gravity-feed water cooling of two diamond or silicon crystals correctly positioned about a common rotation axis so that the incident and diffracted beam do not walk off the edges of the crystals within the energy range 6-15KeV (30° <q<11. 6°)

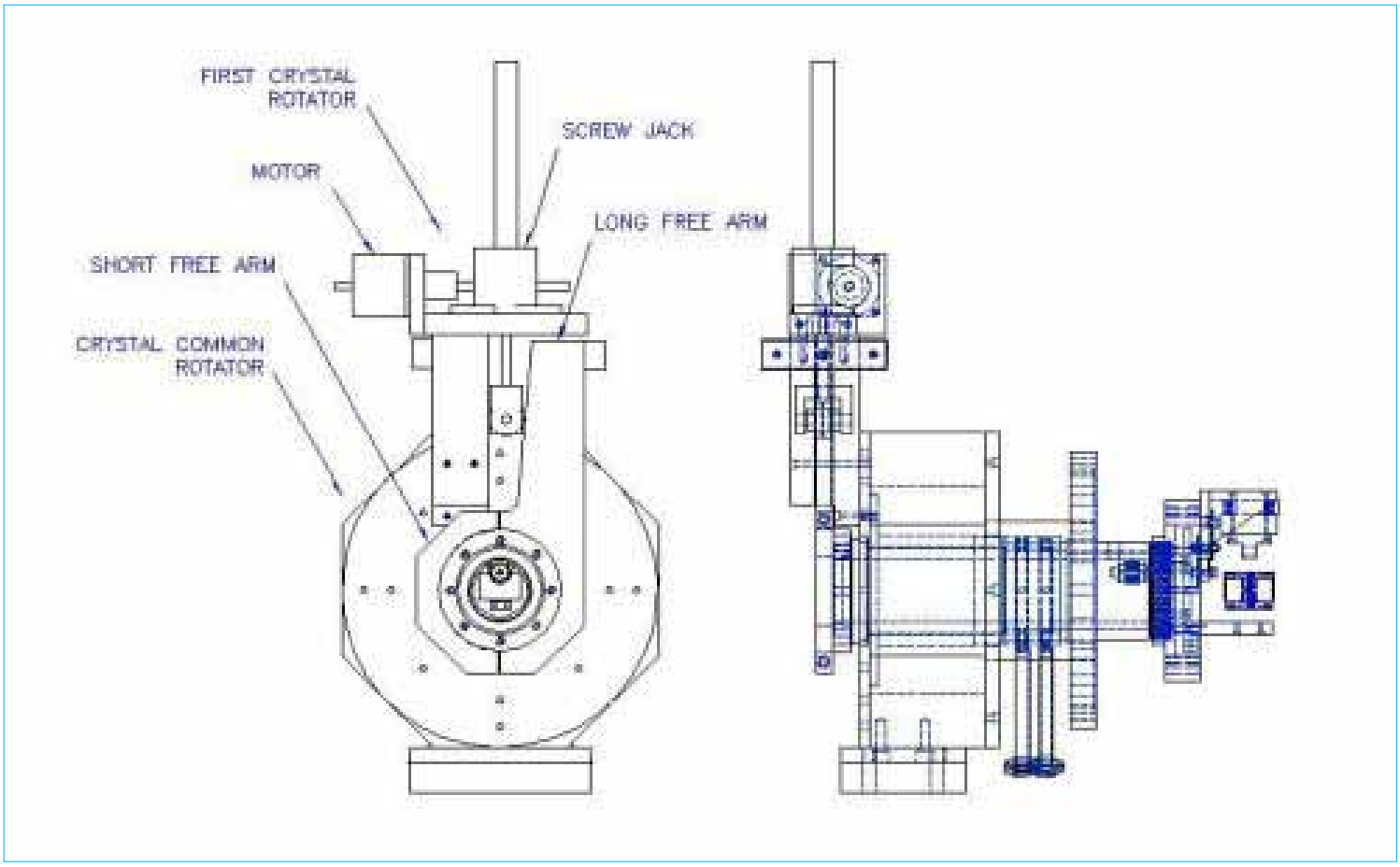
Monochromator Design: The design was created using parametric solid models. Finite Element Analysis was conducted on several critical parts to determine the possible deflection under different load and heat constraints. Key design features include: First crystal holder. This is a copper block excavated under the crystal and cooled by a continuous water tube starting and ending outside the vacuum. This tube features sections with wave-like bends to accommodate rotation of the crystal holder relative to the tubing entrance/exit flange. This was especially difficult to produce since it was made from OFHC copper which is available only in a relatively hard temper. Second Crystal Holder:This tilts +/-6° by being attached to a small vacuum-compatible tilt stage driven by an arrangement of miniature gears, shafts and couplings connected to a motorized feedthrough. A short manual horizontal adjustment is also incorporated. Both holders incorporate a matrix of very small tapped holes for attachment of the crystals via small wedges. Compton shield. This is attached to the second crystal holder to absorb parasitic radiation emitted from the first crystal holder. It is cooled by a tube virtually identical to that on the first crystal holder. Because of the very small area through which these tubes must pass, and their proximity to each other, the four wavelike areas mentioned above are staggered so they can nest together without interference







Argonne NATIONAL LABORATORY


FIRST CRYSTAL ROTATOR
SCREW JACK
MOTOR
LONG FREE ARM
SHORT FREE ARM
CRYSTAL COMMON ROTATOR


EXIT

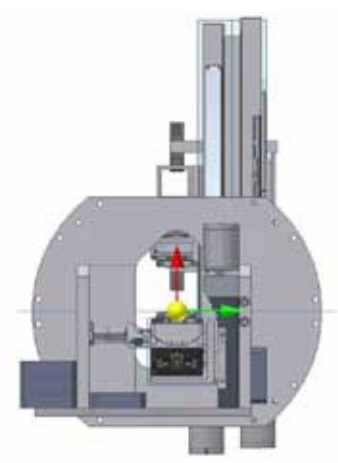
HIGH VACUUM DOUBLE CRYSTAL DEFLECTOR ASSEMBLY

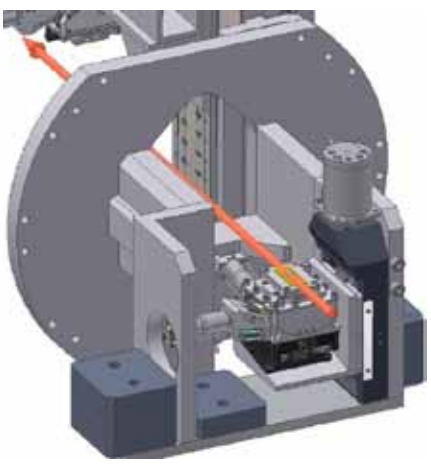
for Diamond Light Source

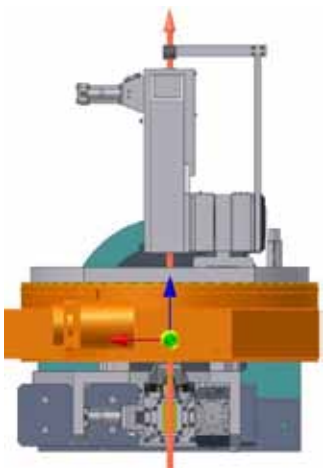
http://www.adc9001.com/DLS-Double-Crystal-Deflector

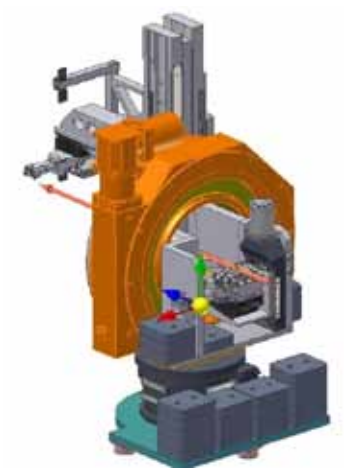
This is a custom double crystal reflector system. The two crystals reflections being used to deflect the beam are Si(111) and Si(220). These crystals are mounted on a stage that allows for adjustable alignment within the beamline, and for their rotation around the beam axis. The radial separation of the second crystal is variable. The optics stage is adjustable in the horizontal and vertical planes and for alignment in pitch and yaw to allow the center of rotation to be adjusted

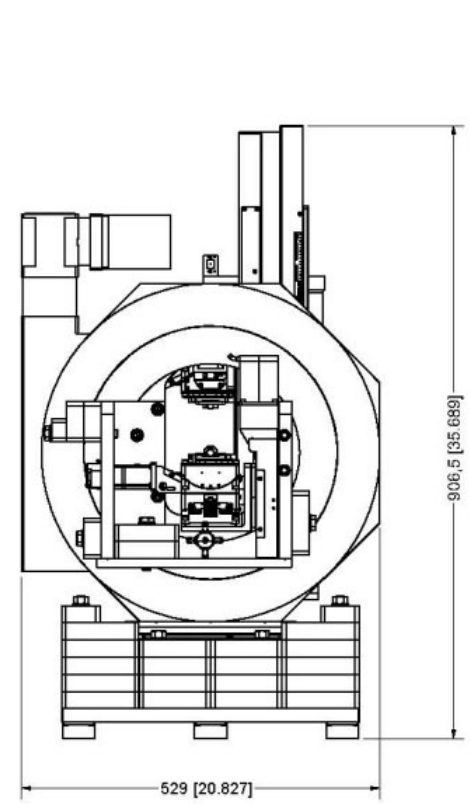
diamond

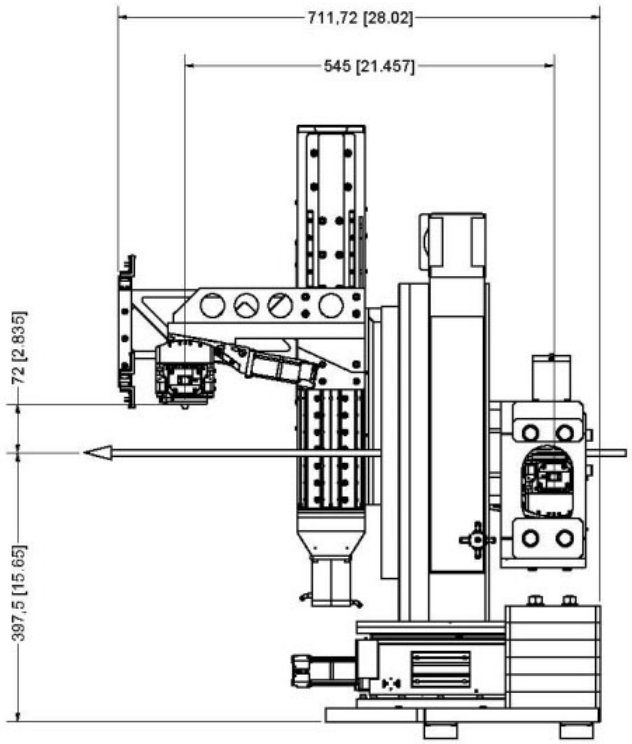


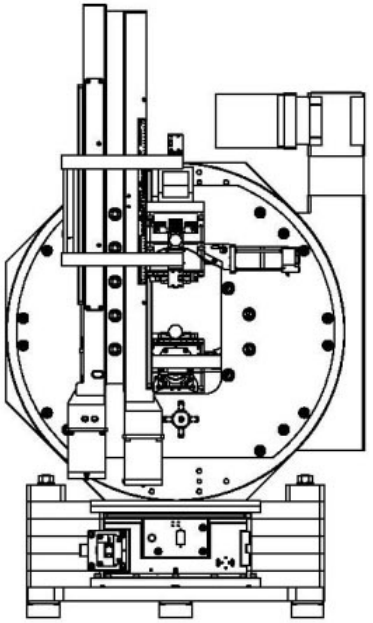


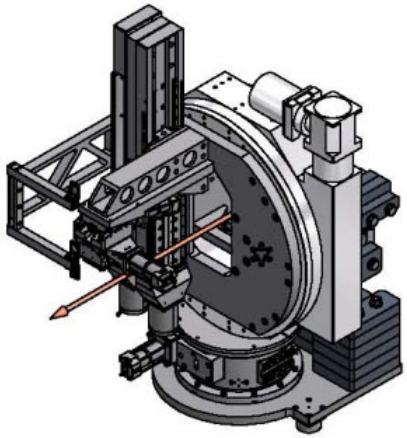












Notes:

1.) **Customer Supplied To: Diamond Light Source**
2.) **Approximate Weight Of System: 260 kg (575 lbs)**

UHV

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

UHV approval by: D Waterman | Date: 6/4/2010
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	S Hartman	6/4/2010
Eng approval	D Waterman	6/4/2010
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13 / 0,38
0,25 A B C
0,25 A B C

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 107
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3610
E-mail: adc@ado9001.com / Web: www.ado9001.com

Dual Crystal Deflector Assembly

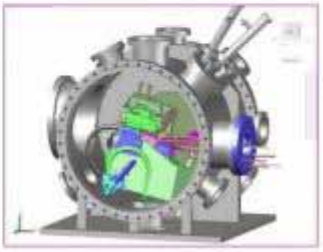
Part Number	Revision	Size	Sheet
	3	A2	

CRYO-COOLED DOUBLE CRYSTAL MONOCHROMATOR

http://www.adc9001.com/products/view/643

EPICS compatible/ Licensed from Advanced Photon Source (APS) This DCM is suitable for use on bending magnet, SC wiggler, Wiggler, and other insertion device beamlines at second and third generation sources and is capable of being used in fixed exit or pseudo channel-cut. The first crystal can be LN or water cooled. Single or multiple second crystals are available. The DCM provides a tunable energy range of 2.0 to 50 keV through crystal exchange or custom designed to meet customer requirements.

The cooling of the 1st crystal accommodate approximately 400W of incident power. The results of the current crystal design at high power loads are shown below. These are crystal rocking curves at low power and maximum power conditions. [Note: for reference, ideal crystal rocking curve widths are 5.843 arc-sec for Si(111) and 1.339 arc-sec for Si(333).]



Argonne NATIONAL LABORATORY

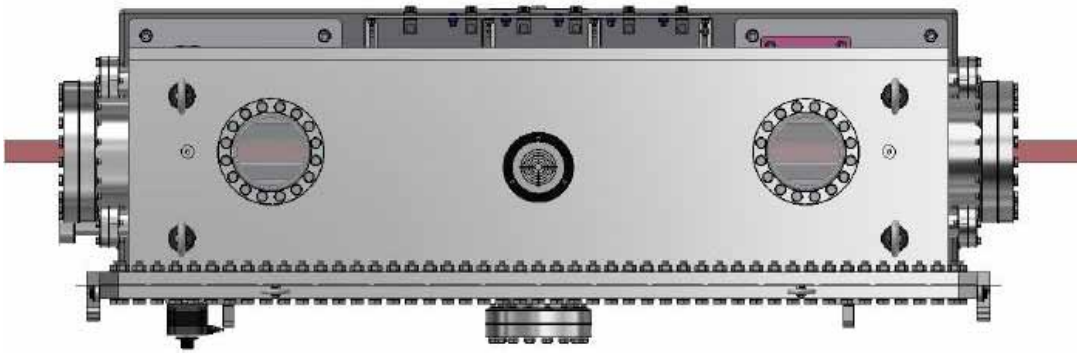
Motion	Parameter	Value(s)
Bragg Angle (Θ)	Range	Customer Specify
(manual adjustment)	Resolution	<1 µrad
	Encoder Resolution	<1 µrad
	Repeatability	<5 µrad
	Scanning Speed	up to 1° / second
White Beam height (input)		Customer Specify
Mono Beam Height (output)		Customer Specify
Primary Stage Lateral Adjustment (X)	Range	± 20mm *(or Customer Specify)*
(Motorized for Crystal Exchange)	Resolution	1 µm
	Repeatability	2 µm
Primary Stage Height Adjustment (Y)	Range	20 mm
(Motorized for Input Beam Adjustment)	Minimum Incremental Motion	10 µm
Primary Stage Lateral Adjustment (X)	Range	20 mm
(manual during installation only)	Minimum Incremental Motion	10 µm
Primary Stage Lateral Adjustment (Rz)	Range	± 1.5°
(manual during installation only)	Minimum Incremental Motion	10 µrad
Primary Stage Lateral Adjustment (Ry)	Range	± 1.5°
(manual during installation only)	Minimum Incremental Motion	10 µrad
Primary Stage Lateral Adjustment (Rx)	Range	± 1.5°
	Minimum Incremental Motion	10 µrad

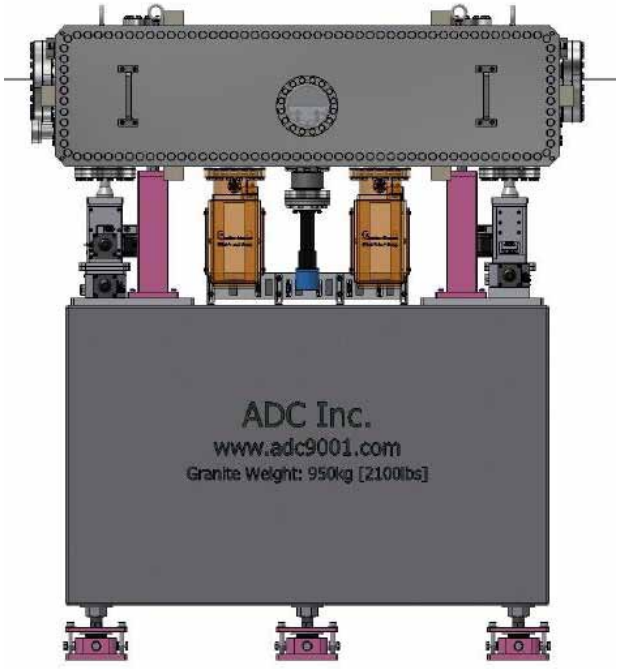
FOCUSING MIRROR SYSTEM

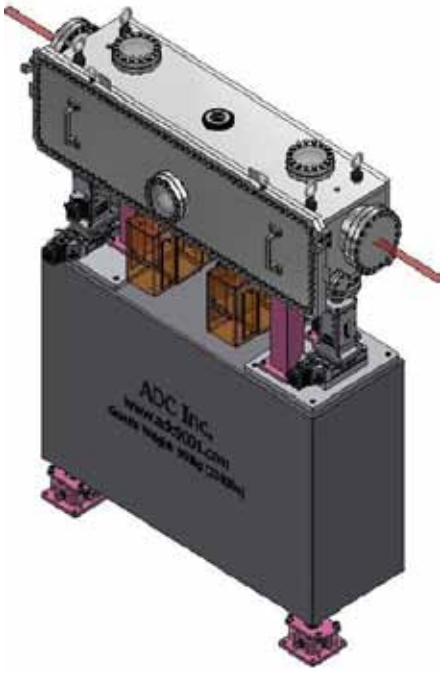
for Argonne

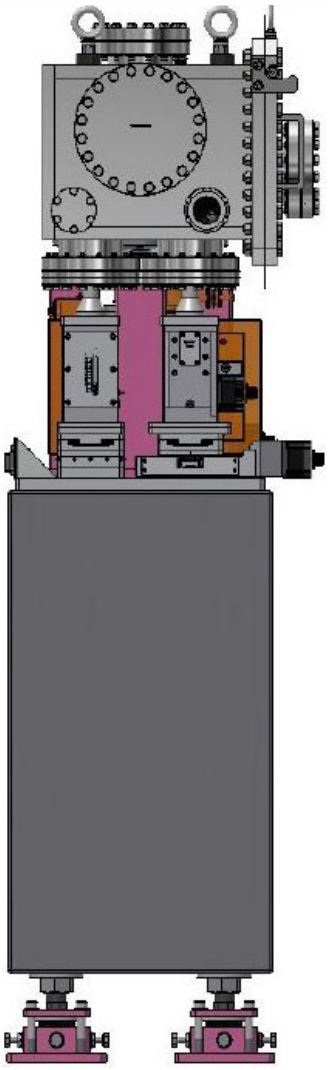
http://www.adc9001.com/products/view/664

ADC has recently finished the design for a new upward reflecting focusing mirror system for use in Advanced Photon Source (APS). The mirror system consists of a large vacuum chamber supported by welded steel posts. This arrangement sits on a granite plinth providing great stability. The vacuum chamber has a number of flanges for viewports, ion pumps, and other accessories. Within the vacuum chamber is a Single Crystal Silicon mirror. This mirror can be bent to a radius as small as 8km by using a linear actuator to bend leaf springs within the vacuum chamber resulting in a moment at the ends of the mirror. Additionally, the mirror can be positioned within the vacuum chamber through the use of ADC's 300 series precision jacks and slides. This series utilizes NEMA 23 stepper motors with Renishaw encoders to achieve great accuracy and repeatability. These are arranged in a way to provide 5 axis of movement to position the mirror



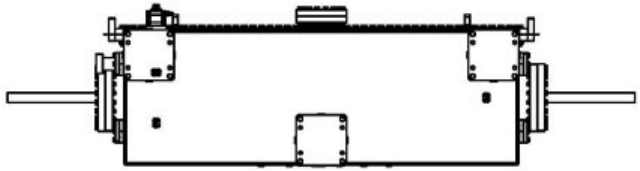


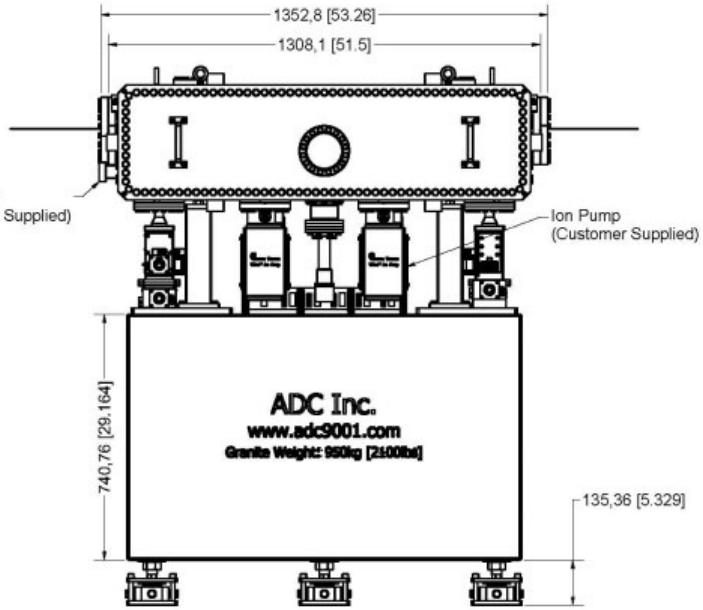


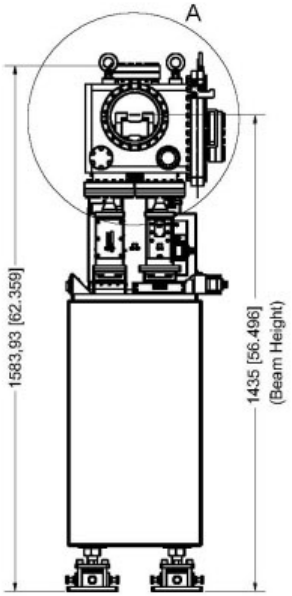


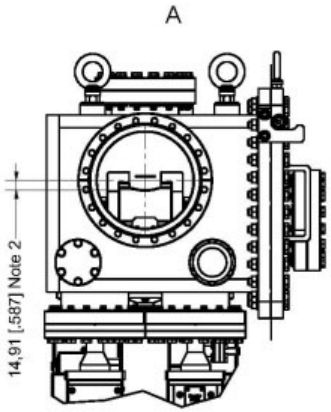
Motion*	Range	Resolution	Repeatability
X (Transverse to Beam)	50 mm	0.1 µm	± 0.5 µm
Y (Vertical)	50 mm	0.05 µm	± 0.5 µm
Z (Beam Direction)	50 mm	0.1 µm	± 0.5 µm
Pitch (Rot. About X)	100 mrad	0.05 µrad	± 0.5 µrad
Roll (Rot. About Z)	580 mrad	0.32 µrad	± 1.6 µrad
Yaw (Rot. About Y)	100 mrad	0.1 µrad	± 0.5 µrad

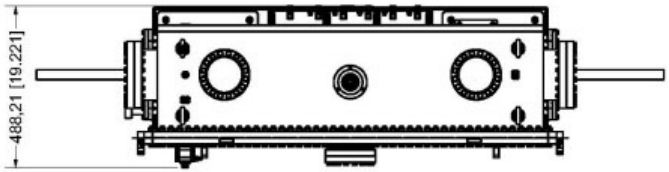
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2015-02-10	C Adams

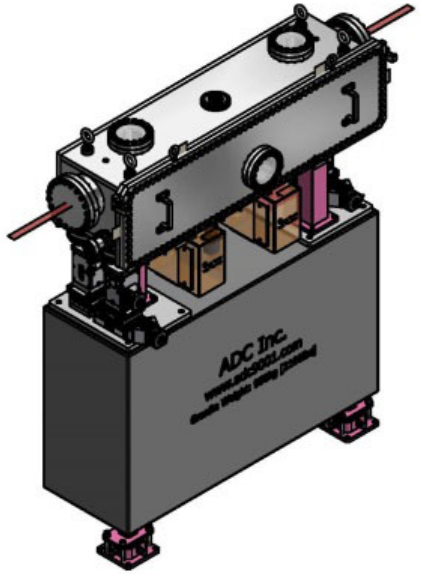












Notes:

1) Mirror Motion Specs:
   X (Horizontal): +/- 5mm
   Y (Vertical): +/- 10mm
   Tilt about X: -5 to 10mrad
   Yaw about Y: +/- 10mrad
   Roll about Z: +/- 10mrad

2) Mirror shown in its fully retracted state

3) Approximate system weight: 1380 kg [3040 lbs]

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	C Adams	2015-02-10
Design by	C Adams	2015-02-05

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13
0,38
0,25 A B C
0,25 A B C

ADC Inc.
128 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

ADC

Focusing Mirror System Assembly

Part Number	Revision	Size	Sheet
2D Overview	0	A2	1 / 1

UNIVERSITY OF GEORGIA MOTION SYSTEM

for KB Mirror

http://www.adc9001.com/products/view/665

A system was designed for University of Georgia that provides 5 degrees of motion for their KB Mirror. The mirror chamber has 50 mm of vertical (z-axis) travel and 75 mm horizontal (x-axis) travel with a resolution of 1 µm. Through the use of stacked precision slides, precision jacks, free slides, and spherical bearings the chamber can also be rotated around the x-axis, y-axis, and z-axis to allow for leveling and alignment of the chamber. The slides and jacks use MDM-5000 Series Brushless Servo Motors. The motion system sits on a granite base providing stability and vibration dampening. The granite is fitted with removable aluminum breadboards and aluminum plates where additional holes can be added to allow for wiring and other devices to easily be secured in place. The granite is leveled precisely with ADC's lockable leveling feet and bolted to an aluminum plate grouted to the floor.

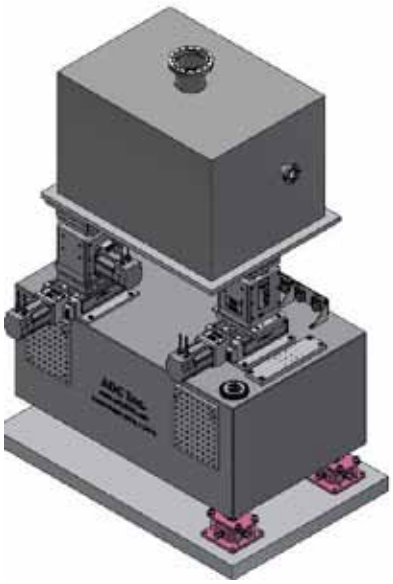
1785
The University of Georgia

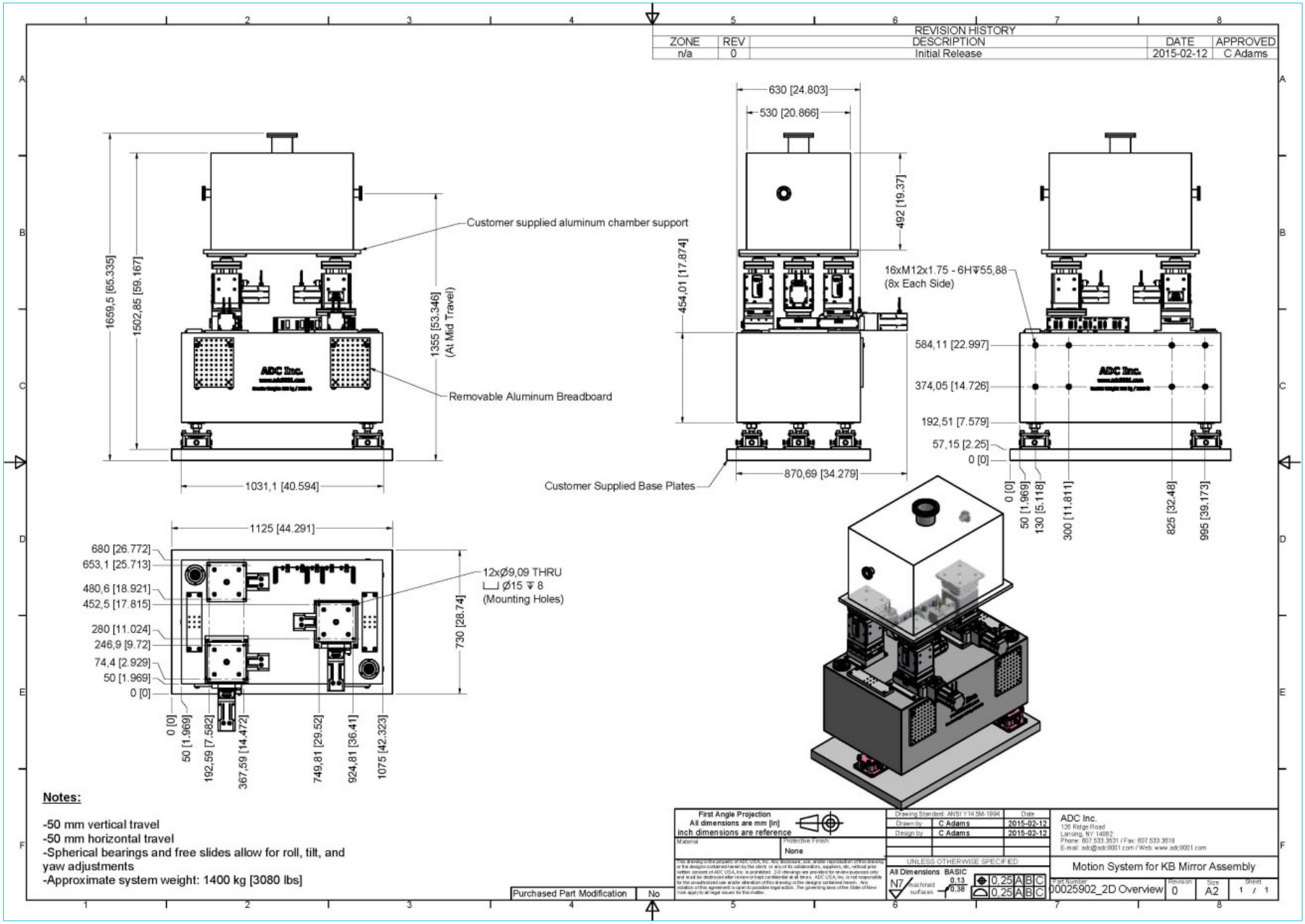
Key Specifications:

Linear Travel Specifications:

Description	Value	Units
Range of Motion (Z Axis)	50 [~2]	mm [in]
Resolution (unit/step)	~0.005	mm/step
Encoder Manuf.	Renishaw	-
Encoder Resolution	0.1	µm

Description	Value	Units
Range of Motion (X Axis)	50 [~3]	mm [in]
Resolution (unit/step)	~0.010	mm/step
Encoder Manuf.	Renishaw	-
Encoder Resolution	0.1	µm



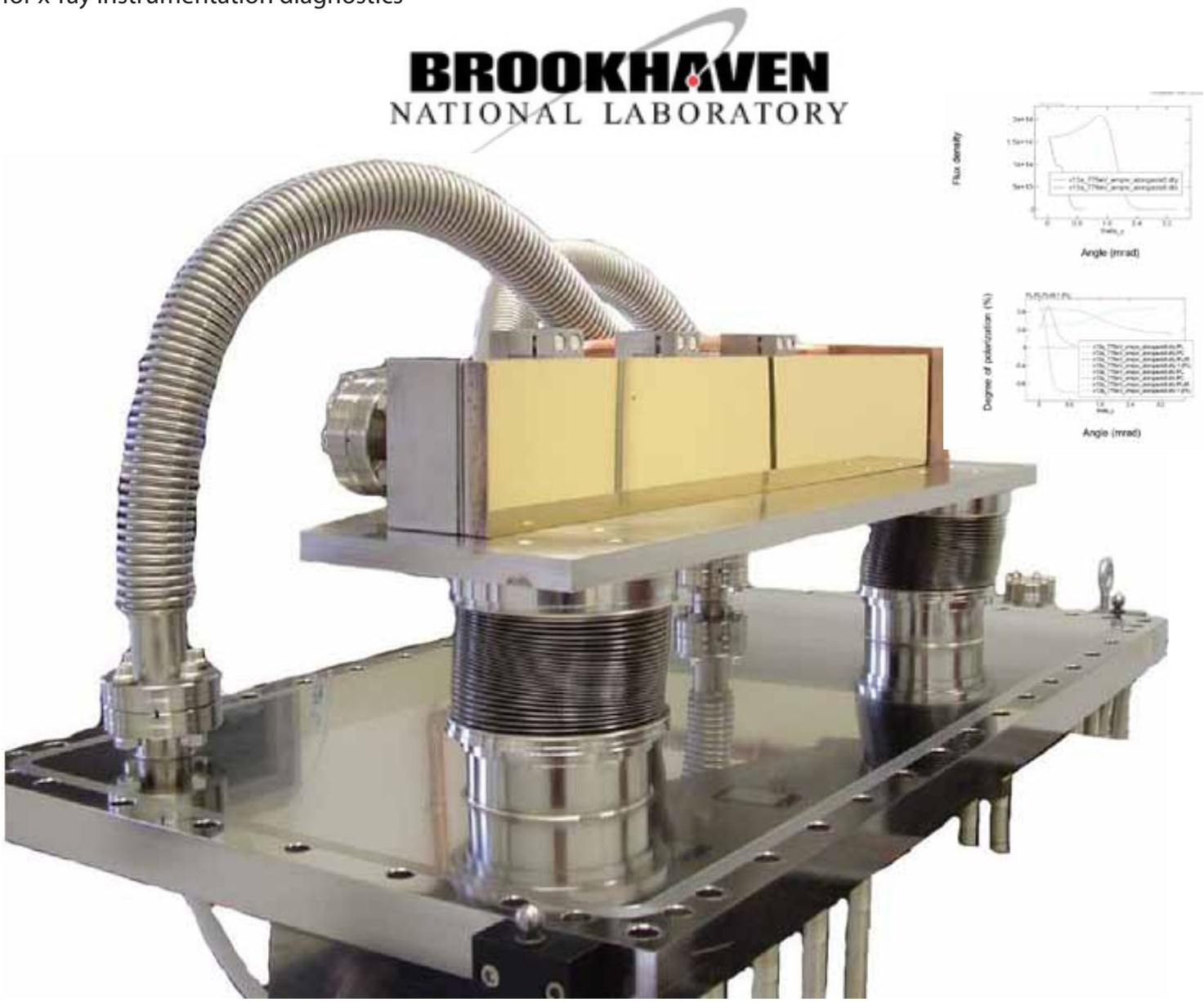

REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Initial Release | 2015-02-12 | C Adams
1659,5 [65.335]
1502,85 [59.167]
1355 [53.346] (At Mid Travel)
Customer supplied aluminum chamber support
Removable Aluminum Breadboard
1031,1 [40.594]
630 [24.803]
530 [20.866]
492 [19.37]
454,01 [17.874]
Customer Supplied Base Plates
870,69 [34.279]
16xM12x1.75 - 6H↧55,88
(8x Each Side)
584,11 [22.997]
374,05 [14.726]
192,51 [7.579]
57,15 [2.25]
0 [0]
0 [0]
50 [1.969]
130 [5.118]
300 [11.811]
825 [32.48]
995 [39.173]
1125 [44.291]
680 [26.772]
653,1 [25.713]
480,6 [18.921]
452,5 [17.815]
280 [11.024]
246,9 [9.72]
74,4 [2.929]
50 [1.969]
0 [0]
730 [28.74]
12xØ9,09 THRU
⌴ Ø15 ↧ 8
(Mounting Holes)
0 [0]
50 [1.969]
192,59 [7.582]
367,59 [14.472]
749,81 [29.52]
924,81 [36.41]
1075 [42.323]
Notes:
-50 mm vertical travel
-50 mm horizontal travel
-Spherical bearings and free slides allow for roll, tilt, and yaw adjustments
-Approximate system weight: 1400 kg [3080 lbs]
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
None
Drawing Standard: ANSI Y14.5M-1994
Drawn by C Adams 2015-02-12
Design by C Adams 2015-02-12
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13 0,38
0,25 A B C
0,25 A B C
ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
Motion System for KB Mirror Assembly
Part Number 00025902_2D Overview
Revision 0
Size A2
Sheet 1 / 1
Purchased Part Modification No

INTEGRALLY WATER COOLED DEFLECTION/FOCUSING MIRROR

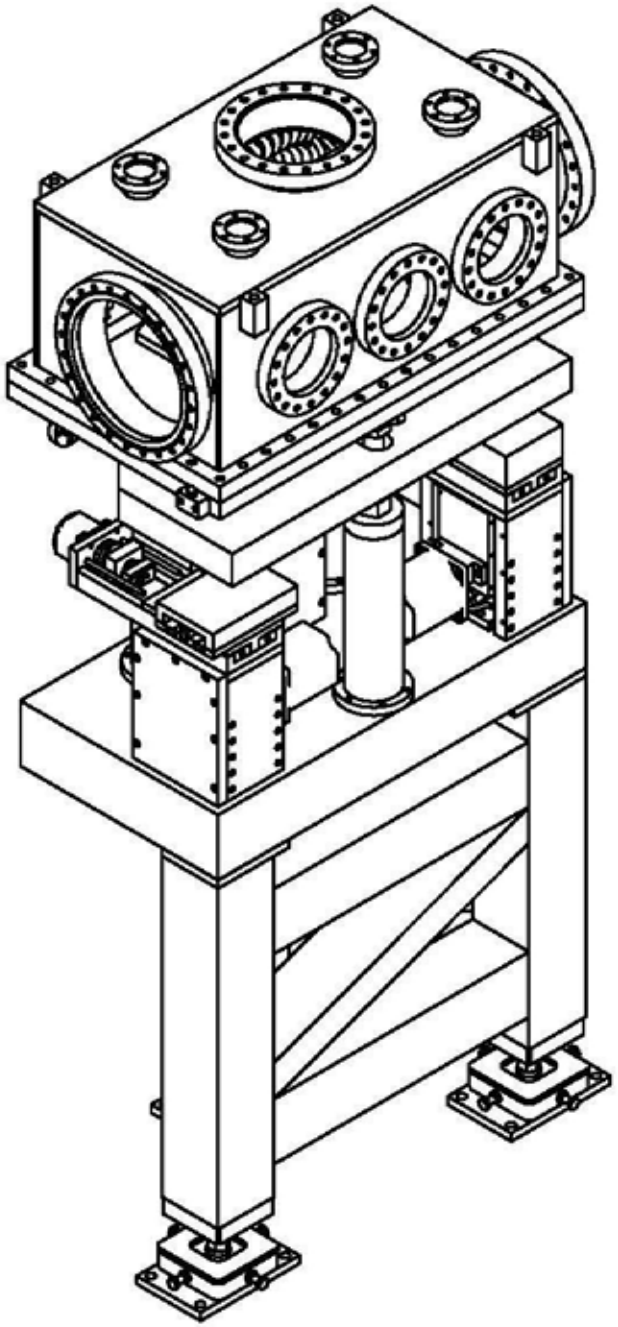
http://www.adc9001.com/products/view/451

The X13A optics consist of an integrally-water-cooled deflection/focusing mirror (M0) followed by a horizontally dispersing soft x-ray spherical grating monochromator (SGM) and a 22-Hz polarization selection chopper. The M0 mirror, installed and commissioned in mid-2004, provides more stability and higher flux (gain of one order of magnitude) than did the old mirror. The SGM features two diffraction gratings (800 and 1600 grooves/mm), a water-cooled entrance slit, and a movable exit slit. The 22-Hz chopper is synchronized to the switching frequency of the EPW and provides both 22 Hz and 44 Hz signals to the phase-sensitive detector electronics.

The undulator has an 8 cm period, and its first harmonic is in the energy range of 200–700 eV at the nominal ring energy of 2.5 GeV. The beamline uses horizontally deflecting optics. It consists of a SiC plane mirror, a water cooled entrance slit, a spherical grating, and two fixed exit slits. A flux of more than 1012 photons/s at 450 eV was measured at X13A with an aluminum-oxide photodiode with a 200 µm entrance slit, a 500 µm exit slit, and a ring current of 242 mA. A VF3absorptionspectrum recorded at X13A shows the monochromator resolving power is at least 1000 at 500 eV with 30 µmentrances and exit slits, in agreement with calculations. The X13A beamline is used for x-ray coherence studies, spectroscopy, and multilayer reflectivity measurements as well as for x-ray instrumentation diagnostics



QUANTITY	SOURCE	PART NUMBER	DESCRIPTION	VALUE	COMPONENT DESIGNATION
1	ABC	X	X		1



ITEM	QTY	NAME	MATERIAL	VENDOR	NOTE
38	1	00002924			
35	3	00003185	VRDM 3910/50 LWB	BERGER LAHR	NEMA 34
34	1	00003186	VRDM 364/50 LWB	BERGER LAHR	NEMA 34 MOTOR
30	1	00002765			
29	3	00002594			
28	3	00002593	TCB-26810	REID	TOOLING BALL
27	2	00000813			
26	2	00002576	401021	MDC	1.33 TAPPED NIPPLE
25	3	00002571			
24	3	00002570			
23	2	00002569			
22	1	00002513			
21	1	00002506			
20	1	00002542			
19	1	00002386			
18	2	00002339			
17	1	00002192			
16	2	00002193			
15	4	00002197	110006	MDC	2-1/8" NR
14	3	00002340			
13	3	00002325			
12	2	00002326			
11	2	00002327			
10	1	00002330			
9	3	00002331			
8	3	00002332			
7	3	00002145	471025	MDC	WELDED BELLOWS
6	1	00002323			
5	3	TBL-JACK			
4	1	00002322			
3	2	00000571			
2	3	SLIDE			
1	2	00002194			

Ports List

00002321

X13A MIRROR

0 0 0 - 0 0 0 0 XXX

WHITE LIGHT FOCUSING MIRROR

http://www.adc9001.com/BNL-Mirror

ADC USA, Inc. in collaboration with Case Western Reserve University, Center for Synchrotron Biosciences has completed the design of a bendable mirror for the X28C beamline. It is a 50 mm x 100 mm x 1100 mm single crystal silicon with a cylindrical cut with a radius of 43.1 mm bendable to a toroid from infinite to 1200 m radius. The unique feature of this mirror system is the dual use of Indalloy 51 as both a mechanism for heat transfer and a buoyant support to negate the effects of gravity.

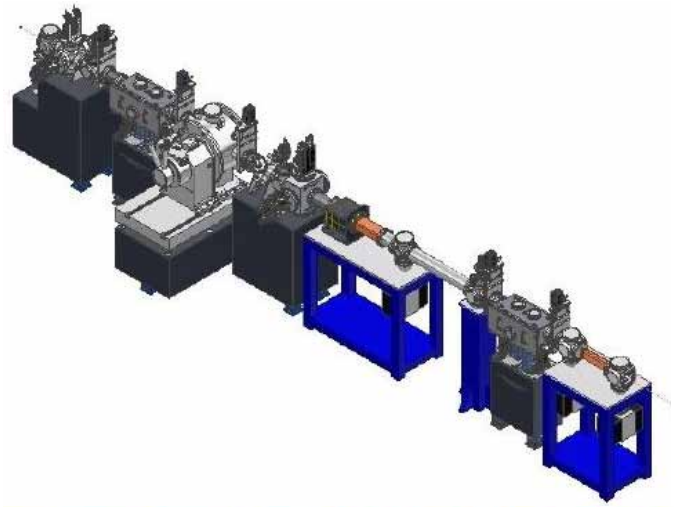
BROOKHAVEN
NATIONAL LABORATORY

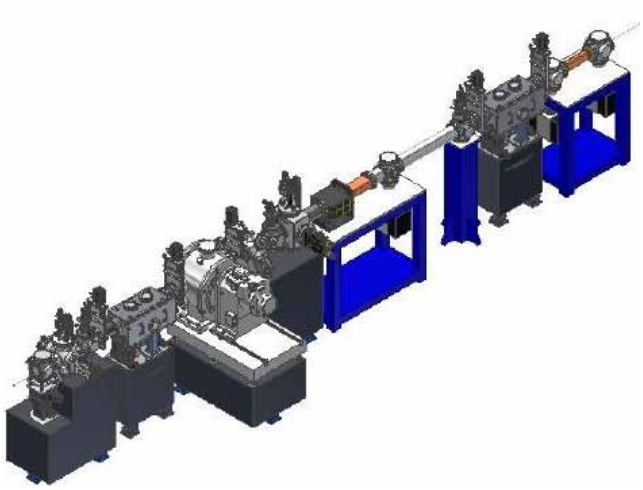
TURN-KEY BEAMLINE

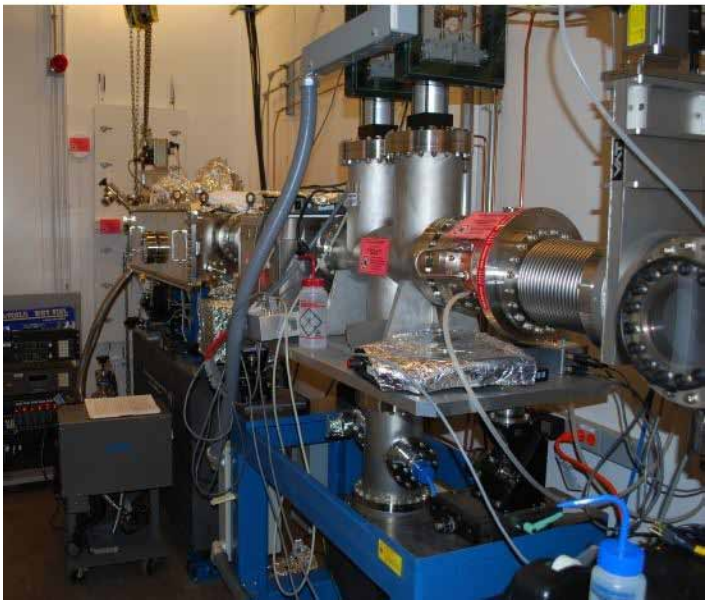
http://www.adc9001.com/products/view/457

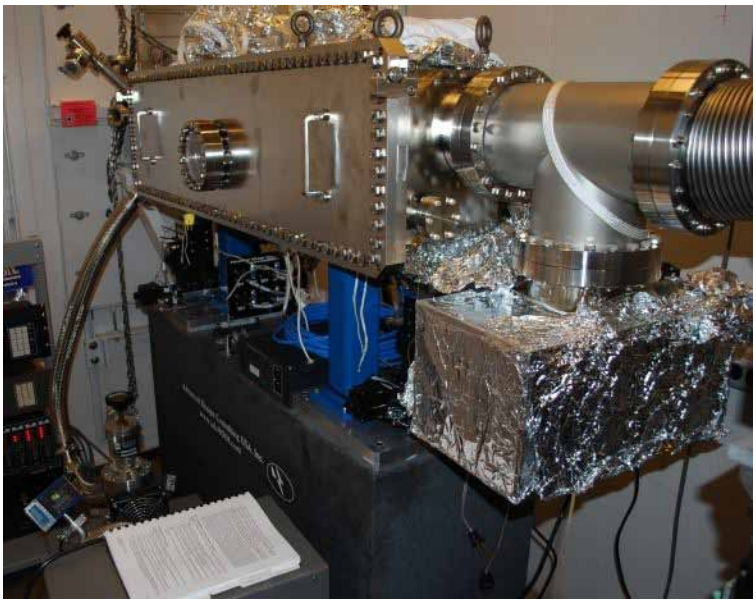
ADC manages designs and manufactures complete front ends and beamlines. Our assistance includes overall project management, mechanical and instrumentation design, manufacturing, assembly and testing, commissioning and training, including:

- Ray-tracing, including measured optical elements profile.
- Thermal and stress analysis, using ANSYS FEA calculations, to validate high heat load components design.
- Cryo-cooling design optimization.
- Selection of cooling scheme for mirrors and crystals.
- Heat load calculations for filters, masks and mirrors.
- Mirrors substrate selections.
- Design of complex brazing and special welding.
- Mirror coating selection.
- Equipment protection system.
- Beamline control system.
- Beamline operation training.









SOFT X-RAY SCATTERING OCTUPOLE END STATION

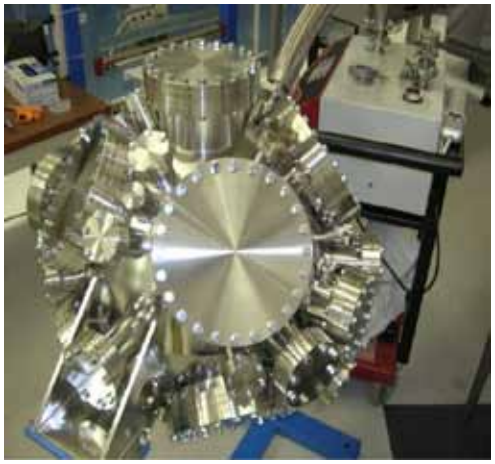
The Octupole End Station is used for Soft X-ray Scattering. This device imparts a magnetic field in any direction on a sample for magnetic dichroism (XMD) experiments. Eight magnets, equidistantly spaced about the surface of a sphere, create an omnidirectional magnetic field vector with a magnitude of 1 [T]. The magnets protrude into an ultra-high vacuum chamber with a base pressure of 5E-10 [mbar] that houses both the sample and detector apparatus. The entire system is then capable of rotation about the beam axis.

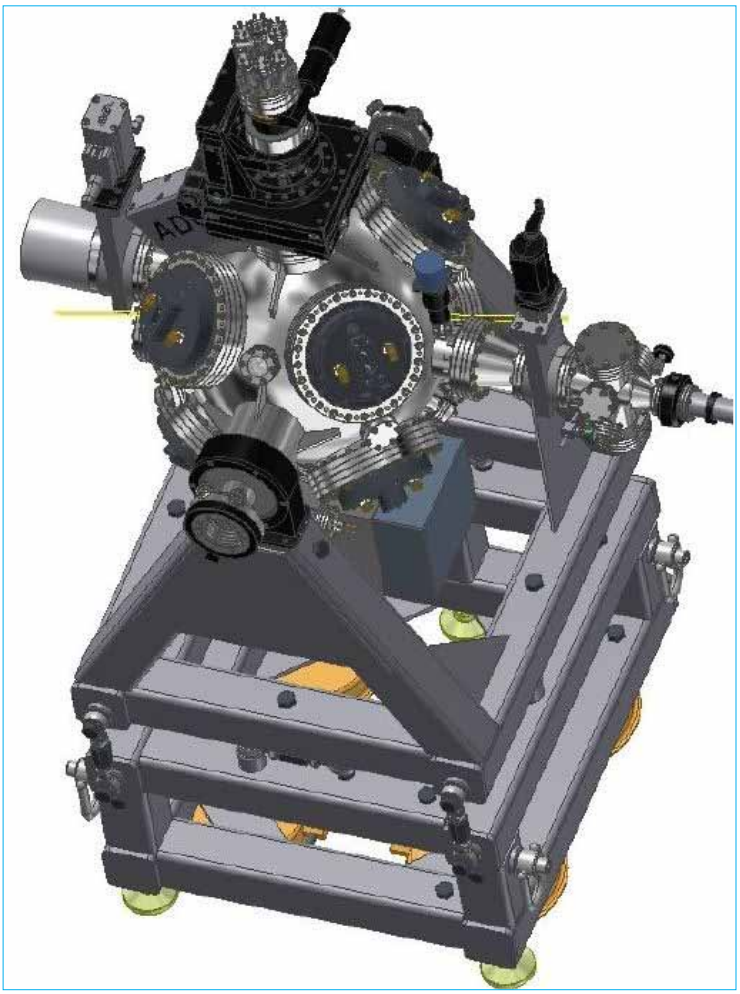
Technical Specification:

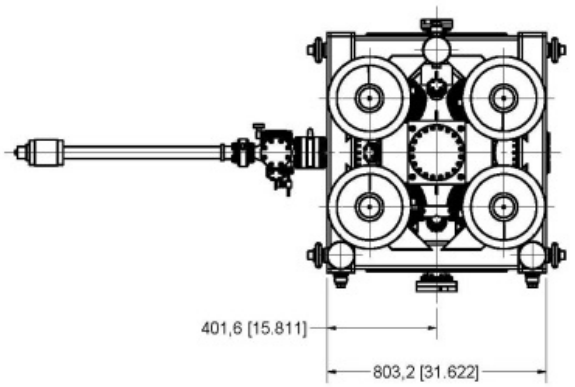
- Peak field magnitude of 1T
- Field uniformity of 5% over 10mm cube • Field vector rotatable in free space
- Integrated goniometer
- UHV operation @ 5E-10mbar
- System rotatable from +/-45O about beam axis
- Support frame constructed of 304SS
- Optional x,y,z,theta sample manipulator
- Optional load lock chamber
- Optional LHe cryostat for sample cooling to 4K
- Optional Programmable power supplies with 0-60V, 0-100A
- Optional EPICS motion controller

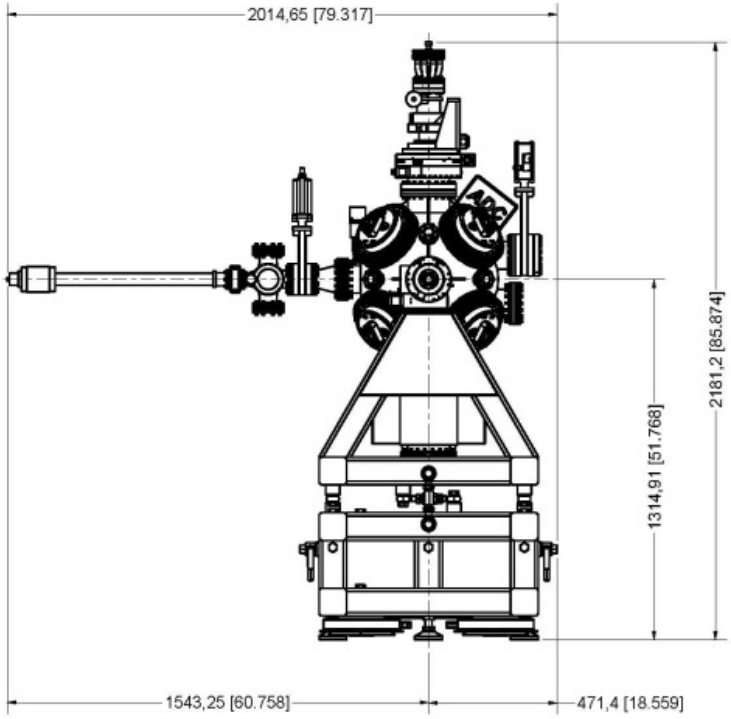
Note: The original idea for this Octupole End Station was originated from ALS:
Design and performance of an eight-pole resistive magnet for soft x-ray magnetic dichroism measurements Rev. Sci. Instrum. 76, 083908 (2005)
http://dx.doi.org/10.1063/1.2008027
http://ssg.als.lbl.gov/ssgdirectory/arenholz/Vectormagnet.html

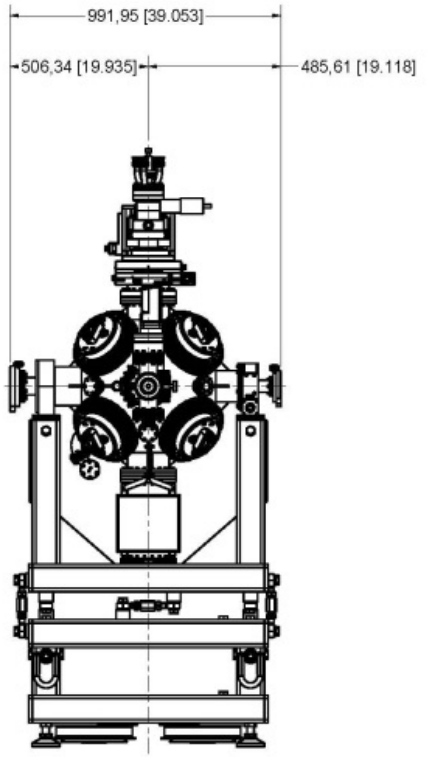
Argonne NATIONAL LABORATORY











First Angle Projection All dimensions are mm [in]		Drawing Standard: ANSI Y14.5M-1994	Date
		Drawn by: SWH	7/18/2006
		Eng approval: AJL	7/18/2006
Material	Protective finish	Mfg approval	
		Assy approval	

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N8 machined surfaces 0,13 / 0,38
0,25 A B C
0,25 A B C

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

Layout Dimensions, Octupole

Part Number	Revision	Size
00009386_layout	1	A2

OTFD-100 IN-SITU X-RAY SCATTERING

of organic thin film deposition

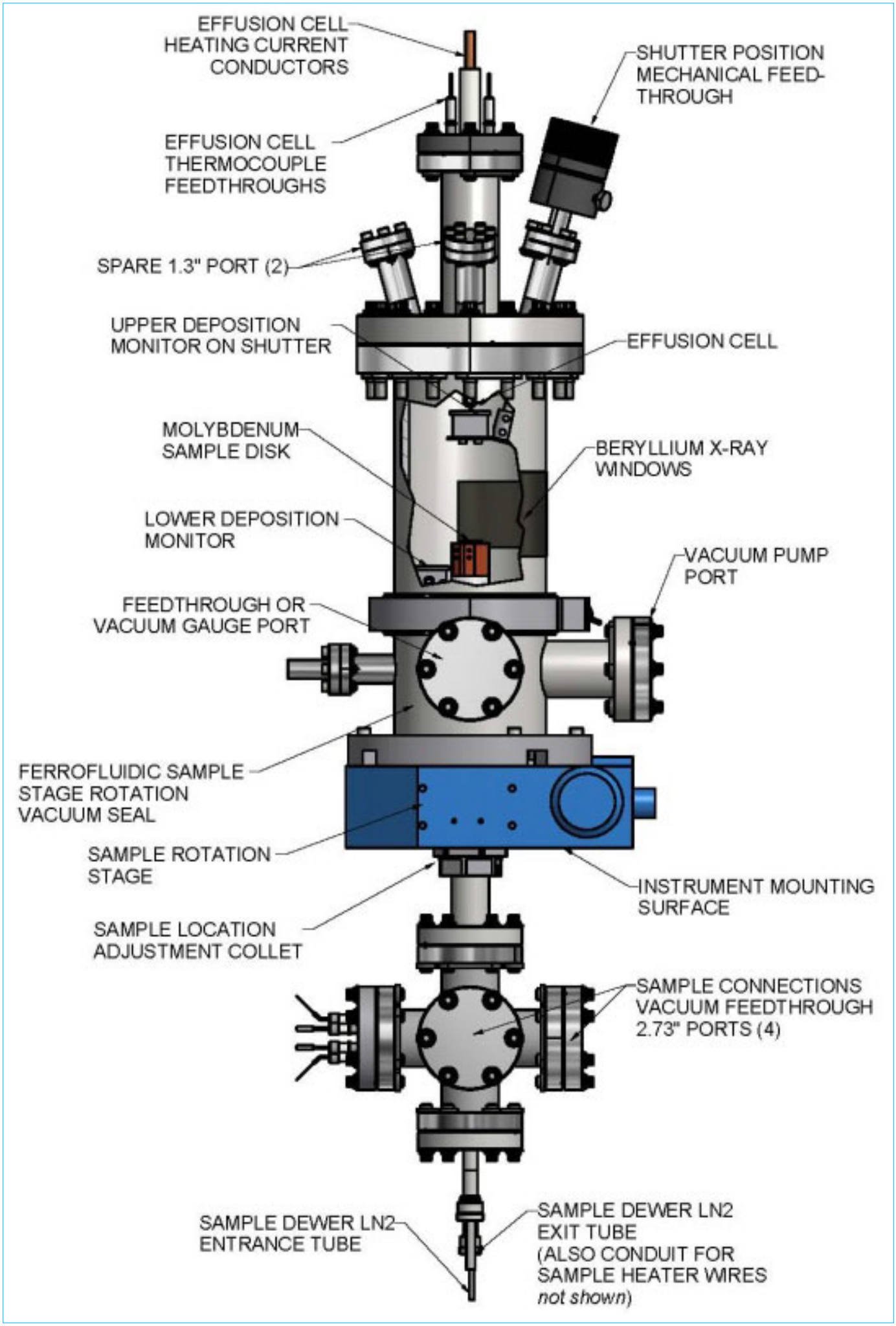
http://www.adc9001.com/Standard-Pentacene-Film-Growth-Instrument

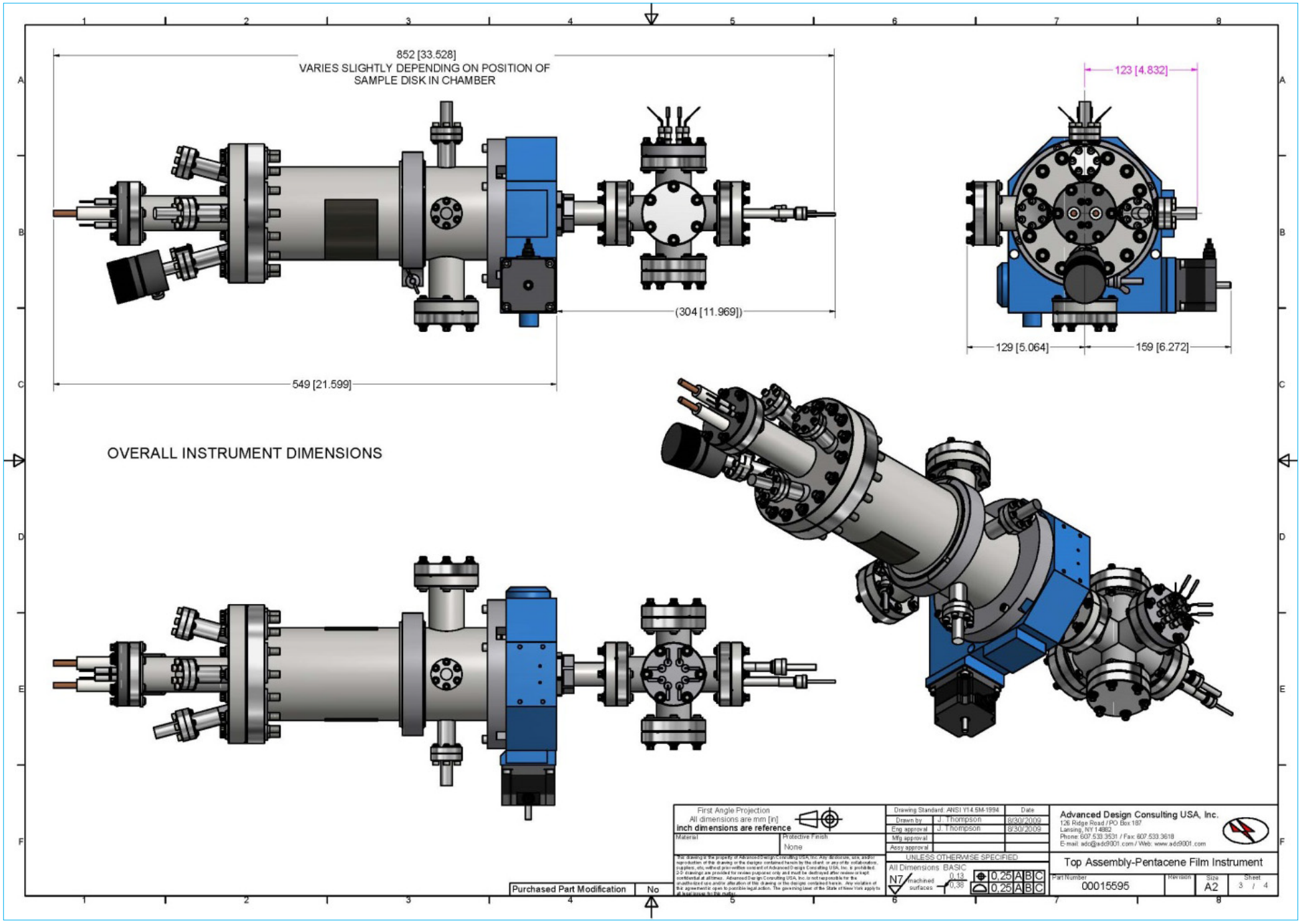
Modern materials science calls for sophisticated tools that allow X-ray investigations in defined environments and under controlled temperature conditions. Organic electronic materials have potential applications in a number of low-cost, large area electronic devices, such as flat panel displays and inexpensive solar panels. Small molecules of the series Anthracene, Tetracene, Pentacene, are model molecules for organic, semiconductor, thin films, to be used as the active layers in such devices. The OTFD-100 is a compact vacuum deposition chamber for in-situ x-ray scattering studies of organic thin film growth. The system is based on a small cylindrical chamber that can be mounted on a standard four-circle diffractometer. Incident and scattered x-rays enter and exit the chamber through a curved Be foil window that covers 270 degrees, and is sealed to the body of the chamber. The sample is mounted on a post with heating and cooling from liquid nitrogen temperature to >100 centigrade. Integral to the sample stage is a multi-wire feed through to facilitate in-situ electrical transport characterization of organic semiconductor thin films. This is one of the unique capabilities of the system. In addition, the sample stage is mounted on a rotary vacuum feed through, which is mechanically coupled to the "phi" stage of the diffractometer. An effusion cell, shutter, and quartz oscillator thickness monitor are also incorporated into the system, which is pumped by a small turbomolecular pump. The system thus configured is capable of access to full reciprocal space, within the limits of the Be window.

Features and Benefits

- Excellent sample temperature uniformity due to environmental heating and cooling
- Reliable measurement and control of the sample temperature
- Sample mounting for optimal data quality
- Custom specialized inner and outer heater shielding
- Easy exchange of samples
- Chemically passive sample carrier
- Easy installation in most standard diffractometers
- Robustness and long durability
- Automatic heating, cooling and pumping of samples with one button
- Graphical data display of real time for each run
- Integrated work station
- Integrated high-end PLC with large screen interface
- Universal and application specific sample base
- Safety and ergonomically designed system process chamber
- Multilingual operating
- Compact and mobile
- Uses standard 100-250 V / 50-60 hz power supply

Canadian Light Source
Centre canadien de rayonnement synchrotron
CHESS


EFFUSION CELL HEATING CURRENT CONDUCTORS
SHUTTER POSITION MECHANICAL FEED-THROUGH
EFFUSION CELL THERMOCOUPLE FEEDTHROUGHS
SPARE 1.3" PORT (2)
UPPER DEPOSITION MONITOR ON SHUTTER
EFFUSION CELL
MOLYBDENUM SAMPLE DISK
BERYLLIUM X-RAY WINDOWS
LOWER DEPOSITION MONITOR
VACUUM PUMP PORT
FEEDTHROUGH OR VACUUM GAUGE PORT
FERROFLUIDIC SAMPLE STAGE ROTATION VACUUM SEAL
SAMPLE ROTATION STAGE
INSTRUMENT MOUNTING SURFACE
SAMPLE LOCATION ADJUSTMENT COLLET
SAMPLE CONNECTIONS VACUUM FEEDTHROUGH 2.73" PORTS (4)
SAMPLE DEWER LN2 ENTRANCE TUBE
SAMPLE DEWER LN2 EXIT TUBE (ALSO CONDUIT FOR SAMPLE HEATER WIRES not shown)


852 [33.528]
VARIES SLIGHTLY DEPENDING ON POSITION OF
SAMPLE DISK IN CHAMBER
(304 [11.969])
549 [21.599]
123 [4.832]
129 [5.064]
159 [6.272]
OVERALL INSTRUMENT DIMENSIONS
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 J. Thompson 8/30/2009
Eng approval J. Thompson 8/30/2009
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13
0,38
0,25 A B C
0,25 A B C
Purchased Part Modification
No
Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
Top Assembly-Pentacene Film Instrument
Part Number
00015595
Revision
Size
A2
Sheet
3 / 4

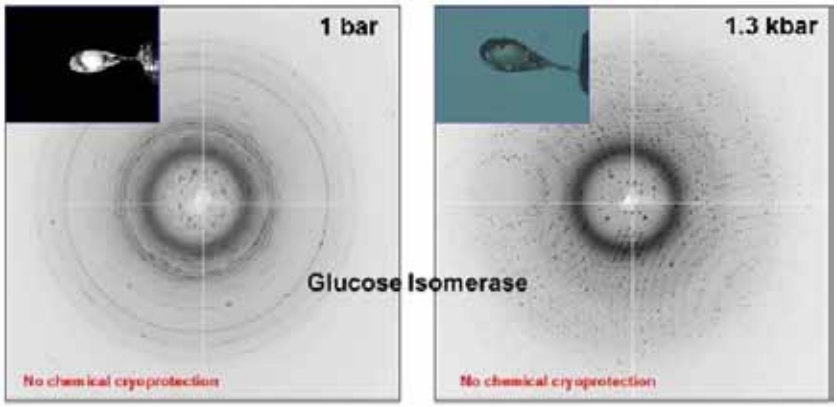
HIGH PRESSURE CRYO-COOLER

for X-Ray Crystallography (HPC-201)

http://www.adc9001.com/products/view/659

ADC is offering a High Pressure Cryo-Cooler for preparing protein crystals. This device is based on a process developed by Cornell University scientists Prof. Sol M. Gruner and Dr. Chae Un Kim. This exciting new technology enables the simultaneous capture of both amplitude and phase information from single anomalous diffraction (SAD) of a cryocooled protein crystal, thereby providing sufficient data to solve the crystal structure of a protein with an unknown structure. Flash-freezing at atmospheric pressure requires the use of cryoprotectants. Finding the right cyroprotectant for a sample type can be a long trial-and-error process. The High Pressure Cryo-Cooler eliminates the need to use cryoprotectants and produces superior results. The scatter images below of a glucose isomerase crystal prepared at atmospheric pressure (left) and under high pressure (right) demonstrate the benefits of high-pressure cryocooling.

The high-pressure cryo-cooler is designed to hold 3 samples at a time. Crystal samples are picked up using a standard cryoloop. Cryoloops are mounted to heavy duty stainless steel tubing in the unit and are then ready to be pressurized and cooled. A high pressure oil pump provides helium gas to the samples. External controls allow the sample to be first pressurized and then cooled by a LN2 bath. Once pressure is released the samples can be removed and handled like any other samples prepared by the conventional flash freezing.



Resolution = 5.0 Å
Mosaicity = N/A

Resol. = 1.1 Å (1.3 Å for 3 crystals)
Mos. = 0.39° (0.48° for 3 crystals)

Features

Pressurizing Gas	Helium
Working Pressure	200 MPa
Cooling Fluid	LN_2
Cryo Cooling Temp	77 K (-196 °C)
Sample Capacity (per pressure & cooling cycle)	3
Process Time	< 10 min (2 min for pump operation; ~ 5 min under pressure; 1min freezing)
ZEISS Microscope	SteREO Discovery.V8
LN2 dewar	Taylor-Wharton HC34

Connection Data

Voltages, frequencies	50/60 Hz
Power input, approx.	115/230 VAC
Oil pump pressure	200 MPa
LN_2 Dewar Holding	200 Days

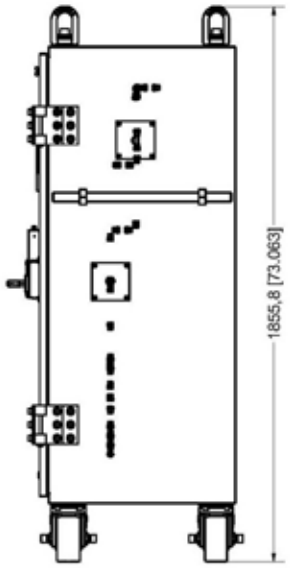
Cornell University
Department of Astronomy

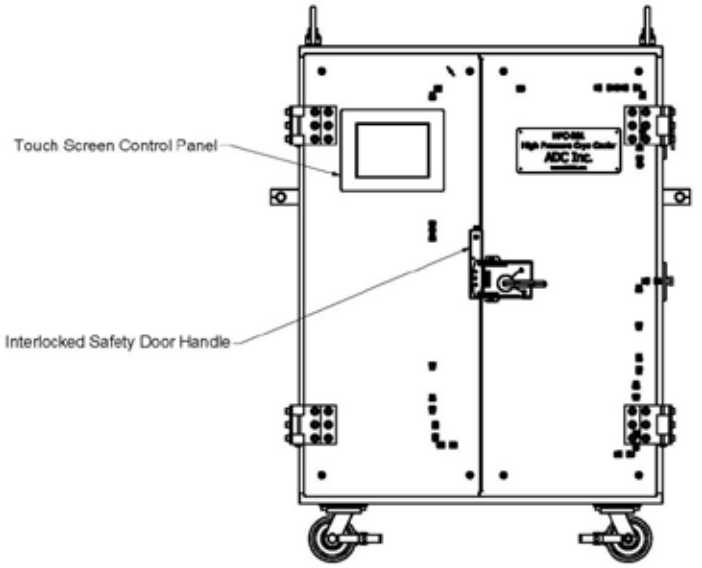
Specifications:

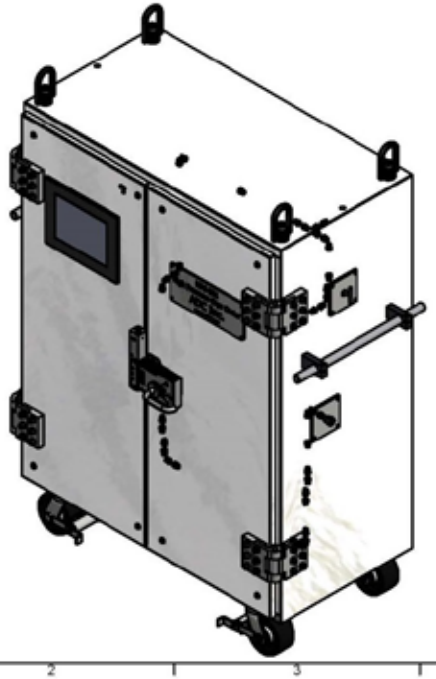
-$\frac{1}{4}$" or $\frac{9}{16}$" High Pressure Tubing can be used during this process
-Maximum 3 samples can be cooled per cycle
-Touch screen display for operating the system
-LED indicators provide visual feedback of what state the system is in during operaion
-Compressor requires He gas supplied at 6.9 MPa
-Internal pressure reaches 200 MPa
-Approximate system weight = 1350 kg [2976 lb]

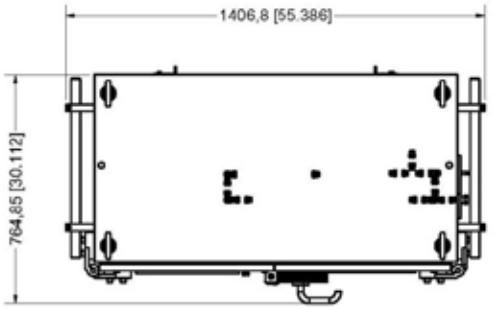
REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2014-06-04	C Adams









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	C Adams	2014-06-04
Design by	C Adams	2014-04-16

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

ADC Inc.
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Phone: 607.533.3631 / Fax: 607.533.3610
E-mail: adc@adc9001.com / Web: www.adc9001.com

High Pressure Cryo Cooler Assembly

Part Number	Revision	Size	Sheet
00023894_2D Overview	0	A2	1 / 1

BERYLLIUM WINDOWS

http://www.adc9001.com/Beryllium-Windows

ADC produces beryllium window assemblies that incorporate state-of-the-art bonding of beryllium to OFHC copper. These assemblies typically include TIG-welded lengths of stainless steel pipe and vacuum flanges. Better beryllium foil surface finish and/or customization is available upon request. Standard Surface Finish: is ~ 1.0 micrometer Ra Vacuum Tested: Better than 2 x 10-10 Torr

BEAM PIPES

http://www.adc9001.com/products/show_list/id/172

ADC delivers high quality beam pipes, used for front and back end synchrotron equipment. The pipes are manufactured to exact customer specifications and requirements, and come with or without lead shielding. Lead shielded transport pipes are used for locations such as hard X-ray insertion device beamlines at synchrotron facilities to transport white beam from one experimental hutch to another. These pipes are UHV-clean stainless steel pipes with conflat flanges on either end to complete the vacuum seal, but have a certain thickness of lead around the outside. Each assembly undergoes complete leak testing. In addition, a lead clam shell-type transition piece is installed over the conflat connections to prevent radiation from escaping in this location.

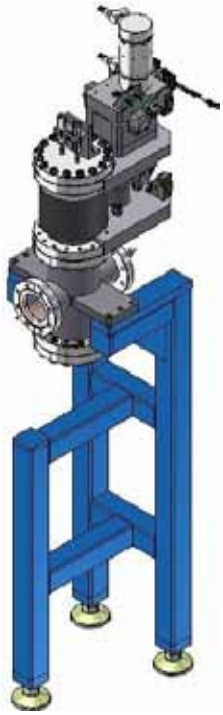
The lead shielded design ensures that every linear path from inside the pipe to outside pass through the design specification of lead thickness. ADC produces the lead either in sheet form and wrapped around the pipe or extruded as 1 piece and slid over the outside pipe diameter. When the lead is in sheet form, all the joints are staggered to prevent a line of sight to the inside of the tube and the overall minimum thickness of the lead in all areas are met. A minimum 0.020 inch thick stainless steel sheet is tack welded over the entire outside diameter of the lead in order to prevent lead handling contamination. ADC uses lead that meets ASTM specification B29-92, Standard Specification for Refined Lead. All lead are free from voids or fissures. All transport pipes are 304 stainless steel

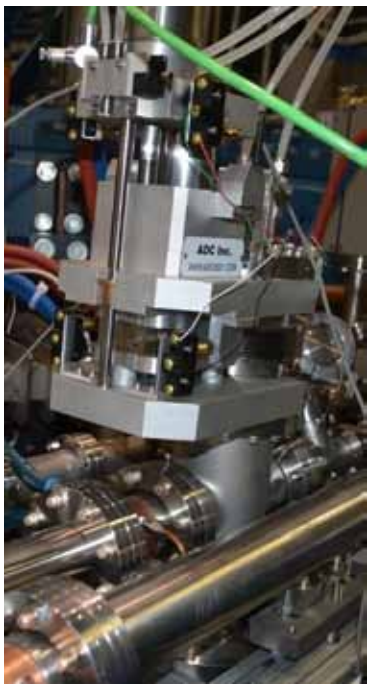
ADC delivers customized evacuated flight tubes, used to minimize absorption and stray scattering. The pipes are manufactured to exact customer specifications and requirements and come in fixed or adjustable lengths.

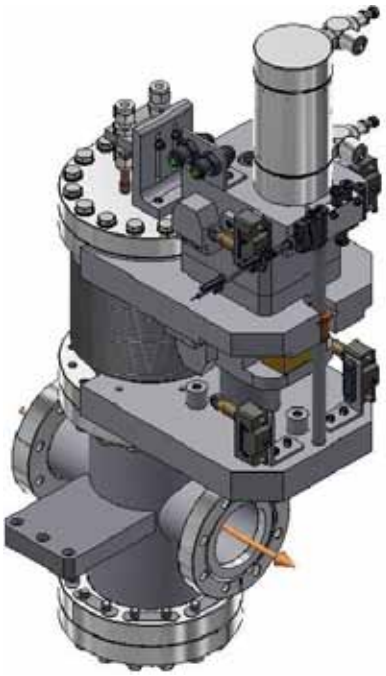
PHOTON SHUTTER

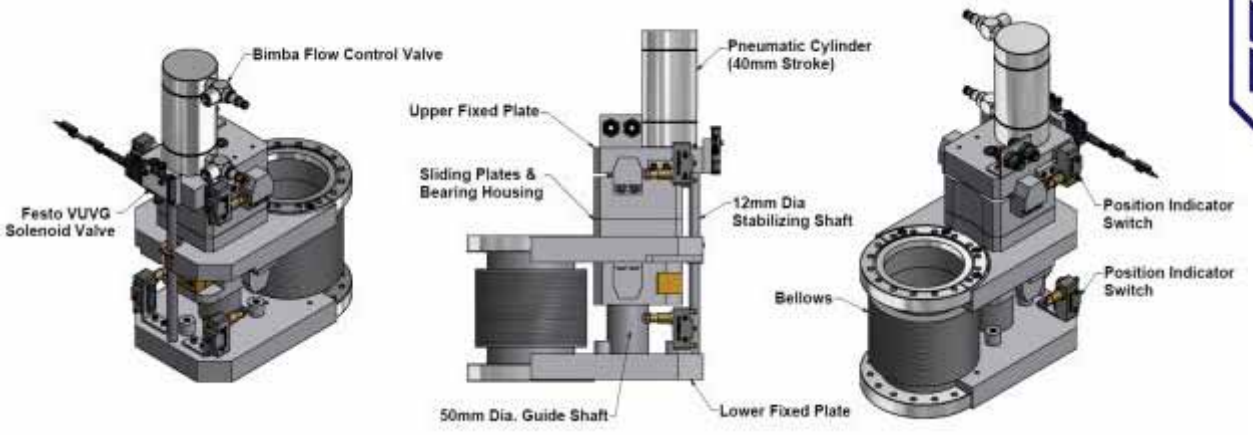
http://www.adc9001.com/products/view/459

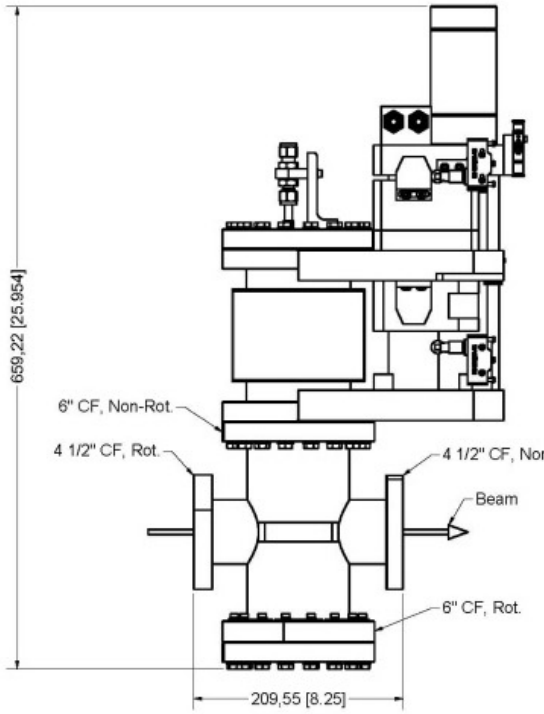
This document presents a detailed overview of ADC's beam stop and safety shutter design. Beam stops are designed as high heat load absorpers to provide equipment protection. For applications requiring personnel protection, safety shutters are designed to provide high heat load and radiation absorption. ADC has designed these components to be easily removed from the beamline. This reduces the downtime required for the beamline while these critical front-end components are replaced or repaired. The following paragraphs, figures, and attached drawings will present the detailed design of ADC's beam stop and safety shutter offerings. ADC's stops and shutters consist of three major components – a linear pneumatic actuator, water cooled absorber, and a vacuum chamber. These shutters are designed for ease of assembly and servicing. Figure 1 below shows the complete assembly of a photon shutter along with an exploded view highlighting the major components. By using a 4-way cross, the beam stop assembly and actuator assembly can be removed without disconnecting components directly fromt the beamline. A similar pneumatic actuator is used for ADC's safety shutter design, shown in Figure 2. The longer length absorber is attached to the actuator at two points. A rectangular UHV chamber houses the absorber allowing the actuator and absorber to be removed as a single unit.

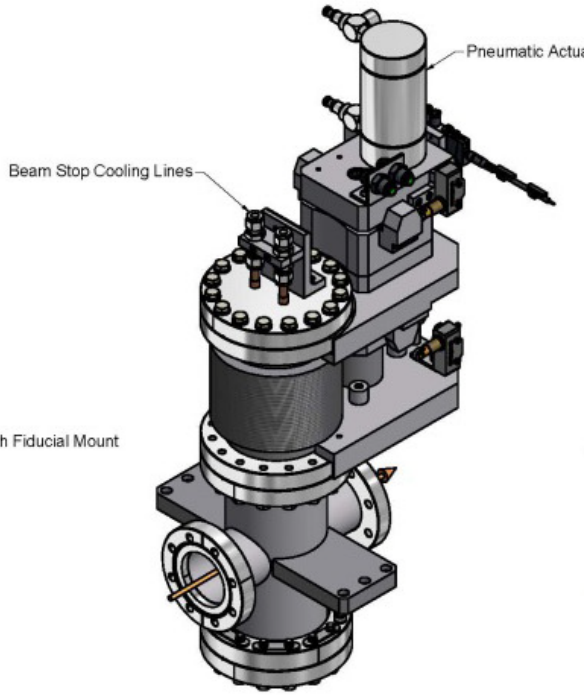


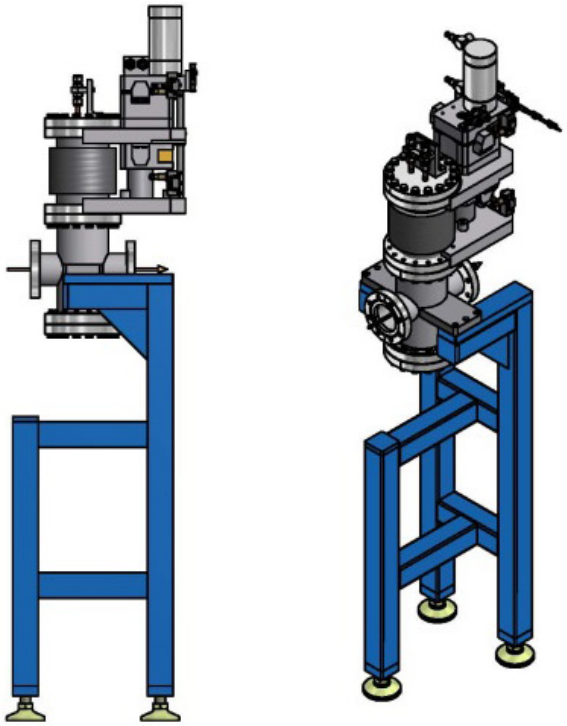




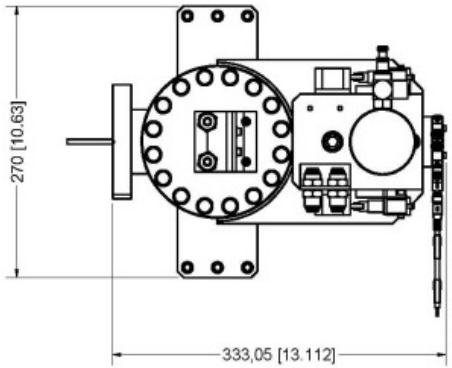








Photon Shutter Assembly Mounted to Adjustable Stand



Specifications:

- Vacuum Level: UHV
- Bellows: Rated for 10,000 Cycles
- Actuator Stroke Designed to Meet Individual Requirements
- Water Cooled Copper Beam Stop Designed for High Heat Load Applications
- Approximate System Weight: 40.19 kg [88.6 lb] Without Stand, 63.32 kg [139.6 lb] With Stand
- Different Flange Sizes and Bellows Sizes Available to Meet Specific Requirements

UHV

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

UHV approval by: M Popov | Date: 9/14/2012
Purchased Part Modification | No

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

Material | Protective Finish

		Date
Drawing Standard: ANSI Y14.5M-1994		
Drawn by	E Acome	9/14/2012
Eng approval	M Popov	9/14/2012
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13 / 0,38
0.25 A B C
0.25 A B C

ADC USA, Inc.
120 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3518
E-mail: adc@adc9001.com / Web: www.adc9001.com

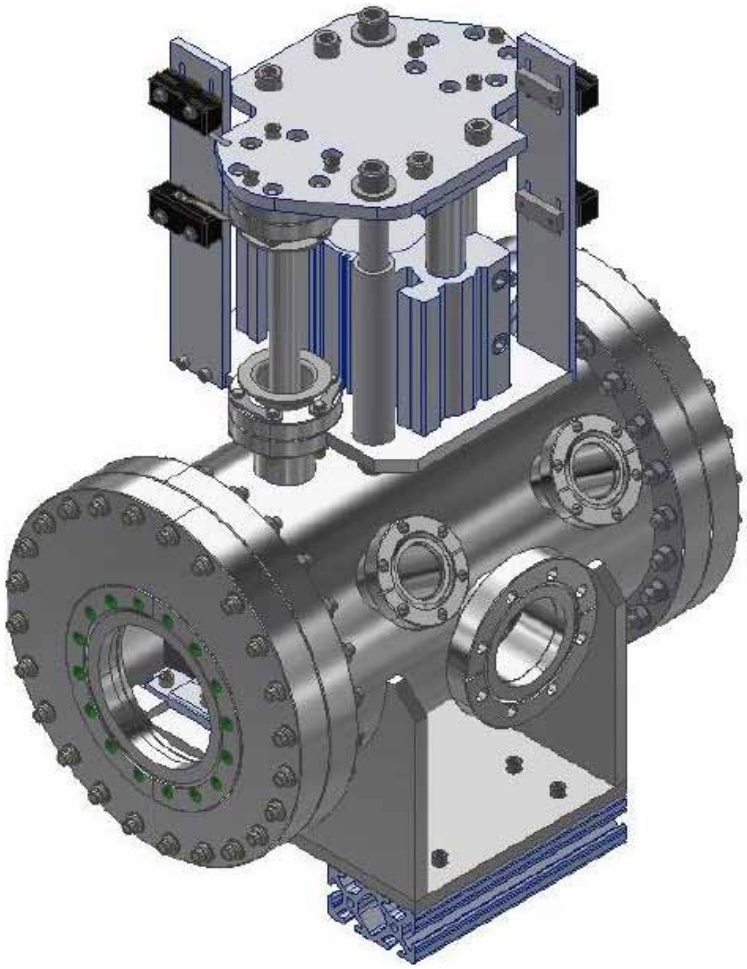
Photon Shutter Assembly

Part Number	Revision	Size	Sheet
Shutter With Stand	0	A2	1 / 1

BREMSSTRAHLUNG SAFETY SHUTTER

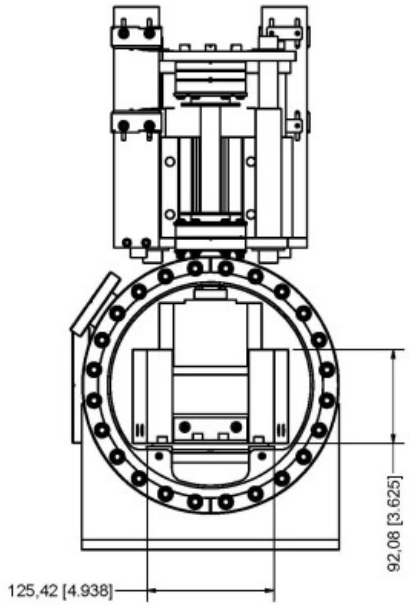
http://www.adc9001.com/products/view/668

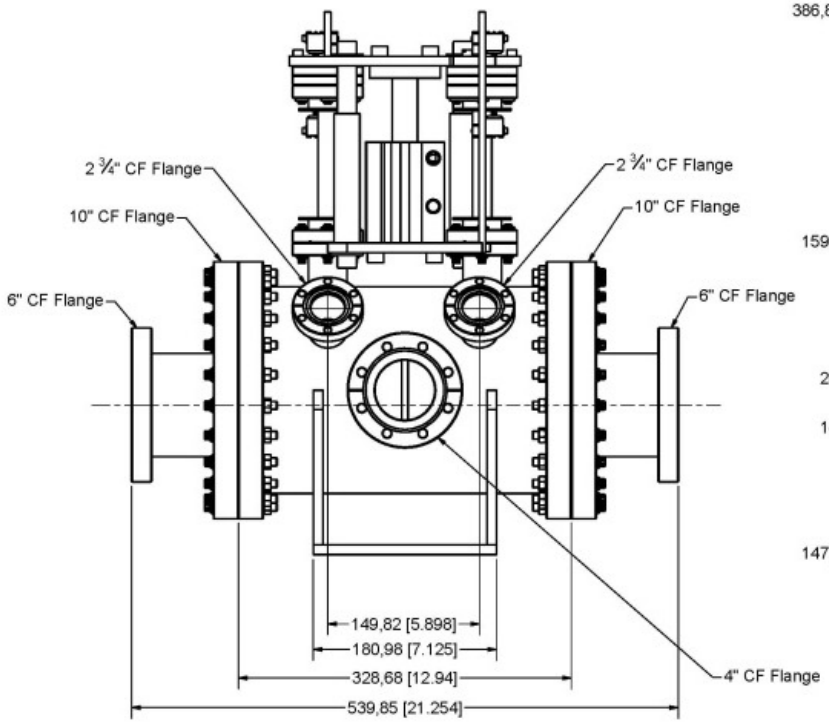
An adaptation of the bremsstrahlung safety shutter on A-Line at the Cornell High Energy Synchrotron Source (CHESS) was designed for use on F-Line. The significant changes were a larger profile of tungsten transverse to the beam, and the correspondingly larger actuator stroke and chamber size. Other changes included re-orienting the pump and auxiliary ports on the chamber, providing a chamber base that easily interfaces with 80/20© 15-Series aluminum extrusions, and adding adjustability for the position switch locations. The shutter consists of a stationary, U-shaped block of tungsten into and out of which the moving block is raised and lowered to open and close the shutter. These blocks are made with sloped walls and overlaps to ensure there are no gaps allowing direct line of sight through the tungsten. If the actuator fails or the moving bock becomes disconnected, the moving block falls into the closed position and is held by the stationary block.

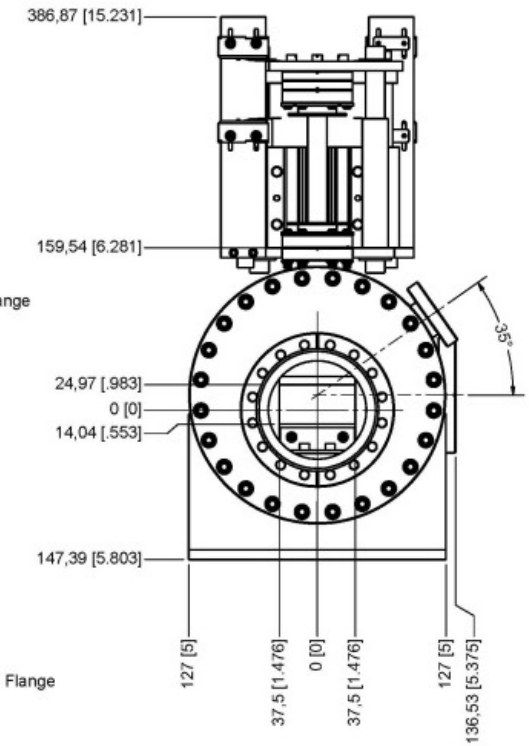


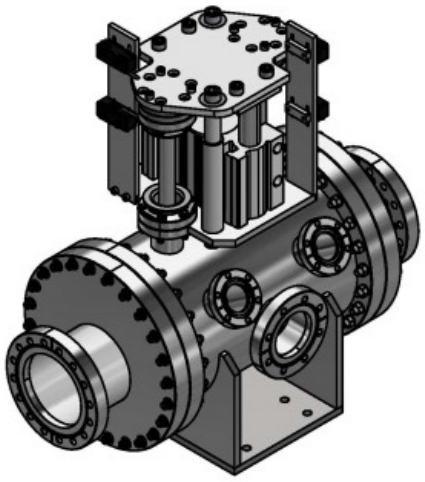
Key Specifications:

Description	Value	Units
Range of Motion	46 [1.811]	mm [inch]
Weight	108 [240]	kg [lbs.]
Horizontal Aperture	75 [2.953]	mm [inch]
Vertical Aperture	-14 / +25 [-0.551 / +0.984] (not centered on beam)	mm [inch]
Tungsten Profile (Closed)	76.2 [3] tall x 127 [5] wide	mm [inch]
Tungsten Thickness	228.6 [9] nominal 190.5 [7.5] minimum	mm [inch]









Notes:

1. Aperture when open: 39 mm tall x 75 mm wide
2. Tungsten block size when closed: 3.5" tall x 5" wide (nominal)
3. System Weight: 111 kg [245 lb]
4. Tungsten nominal thickness: 228 mm [9 in.]

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: 2015-09-28
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	2015-10-06
Design By	T Shea	2015-09-03

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 0,13 0,38
0,25 A B C
0,25 A B C

ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

ADC

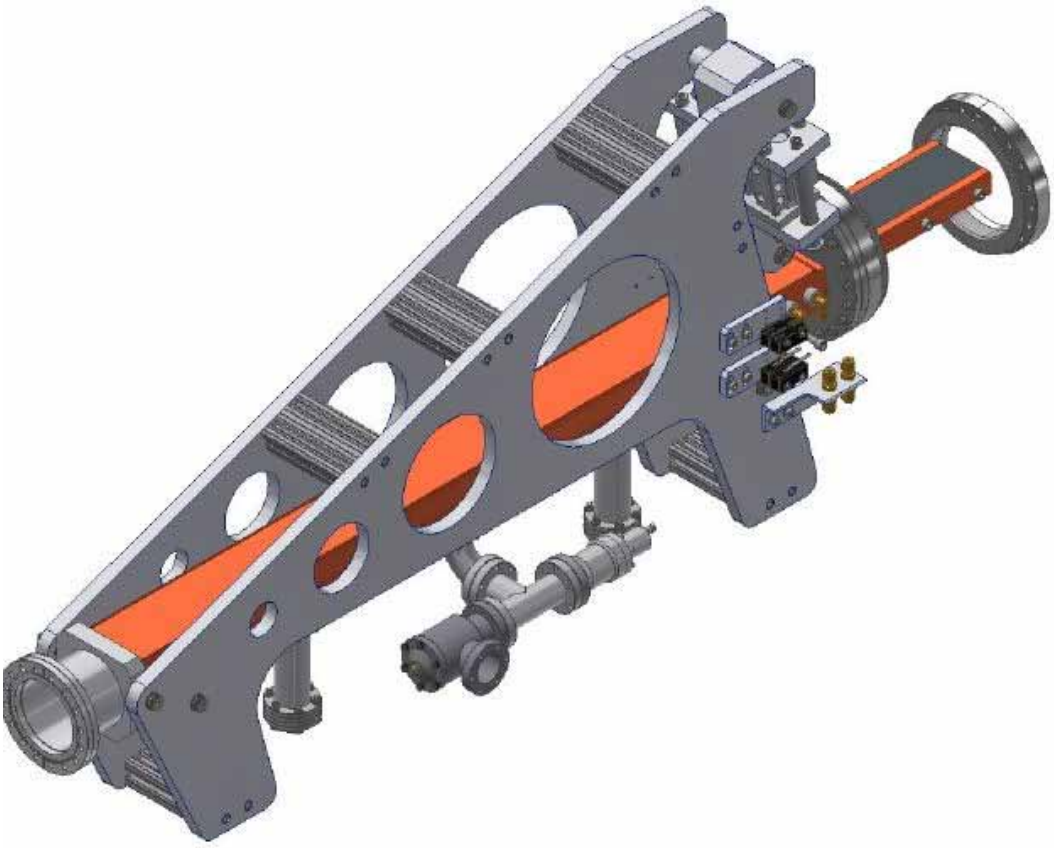
Bremsstrahlung Shutter Top Assembly

Part Number	Risk	Revision	Size	Sheet
00026774		0	A2	/

EMERGENCY LINE STOP WITH TUNGSTEN BACKING

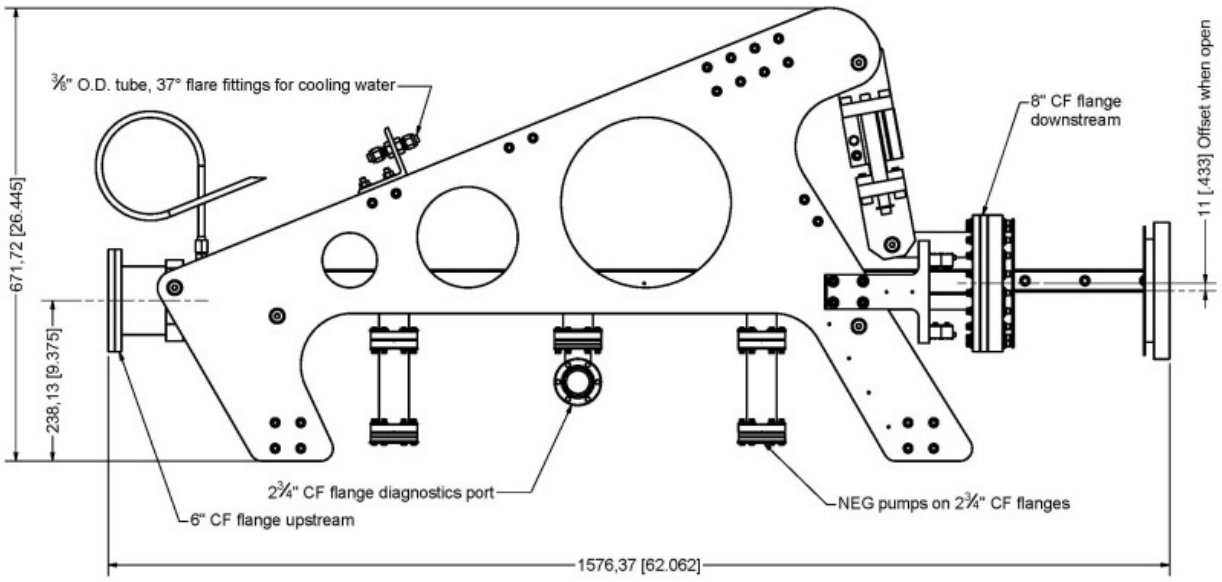
http://www.adc9001.com/products/view/669

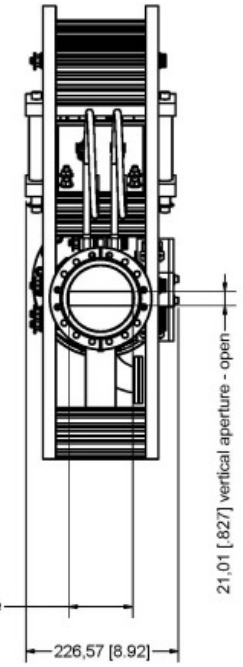
Improvements were designed for an existing emergency line stop design (operating on A-Line) for the Cornell High Energy Synchrotron Source (CHESS). These included a new support structure to allow table mounting and simplify manufacturing, an added tungsten backing block to attenuate higher-energy photons, widening the cooled copper absorber to accommodate the canting angle on F-Line, and improving limit switch position tuning. The photon absorber is a length of beam pipe made from copper, with a thick, water-cooled upper wall. When closed, one end of the pipe is lowered so that the upper interior surface blocks the beam path with a ramp to spread the deposited power over a wide area. The robust frame is made from two mirror-imaged aluminum plates and cross bars cut from 80/20© 15-Series extrusion. For security, features on the tungsten block engage with features on the copper absorber to hold the two together, while the added bolts are safety-wired to prevent tampering. NEG pumps and vacuum diagnostics connect to ports on the absorber section. The absorber is opened and closed by a pneumatic cylinder, and fails closed under loss of air pressure.

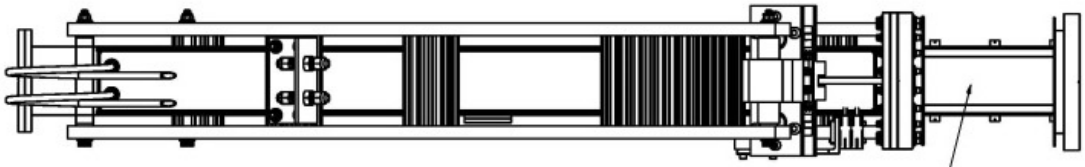


Key Specifications:

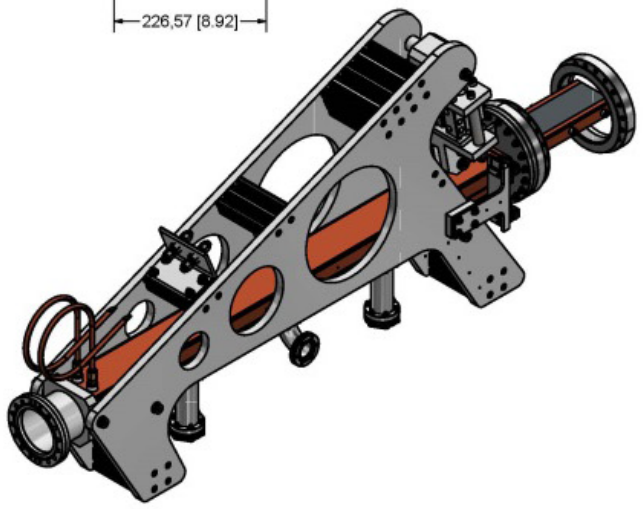
Description	Value	Units
Range of Motion	21 [0.827]	mm [inch]
Range of Motion	17.4 [1]	mrad [degree]
Upstream Flange	6" CF	-
Downstream Flange	8" CF	-
Weight	112.3 [247]	kg [lb.]







Tungsten block attenuates higher-energy photons not absorbed by cooled copper block



Notes:

1. Device pivots closed to present a cooled copper ramp, spreading the incident beam over a large area.
2. Open Aperture: 95 mm wide x 21 mm tall
3. System Weight: 114 kg [250 lb]

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: 2015-09-30

Purchased Part Modification: No

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

Material: | Protective Finish: None

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Drawing Standard: ANSI Y14.5M-1994		Date
Drawn By	T Shea	2015-10-07
Design By	T Shea	2015-09-24

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 0,13 0,38
0,25 A B C
0,25 A B C

ADC Inc.
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ADC

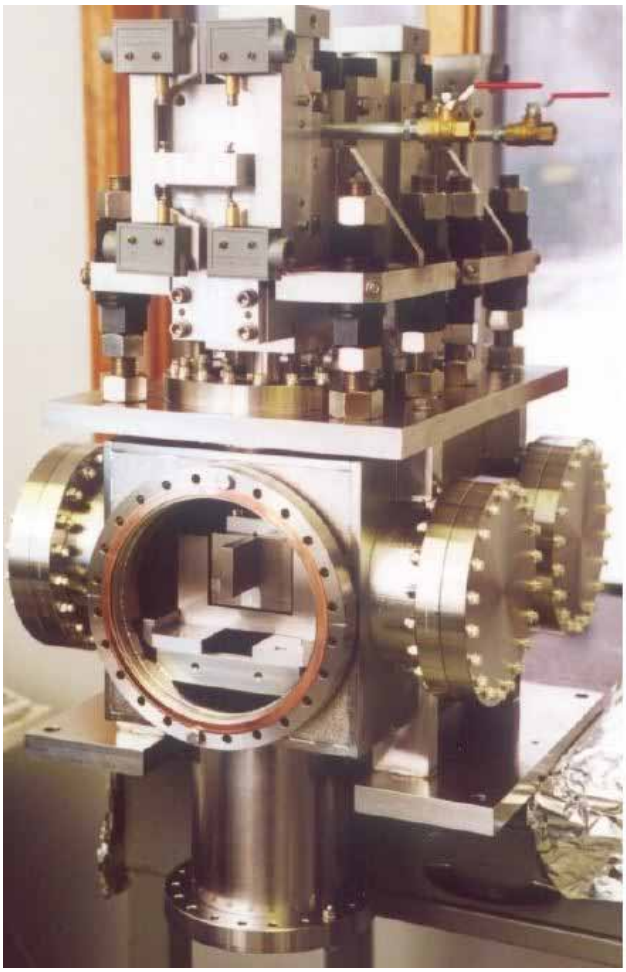
Line Stop Top Assembly

Part Number	Risk	Revision	Size	Sheet
00026809		0	A2	1

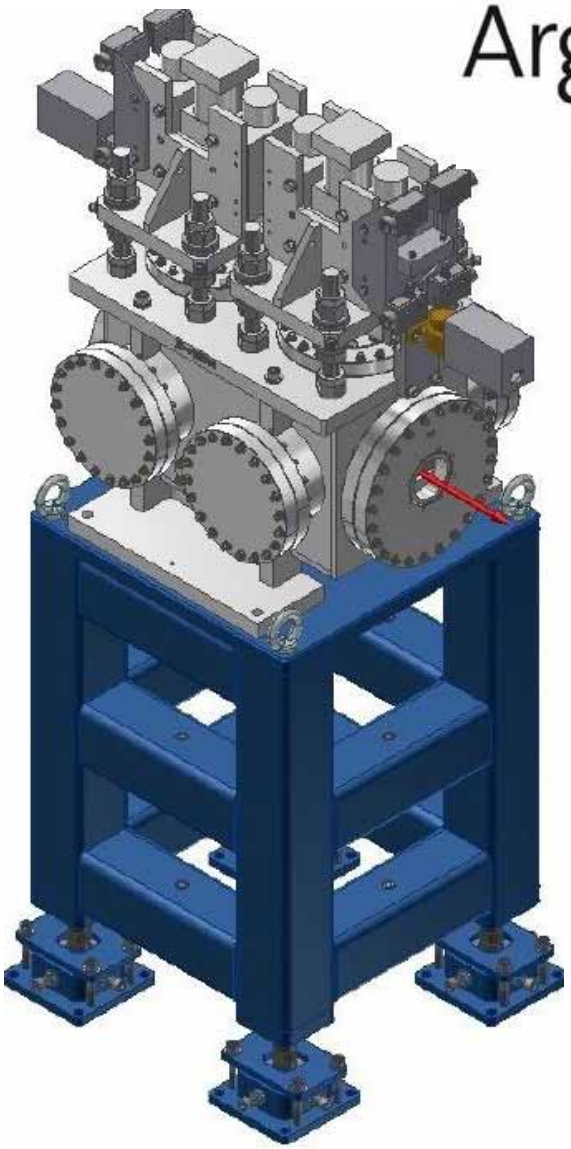
UHV SAFETY SHUTTER/COLLIMATOR (SS3)

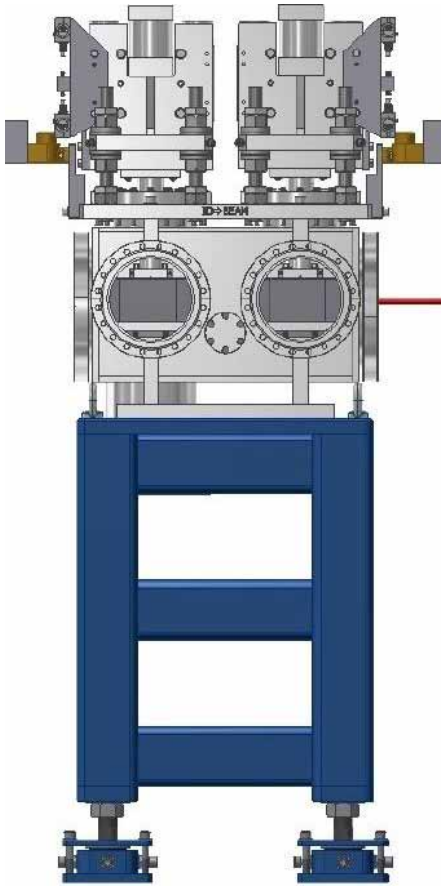
http://www.adc9001.com/Beam-Stops-

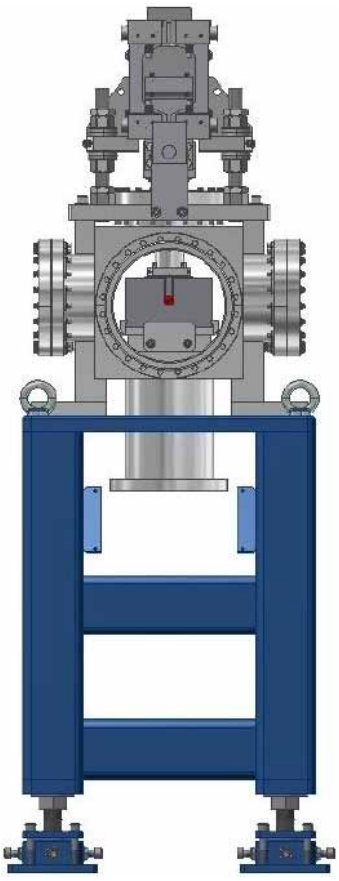
The Bremsstrahlung safety shutter is an important device for synchrotron radiation facility personnel safety. These assemblies are needed to guard against accidental positron beam loss during injection and normal operation, which then can result in high-energy Bremsstrahlung radiation being directed down the front end into an experimental station. In, for example, the Advanced Photon Source (APS) top-up mode of operation, positron injection will be continued during normal operation. Therefore, it is necessary to have special Bremsstrahlung shielding to protect the downstream experimental area. The most economical way to do this is to employ a special long Bremsstrahlung collimator in the front-end area.

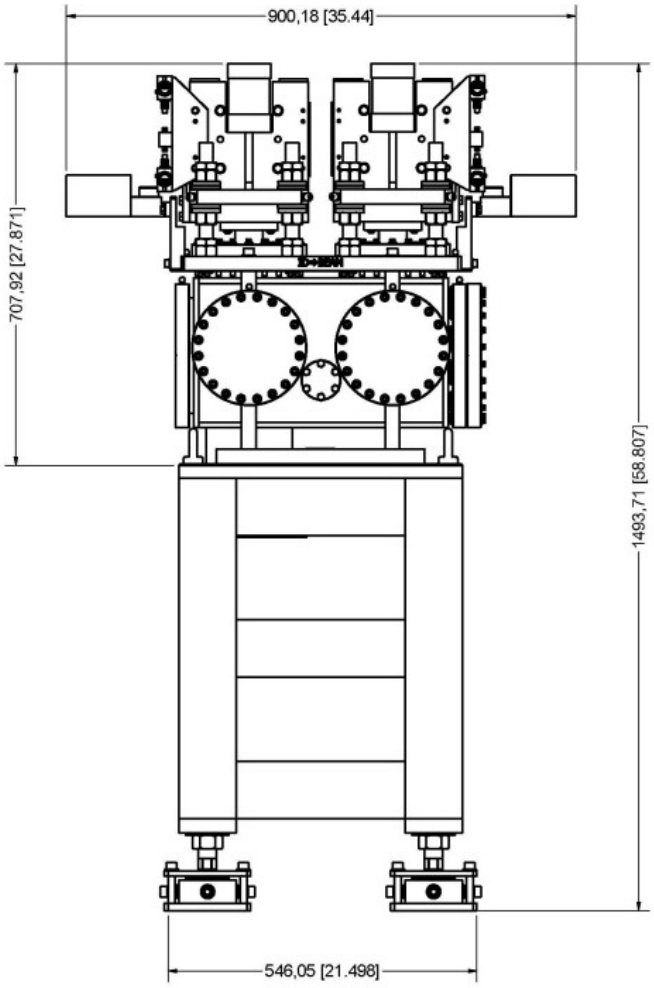


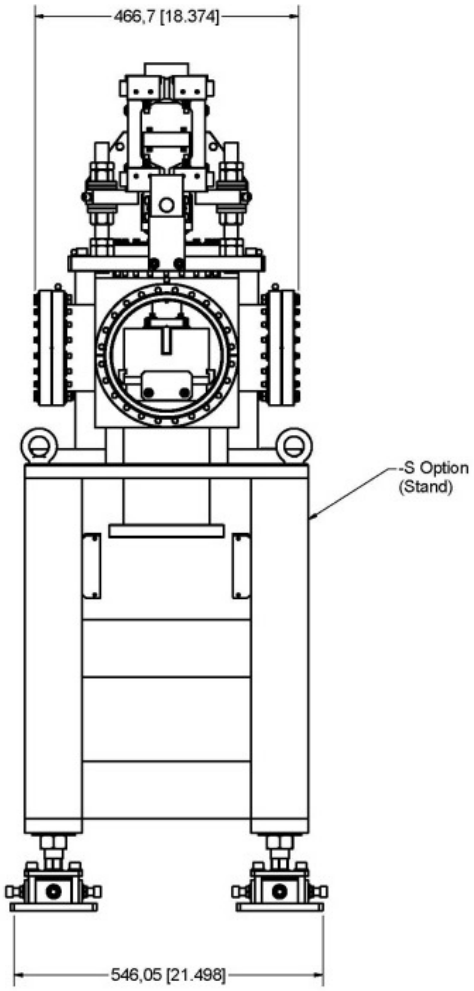
Argonne NATIONAL LABORATORY

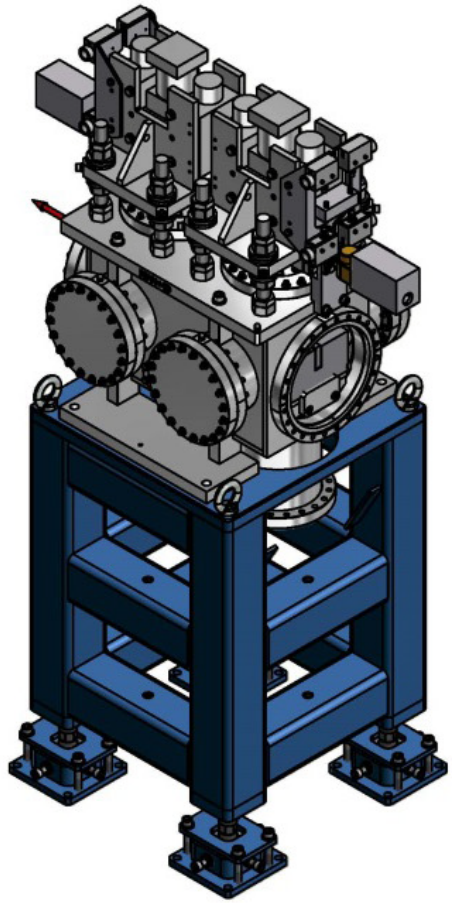












Notes:

Approximate Weight: 365 kg [803 lbs] (no stand)
544 kg [1197 lbs] (with stand)

UHV

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

UHV approval by: | Date:

Purchased Part Modification: No

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

Material | Protective Finish: No

		Date
Drawing Standard: ANSI Y14.5M-1994		
Drawn by	Tom Kupp	6/17/11
Eng approval	E Van Every	
Mfg approval		
Assy approval		

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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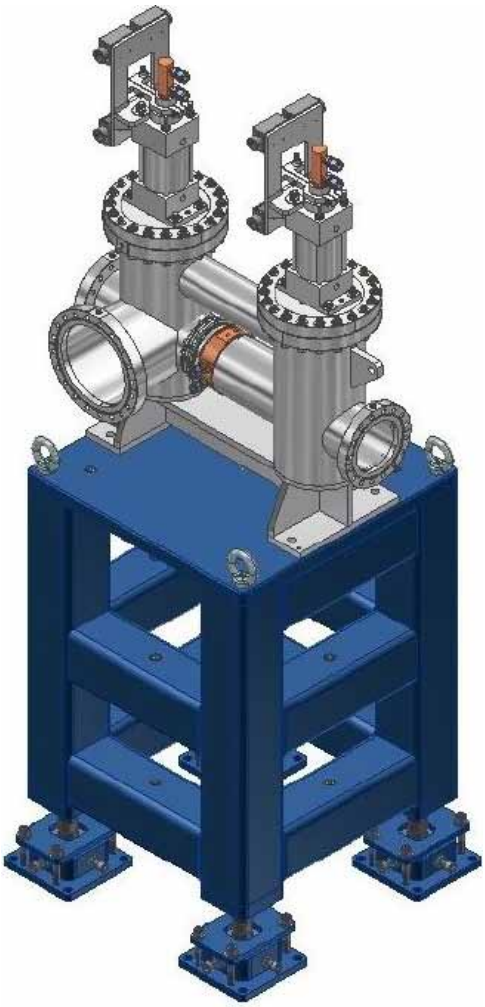
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

SS3 Safety Shutter/Collimator

Part Number	Revision	Size	Sheet
00018887	0	A2	1 / 1

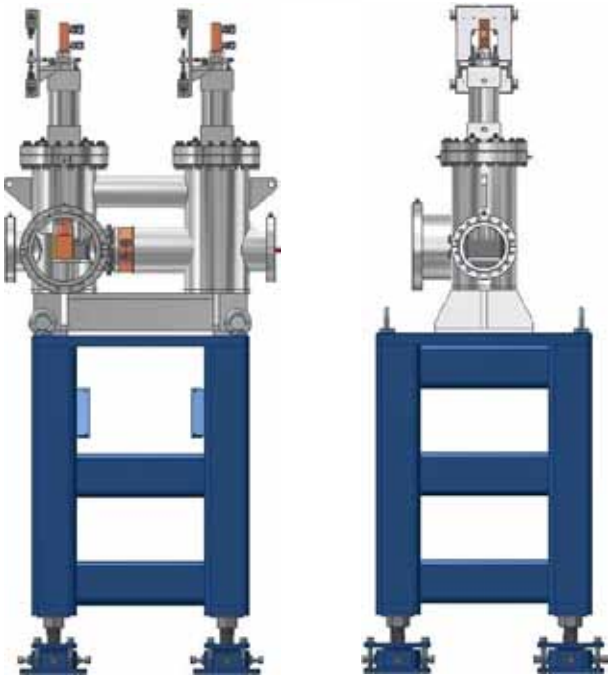
UHV INTEGRAL SHUTTER (IS9)

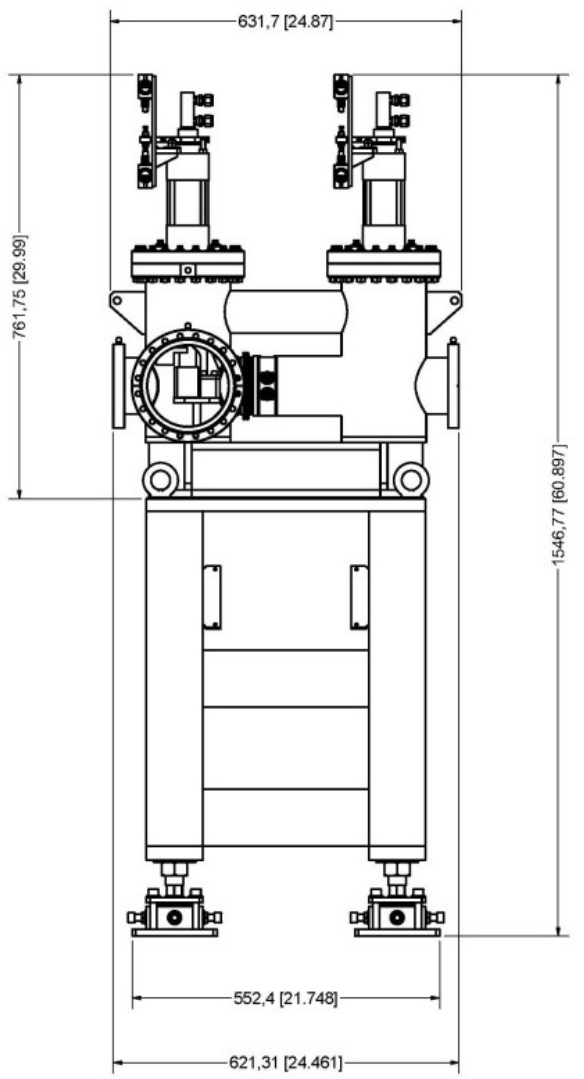
http://www.adc9001.com/Beam-Shutters-

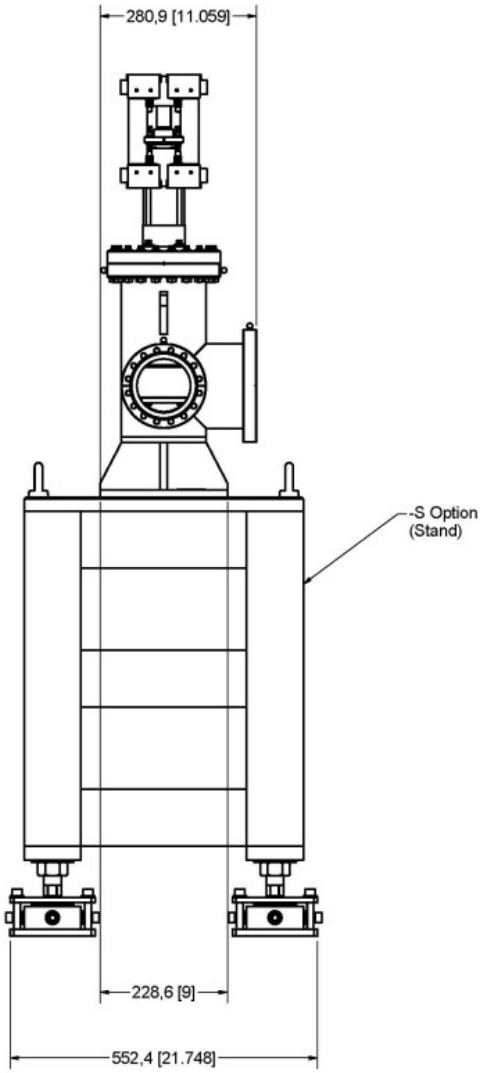


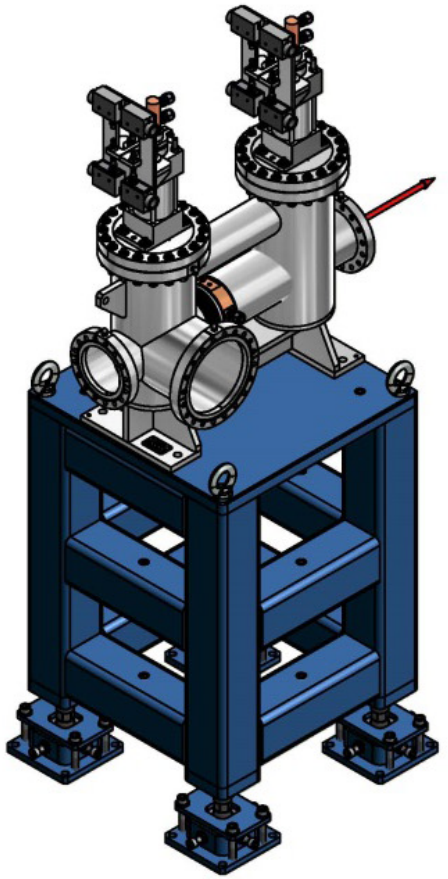
Overview: The integral shutter combines the features of a pink beam photon shutter, a pink beam safety shutter, a pink beam fixed mask and a pink beam collimator. The safety shutter is an important device for synchrotron radiation facility personal safety. These assemblies are needed to guard against accidental positron beam loss during injection and normal operation, which then can result in high-energy radiation being directed down the front end into an experimental station. The moving assembly is a double-redundant remotely-actuated device containing tungsten and explosivebondedGlidcop/OFHC copper which prevents the photon beam from traveling down a beamline into an experimental enclosure. When the shutter is closed, two shielding blocks are positioned to stop the synchrotron beam, although either block by itself provides adequate shielding. Redundant switches detect any shutter failure so that a personnel safety interlock system can takes appropriate measures to shut the beam off during a fault condition. All shutters are designed in the 'fail safe' mode such that, in the event of a power, communication, or mechanical system failure, the shutter will come to a closed state and will remain in the closed state. The fixed mask and collimator are positioned between the shutter assemblies.

Argonne
NATIONAL
LABORATORY









Notes:

Approximate Weight: 112 kg [246 lbs] (no stand)
298 kg [656 lbs] (with stand)

UHV

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

UHV approval by: | Date:

Purchased Part Modification | No

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

Material | Protective Finish: None

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Drawing Standard: ANSI Y14.5M-1994		Date
Drawn by	Tom Kupp	7/13/11
Eng approval	E Van Every	
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 0,13 / 0,38
0,25 A B C
0,25 A B C

ADC USA, Inc.
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Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

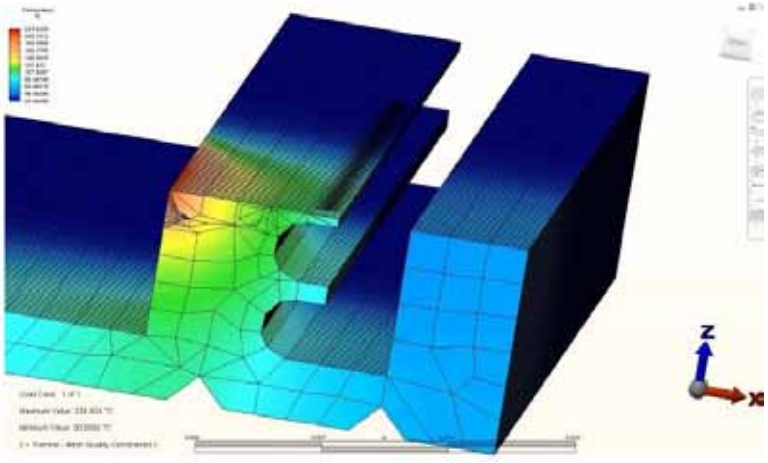
IS9 Integral Shutter

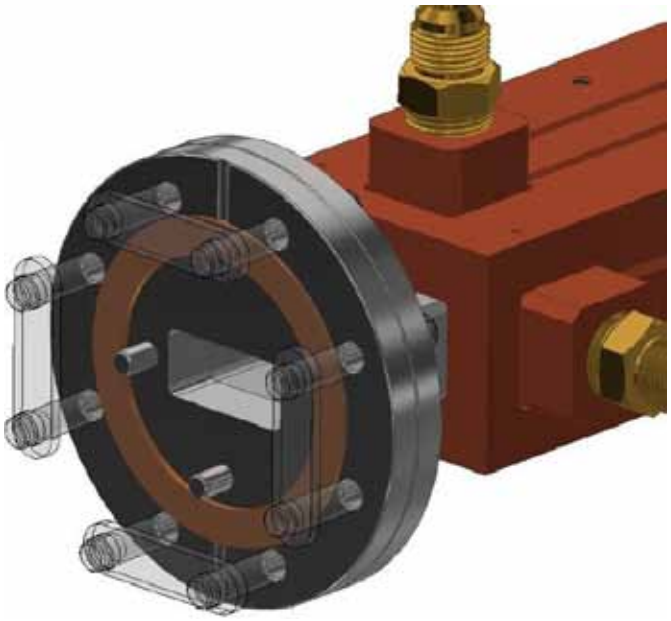
Part Number	Revision	Size	Sheet
00018998	0	A2	1 / 1

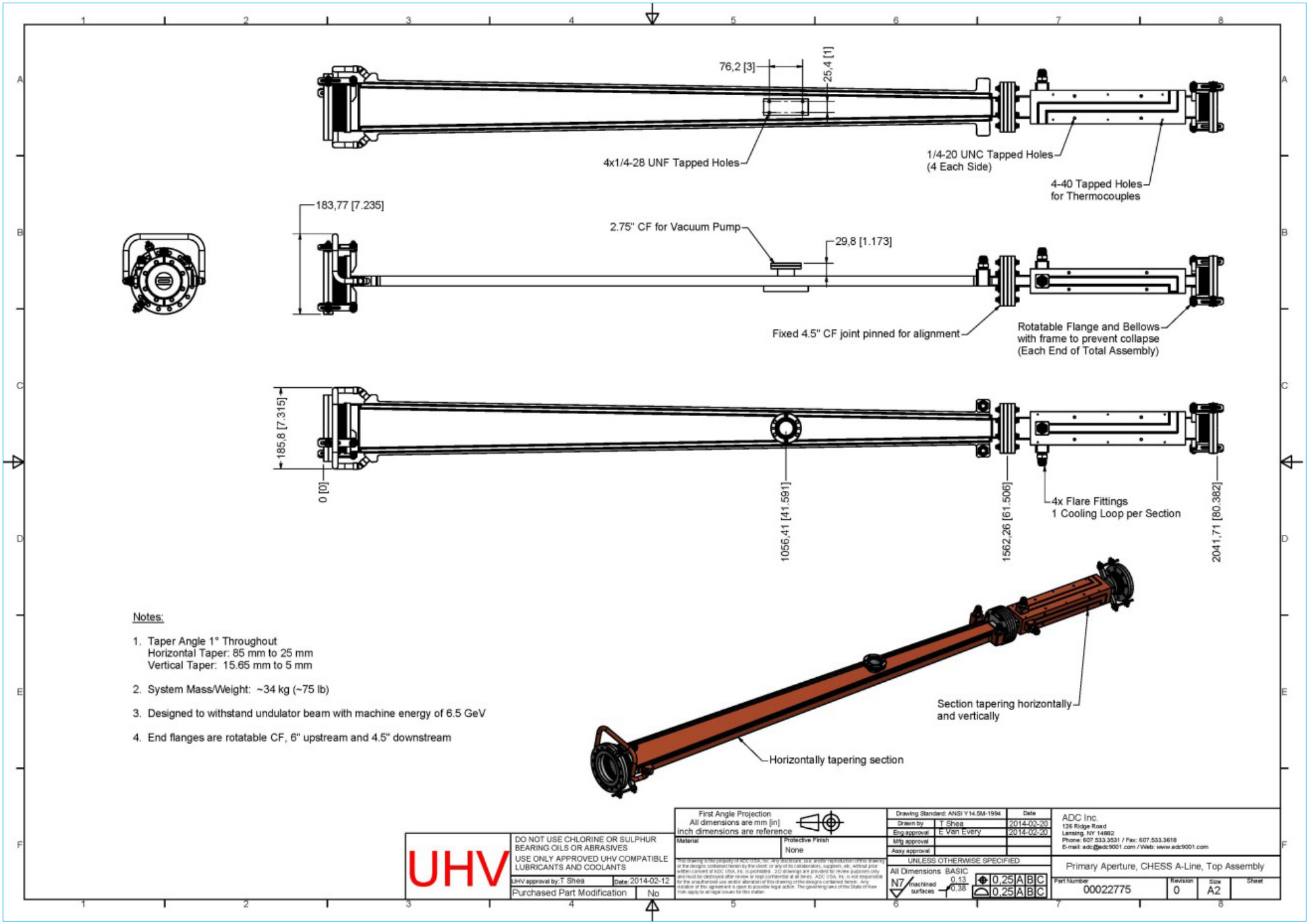
HIGH HEAT LOAD PRIMARY APERTURE

http://www.adc9001.com/products/view/644

Overview: The integral shutter combines the features of a pink beam photon shutter, a pink beam safety shutter, a pink beam fixed mask and a pink beam collimator. The safety shutter is an important device for synchrotron radiation facility personal safety. These assemblies are needed to guard against accidental positron beam loss during injection and normal operation, which then can result in high-energy radiation being directed down the front end into an experimental station. The moving assembly is a double-redundant remotely-actuated device containing tungsten and explosivebondedGlidcop/OFHC copper which prevents the photon beam from traveling down a beamline into an experimental enclosure. When the shutter is closed, two shielding blocks are positioned to stop the synchrotron beam, although either block by itself provides adequate shielding. Redundant switches detect any shutter failure so that a personnel safety interlock system can takes appropriate measures to shut the beam off during a fault condition. All shutters are designed in the 'fail safe' mode such that, in the event of a power, communication, or mechanical system failure, the shutter will come to a closed state and will remain in the closed state. The fixed mask and collimator are positioned between the shutter assemblies.



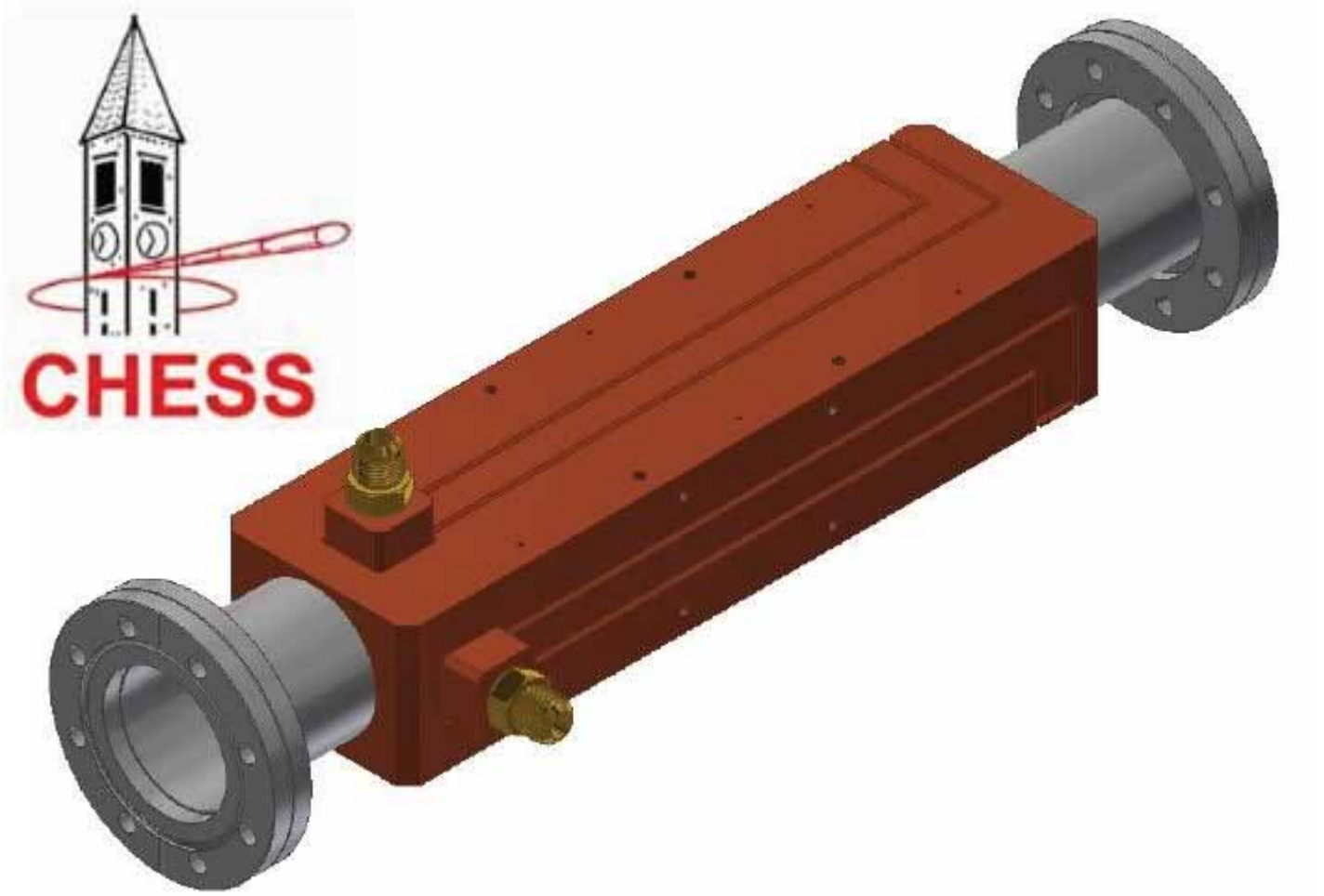



76,2 [3]
25,4 [1]
4x1/4-28 UNF Tapped Holes
1/4-20 UNC Tapped Holes
(4 Each Side)
4-40 Tapped Holes
for Thermocouples
183,77 [7.235]
2.75" CF for Vacuum Pump
29,8 [1.173]
Fixed 4.5" CF joint pinned for alignment
Rotatable Flange and Bellows
with frame to prevent collapse
(Each End of Total Assembly)
185,8 [7.315]
0 [0]
1056,41 [41.591]
1562,26 [61.506]
4x Flare Fittings
1 Cooling Loop per Section
2041,71 [80.382]
Section tapering horizontally
and vertically
Horizontally tapering section
Notes:
1. Taper Angle 1° Throughout
Horizontal Taper: 85 mm to 25 mm
Vertical Taper: 15.65 mm to 5 mm
2. System Mass/Weight: ~34 kg (~75 lb)
3. Designed to withstand undulator beam with machine energy of 6.5 GeV
4. End flanges are rotatable CF, 6" upstream and 4.5" downstream
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: 2014-02-12
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
Drawn by T Shea 2014-02-20
Eng approval E Van Every 2014-02-20
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13
0,38
0,25 A B C
0,25 A B C
ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
Primary Aperture, CHESS A-Line, Top Assembly
Part Number 00022775
Revision 0
Size A2
Sheet

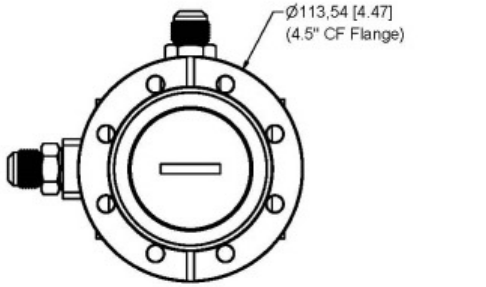
SECONDARY AND TERTIARY APERTURES

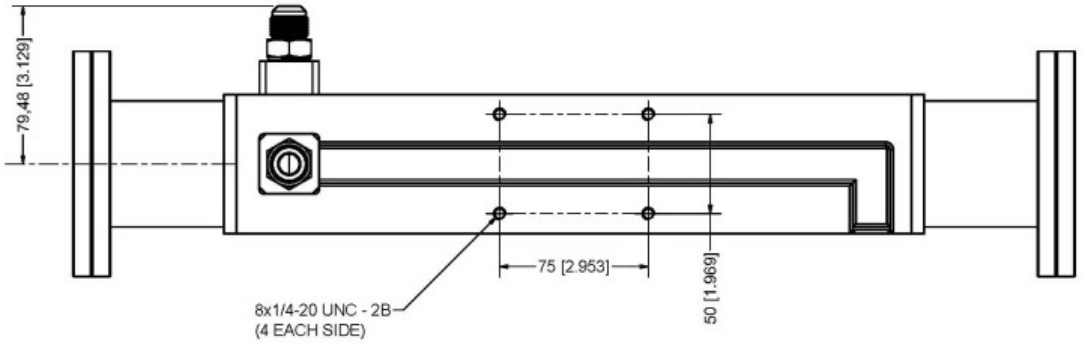
http://www.adc9001.com/products/view/645

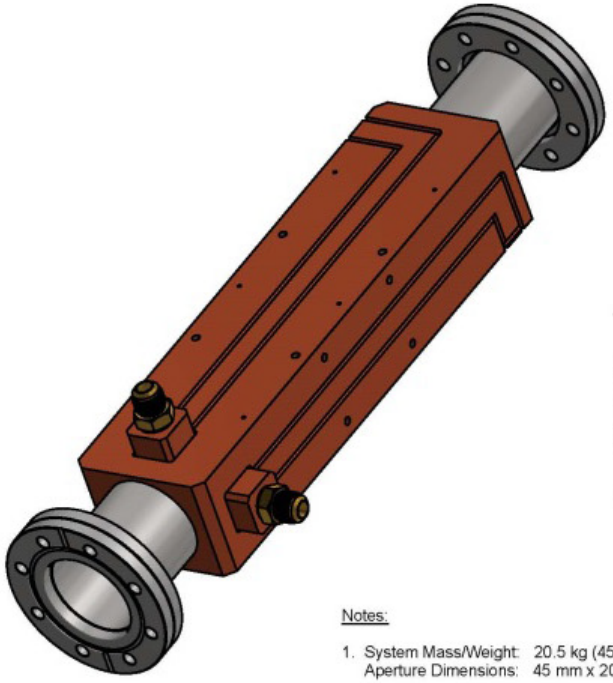
These apertures are designed for use with an undulator beam produced at machine energy of 5.3 GeV and current of 250 mA. Both are constructed from a solid block of copper with the aperture cavity cut out using wire EDM. A single cooling channel is milled into the block and covered with copper plates. The apertures connect to the facility cooling system using 45° flare fittings, and connect into the beamline with rotatable 4.5" CF flanges at each end. The table below summarizes the dimensions of the two apertures, while the cutaway views further illustrate the internal arrangement and cooling channels.

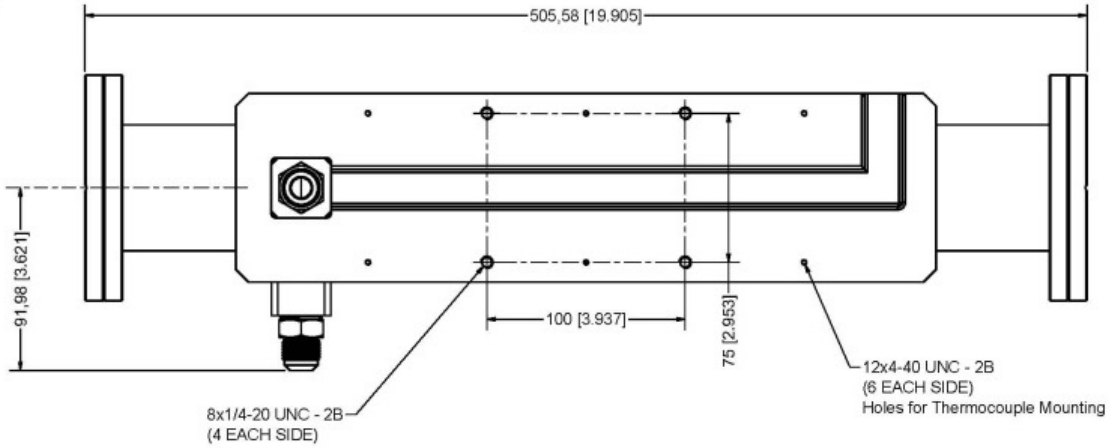


Aperture Dimensions			
Quantity	Secondary Aperture	Tertiary Aperture	Units
Upstream Width	45	35	[mm]
Upstream Height	20	10	[mm]
Downstream Width	30	5	[mm]
Downstream Height	5	3	[mm]
Length (Flange-to-Flange)	505.6	485.6	[mm]
Side Wall Taper Angle	1.23	2.6	[°]
Top/Bottom Taper Angle	1.23	0.6	[°]









Notes:

1. System Mass/Weight: 20.5 kg (45 lb.)
   Aperture Dimensions: 45 mm x 20 mm tapering to 30 mm x 5 mm (1.23° taper)
2. Cooling: One loop, water cooling, 45° flare fittings
3. Vacuum Connection: 4.5" CF flanges, both ends rotatable

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: 2014-03-05
Purchased Part Modification: No

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

Material:
Protective Finish: None

		Date
Drawing Standard: ANSI Y14.5M-1994		
Drawn by:	T Shea	2014-03-06
Eng approval	E Van Every	2014-03-06
Mfg approval		
Assy approval		

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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Phone: 607.533.3531 / Fax: 607.533.3618
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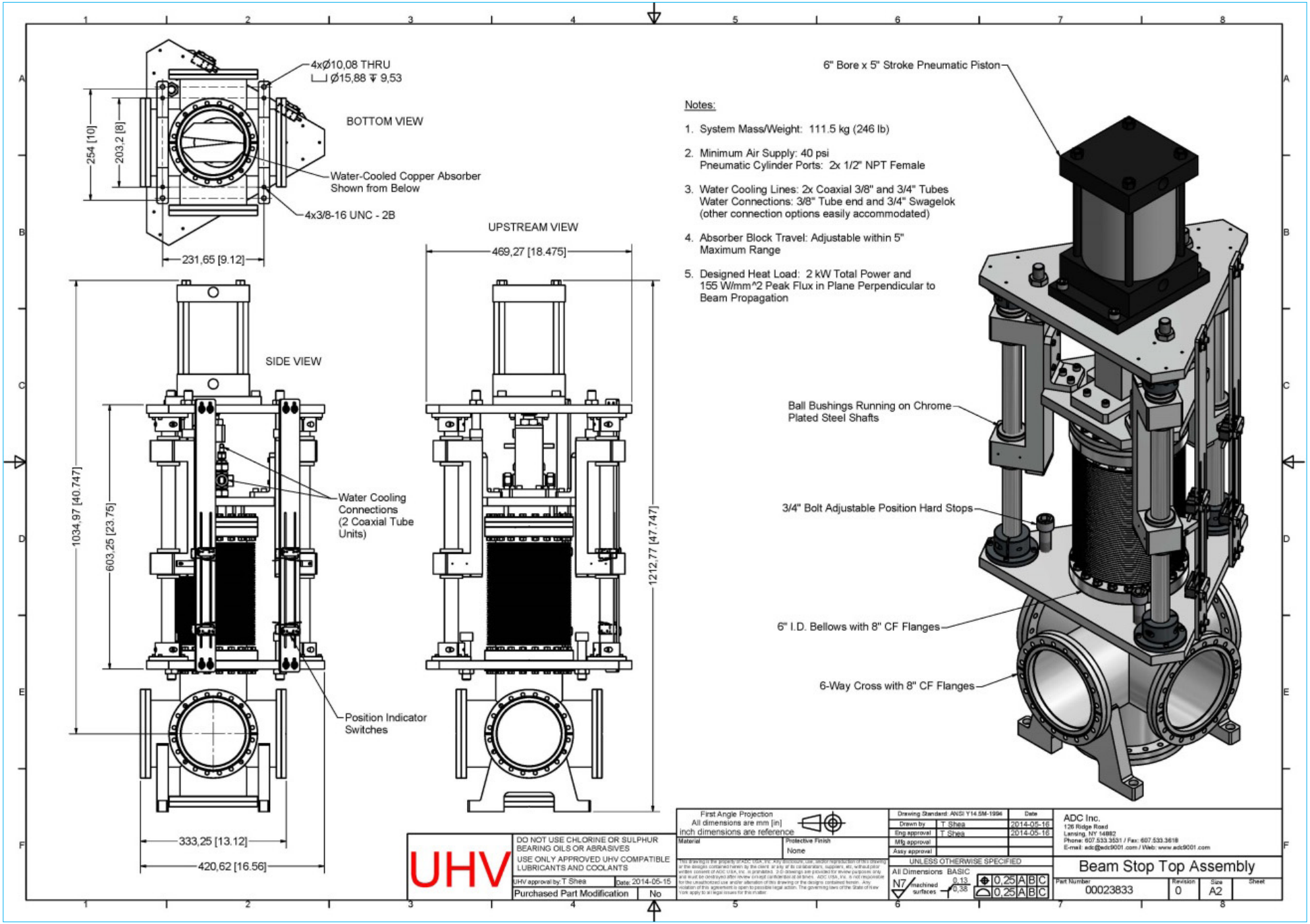
Secondary Aperture, Top Assembly

Part Number	Revision	Size	Sheet
00022931	0	A2	

HIGH HEAT LOAD BEAM STOP

http://www.adc9001.com/products/view/646

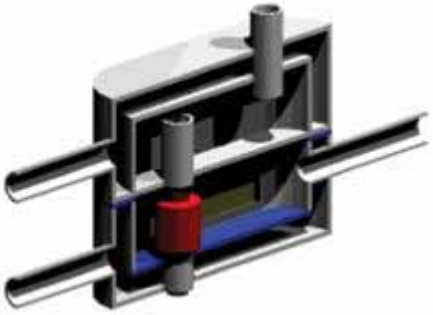
This pneumatically operated beam stop was designed by ADC. The water cooled copper block will absorb an undulator white beam with a peak heat flux (in a plane perpendicular to the beam propagation) of 155 W/mm2 and total power delivery into the copper of 2 kW. Surfaces of the copper block struck by the beam are sloped at 6° relative to the beam axis in order to reduce the flux intensity at the surfaces. Four inches of vertical acceptance are provided to allow the block to stop either the white beam, pink beam, or one of two monochromatic beams to be used, each of which runs at a different height in the flight path tube. The horizontal acceptance of the block is 1 inch, and the travel is adjustable within the 5 inch maximum stroke of the pneumatic piston using the hard stop bolts. Water cooling is provided by two coaxial tube circuits, one into each half of the copper block. These circuits could be tied together, or connected individually to the facility cooling system, and numerous connection fitting options could easily be substituted. The pneumatic cylinder requires a minimum of 40 psi supplied pressure, and connects with ½" NPT female ports. It has built-in flow adjustment valves. Two sets of position sensing switches are provided for redundancy. The chamber consists of a 6-way cross with 8 inch CF flanges, and the additional openings can be fitted with view ports, pumps, or other instrumentation, or simply capped. Advantages of the design include: robust construction, an extra-long bellows to extend its lifetime, pneumatic actuation which fails closed, and modularity which allows maintenance without removing the chamber from the beamline.


4xØ10,08 THRU
Ø15,88 ↧ 9,53
BOTTOM VIEW
254 [10]
203,2 [8]
Water-Cooled Copper Absorber
Shown from Below
4x3/8-16 UNC - 2B
231,65 [9.12]
UPSTREAM VIEW
469,27 [18.475]
SIDE VIEW
1034,97 [40.747]
603,25 [23.75]
Water Cooling
Connections
(2 Coaxial Tube
Units)
Position Indicator
Switches
1212,77 [47.747]
333,25 [13.12]
420,62 [16.56]
6" Bore x 5" Stroke Pneumatic Piston
Notes:
1. System Mass/Weight: 111.5 kg (246 lb)
2. Minimum Air Supply: 40 psi
Pneumatic Cylinder Ports: 2x 1/2" NPT Female
3. Water Cooling Lines: 2x Coaxial 3/8" and 3/4" Tubes
Water Connections: 3/8" Tube end and 3/4" Swagelok
(other connection options easily accommodated)
4. Absorber Block Travel: Adjustable within 5"
Maximum Range
5. Designed Heat Load: 2 kW Total Power and
155 W/mm^2 Peak Flux in Plane Perpendicular to
Beam Propagation
Ball Bushings Running on Chrome
Plated Steel Shafts
3/4" Bolt Adjustable Position Hard Stops
6" I.D. Bellows with 8" CF Flanges
6-Way Cross with 8" CF Flanges
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: 2014-05-15
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
Drawn by T Shea 2014-05-16
Eng approval T Shea 2014-05-16
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
0,13 0,38
0,25 A B C
0,25 A B C
ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
Beam Stop Top Assembly
Part Number 00023833
Revision 0
Size A2
Sheet

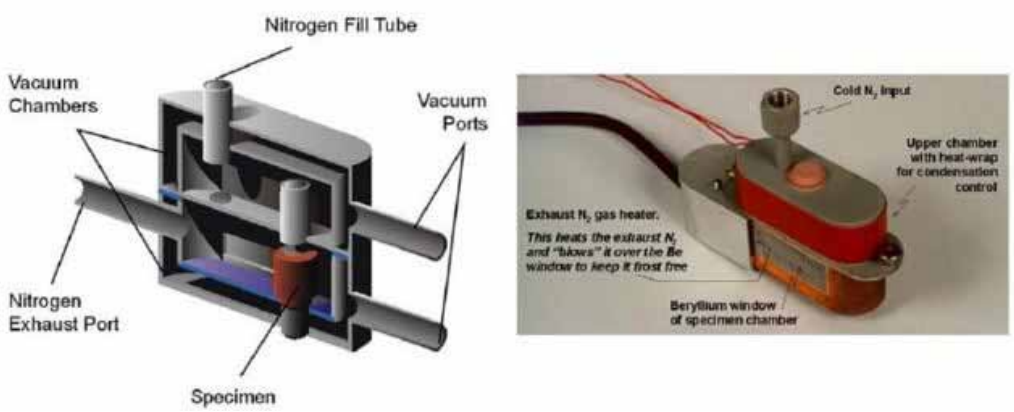
CRYOSTATIC MICRO-CT IMAGING

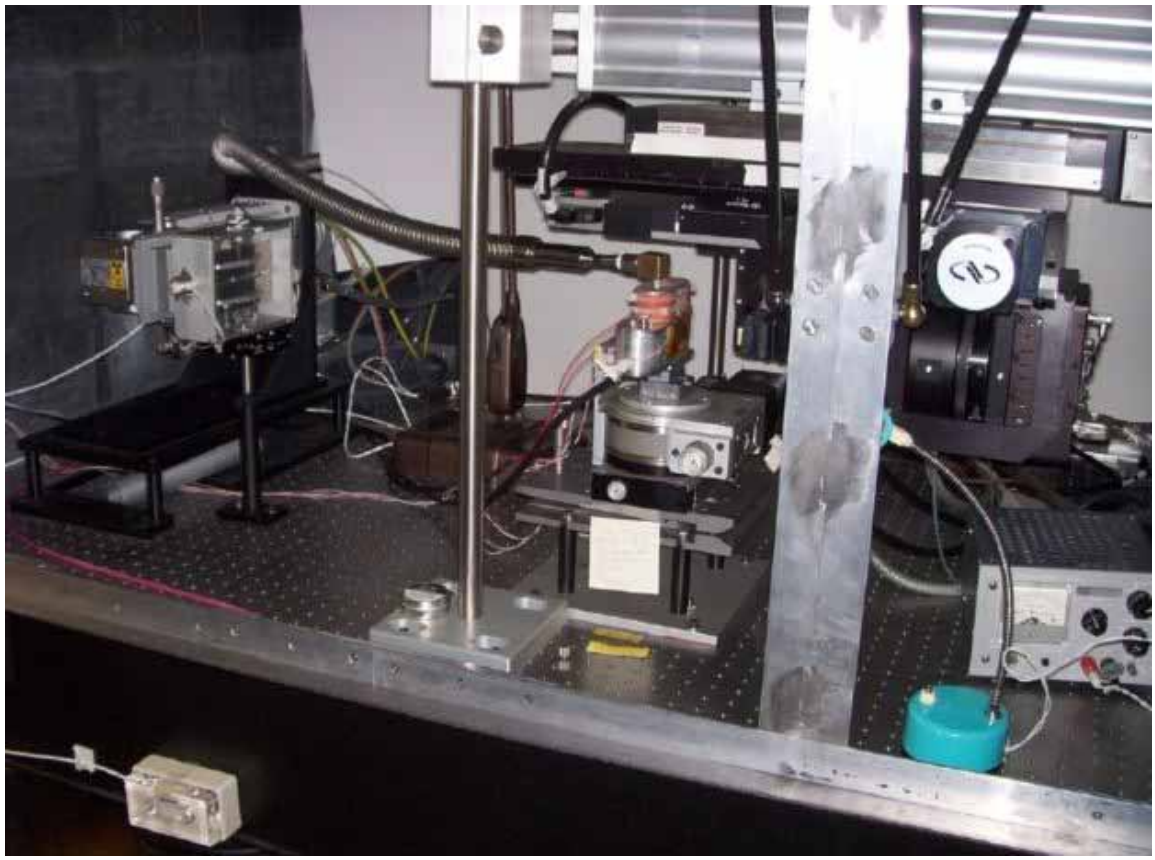
Transient Process System

http://www.adc9001.com/Cryostatic-Micro-CT-Imaging



A double walled copper vessel was fabricated for the micro-CT scanning of tissue specimens maintained at cryogenic temperature. The space between the two nested vessels was evacuated and in two opposing sides of the vessel the copper was replaced by beryllium foil. The vessel consists of two chambers, each of which is surrounded by vacuum for better thermal stability. The vacuum in this area is on the order of 1x10-3 torr. Nitrogen gas, boiling off liquid nitrogen, is injected continuously into the top of the chamber during the scanning process. Just prior to venting from the vessel the gas is heated and directed through a narrow gap over the outside of the beryllium windows to keep them frost-free. A temperature detector within the chamber is used to control the rate of inflow of the nitrogen gas. The frozen specimen is attached to a small horizontal platform on top of a vertical stainless steel pin which exits the base of the vessel through a closely fitting hole and is attached to the computer-controlled rotating stage under the vessel. The vessel and rotation-stage assembly is mounted on a chamber-controlled horizontal translation stage which can move the specimen out of the x-ray beam, from time to time, for x-ray beam calibration purposes.





EXCHANGE SYSTEM

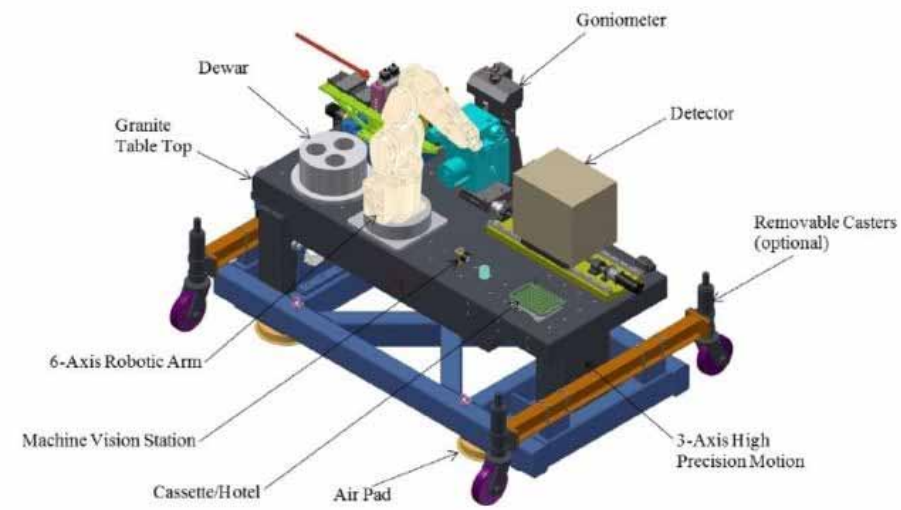
for Protein Crystallography

http://www.adc9001.com/products/view/640

The ADC robotic Sample Exchange System (SES-800) is designed for the automated handling of protein crystallography samples in a synchrotron beamline hutch. The SES-800 six-axis ABB IRB1200 robot offers the world's highest speed and precision for their class. The SES-800 provides compact size, broad work envelopes, high speed, precise location, clean environments, ABB SafeMove, and, above all, the flexibility to adapt to the greatest number of tasks. ANSI and CE safety compliance allows global deployment. The SES-800 system is capable of accurately and automatically, transferring frozen samples from a storage Dewar or ambient temperature cassette to a diffractometer.

The SES-800 robotic sample exchange system is based on the popular ABB IRB1200 series robot, shown above. This Swedish made 6 DOF robot has been modified and calibrated at the factory using ABB absolute calibration (AbsAcc) to achieve exceptional repeatability on low mass payloads. The SES- 800 system has a 900 mm reach relative to the center of the base. The maximum speed is 8.9 meters per second. The sleek enclosed structure allows a more compact sample exchange system in the hutch where space is a premium. The control system is intuitive and easy to use and connects easily to safety limits and PLCs. The user can control the robot directly using built-in routines, ABB software, or through an ADC, PC based controller executing LabView routines. The ADC control system is compatible with EPICS IOC commands and also interfaces directly, via Ethernet, to motion controllers such as Delta-Tau, Parker, and Galil as well as to host controllers for easy integration to beamline controls.

The SES-800 robotic sample exchange system, shown below, is comprised of an advanced articulating arm robot that is linked with an adaptive vision system and equipped with a library of application-specific tools. The SES-800 handles samples at ambient temperature or cryo-cooled crystals in a liquid nitrogen Dewar. Sensors on the Dewar monitor liquid level and cover access and auto make-up is optional.



X-RAY OVENS

(XRD-1500)

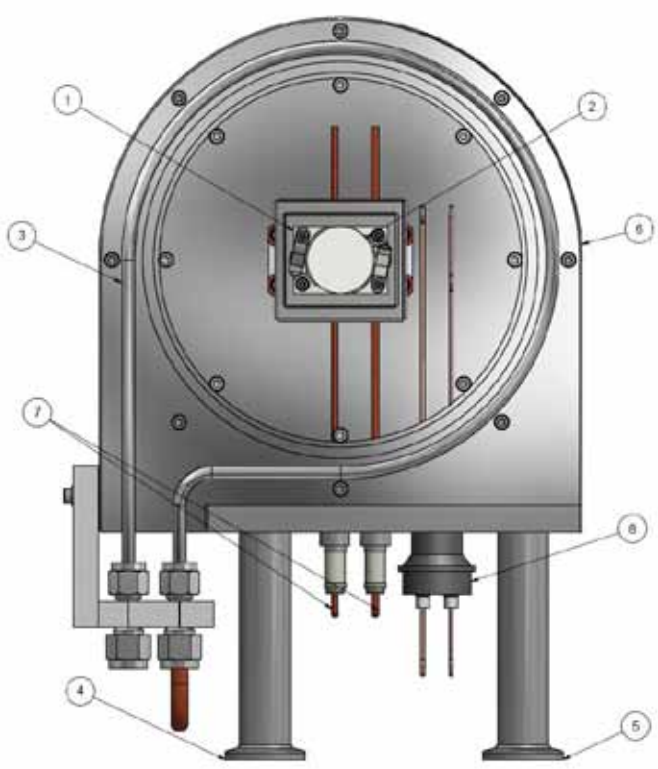
http://www.adc9001.com/XOV-35-X-Ray-Oven

New materials science calls for refined tools that enable X-ray research in well-defined environments and under controlled temperature conditions. The XRD-1500 High-Temperature Oven Chamber is a resourceful and dynamic sample stage for in-situ X-ray studies in different atmospheres up to 1500 °C. It guarantees superb temperature consistency in the sample as well as precise temperature measurement and control.

The XRD-1500 is an innovative heating High-Temperature Oven Chamber for in-situ diffraction studies on two, four, six or eight-circle goniometers up to 1500 °C. It fits all common goniometers. The XRD-1500 is exceptionally compact and lightweight. The heating plate design secures a high temperature regularity and respectable position stability at higher temperatures.

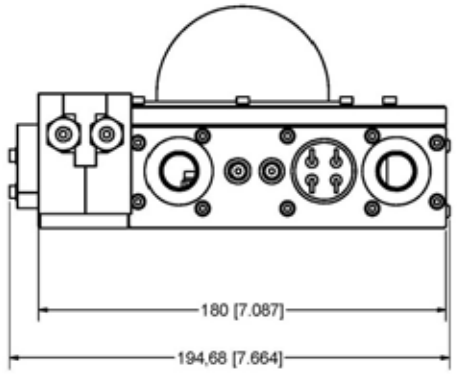
The distinctive dome-shaped X-ray window made of beryllium allows the investigation of samples under vacuum and inert gas conditions to avoid oxidation or other chemical reactions of the sample at high temperatures. Extensive cooling of the dome and the XRD-1500 housing is reached. The unique design of the XRD-1500 provides all the features our customers have in mind - compactness, safety and high performance.

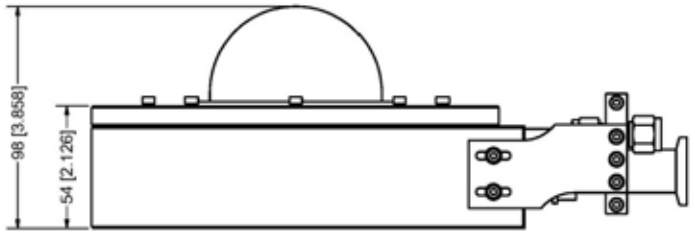
The temperature sensor in XRD-1500 is located directly under the sample in a protective ceramic sample holder. This type of structure allows for a highly repeatable and dependable temperature measurement and firm temperature control compared to those arrangements with free-standing temperature sensors. The well-proven design of the environmental heater assures that there are essentially no temperature gradients in the sample, allowing for varying sample thicknesses.

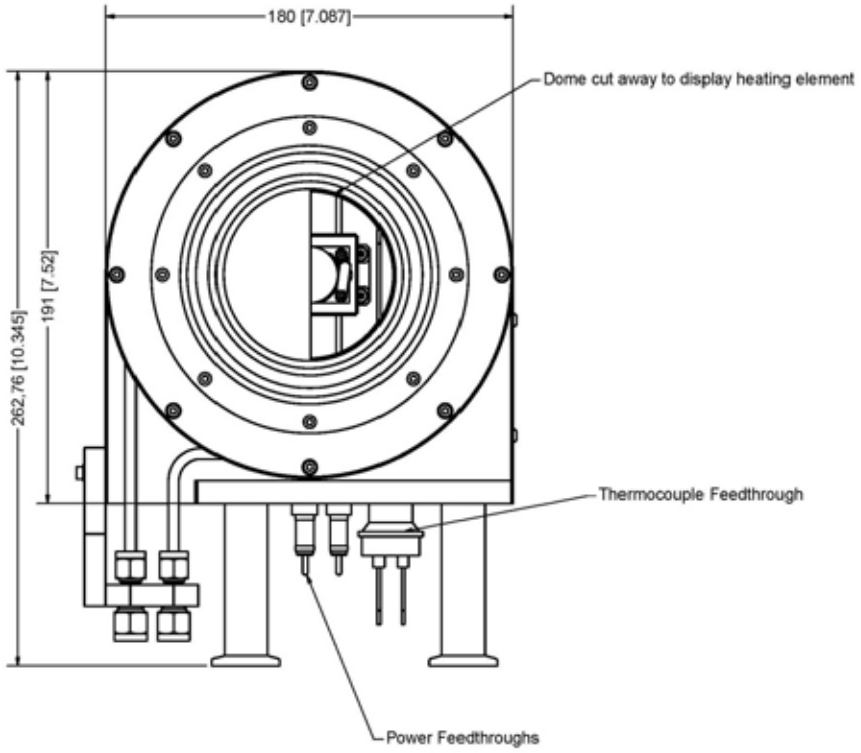


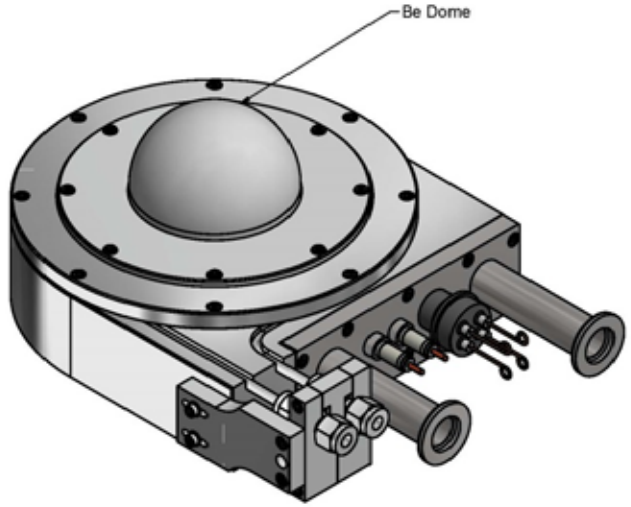
Parts List

ITEM	QTY	DESCRIPTION
1	1	High-Temperature Oven Heater Assembly
2	1	Sample Disk
3	2	Copper Cooling Loops
4	1	KF Output Tube
5	1	KF Input Tube
6	1	Oven Chamber
7	2	Power Feedthroughs
8	1	Thermocouple Feedthrough









Approximate Weight = 9.1 kg [20 lbs]

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
Material: — Protective Finish: None	Drawn by: C Adams	2014-05-16	
	Design by: J Stranger	2014-04-17	
This drawing is the property of ADC USA, Inc. and its reproduction and/or duplication 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 open 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		XRD-1500 High-Temperature Oven Assembly Part Number: 00023648_overview — Revision: 5 — Size: A2 — Sheet: 1 / 1

Purchased Part Modification: No

INSERTION DEVICES

http://www.adc9001.com/products/show_list/id/113

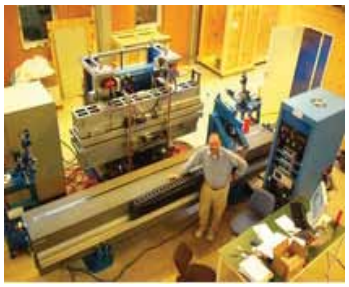
ADC USA (ISO 9001 certified), has provided insertion devices and magnetic measurement systems to synchrotron facilities around the world for the last 15 years. We have built EPUs, Planers, IVUs, CPMUs, Wigglers, and Tapered Undulators – 18 in all. We have also recently engineered and designed a Segmented Adjustable Gap Undulator or SAGU for BNL. We have built 5 magnetic measurements systems which are in operation at Maxlab, PAL, SSRF, Danfysik, and BNL. From magnet modeling, FEA, and engineering and design to fabrication, assembly, shimming, and magnetic characterization; ADC capability, procedures, quality organization and trained staff to provide "Turn-Key" Insertion Devices and Magnetic Measurement Systems complete with in-house and customer site training.

BNL Cryo In-Vacuum Undulator

Australian Synchrotron Wiggler

ALBA Synchrotron Wiggler

NSLS II Three-Pole Wiggler - TPW



MAX Lab Magnetic Field Measurement System

SSRF Magnetic Field Measurement System

PAL Magnetic Field Measurement System

ADC OLD In-House Undulator Magnetic Measurement System

NSLS II Flip Coil System

ADC's New 8 Meter Magnetic

CLS Planar Undulator

MAX Lab Planar Undulator

Synchrotron Radiation Center (SRC) Planar Undulator

CHESS Tapered Undulator

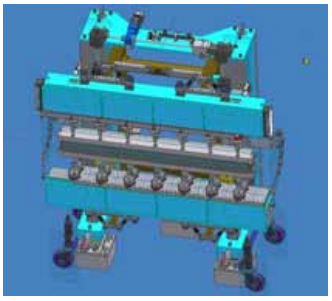
CLS EPU Undulator

MAX Lab EPU Undulator

MAX Lab Hybrid EPU Undulator

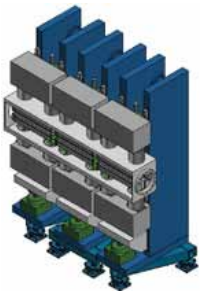
NSLS II EPU Undulator

NSRRC 4 Meter EPU

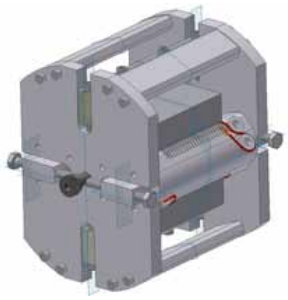


SSRF In-Vacuum Undulator

PAL In-Vacuum Undulator



NSLS II Segmented Adaptive-Gap In-Vacuum Undulator



SSLS Superconducting Mini-Unulator

Canada Planar Undulator

ENGINEERING SYSTEMS

http://www.adc9001.com/products/show_list/id/106

ADC (ISO9001:2008 certified) has been a leading supplier of high quality Complex Precision Systems to the synchrotron and neutron source scientific community as well as FELs and laser based experiments for over 18 years. Many of our High Precision Systems have been in operation nearly that long in facilities around the world. Our Precision Systems are noted for stability as well as range of motion and load capacity. Options run from steel to granite base as well as size of the system and range of motion.
Please see http://www.adc9001.com/products/show_list/id/106

ADC has continuously improved our designs by supporting our customer's unique needs for improved space constraint, load capacity, vibrational stability, positional precision and stability, encoder position feedback, and base and frame requirements. ADC has developed a portfolio of complex high precision components such as base and frames, lifts and lateral stages, floor location and attachments, wheel and air bearing movement, breadboards, and controls. These components are customizable to meet your specific application. The attached catalog provides more information on our optical tables and custom designs along with specific applications and references.


Motion System for KB Mirror


VSANS Instrument for NIST (Very Small Angle Neutron Scattering)


Cryostat Dilution Refrigerator


Radar Cross Section (RCS) Test Range


Interchangeable (Switchable) Beamline Design


Taiwan Spectrometer for Inelastic X-ray Measurements at SPring-8


Five-Axis Vacuum Compatible Positioning System for NASA


Four-Axis High Precision System for ANKA

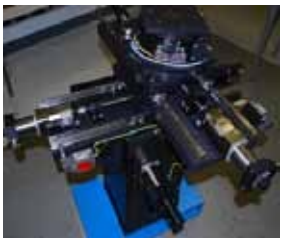

SMARTS Translator for LANL Neutron Facility


Twelve-Axis High Precision System for Diamond Light Source


Fourteen-Axis High Precision System for DLS


Custom High Precision Motion System


Four-Axis High Precision System for DLS


ANSTO 4-Axis Translation & Rotation Stages


Ultra-small-angle neutron scattering (USANS) instrument

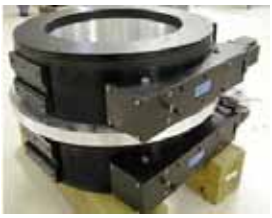

Ultra-high energy resolution monochromator/analyzer

Small-Angle Neutron Scattering (SANS) Instrument

Compact Precision Translator for LANL Neutron Facility

Selector Wheel Shutter Unit

Four-Axis Goniometer for the Canadian Neutron Beam Centre



Four-Axis Goniometer for the Korea Neutron Facility

High Precision Upright Cryostat Holder for SPring-8

Rotational Platform for NSRRC SPring-8

Nine-Axis High Precision System

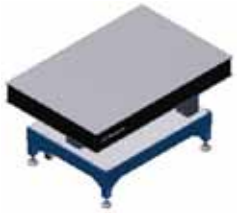
DLS Double Crystal Deflector

ANKA Fast Sample Exchange System

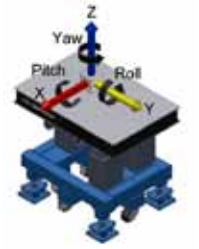
Kappa Six-Circle Goniometer for CHESS

MAX-Lab Precision Positioning System

Two-Axis High Precision System for DLS



Six-Axis High Precision System

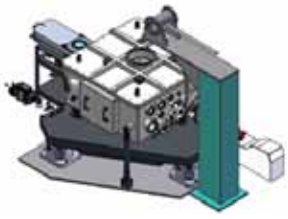


Six-Axis High Precision System for Brookhaven National Laboratory

Arecibo Observatory Upgrade

Colorado Gimbal System for MOBI Vacuum

HFIR Image Neutron Focusing System



High-resolution extreme-ultraviolet-light (EUV) microscope

Eleven Axis Custom Design Motion for a Press and a Detector System

Four Axis Custom Design Motion for a Press Manipulation System

XYZ & Multistage UHV Manipulators

Diffractometer Table, 2 Axis Motion System

Seven Axis High Load Precision Motion System

OPTICAL TABLES

http://www.adc9001.com/Custom-Optical-Tables

ADC (ISO9001:2008 certified) has been a leading supplier of high quality optical tables to the synchrotron and neutron source scientific community as well as FELs and laser based experiments for over 18 years. Many of our optical tables have been in operation nearly that long in facilities around the world. Our tables are noted for stability as well as range of motion and load capacity. Options run from steel to granite base as well as size of the table and range of motion.

please see http://www.adc9001.com/Custom-Optical-Tables

ADC has continuously improved our designs by supporting our customer's unique needs for improved space constraint, load capacity, vibrational stability, positional precision and stability, encoder position feedback, and base and frame requirements. ADC has developed a portfolio of optical table components such as base and frames, lifts and lateral stages, floor location and attachments, wheel and air bearing movement, breadboards, and controls. These components are customizable to meet your specific application.

SOLARIS 3-Axis Motorized Positioner High Precision Device

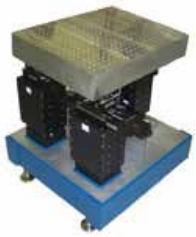
One Degree of Freedom Optical Table (Brookhaven National Lab)

Cornell Custom Optics Table

The Air Force 3-Axis Optical Table

ANKA - the Synchrotron Radiation Facility at KIT 3 Axis Table

Cornell Custom Optics Table



NASA Custom Optics Table

3 Degree of Freedom Optical Table (CHESS, Cornell University)

Diamond Light Source (DLS) Custom Optics Table

Advanced Photon Source (APS) Custom Optics Table

Advanced Photon Source (APS) Custom Optics Table

2 Degree of Freedom Optical Table (Argonne National Lab)

ANKA - the Synchrotron Radiation Facility at KIT 6 Axis Table

MAX IV Laboratory Custom Optics Table

Diamond Light Source (DLS) 2 Degree of Freedom Custom Optics Table

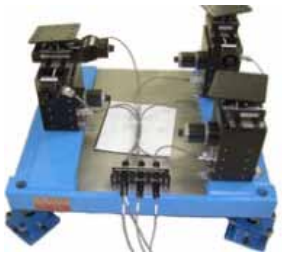
DeutschesElektronen-Synchrotron (DESY) Custom Optics Table

ElettraSincrotrone Trieste Custom Optics Table

Center for Advanced Microstructures and Devices (CAMD) Custom Optics Table

Michigan State University (MSU) Custom Optics Table

Six Degree of Freedom Optical Table (Brookhaven National Lab)



SLAC National Accelerator Laboratory Six Degree of Freedom Optical Table

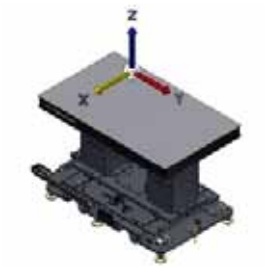
Low Profile Diffractometer Table (LPDT-100)

DeutschesElektronen-Synchrotron (DESY-2) Custom Optics Table

Two Degree of Freedom Optical Table (Brookhaven National Lab)

Advanced Photon Source (APS) Custom Optics Table

Canadian Light Source (CLS) Custom Optics Table



OPT-1000-3-X-X

Six Degree of Freedom Optical Table (Brookhaven National Lab)

For detailed information regarding ADC's Optical Tables please refer to our 2016 Optical Table Catalog or visit the following website:

http://www.adc9001.com/ABOUT-US/Catalogs

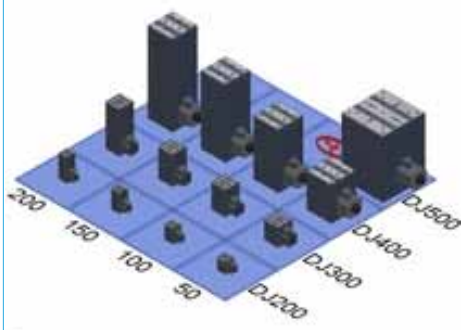
PRECISION STAGES

http://www.adc9001.com/products/show_list/id/104

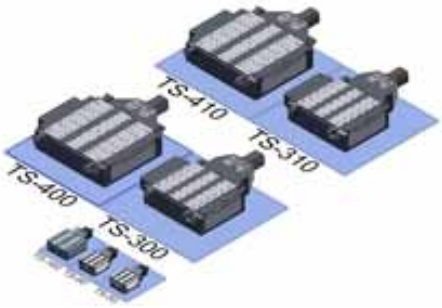
ADC manufactures high quality motion control products and systems that are qualified for Semi-conductor, Automation, and Aerospace industries. Our extensive product line includes; linear stages, lift stages (Jacks), rotation stages, goniometers, gantry systems, optical tables, vacuum compatible motion systems, and Nanotechnology positioners.

Mounting Plates and Brackets

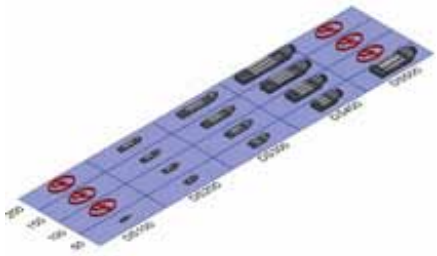
Rotation Stages



Lift Stages



Goniometers



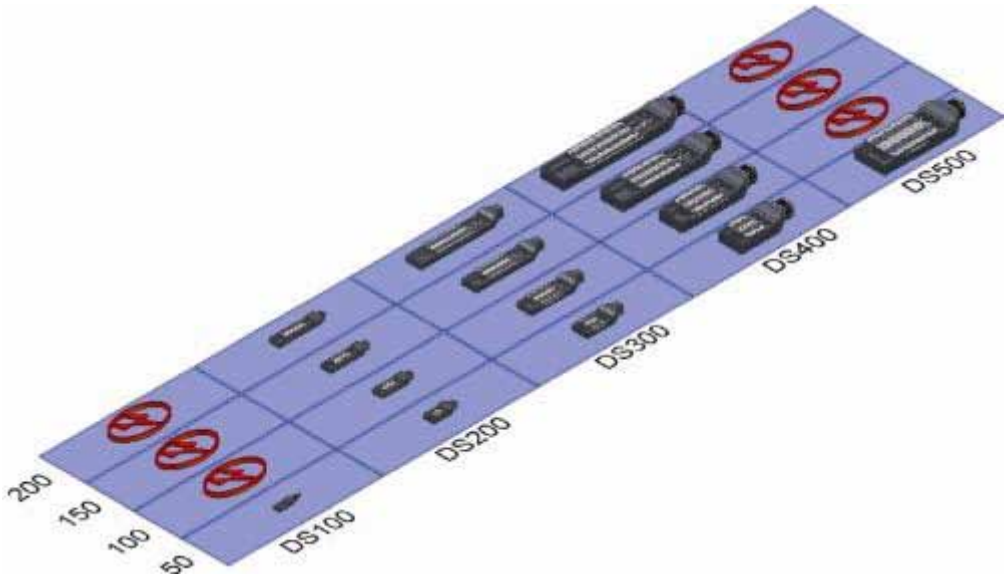
Linear Stages

Custom Stages

LINEAR STAGES

http://www.adc9001.com/Linear-Stages

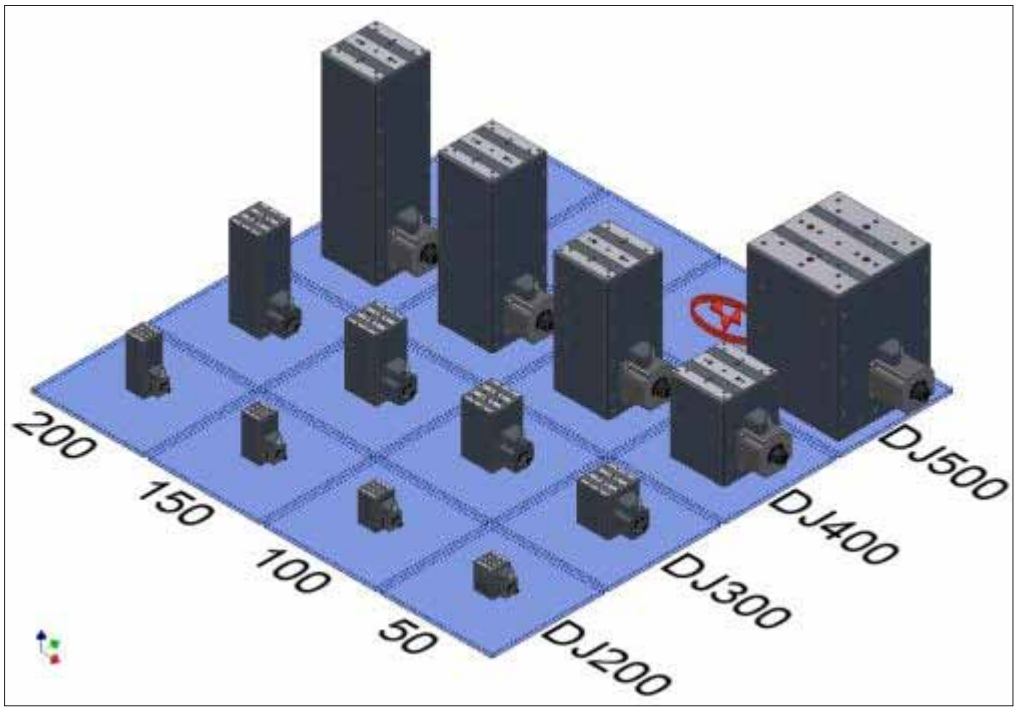
ADC's high precision linear slides provide an accurate and rigid platform for use in any positioning system. The rugged black anodized aluminum housing features a precision ground base and top plate, each with multiple utility holes for easy integration into the users' system. The stage is driven by a high class preloaded ballscrew coupled to a high torque 200 step per revolution stepper motor which can be run in full, half, or microstepping mode to meet your resolution requirements. Maximum rigidity is assured through the use of preloaded crossed roller linear bearings. Each slide also features two fully adjustable, normally closed limit switches to define the extents of travel.



LIFT STAGES

http://www.adc9001.com/Lift-Stages

ADC's high precision jacks provide an accurate and rigid platform for use in any positioning system. The rugged black anodized aluminum housing features a precision ground base and top plate, each with multiple utility holes for easy integration into the users' system. The vertical stage is driven by a high class preloaded ballscrew coupled to a high torque 200 step per revolution stepper motor which can be run in full, half, or microstepping mode to meet your resolution requirements. Maximum rigidity is assured through the use of preloaded crossed roller linear bearings. Each jack also features two adjustable, normally closed limit switches at the end of travel.



ROTATION STAGES

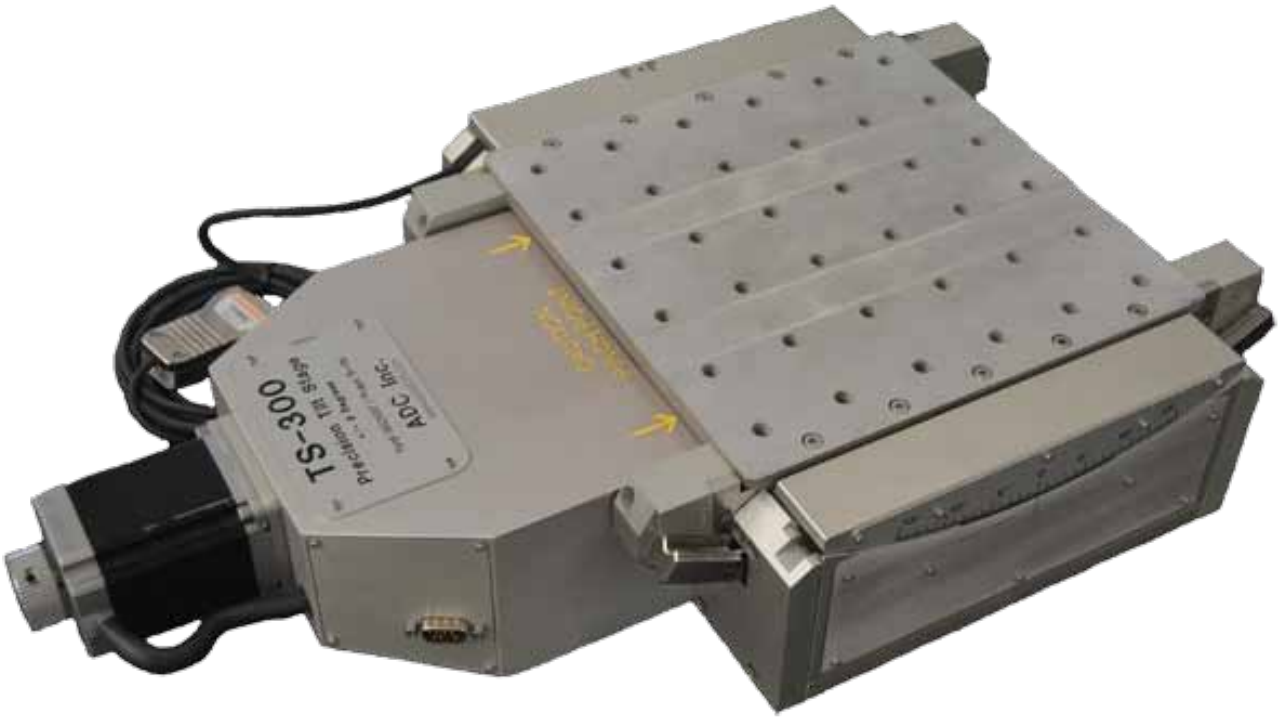
http://www.adc9001.com/Rotation-Stages

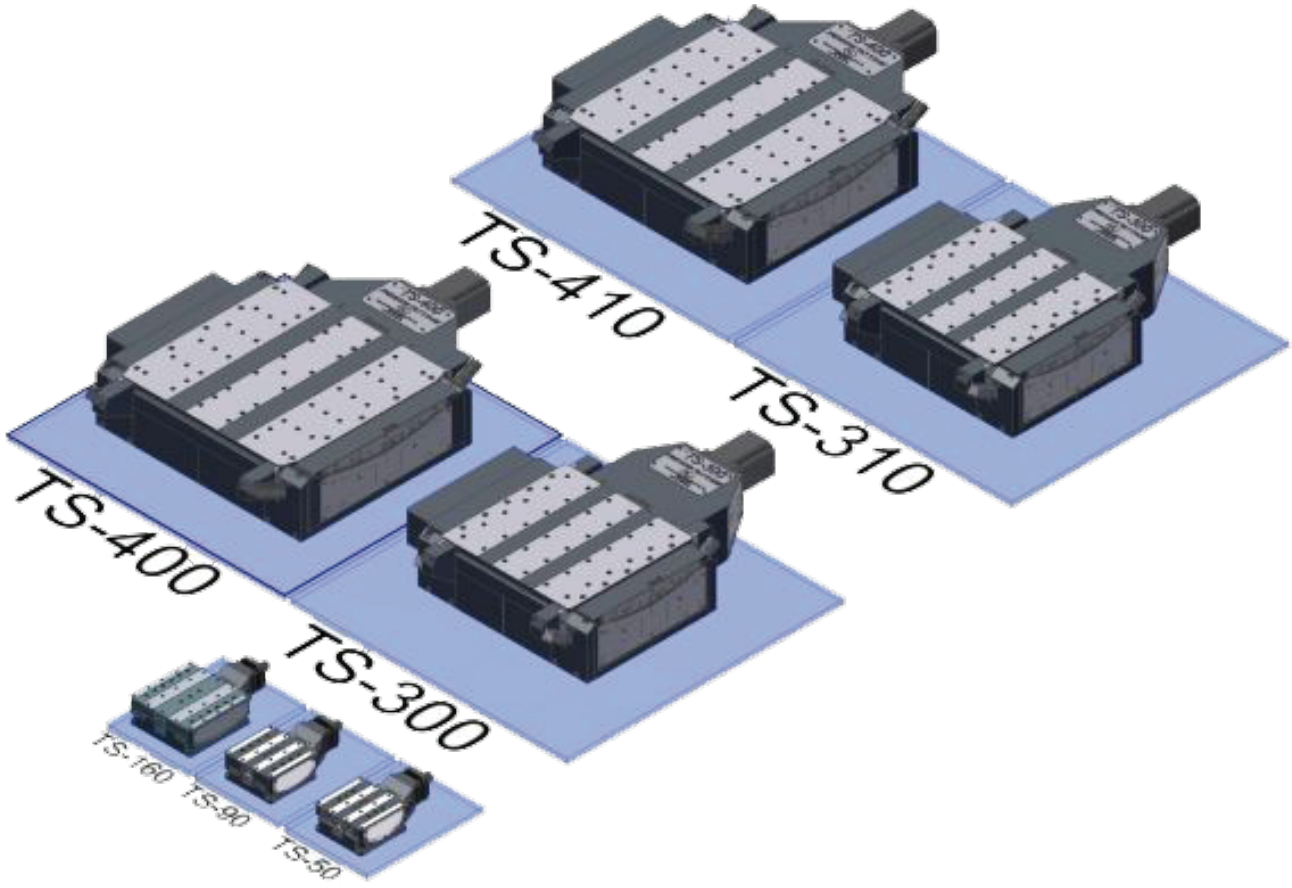
ADC's series 100 to 700 rotation stages are designed for use in industrial applications such as measurement systems, vision control, automation, and robotics, and in scientific applications such as synchrotron experiments. The body is fabricated from a high rigidity aluminum alloy. Two industrial high-precision angular contact ball bearings capable of withstanding substantial radial and thrust loads guarantee the highest precision with excellent rigidity. A high-precision worm gear drive provides optimal, quiet, smooth motio

PRECISION GONIOMETERS

http://www.adc9001.com/Goniometers

These tilt stages are based on precision curved guide rails combined with a tangent bar (TS Series) or worm gear drive system (TSW Series) providing fine angular resolution and accuracy. The stages can be paired to provide an orthogonal (X-Y) tilt stage system. All tilt stages come standard with a stepper motor.





OVERALL CAPABILITIES

Design

Fabrication

Assembly

Installation

MANUFACTURING CAPABILITIES

ADC USA, located near Cornell University in Ithaca, New York, is a leading developer and supplier of complex engineering components and instruments for large government laboratories and corporations around the world. Founded as a privately held company in 1995, ADC has grown into one of world's leading technology companies with more than 500 customers located in over 26 countries. 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.

Our customers say ADC is unique because we:

- Proactively solve manufacturing challenges
- Initiate cost savings for our customers
- Innovate – in the way we build and the equipment we use
- Integrate complex systems, efficiently
- Understand schedule
- Listen

Customers are the most valuable people for an organization. They are the resource upon which the success of our business depends. The relationships we build with our customers are based upon loyalty and satisfaction. Our purpose is to fulfill the needs of the customer and they in turn make achieving our business aims possible.

ADC offers a large assortment of synchrotron equipment including; High Precision Slits, Optical Tables, Custom Complex Motion Systems, Micro and Split Two Axis Ion Chambers, Mirror Systems, Spectrometers, and Insertion Devices.

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 a Brown & Sharpe CMM, a Jones &Lamson Optical Comparator, and an extensive selection of gages. We ensure calibrations are performed and are traceable to meet your 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.

Process Flow

We pay strict attention to every detail of our operation. Our process includes having the machinists check parts throughout the process flow and inspect parts as they are run. First articles are performed on all new parts and at each operation. In addition, all parts also go through a final inspection on state-of-the-art measuring equipment. We are pleased our clients recognize and count on our quality capabilities so much so that we've even had customers come to us to help them inspect parts where there may be a discrepancy even though the parts were made by a different machine shop!

ADC's Manufacturing Material Stack
for Machining Projects

WELDING

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

Welding shop strength is our ability to engineer and fabricate complex, multiple part welded assemblies. We also design and build our own weld fixtures when needed.

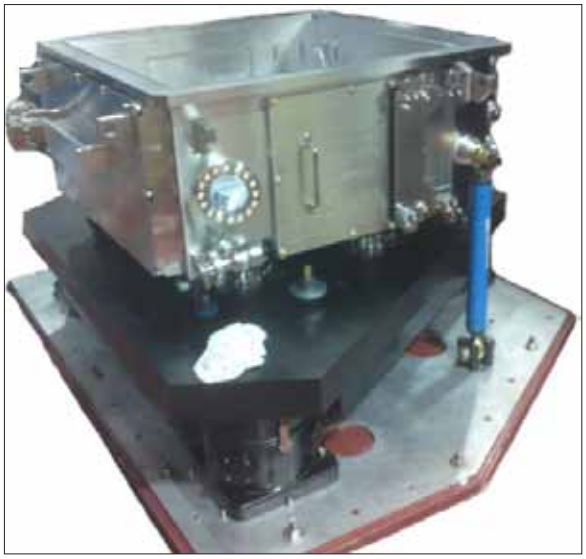
ADC has 23 years of combined experience as a welding shop and high attention to detail required ensuring that our welding shop provides the best welds and custom metal fabrication products every time.

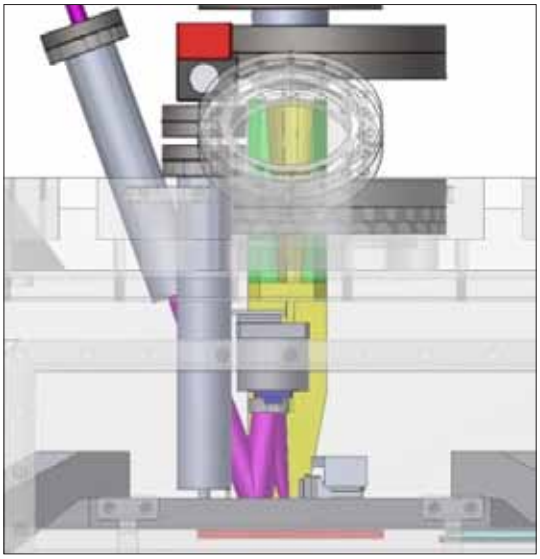
ADC welders are constantly trained and kept up-to-date on the latest welding techniques and have some of the most technologically advanced equipment available. That means customers enjoy a welding shop with knowledgeable craftsmen who give more attention to detail than other welding companies. Our goal is to complete every custom metal fabrication job in the most timely, professional, and mistake-free manner possible.

ENGINEERING DESIGN & 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, Turbomachinery, Automated Machinery, Electro-Optical Products, synchrotron, high energy physics, and neutron diffraction communities. Parametric solid models are created for all mechanical designs, using Autodesk Inventor 2014 Professional. Drawing on our extensive experience, we present practical, economical and safe designs. We stand apart by providing a multidisciplinary approach - in materials, modelling and manufacturing to the design process. We review design and fabrication requirements, scoping and detailed stress analysis, determining specification and regulatory constraints, and working to practical cost limitations.

These models are the basis for procurement, manufacturing and assembly, ensuring accurate and timely execution of the designs. Autodesk Inventor 2014 comes with a finite element package capable of many different types of simulations including stress analysis, modal analysis and thermal analysis. These simulations as well as ANSYS are used for providing numerical results that cannot be efficiently calculated by hand. With a dedication to customer satisfaction backed by over 18 years of experience in developing innovative designs, we are confident we can tackle and solve the most challenging problems; examples below.



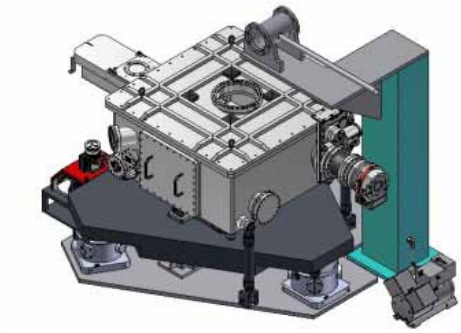


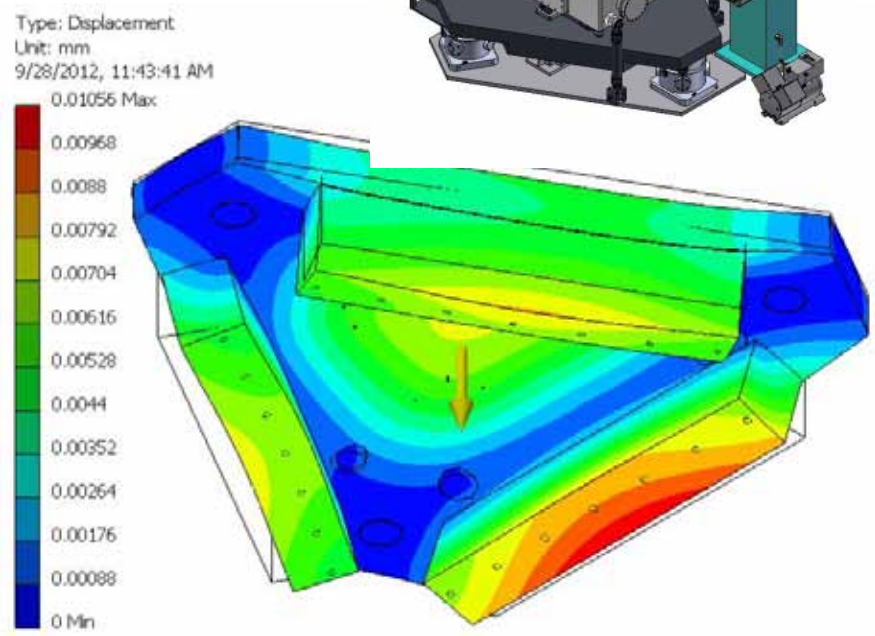
FINITE ELEMENT ANALYSIS

ADC Engineers perform structural design and analysis for the manufacturing, aerospace, Electro-Optical Products, synchrotron, high energy physics, and neutron diffraction communities. We perform finite element analysis (FEA) to accurately model products and processes to determine structural integrity, performance and reliability, as well as predict structural failures. ADC uses FEA for decreasing design cycles, keeping production costs low through design optimization, and uncovering potential sources of field failures. Analysis includes:

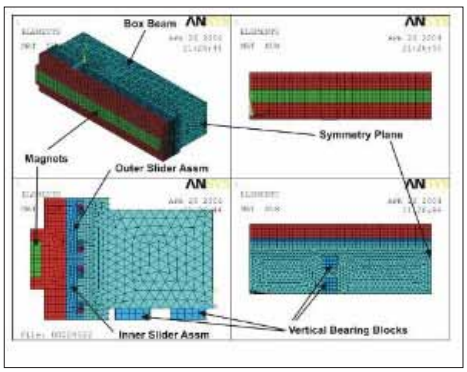
Structural Integrity

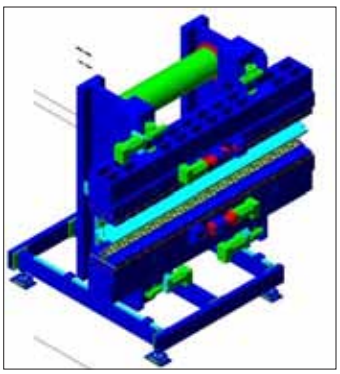
- Component Life Prediction
- Fatigue, Buckling, and Code Compliance
- Design Optimization
- Fabrication Process Evaluation
- Heat Transfer
- Thermal Cycling
- Creep Response & Ratcheting
- Shock, Vibration & Impact
- Flow-Induced Vibrations
- Fluid Flow Analyses
- Computational Fluid Mechanics
- 2D & 3D Finite Element Analysis
- Linear & Nonlinear
- Seismic & Vibration
- Thermal Analysis
- Elevated Temperature Applications

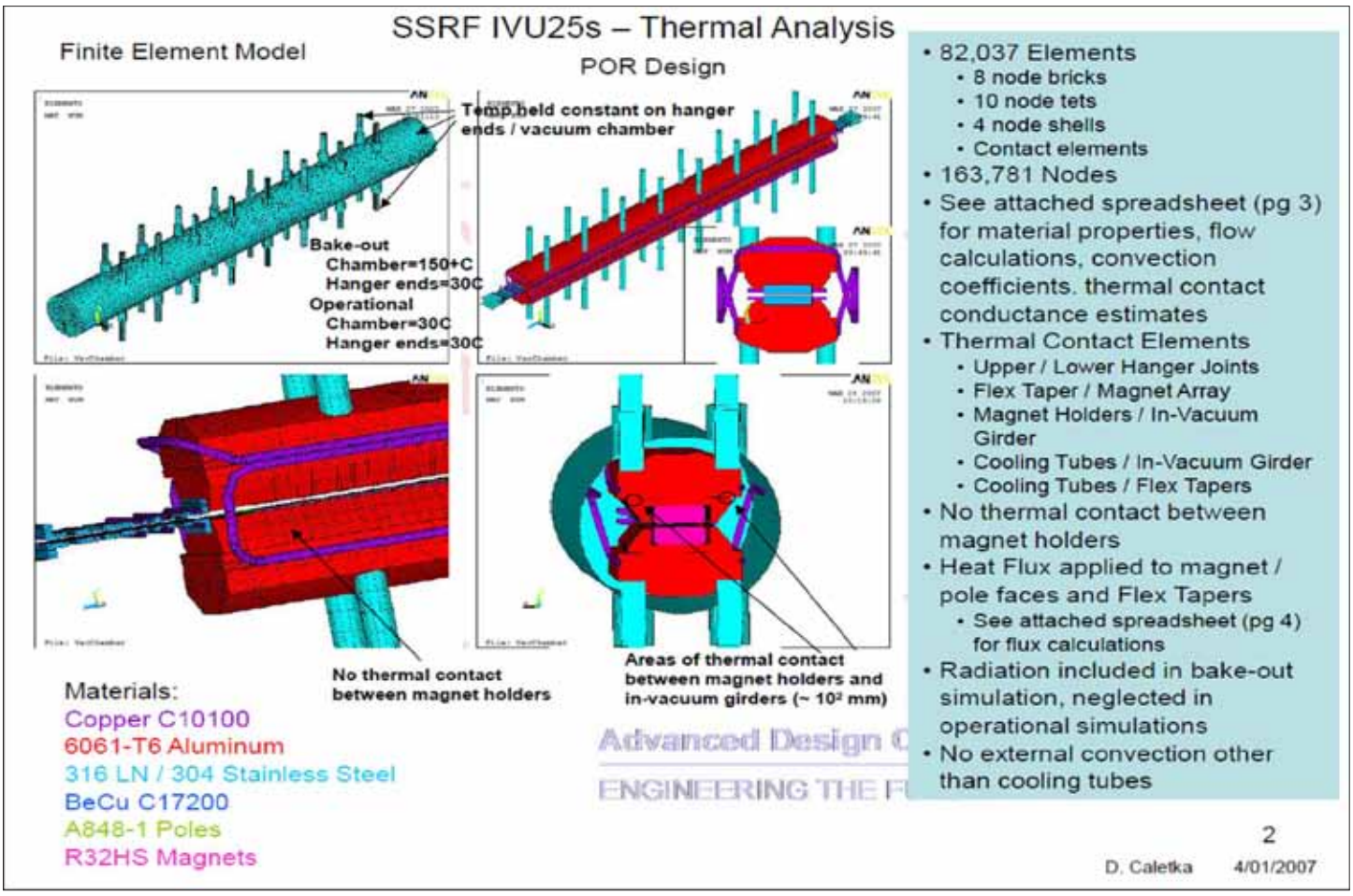




ADC uses Finite Element Analysis (FEA) to predict the deflections of complex and critical structures and to solve the most challenging product engineering problems. For example, when ADC's engineers design insertion devices, the magnet support structure behavior can be simulated in ANSYS by applying the anticipated magnetic forces, which are determined from a RADIA calculation. Solid models generated using Autodesk Inventor can be imported into ANSYS, greatly simplifying the interactive design process. Many aspects of the design, such as material selection, girder geometry, bearing size and preload, and magnet clamping are optimized using FEA. Below is a typical example of what you would expect to see from ADC, including a solid model, finished product and installed product.







Design process and project completion

Magnetic Design

The Engineering Design and Analysis group at ADC also perform magnetic designs. These are typically performed for an insertion device. ADC's scientists use B2E, SRW and RADIA (developed at the ESRF), along with Mathematica and ANSYS FEA in the design of insertion devices. An initial, parametric magnetic design is completed as part of each proposal to ensure that the customer's specifications can be met. From these specifications the magnetic materials are chosen to produce either a pure permanent magnet (PPM) or hybrid design (both SmCo and NdFeB magnets have been used in our designs).

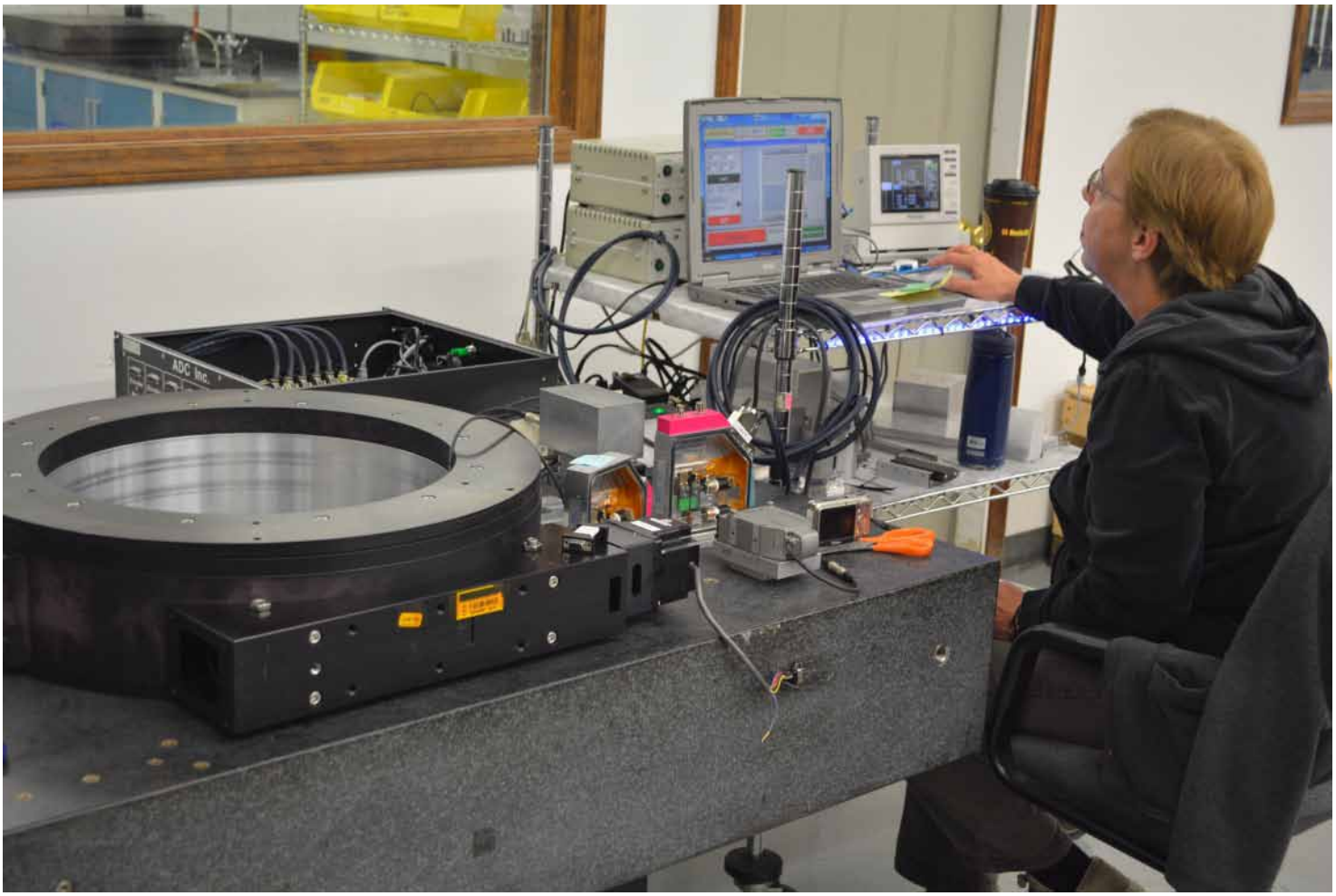
Using a model of the device, and a preliminary magnet design, the specifications are checked to ensure that the period, length, gap and flux density are sufficient to meet the desired range of photon energy.

Optics Design

ADC uses SHADOW a widely used program for the simulation of optical systems, more geared to the synchrotron radiation research. It is based on a geometrical ray-tracing approach, but also traces field amplitude with phase difference. This design tool is used by ADC in combination with ADC's High Accuracy Optical Mirror Metrology Profilometer.

ELECTRONICS AND INSTRUMENTATION

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.



We have a suite of instrumentation tools for test and measurement of temperature, position, angular displacement, tolerance, acceleration, vacuum, magnetic fields, and motor controls with extensive stock components for prototyping and breadboard. Our electrical lab includes various precision DVMs, oscilloscopes, power supplies, and other tools.

Our design tool set includes National Instruments (NI) MultiSim for schematic capture and NI UltiBoard for circuit board design, Xilinx ISE for FPGA design, ModelSim for simulation, and StateCad. Non-circuit board Schematics are drawn on various platforms with output to DXF. Microprocessor experience is broad but recent projects focus on the PIC Micro Family from MicroChip. ICE units and code simulation for the PIC microprocessors are in-house. Software skills and development platforms include Microsoft Visual C++, PERL, LabView, Visual Basic, CNC, and generic PLC (AB, NAIS, GE-Fanuc, Schneider, etc.) and Parker 6K and 9K (Accroloop).

Our standard motor controls and driver that we offer is Galil as described in this document. However, many of our customers have requirements for custom integration of these components into a functioning system, fully debugged, documented, and ready for operation.

ADC's Standard Motor Controls and Driver
The DMC-40x0 motion controller is Galil's highest performance, stand-alone motion controller, at right. It belongs to Galil's latest generation motion controller family:

the Accelera Series, which accepts encoder inputs up to 22 MHz, provides servo update rates as high as 32 kHz, and processes commands as fast as 40 microseconds-10 times the speed of prior generation controllers.

ADC has supplied many customers turn-key slits system using the Ensemble® motion controller. This is a 4 multi-axis, stand-alone controller for high-performance applications with high-speed communication through 10/100 Base T Ethernet or USB interfaces. The Ensemble™ can control brushless, brush or stepper motors or stages in any combination, and both PWM and linear drives are available. It offers easy to use, affordable multi-axis (1-10 axes) motion programming for laboratory experimentation, production testing or advanced OEM automated manufacturing systems.

ADC Standard Motor Controls and Driver

Ensemble Series of Controllers by Aerotech

The Ensemble® motion controller is a next-generation, multi-axis, stand-alone controller for moderate- to high-performance applications with high-speed communication through 10/100 Base T Ethernet or USB interfaces. The Ensemble™ can control brushless, brush or stepper motors or stages in any combination, and both PWM and linear drives are available. It offers easy to use, affordable multi-axis (1-10 axes) motion programming for laboratory experimentation, production testing or advanced OEM automated manufacturing systems.

Like all Galil controllers, programming the DMC-40x0 is simplified with two-letter, intuitive commands and a full set of software tools such as GalilTools for servo tuning and analysis.

Computer Hardware

Dell- Personal Computer

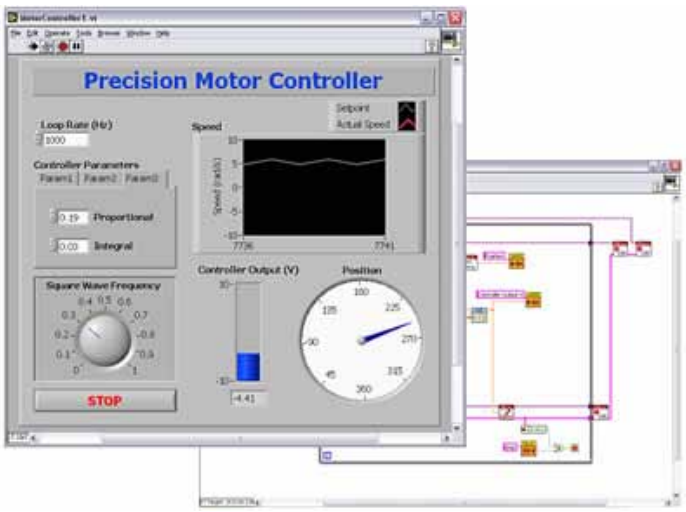
- Intel® Core™ i3-2100 processor (3MB Cache, 3.10GHz)
- 2GB Dual Channel DDR3 SDRAM at 1333MHz - 2 DIMMs
- 250GB Serial ATA Hard Drive (7200RPM) w/DataBurst Cache™
- Genuine Windows® 7 Professional SP1, 64bit
- Dell E Series E2011H 20"W Monitor, 20.0 Inch VIS, Widescreen, VGA/DVI

User / Software Interface

National Instruments- LabView

LabVIEW is a graphical programming environment used by millions of engineers and scientists to develop sophisticated measurement, test, and control systems using intuitive graphical icons and wires that resemble a flowchart. It offers unrivaled integration with thousands of hardware devices and provides hundreds of built-in libraries for advanced analysis and data visualization – all for creating virtual instrumentation. The LabVIEW platform is scalable across multiple targets and OSs, and, since its introduction in 1986, it has become an industry leader.

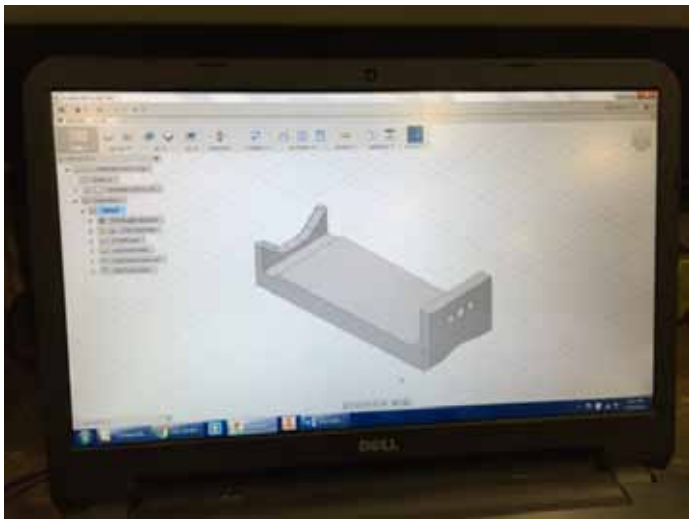
Graphical User interface for the motion control include:

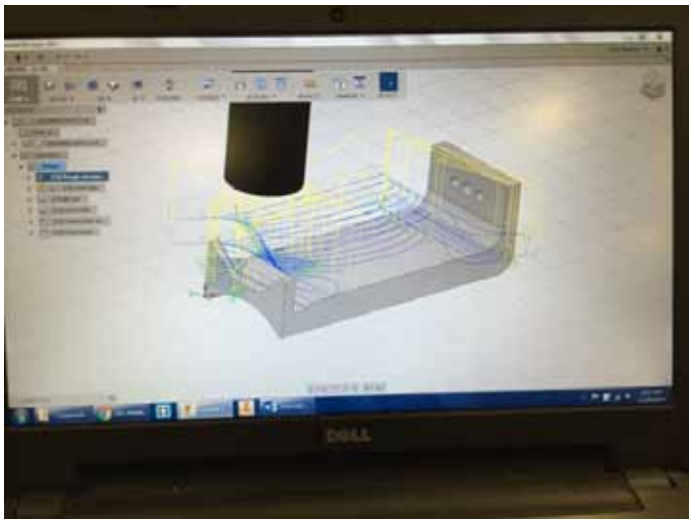


- Data Display;
- Ability to move individual axis;
- Absolute move of axis;
- Relative move of axis;
- Home individual axis;
- Encoder feedback;
- Limit switch detection, and;
- Easy install on a Windows OS platform.

CAM SOFTWARE

We have also set up a computer station with the appropriate program packages so that we can feed our CAD drawings directly into our machining centers. We have recently switched to new powerful CAM software called Fusion 360 from Autodesk. Fusion 360 is built off of the same kernel as HSMWorks and Inventor HSM giving it years of proven experience. Fusion 360 is the next generation of CAM software allowing the machinist to create a CNC program faster and more accurately than ever before. Using adaptive clearing strategies that maintain load on the tool cutting time is decreased by as much as 50% while also increasing tool life. Fusion 360 also includes extensive finishing strategies to allow machining of fine details. The part shown below was programmed and run in the CNC machine in less than 90 minutes while maintaining a small tolerance of one thousandth of an inch!!





ASSEMBLY & TESTING

Team Structure

Our team-based structure provides a distinctive advantage in the overall success of the organization. Common processes and integrated team based concepts allow for effective and efficient program management. We measure the performance of our teams through feedback channels that allow for continual improvement. This element is essential to the team's ability to meet and exceed their objectives. Through the team process, with a focus on our vision of being our customer's premier supplier, we provide the highest level of customer satisfaction possible.

Each month our Manufacturing, CFT, and Support teams hold a Workplace Meeting. This is a devoted time for each team to communicate important team-based and corporate information. Every team is empowered to hold other meetings as needed to ensure all customer specific requirements are met.
ADC's assembly and testing consists of different departments to make up the framework of our operations. This includes: Ultra-High Vacuum (UHV) Facility, Metrology Laboratory, Magnetic Measurement Facility (Undulator Testing Facility), and Electronics and Instrumentation. Each department plays an important role in the capabilities we offer to our customers. It is rare to find this myriad of capabilities in one company.

Temperature Control/Clean Room Assembly/Testing Facility

ADC has a temperature controlled class 10,000 clean room that is used for testing purposes (below). The room has a vibration-dampening vault (in the lower two photos) to isolate the testing area from building vibrations. This room is also isolated from the rest of the assembly area and can be closed off for temperature control.

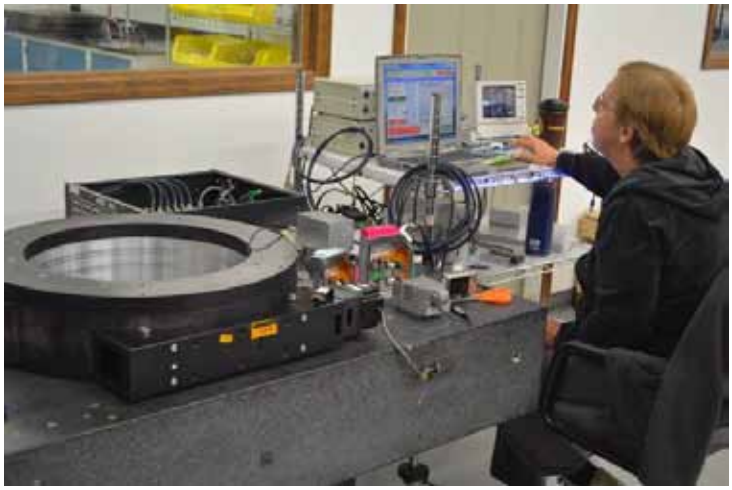
Vibration dampening vault

Dedicated Assembly Area

ADC's assembly department (below) is dedicated to providing quality assembly and technical support to our manufacturing department and customers. Assembly methods are guided by procedures developed in accordance with requirements of military standards, federal specifications, international standards, and customers' "in-house" specifications (photos below).

ADC has a large solid granite table, 8-foot (3.8 m) by 14-foot (6.6 m) polished to a flatness of one-micron accuracy over its entire length providing an excellent surface to assemble massive high precision systems as well as undulator back bones. It is isolated from external vibrations by a 0.75 meter thick concrete block that is supported on Unisorb™ anti-vibration padding.







QUALITY CONTROL

ADC has developed and implemented aquality management system in order to document the company' sbestbus inesspractices, better satisfy ther equirements and expectations of its customers and to improve the overall management of the company.

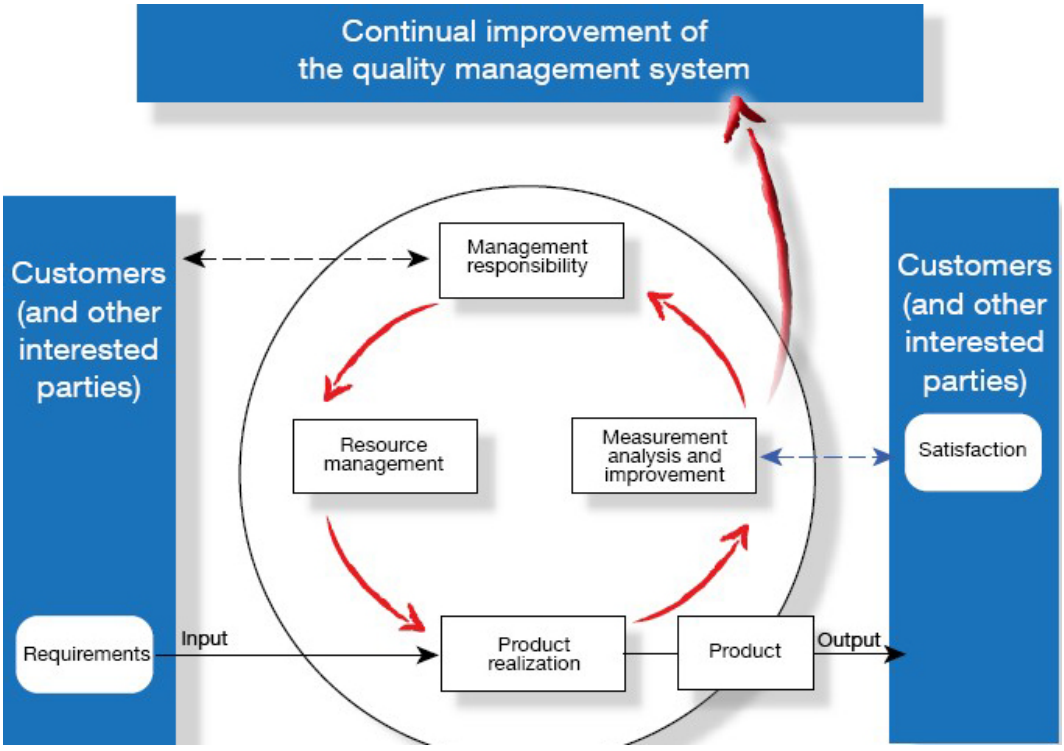
The uality management system of ADC meets ther equirements of the international standard ISO9001:2008. This system addresses the manufactur eandpr oduction of ADC's and its customers' products.

This manual describes the quality management system, delineates authorities, inter relationships and responsibilities of personnel responsible for performing within the system. The manual also provides procedures or references for all activities comprising the quality management systemt oensure compliance to the necessary requirements of the standard.

This manual is also used externally to introduce our quality management systemt our customer sand other external or ganizations or individuals. The manual is used of amiliarize the with the controls that have been implemented and to assure that the integrity of our quality management system is maintained and focused on customer satisfaction and continuous improvement.

ADC has its own quality management team which consists of three individuals. ADC President, who is responsible for finance, sales/marketing, public relations.Director of Operations, who is responsible for the day to dayoperations of ADC including the overseeing of the quality management system.Quality administrator, who is responsible for dealing with supplier issues before and after orders are placed, helps oversee the quality management systems, deals with the maintenance and ADC upkeep.

Quality Management System Process Approach
The model above illustrates that effectiveness and improvement can be represented as a cyclical process that uses components of the quality management system to analyze data and then direct changes and initiatives that ensure the system's continual improvement. This ensures aproactive approach to meet ingthequality management system objectives and customer requirements.



General Requirements

ADC has implemented a quality management system that exists as part of a larger, overall management system which has established, documented and implemented our quality policy and related processes for providing products and services which meet or exceed customer requirements, while satisfying the requirements of ISO9001:2008.

ADC has adopted the process approach advocated by ISO9000:2005, by defining and managing process inputs, controls and outputs to ensure the desired results are achieved and by managing the interfaces between interrelated processes to ensure systeme ffectiveness is maintained.

ADC monitors, measures and analyzes needed processes and takes action to achieve planned results and ensures the continue a improvement of our quality management system. Any outsourced process or activity is controlled as per applicable ISO9001 requirements.

Specific responsibilities for, and the sequence and interaction of key quality management system processes are detailed in the quality procedures, some of which contain or reference deployment flowcharts depicting the processor which is also described in the narrative of the procedure.

Management has the responsibility and authority for supporting the development and implementation of the quality management system, for ensuring that it remains relevant to the company's objectives, and the needs and expectations of customers while promoting an ethos of continual improvement. Management and their direct reports are responsible for communicating the quality policy as well as the importance of meeting customer, statutory and regulatory requirements to employees within their respective departments. They ensure the policy is understood and that it is applied to the daily work of the organization through the establishment of measureable goals and objectives.

Management is responsible for ensuring that the quality policy is appropriate for the goals of the business, that it promotes the continuing improvement of the effectiveness of the quality management system and that it is reviewed for continuing suitability.

All managers are responsible for reporting back to the organization on the performance and effectiveness of the quality management system.


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

Standards

ISO 9001:2008

Scope of certification

Design, manufacture, and delivery of devices, integrated systems, components and instruments for commercial, academic and government agencies

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

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **30 December 2017**

Original certification date: **31 December 2014**

Certificate No. US007406-1

Signed on behalf of BVCH SAS – UK Branch

UKAS

After Sale Support

Customer Satisfaction

Customer complaints, whether received in writing, verbally or electronically are immediately forwarded to the Manufacturing Manager for action.

Customer survey data along with other customer feedback, including written or verbal complaints and information collected via the customer feedback form arer eviewed by management who initiates appropriate corrective actions needed as required by Section 8.5.

Customer satisfaction is monitored in various ways:

- Product returns and warranty claims
- Repeat customers
- Analysis of customer complaints
- Levels of repeat business
- Recognition and awards
- On-time delivery

CorrectiveAction

Evidence of non-conformance, customer dissatisfaction or process weakness is used to drive our corrective action system. Since problems mayexist, they will require immediate correction and possible additional action a imedate liminating or reducing the like lihood of recurrence. Management with responsibility and authority for corrective action are notified promptly of product or process non-conformities. Investigating and eliminating the root cause of the sefailures is a critical part of our continual improvement process.

ADC take saction to eliminate the cause of non-conformities in order to prevent recurrence. Corrective actions are appropriate to the effects of the non-conformities encountered.
The documented Complaints, Corrective, and preventive Action Procedure (OP-85-02) defines the requirements for:

- Reviewing non-conformities (including customer complaints)
- Determining the causes of non-conformities
- Evaluating the need for action to ensure that non-conformities donotrecur
- Determining and implementing action needed
- Records of the results of action taken (seeSection 4.2.4)
- Reviewing corrective action taken

Follow-up audits are conducted in accordance with the internal audit process; Section 8.2.2, to ensure that effective corrective action is taken and that the action is appropriate to the impact and nature of the problem encountered. Inaddition, management summarizes and analyzes corrective action data to identify trends in order to assess the overall effectiveness of the corrective action system and to develop related recommendations for improvement.

The corrective actions are considered effective if the specific problem was corrected and data indicates that the same or similar problems have not recurred. Results of data analysis and subsequent recommendations are presented to management for review.

Preventative Action

ADC determines any necessary action to eliminate the causes of potential non-conformities in order to prevent their occurrence. Preventive actions are appropriate to the nature of a potential problem.
Data from internal audits, customer feedback, employee suggestions, and other appropriate data is collected and analyzed to identify the actions needed to eliminate the causes of potential. Investigating and eliminating the root cause of potential failuresisa critical part of our continual improvement process.

REFERENCES

The following is a list of the world class facilities that work with ADC creating cutting edge instrumentation. To see more information, follow the link to our reference page on our website.
http://www.adc9001.com/REFERENCES

National Aeronautics and Space Administration (NASA)	The Air Force Research Laboratory (AFRL)	ITER(International Thermonuclear Experimental Reactor)	The Advanced Light Source (ALS)
ANKA (abbreviation for„ Angströmquelle Karlsruhe“)	The Australian Nuclear Science and Technology Organisation (ANSTO)	The Australian Synchrotron (AS)	Diamond Light Source (DLS)
MAX IV Laboratory	CCLRC (Council for the Central Laboratory of the Research Councils)	Cornell High Energy Synchrotron Source (CHESS)	The Canadian Light Source (CLS)
Deutsches Elektronen-Synchrotron (DESY)	Department of Justice (DOJ)	Department of Transportation (DOT)	Brookhaven National Laboratory (BNL)
The European Synchrotron Radiation Facility (ESRF)	Free Electron Laser for Infrared eXperiments (FELIX)	High Flux Isotope Reactor (HFIR)	Hiroshima Synchrotron Radiation Center (HiSOR)
Raja Ramanna Centre for Advanced Technology, Indore (INDUS, RRCAT)	Science & Technology Facilities Council (ISIS)	ALBA (meaning "Sunrise" in Catalan and in Spanish)	IUC
Korea Atomic Energy Research Institute (KAERI)	Photon Factory (PF) at KEK	Los Alamos National Laboratory (LANL)	Laboratory for Atmospheric and Space Physics (LASP)

Michigan State University (MSU)

United States Navy (USN)

National Institute of Standards and Technology (NIST)

National Nuclear Security Administration (NNSA)

National Synchrotron Radiation Research Center (NSRRC)

Oak Ridge National Laboratory (ORNL)

Pohang Accelerator Laboratory (PAL)

Paul Scherrer Institute (PSI)

SLAC National Accelerator Laboratory

Spallation Neutron Source (SNS)

Special Operations Command (USSOCOM)

SOLARIS National Synchrotron Radiation Centre

Shanghai Synchrotron Radiation Facility (SSRF)

Mayo Clinic

Cornell University Department of Astronomy

Bar-Ilan University

The Advanced Photon Source (APS)

CAMD (LSU Lousiana State University)

Canadian Institute for Neutron Scattering (CINS)

Elettra Sincrotrone Trieste

Institute of High Energy Physics, Chinese Academy of Sciences (IHEP)

Thomas Jefferson National Accelerator Facility (Jefferson Lab)

Brazilian Synchrotron Light Laboratory (LNLS)

National Oceanic and Atmospheric Administration (NOAA)

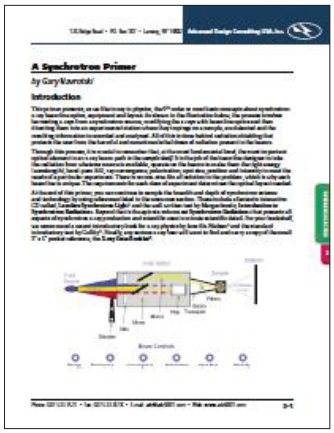
Shanghai Institute of Applied Physics (SINAP)

SPring-8
(Super Photon ring-8 GeV)

National Science Foundation

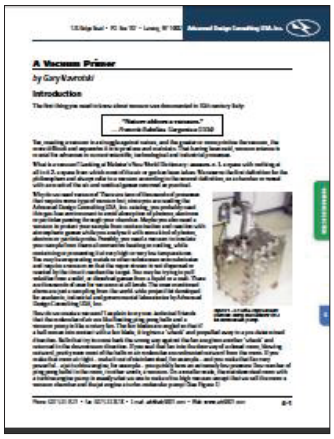
PRIMERS

The following are primers offered by ADC, Inc. To view or download a copy of our primers, visit our website at: http://www.adc9001.com/ABOUT-US/Primers.



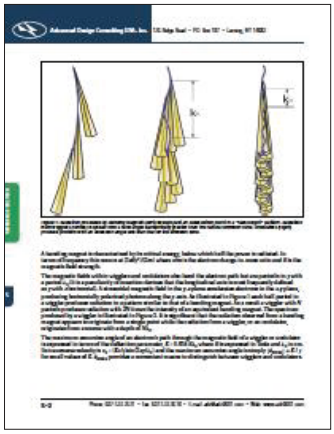
A Synchrotron Primer

"This primer presents, as we like to say in physics, the 0-th order or most basic concepts about synchrotron x-ray beamline optics, equipment and layout...."



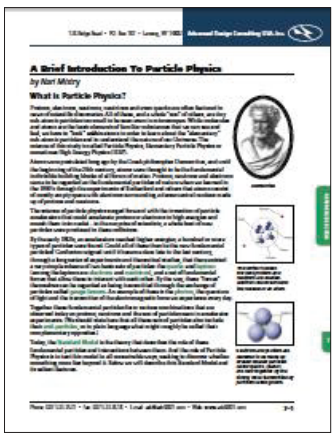
A Vacuum Primer

"The first thing you need to know about vacuum was documented in 16th century Italy..."



Insertion Devices Primer

"Applications such as protein crystallography have recently driven much greater interest in the use of synchrotron radiation as a research tool...."



A Brief Introduction to Particle Physics

Design

Fabrication

Assembly

Installation

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