Neutron Instrumentation 2016

Custom Neutron
and High Energy Physics
Instrumentation/Manufacturing

CERTIFIED ISO 9001:2008 COMPANY

ITAR Registered International Traffic in Arms Regulations

ADC

ISO 9001:2008 Certified
www.adc9001.com

Table of Contents

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

Custom Neutron and High Energy Physics Instrumentation Manufacturing

ADC (ISO9001:2008 certified) has been a leading supplier of high quality instrumentation to the neutron source and high energy physics 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 USANS monochromator to VSANS vessels, ADC has provided many exotic instruments to the world. Some examples are: the VSANS vessel that weighed 30 tons and was moved on external rails with a repeatability of 100 um; the pellet selector for US-ITER that delivers frozen gas pellets to the plasma; the NASA Experimental Test Range that measures flight characteristics and radar signature; and the deuterium cryostat port plugs for the NIST reactor upgrade.

Please see http://www.adc9001.com/products/show_list/id/115 for more details.

Our engineering design, and build staff are well acquainted with the special requirements of the neutron source and high energy physics industry 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 neutron and high energy physics 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

NEUTRON INSTRUMENTATION

PROJECTS

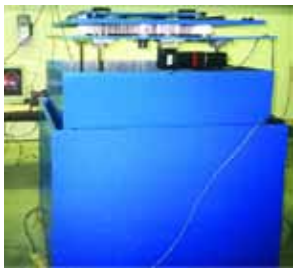
http://www.adc9001.com/products/show_list/id/115

ADC offers a large assortment of custom designed Neutron precision equipment. Some of the equipment includes: Slits, Neutron Monochromator, Optical Tables, Spectrometers, Goniometers and many other high precision motion systems for Neutron & High Energy Physics Facilities, worldwide.

Deuterium Cryostat Plugs For Neutron Application

VSANS Instrument for NIST (Very Small Angle Neutron Scattering)

International Thermonuclear Experimental Reactor (ITER)



SMARTS Spectrometer for LANL Neutron Facility

Small-Angle Neutron Scattering (SANS) Instrument

ANSTO Motion Control Stages - Kookaburra

Selector Wheel Shutter Unit

ANSTO 4-Axis Translation & Rotation Stages - DINGO

Compact Precision Translator for LANL Neutron Facility

Goniometer for Canadian Neutron Beam Centre

HFIR Image Neutron Focusing System

Seven Axis High Load Precision Motion System

Neutron Slits

Tuning Stub Outer and Inner Conductors

Cryostat Dilution Refrigerator

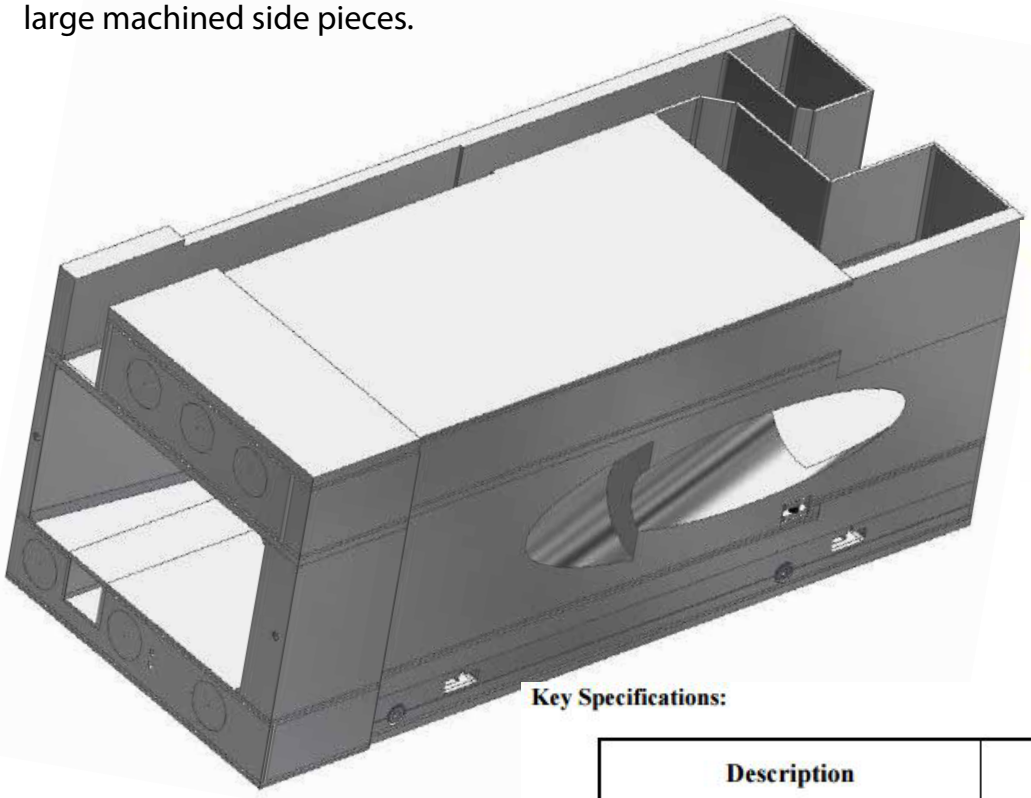
High Pressure Cryo-Cooler for X-Ray Crystallography (HPC-201)

DEUTERIUM CRYOSTAT PLUGS

For Neutron Application

http://www.adc9001.com/products/view/656

A structure was designed for NIST to hold a cryostat assembly. The structure, known as a cryostat plug, will serve as a support for the cryostat support as well as a radiation shield. The plug was built to house the new liquid deuterium cold neutron source that replaced the existing liquid hydrogen source and its plug assembly. The cryostat plug holds the deuterium cryostat inside the cold port of the NBSR reactor. The cryostat plug is a large stainless steel welded structure that is made up of two separate weldments, a top and bottom weldment, and two side pieces to connect them. All pieces are made out of 304 Stainless Steel. The top and bottom weldments consist of individual stainless steel pieces that are cut to size and welded together. After welding, the top and bottom weldments are connected with the two large machined side pieces.

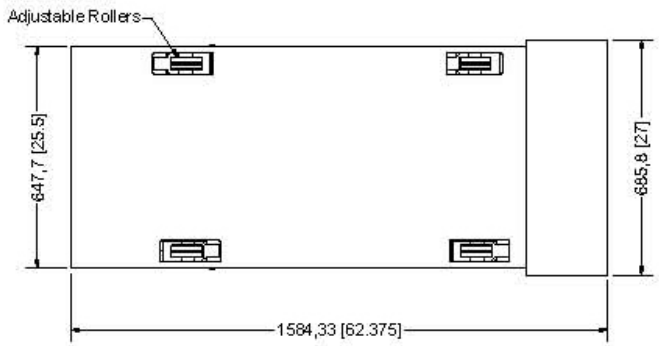


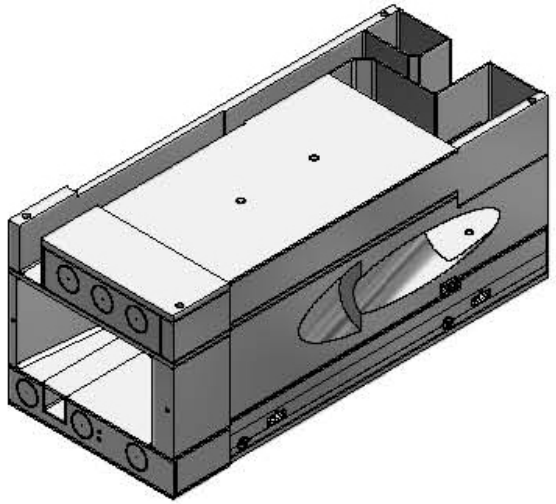
NIST
National Institute of Standards and Technology

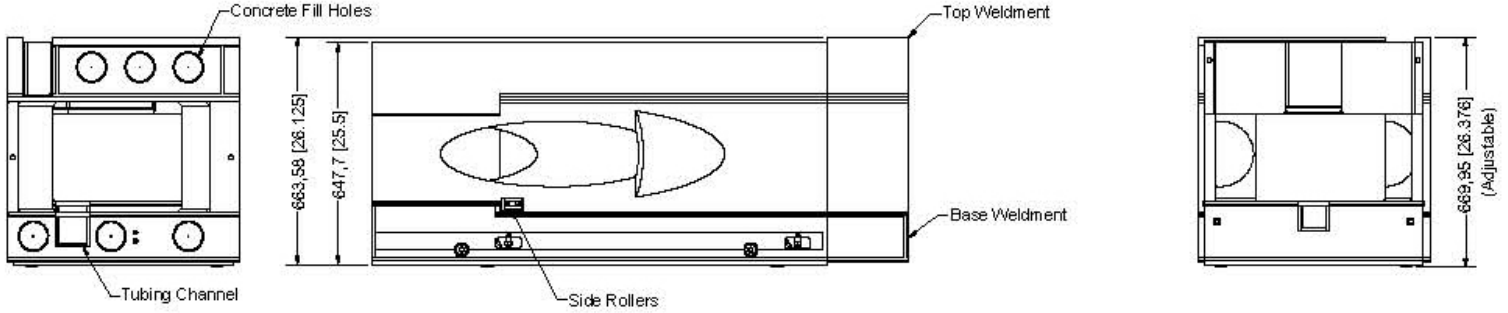
Key Specifications:

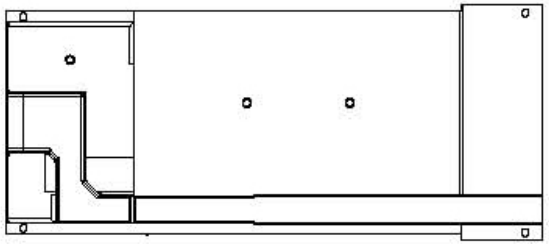
Description	Value	Units
Height	663.5 [26.13]	mm [“]
Width	685.8 [27.00]	mm [“]
Length	1584.3 [62.38]	mm [“]
Weight (Empty)	~1300 [2866]	Kg [lbs]
Weight (w/ Concrete)	~1750[3858]	Kg [lbs]

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2014-08-04	J Stranger









Notes:

1) Fill with empty spaces MS1-a concrete mixture for radiation shielding.

2) Weld in vented cover plates. Cover plates must be vented to allow gases to escape.

First Angle Projection All dimensions are in mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994		Date
	Drawn by	J Stranger	2014-08-04
	Design by	J Stranger	2014-07-24
Material:	Protective Finish: None		
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 3551 Fax: 607 533 3813 E-mail: adc@adc2001.com Web: www.adc2001.com		
Cryostat Plug Assembly			
Part Number: 00024124_2DOverview	Revision: 0	Size: A2	Sheet: 1 / 1

Purchased Part Modification	No

SMARTS TRANSLATOR

for LANL Neutron Facility

http://www.adc9001.com/smarts-translator-for-lanl-neutron-facility

The SMARTS is a third-generation neutron diffractometer optimized for the study of engineering materials. It was funded by DOE, designed and installed by ADC at the Lujan Center, and went online in the summer of 2001.

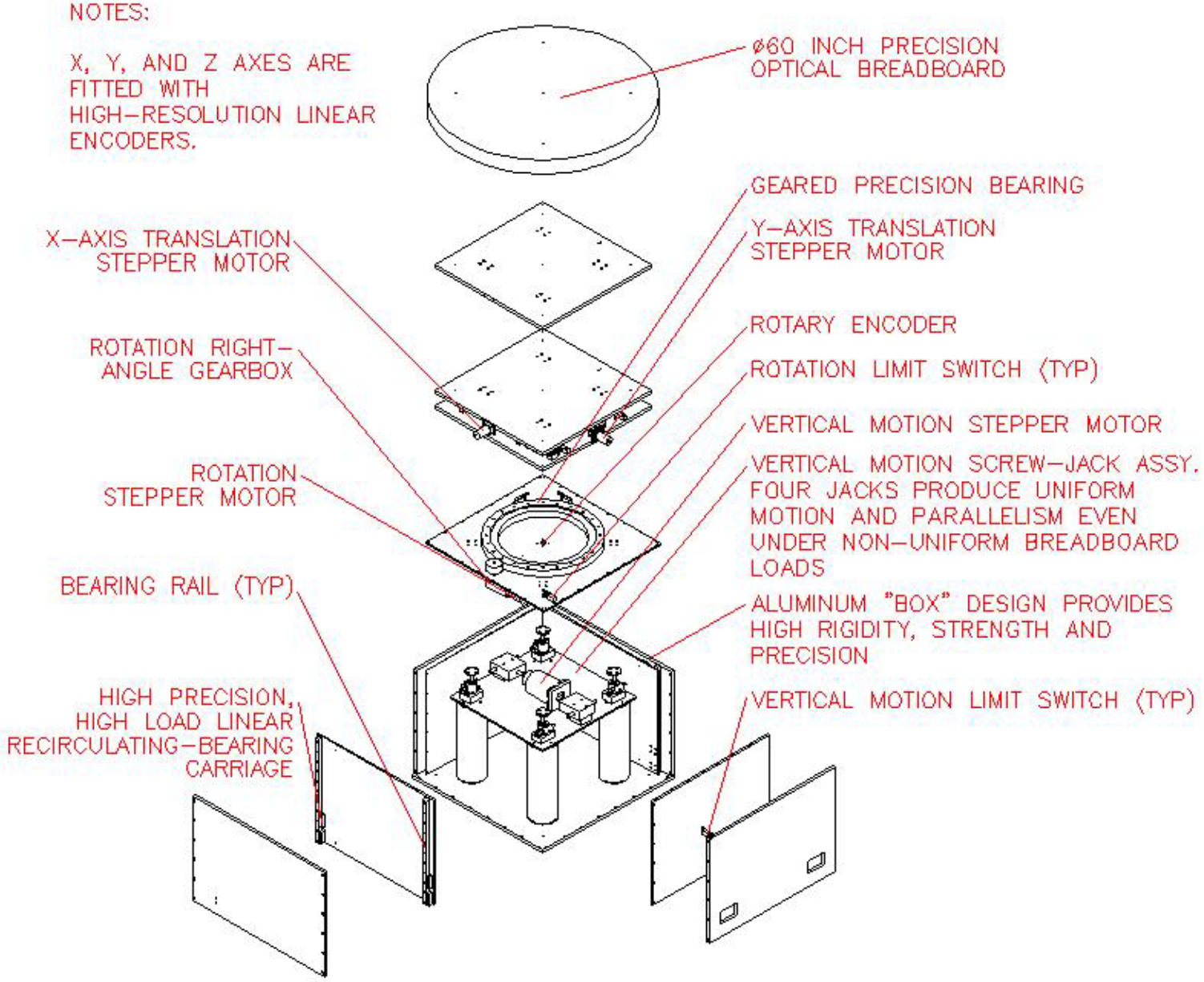
SMARTS provides a range of capabilities for studying polycrystalline materials focusing on two areas; the measurement of deformation under stress and extreme temperature and the measurement of spatially resolved strain fields.

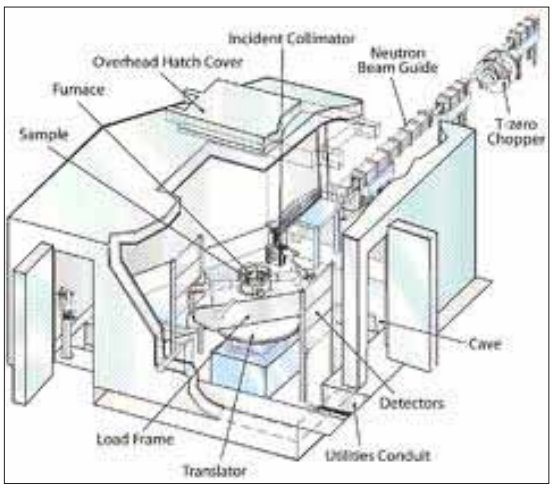
With an extensive array of in situ capabilities for sample environments, it enables measurements on small (1 mm3) or large (1 m3) samples. Components with dimensions up to 1 m and up to 1,500 kg can be positioned precisely in the beam. Permanently mounted alignment theodolites provide a simple and efficient way to position samples or equipment to within 0.01 mm.

Los Alamos
NATIONAL LABORATORY
EST. 1943

NOTES:

X, Y, AND Z AXES ARE FITTED WITH HIGH-RESOLUTION LINEAR ENCODERS.



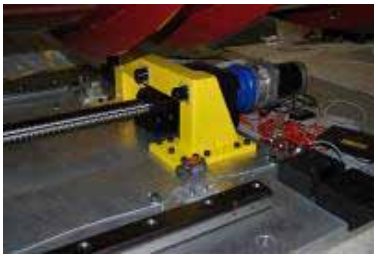


SMALL-ANGLE NEUTRON SCATTERING

(SANS) Instrument

http://www.adc9001.com/products/view/461

The Time-of-Flight Small Angle Neutron Scattering (ToF SANS) instrument is being built at reactor source, at ANSTO, Australia. SANS is complex machine. One of key parts of it is large detector vessel. ADC has taken the overall concept for the vessel developed by ANSTO designers, and provided final engineering design and then built the detector vessel as imaged below. In addition the entire vessel can be accurately moved 1.5 meters using external rails and a ball screw. The front end consists of a sample window and 630 mm gate valve. The rear of the vessel has a hatch with an articulated hinge. There is a central man-way hatch on the top and 17 ports for vacuum pumps, electrical, feed through, and sensors. The vessel was designed in compliance with ASME BPVC, Section VIII, Division 1, 2011 Revision, with exceptions for good vacuum practice and approved by the Australian Work Cover Authority.





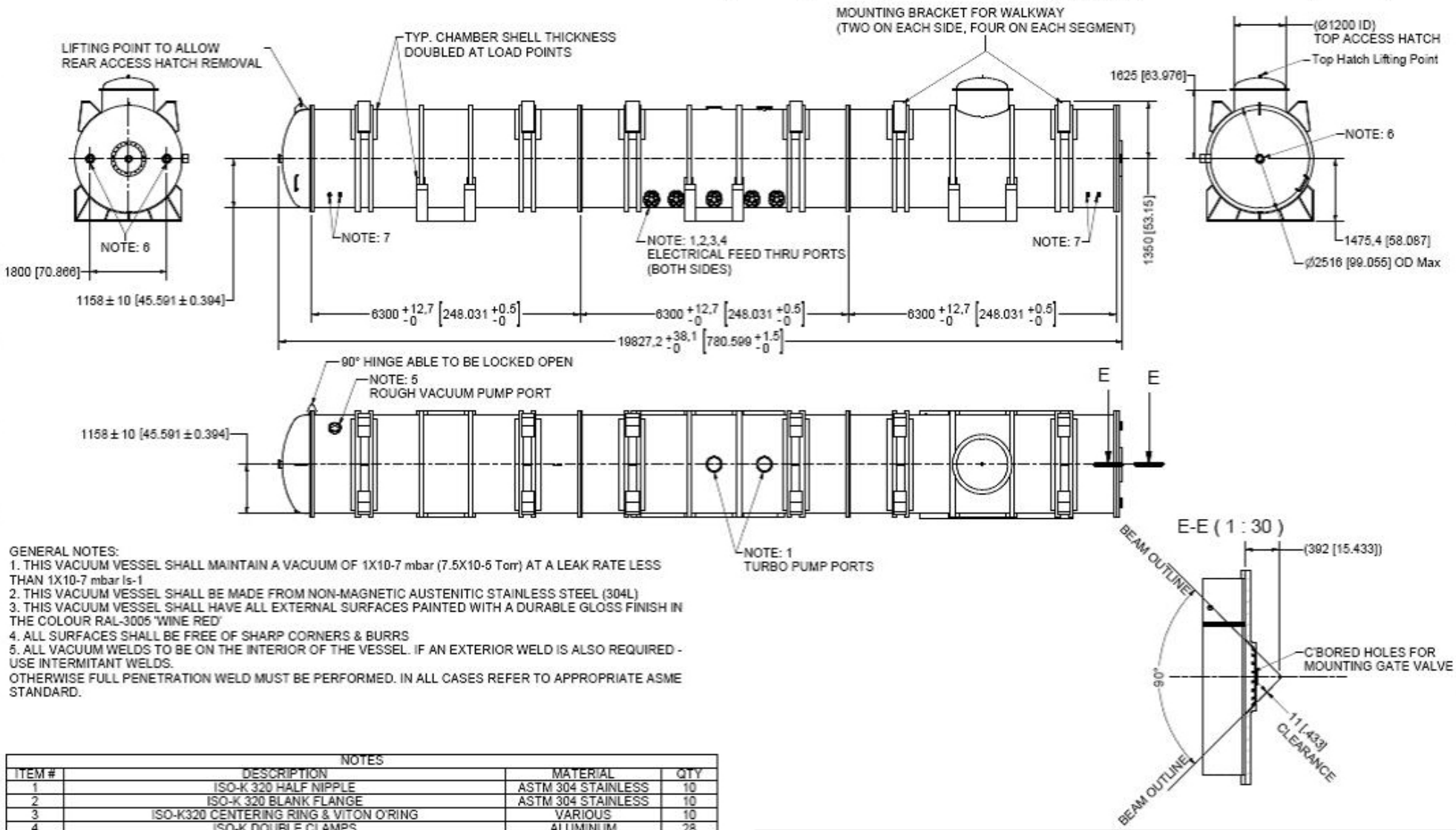






Preliminary Sketch

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Bilby Detector Vessel Engineering Specifications	8/03/2011	N Roscup
B7	1	Added Top Access Hatch	8/19/2011	N Roscup
B4	2	Changed # of Electrical Feed Thru Ports(12 to 10); Added Walkway Support Brackets	9/8/2011	N Roscup



GENERAL NOTES:
1. THIS VACUUM VESSEL SHALL MAINTAIN A VACUUM OF 1X10-7 mbar (7.5X10-5 Torr) AT A LEAK RATE LESS THAN 1X10-7 mbar ls-1
2. THIS VACUUM VESSEL SHALL BE MADE FROM NON-MAGNETIC AUSTENITIC STAINLESS STEEL (304L)
3. THIS VACUUM VESSEL SHALL HAVE ALL EXTERNAL SURFACES PAINTED WITH A DURABLE GLOSS FINISH IN THE COLOUR RAL-3005 'WINE RED'
4. ALL SURFACES SHALL BE FREE OF SHARP CORNERS & BURRS
5. ALL VACUUM WELDS TO BE ON THE INTERIOR OF THE VESSEL. IF AN EXTERIOR WELD IS ALSO REQUIRED - USE INTERMITANT WELDS.
OTHERWISE FULL PENETRATION WELD MUST BE PERFORMED. IN ALL CASES REFER TO APPROPRIATE ASME STANDARD.

NOTES			
ITEM #	DESCRIPTION	MATERIAL	QTY
1	ISO-K 320 HALF NIPPLE	ASTM 304 STAINLESS	10
2	ISO-K 320 BLANK FLANGE	ASTM 304 STAINLESS	10
3	ISO-K320 CENTERING RING & VITON O'RING	VARIOUS	10
4	ISO-K DOUBLE CLAMPS	ALUMINUM	28
5	ISO-K 250 HALF NIPPLE	ASTM 304 STAINLESS	1
6	8" CF HALF NIPPLE(TAPPED), COPPER GASKET & 8" CF ZERO PROFILE VIEWPORT	AS REQUIRED	3
7	ISO-KF 50 HALF NIPPLE, CENTERING RINGS & BLANK FLANGES	ASTM 304, AL & VITON	4

Purchased Part Modification

First Angle Projection
All dimensions are mm [in]
Inch dimensions are reference
Material: Protective Finish:

Drawing Standard: ANSI Y14.5M-1994
Drawn by: mroscup 8/11/2011
Eng approval: N 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

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3534 / Fax: 607.533.3686
E-mail: adc@adc9001.com / Web: www.adc9001.com

Part Number | Revision | Size A2 | Sheet 1 / 2

VSANS INSTRUMENT

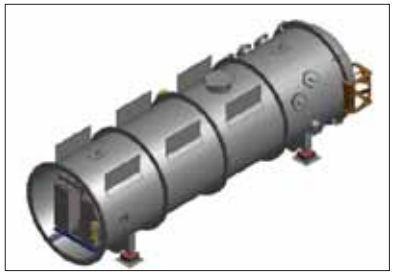
for NIST Very Small Angle Neutron Scattering

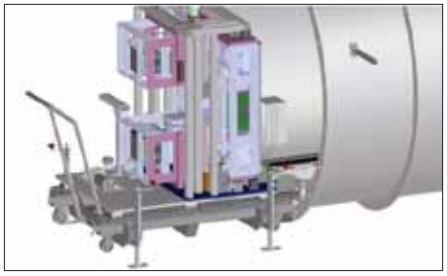
http://www.adc9001.com/products/view/657

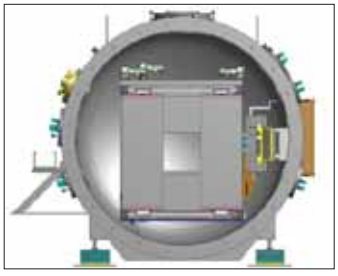
ADC is designing and building a large instrument for National Institute of Standards And Technology (NIST). This instrument is similar to a more complex instrument we designed and delivered to Ansto in Australia called the Bilby SANS instrument. The NIST VSANS and the AnstoBilby SANS instruments have very similar dimensions for length and diameter and have similar requirements for internal detector motion, top access port, walkway supports, and ports; however, the Bilby SANS instrument was more complex because the vacuum requirement was lower (7.5x10-5 Torr) and the entire (60,000 pound) vessel was required to move 1.5 meters on external rails with a repeatability of 100 um, which ADC achieved

NIST VSANS and AnstoBilby Spec Comparison

Specification	NIST VSANS	AnstoBilby
Length	24,000 mm +/- 50 mm	20,020 mm -5, +36 mm
Internal Diameter	2300 mm	2300 mm
Vacuum	1 x 10-3 Torr	7.5 x 10 -5 Torr
Vessel Straightness	+/- 12 mm	+/- 10 mm
Leak Rate	.01 Torr/hr	1 x 10-7 mbar-l/sec
Carriage Load	800 Kg	2000 Kg
Carriage Travel	17,400 mm Max (Mid)	18,800 mm
Carriage Deviation	+/- 2 mm	+/- 1 mm
Vessel Adjustment Vertical	+/- 25 mm	+/- 10 mm
Vessel Adjustment Lateral	+/- 25 mm	+/- 20 mm
Vessel Adjustment Axial	+/- 25 mm	1.5 meters (motorized)
Rail Adjustment Vertical	None	+/- 20 mm
Rail Adjustment Lateral	None	+/- 20 mm
Codes	ASME BPV Section VII	AS 1210
Material	Steel 517	Stainless Steel 304
Sections	3	3
Rear Hinge	Yes	Yes
O-Rings	Buna- N	Buna- N
Walkway Support	2000 lbs/tab	250 kg/m2
Manway Hatch	# TBD 66" Diameter	x1, 46 " diameter





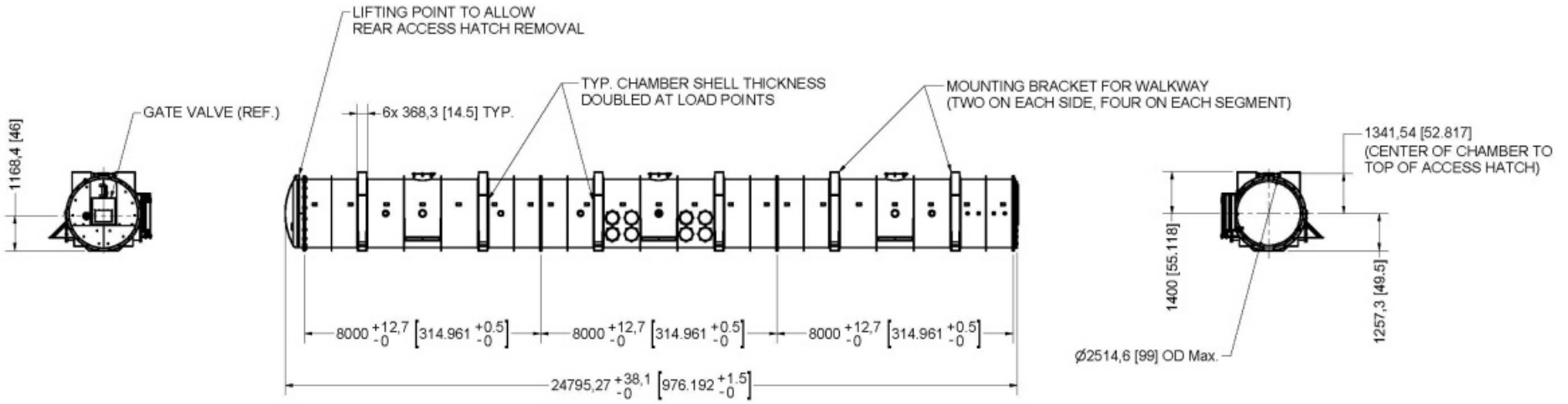


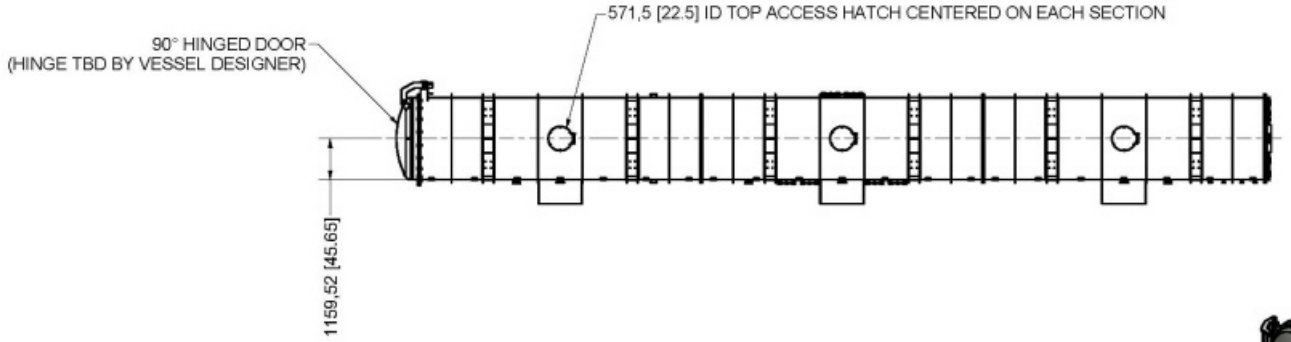
GENERAL NOTES:

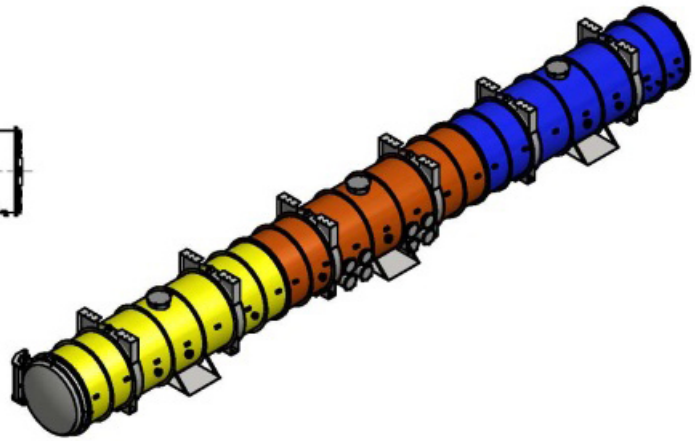
1.) THIS VACUUM VESSEL SHALL MAINTAIN A VACUUM OF 1 x 10-5 Torr AT A LEAK RATE LESS THAN .01 Torr/hr.
2.) THIS VACUUM VESSEL SHALL BE MADE FROM STEEL ASTM A517.
3.) THIS VACUUM VESSEL SHALL HAVE ALL EXTERNAL AND INTERNAL SURFACES PAINTED WITH RUSTOLEUM 3400 (3492402) OR APPROVED EQUIVALENT.
4.) NO PAINT IS ALLOWED IN O-RING GROOVES OR BOLT HOLES WHERE CHAMBERS MATE.
5.) ALL SURFACES SHALL BE FREE OF SHARP CORNERS AND BURRS.
6.) ALL VACUUM WELDS TO BE ON THE INTERIOR OF THE VESSEL. IF AN EXTERIOR WELD IS ALSO REQUIRED USE INTERMITTANT WELDS. OTHERWISE FULL PENETRATION WELD MUST BE PERFORMED. IN ALL CASES REFER TO THE APPROPRIATE ASME STANDARD.

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	A	Initial Release	10/27/2014	S Hartman







VACUUM APPLICATION

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

Approval by: S Hartman | Date: 10/15/2014
Purchased Part Modification | No

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

Material	Protective Finish
SEE NOTES	SEE NOTES

Drawing Standard: ANSI Y14.5M-1994		Date
Drawn by	S Hartman	10/27/2014
Eng approval	E VanEvery	10/27/2014
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

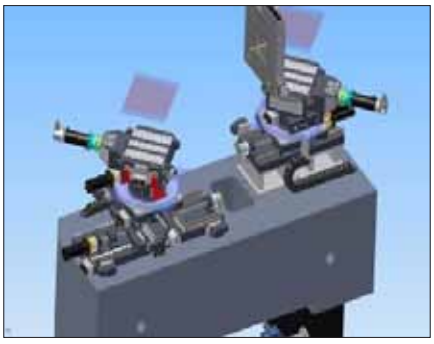
VSANS Detector Vacuum Vessel

Part Number	Revision	Size	Sheet
Vessel_Prelim	A	A2	1 / 8

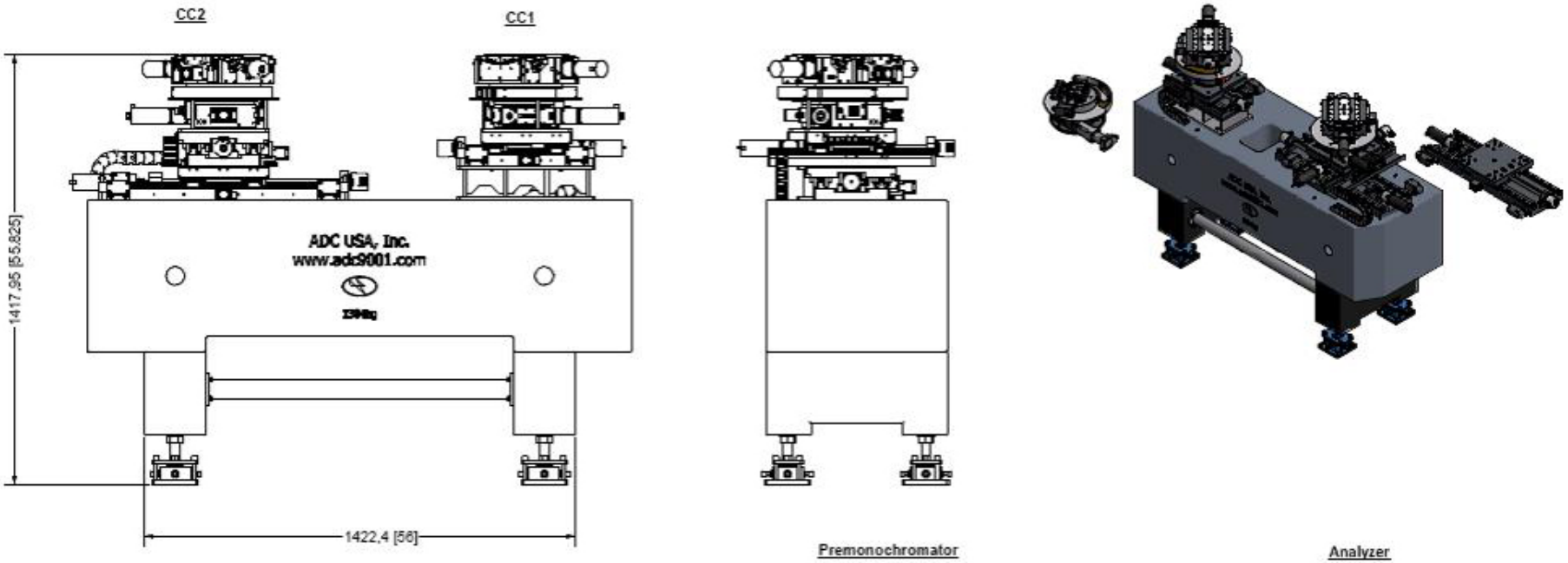
MONOCHROMATOR INSTRUMENT

Ultra-Small –angle neutron scattering

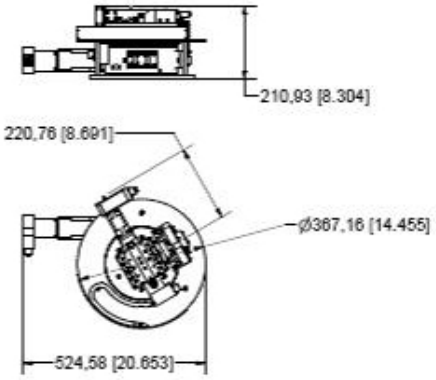
USANS has all the normal advantages of neutron; contrast different to that of x-rays, ability to vary contrast using deuteration, sensitivity to magnetism, and penetration into macroscopic samples. Thus, USANS is useful for studies of pores and cracks in rocks, cement or engineering materials, very large biological or polymer molecules or macromolecular assemblies, and mesoscopic magnetic particles. The range of interest includes bacteria, blood, cements, clays, clusters in metals, coals, colloids, complex fluids, emulsions, foams, food, gels, granular materials, hydrogels, membranes, micellar systems, minerals and mineral processing, nanocomposites, nanotechnology, phase transitions, polymer blends, polymers, porous materials, powders, precipitates, proteins, rocks, thin metallic or organic films, and viruses.



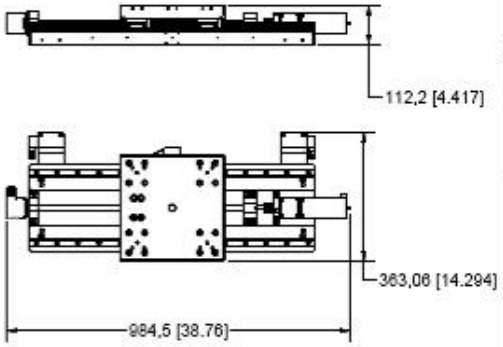
Monochromator



Premonochromator



Analyzer



Notes:

Premonochromator:
Weight: 36.7 kg [80.9 lb]
Travel:
Rotation = 360°
Tilt = 20°

Monochromator:
Weight: 1607.4 kg [3543.7 lb]
Travel:
-CC1
x = 150 mm [5.9 in]
Rotation = 360°
Tilt = 16°
-CC2
x = 500 mm [19.7 in]
y = 250 mm [9.8 in]
Rotation = 360°
Tilt = 16°

Analyzer:
Weight: 45.2 kg [99.6 lb]
Travel
x = 500 mm

First Angle Projection All dimensions are mm [in] Inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date	Advanced Design Consulting USA, Inc. 129 Ridge Road / PO Box 197 Lansing, NY 14882 Phone: 607.533.3031 / Fax: 607.533.3616 E-mail: adc@adc9001.com / Web: www.adc9001.com
Material:	Drawn by: RRDSCUD	5/23/2011	
Protective Finish:	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		Part Number: 00018001 / Revision: / Size: A2 / Sheet: 3 / 3

Purchased Part Modification: No

AXIS TRANSLATION / ROTATION TABLE

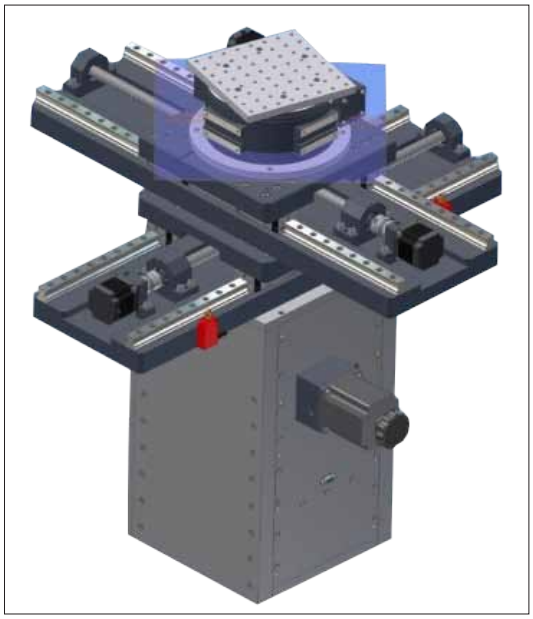
for Radiography Instrument

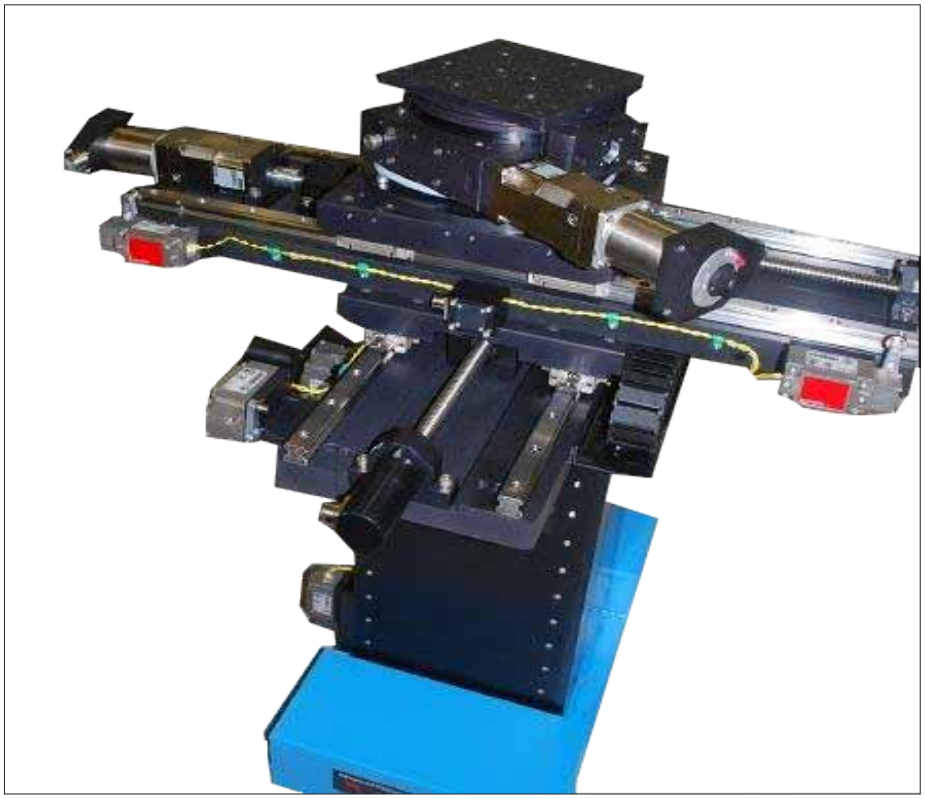
http://www.adc9001.com/ANSTO-4-Axis-Translation--Rotation-Stages-DINGO

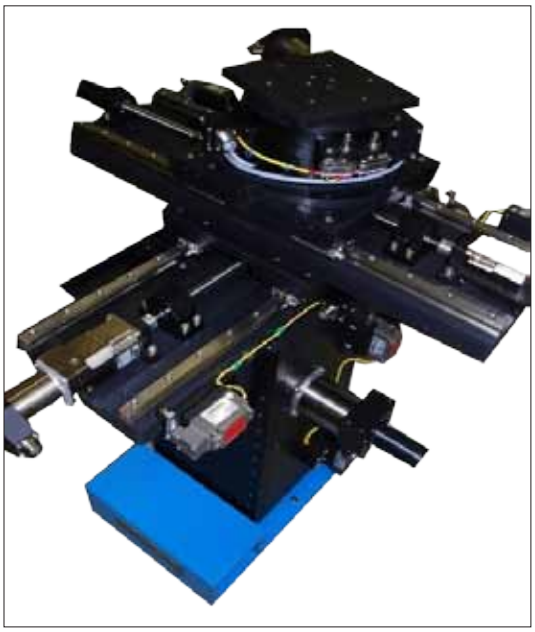
This new state-of-the-art instrument was built and delivered to support Dingo - Radiography/Tomography/Imaging Station. The sample stage consists of a xyz translation table and a rotation stage. The xyz translation table was needed for sample positioning in front of the detector. For this procedure a range of >500mm in xydirection and 400mm in z-direction was essential.

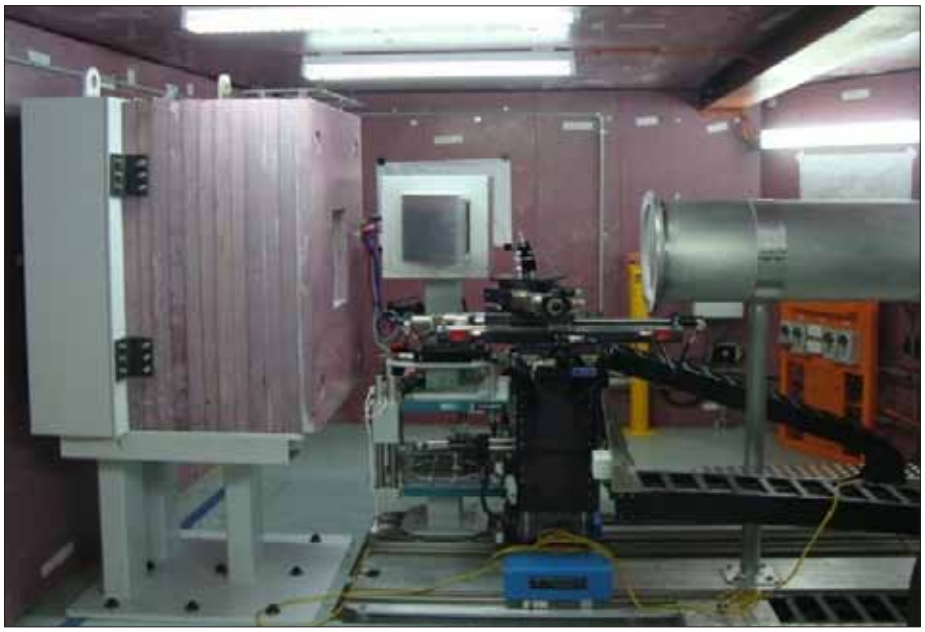
In addition a high precision rotation stage with a resolution of 0.001° was needed for neutron tomography. The rotation stage has a loading capacity up to 200kg. Due to high absorption and long counting times, very large samples are not feasible for tomography.

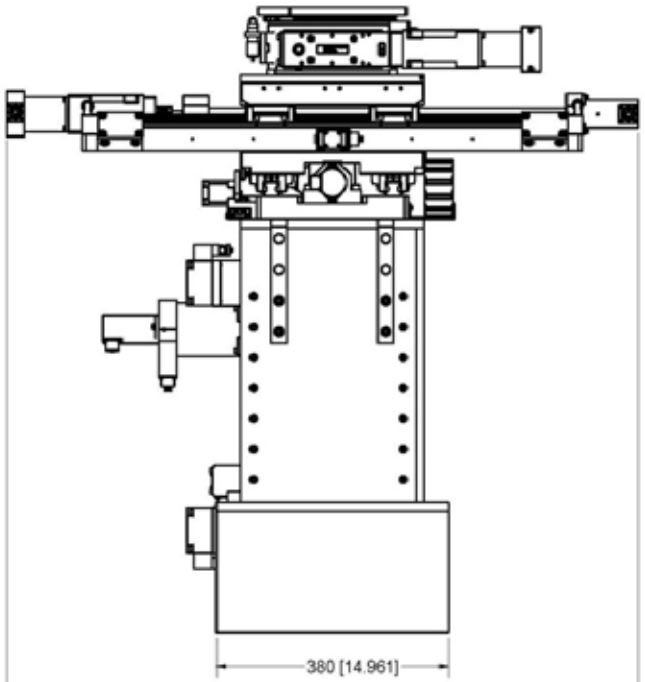
Ansto
Nuclear-based science benefiting all Australians

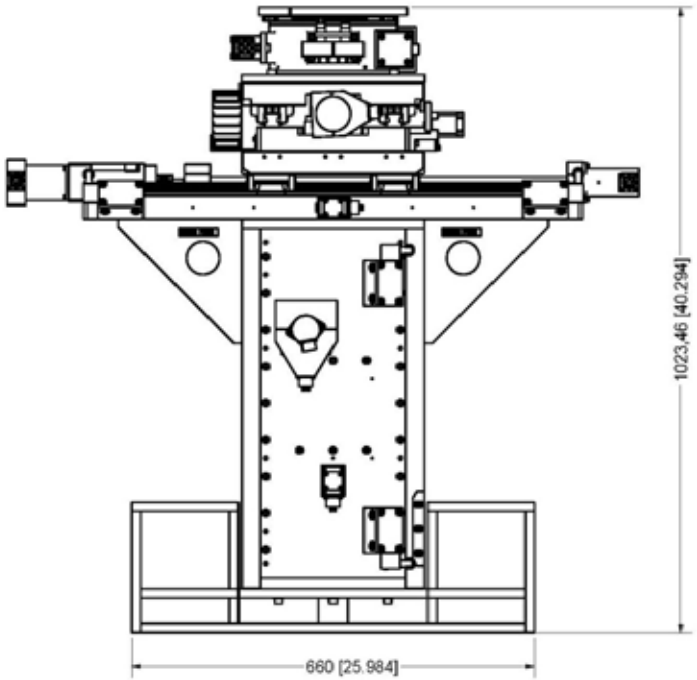


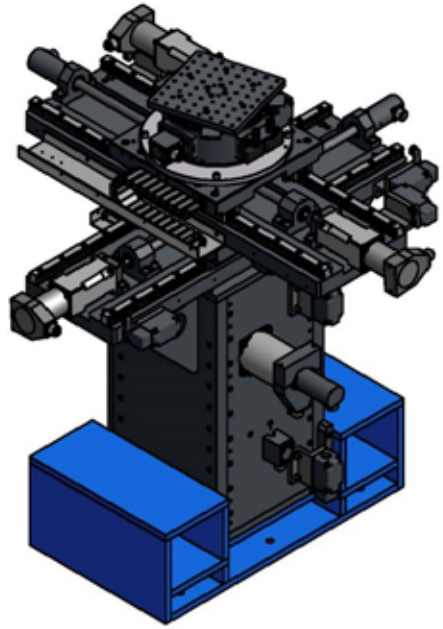












Notes:
Apprx Weight: 291.706 kg [641.5 lb]
Travel:
X: 500 [19.68]
Y: 500 [19.68]
Z: 400 [15.75]
θ: 360°
Load: 500kg [1102 lb]

Purchased Part Modification

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

Material | Protective Finish

Drawing Standard: ANSI Y14.5M-1994 | Date
Drawn by: mroscup | 6/23/2011
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

Advanced Design Consulting USA, Inc.
136 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3610
E-mail: adc@adc9001.com / Web: www.adc9001.com

Part Number: 00018201 | Revision | Size: A2 | Sheet: 4 / 4

SELECTOR WHEEL SYSTEM

for SANS Instrument

http://www.adc9001.com/products/view/481

This system is for the Bragg Institute, a division of ANSTO, to provide a selector wheel shutter unit for their Radiography Instrument.

This new state-of-the-art instrument is to support the area of neutron imaging research (neutron radiography/tomography). It provides university, government and industry-based users of the new ANSTO research reactor OPAL a new world-class powerful tool for nondestructive real space testing and evaluation, with properties complementary to x-rays and synchrotron methods. The instrument covers a large area of scientific research from medical applications, biology and environmental science, geology and engineering science as well industrial application, which are key areas for future technology and industrial developments in Australia.

The selector wheel shutter unit combines two different functions in one item. The first function is to work as an instrument shutter and the second one is to work as a selector wheel.

The selector wheel assembly component as suggested in its name provides selective aperture options for high resolution or phase contrast imaging and separate the two beams coming from the in-pile collimator. One beam is blocked and the other passes the selector wheel insert is used for an imaging experiment. A positioning accuracy of 0.01° step width is achieved.

The selector wheel was designed with a stepped housing to mate with the inserts and prevent direct shine from the beam.

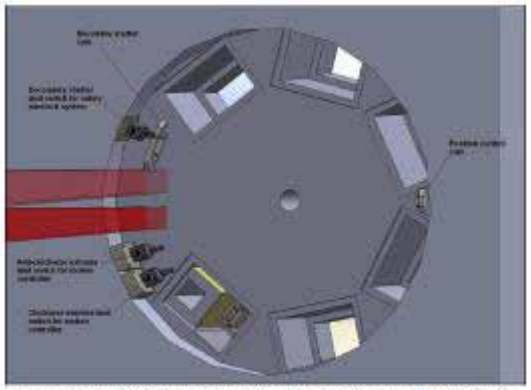
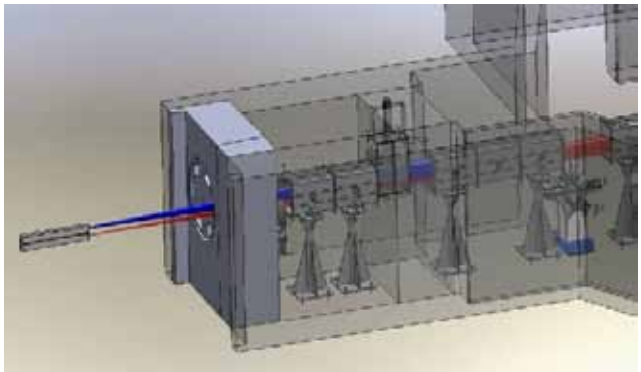
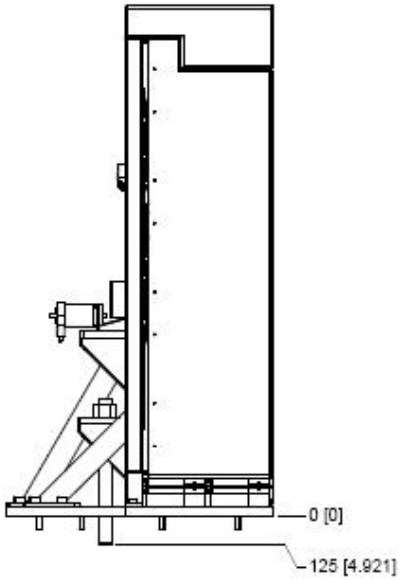
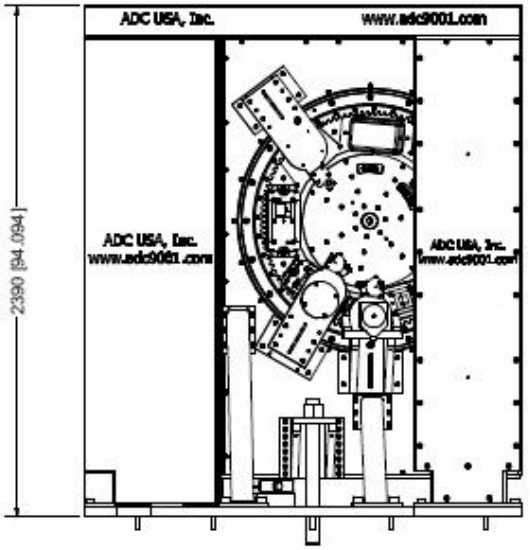


Figure 21: Schematic of the three limit switches and the actuating cam employed for the secondary shutter and motion control



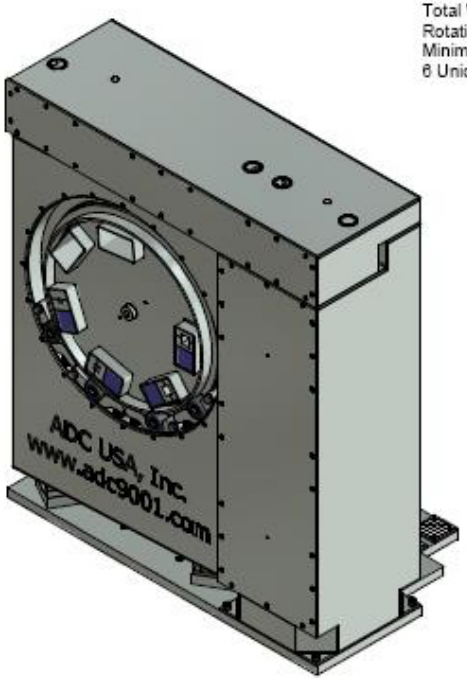

ADC
SHARP

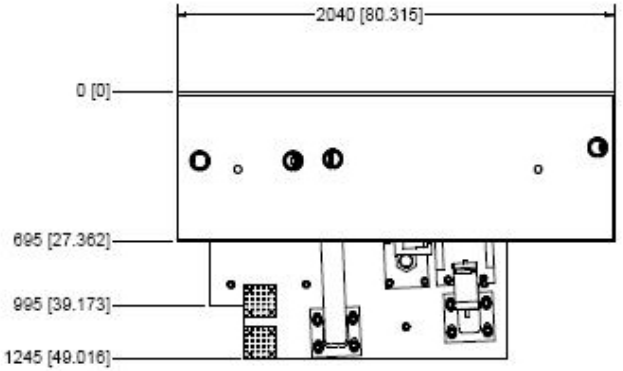




SPECS:

Total Weight: 144214.5 kg [31,800 lbs]
Rotational Speed:1.4 RPM
Minimum Shielding Thickness: 400 mm
6 Unique inserts with unique tapers allow the beam to be collimated





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	M Popov	4/21/2012
Eng approval	M Popov	4/21/2012
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 3.13 / 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: 607.533.3010
E-mail: adc@adc9001.com / Web: www.adc9001.com

ANSTO Selector Wheel Top Level Assembly

Part Number	Revision	Size	Sheet
00020556	0	A2	

SEVEN AXIS HIGH LOAD PRECISION SYSTEM

Neutron Instrumentation

http://www.adc9001.com/products/view/508

This is a high load and high precision system that can be used in wide areas of Neutron and Synchrotron experimental stations.

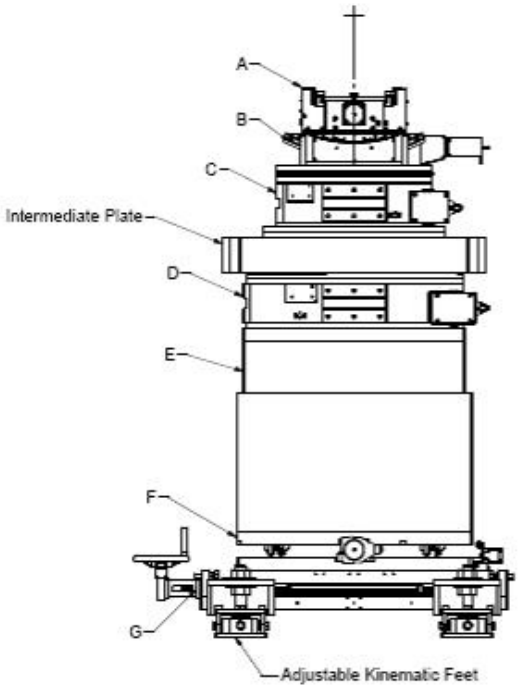
1 The common rotation point from the goniometers is located 270 mm above the surface of the top plate.

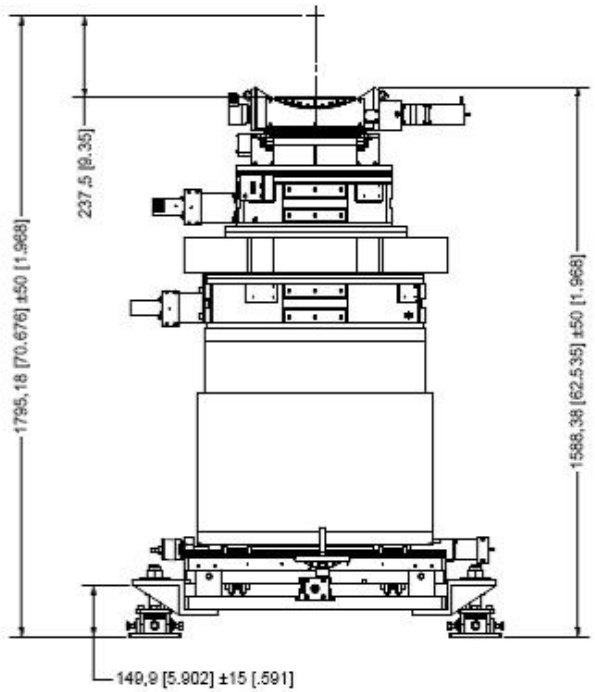
2 The maximum load is 600 kg.

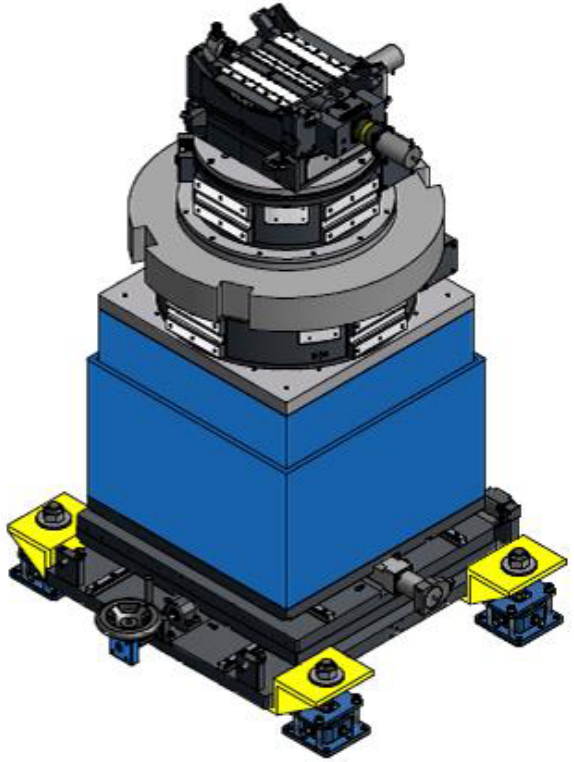
3 One manual translation stage of 300 mm support the whole assembly. The translation has adjustable move stoppers with dampers. It allows the whole assembly with 1000 kg to be maneuvered by only one person with an accuracy of 1 mm. The translation is mechanically fixed to the floor with 4 adjustable feet, each allowing a 30 mm vertical course.

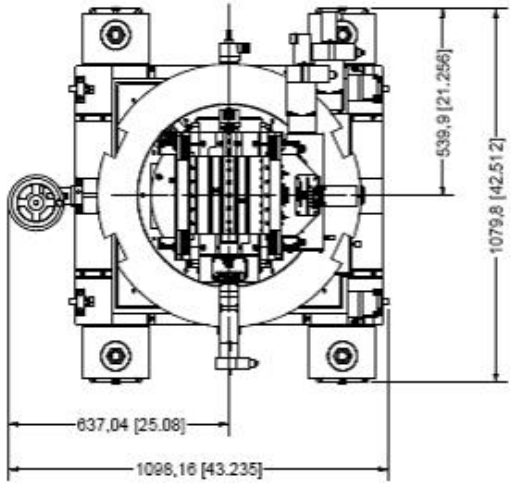
Motion Description	ADC Product	Range	Load	Accuracy	Speed
Rotation About Z-Axis	TSW-300-18-E Tilt Stage Assembly	+/-18°	1 kg	0.003°	20°/min
		≤ +/-2°	600 kg		
		≤ +/-5°	150 kg		
Rotation About X-Axis	TS400 Tilt Stage Assembly	+/-8°	1 kg	0.003°	20°/min
		≤ +/-2°	600 kg		
		≤ +/-5°	150 kg		
Rotation About Y-Axis	RS400 Rotation Stage Assembly	360°	600 kg	0.003°	60°/min
Rotation About Y-Axis	RS500 Rotation Stage Assembly	360°	600 kg	0.003°	20°/min
Vertical Elevator	Custom Jack	300 mm	700 kg	0.005 mm	50 mm/min
Translation X-Axis	X-Axis Linear Slide	100 mm	1000 kg	0.005 mm	100 mm/min
Translation Z-Axis	Z-Axis Linear Slide (Manual)	300 mm	1000 kg	1 mm	n/a

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	A	Release for Review	4/9/2013	E Acome









	Description	Range	Load	Speed
A	Z-Axis Tilt Stage	+/- 18 deg	1 kg	20 deg/min
		+/- 2 deg	600 kg	20 deg/min
		+/- 5 deg	150 kg	20 deg/min
B	X-Axis Tilt Stage	+/- 8 deg	1 kg	20 deg/min
		+/- 2 deg	600 kg	20 deg/min
		+/- 5 deg	150 kg	20 deg/min
C	Y-Axis Rotation	360 deg	600 kg	60 deg/min
D	Y-Axis Rotation	360 deg	700 kg	20 deg/min
E	Y-Axis Lift	+/- 150 mm	700 kg	50 mm/min
F	X-Axis Slide	+/- 50mm	1000 kg	100 mm/min
G	Y-Axis Slide	+/- 150 mm	1000 kg	n/a

Notes:

- Overall Dimensions Shown with All Axes at Mid-Travel
- All Components are Non-Magnetic and Radiation Hard
- Approximate Weight: 715 kg [1576 lb]

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	E Acome	4/9/2013
Eng approval	M Poppy	4/9/2013
Mfg approval		
Assy approved		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces
2.13 / 0.38
0.25 A B C
0.25 A B C

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E-mail: adc@adc9001.com / Web: www.adc9001.com

CEA Motion System

Part Number	Revision	Size	Sheet
	A	A2	1 / 1

HIGH PRESSURE CRYO-COOLER

for Crystallography (HPC-201)

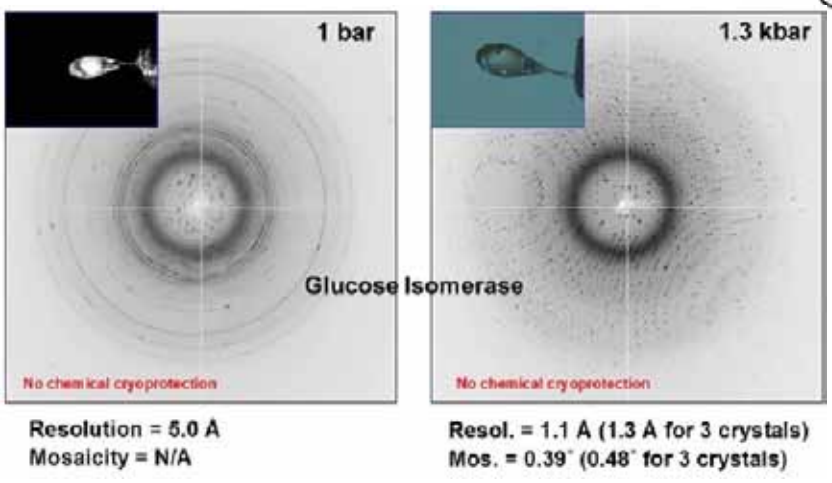
http://www.adc9001.com/products/view/659

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. ChaeUn 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.

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

Connection Data	
Voltage frequency	50/60Hz
Power input approx.	115/230 VAC
Oil pump pressure	200 MPa
Ln2 Dewar Holding	200 Days



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)

Cornell University
Department of Astronomy

For more information please visit:

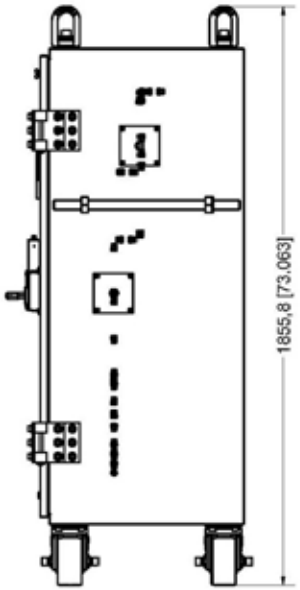
http://www.adc9001.com/products/view/455

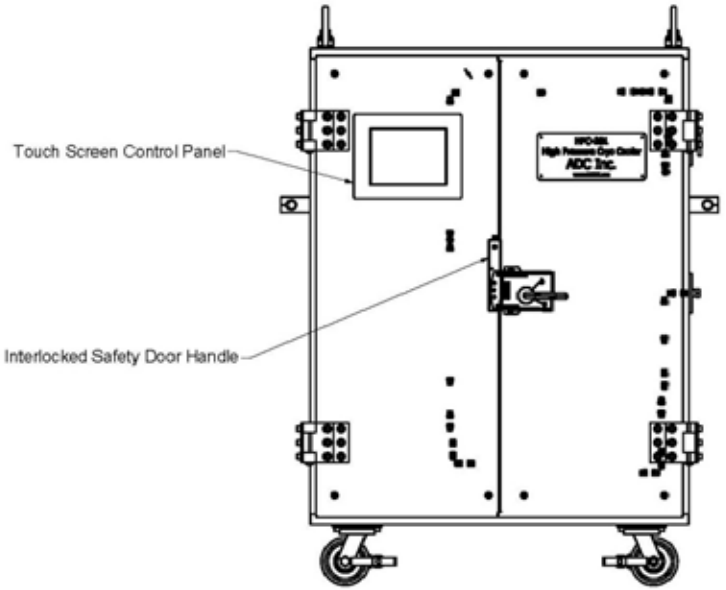
Specifications:

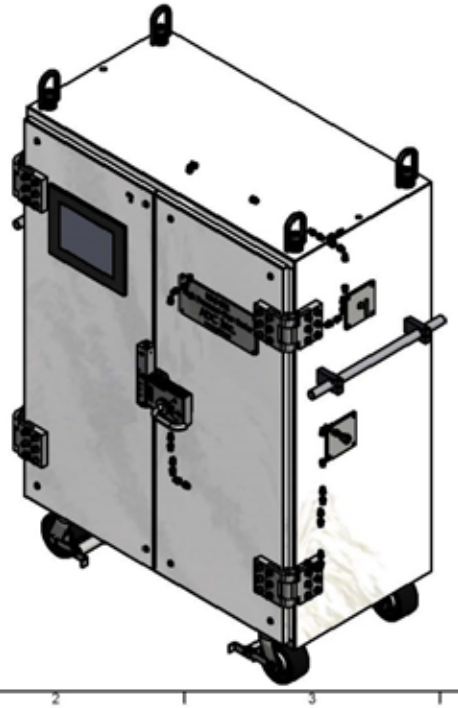
$\frac{1}{4}$" or $\frac{9}{16}$" High Pressure Tubing can be used during this process
-Maximum 3 samples can be cooled per cycle
-Touch screen display for operating the system
-LED indicators provide visual feedback of what state the system is in during operaion
-Compressor requires He gas supplied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

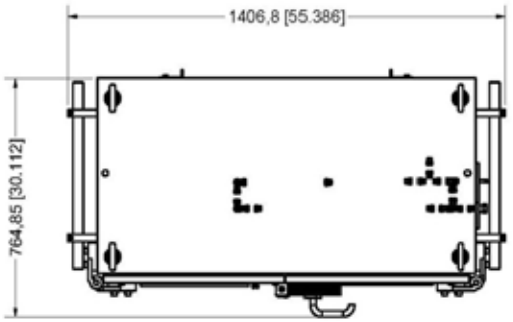
REVISION HISTORY

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.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3616
E-mail: adc@adc9001.com / Web: www.adc9001.com

High Pressure Cryo Cooler Assembly

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

NEUTRON SLITS

Please Refer to ADC's Slits Catalog for Further Detail

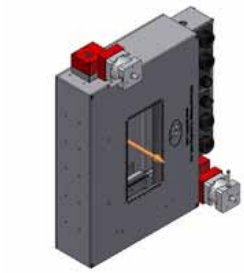
Ultra High Precision Slits for Neutron

http://www.adc9001.com/products/show_list/id/111

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 . Please do not hesitate to contact ADC for further details.

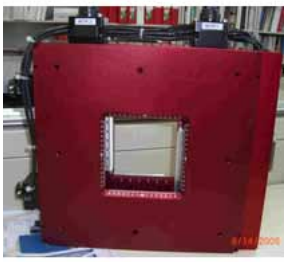
All standard models use cross-roller bearing technology for exceptional straightness of travel. All of these slits use standard micro stepped stepper motors that could be controlled with a wide array of controllers/drivers available on the market. Our slits are being used in many of neutron facilities around the world (ANSTO, SNS, CCLRC, LANL …)
We now do 100% inspection on all our slits blades being sold. For a copy of the report please contact ADC.

NSLT-100 Series



NIST "curtain style" XY Vacuum Slit

ANSTO Kookaburra Instrument Slits



CCLRC Reflectometer Slits

ANSTO PELICAN INSTRUMENT Slits

LANL SMART Instrument Slits

SNS Custom SLT-100-30

ANSTO SANS Instrument Vacuum Slits

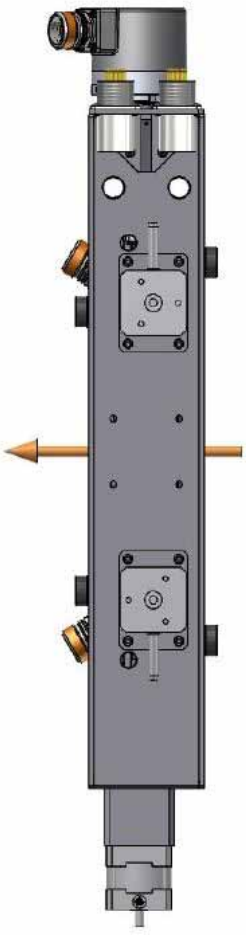
STANDARD NEUTRON SLITS

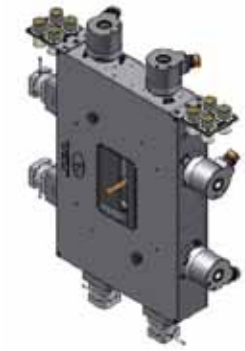
NSLT 100 Series

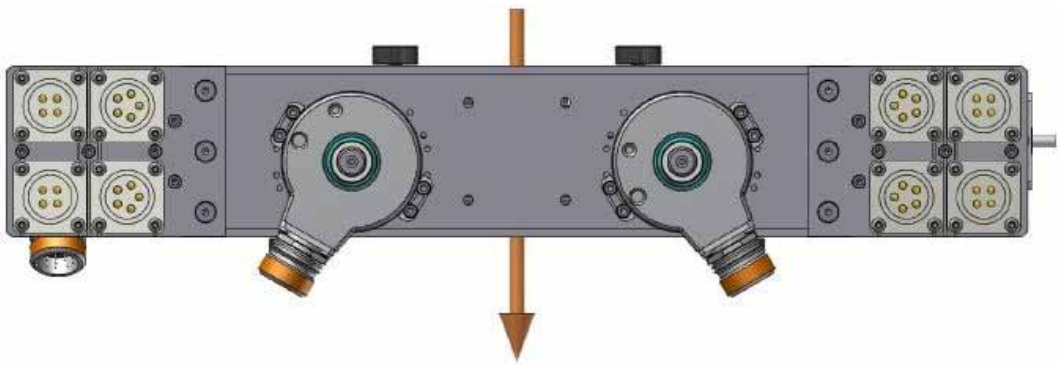
http://www.adc9001.com/products/view/483

ADC offers the most complete set of ultra-high-precision slits for neutron applications.

- Micron precision
- Encoder option
- Best slit blade edges in the synchrotron community!!!
- Blade material; Cadmium, Boron Nitride, Boron Carbide
- Blades can go "past closed" without clashing (Overlapping/Zero beam).
- FEA analysis for thermal and mechanical
- Customized to customer specifications; flange size, blade material, etc.







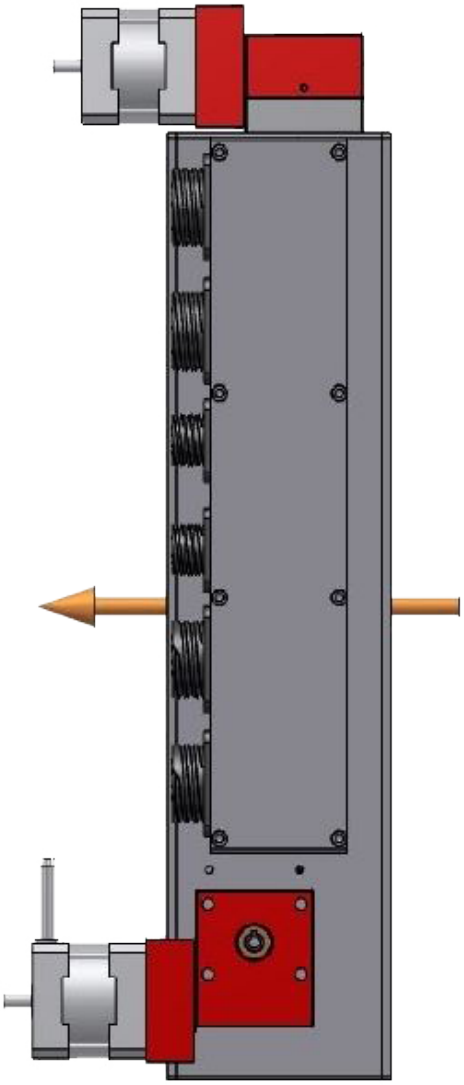
NIST CURTAIN STYLE

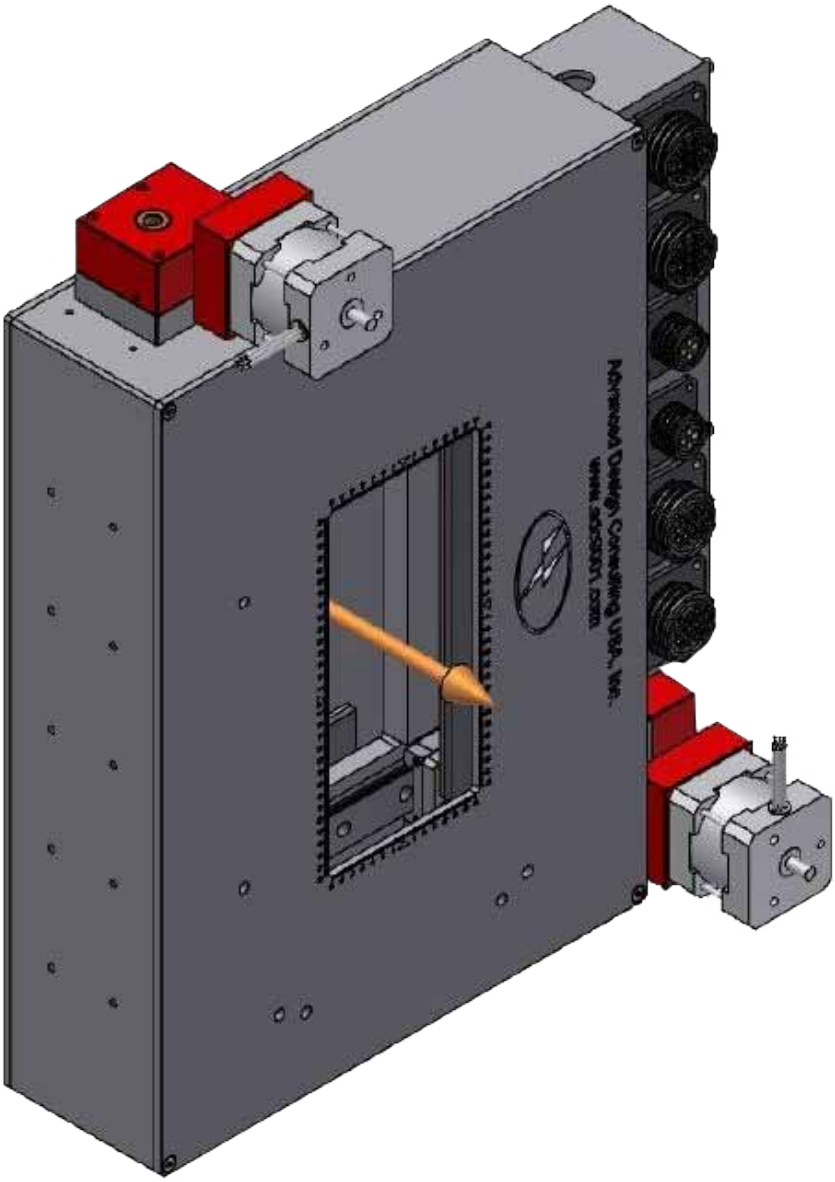
XY Vacuum Slit

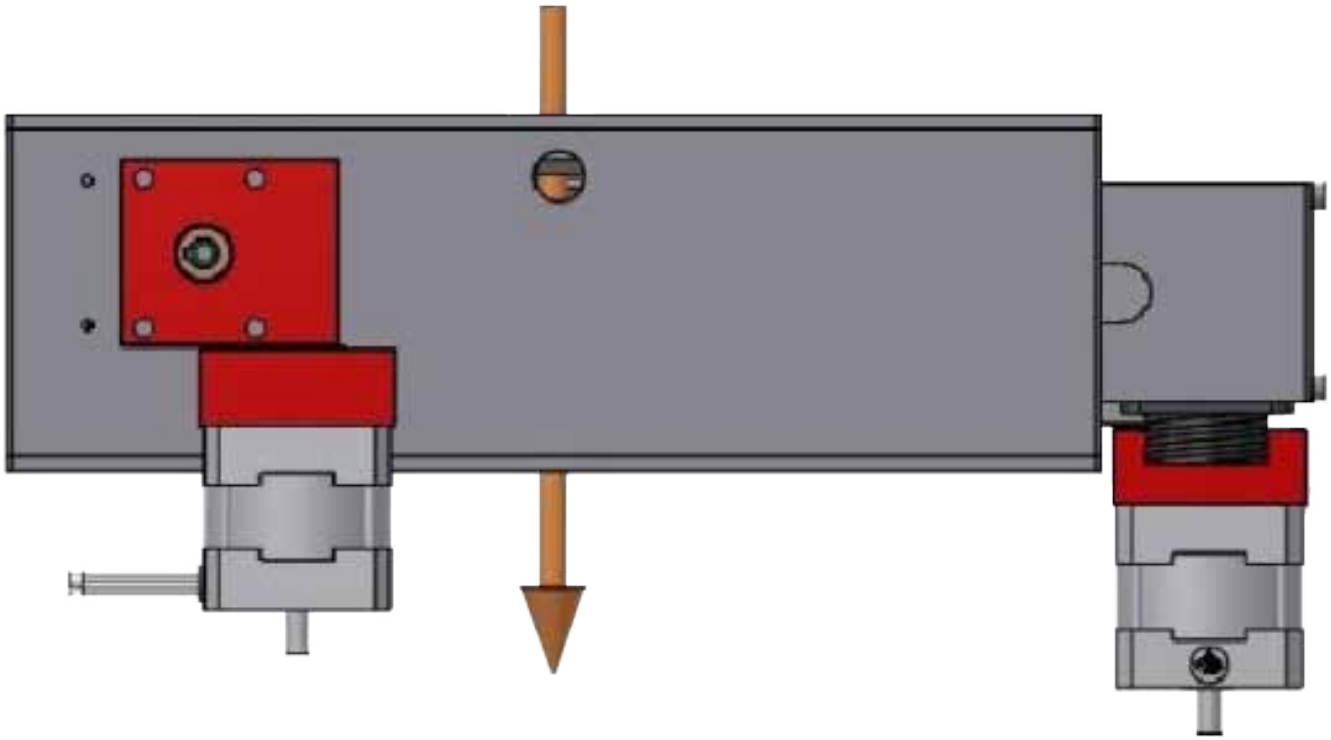
http://www.adc9001.com/products/view/491

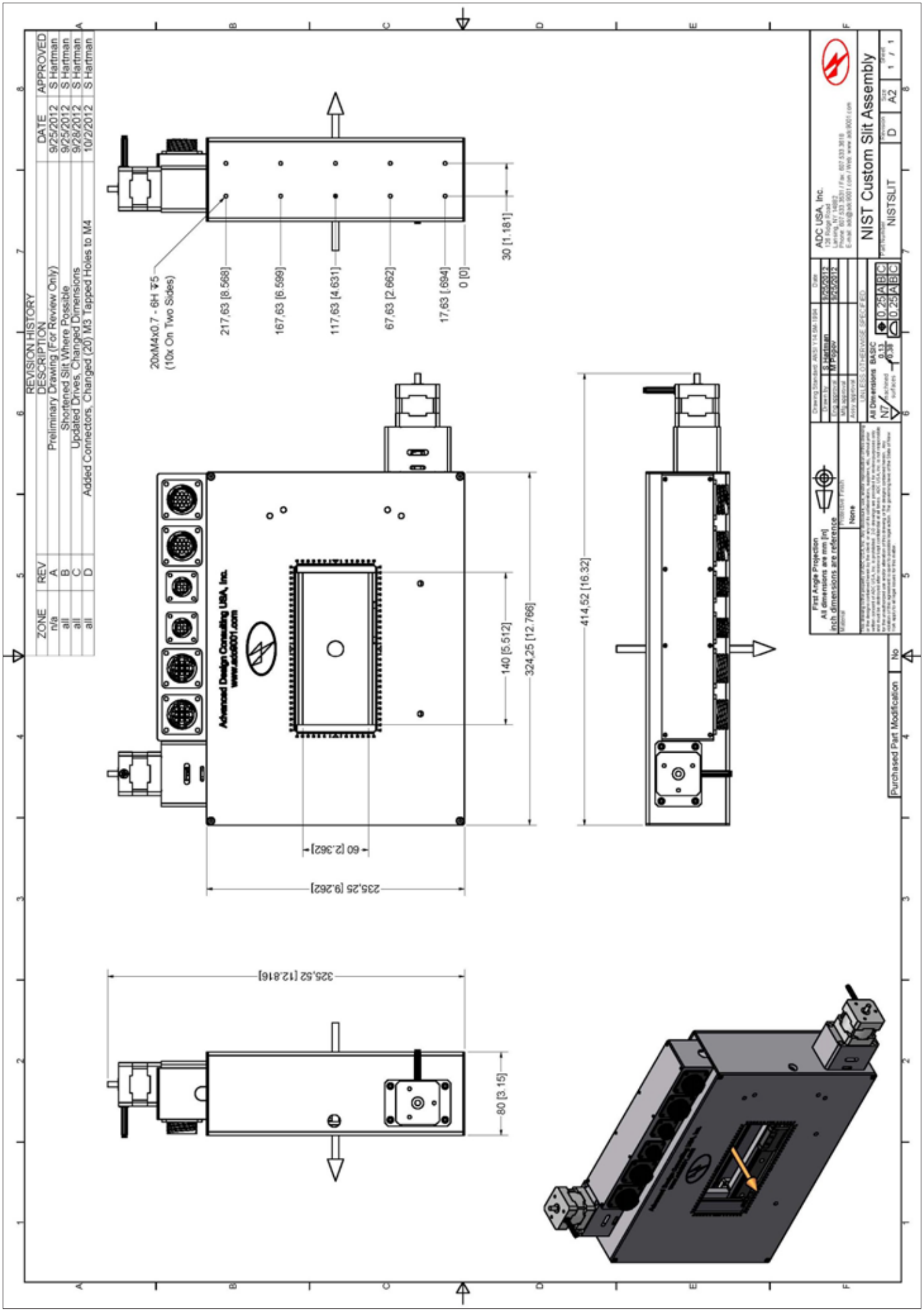
The NIST Neutron Beam Slit is a "curtain style" XY Slit. This slit uses a single NEMA 17 motor on each axis coupled to a screw with both right and left hand threads to move two blades simultaneously to open and close the aperture. The blades are mounted on preloaded carriages that are guided by miniature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

NIST
National Institute of Standards and Technology








REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | A | Preliminary Drawing (For Review Only) | 9/25/2012 | S.Hartman
all | B | Shortened Slit Where Possible | 9/25/2012 | S.Hartman
all | C | Updated Drives, Changed Dimensions | 9/28/2012 | S.Hartman
all | D | Added Connectors, Changed (20) M3 Tapped Holes to M4 | 10/2/2012 | S.Hartman
20xM4x0.7 - 6H ↧5
(10x On Two Sides)
217,63 [8.568]
167,63 [6.599]
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67,63 [2.662]
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30 [1.181]
Advanced Design Consulting USA, Inc.
www.adc9001.com
140 [5.512]
324,25 [12.766]
60 [2.362]
235,25 [9.262]
414,52 [16.32]
325,52 [12.816]
80 [3.15]
ADC USA, Inc.
NIST Custom Slit Assembly
NISTSLIT
Purchased Part Modification
No

ANSTO KOOKABURRA INSTRUMENT SLITS

http://www.adc9001.com/products/view/489

ADC custom designed and built two slits for Kookaburra instrument located at ANSTO Neutron facility. The blades are mounted on preloaded carriages that are guided by miniature ball guide rails. The blades are fully scanable. A Kubler Absolute Multiturn Rotary Encoder is used to track the position of the blades. The limits are lever style snapaction switches. ADC has developed the most complete set of highprecision slits for Neutron applications.

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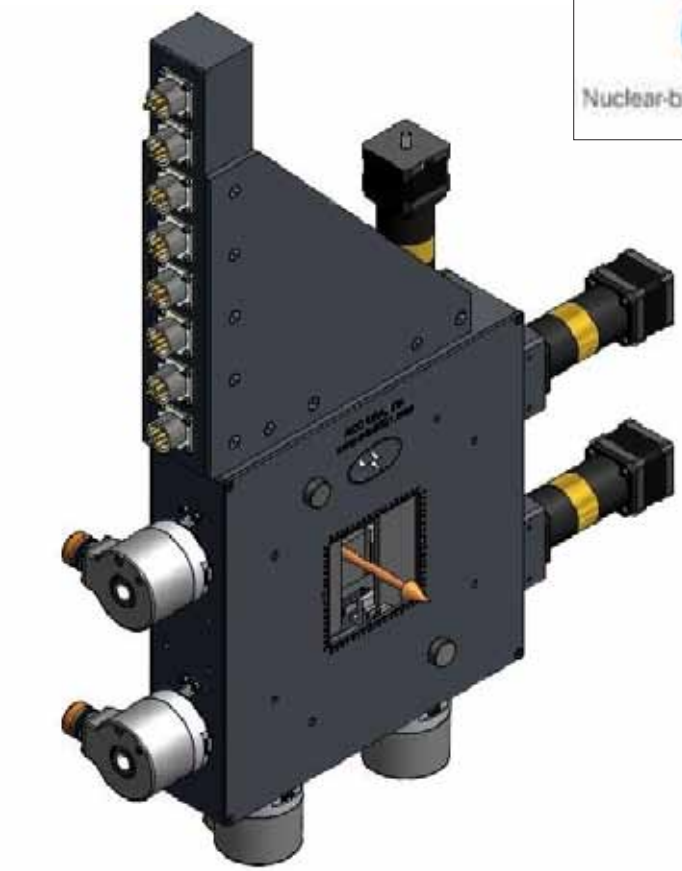
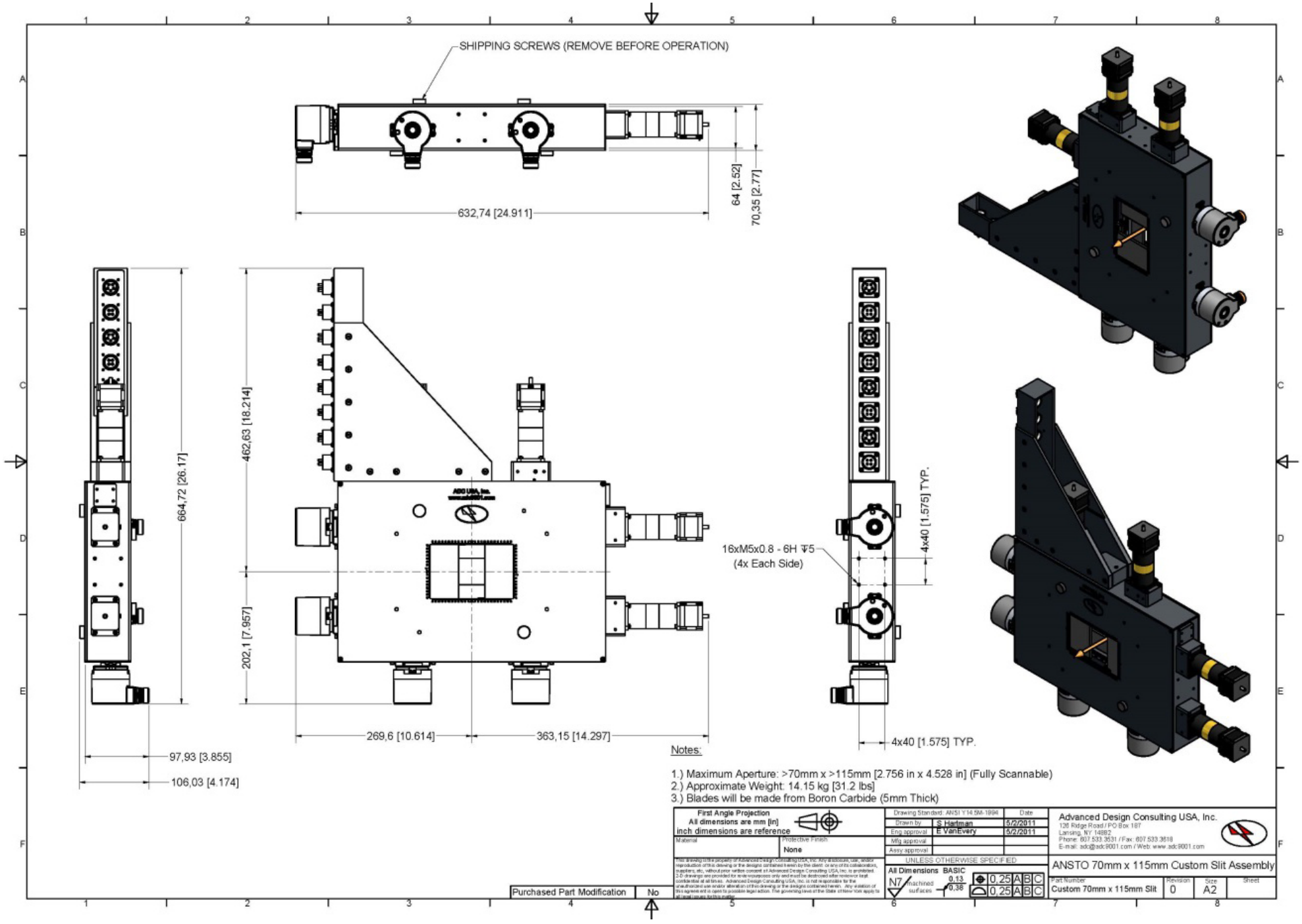
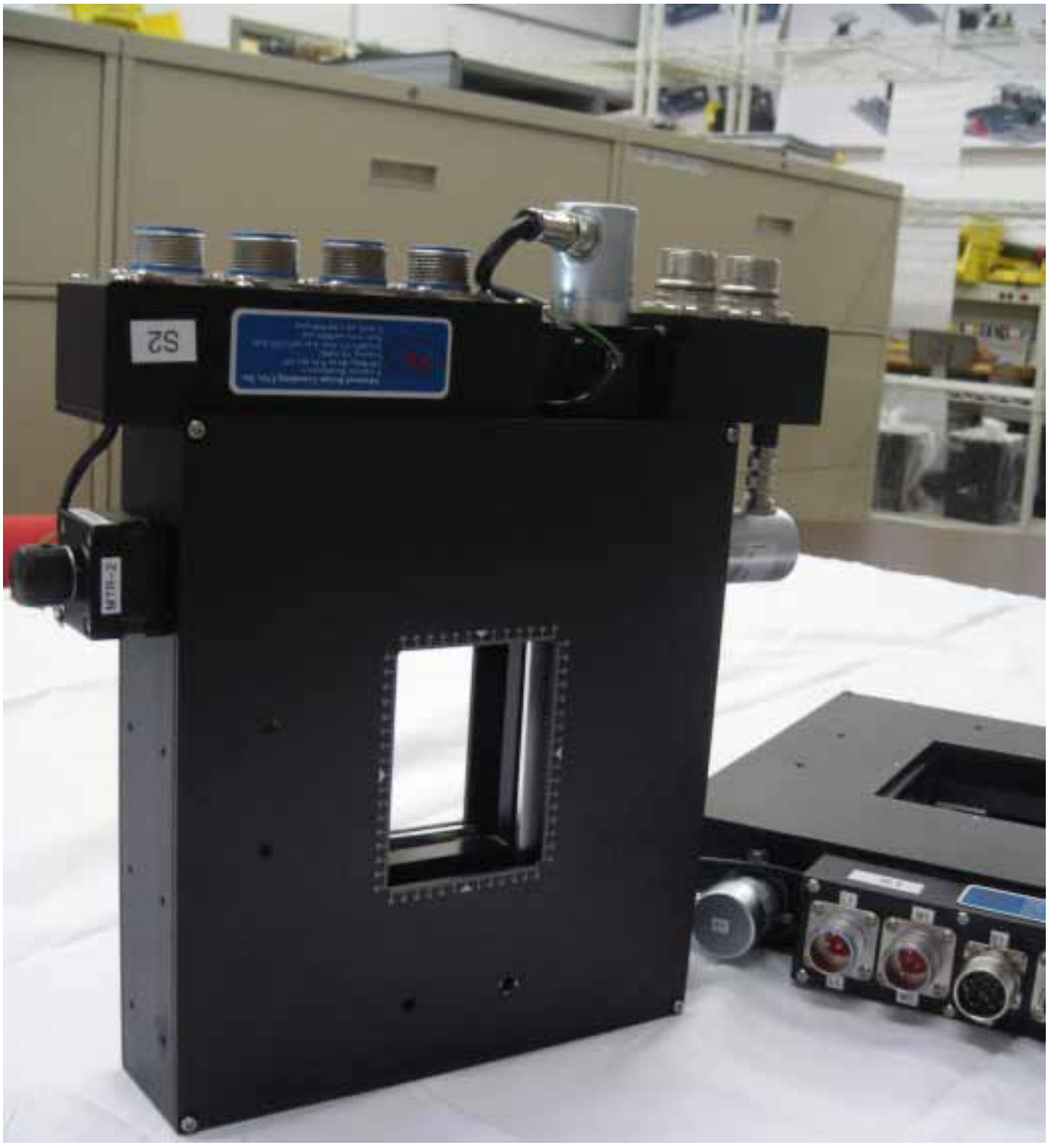


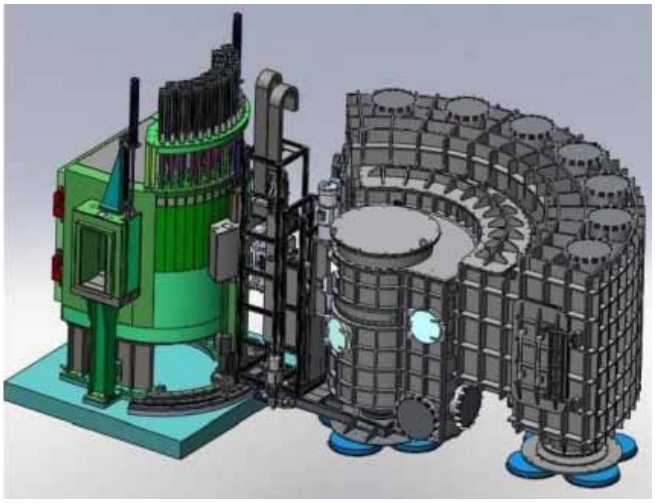

SHIPPING SCREWS (REMOVE BEFORE OPERATION)
632,74 [24.911]
64 [2.52]
70,35 [2.77]
664,72 [26.17]
462,63 [18.214]
202,1 [7.957]
97,93 [3.855]
106,03 [4.174]
269,6 [10.614]
363,15 [14.297]
16xM5x0.8 - 6H ↧5
(4x Each Side)
4x40 [1.575] TYP.
4x40 [1.575] TYP.
Notes:
1.) Maximum Aperture: >70mm x >115mm [2.756 in x 4.528 in] (Fully Scannable)
2.) Approximate Weight: 14.15 kg [31.2 lbs]
3.) Blades will be made from Boron Carbide (5mm Thick)
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
None
Drawing Standard: ANSI Y14.5M-1994
Drawn by S Hartman 5/2/2011
Eng approval E VanEvery 5/2/2011
Mfg approval
Assy approval
Date
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 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
ANSTO 70mm x 115mm Custom Slit Assembly
Part Number
Custom 70mm x 115mm Slit
Revision
0
Size
A2
Sheet
Purchased Part Modification
No

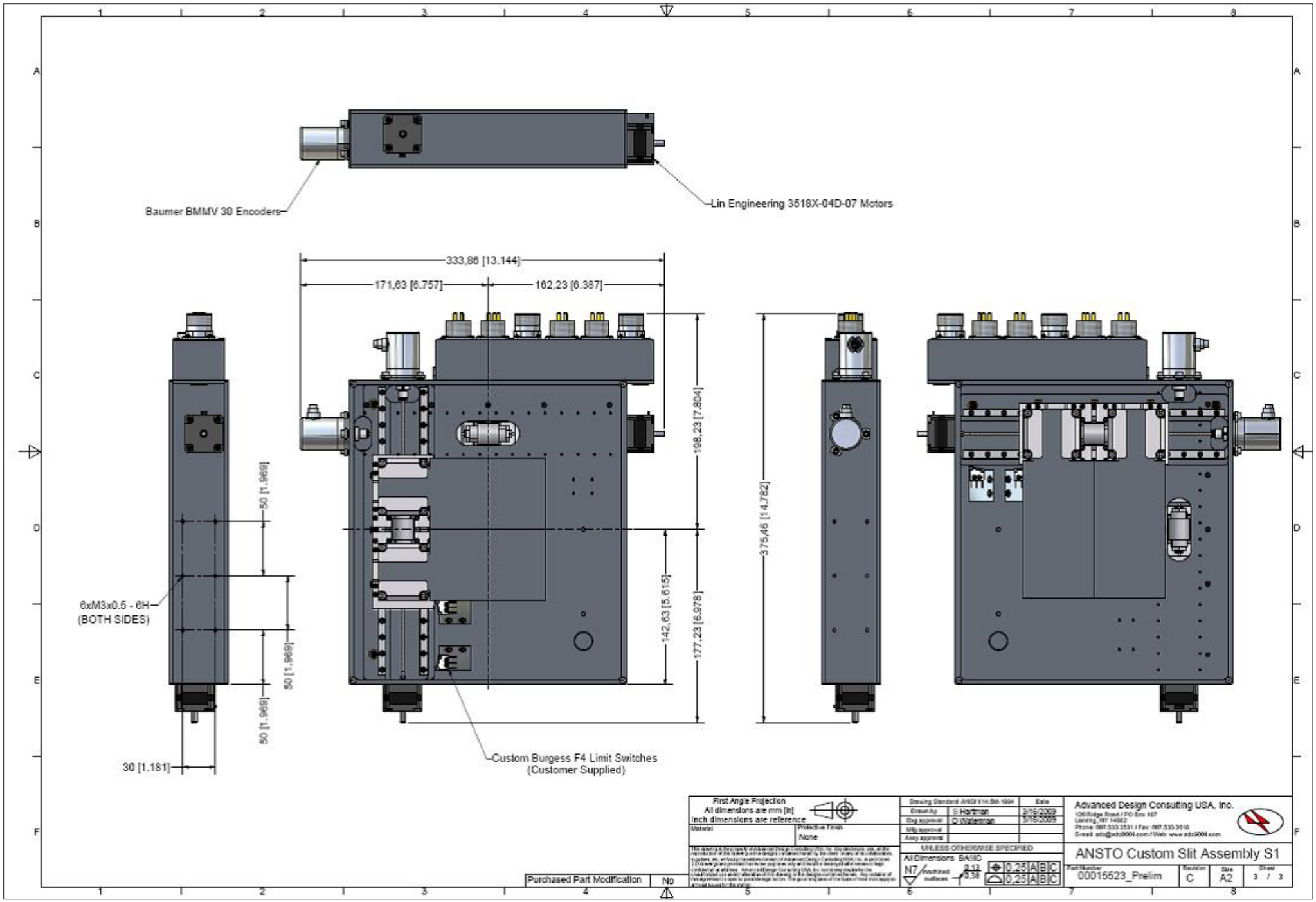
ANSTO PELICAN INSTRUMENT SLITS

http://www.adc9001.com/products/view/468

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






Baumer BMMV 30 Encoders
Lin Engineering 3518X-04D-07 Motors
333,86 [13.144]
171,63 [6.757]
162,23 [6.387]
198,23 [7.804]
142,63 [5.615]
177,23 [6.978]
375,46 [14.782]
50 [1.969]
50 [1.969]
50 [1.969]
6xM3x0.5 - 6H
(BOTH SIDES)
30 [1.181]
Custom Burgess F4 Limit Switches
(Customer Supplied)
First Angle Projection
All dimensions are mm [in]
Inch dimensions are reference
Material
Protective Finish
None
Drawing Standard: ANSI Y14.5M-1994
Drawn by S Hartman 3/16/2009
Eng approval D Waterman 3/16/2009
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7
Purchased Part Modification No
Advanced Design Consulting USA, Inc.
ANSTO Custom Slit Assembly S1
Part Number 00015523_Prelim
Revision C
Size A2
Sheet 3 / 3

SANS INSTRUMENT VACUUM SLITS

http://www.adc9001.com/products/view/488

ADC custom designed and built slits for the SANS instrument located at ANSTO Neutron facility in Australia. These slits uses a single NEMA 17 motor coupled to a screw for each blade to open and close the aperture. The blades are mounted on preloaded carriages that are guided by miniature ball guide rails. The blades are made from 5mm Thick Boron Carbide. The blades are fully scanable and the maximum aperture size is 70mm x 115mm. A Kubler Absolute Multiturn Rotary Encoder is used to track the position of the blades. The limits are lever style snap-action switches. This slit has been designed for use in a rough vacuum environment.

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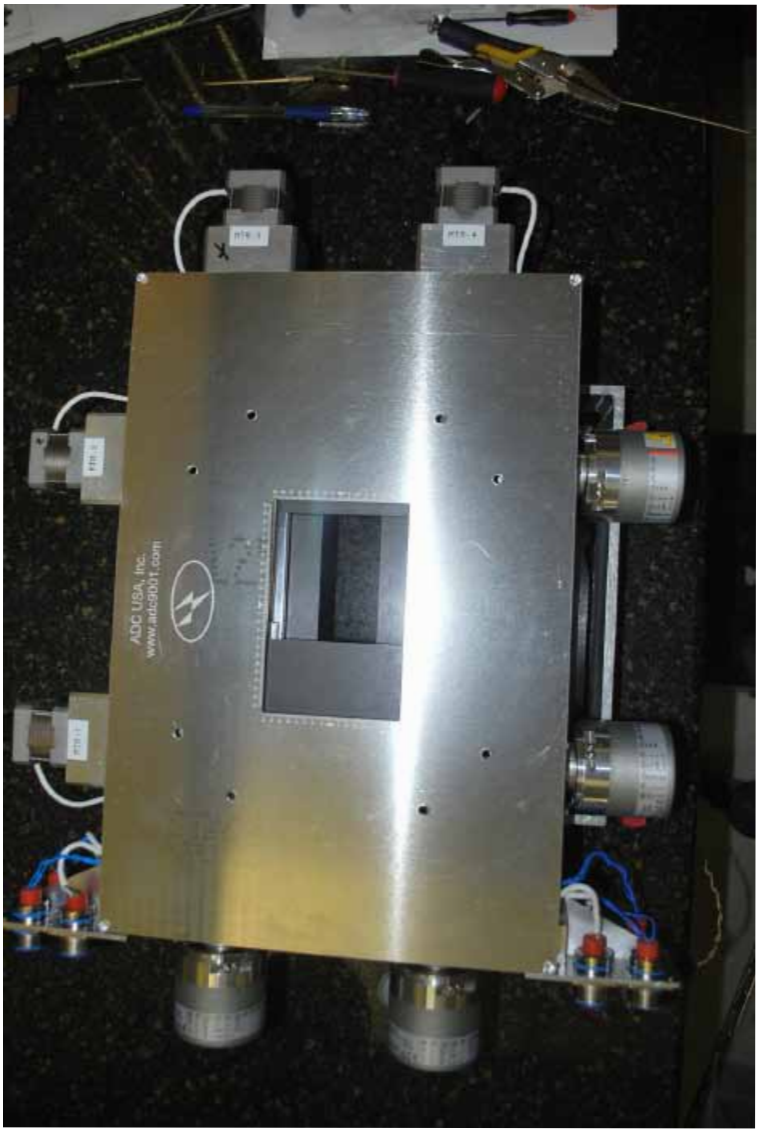
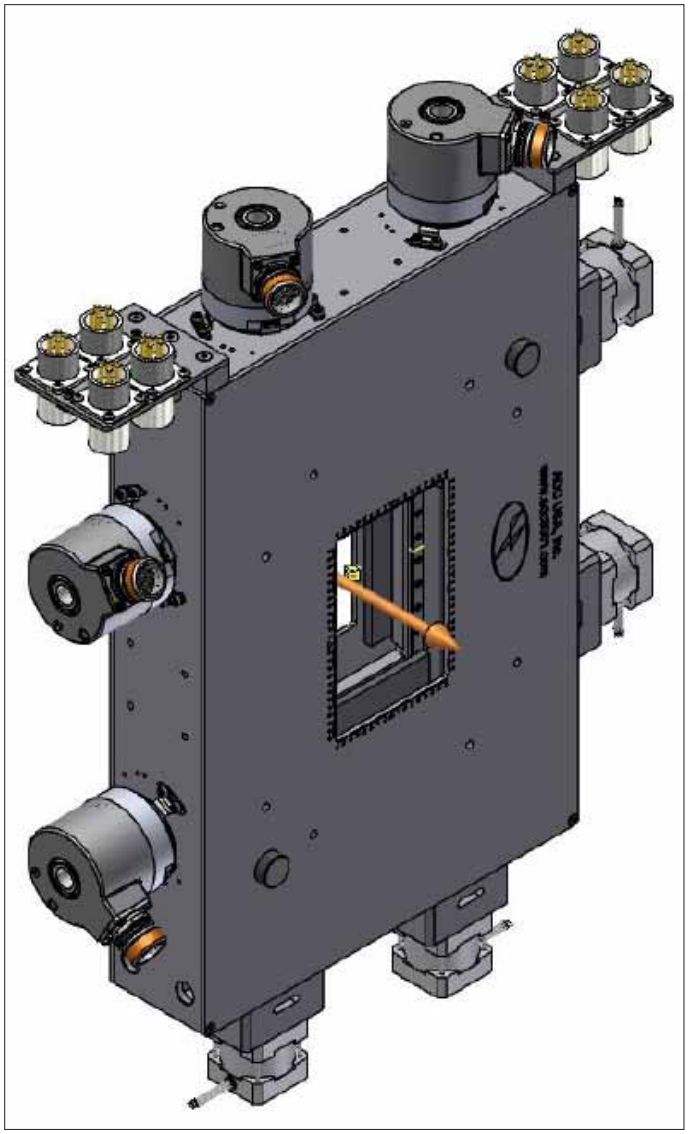
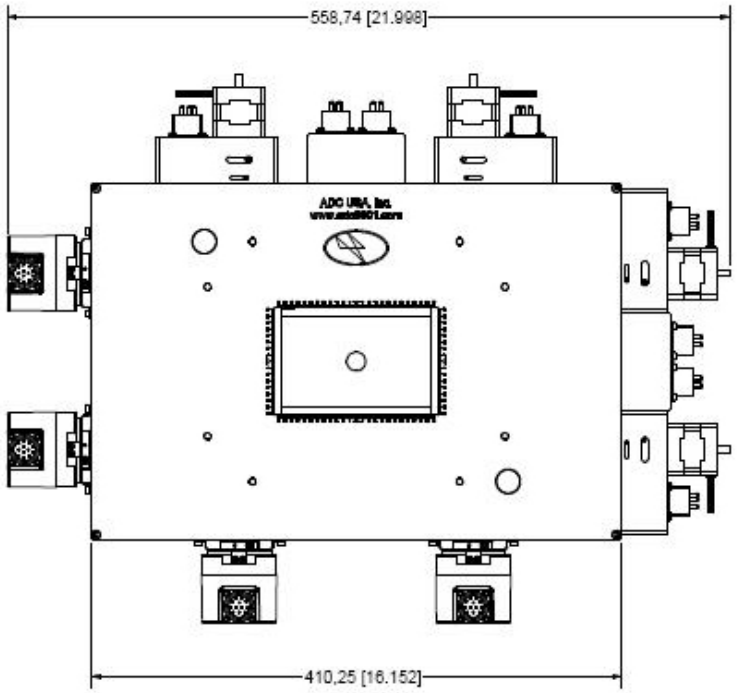
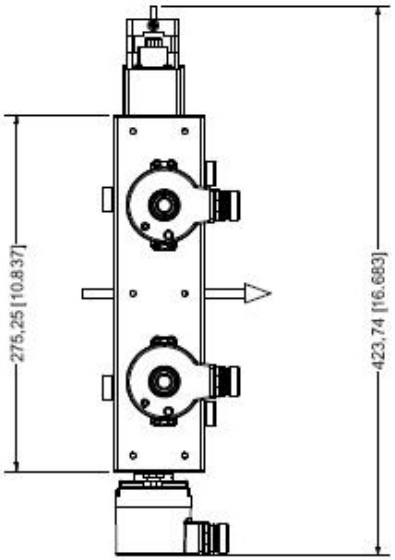
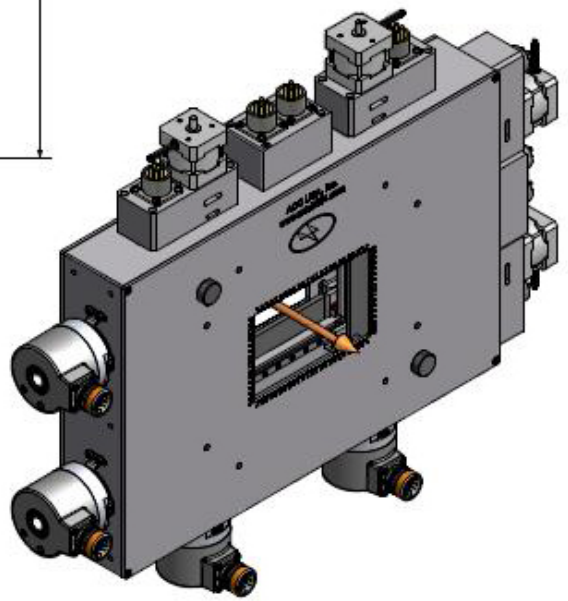


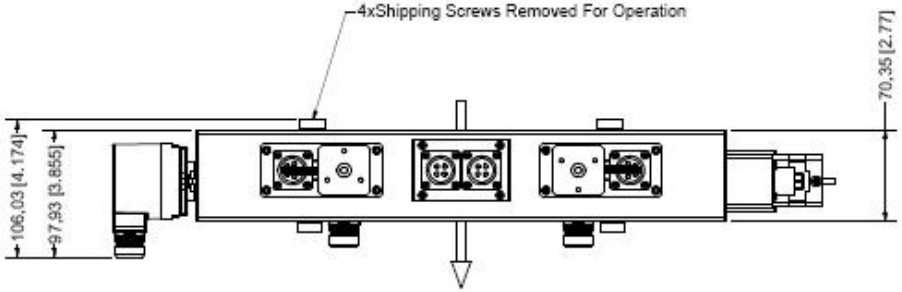


REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	A	Preliminary Review Only	6/13/2012	S Hartman









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	6/13/2012
Eng approval	M Popov	
Mfg approval		
Assy approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 3,18 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: 607.533.3616
E-mail: adc@adc9001.com / Web: www.adc9001.com

ANSTO Bilby Slit Assembly

Part Number	Revision	Size	Sheet
00020787	0	A2	1 / 1

ENGINEERING SYSTEMS

ADC (ISO9001:2008 certified) has been a leading supplier of high quality Complex Precision Systems to the neutron source scientific community 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.

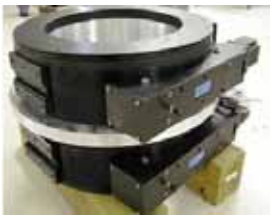
Please also add this sentence to the top of page 39:" Please refer to ADC's High Precision Systems Catalog for More Information"

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

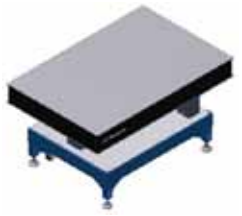
DLS Double Crystal Deflector

ANKA Fast Sample Exchange System

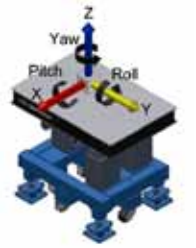
Kappa Six-Circle Goniometer for CHESS

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

Please refer to ADC's Optical Table Catalog for More Information

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

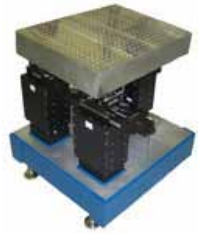
One Degree of Freedom Optical Table (Brookhaven National Lab)

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

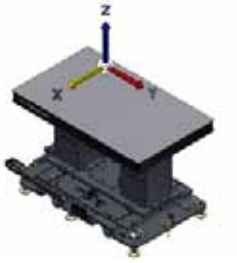
Low Profile Diffractometer Table (LPDT-100)

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

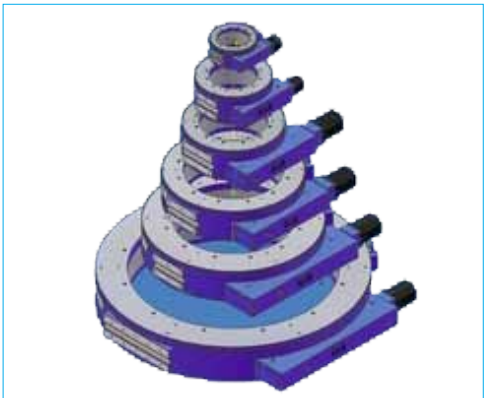
Six Degree of Freedom Optical Table (Brookhaven National Lab)

STAGES

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

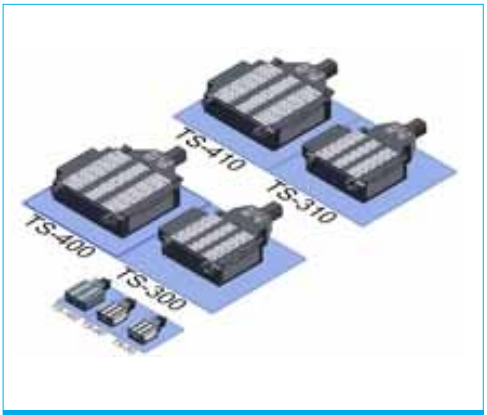
ADC manufactures high quality motion control products and systems that are qualified for Semi-conductor, Automation, and Aerospace industries. Our extensive product line includes; linear stages, lift stages (Jacks), rotation stages, goniometers, gantry systems, optical tables, vacuum compatible motion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

Mounting Plates and Brackets

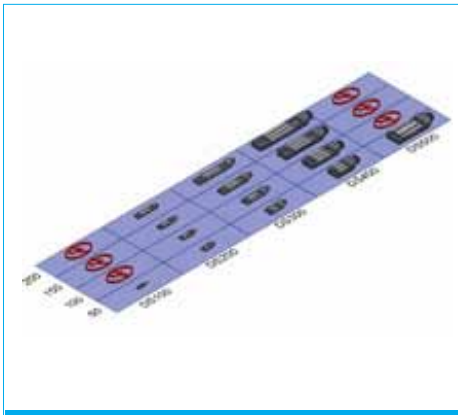


Rotation Stages

Lift Stages



Goniometers



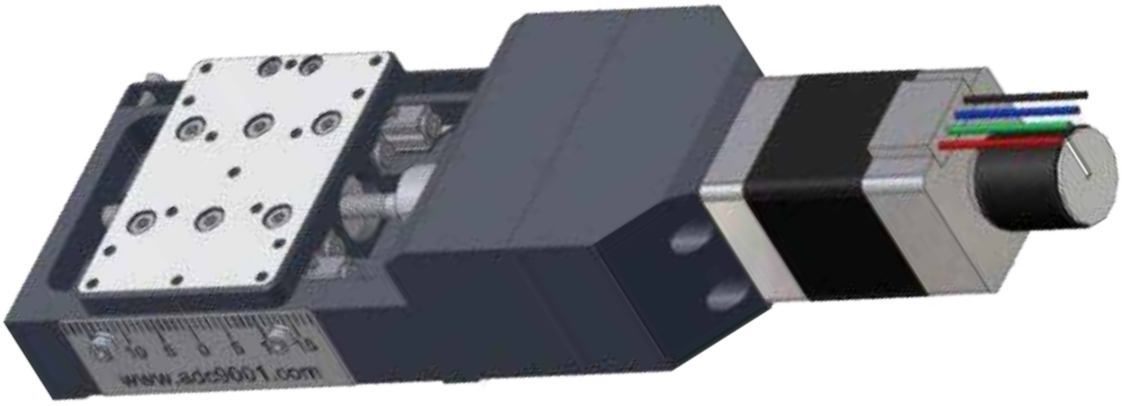
Linear Stages

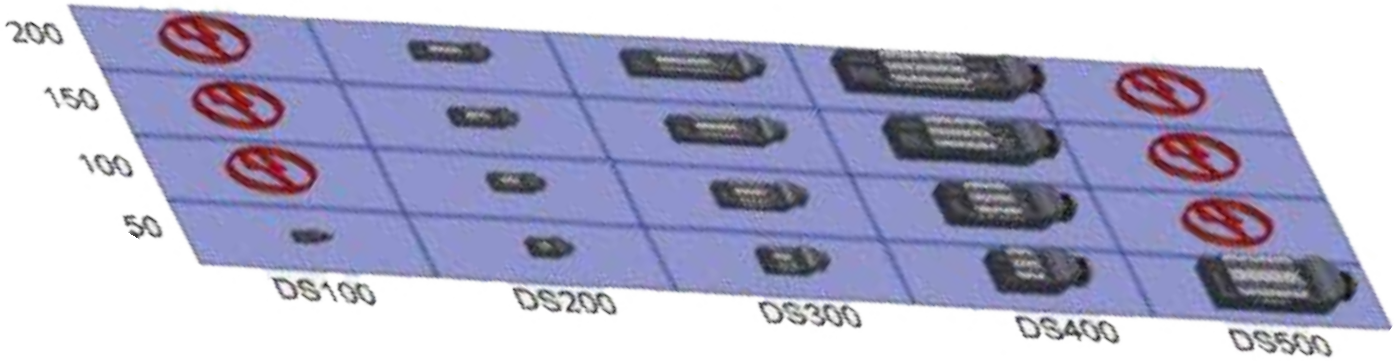
Custom Stages

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.

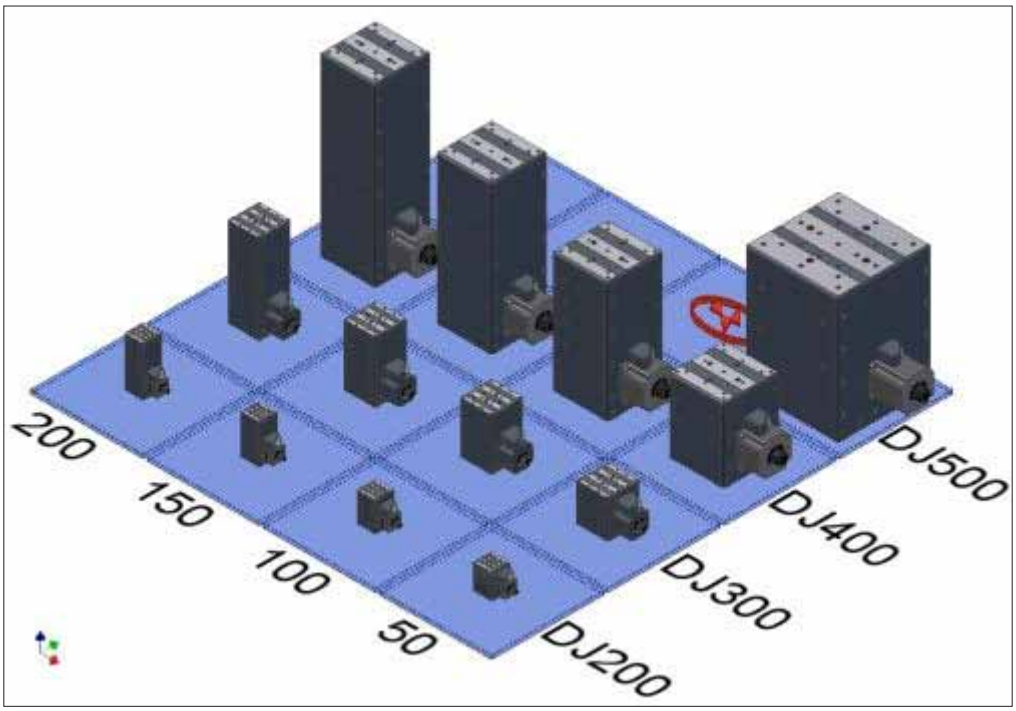




LIFT STAGES

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

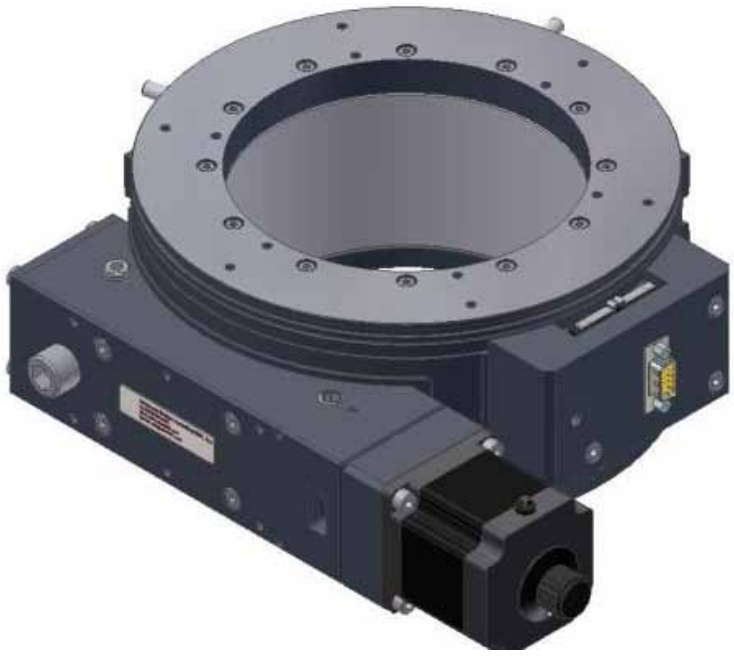
ADC's high precision jacks provide an accurate and rigid platform for use in any positioning system. The rugged black anodized aluminum housing features a precision ground base and top plate, each with multiple utility holes for easy integration into the users' system. The vertical stage is driven by 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

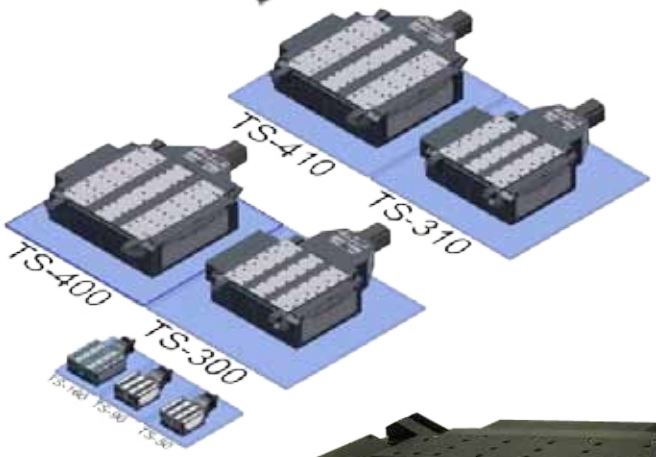
ADC's series 100 to 700 rotation stages are designed for use in industrial applications such as measurement systems, vision control, automation, and robotics, and in scientific applications such as synchrotron experiments. The body is fabricated from a high rigidity aluminum alloy. Two industrial high-precision 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.

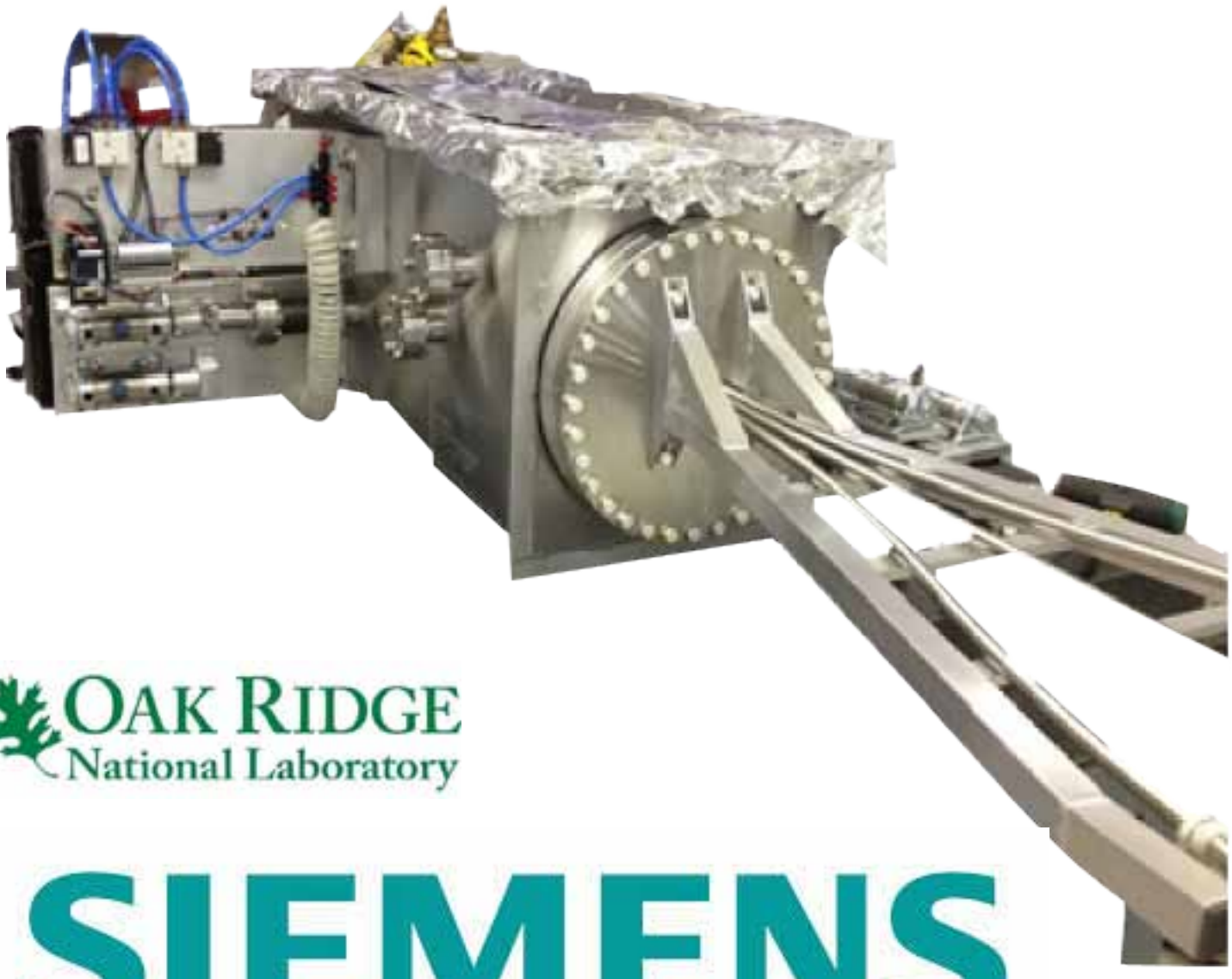


HIGH ENERGY PHYSICS PROJECTS

International Thermonuclear Experimental Reactor (ITER) Project

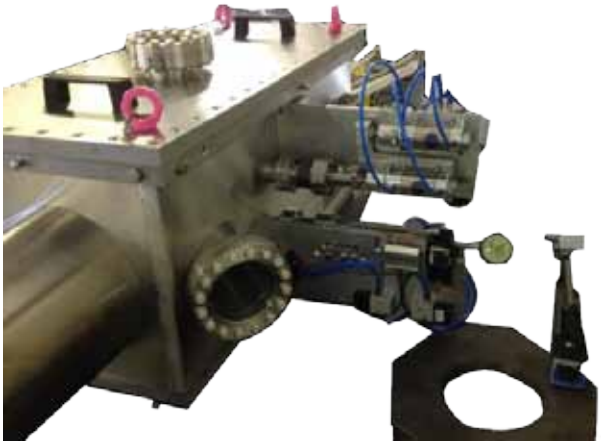
http://www.adc9001.com/products/view/464

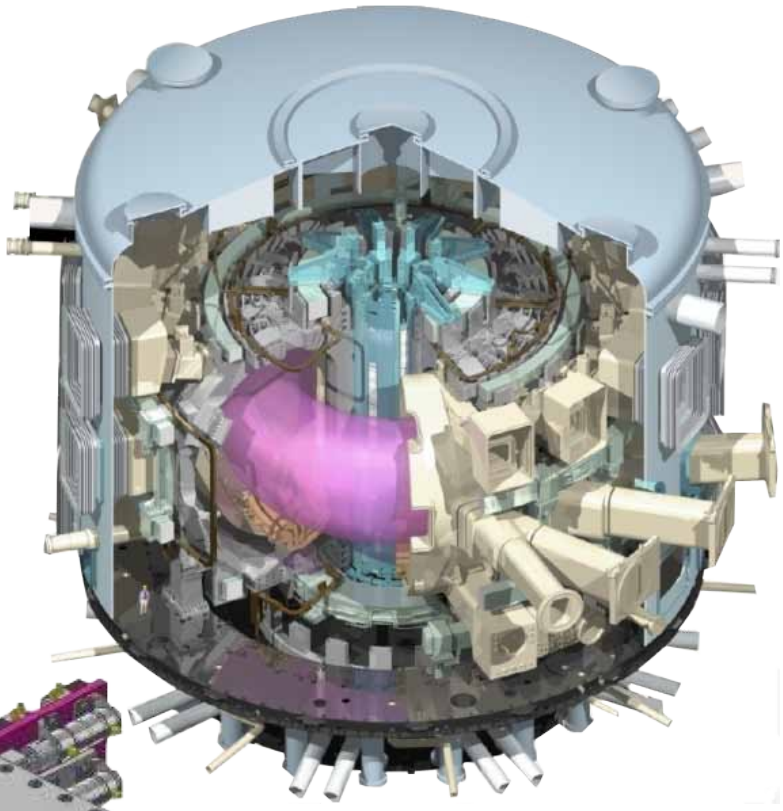
ADC provided the design, engineering, and procurement of material, manufacture, assembly, inspection, test, and installation of a pre-prototype pellet selector as a part of the International Thermonuclear Experimental Reactor for Oakridge National Lab. Fusion is the process of having the nuclei of two light atoms forming into one heavier nucleus. The result is a release of more energy than put into the action. This is the same process generated by the sun and most other stars. Fusion is also the reason for the massive destructive power in hydrogen bombs. In contrast, fission involves a subatomic particle impacting with and splitting apart an atomic nucleus. All current nuclear reactors and power plants utilize some form of nuclear fission. Fusion power is also much cleaner than fission in terms of releasing radiation into the surrounding environment. The $30 billion ITER program plans to see their first sustained fusion reactions around 2020. For more information please go to: https://www.iter.org/

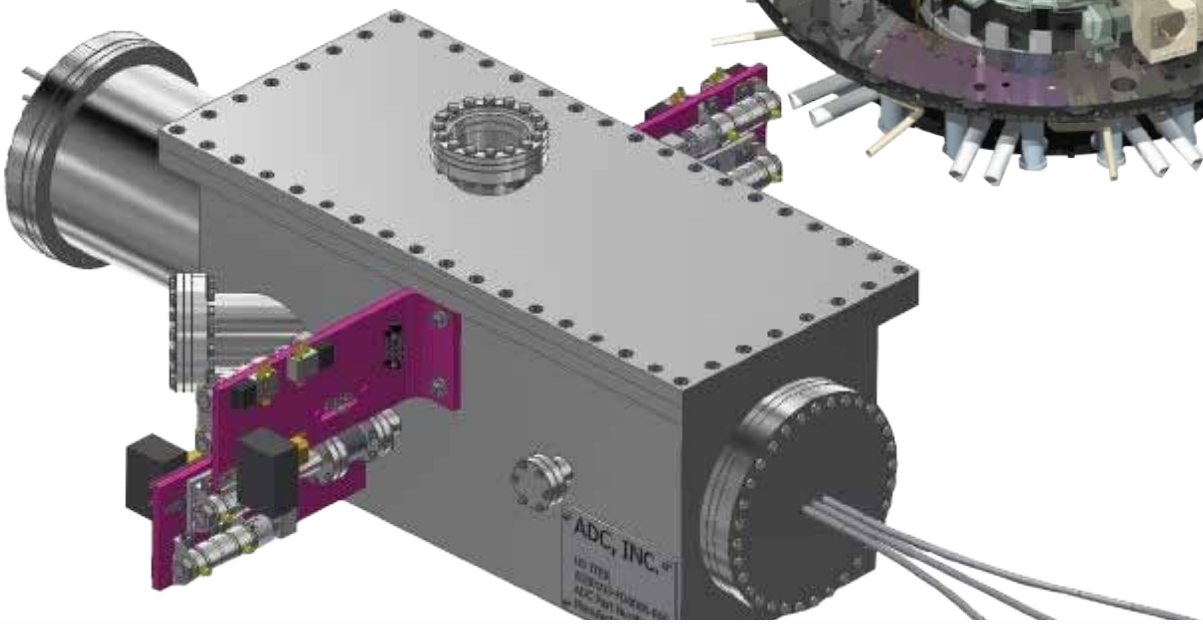


OAK RIDGE National Laboratory

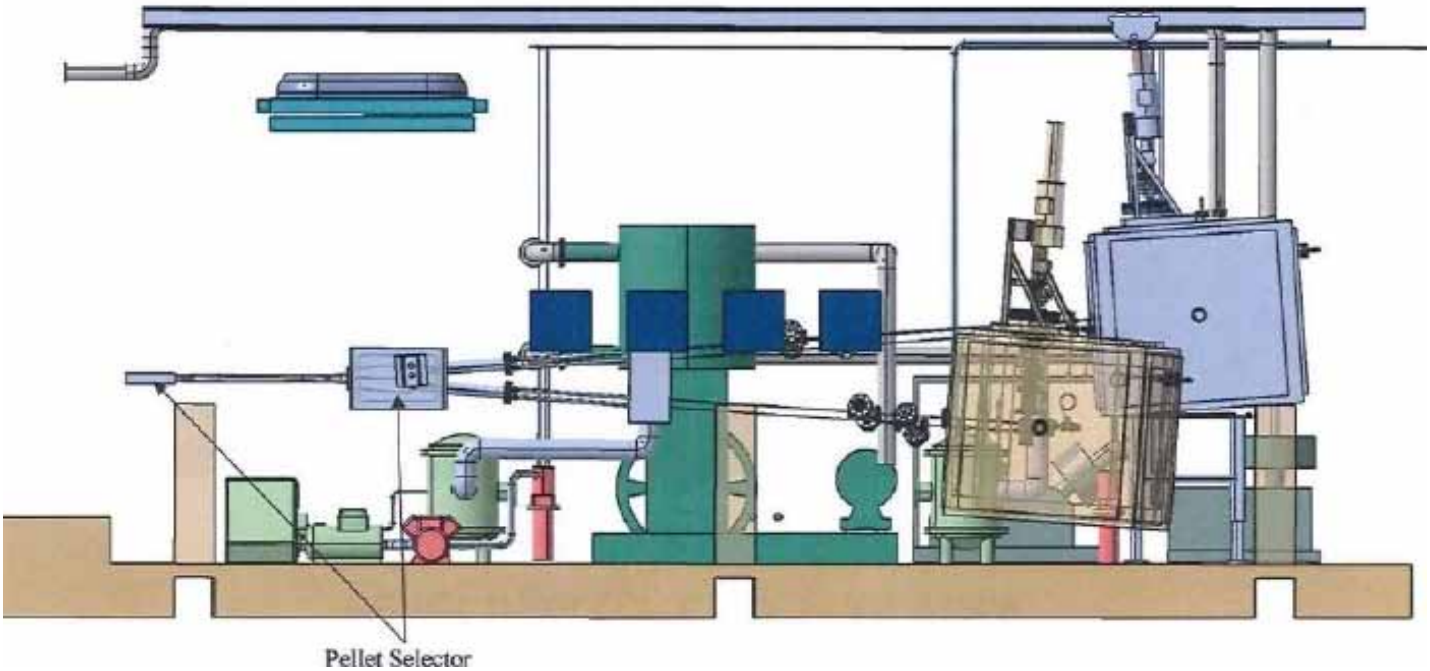
SIEMENS

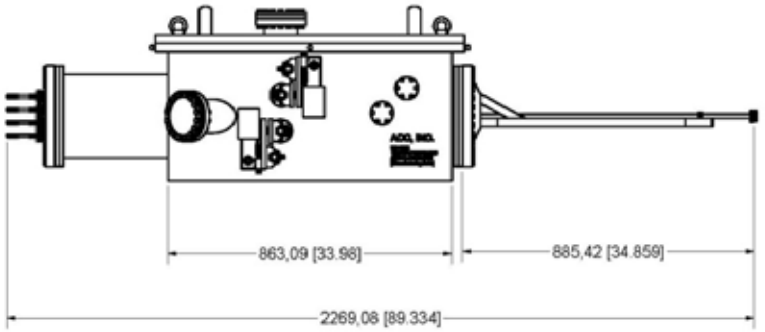


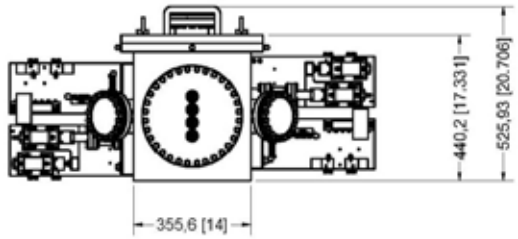


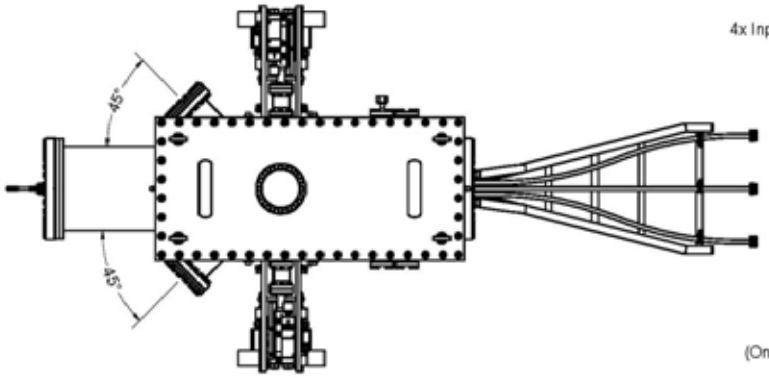


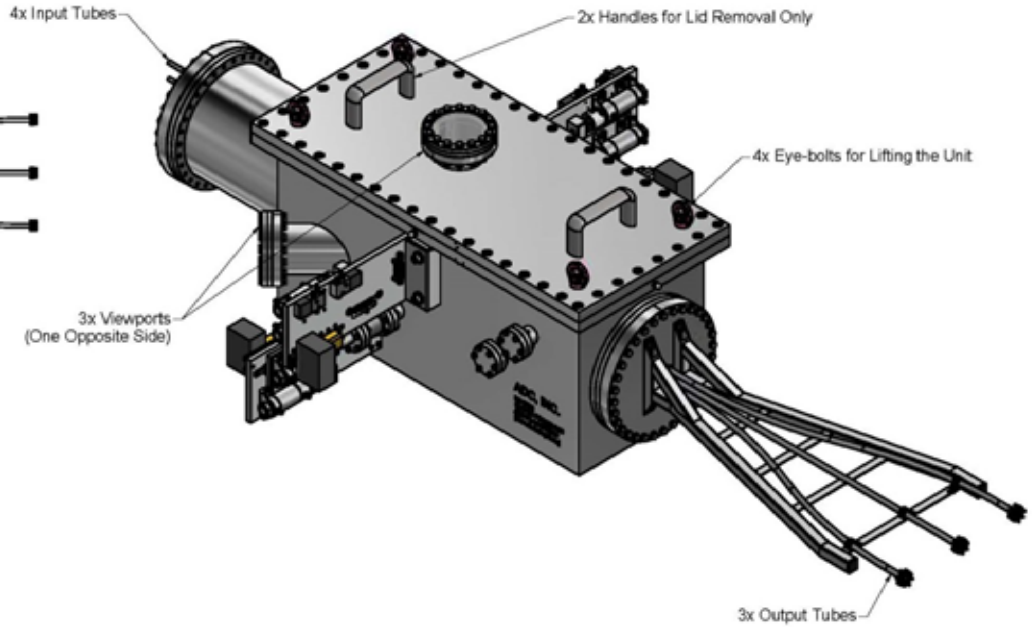
Pellet Injector Cask Side View (Cask Removed for Clarity)











Notes:

1. 4 inputs, each of which can be directed to any of 3 outputs
2. Actuation by pneumatic pistons
3. 8 mm Ø input and 10 mm Ø output
4. System Mass/Weight: ~500 kg (~1100 lb)

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 11/5/2013

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	M Popov	11/14/2013
Eng approval	M Popov	11/14/2013
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: 607.533.3616
E-mail: adc@adc9001.com / Web: www.adc9001.com

Pellet Selector

Part Number	Revision	Size
00022363	4	A2

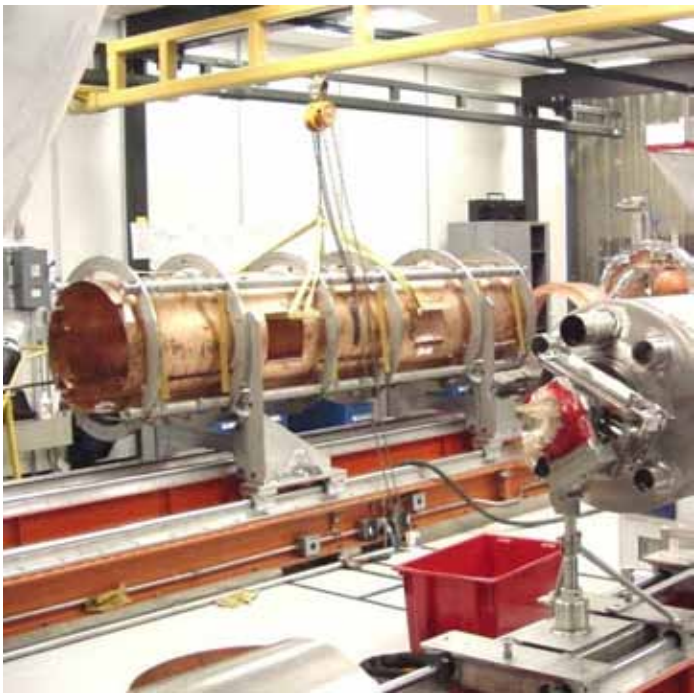
CAVITY PARTS

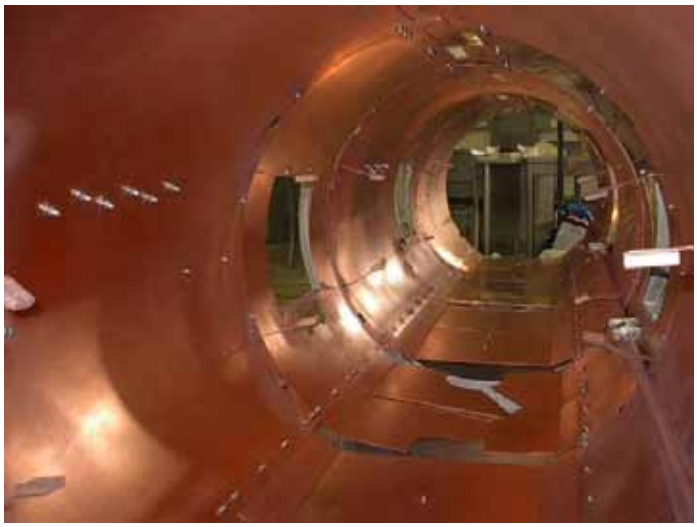
for Jefferson Laboratory (JLAB-USA)

http://www.adc9001.com/Cavity-Parts-for-Spallation-Neutron-Source

Cavity Parts for Spallation Neutron Source
ADC fabricated 24 sets of the space frame and thermal shield assemblies for the U.S. Department of Energy Spallation Neutron Source program. This work involved sheet metal rolling, bending, ASME certified brazing operation, precision machining, ASME certified welding, vacuum cleaning, and vacuum testing. Each system underwent complete testing and inspection which included thermal shock, leak checking, and precise physical measurements.

Jefferson Lab





JEFFERSON LAB 12GEV UPGRADE

http://www.adc9001.com/Space-Frame-for-Jefferson-Laboratories

ADC fabricated and is assembled ten sets of C100 Cryomodule Space frame Assemblies for the Jefferson Lab 12GeV cryomodule upgrade. The project required fabricating jigs and simple fixtures to ensure important components are maintained to specified tolerances. This work involved; precision machining, ASME certified welding, and vacuum cleaning.

Each space frame has a 13 page test report provide to JLab detailing dimensions and welding. Travelers are provided on each space frame. Each space frame is verified by a third party source.

TRANSPORT MAGNET

for Jefferson Laboratory (JLAB-USA)

http://www.adc9001.com/H-Steel-for-Jefferson-Laboratories-Magnet-Upgrades

ADC fabricated a large order of magnet material for Jefferson Laboratory's latest upgrade. All the magnet materials had to come from the same heat from a mill supplier; material had to be heat treated with very tight tolerances, then the magnet material was rough cut. Strict material handling procedures were implemented including barring the use of magnetic lifting devices (as to not magnetize the material). The parts were then machined using large machining centers to achieve the tight machining tolerances for large pieces. After this, the parts were then painted and delivered for assembly at JLab.

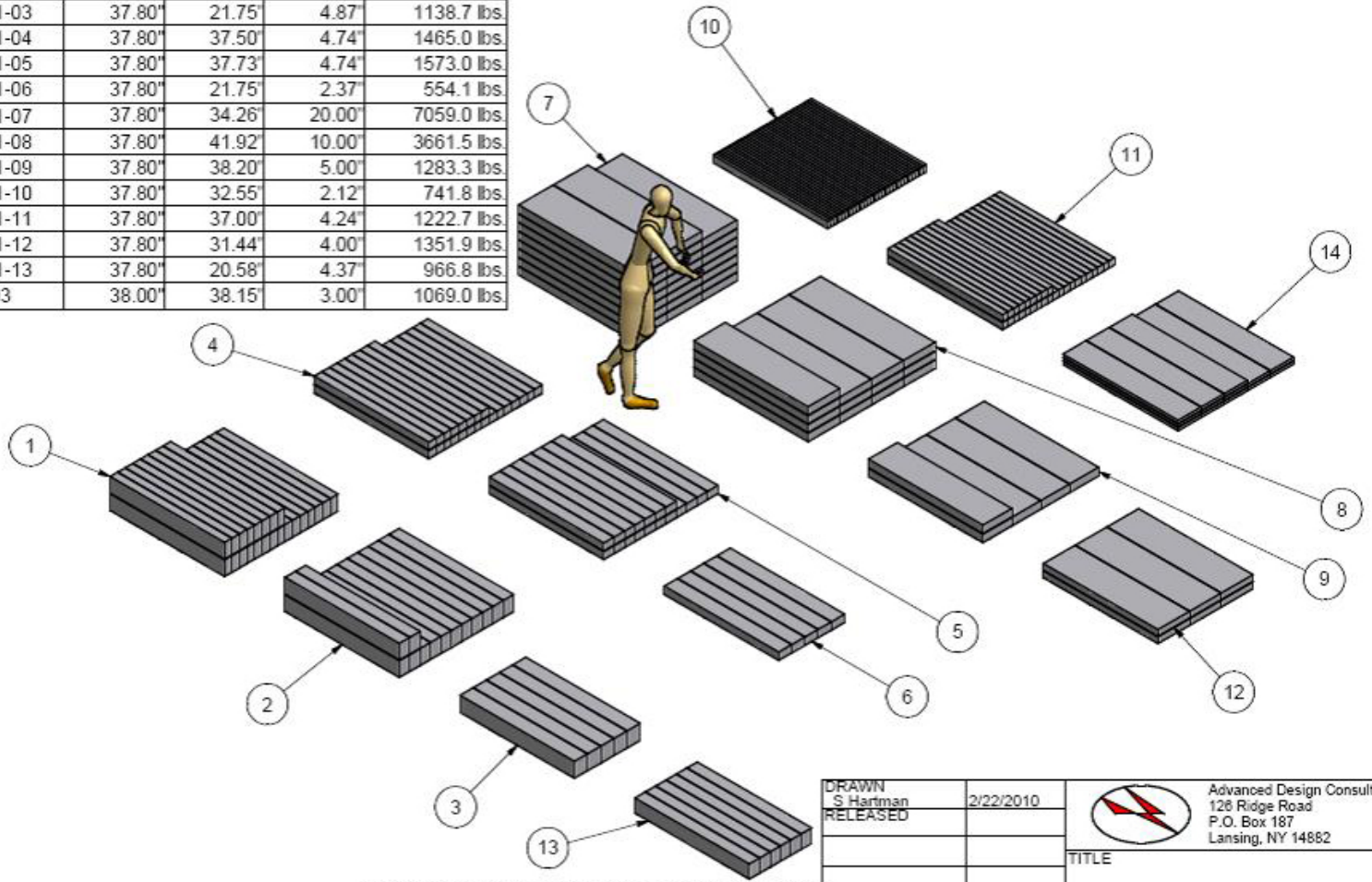
Jefferson Lab

Parts List

ITEM	QTY	PART NUMBER	LENGTH	WIDTH	HEIGHT	WEIGHT
1	23	MAG00300100001-01	37.80"	37.50"	9.74"	3010.3 lbs.
2	13	MAG00300100001-02	37.80"	37.73"	9.74"	2334.4 lbs.
3	5	MAG00300100001-03	37.80"	21.75"	4.87"	1138.7 lbs.
4	23	MAG00300100001-04	37.80"	37.50"	4.74"	1465.0 lbs.
5	18	MAG00300100001-05	37.80"	37.73"	4.74"	1573.0 lbs.
6	5	MAG00300100001-06	37.80"	21.75"	2.37"	554.1 lbs.
7	23	MAG00300100001-07	37.80"	34.26"	20.00"	7059.0 lbs.
8	13	MAG00300100001-08	37.80"	41.92"	10.00"	3661.5 lbs.
9	5	MAG00300100001-09	37.80"	38.20"	5.00"	1283.3 lbs.
10	35	MAG00300100001-10	37.80"	32.55"	2.12"	741.8 lbs.
11	29	MAG00300100001-11	37.80"	37.00"	4.24"	1222.7 lbs.
12	6	MAG00300100001-12	37.80"	31.44"	4.00"	1351.9 lbs.
13	6	MAG00300100001-13	37.80"	20.58"	4.37"	966.8 lbs.
14	13	MAG0030010-0203	38.00"	38.15"	3.00"	1069.0 lbs.

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
all	1	Revised Weights; Added Items 12 & 13	4/27/2010	S Hartman
all	2	Added Item 14; Corrected Quantities	6/15/2010	S Hartman



NOTES:

THIRD ANGLE PROJECTION
ALL DIMENSIONS ARE IN INCHES

REMOVE BURRS AND SHARP EDGES
DO NOT SCALE THIS DRAWING

DRAWN S Hartman	2/22/2010
RELEASED	

UNLESS OTHERWISE SPECIFIED

ALL DIMENSIONS ARE BASIC

0.01 A B C

0.01 A B C

FINISHED SURFACES 125

Advanced Design Consulting, Inc.
126 Ridge Road
P.O. Box 187
Lansing, NY 14882
Voice: 607.533.3531
Fax: 607.533.3618

TITLE

SIZE	SCALE	DWG NO	REV
B		MAG0030010-0001	2

MATERIAL

SHEET 1 OF 1

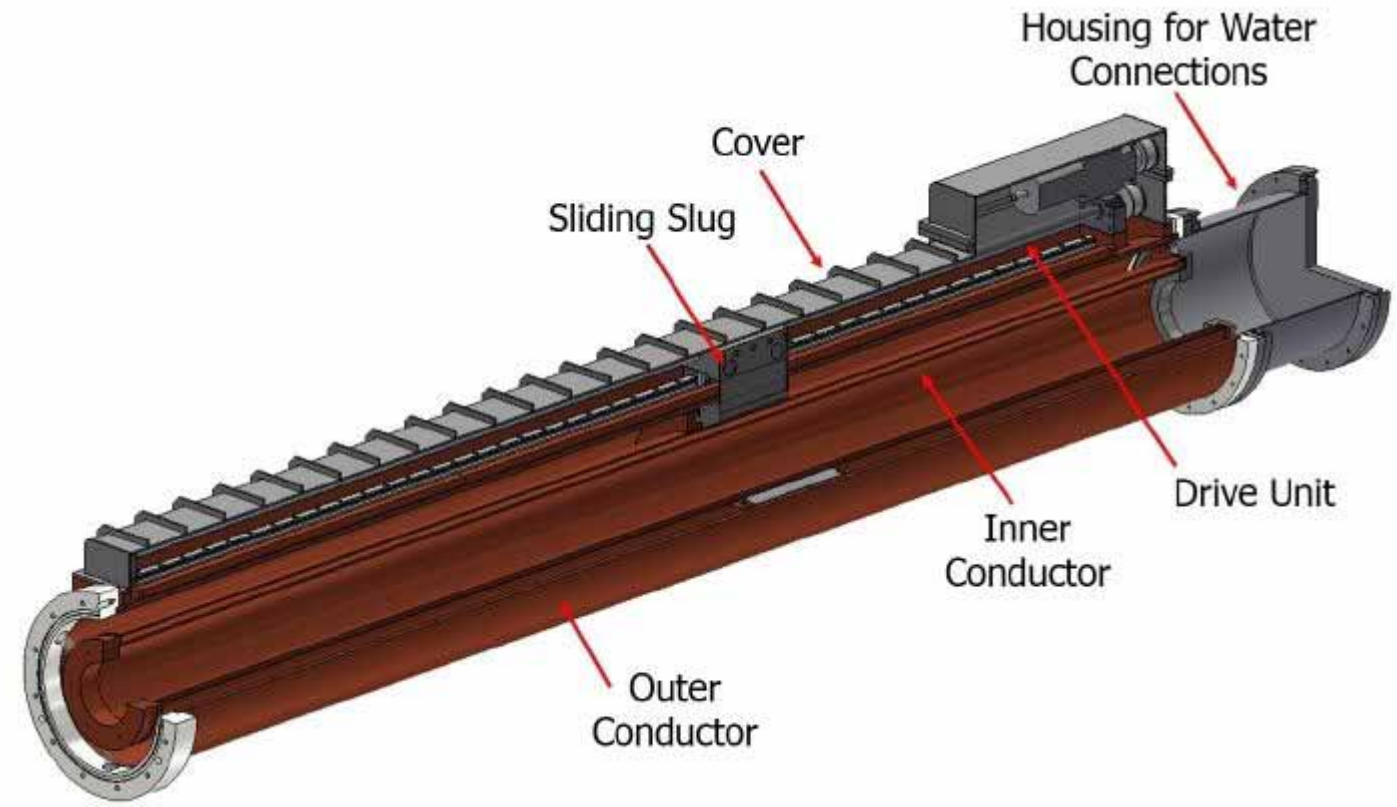
TUNING STUB OUTER AND INNER CONDUCTORS

for Fusion (ORNL)

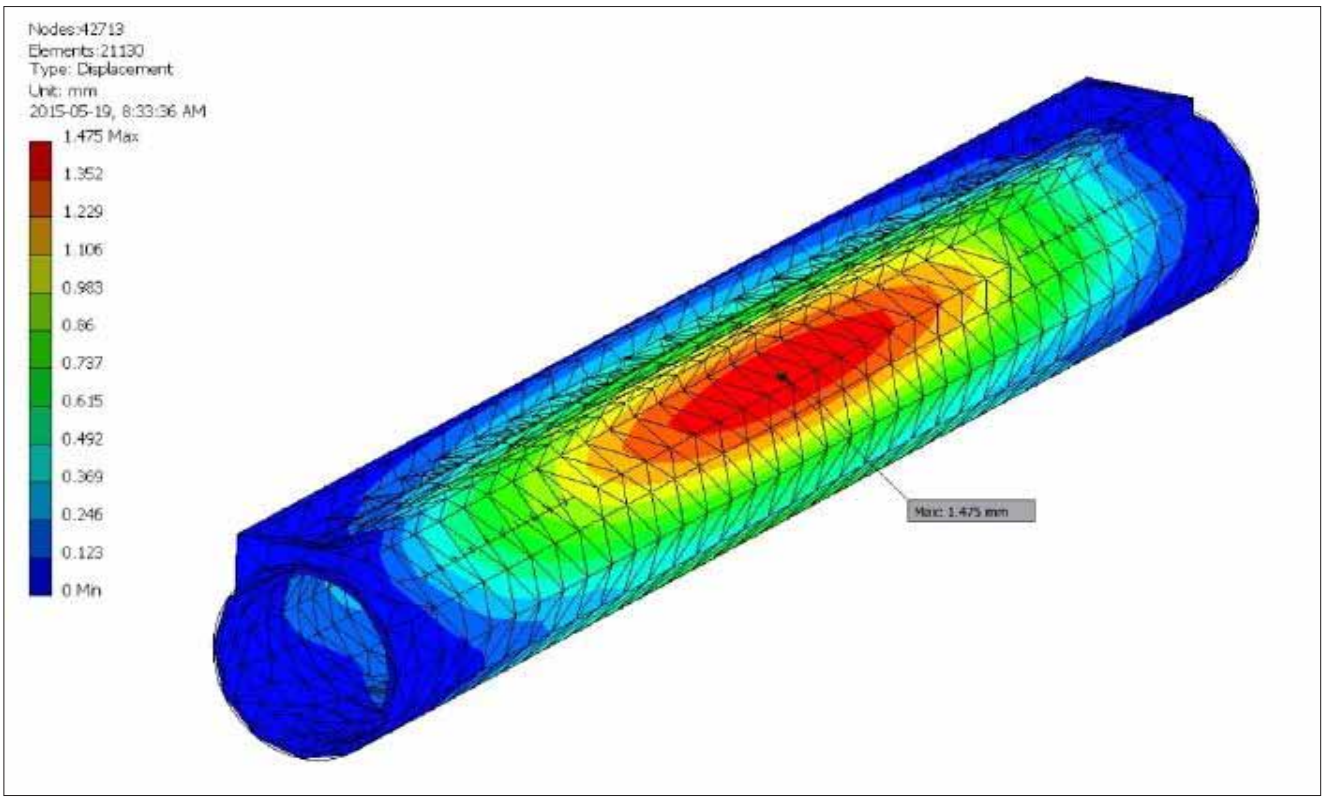
http://www.adc9001.com/products/view/616

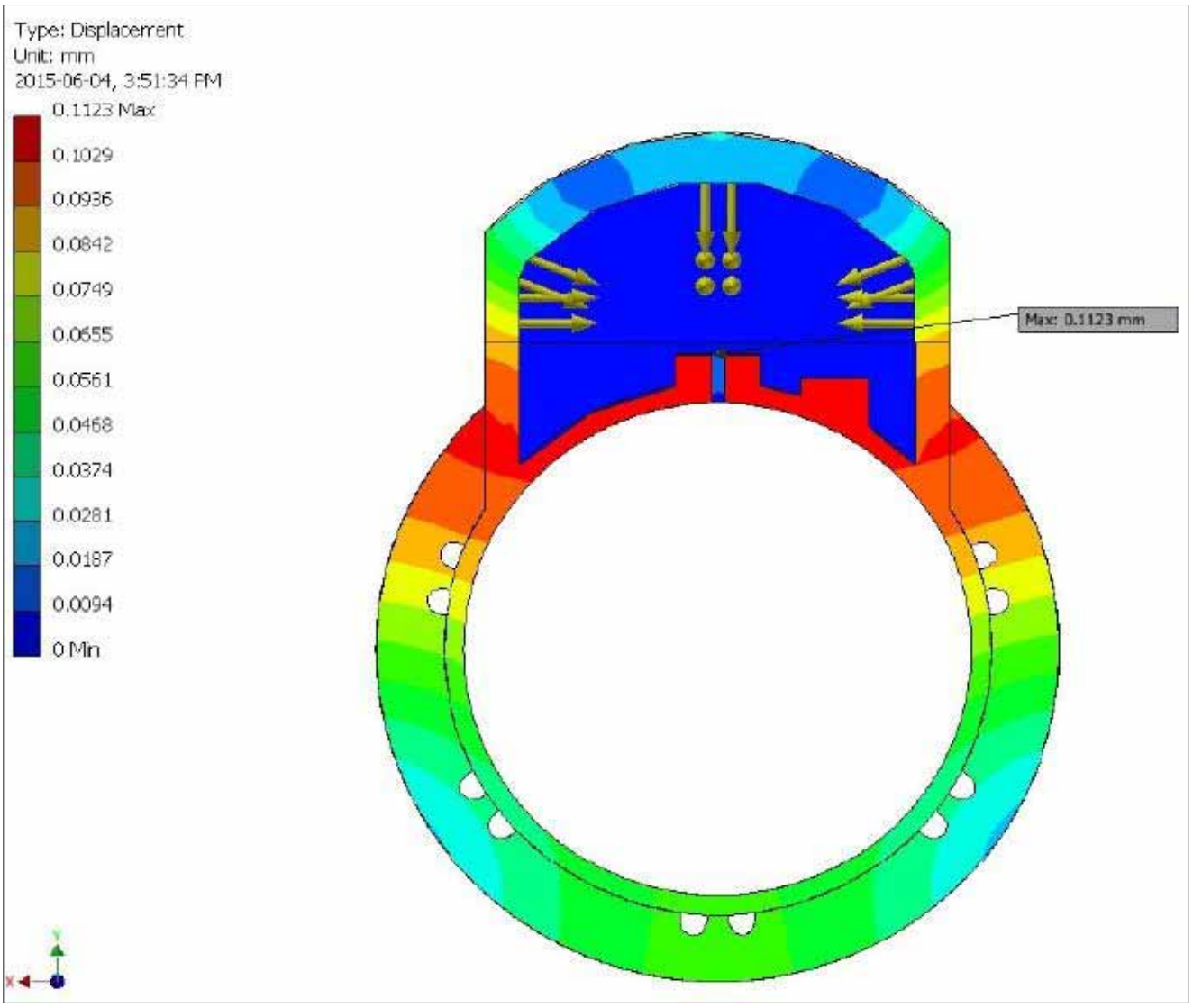
ADC provided the design and engineering for Tuning Stub Outer and Inner Conductors and Sliding Short for the Ion Cyclotron Heating (ICH) system on the ITER fusion reactor under construction in France. Fusion is the process of having the nuclei of two light atoms forming into one heavier nucleus. The result is a release of more energy than put into the action. This is the same process generated by the sun and most other stars. Fusion is also the reason for the massive destructive power in hydrogen bombs. In contrast, fission involves a subatomic particle impacting with and splitting apart an atomic nucleus. All current nuclear reactors and power plants utilize some form of nuclear fission. Fusion power is also much cleaner than fission in terms of releasing radiation into the surrounding environment. The $30 billion ITER program plans to see their first sustained fusion reactions around 2020.
For more information please go to: https://www.iter.org/

OAK RIDGE National Laboratory



To facilitate in understanding how fusion works and the complexities in recreating such powerful energies on earth to what goes on inside the sun we recommend viewing the following: http://www.youtube.com/watch?v=GbzKFGnFWr0&list=TLTLdjPkVoBlg





OVERALL CAPABILITIES

Design

Fabrication

Assembly

Installation

OVERALL CAPABILITIES

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.

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.

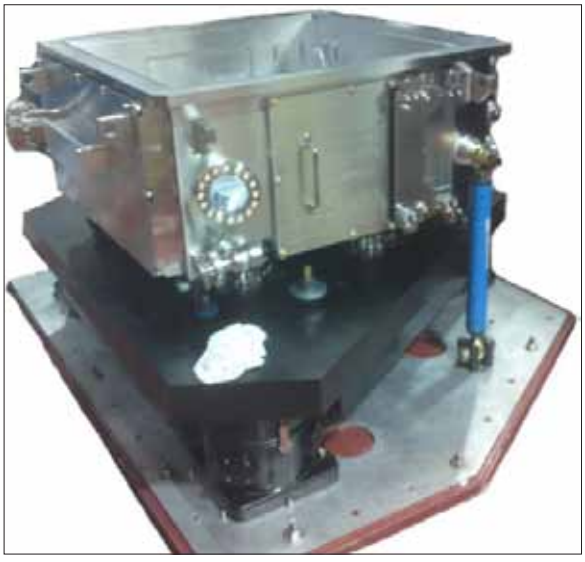
ADC has 23 years of combined experience as a welding shop and high attention to detail required ensuring that our welding shop provides the best welds and custom metal fabrication products every time.

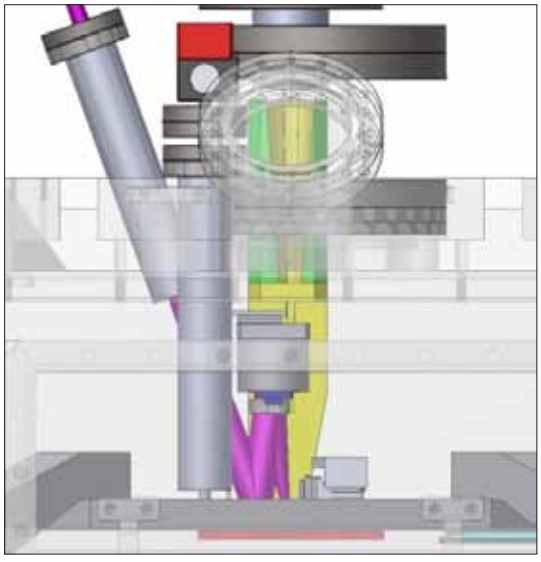
ADC welders are constantly trained and kept up-to-date on the latest welding techniques and have some of the most technologically advanced equipment available. That means customers enjoy a welding shop with knowledgeable craftsmen who give more attention to detail than other welding companies. Our goal 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.



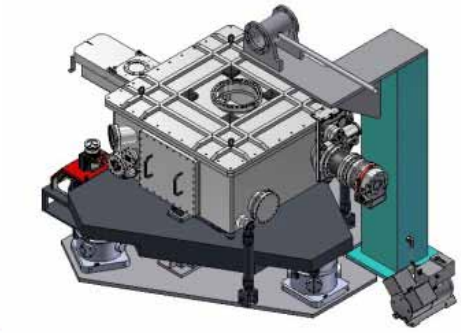


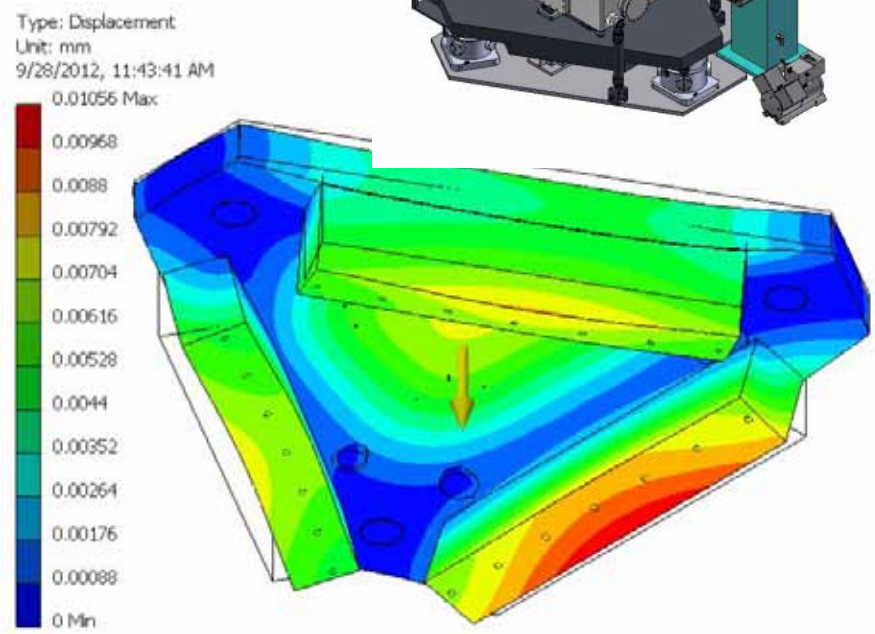
FINITE ELEMENT ANALYSIS

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:

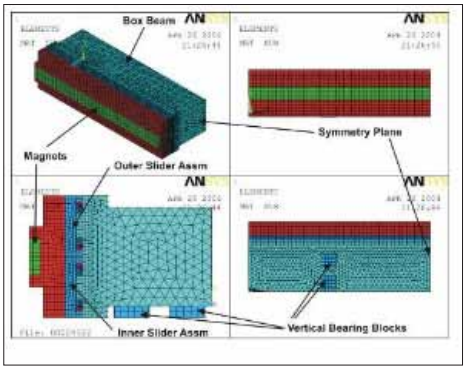
Structural Integrity

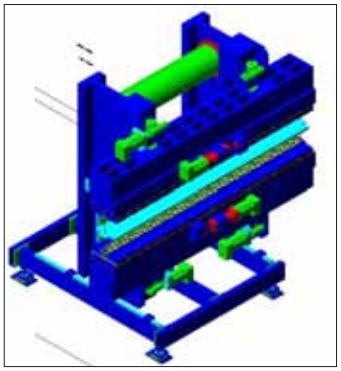
- Component Life Prediction
- Fatigue, Buckling, and Code Compliance
- Design Optimization
- Fabrication Process Evaluation
- Heat Transfer
- Thermal Cycling
- Creep Response & Ratcheting
- Shock, Vibration & Impact
- Flow-Induced Vibrations
- Fluid Flow Analyses
- Computational Fluid Mechanics
- 2D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

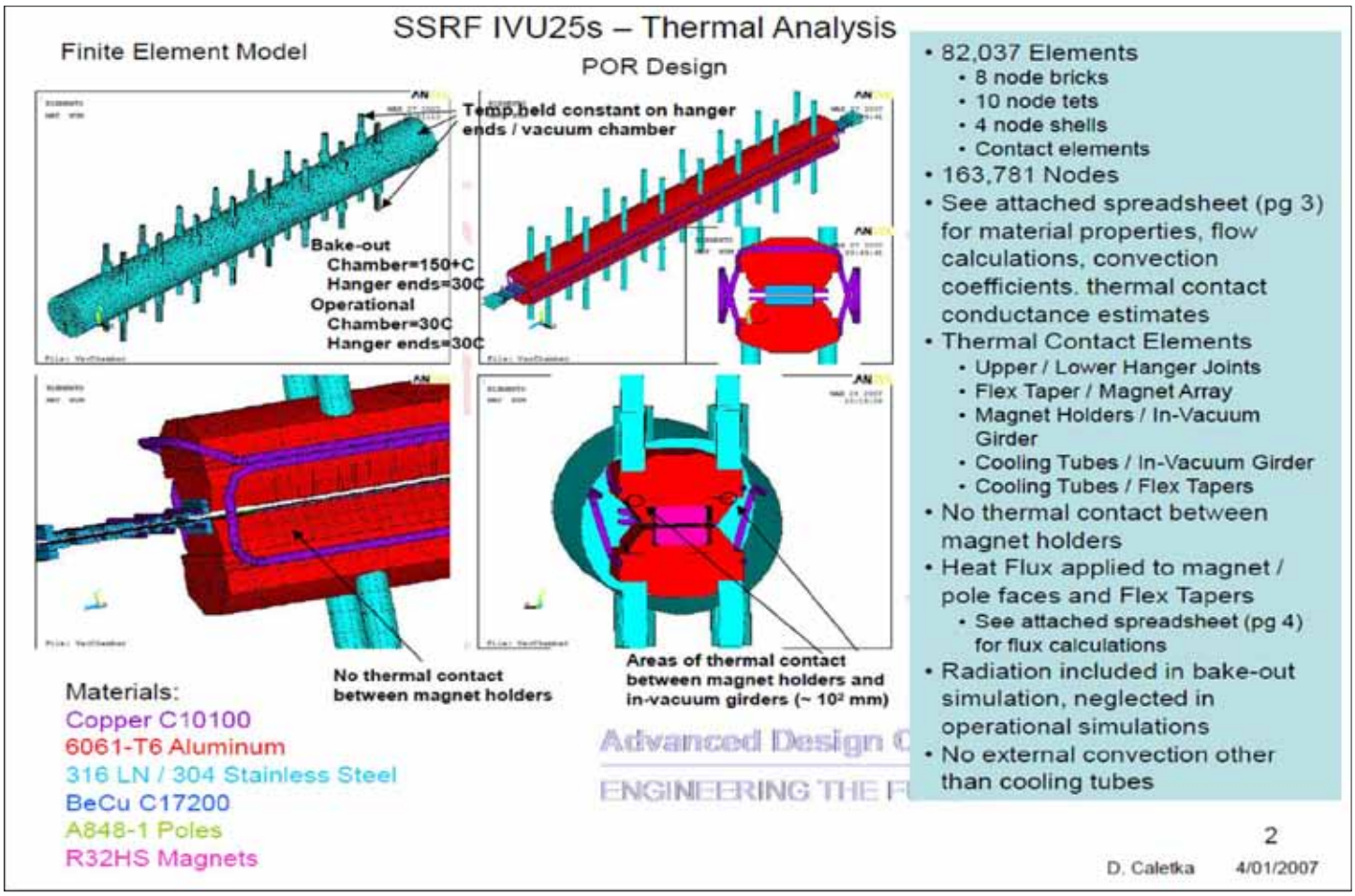




ADC uses Finite Element Analysis (FEA) to predict the deflections of complex and critical structures and to solve the most challenging product engineering problems. For example, when ADC's engineers design insertion devices, the magnet support structure behavior can be simulated in ANSYS by applying 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

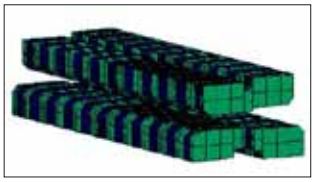
The Engineering Design and Analysis group at ADC also perform magnetic designs. These are typically performed for an insertion device. ADC's scientists use B2E, SRW and RADIA (developed at the ESRF), along with Mathematica and ANSYS FEA in the design of insertion devices. An initial, parametric magnetic 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

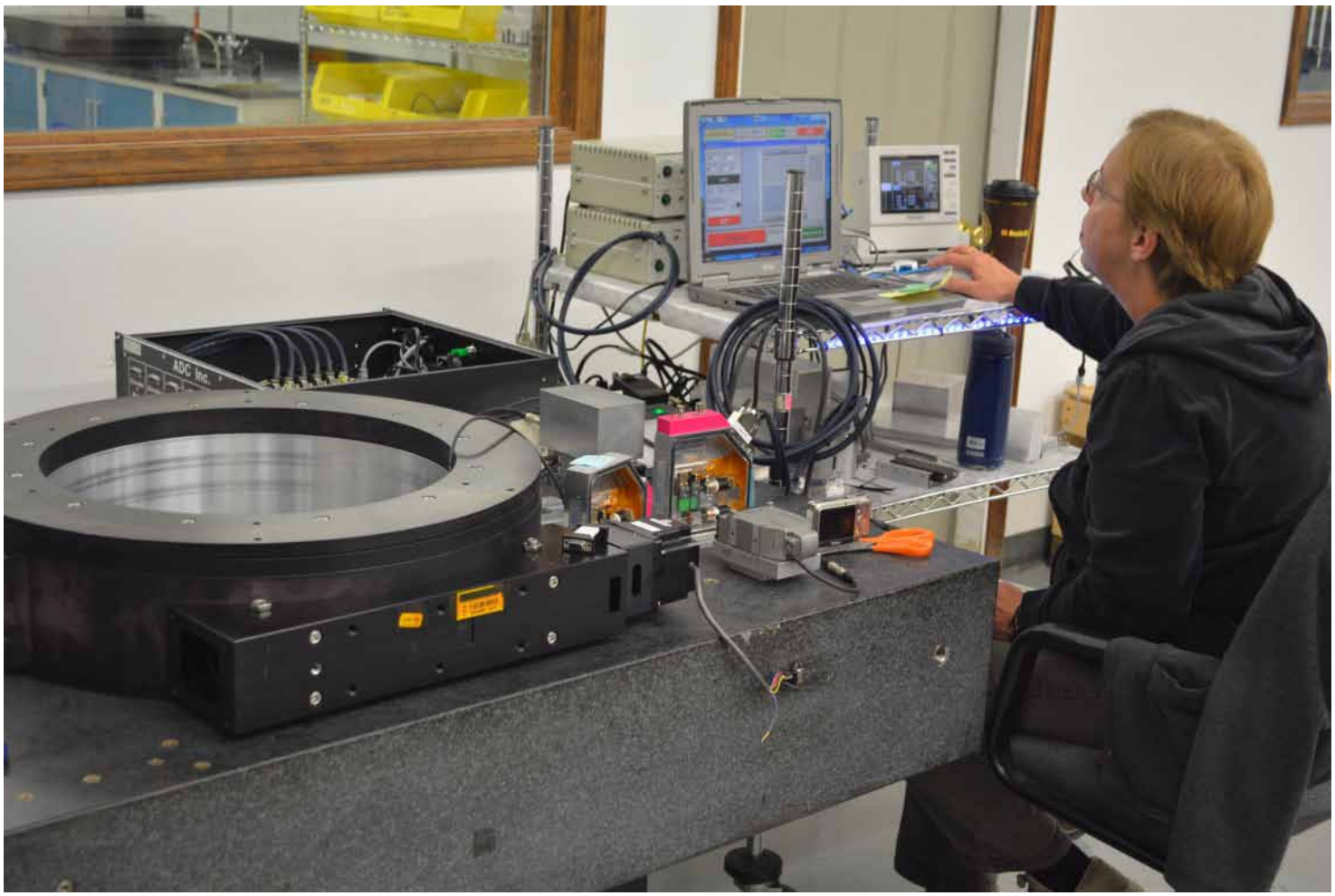
ADC uses SHADOW a widely used program for the simulation of optical systems, more geared to the synchrotron radiation research. It is based on a geometrical ray-tracing approach, but also traces field amplitude with phase difference. This design tool is used by ADC in combination with ADC's High Accuracy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

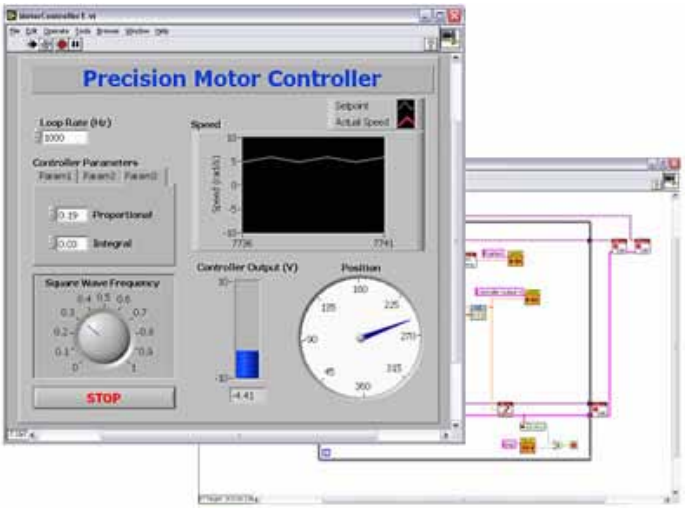
- Intel® Core™ i3-2100 processor (3MB Cache, 3.10GHz)
- 2GB Dual Channel DDR3 SDRAM at 1333MHz - 2 DIMMs
- 250GB Serial ATA Hard Drive (7200RPM) w/DataBurst Cache™
- Genuine Windows® 7 Professional SP1, 64bit
- Dell E Series E2011H 20"W Monitor, 20.0 Inch VIS, Widescreen, VGA/DVI

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.

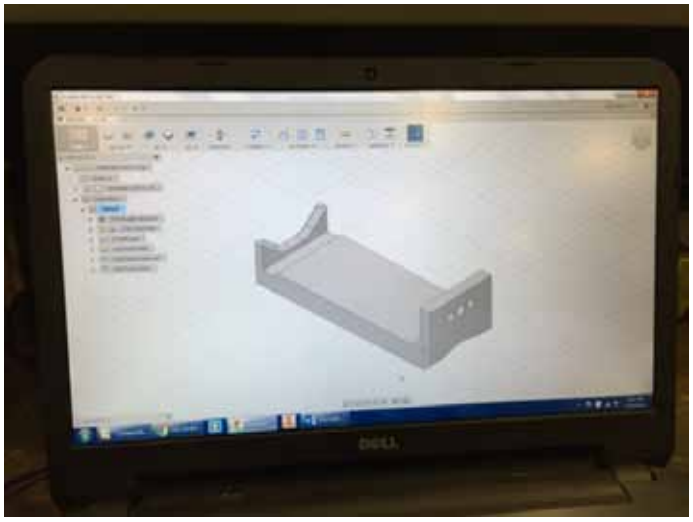
Graphical User interface for the motion control include:

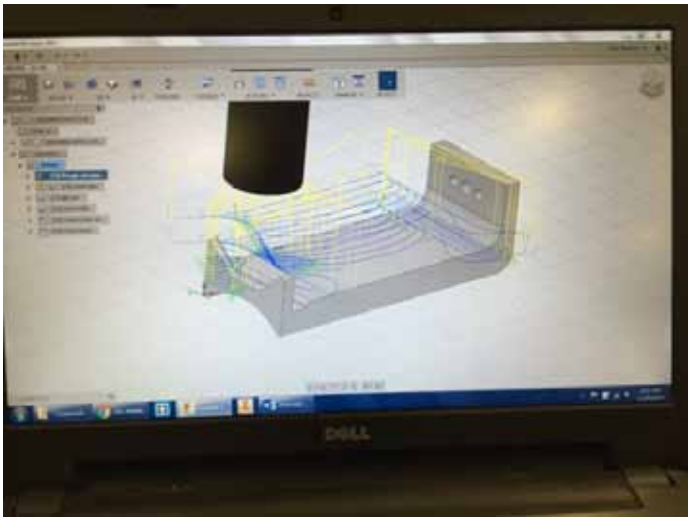


- Data Display;
- Ability to move individual axis;
- Absolute move of axis;
- Relative move of axis;
- Home individual axis;
- Encoder feedback;
- Limit switch detection, and;
- Easy install on a Windows OS platform.

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.



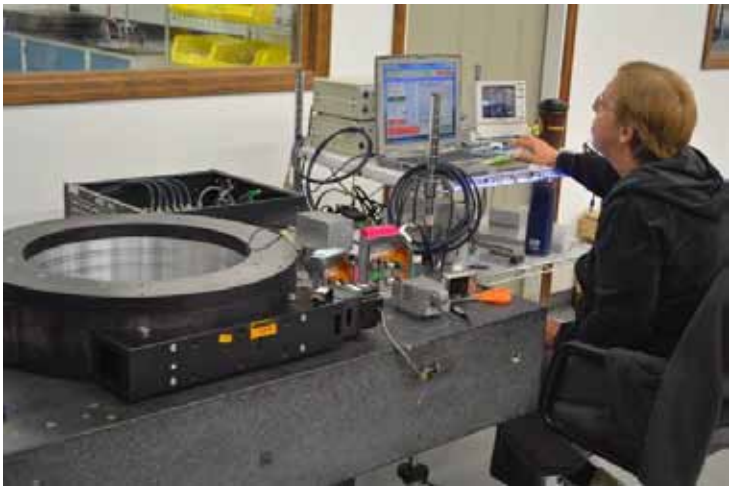

Vibration dampening vault

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.

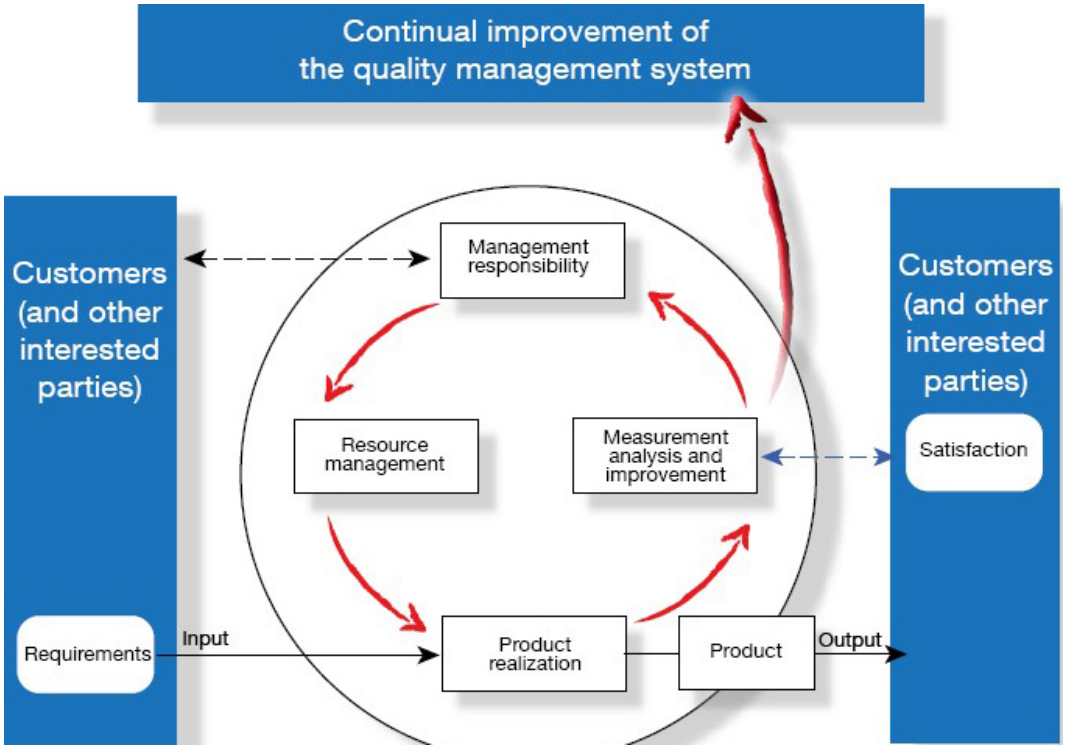
The uality management system of ADC meets ther equirements of the international standard ISO9001:2008. This system addresses the manufactur eandpr oduction of ADC's and its customers' products.

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.

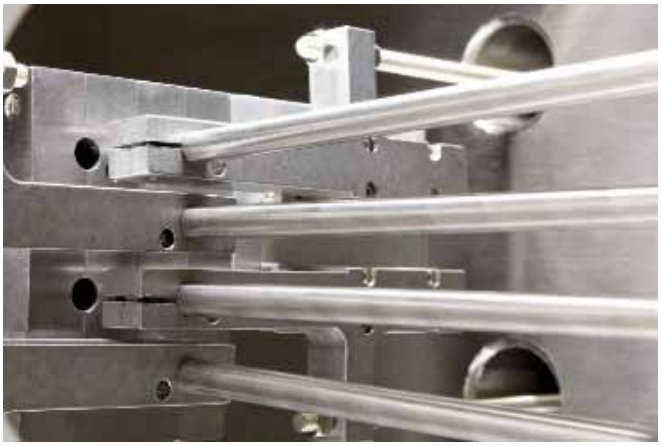
http://www.adc9001.com/REFERENCES

SUCESSFUL PROJECT

"Pellet Selector" as part of the International ITER project for Fusion

A new article titled "Controlling ITER with fuelers, ticklers, and terminator" September 9, 2015

The following shows a copy of the article featured on the Oak Ridge National Laboratory website describing the project completed by ADC USA, Inc. for the Pellet Selector:



Media Contact
Leo Williams, Communications
williamsjl2@ornl.gov, 865.574.8891

When it's up and running, the ITER fusion reactor will be very big and very hot, with more than 800 cubic meters of hydrogen plasma reaching 170 million degrees centigrade. The systems that fuel and control it, on the other hand, will be small and very cold.

Pellets of frozen gas will be shot into the plasma—some to keep it fueled, some to manage plasma activity, and some to extinguish the plasma as needed.

The idea of using frozen pellets to fuel a magnetic fusion reactor is not new. Researchers with ORNL's Fusion Materials and Nuclear Systems Division have been working on the technology for 35 years. Their handiwork helps run fusion experiments across the world, including America's largest fusion reactor, the DIII-D tokamak operated by General Atomics in San Diego.

Their expertise also made them the right choice to take on the much more challenging job of controlling ITER, which is more than eight times larger than the largest fusion reactor now in existence.

"The pellets are much more efficient at fueling the fusion plasma because they can penetrate fairly deep into the hot plasma before being ablated and ionized into additional plasma," explained Larry Baylor of ORNL's Plasma Technology and Applications Group.

"The alternative method of injecting gas that is primarily used in today's smaller devices will not add fuel efficiently in ITER because of its large size and high magnetic field."

Baylor said his group is working on three types of pellet, which he refers to as fuelers, ticklers, and terminators.

Fuel pellets containing two hydrogen isotopes—deuterium and tritium—will be shot into the inside of the donut-shaped plasma to keep it burning. The pellets will be produced in a screw extruder chilled with liquid helium.

Helium in its liquid state is a chilly minus-452 degrees Fahrenheit, or four degrees above absolute zero. The cold turns the hydrogen into a liquid in the top of the extruder and a solid in the bottom.

At this point the hydrogen has a consistency not unlike toothpaste. The ORNL-designed device uses twin screws to pump the solid through a small nozzle, where it is cut into pellets and shot into the reactor with a device called a "repeating pneumatic gun."

Baylor said the fuel pellets are a little larger than .177-caliber air rifle pellets. To keep ITER going, the system will need to inject about four each second, or 15,000 an hour.

The same system produces the tickler pellets, which are about four times smaller than the fuel pellets. The tickler pellets are designed to prevent a fusion reactor's version of damaging solar flares—bits of plasma that peal off and hit the plasma-facing surfaces on the inner wall of the vessel. They do this by creating a series of smaller flares to diffuse the built-up energy.

"We want to make the flare-like events as small as possible," Baylor said. "We use the same device to shoot small hydrogen bullets to tickle the edge of the plasma so that it stays relatively stable."

Of all the pellets being designed by the ORNL team, the ticklers are the trickiest, Baylor said, because the experience gained from existing facilities such as the San Diego reactor is limited and high repetition rates are needed.

"The most difficult of the three to extrapolate is the tickler, because the ITER plasma is so much larger. It's a higher magnetic field, and hotter, and we cannot very well replicate the edge of the plasma conditions in DIII-D. That one is much more difficult."

The third type of pellet is meant to halt the fusion reactions altogether. It is for times when the whole plasma becomes unstable and threatens to come in contact and severely damage the plasma-facing surfaces of the containment vessel. These pellets are much larger than the others and are filled with frozen neon.

ITER will have around two dozen frozen terminator pellets ready to blast into the plasma. The system won't get much warning of an impending disruption—in some cases only about 20 milliseconds. As a result, the pellets will have to reach speeds over 670 miles an hour to get to the plasma in time.

The tubes that carry the terminator pellets into the plasma will have a sharp bend, causing the pellets to shatter just before they reach the plasma and ensuring that the frozen neon is injected as a spray. The spray will stop the fusion reactions and cool the plasma, turning it back into a gas.

The instabilities are known as disruptions. Baylor said ITER's developers came to appreciate over time the serious possibility that 800 cubic meters of super hot plasma could damage the plasma-facing surface.

"When ITER was first designed, they really didn't worry too much about these disruption events," he explained. "Then, over time, they realized it could be a detriment to machine operation. So it's very critical that we develop a reliable mitigation technique to keep that from happening."

Baylor said the pellet systems will go through final design review during the 2018 federal fiscal year, which ends in September. He said they expect to deliver the systems to the ITER site in southern France starting in 2020.

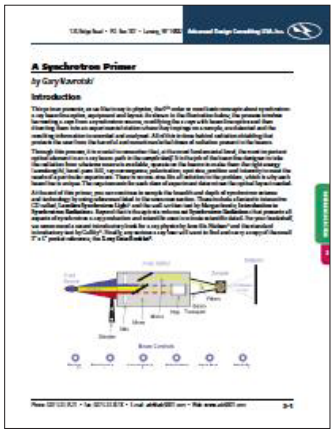
Link to the article on ORNL.gov:
https://www.ornl.gov/news/controlling-iter-fuelers-ticklers-and-terminators-0

To view information on ADC's website for the pellet selector, click the following link:
http://www.adc9001.com/products/view/464

ITER is a large-scale scientific experiment that aims to demonstrate that it is possible to produce commercial energy from fusion. For additional information, please visit the ITER web site at **http://www.iter.org/.**

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.

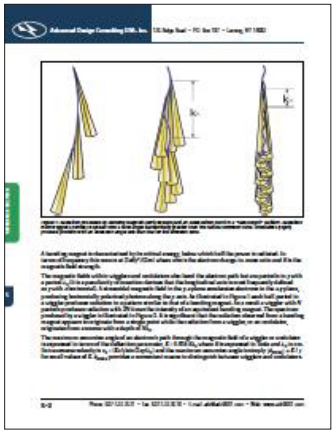


A Synchrotron Primer

"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...."

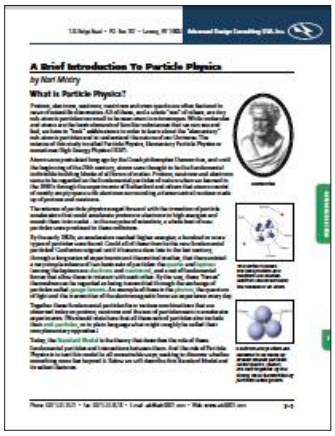
A Vacuum Primer

"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

"To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science"

Albert Einstein

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