High Precision Systems

High Quality Systems to the Synchrotron, Neutron,

FEL, and High Radiation Scientific Communities

2019

www.adc9001.com

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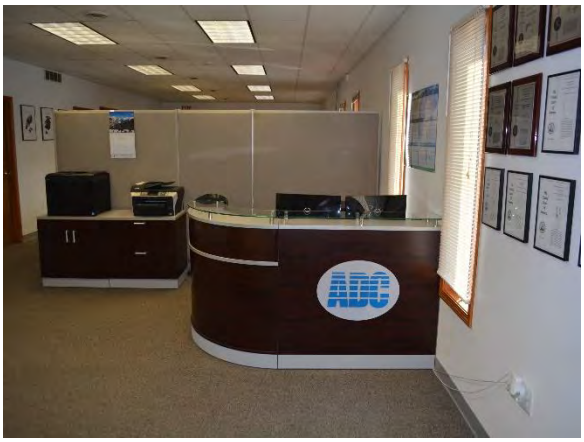
ADC USA, Inc.

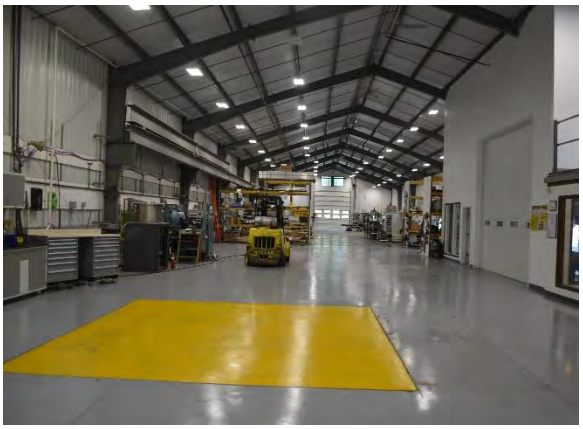
ADC USA, Inc. (ADC) is a leading developer and supplier of complex scientific components and instruments for large government laboratories and corporations around the world.



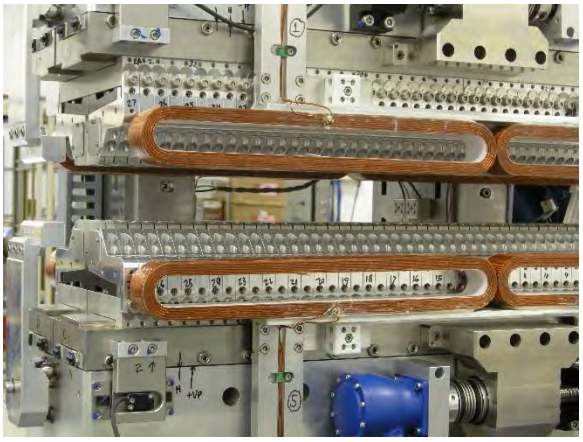
ADC, like many successful companies (and rock bands), got its start in a garage in 1995. Our garage was in Ithaca, NY, on the shores of Cayuga Lake and home of Cornell University. ADC has since grown into a worldwide leader in the field of design and manufacturing of complex research instrumentation.

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

We specialize in Engineered Experimental Tables (EET) and beamline components.



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



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

Company History

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

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

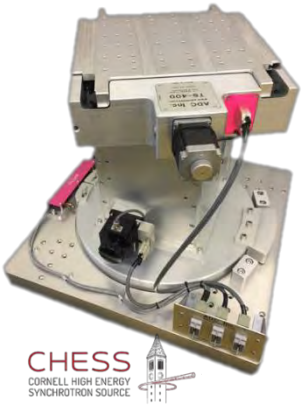
Today, ADC has a worldwide reach. ADC's vision is to be a global leader in the development and manufacturing of innovative products for scientific and research markets.

High Precision Systems Overview

ADC has been a leading supplier of high-quality systems to the synchrotron, neutron, FEL, and high radiation scientific community for over 20 years. Many of our instruments have been in operation nearly that long in facilities around the world. From slits to undulators, ADC has provided instruments both inside and outside the shield wall.

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

2-Axis System with Controller



3-Axis Stage Stack

3-Axis Motorized System

Monochromator

Positioning System

Small-Angle Neutron Scatterina Instrument

Spectrometer

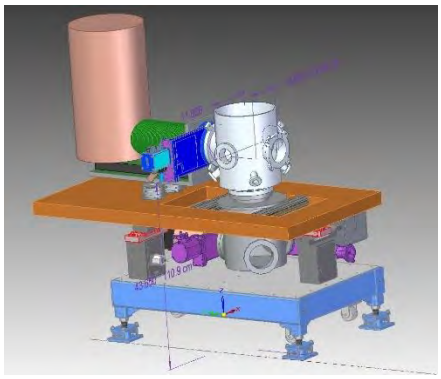
DLS Experimental Tables

Cryostat Dilution Refrigerator

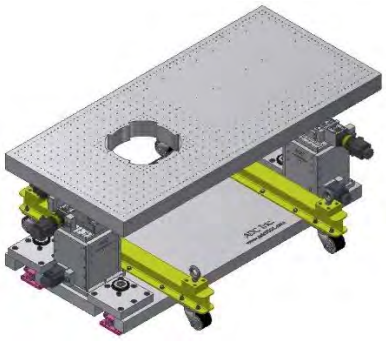
General Information

The Design Starts at ADC

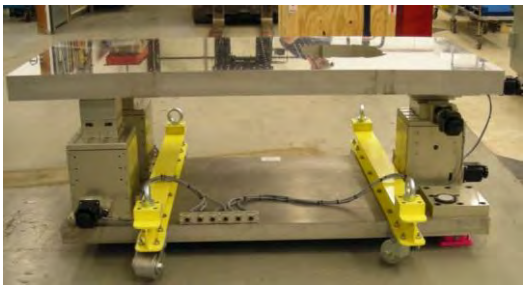
ADC designs systems from the ground up. This means we can build a system from just a simple idea. Our engineering staff has extensive experience designing and building systems from scratch. We have a large library of designs to make a very modular system. We can take a customer's idea from a preliminary design all the way to a final product.



Preliminary Design



Final Design



Finished Product

Floor Mounting

- Adjustable feet
- Air Bearings
- Custom Casters
- Floor Grouting

Breadboard

ADC typically uses Newport's Optical Breadboards to provide rock-solid stability and rigidity to support demanding research applications. They are available in different thicknesses, lengths, and widths.

Motors

ADC's High Precision Systems are provided with motors and limit switches. ADC uses standard Lin Engineering NEMA bi-polar (2-phase) stepper motors with 200 steps/rev (1.8°/step). Depending upon the application and customer requirements, stepper motors of sizes NEMA 23 or 34 may be used.

These motors can be controlled with the majority of off-the-shelf controller/drivers on the market. Planetary gear boxes from CGI are provided on high precision systems to achieve high resolution and load capacity. **ADC also offers the option of using a 5-phase stepper motor or servo motor on the Custom High Precision Systems**.

Limit Switches

Motions in all axes are fitted with mechanical limit switches. Depending on the size and scale of the system there will be a range of limit switches used. In smaller systems a Burgess PN: F4T7Y1 with a lever modification will be used. In larger systems a Honeywell BZ-2RQ18-A2 switch is used. All limit switches are calibrated and tested by ADC's engineers to ensure proper operation and travel. Limit switches are also mounted in slots so they can be adjusted if a different travel is required.

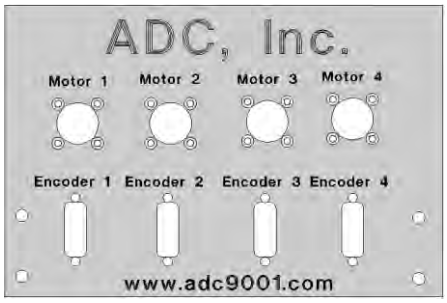
Linear Incremental Encoders

Linear incremental encoders are available as an additional option for ADC's systems. ADC uses high resolution Renishaw TONiC series encoders. TONiC is Renishaw's new super-compact non-contact optical encoder that offers speeds up to 10 m/s and resolutions down to 1 nm for both linear and rotary applications. Offering significant enhancements to Renishaw's existing range of high-speed non-contact optical encoders, TONiC also gives improved signal stability and long-term reliability, low cost of ownership and refreshing simplicity.

Linear Absolute Encoders

Linear absolute encoders are also available on most of ADC's systems. The Renishaw RESOLUTE is a true absolute, fine pitch optical encoder system that has excellent dirt immunity, and an impressive specification that breaks new ground in position feedback. It is the world's first absolute encoder capable of 1 nm resolution up to 100 m/s.

Cabling & Connectors

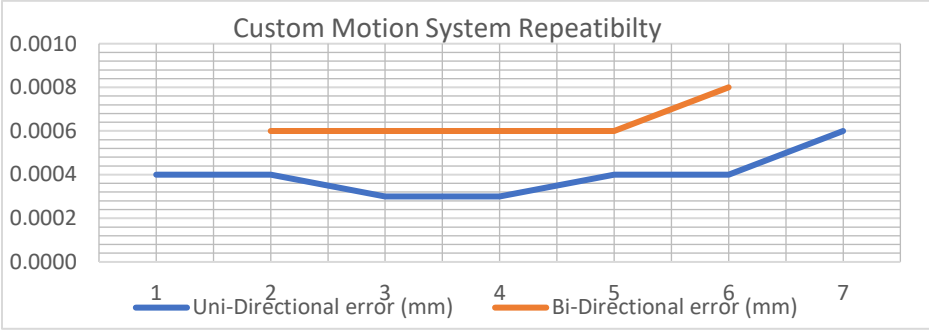


To ensure proper operation of the system, all cabling, wiring and connectors supplied comply with the EMC and NEC directive. To meet these criteria, all conductors and connectors used have sufficient and appropriate shielding capacity. The shielding efficiency is affected by a number of factors such as the overall cable installation and the components employed. Therefore, continuous and homogeneous shielding is done by the use of screened conductors. ADC provides a proper routing and grouping of cables installed. Consideration is given to the design of the cable management system, so practical assembly/disassembly of individual sub-assemblies is not affected during installation or maintenance.

All high precision systems feature a control panel to allow for simple and organized electrical connections.

Testing

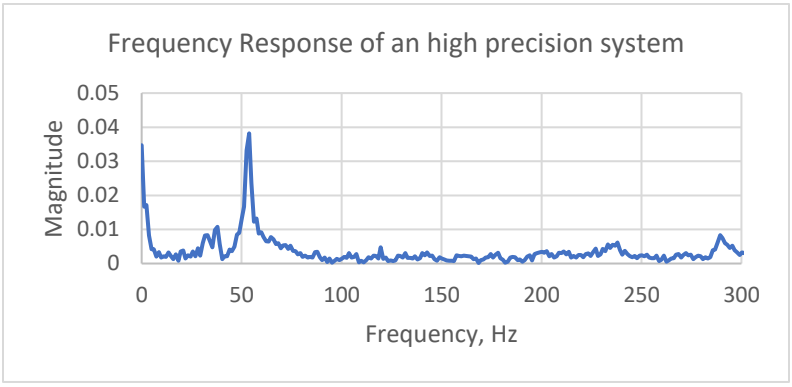
ADC's Custom High Precision Systems are typically designed, built and tested based upon customer specifications/requirements. Typical measurements include mechanical repeatability and frequency response measurements. ADC provides a detailed report with delivery of the equipment to the customer. Below are examples of actual mechanical repeatability measurement tests performed on previous projects:



Uni-Directional error 0.0004 mm / Bi-Directional error 0.0006 mm

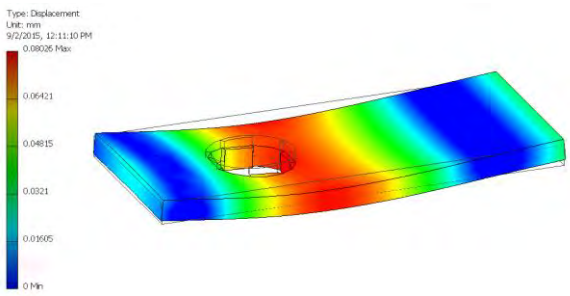
Frequency Response of Built System

The vibrational response of a Custom High Precision System was measured using an accelerometer. Data was recorded on an oscilloscope and exported to Excel for further processing. Using a Fourier analysis, we are able to graph the frequency response. The table was excited using a dead-blow hammer. The oscilloscope took data at a rate of 2,500 samples/sec and sample size for the Fourier analysis was 2,048. Results showed a natural frequency at 54 Hz.



Measured frequency response of the system. These results indicate a fundamental frequency at about 54 Hz.

FEA on the Table Deflection When Loaded

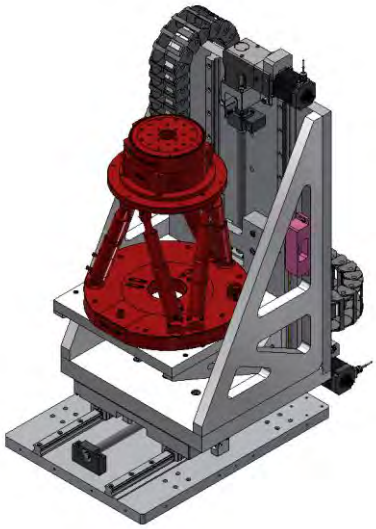


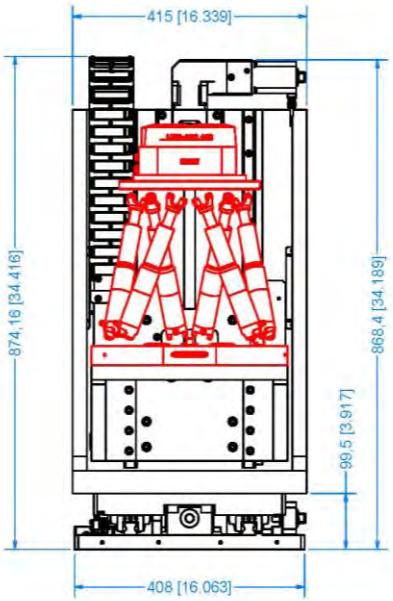
In order to maintain the accuracy of the system, it is important to minimize the deflections due to bending under loading. Different table thicknesses are possible. At right is an analysis to examine the effects of a deflection on a 4" thick Engineered Experimental Tables (EET). These results show that the deflection would more than double if a 3" thick table was used. Therefore, it was decided to use a 4" thick table unless it became absolutely necessary to use a thinner table in order to meet the overall height requirement.

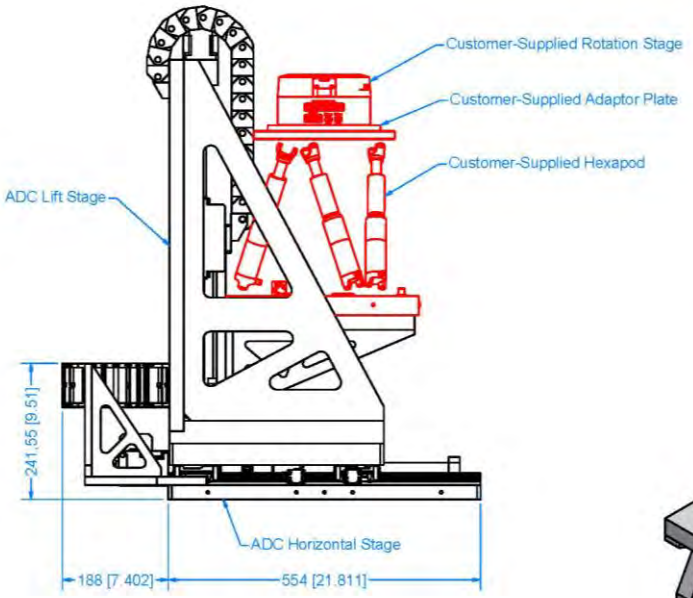
2-Axis System with Controller

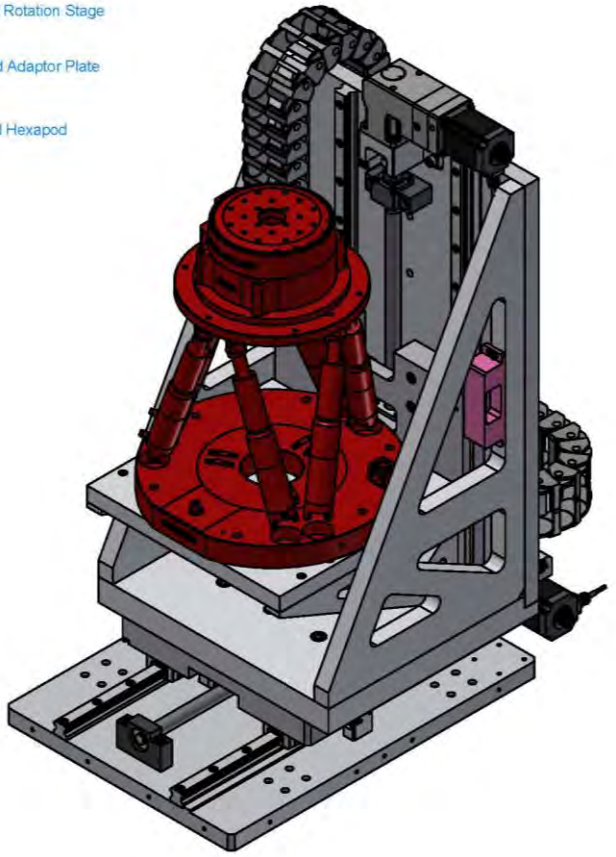
Customer:
Sincrotrone Trieste S.C.p.A.
S.S.14 km 163,5 in Area Science Park
34149 Basovizza Trieste
ITALY

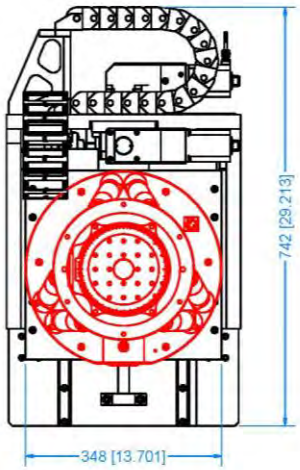
Motion stages for the Elettra synchrotron in Trieste, Italy, were designed and built to hold another set of stages (shown in red below) which manipulate a sample for X-ray experiments. The lift stage arrangement was selected to produce a more compact total height than if a more conventional jack stage was placed directly under the hexapod. The ADC stages are positioned using ball screws driven by stepper motors, with right-angle gearboxes to keep the overall size as small as possible. Incremental linear encoders are installed to provide position feedback for the control system.











Notes:

1. Customer-supplied equipment shown in red on this sheet
2. Approximate mass 143 kg
3. Horizontal stage specifications:
   Travel: at least 150 mm
   Resolution: 5 micron/step
   Speed: 5 mm/step
   Equipped with Incremental Encoder
   Driven by 2-phase stepper motor with 5:1 gear reduction
4. Vertical stage specifications:
   Travel: 300 mm
   Resolution: 2.5 micron/step
   Speed: 2.5 mm/step
   Equipped with Incremental Encoder
   Driven by 2-phase stepper motor with 10:1 gear reduction

Material	Protective Finish: None	Drawing Standard: ASME Y14.5-2009		Date
Purchased Part Modification: No	Approximate Mass: 143 kg [315 lbs]	Drawn By: T Shea		2018-10-08
		Design by: T Shea		2018-09-28

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

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

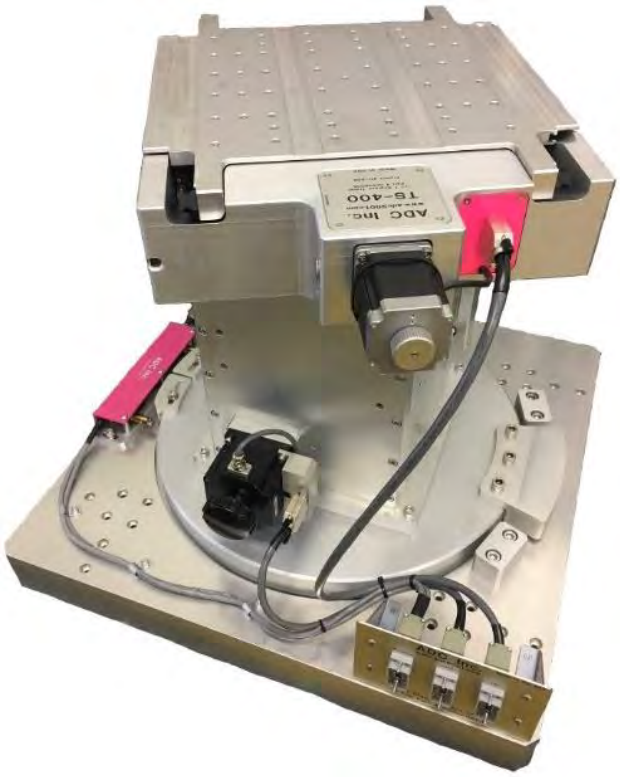
ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

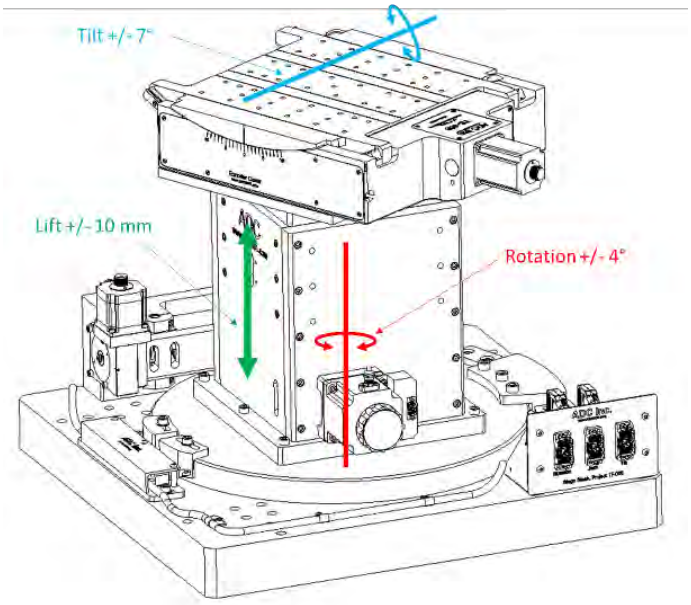
2-Axis Stage System Assembly, 18-030

Part Number	Risk	Revision	Size	Sheet
00031711	D2/S1	0	A2	

3-Axis Stage Stack

Customer:
CHESS
Wilson Laboratory
161 Synchrotron Drive
Ithaca, NY 14853

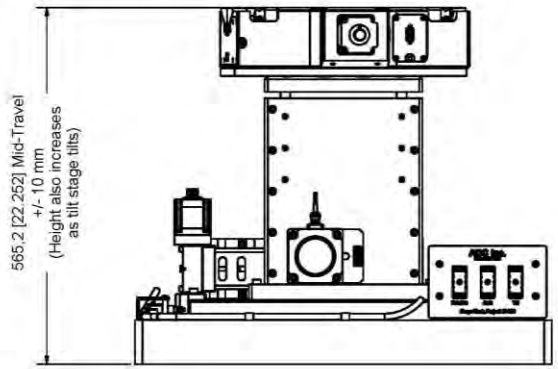


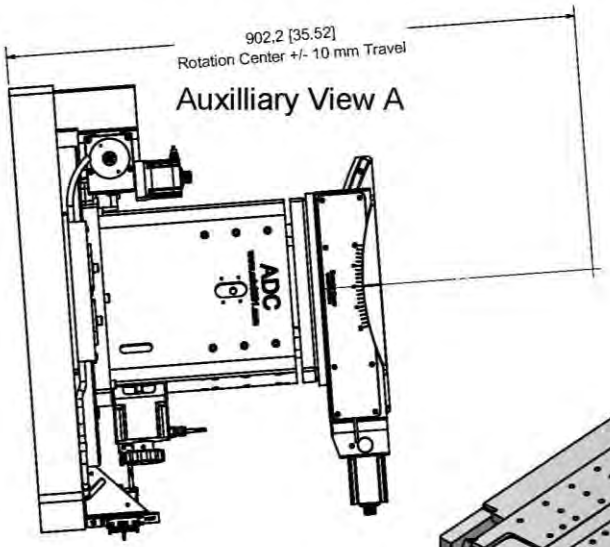


A set of five (5) vertical lift stages (jacks), three (3) tilt stages (horizontal rotation axis), and three (3) rotation stages (vertical rotation axis) were delivered to the Cornell High Energy Synchrotron Source (CHESS) as three stacks containing one of each stage type, and two more lone jacks. This equipment was part of the CHESS-U upgrade effort, with the 3-axis stacks supporting and moving components to divert the x-ray beam and allow multiple experimental stations to be served by a single front end. The system was designed as an assembly of standard or semi-standard components and remains very modular. Each axis of motion was provided by an independent stage which could be separated and used elsewhere. All were driven by stepper motors, and no position feedback was required by the customer, though it could easily have been supplied.

Key Specifications:

Description	Value	Units
Rotation Range	+/- 4	°
Tilt Range	+/- 7	°
Vertical Travel Range	+/- 0.393 [10]	In [mm]
System Weight/Mass	450 [210]	lbf [kg]
Max. Lifted Load	275 [125]	lbf [kg]
Max. Tilted Load	150 [203]	lbf*ft [N*m]

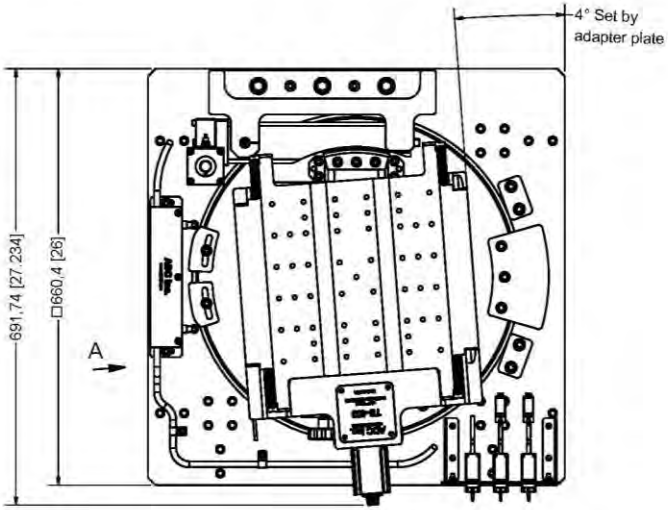


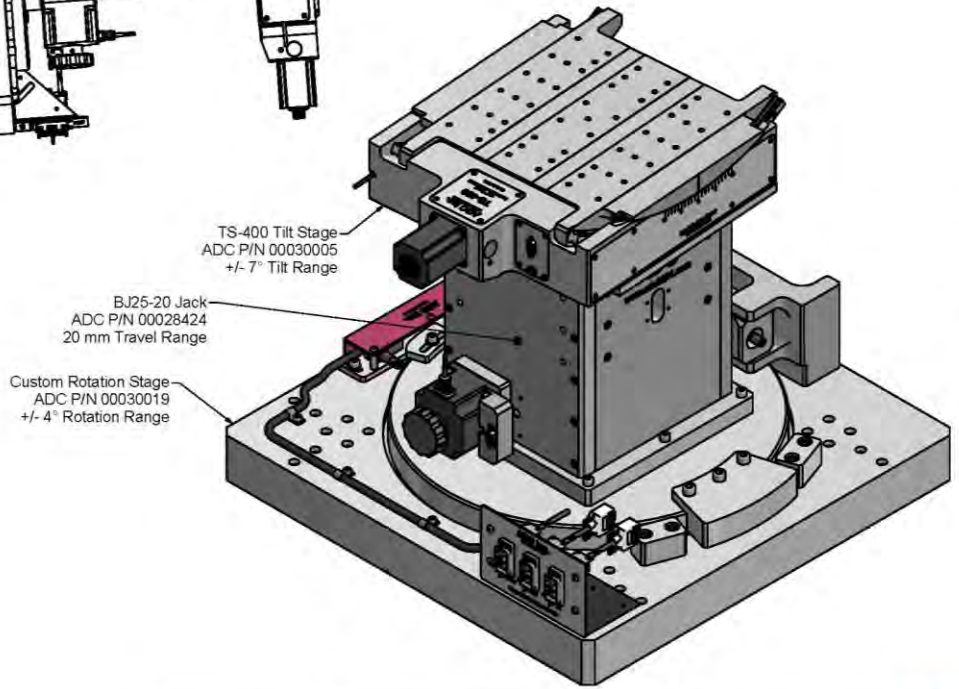


NOTES:

1. See individual stage literature for full data on each stage

2. Patch panel with EDAC connectors shown (other connects available on request)





Material	Protective Finish: None	Drawing Standard: ANSI Y14.5M-1994		Date	ADC Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3610 E-mail: adc@adc9001.com / Web: www.adc9001.com ISO 9001:2008 Certified
Purchased Part Modification: No	Approximate Mass: 206.4 kg [454 lbs]	Drawn By: T Shea		2017-09-07	
		Design by: T Shea		2017-09-07	
This drawing is the property of ADC USA, Inc. Any disclosure, use, and/or reproduction of this drawing or the designs contained herein by the client or any of its collaborators, suppliers, etc. without prior written consent of ADC USA, Inc. is prohibited. 2-D drawings are provided for review purposes only and must be destroyed after review or kept confidential at all times. ADC USA, Inc. is not responsible for the unauthorized use and/or alteration of this drawing or the designs contained herein. Any violation of this agreement is open to possible legal action. The governing laws of the State of New York apply to all legal issues for this matter.		UNLESS OTHERWISE SPECIFIED: All Dimensions BASIC N7 machined surfaces 0.13, 0.38 ⌖ 0.25 A B C ⌓ 0.25 A B C			Stage Stack Assembly, Sector 4, Project 17-006	
					Part Number: 00030056 | Rsk: D2/S0 | Revision: 0 | Size: A2 | Sheet:

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

Motion System for KB Mirror

Customer:

Argonne National Laboratory
9700 S. Cass Ave.
Argonne, IL 60439

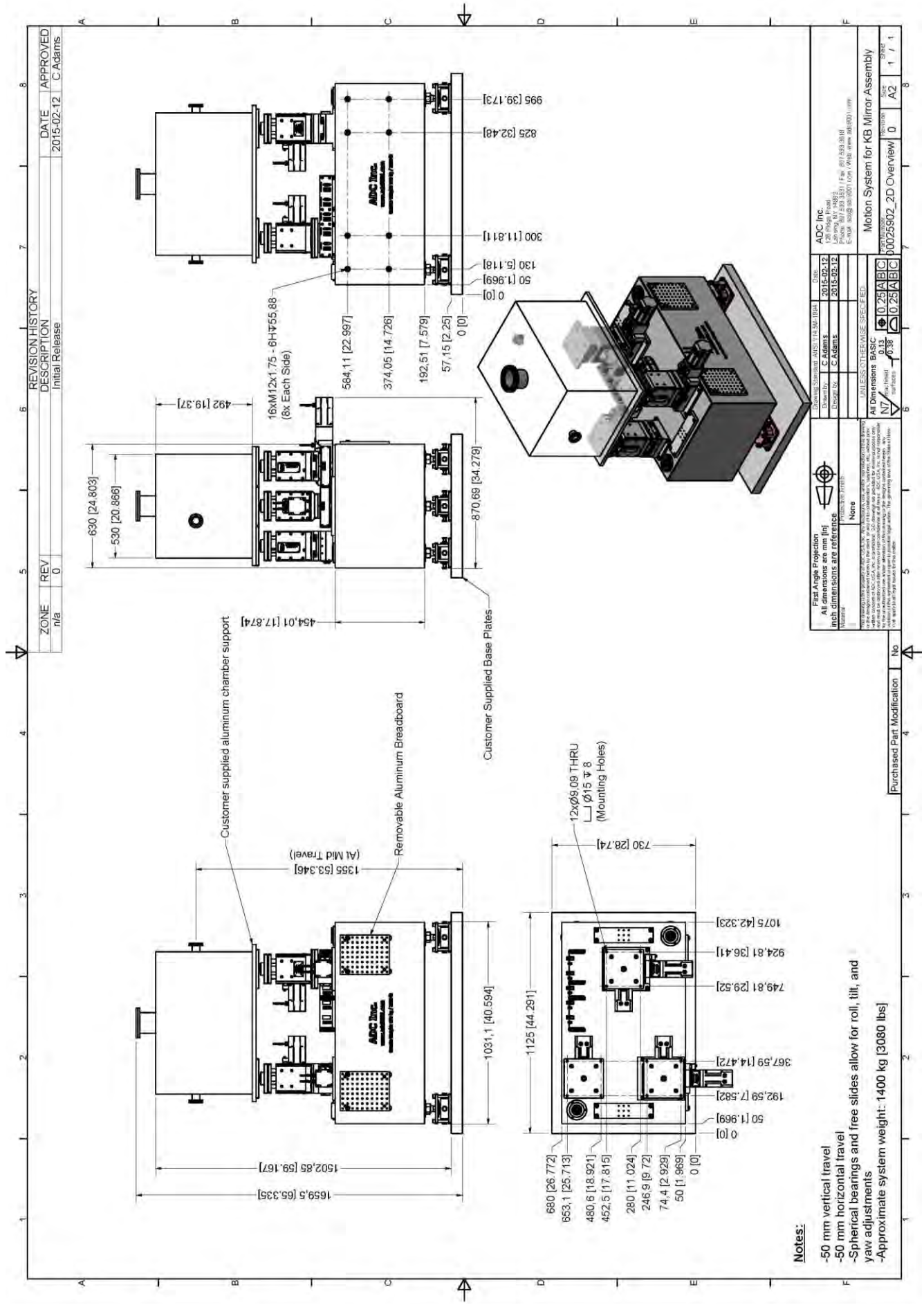
A system was designed for Argonne National Laboratory that provides 5 degrees of motion for their KB Mirror. The mirror chamber has 50 mm of vertical (z-axis) travel and 75 mm horizontal (x-axis) travel with a resolution of 1 µm. Through the use of stacked precision slides, precision jacks, and free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

Key Specifications:

Linear Travel Specifications:

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

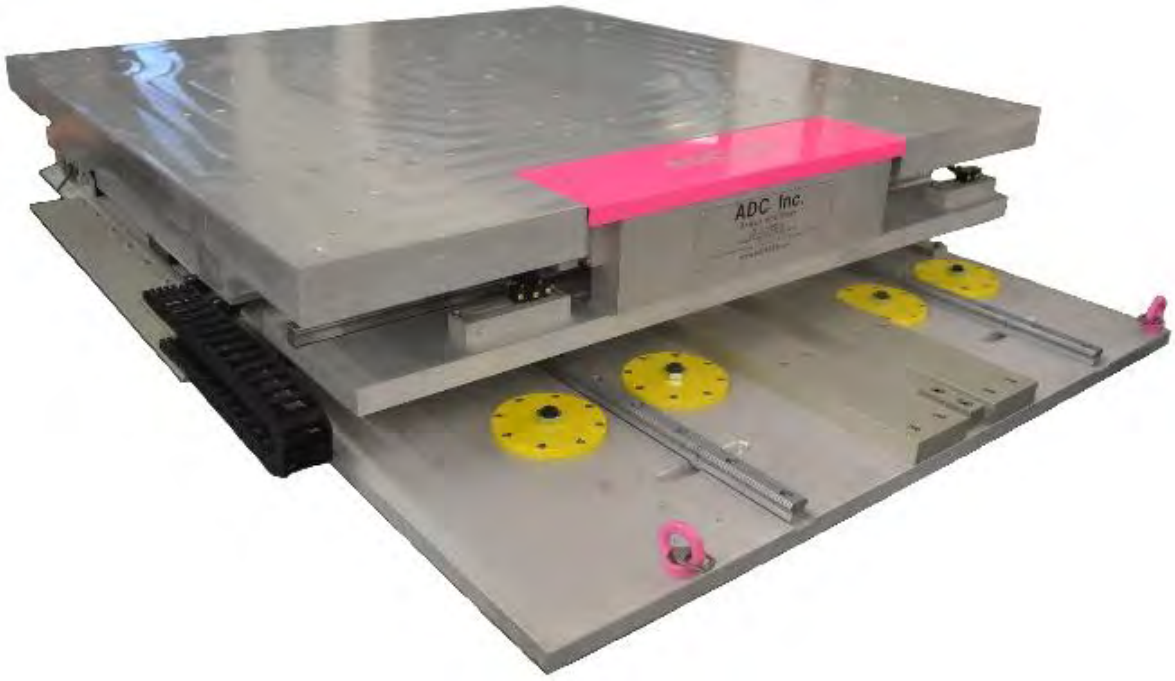
Description	Value	Units
Range of Motion (X Axis)	75 [~3]	mm [in]
Resolution (unit/step)	~0.001	mm/step
Encoder Manuf.	Renishaw	-
Encoder Resolution	0.1	µm


REVISION HISTORY
ZONE | REV | DESCRIPTION | DATE | APPROVED
n/a | 0 | Initial Release | 2015-02-12 | C Adams
995 [39.173]
825 [32.48]
300 [11.811]
130 [5.118]
50 [1.969]
0 [0]
16xM12x1.75 - 6H↧55.88
(8x Each Side)
584,11 [22.997]
374,05 [14.726]
192,51 [7.579]
57,15 [2.25]
0 [0]
492 [19.37]
630 [24.803]
530 [20.866]
870,69 [34.279]
454,01 [17.874]
Customer supplied aluminum chamber support
Removable Aluminum Breadboard
Customer Supplied Base Plates
1355 [53.346]
(At Mid Travel)
1031,1 [40.594]
1502,85 [59.167]
1659,5 [65.335]
12xØ9.09 THRU
⌴ Ø15 ↧ 8
(Mounting Holes)
730 [28.74]
1125 [44.291]
1075 [42.323]
924,81 [36.41]
749,81 [29.52]
367,59 [14.472]
192,59 [7.582]
50 [1.969]
0 [0]
680 [26.772]
653,1 [25.713]
480,6 [18.921]
452,5 [17.815]
280 [11.024]
246,9 [9.72]
74,4 [2.929]
50 [1.969]
0 [0]
Notes:
-50 mm vertical travel
-50 mm horizontal travel
-Spherical bearings and free slides allow for roll, tilt, and yaw adjustments
-Approximate system weight: 1400 kg [3080 lbs]
Purchased Part Modification | No
First Angle Projection
All dimensions are mm [in]
Inch dimensions are reference
Material
Finish
None
Drawing Standard: ASME Y14.5M-1994
Drawn by: C Adams | 2015-02-12
Design by: C Adams | 2015-02-12
UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
Surface finish 0.13 / 0.38
0.25 A B C
0.25 A B C
ADC Inc.
Lansing, NY 14882
Phone: 607 533 3531 | Fax: 607 533 3516
E-mail: adc@adc9001.com | Web: www.adc9001.com
Motion System for KB Mirror Assembly
Part Number: 0025902_2D Overview
Revision: 0
Size: A2
Sheet: 1 / 1

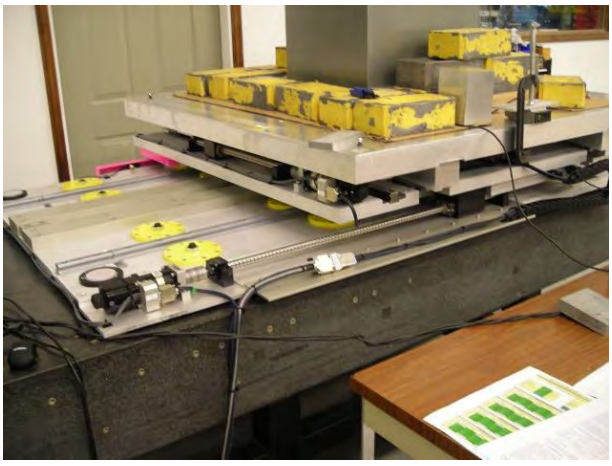
3-Axis Motorized Positioner

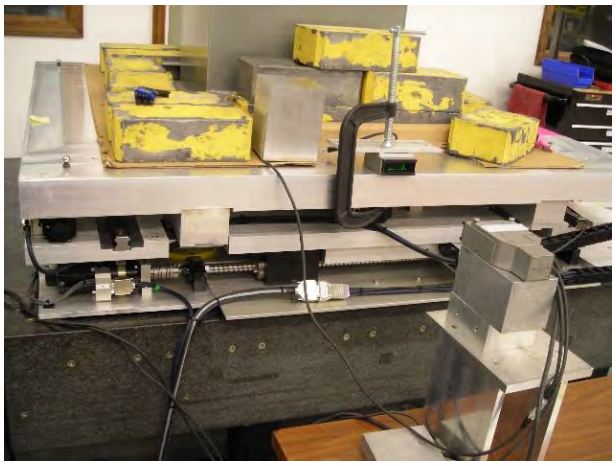
Customer:

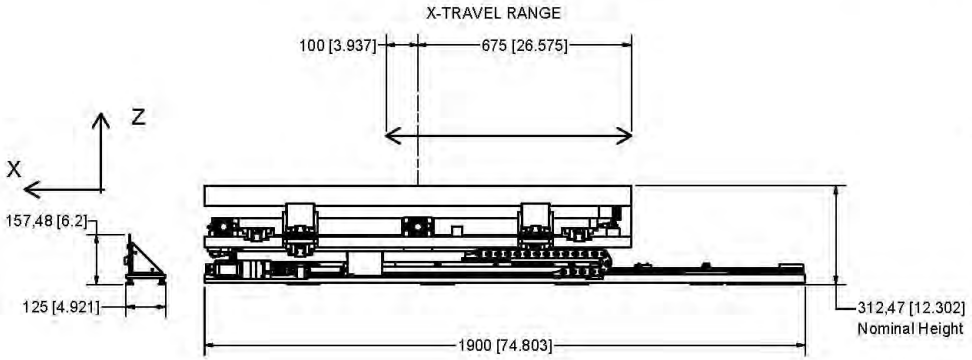
National Synchrotron Radiation Center
SOLARIS
U1. Czerwone Maki 98
30-392 Krakow, Poland

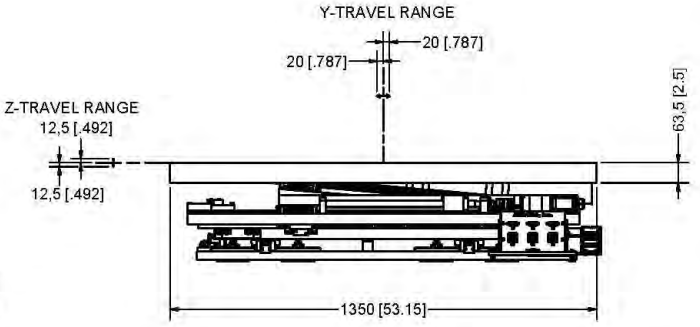


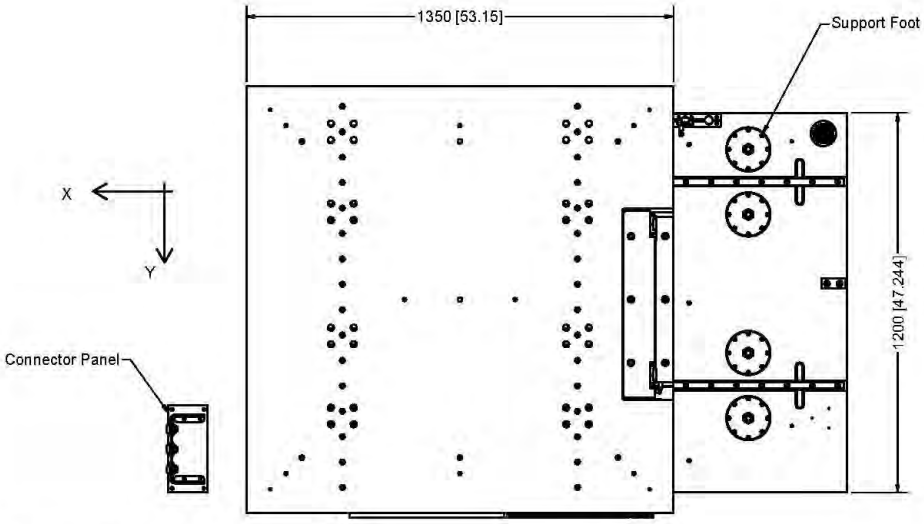
This custom high load, high precision 3-axis motorized system was designed for one of the first two beamlines at SOLARIS Jagiellonian University in Krakow, Poland. The system allows for vertical axis positioning for a 1500 kg load. All three motions are supported on THK rails and driven by a ball screw with a NEMA 23 stepper motor and planetary gearbox. All motions have adjustable limit switches to change the travel within the maximum range. The mechanics allow the three degrees of freedom motion of the movable platform work surface. Vertical motion (Z direction) and horizontal transversal motions (Y & X direction) of the platform work surface are controlled and operated by means motorized stages.

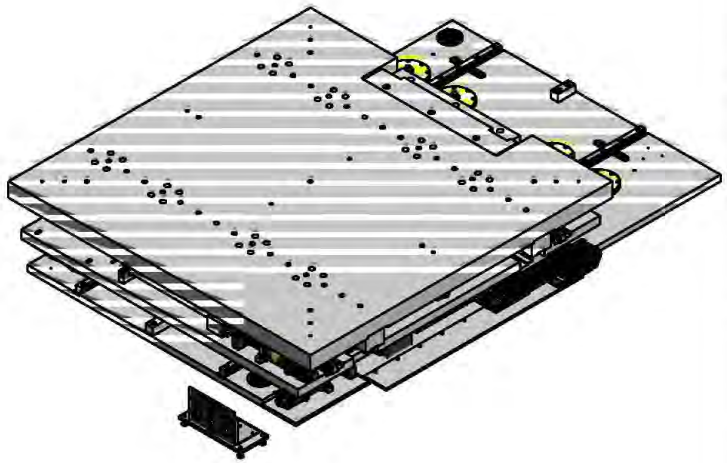












3-Axis Motorized Positioner
Load Capacity: 1500 kg
X-Axis
Travel Range: +100mm/-675mm
Resolution: 5 micron/full step
Y-Axis
Travel Range: +20mm/-20mm
Resolution: 1.1 micron/full step
Z-Axis
Travel Range: +12.5mm/-12.5mm
Resolution: 0.1 micron/full step
Support Foot:
Adjustment Range: +5mm/-5mm
Estimated System Mass: 993 kg

First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994	Date
Material	Protective Finish	Drawn by: E Acome	12/16/2014
		Eng approval: Engineer	
		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: 607.533.3531 / Fax: 607.533.3618 E-mail: adc@adc9001.com / Web: www.adc9001.com	
3-Axis Positioner Assembly			
Part Number	Revision: 0	Size: A2	Sheet

Purchased Part Modification | No

Cryostat Dilution Refrigerator

Customer:

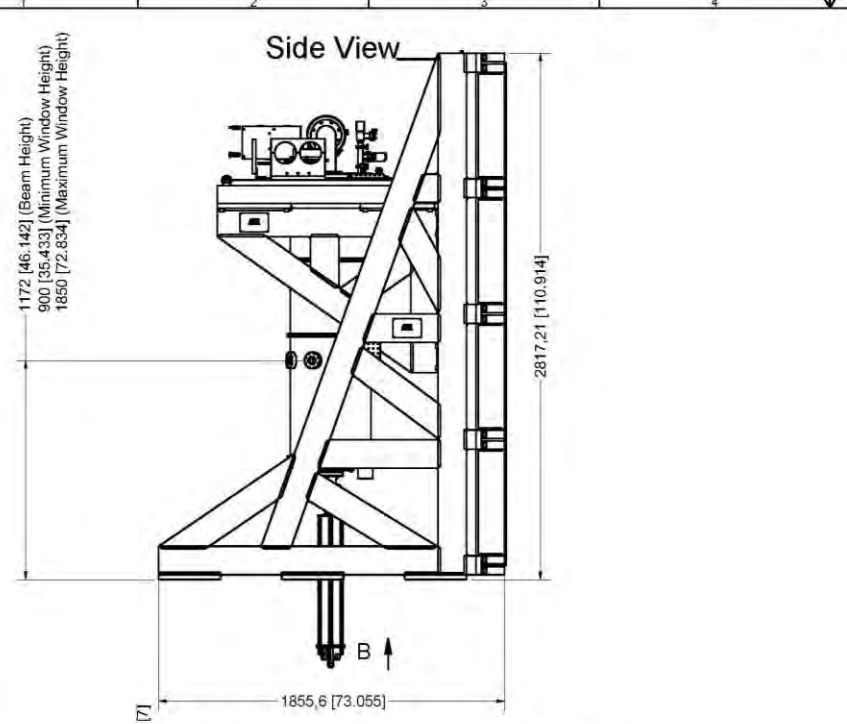
University College London

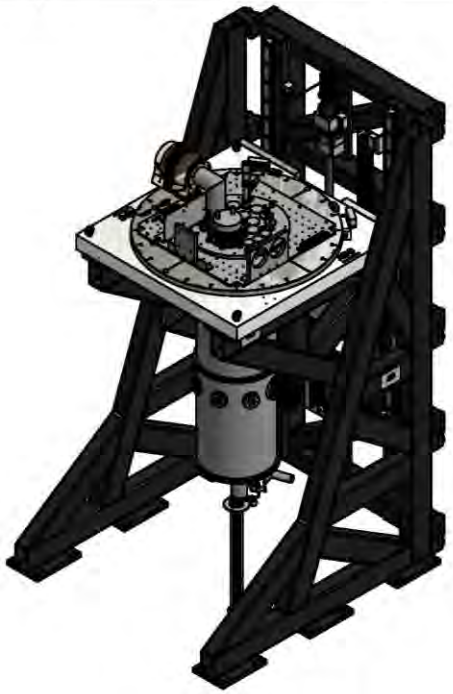
London Centre for Nanotechnology

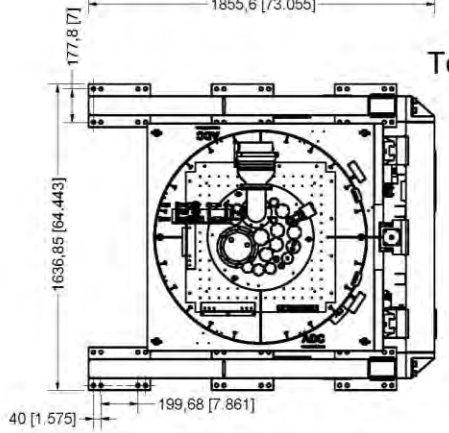
17-19 Gordon Street

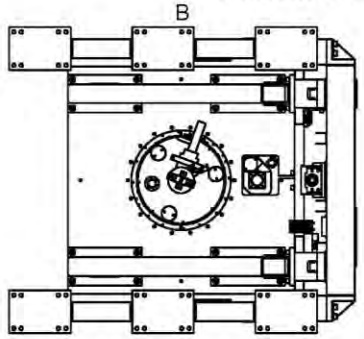
London WC1H 0AH, UK

A system was custom designed for the Free Electron Laser for Infrared eXperiments (FELIX) in the Netherlands that provides both vertical (z) axis positioning and rotation about the z-axis of a Cryo-Free dilution refrigerator from Oxford Instruments (Kelvinox). The refrigerator has a vertical travel of 950 mm using linear bearings and a 40mm ball screw driven by a triple stack NEMA 34 stepper motor and a planetary inline gearbox. With a 10:1 gear ratio on the 200 steps/rev motor the resolution is approximately 5 µm. 180 degrees of rotation is achieved through the use of a large bearing driven by a double stack NEMA 34 stepper motor and a planetary inline gearbox. With a 3:1 gear ratio on the 200 steps/rev motor the rotation has a resolution of approximately 0.07 degrees. The Aluminum frame (Non-Magnetic) is bolted to the floor using M16 Screws to provide ultimate stability.









Notes:

1) Linear Travel: 950 mm [35.433 in]
2) Rotation: 180 degrees [3.14 radians]
3) Approximate Weight: 1560 kg [3439 lbs]

Purchased Part Modification	No

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

Material: None
Protective Finish:

Drawing Standard: ANSI Y14.5M-1994		Date
Drawn by	C. Adams	2014-04-01
Eng. approval	E Van Every	2014-04-01
Mfg. approval		
Assy. approval		

UNLESS OTHERWISE SPECIFIED
All Dimensions BASIC
N7 machined surfaces 6,13 / 0,38
0,25 A B C
0,25 A B C

ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone 607 533 3531 / Fax 607 533 3618
E-mail adc@adc9001.com / Web: www.adc9001.com

Cryostat and Rack Assembly

Part Number	Revision	Size
	0	A2

Experimental Test Range (ETR) Positioning System

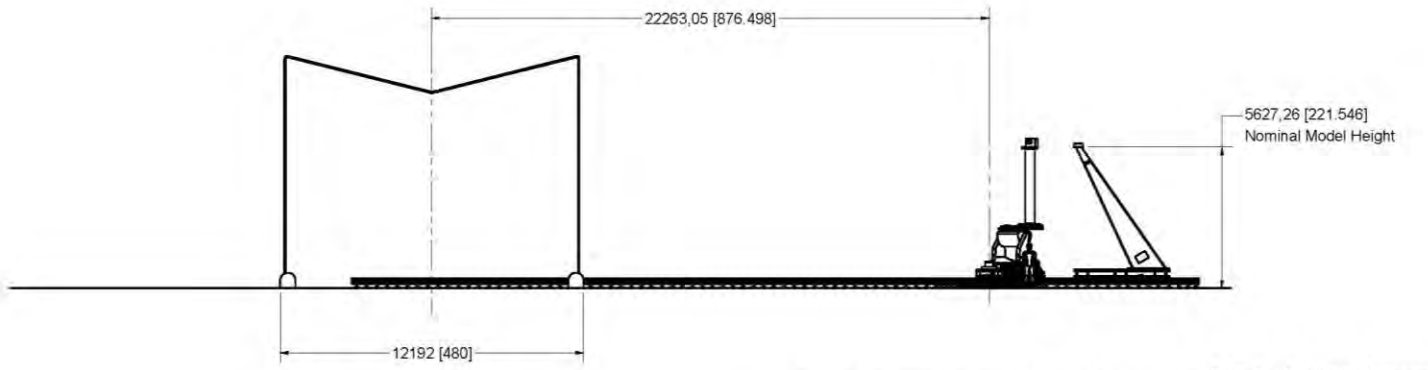
Customer:

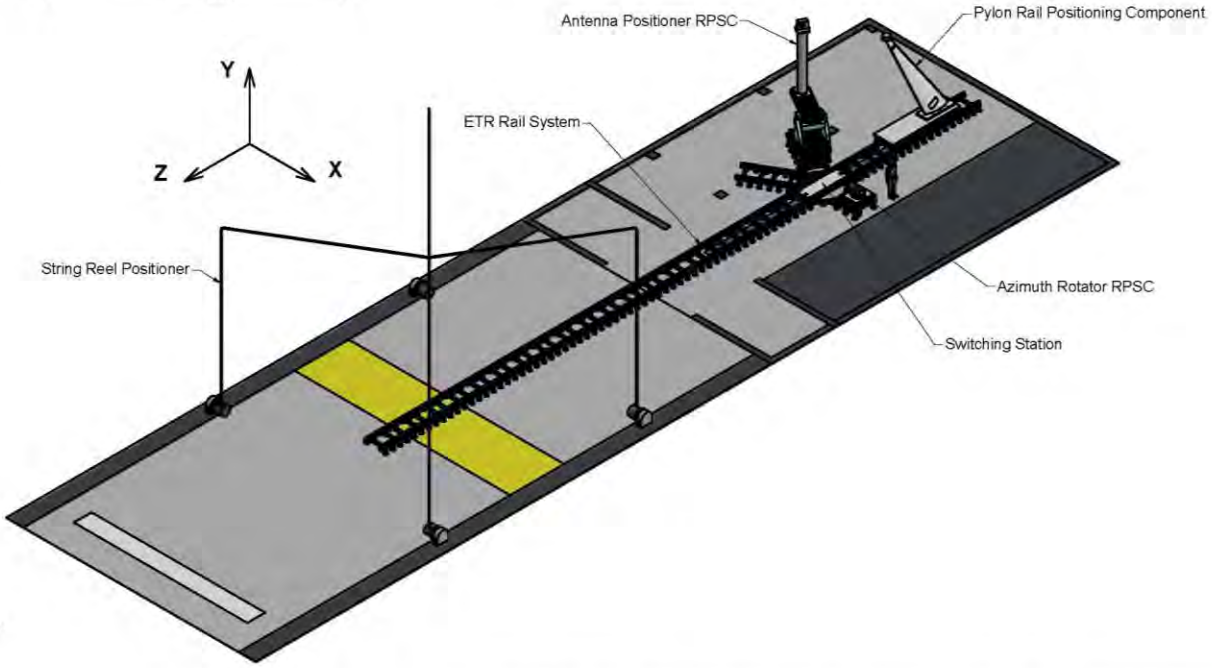
NASA/Langley Research Center

5 Langley Blvd. Bldg. 2101 M/S 12

Hampton, VA 23681-2199

ADC, in collaboration with NASA Langley Research Center, completed a turn-key design, built, and installed major components for an updated indoor radar cross section and antenna measurement range. Modern radar systems, which include specialized active antennas, microwave circuits and devices, are governed by underlying electromagnetic physics. Designing sophisticated motion systems pushes the limits of engineering to solve ever-larger and more complex electromagnetic radiation and scattering problems. The RCS NASA Experimental Test Range consists of a rail positioning system and four rail positioning carriages: antenna measurement positioner, RCS pylon, azimuth rotator, and an electric manlift. A switching station allows for rail positioning carriages to be quickly moved on and off the rail system. Within the test chamber there is also a string reel positioning system capable of moving objects within a 40’ x 40’ x 25’ volume.





Description:

Experimental Test Range (ETR) designed for NASA Langley Research Center to perform radar testing of aircraft models and antenna models.

Major Components

Rail System
- Total Length of Travel: 33.9 m [111']
- Test Zone: +/- 3.05 m [10']
- Position Repeatability within Test Zone: 1.27 mm [0.050"]

Rail Positioning System Components (RPSCs)

Antenna Positioner:
- Azimuth over Elevation Positioner
- Manual Offset Slide w/ 1.22m [4'] Travel
- Model Tower Mast, Aluminum Construction
- Polarization Positioner with DC-18 GHz Rotary Joint and 24 Conductor Slip-Ring
- Maximum Payload: 450 kg [1,000 lb]

RCS Ogive Pylon:
- 4:1 Ogival Ratio
- Spline Drive Rotator w/ Digital Encoder Feedback
- Suface Roughness: 65 micro-inch RMS
- Edge Sharpness: 0.004-0.008"
- Design Payload: 680 kg [1,500 lb]

Manlift Positioner:
- Carriage to Mount and Secure Electric Manlift w/ Up to 20' Vertical Height

Azimuth Rotator:
- Universal Carriage for 3x Azimuth Rotators

String Reel Positioning System
- Positioning Area: 40' x 40' x 25'
- Maximum Payload: 680 kg [1,500 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: E Acome | 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: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

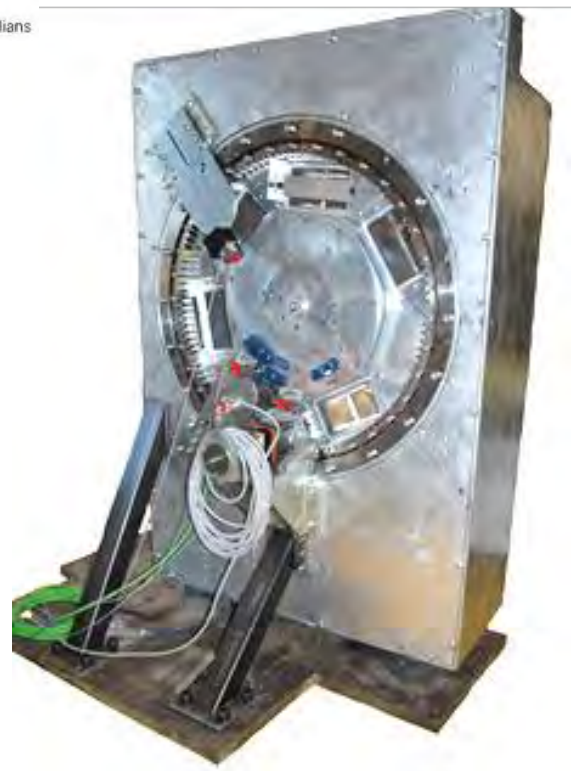
Experimental Test Range

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

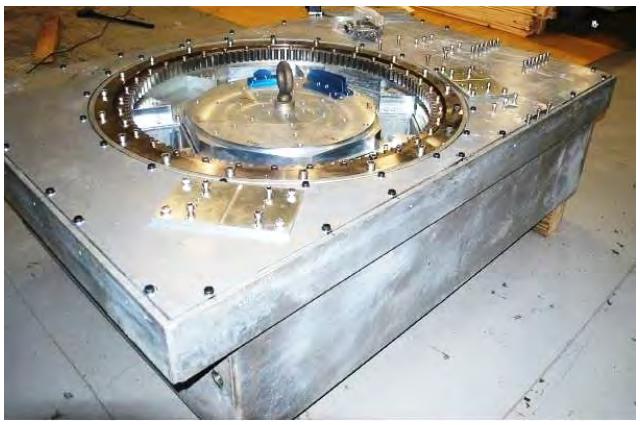
Selector System for SANS Instrument

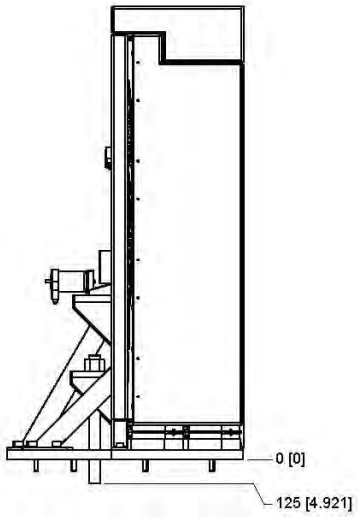
Customer:

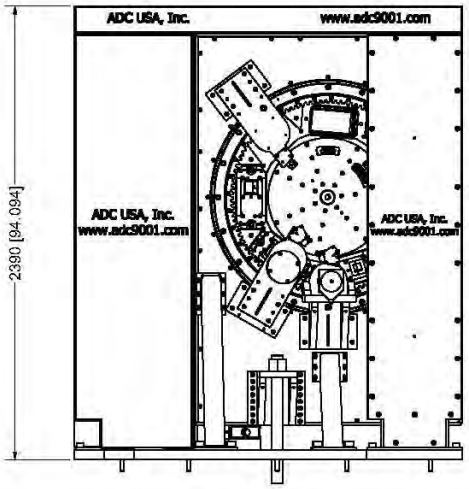
ANSTO
New Illawarra Road
Lucas Heights, NSW Australia



This system was designed 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. It separates the two beams coming from the in-pile collimator. One beam is blocked and the other passes the selector wheel insert to be used for imaging experiments. 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 to prevent direct shine from the beam.

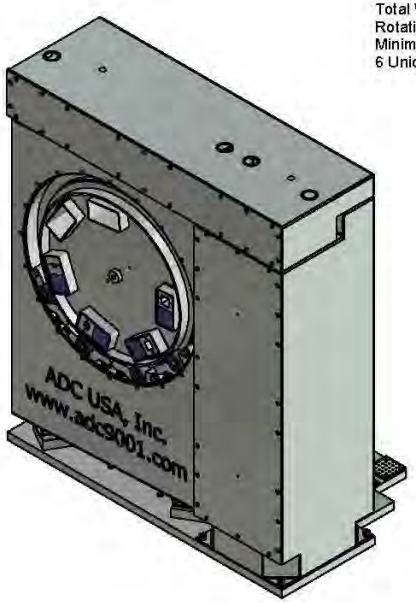


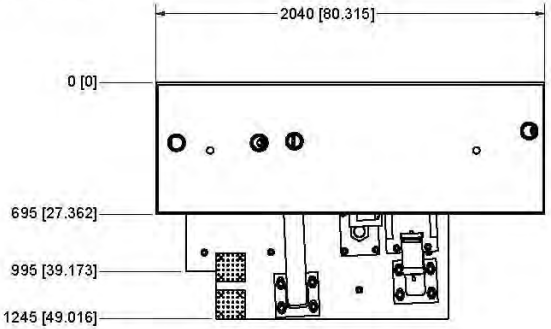




SPECS:

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





First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994		Date	ADC USA, Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3618 E-mail: adc@adc9001.com / Web: www.adc9001.com
Material	Protective Finish: None	Drawn by	M.Popov	4/21/2012	
		Eng. approval	M.Popov	4/21/2012	
		Mfg. approval			
		Assy approval			
This drawing is the property of ADC USA, Inc. Any disclosure, use, and/or reproduction of this drawing or the designs contained herein by the client or any of its collaborators, suppliers, etc. without prior written consent of ADC USA, Inc. is prohibited. 2-D drawings are provided for review purposes only and do not be overlayed with models or kept over the material lines. ADC USA, Inc. is not responsible for the mentioned unauthorized use of this drawing or the designs contained herein. Any violations of this agreement will open to possible legal action. The governing laws of the State of New York apply to all legal issues for this matter.		UNLESS OTHERWISE SPECIFIED All Dimensions BASIC N7 machined surfaces 0,13 0,38 0,25 A B C 0,25 A B C			ANSTO Selector Wheel Top Level Assembly
					Part Number: 00020556 | Revision: 0 | Size: A2 | Sheet:

Purchased Part Modification	No

Press Manipulation System

Customer:
University of Chicago/APS
9700 S. Cass Ave.
Argonne, IL 60439

A system was designed for University of Chicago that allows for the positioning of a large press that is aligned with the beam and a detector that is located downstream. Since the press and detector need to move independently, two sub-systems were designed. One sub-system controls the motion of the 2000 lb press. The second sub-system supports a detector assembly and provides motion in several directions. Both sub-systems share a set of guide rails which are mounted to a large base plate. This plate is designed to be grouted to the hutch floor, providing a permanent and stable base for the entire system. The sub-systems can be manually moved back and forth on the guide rails and secured using manual rail clamps.

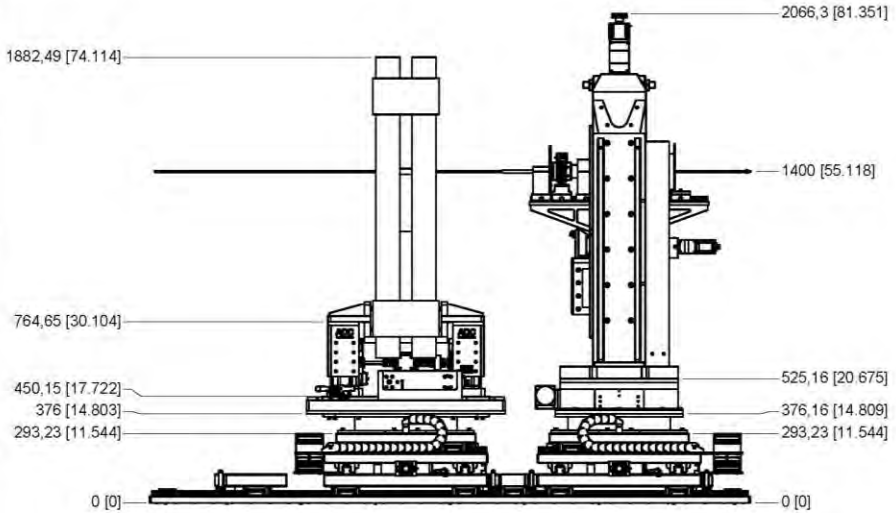
Key Specifications:

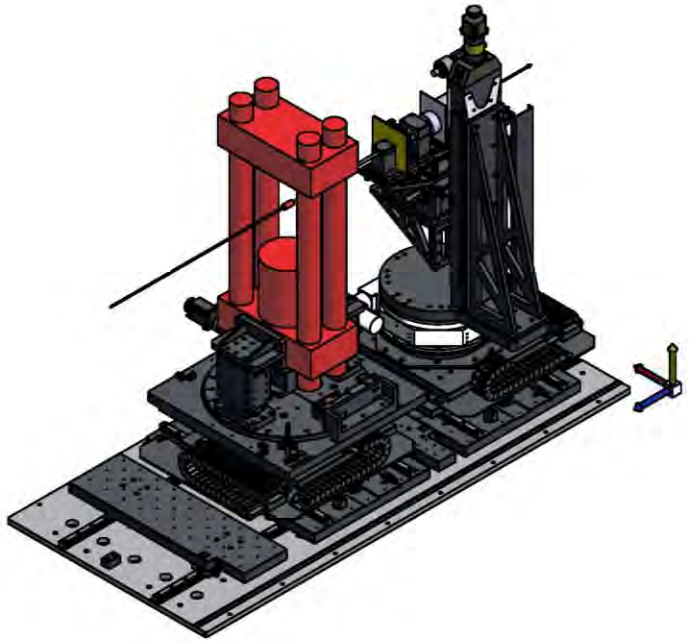
Detector Sub-System

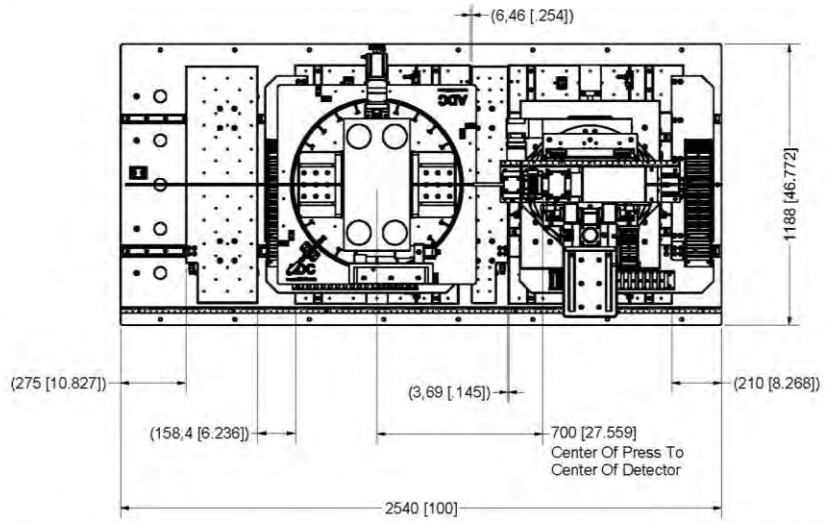
Parameter	Value
Vertical Translation	+/- 200mm
Transverse to Beam	+/- 200mm
Beam Direction	+/- 50mm
Rotation in Horizontal Plane	+/- 180°
Rotation in Vertical Plane	+/- 18°

Press Sub-System

Parameter	Value
Vertical Translation	+/- 50mm
Transverse to Beam	+/- 50mm
Beam Direction	+/- 50mm
Yaw About Vertical Axis	+/- 3°







Notes:

1.) Total Weight Of System (W/O Customer Supplied Press): 1,500kg (3,310 lbs)
2.) Customer Provided For: University Of Chicago

First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994	Date
		Drawn by: S Hartman	4/27/2012
		Eng approval: M Popov	4/27/2012
Material	Protective Finish: None	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: 607.533.3619
E-mail: adc@adc9001.com / Web: www.adc9001.com

Press Assembly Motion System Assembly

Part Number	Revision	Size	Sheet
00020310	0	A2	3 / 3

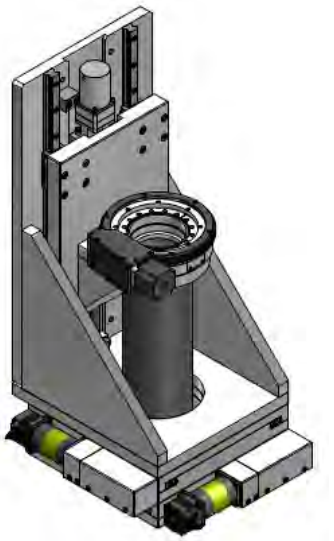
Purchased Part Modification	No

UNIVERSITÉ DE GENÈVE
HEC - Hautes Études Commerciales

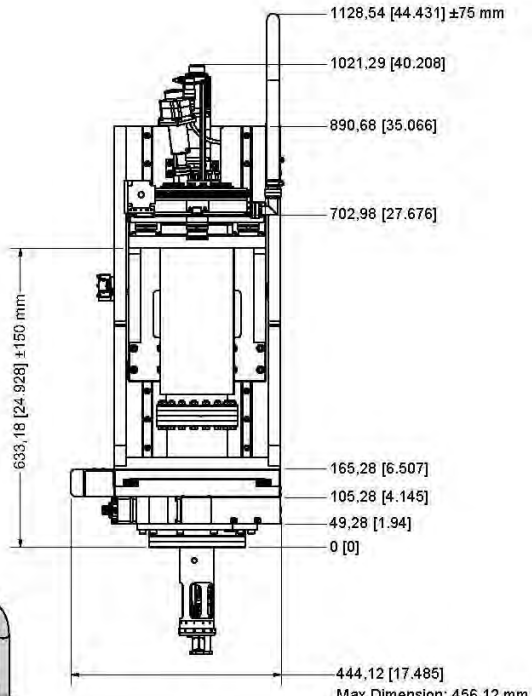
Customer:

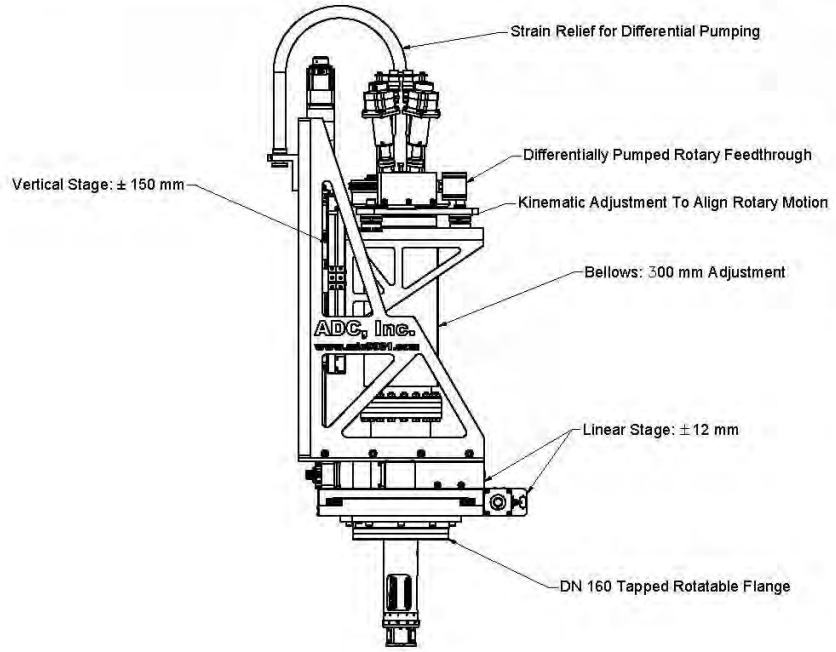
Universitè de Genéve
Dépt de la Phys. de Mat. Cond.
24 quai Ernest Ansermet
CH - 1211 Genéve 4 Switzerland

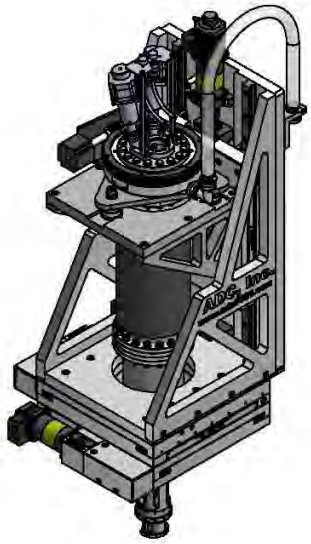
The UHV XYZ Stages is a 4-axis motion system consisting of two horizontal linear stages, one vertical linear stage and a rotation stage. The XYZ stages can reach a UHV vacuum level of $1x10^{-9}$ Torr, while the rotary stage can be differentially pumped with a vacuum level of $1x10^{-2}$ Torr. Edge welded bellows with a 300 mm stroke provide a movable connection between the rotary feed through and the DN150 CF flange that is used for mounting the system. The differentially pumped rotary feed through has a kinematic base which allows for adjustment of the users' equipment to the appropriate orientation with respect to the beam. The Vertical Stage has a total travel of 300 mm (±150 mm) and consists of a NEMA 34 motor coupled to a 55:1 gear box, a preloaded 20x5 mm ballscrew and preloaded linear guide rails which allows for smooth operation of the vertical stage. The combination of the gearbox and ballscrew allows the vertical stage to have a resolution of 0.455 µm per step. The motor was sized to provide the vertical motion to be able to travel at a max speed of 1.81 mm/sec. The vertical stage is also equipped with fully adjustable limit switches and closed loop feedback is provided by a Renishaw Tonic Encoder with a resolution of 0.1 µm

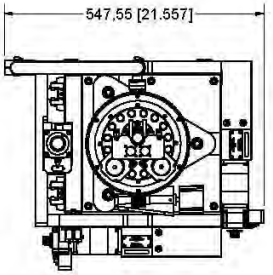


REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Approval Drawing	3/19/2013	M Popov









Specs:

Vertical Travel: ±150 mm
Horizontal Travel: ±12 mm (X and Y)
Rotation: Full 360°
Vacuum Level: 1x10-9 Torr
Differential Pumping Vacuum Level: 1x10-2 Torr
Weight: 115 kg

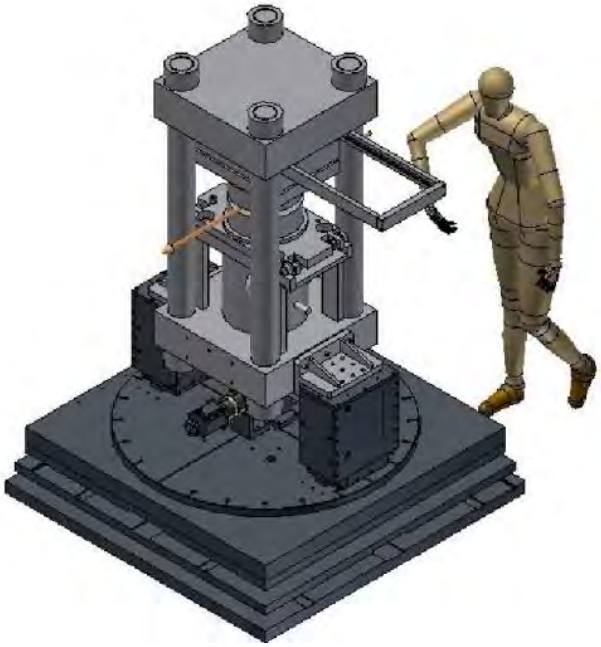
First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date	ADC USA, Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3618 E-mail: adc@adc9001.com / Web: www.adc9001.com
Material / Protective Finish	Drawn by: M Popov	3/19/2013	
	Eng approval: M Popov		
	Mfg approval		UHV_XYZ_Stages
	Assy approval		
This drawing is the property of ADC USA, Inc. Any disclosure, use, and/or reproduction of this drawing or the design contained herein by the client or any of its collaborators, suppliers, etc. without prior written consent of ADC USA, Inc. is prohibited. 2-D drawings are provided for review purposes only and in turn will be destroyed after review or kept confidential at all times. ADC USA, Inc. is not responsible for the misinterpretation or inadvertent alteration of this drawing or the design contained herein. Any violation of this agreement is open to possible legal action. The governing laws of the State of New York apply to all legal issues for this matter.	UNLESS OTHERWISE SPECIFIED All Dimensions BASIC N7 machined surfaces 0,13 / 0,38 0,25 A B C 0,25 A B C		Part Number: UHV_XYZ_Stages Revision: 0 Size: A2 Sheet: 1 / 1

Purchased Part Modification	No

4-Axis Custom Design Motion for a Press Manipulation System

Customer:

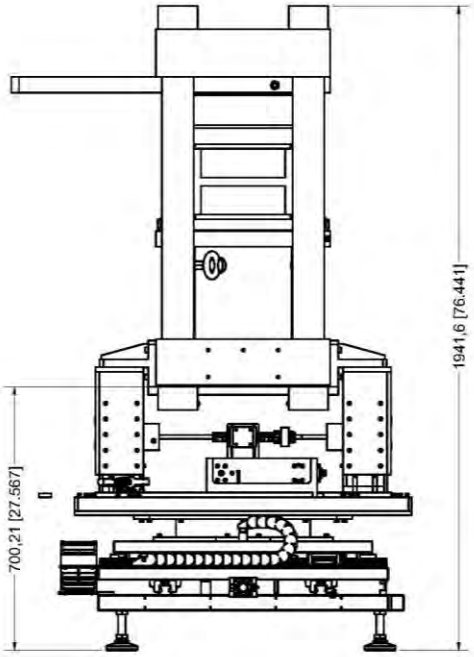
Macquarie University
299 Lane Cover Road
North Ryde NSW 2113
Australia

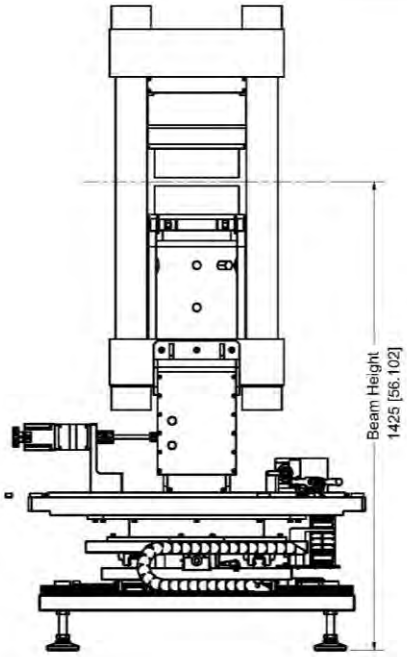


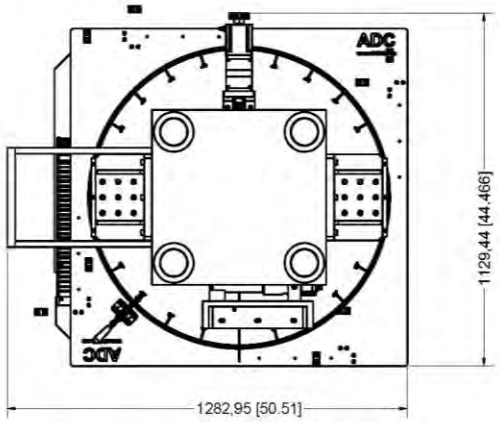
A system was designed for Macquarie University – Australian Synchrotron, which allows for multi-axis positioning for a 3,200 lb press. There are four degrees of freedom for the press motion system. Vertical motion is provided by two ADC utility jacks, each having a load capacity of 25 kN (5,620 lbs). The two jacks are driven simultaneously using a bevel gearbox. Custom linear slides provide motion transverse to the beam and in the beam direction. Linear travel is supported by THK HSR35 guide rails and bearings. A high-load-capacity manual rotation stage allows for rough positioning of the press and sample alignment. Vertical and linear motions are equipped with encoders to provide closed-loop precision motion. The table below provides the product description, range of motion, and resolution for each degree of freedom on the press manipulation system.

Motion	ADC Product Description	Range of Motion	Resolution (unit/step)
Vertical Translation	UJ-25kN-100-C Utility Jack	+/- 50mm	1.04 µm
Transverse to Beam	Custom Linear Slide	+/- 200mm	0.455 µm
Beam Direction	Custom Linear Slide	+/- 50 mm	0.455 µm
Yaw About Vertical Axis	Manual Rotation Stage	+/-180°	-

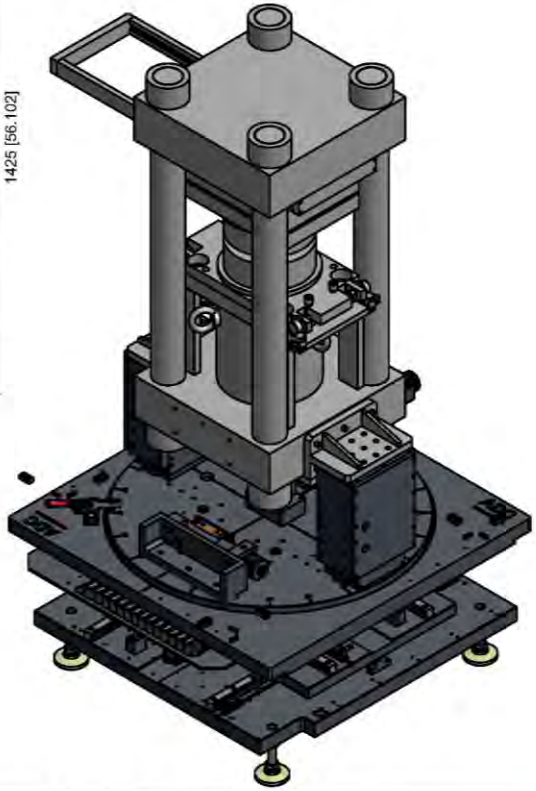
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Concept Drawing	9/6/2012	M Popov







Note: Jacks are shown at mid travel of 50 mm



First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994	Date
Material	Protective Finish: None	Drawn by: M Popov	9/6/2012
		Eng approval: M Popov	
		Mfg approval:	
		Assy approval:	

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

Purchased Part Modification	No

ADC USA, Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3818
E-mail: adc@adc9001.com / Web: www.adc9001.com

Press Manipulation Assembly

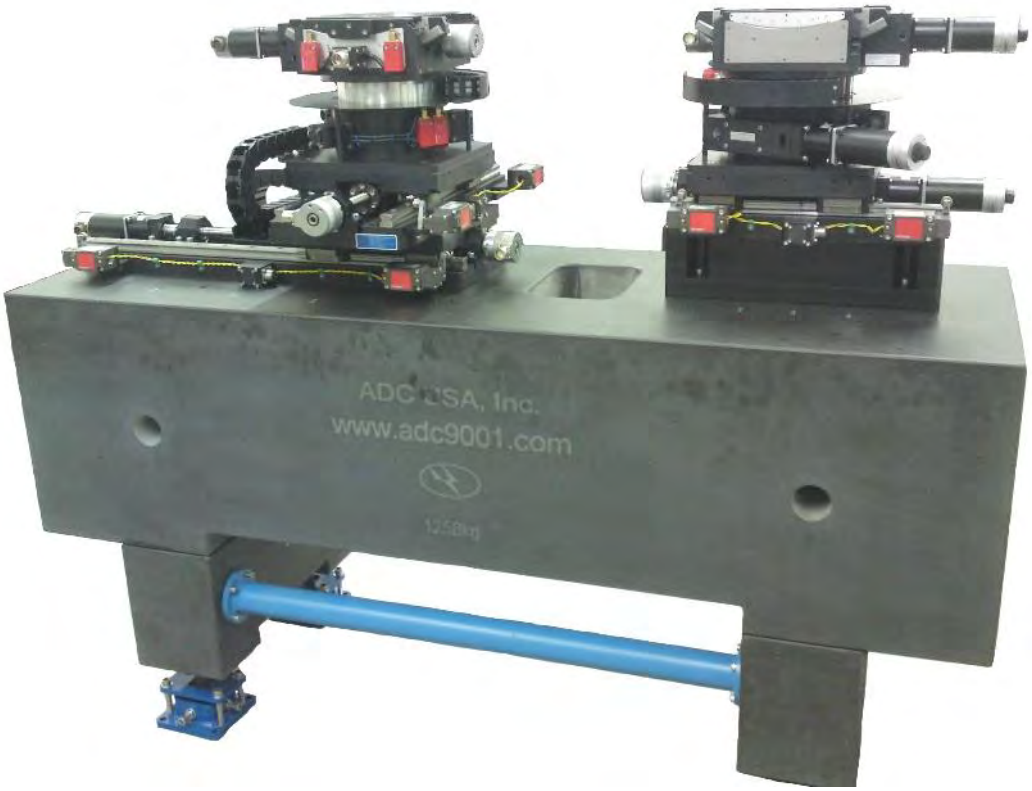
Part Number	Revision	Size	Sheet
Macquarie_Press_System	0	A2	1 / 1

Monochromator-Ultra-Small-Angle Neutron Scattering Instrument

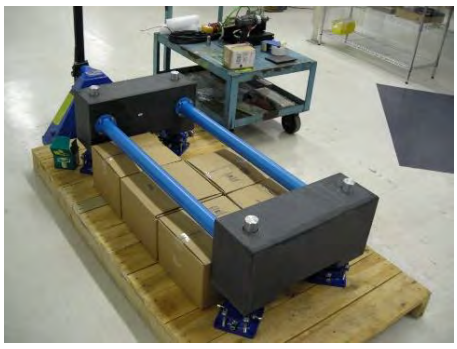
Nuclear-based science benefiting all Australians

Customer:

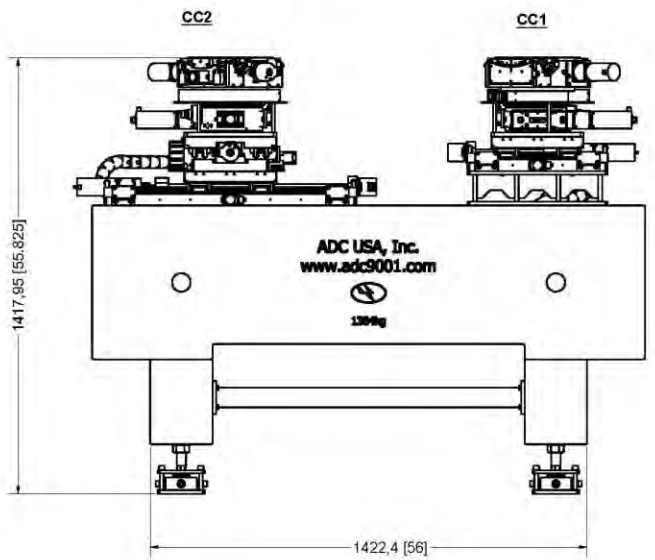
ANSTO
New Illawarra Road
Lucas Heights, NSW Australia

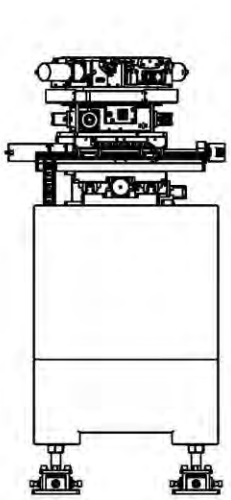


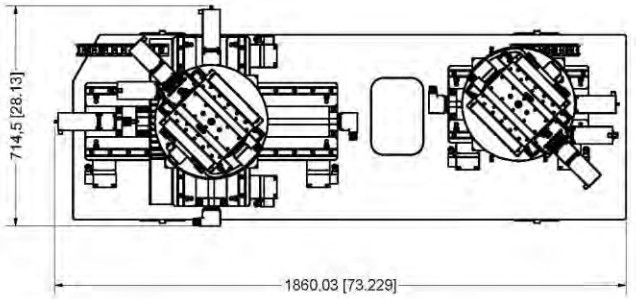
Ultra-small-angle neutron scattering (USANS) is a method for studying structures in the 100 nm to 10 μm range by diffraction. USANS uses a neutron beam with an extremely sharp angular profile which can be obtained by diffraction from a perfect crystal ("Bonse-Hart" technique). USANS has all the normal 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.



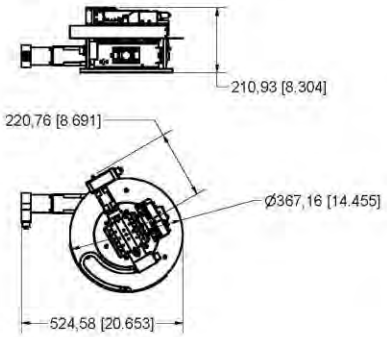
Monochromator



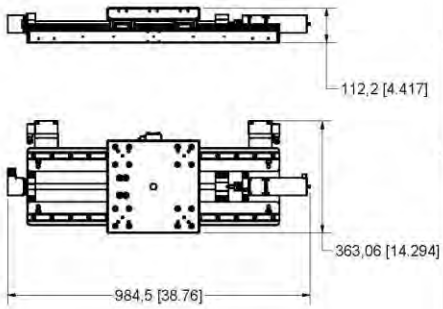




Premonochromator



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

Purchased Part Modification	No

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

Material: Protective Finish:

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Drawing Standard: ANSI Y14.5M-1994	Date
Drawn by: nroscup	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.
128 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3616
E-mail: adc@adc9001.com / Web: www.adc9001.com

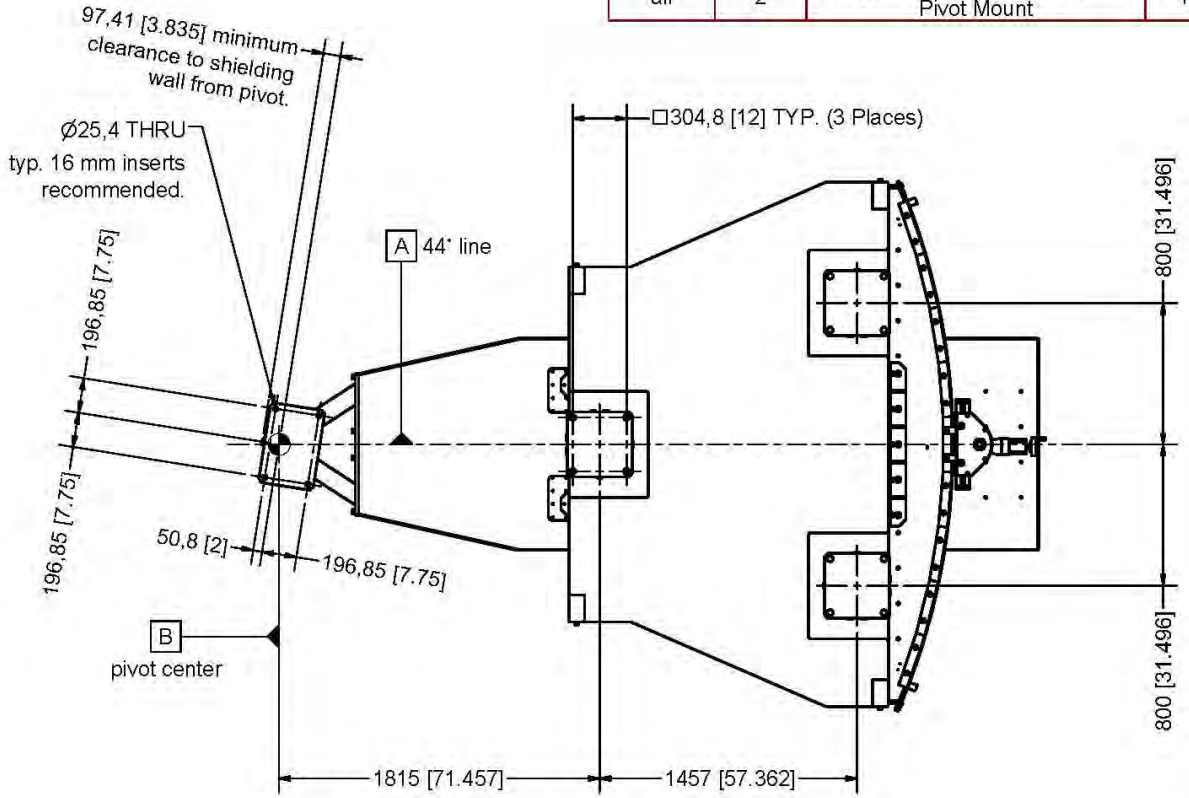
Part Number	Revision	Size	Sheet
00018001		A2	3 / 3

Rotational Platform

Customer:
NSRRC
101 Hsin-Ann Road
Hsinch Science Park
Hsinchu 30076, Taiwan

The rotational platform was designed for use at Spring8 to allow for the rotation of the beamline components following a diamond monochromator to maintain system alignment over the range of beam energies. A 5-phase stepper motor drives the platform with an effective open loop resolution of .002 degrees through a chain drive. A rotary encoder can be used both as a digital readout of the position and to close the positioning loop for a system accuracy of up to .0005 degrees. The machine base is composed of polymer concrete with mounting surfaces ground to +/-20 µm and combined with high precision crossed linear recirculating bearing rails to give the total system straightness of trajectory of +/- 50 µm over the 36 degree arc.

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	1	drawing released	11/9/2007	dwaterman
1A	1	Added distance to wall & recommended inserts.	11/26/2007	dwaterman
all	2	Changed Dimension Style; Rotated Pivot Mount	11/28/2007	S Hartman



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	dwaterman	11/9/2007
Eng approval	D Waterman	
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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E-mail: ado@adc9001.com / Web: www.adc9001.com

ISO 9001:2008 Certified

NSRRC Rotary Platform Assembly

Part Number	Revision	Size	Sheet
00012626 mounting layoutREV2	2	A3	1 / 1

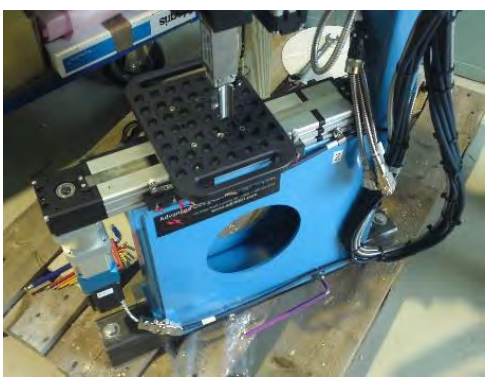
Purchased Part Modification	No

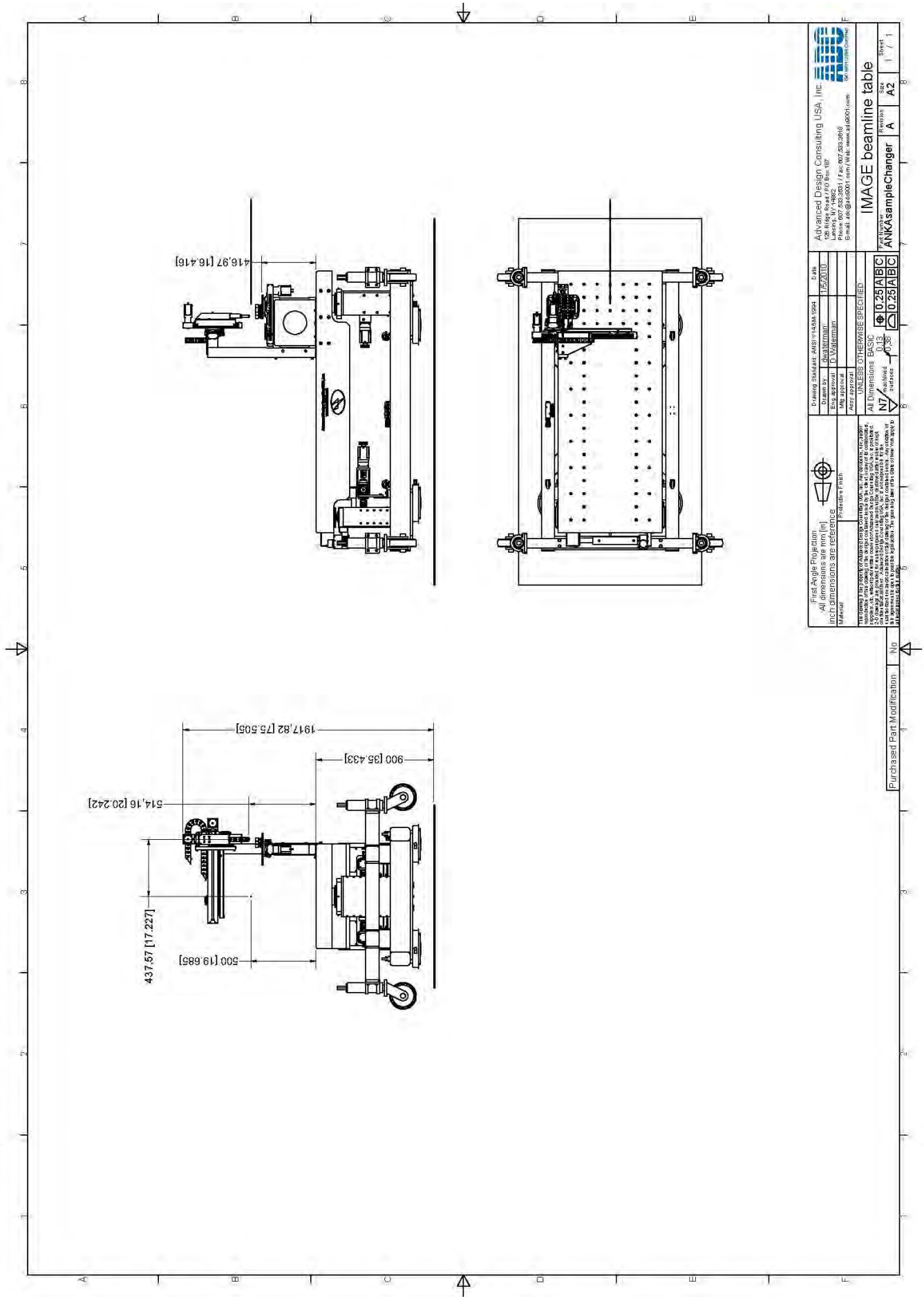
Fast Sample Exchange System

Customer:

Katlsruher Institut für Technologie
Hermann-von-Helmholtz-Platz 1
D-76344 Eggenstein-Leopoldshafen
Germany

The fast tomography experimental station at the IMAGE beamline was designed to offer a very high sample throughput in high resolution 3D imaging. The system is programmable in order to pick the samples in a pre-defined order and it is triggered by the measuring system. The three linear stages have a range of at least 50 cm in order to cover the distances between the measuring stage and the storing sample support. They are equipped with limit switches to prevent possible collisions with the tomographic measuring stage. The system is equipped with a suitable clamp, fitting the size and geometry of the sample holder. The clamp could be activated by an electro-magnet. ADCs' fast sample exchange system moves individual samples from the sample tray to the measurement location which is on top of a stack of translation, tilt, and rotation stages, and then back again. The exchange system can load samples in a predetermined sequence and it is triggered by the measuring system, while also providing TTL signals to indicate completion of its tasks. The gripper is activated by a pulse to an electromagnet and remains gripped until another pulse releases it. Vertical motion is accomplished by a standard ADC slide, which is driven by a stepper motor and can accommodate samples of various heights. Transverse motion is approximately 500 mm by stepper motor. The sample tray is mounted to a standard ADC slide to present various rows of samples of the sample tray to the gripper. Total cycle time to exchange a sample is in the order of 7 seconds.



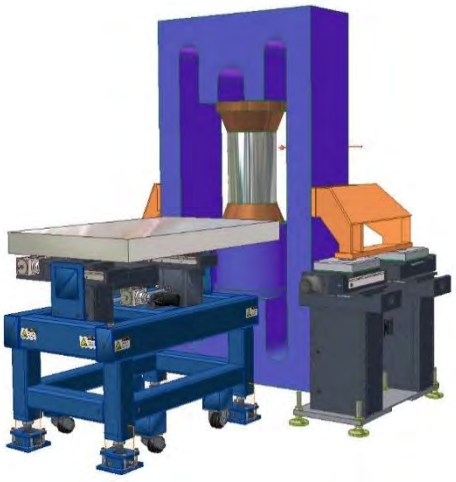

416,97 [16,416]
1917,82 [75,505]
900 [35,433]
514,16 [20,242]
437,57 [17,227]
500 [19,685]
Advanced Design Consulting USA, Inc.
IMAGE beamline table
ANKAsampleChanger
A2
Purchased Part Modification

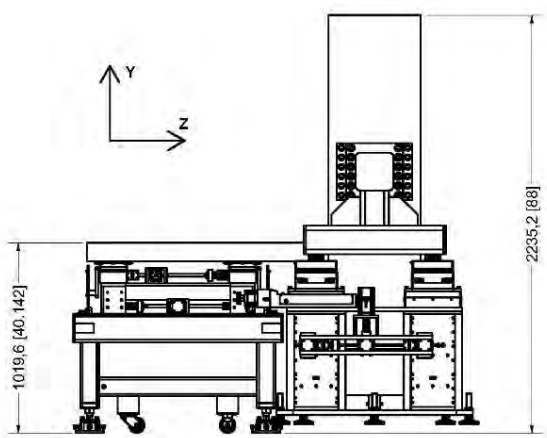
High Precision Press Assembly Motion System

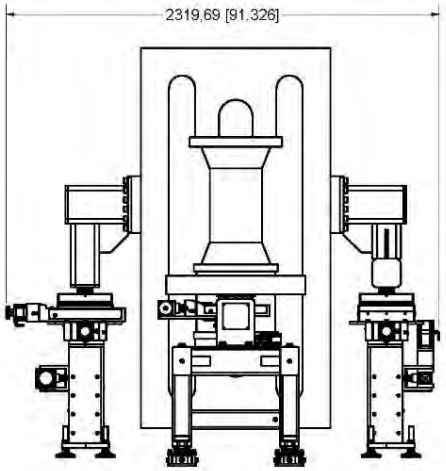
Customer:

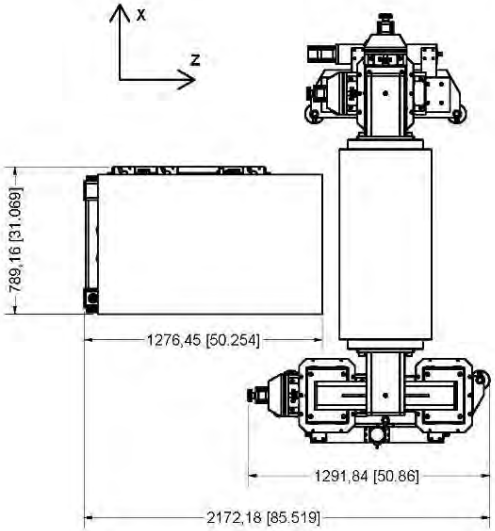
Brookhaven National Laboratory
98 Rochester Street
Upon, NY 11973-5000

ADC designed and built a custom high precision motion system to manipulate a 7 ton press (fabricated by Rockland Research Corporation). The system was installed at Beamline X17B2 NSLS doing High Pressure Mineral Physics research. The beamline contains 0.391 mm of graphite filters, 0.500 mm silicon filter, and 2.0 mm of beryllium windows. The press frame has 8 plates 17" wide bolted together with each plate having 32 - ¾" holes tapped on the side. Additional holes were provided near the elevation of the sample for attaching angle brackets for ADC's motion system supports.







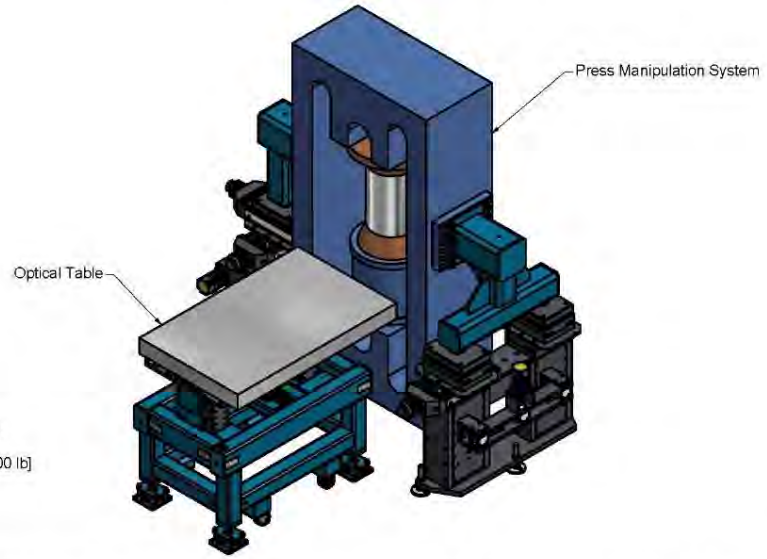


Specifications:

Optical Table
- Travel X-Direction: +/- 50mm
- Travel Y-Direction: +/- 50mm
- Approximate Weight: 368 kg [810 lb]

Press Manipulation System
- Travel X-Direction: +/- 25mm
- Travel Y-Direction: +/- 25mm
- Travel Z-Direction: +/- 25mm
- Approximate Weight: 3132 kg [6890 lb]

- Total Approximate Weight: 3500 kg [7700 lb]



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	4/15/2010
Eng approval	D Waterman	4/15/2010
Mfg approval		
Assy approval		

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

Purchased Part Modification | No

Advanced Design Consulting USA, Inc.
126 Ridge Road / P.O.Box 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3518
E-mail: adc@adc9001.com / Web: www.adc9001.com

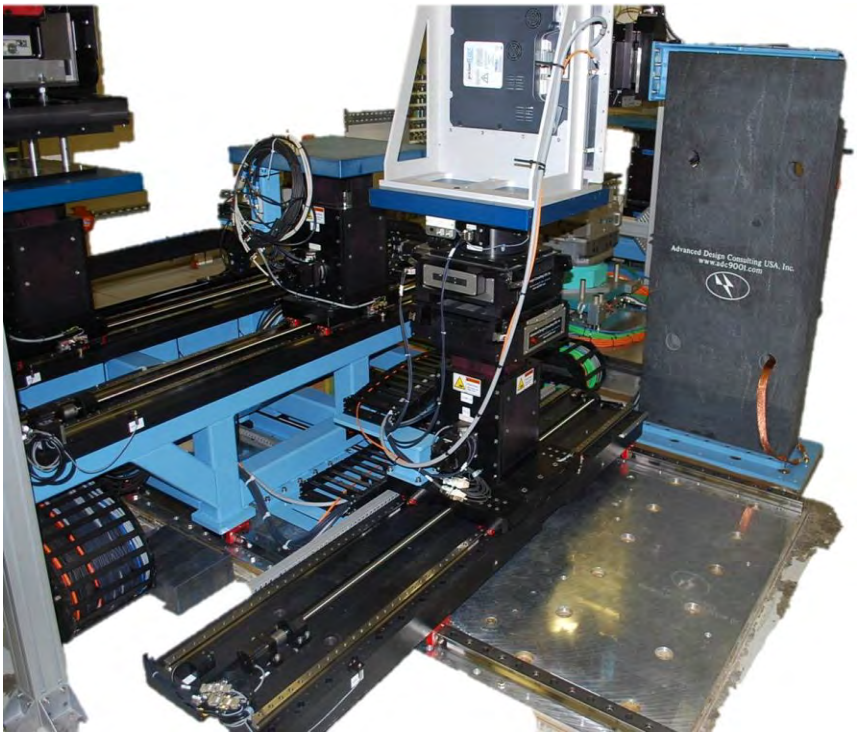
Press Manipulation System

Part Number	Revision	Size	Sheet
00016559	0	A2	3 / 3

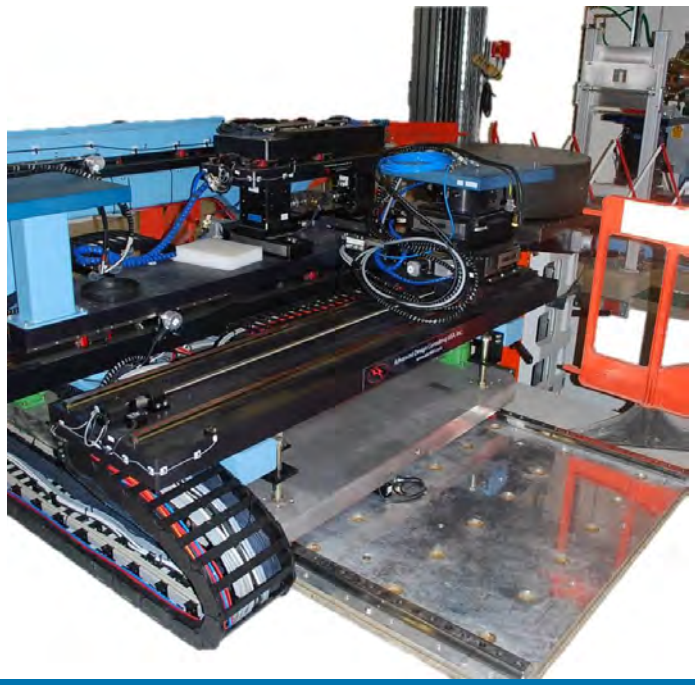
12-Axis High Precision System

Customer:

Diamond Light Source Limited
Harwell Science & Innovation Campus
Didcot OX11 0DE, United Kingdom



This complex high precision positioning system was designed for X-ray diffraction and Tomography Experiments and was delivered to Diamond Light Source (UK). The stages are designed to position with micron accuracy a variety of samples and sample test chambers, stability and high repeatability. Stage motions includes orthogonal motions in X,Y, & Z, tilt motions and rotation motions. In operation, the stages will be used to position and translate samples and test chambers for X-ray diffraction, X-ray scattering, X-ray imaging and tomography experiments.



Parts List

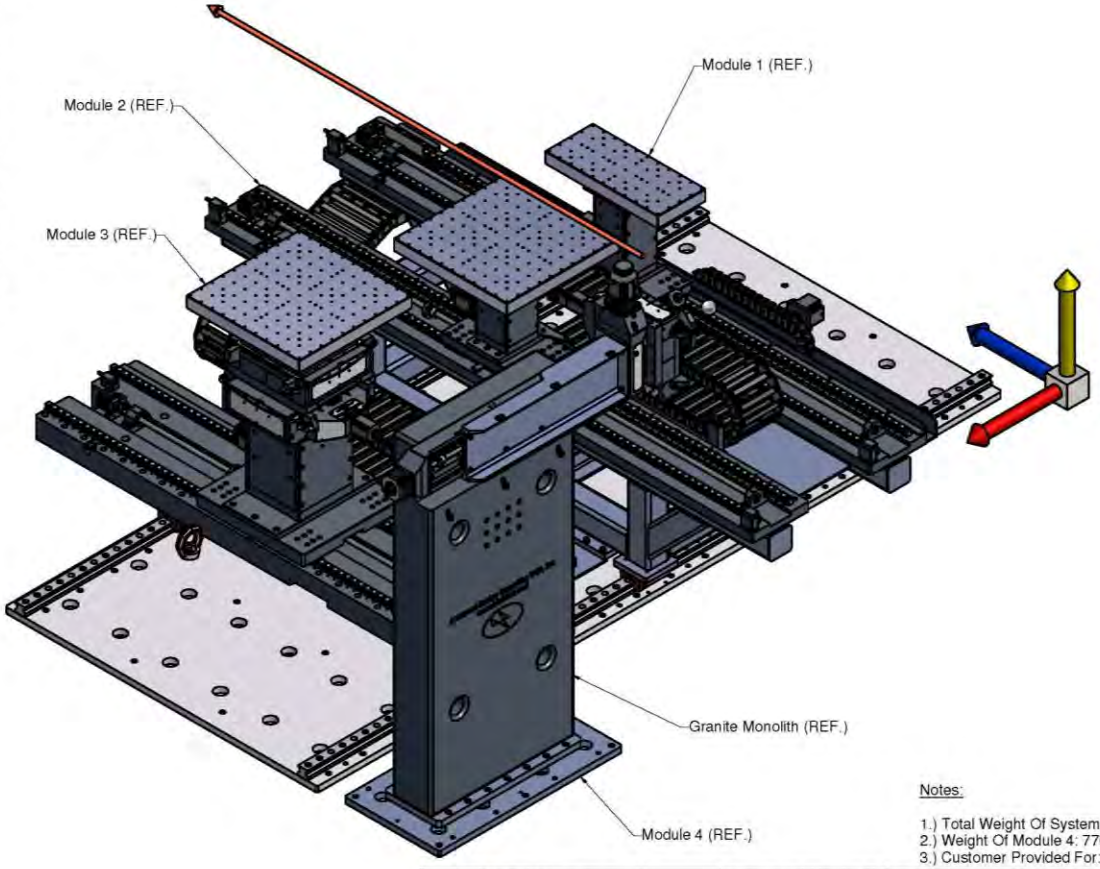
ITEM	QTY	PART #	REV	DESCRIPTION	MATERIAL	MOD	VENDOR
1	1	00014228	0	LDT1 Module 1 Assembly		No	ADC
2	1	00014229	0	LDT1 Module 2 Assembly		No	ADC
3	1	00014230	0	LDT1 Module 3 Assembly		No	ADC
4	1	00014824	0	LDT1 Module 4 Assembly		No	ADC
5	1	00015431	0	LDT Floor Plate Assembly		No	ADC
6	1	00016300	0	LDT1 Module Table Assembly		No	ADC

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	10/3/2009	S Hartman
sht 3	1	Added Travel Chart (sht 1) & Sheet 3	1/22/2010	S Hartman

Module	Travel Direction	Travel Distance
Common (Modules 1,2,&3)	"X" Axis	1300mm
Module 1	"Z" Axis	2000mm
Module 1 (DJ400-100)	"Y" Axis	100mm
Module 2	"Z" Axis	2000mm
Module 2 (DJ400-100)	"Z" Axis	100mm
Module 3	"Z" Axis	1500mm
Module 3 (DJ500-50)	"Y" Axis	100mm
Module 3 (TS-410)	About "X" Axis	+/- 4°
Module 3 (TS-310)	About "Z" Axis	+/- 5°
Module 3 (RS-200)	About "Y" Axis	360°
Module 4 (DS400-200)	"X" Axis	300mm
Module 4 (DS400-50)	"Y" Axis	75mm
Module 4 (TS-300)	About "Y" Axis	+/- 5°
Module 4 (RS-100)	About "X" Axis	360°

"X" Axis = Red Arrow
"Y" Axis = Yellow Arrow
"Z" Axis = Blue Arrow



Notes:

1.) Total Weight Of System: 2,885 kg (6,360 lbs)
2.) Weight Of Module 4: 770.15 kg (1,700 lbs)
3.) Customer Provided For: Diamond Light Source

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	10/3/2009
Eng approval	D Waterman	10/3/2009
Mfg approval		
Assy approval		

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

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Lansing, NY 14882
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E-mail: adc@adc9001.com / Web: www.adc9001.com

Large Detector Table 1 Assembly

Part Number	Revision	Size	Sheet
00014221	1	A2	1 / 3

Purchased Part Modification: No

Parts List

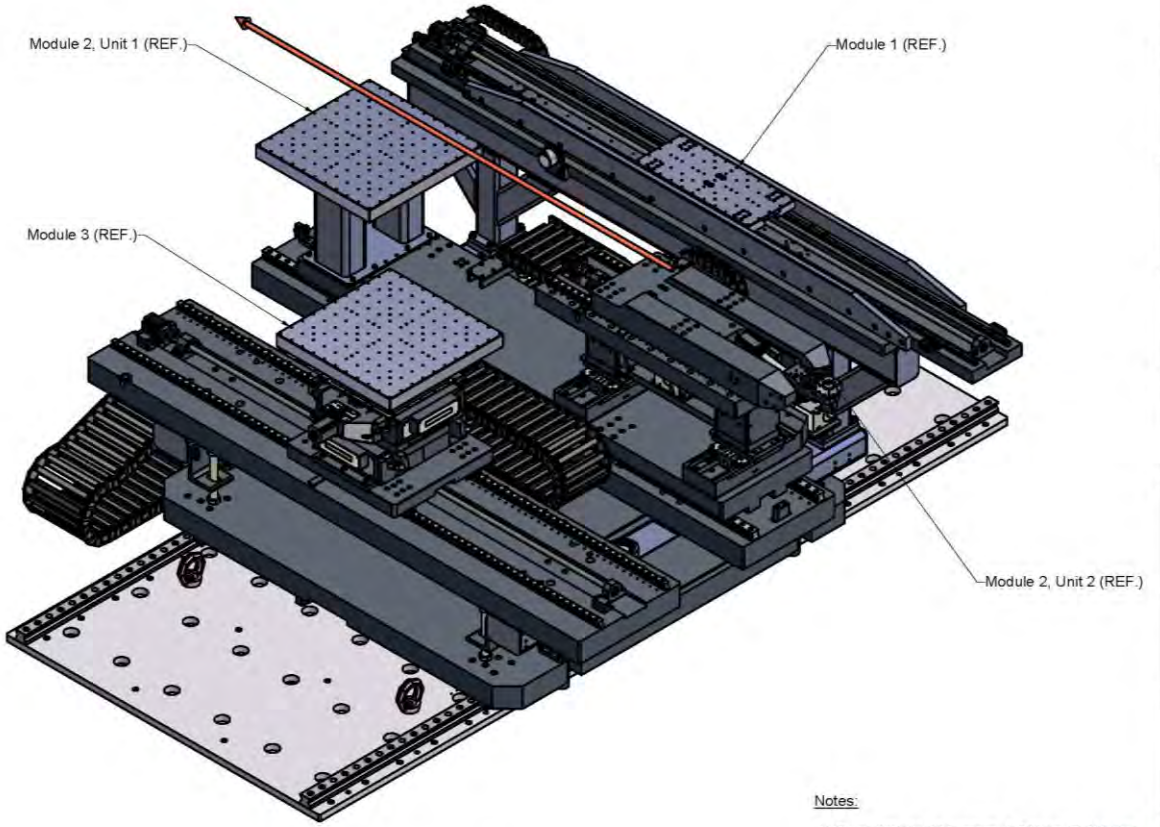
ITEM	QTY	PART #	REV	DESCRIPTION	MATERIAL	MOD	VENDOR
1	1	00014232	0	LDT 2, Module 1 Assembly		No	ADC
2	1	00014233	0	LDT 2, Module 2 Assembly		No	ADC
3	1	00014234	0	LDT2, Module 3 Assembly		No	ADC
4	1	00015431	0	LDT Floor Plate Assembly		No	ADC
5	1	00016323	0	LDT2 Lift Plate Assembly		No	ADC
6	1	00016332	0	LDT2 Module Table Assembly		No	ADC

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	10/14/2009	S Hartman
Sht 1 & Sht 3	1	Added Travel Chart (Sht 1) & Sheet 3	2/16/2010	S Hartman

Module	Travel Direction	Travel Distance
Common (Modules 1,2,&3)	"X" Axis	1300mm
Common (Modules 1,2,&3)	"Y" Axis	100mm
Module 1	"Z" Axis (Motorized)	2060mm
Module 1	"Z" Axis (Manual)	800mm
Module 2 (Unit 1 & Unit 2)	"Z" Axis (Manual)	800mm
Module 2 (Unit 2) (DS400-100)	"X" Axis	150mm
Module 2 (Unit 2) (DJ400-50)	"Y" Axis	50mm
Module 2 (Unit 2)	"Z" Axis	400mm
Module 2 (Unit 2)	About "X" Axis	+/- 5°
Module 2 (Unit 2)	About "Y" Axis	360°
Module 3	"Z" Axis	1730mm
Module 3 (TS-410)	About "X" Axis	+/- 4°
Module 3 (TS-310)	About "Z" Axis	+/- 5°
Module 3 (RS-200)	About "Y" Axis	360°

"X" Axis = Red Arrow
"Y" Axis = Yellow Arrow
"Z" Axis = Blue Arrow



Notes:

1.) Total Weight Of System: 3,500 kg (7,715 lbs)
2.) Customer Provided For: Diamond Light Source

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	10/14/2009
Eng approval	D Waterman	10/14/2009
Mfg approval		
Assy approval		

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

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

Large Detector Table 2 Assembly

Part Number	Revision	Size	Sheet
00014223	1	A2	1 / 3

Purchased Part Modification: No

Spectrometer for Inelastic X-ray Measurements

Customer:
SPring-8 Center
Structural Materials Science Lab
1-1-1 Kouto, Sayo-cho, Sayo-gun
Hyogo, Japan

This spectrometer is operating at the Spring-8 synchrotron in Japan as part of a dedicated inelastic beamline (BL12XU). The system is used for investigating electronic excitations with milli-electron volt resolution; therefore, many of the specifications require high precision, and accuracy on the micron level. The 3-meter analyzer arm on the spectrometer needed to have an angular stability measured in arc seconds over a long range of travel, under vacuum conditions. The spectrometer was designed for several types of inelastic X-ray measurements, such as performing non-resonant inelastic X-ray scattering, which directly measures the dynamical structure factor of the sample. The scientific focus is to study the single-particle and collective electronic excitations in many-body systems. The incident table allows for diagnostics, attenuation of the highly monochromatic beam, and reduction of parasitic scattering. In addition to the standard capability of orienting the sample, the spectrometer is used with large magnets, furnaces, or a specially designed cryostat with a fine-positioning carrier, for measurement of samples in extreme environments. In the initial phase, the spectrometer has a one-, two-, or three- meter radius spherically bent silicon analyzing crystal, allowing for a range of energy resolutions of around 100 meV to 1 eV. The spectrometer has the custom designed versatile capability of positioning a shielded detector in the backscattering geometry for use with various sample chambers, which allows for optimizing the energy resolution. The second purpose of the spectrometer is for Resonant Raman scattering, to capitalize on the large resonant enhancement of the inelastic scattering cross sections. The incident X-ray energy is widely tunable to excite core electron absorption edges of samples ranging from the copper to vanadium.

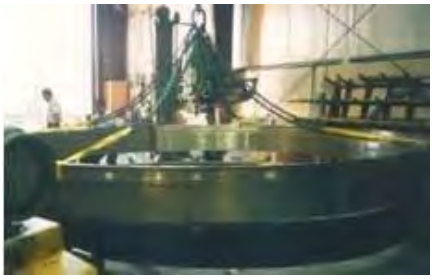
Arecibo Observatory Upgrade

Cornell University

Customer:

Cornell University
Ithaca, NY 14853

The Arecibo Observatory telescope in Arecibo, Puerto Rico, the largest and most sensitive single dish radio telescope in the world, became a good deal more sensitive. ADC was pleased to contribute instrumentation for this upgrade. In April 2004 the telescope received a new “eye on the sky” that helped turn the huge dish, operated by Cornell for the National Science Foundation, into the equivalent of a seven-pixel radio camera. The complex new addition to the Arecibo telescope was hauled 150 meters (492 feet) above the telescope’s 1,000-foot diameter (305 meters) reflector dish. The device, the size of a washing machine, took 30 minutes to reach a platform inside the suspended Gregorian dome, where ultimately it was cooled and then connected to a fiber optic transmission system leading to ultra-high-speed digital signal processors. ADC designed a large turntable capable of positioning the receiver heads to within 0.5 mm (taking into consideration the weight budget and achieving the required velocity). ADC also designed the positioning systems for the tertiary sub reflector and the eight new receiver heads. This project was part of a $25 million upgrade to the Arecibo facility.

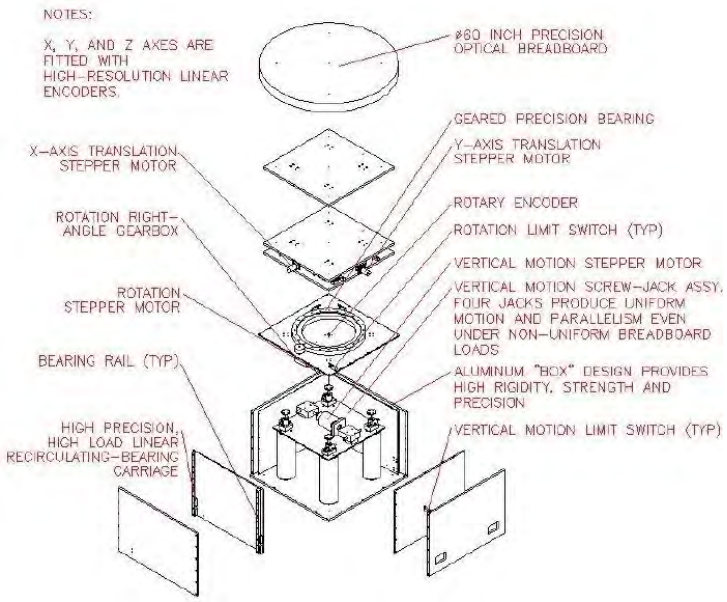


Spectrometer for Materials Research at Temperature and Stress (SMARTS)

Customer:

Los Alamos National Laboratory
Bikini Atoll Rd., SM 30
Los Alamos, NM 87545

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 provide 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 mm^3) or large (1 m^3) 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.



Custom Vacuum Systems

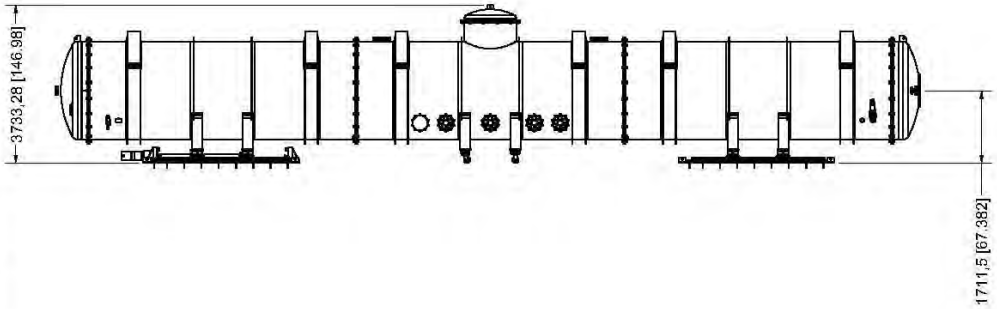
Small-Angle Neutron Scattering Instrument

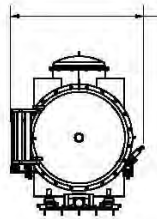
Customer:

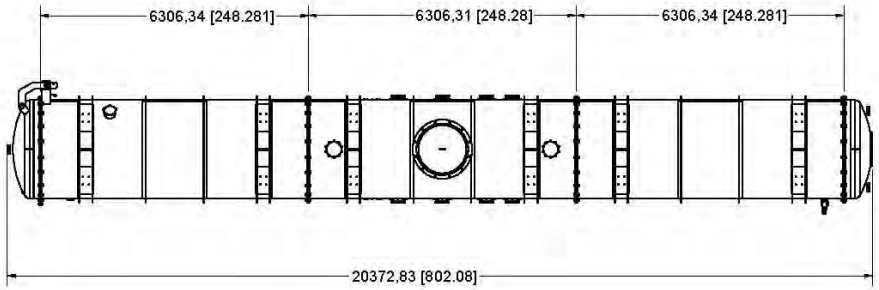
ANSTO
New Illawarra Road
Lucas Heights, NSW Australia

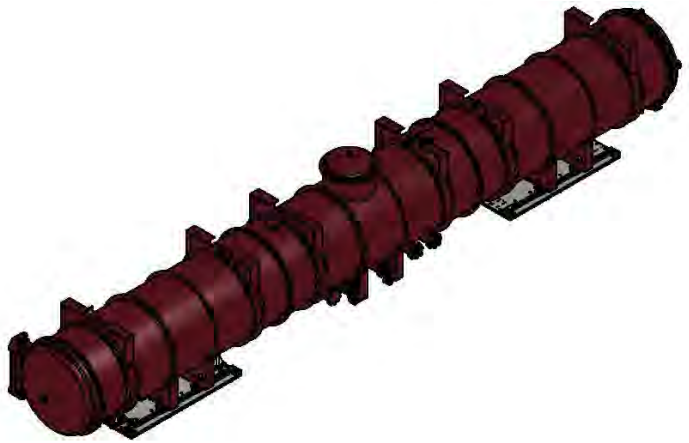
The Time-of-Flight Small Angle Neutron Scattering (ToF SANS) instrument is being built at reactor source, at ANSTO, Australia. SANS is complex machine. One of key parts of it is large detector vessel. ADC has taken the overall concept for the vessel developed by ANSTO designers and provided final engineering 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.

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Sales Drawing	8/1/2012	M Popov









Key Specs:

-External Travel of Chamber: 1500 millimeters
-Internal Travel of Carriage: 16060 millimeters
-Internal Motion Load Capacity: 2000 kg (4400 lbs)
-Weight of Bilby Detector Vessel: 24,632 kg (65,994 lbs)
-Internal Vacuum Level: 1x10-4mbar (7.5x10-5)

First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994	Date
Material	Protective Finish: None	Drawn by: M Popov	8/1/2012
		Eng approval: M Popov	8/1/2012
		Mfg approval	
		Assy approval	

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

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

Bilby Detector Vessel System

Part Number	Revision	Size	Sheet
0002000	0	A2	

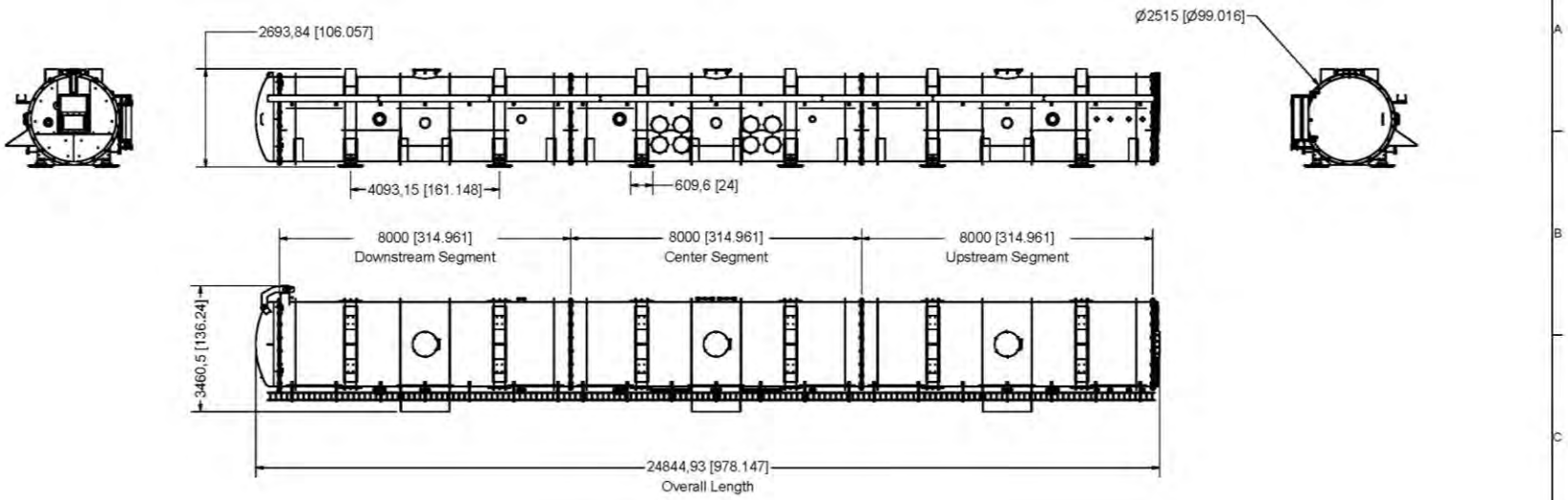
Purchased Part Modification: No

VSANS Detector Vacuum Chamber

Customer:

National Inst. Of Stds. & Technology
100 Bureau Drive
Gaithersburg, MD 20899-001

ADC designed and built components for a large instrument for National Institute of Standards and Technology (NIST). This instrument is similar to a more complex instrument we delivered to ANSTO in Australia called the Bilby SANS instrument. The NIST VSANS and the ANSTO Bilby 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 (7.5×10^{-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.



Notes:

1. Very Small Angle Neutron Scattering (VSANS) evacuated flight tube and detector motion system
2. 3 rack-and-pinion driven carraiges carry 3 neautron detector arrays inside the vessel
3. System Weight: 33246 kg [73141 lb or 36.5 US tons], Foot Area: 48 ft^2, Floor Loading: 1523 psf
4. Vacuum Level: Rough Vacuum (10^-3 mbar)

VACUUM APPLICATION

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

Approval by T Shea | Date 2015-12-04
Purchased Part Modification | No

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

Material | Protective Finish: None

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Drawing Standard: ANSI Y14.5M-1994		Date
Drawn By	T Shea	2015-12-03
Design by	J Stranger	2015-01-26

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: 607.533.3631 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com
ISO 9001:2008 Certified

VSANS System Assembly

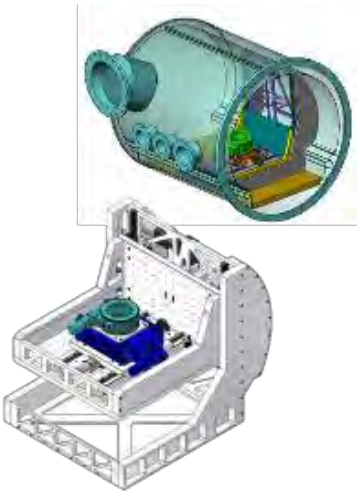
Part Number	Rick	Revision	Size	Sheet
00025178	D2/S2	0	A2	

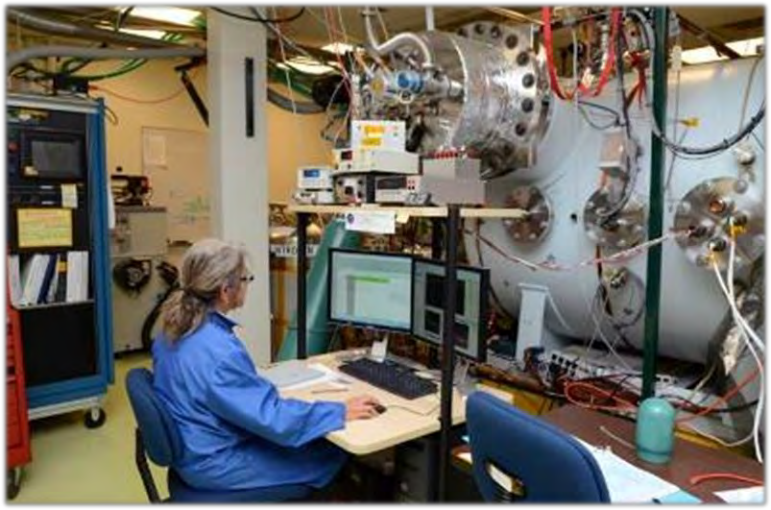
Gimbal System for MOBI High Vacuum

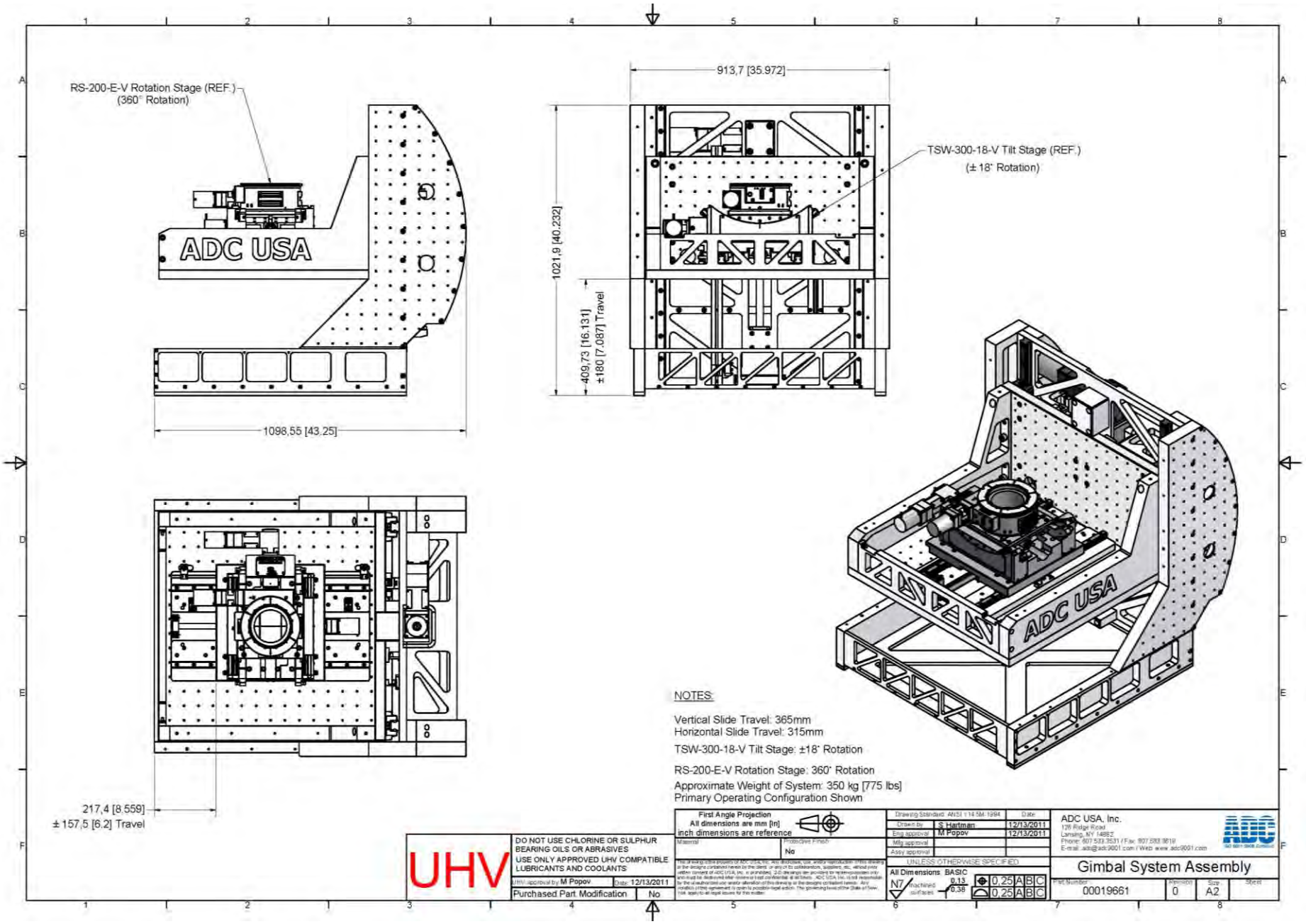
Customer:

Colorado University
Laboratory for Atmospheric and Space Physics
1234 Innovation Dr.
Boulder, CO 80303

A high precision motion system was required to operate in the MOBI Vacuum Chamber at a High Vacuum level at the Laboratory for Atmospheric and Space Physics (LASP). The motion system components are: a custom high precision linear slide used for vertical travel, a custom high precision linear slide used for horizontal travel, a high precision rotation stage that provides yaw motion, and a high precision tilt stage that provides pitch motion. Key specifications: vacuum 1 x 10^{-8} torr, vertical slide 362 mm, horizontal slide 368 mm, tilt ±18; rotation full 360°. ADC wrote the control software and operator interface to debug and test the MOBI system for factory acceptance.





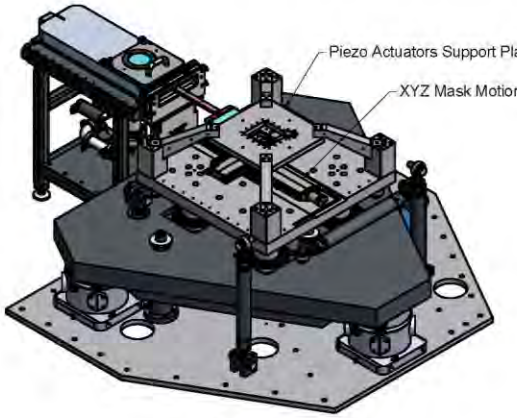

RS-200-E-V Rotation Stage (REF.)
(360° Rotation)
ADC USA
1098,55 [43.25]
913,7 [35.972]
TSW-300-18-V Tilt Stage (REF.)
(± 18° Rotation)
1021,9 [40.232]
409,73 [16.131]
±180 [7.087] Travel
217,4 [8.559]
± 157,5 [6.2] Travel
NOTES:
Vertical Slide Travel: 365mm
Horizontal Slide Travel: 315mm
TSW-300-18-V Tilt Stage: ±18° Rotation
RS-200-E-V Rotation Stage: 360° Rotation
Approximate Weight of System: 350 kg [775 lbs]
Primary Operating Configuration Shown
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: 12/13/2011
Purchased Part Modification
No
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
No
Drawing Standard: ANSI Y14.5M-1994
Drawn by S Hartman 12/13/2011
Eng approval M Popov 12/13/2011
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: 607.533.3619
E-mail: adc@adc9001.com / Web: www.adc9001.com
Gimbal System Assembly
Part Number 00019661
Revision 0
Size A2
Sheet

EVU Mask Microscope for Lithography Generations (SHARP)

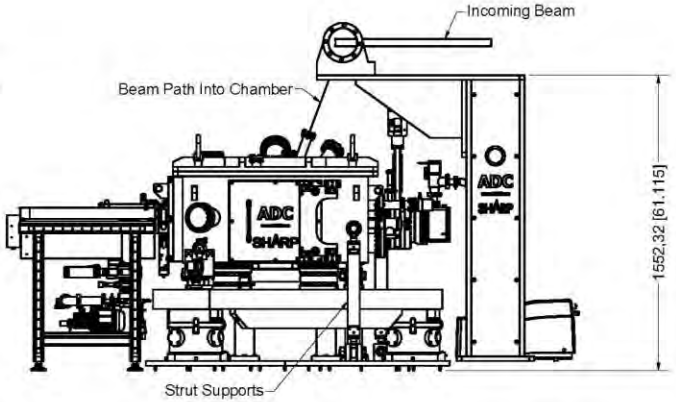
Customer:

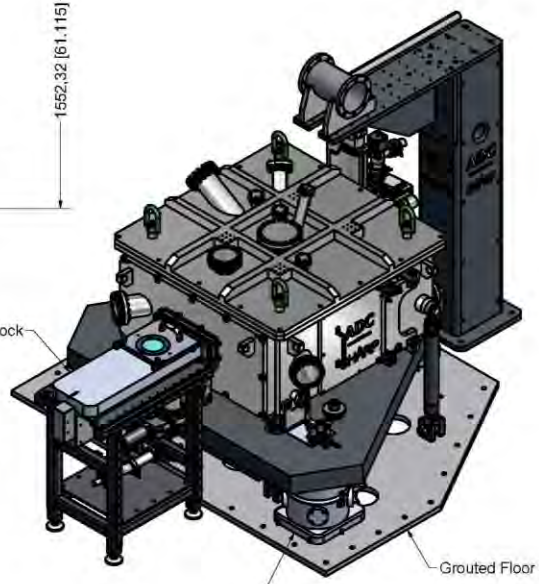
Lawrence Berkeley National Laboratory
US Department of Energy
One Cyclotron Road
Berkeley, CA 94720

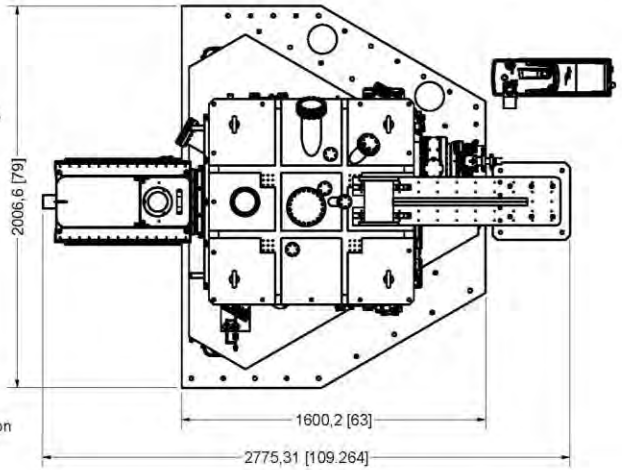
ADC designed, built and installed SHARP (the SEMATECH High-NA Actinic Reticle review Project) an actinic, synchrotron-based microscope dedicated to extreme ultraviolet (EUV) photomask research for Lawrence Berkeley National Laboratory. The system demonstrated the addition of complementary imaging modes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



Internal View







Notes:

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

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

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

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

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

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

Approximate Weight: 3220kg [7081lb]

First Angle Projection	
All dimensions are mm [in]	
inch dimensions are reference	
Material	Protective Finish
Purchased Part Modification	No

Drawing Standard: ANSI Y14.5M-1994		Date
Drawn by	E Acome	7/17/2012
Eng approval	M Popov	7/17/2012
Mfg approval		
Assy approval		

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

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

SHARP Instrument Assembly

Part Number	Revision	Size	Sheet
	0	A2	

High Precision Engineered Experimental Tables (EET)s

Argonne NATIONAL LABORATORY

APS

BROOKHAVEN NATIONAL LABORATORY

BNL

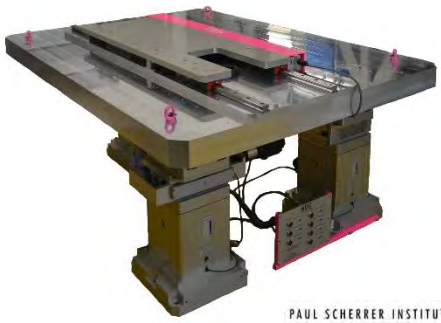
CHESS CORNELL HIGH ENERGY SYNCHROTRON SOURCE

CHESS

Air Force

NSRRC

NSRRC



PAUL SCHERRER INSTITUT PSI

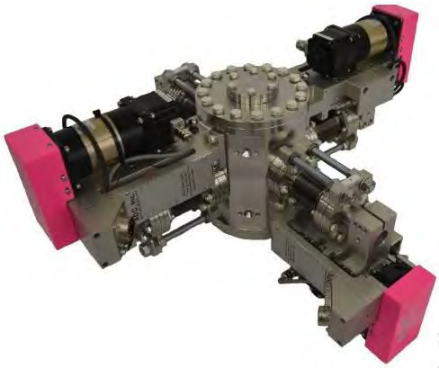
PSI

SLAC NATIONAL ACCELERATOR LABORATORY

SLAC

High Precision Slits

LSU-CAMD Water Cooled

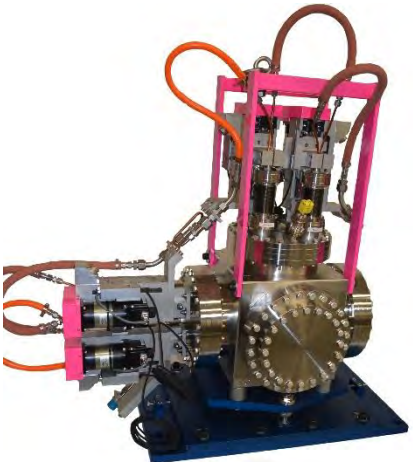


SwissFEL High Precision Slits – 45 Degree

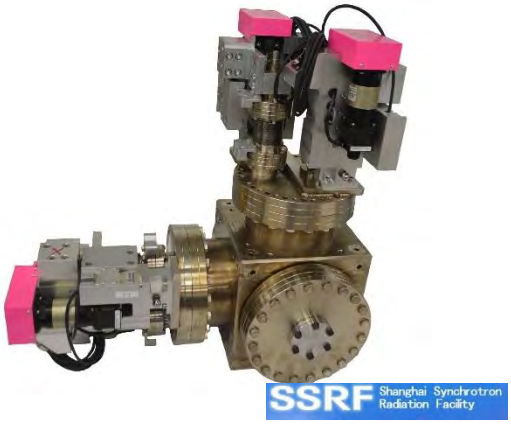
SwissFEL High Precision Slits – Curtain Design

Max IV Lab-Custom UHV Slit

ESRF-High Heat Load Slit



ESRF-High Heat Load UHV Slit System



SSRF-Monochromatic UHV Slits

Berkley Lab-UHV Slit Cooled

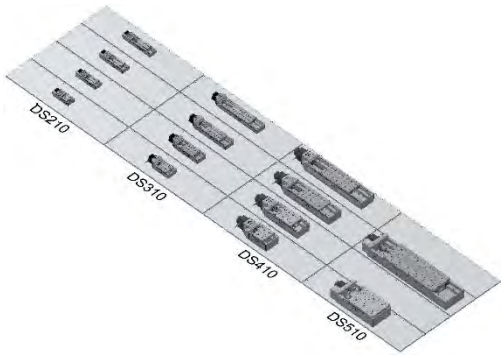
Berkley Lab-UHV Slit Uncooled

High Precision Motion Stages

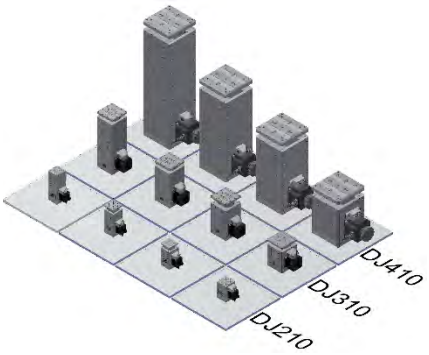
ADC manufactures high quality motion control products and systems that are qualified for Semi-conductor, Automation, and Aerospace industries. Our extensive product line includes linear stages (slides), lift stages (jacks), rotation stages, and tilt stages (goniometers).

Linear stages

ADC's linear slides are 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 micro stepping mode to meet customer 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.



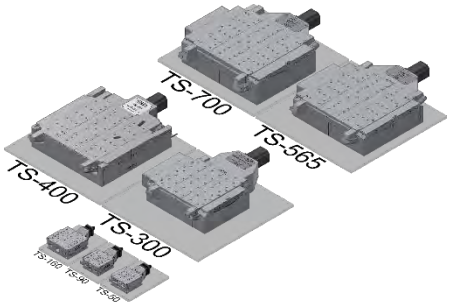
Lift Stages



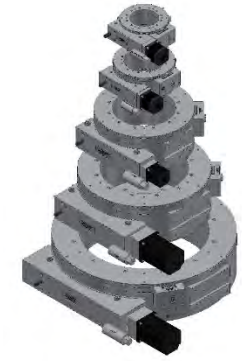
ADC's lift stages are driven by a high class preloaded ballscrew coupled to a high torque 200 step per revolution stepper motor which can be run in full, half, or micro stepping mode to meet customer resolution requirements. Maximum rigidity is assured through the use of preloaded crossed roller linear bearings. Each jack also features two fully adjustable, normally closed limit switches to define the extents of travel.

Tilt Stages/Goniometers

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

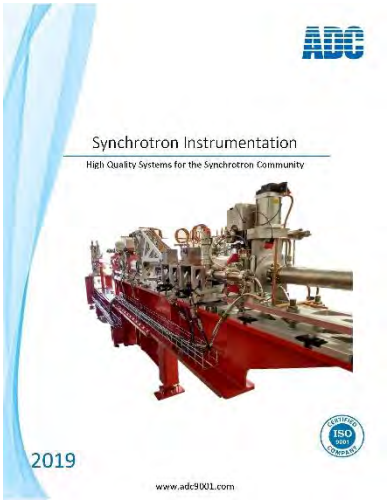


Rotation Stages

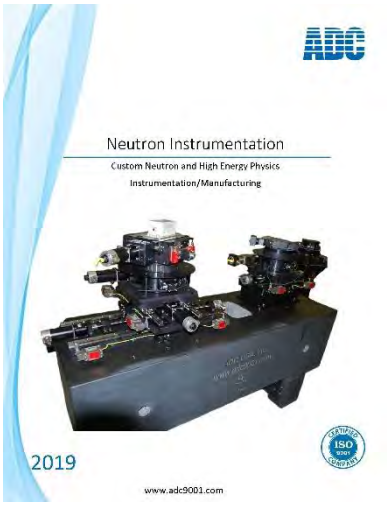


ADC's rotation stages are built upon an industry leading, preloaded, duplexed angular contact bearing set. These stages not only give an exceptionally high running accuracy but allow for large radial and thrust loads as well. Each stage is driven by a precision ground worm gear set and a high resolution, high torque stepper motor. Backlash is reduced by employing a flexure style shimming technique to preload the worm and worm wheel.

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



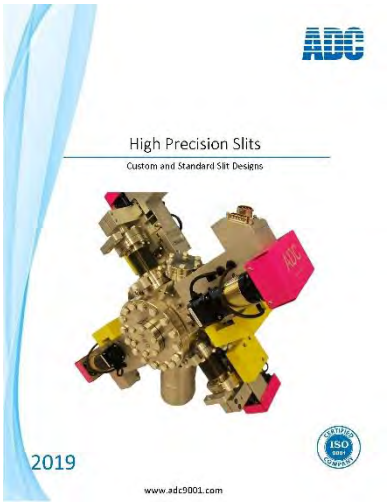
Synchrotron Instrumentation



Neutron Instrumentation

Motion Stages

High Precision Engineered Experimental Tables (EETs)



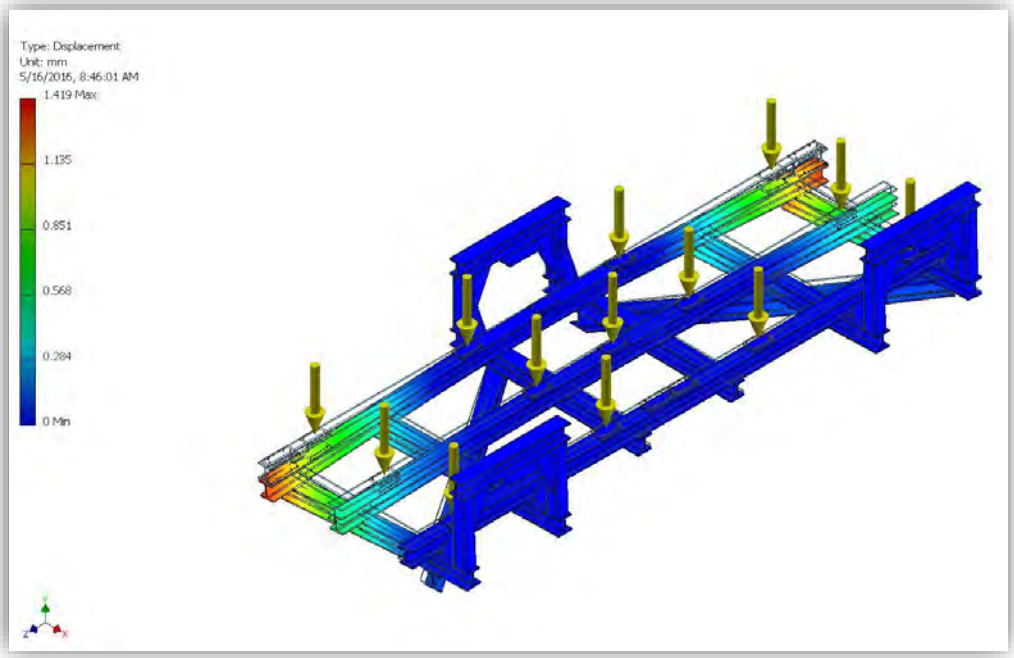
High Precision Slits

Company Capabilities

Engineering Design and Analysis

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

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



Electronics, Instrumentation and Software

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

Vacuum Assembly & Testing

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

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

Advanced Manufacturing

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

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

Equipment

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

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

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

Welding Capabilities

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

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

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

Benefits of TIG Welding

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

Benefits of MIG Welding

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

Benefits of Mesh Welding

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

ADC's Service and Support

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

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

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

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

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

ISO 9001:2015

BUREAU VERITAS
Certification

ADVANCED DESIGN CONSULTING USA, INC.

126 RIDGE RD
LANSING, NY 14882 USA

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

ISO 9001:2015

Scope of certification

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

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

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

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

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

Signed on behalf BVCH SAS – UK Branch

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

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

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