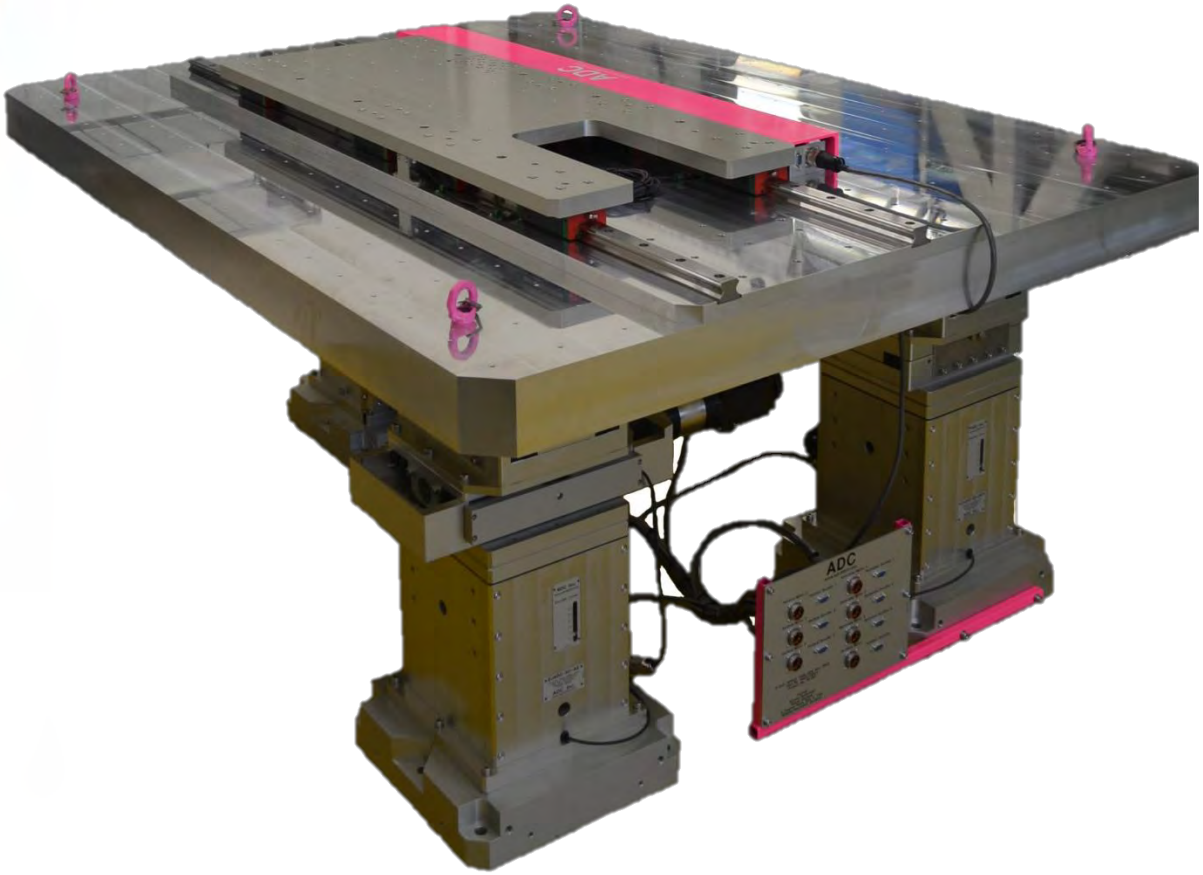
Engineered Experimental Tables (EETs)

High precision, motorized engineered experimental tables for Synchrotron, Neutron, FEL, and High Radiation Scientific Facilities



2019

www.adc9001.com

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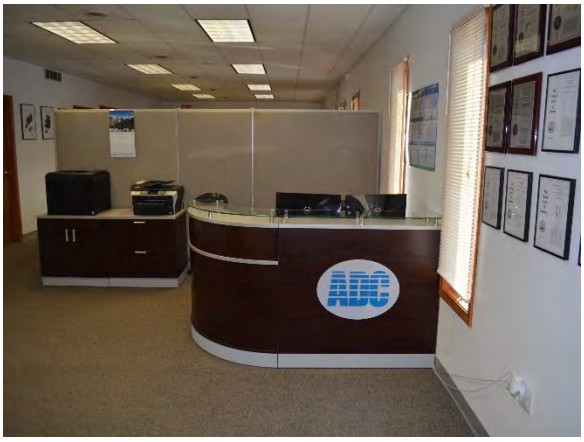
ADC USA, Inc.

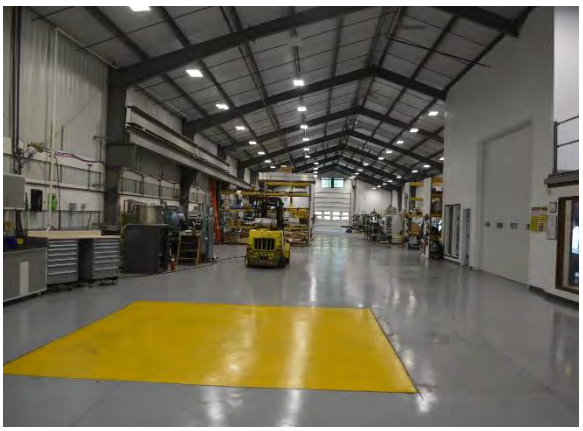
ADC USA, Inc. (ADC) is a leading developer and supplier of complex scientific components and instruments for large government laboratories and corporations around the world.



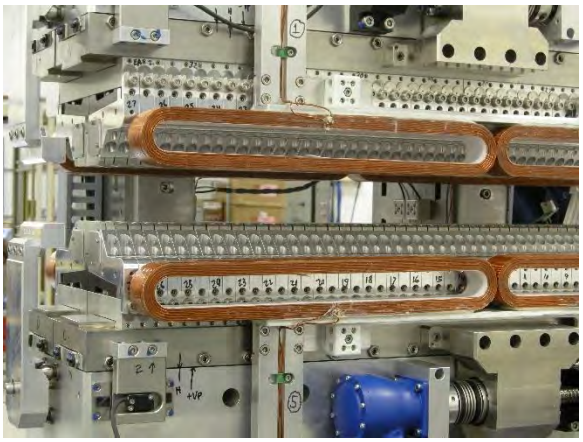
ADC, like many successful companies (and rock bands), got its start in a garage in 1995. Our garage was in Ithaca, NY, on the shores of Cayuga Lake and home of Cornell University. ADC has since grown into a worldwide leader in the field of design and manufacturing of complex research instrumentation.

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 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.

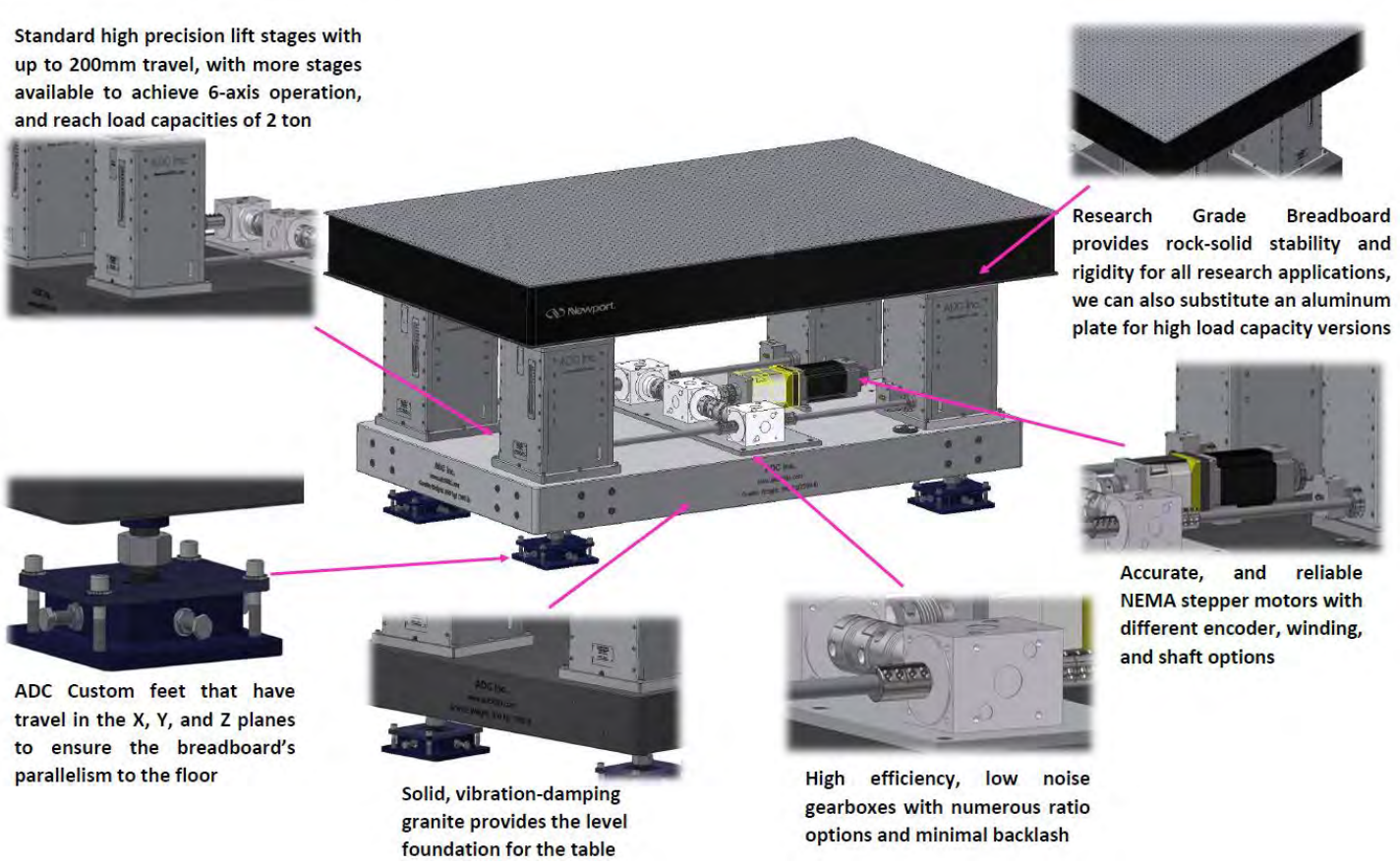
We have come a long way from our modest beginnings by developing our expertise and capabilities while continuing to provide excellence in products and service. ADC now consists of different departments to make up the framework of our operations: Engineering Design and Analysis, Manufacturing and Planning, 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.

Engineered Experimental Table (EET) Overview

ADC has been a leading supplier of high-quality Engineered Experimental Tables (EETs) to the synchrotron and neutron source scientific community as well as FELs and laser-based experiments for over 20 years. Many of our EETs have been in operation nearly that long in facilities around the world. Our tables are noted for stability as well as range of motion and load capacity.

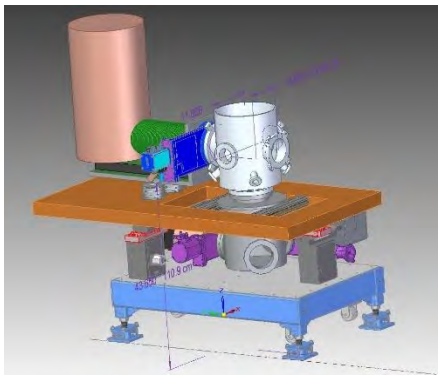
ADC has continuously improved our designs by supporting our customers' unique needs for space constraint, load capacity, vibrational stability, positional precision and stability, encoder position feedback, and base and frame requirements. ADC has developed a portfolio of EET components such as base and frames, lifts and lateral stages, floor location and attachments, wheel and air bearing movement, breadboards, and controls. These components are customizable to meet specific applications. Options include base material (steel or granite), size of table, and of motion. This catalog provides more details on our EETs and custom designs along with specific applications and references.



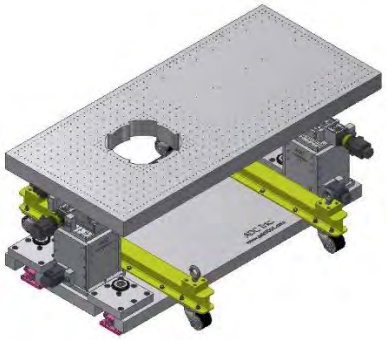
General Information

The Design Starts at ADC

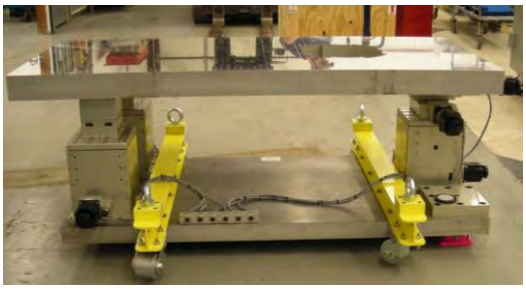
ADC designs systems from the ground up. This means we can build a system from just a simple idea. Our engineering staff has extensive experience designing and building systems from scratch. We have a large library of designs to help make a very modular system. We can take a customer's ideas from a preliminary 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 EETs are provided with motors and limit switches for the required motions. 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 EETs 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.

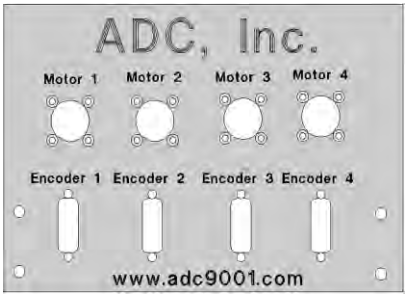
Linear Incremental Encoders

Linear incremental encoders are available as an additional option for EETs. 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 equipment. 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

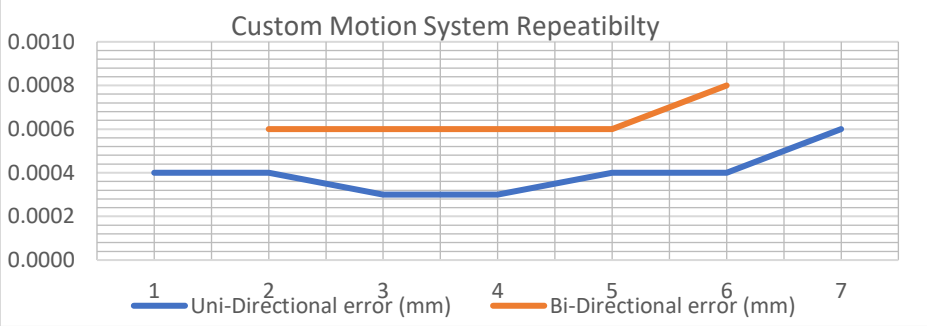


To ensure proper operation of the system, all cabling, wiring and connectors supplied comply with the EMC and NEC directive. To meet these criteria, all conductors and connectors used have sufficient and appropriate shielding capacity. The shielding efficiency is affected by a number of factors such 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 EETs feature a control panel to allow for simple and organized electrical connections.

Testing

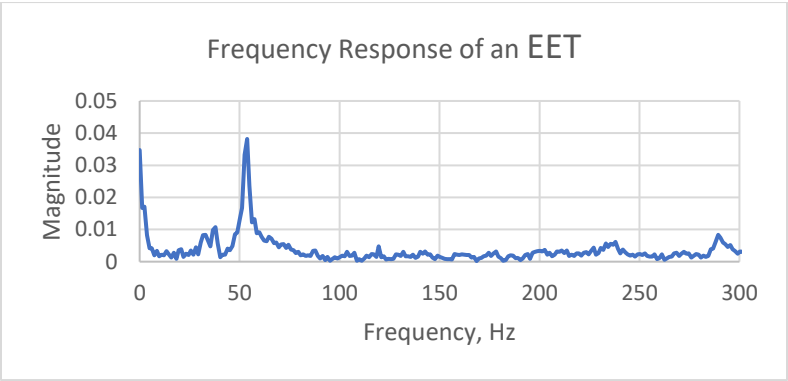
ADC's Custom High Precision Systems are typically designed, built and tested based upon customer specifications/requirements. Typical measurements include mechanical repeatability and frequency response measurements. ADC provides a detailed report with delivery of the equipment to the customer. Below 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 Table

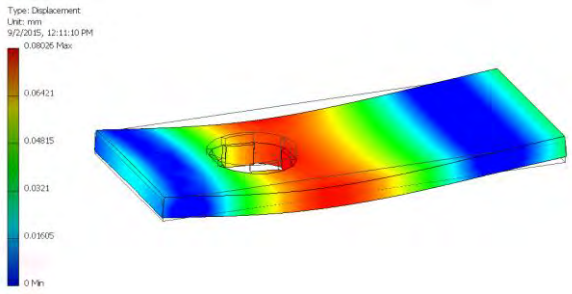
The vibrational response of a Custom High Precision System was measured using an accelerometer. Data was recorded on an oscilloscope and exported to Excel for further processing. Using a Fourier analysis, we are able to graph the frequency response. The table was excited using a dead-blow hammer. The 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 EET. 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 table, it is important to minimize the deflections due to bending under loading. Although a 4" table is typically used, different thicknesses are possible. At right is an analysis to examine the effects of a deflection on a 4" thick table. 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.

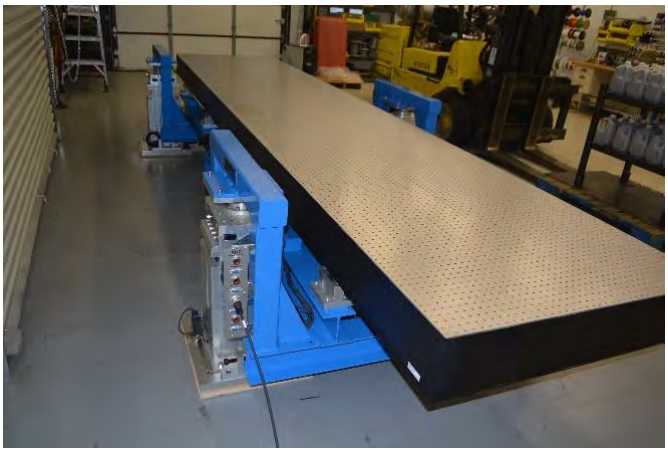


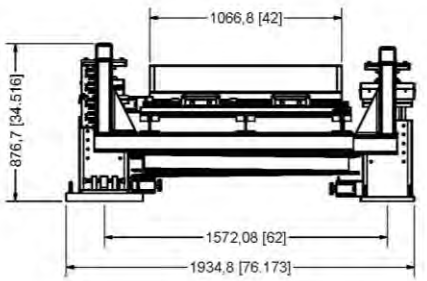
Custom EETs

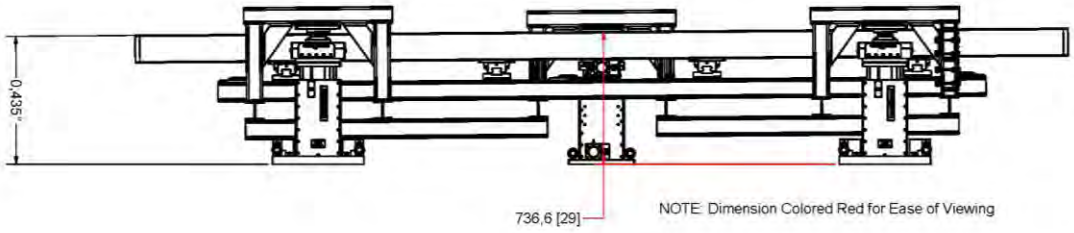
SLAC Custom EET

SLAC National Accelerator Laboratory
2575 Sand Hill Road M/S 1
Menlo Park, CA 94025

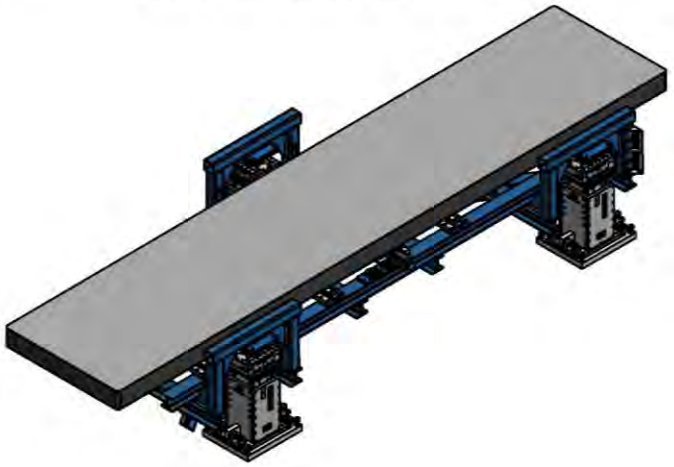
ADC built this custom EET for SLAC National Accelerator Laboratory. The table features a large optical breadboard which is 204” long and 42” wide. The length of this table will allow SLAC to combine two existing EETs into one combined table in order to create a more stable and repeatable experimental setup. The table has three degrees of freedom with micron accuracy and a 1500 lb load capacity. The table has been custom designed to fit within the space constraints of the facility and integrate with neighboring equipment.

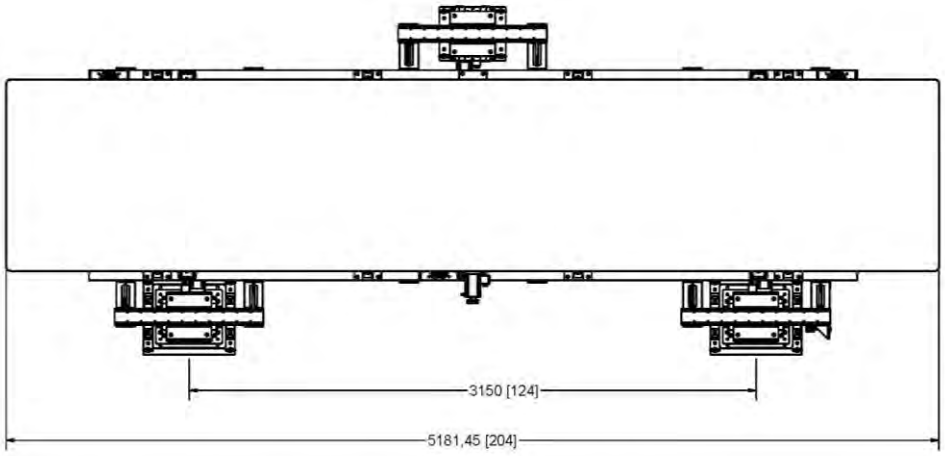






SPECIFICATIONS:
Vertical Travel: +/- 2"
Horizontal Travel: +/- 2"
Nominal Pitch: 7.6 mrad
Pitch Range: -7.6 mrad to 22.8 mrad
Load Capacity: 1500 lbs max





First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994
Material:	Finish: None
Drawn By: M Popov 5/1/2016	
Design By: M Popov 3/29/2016	
UNLESS OTHERWISE SPECIFIED: All Dimensions BASIC 0.13 0.38	N7 machined surfaces; 0.25 A B C; 0.25 A B C
Purchased Part Modification: No	

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

ADC

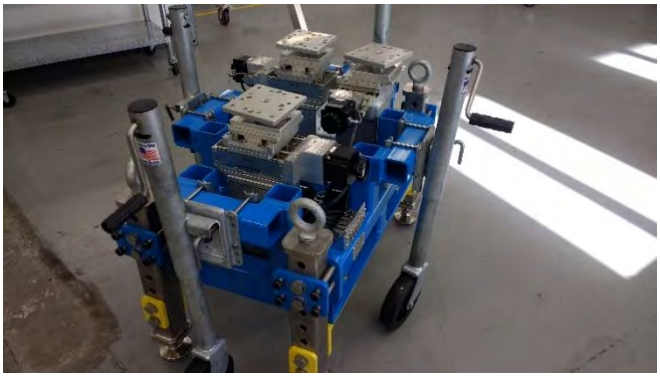
16-001 Slac Optical Table

Part Number	Rev-Index	Size	Sheet
00026645	0	A2	3 / 3

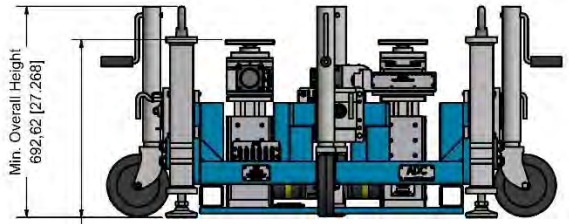
AlbaNova Custom EET

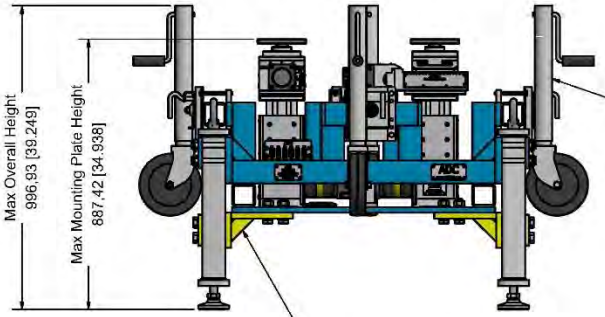
Customer:
Stockholm University
Alba Nova University Center
Roslagsvägen 30 B
SE-114 19 Stockholm, Sweden

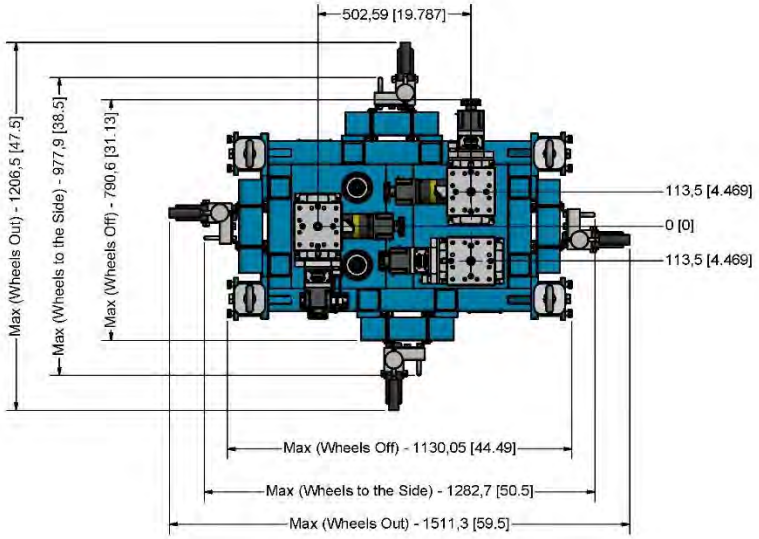
ADC designed an EET with 30 cm of height adjustment built into the support structure for AlbaNova University Center. The precision motion system for controlling the EET is supported by a welded steel frame with adjustable stainless-steel columns on each corner. The height of these columns can be continuously adjusted over the 30 cm range by the combined adjustment of the bolt location and the height of the swivel mounts at the base of each column. The stand also features detachable jacking casters which can be used to adjust the table height without the need for a forklift or crane. The design features ADC's 400 series jacks and slides and has 100 mm of vertical travel, 75 mm of horizontal travel and 6 degrees of freedom. The stand and motion system can support a 700 kg (1540 lb) load.

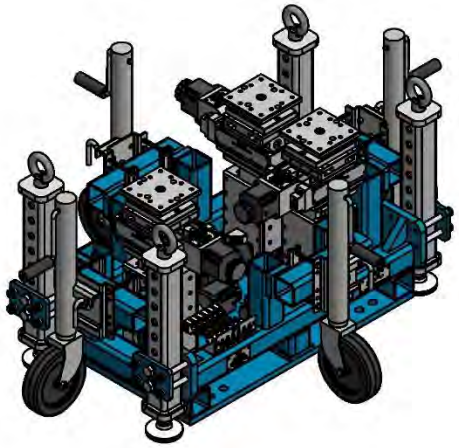


Vertical Stages at Mid-Travel for All Height Measurements:









Specifications:
Adjustable Foot Travel: 300mm [12"]
Vertical Stage Travel: 100mm [4"]
Horizontal Stage Travel: 75mm [3"]
Load Capacity: 700kg [1540 lb.]

Purchased Part Modification	No

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

Material	Protective Finish	
	None	

Drawing Standard: ANSI Y14.5M-1994

		Date
Drawn By	B Hoza	5/3/2016
Design by	B Hoza	4/5/2016

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

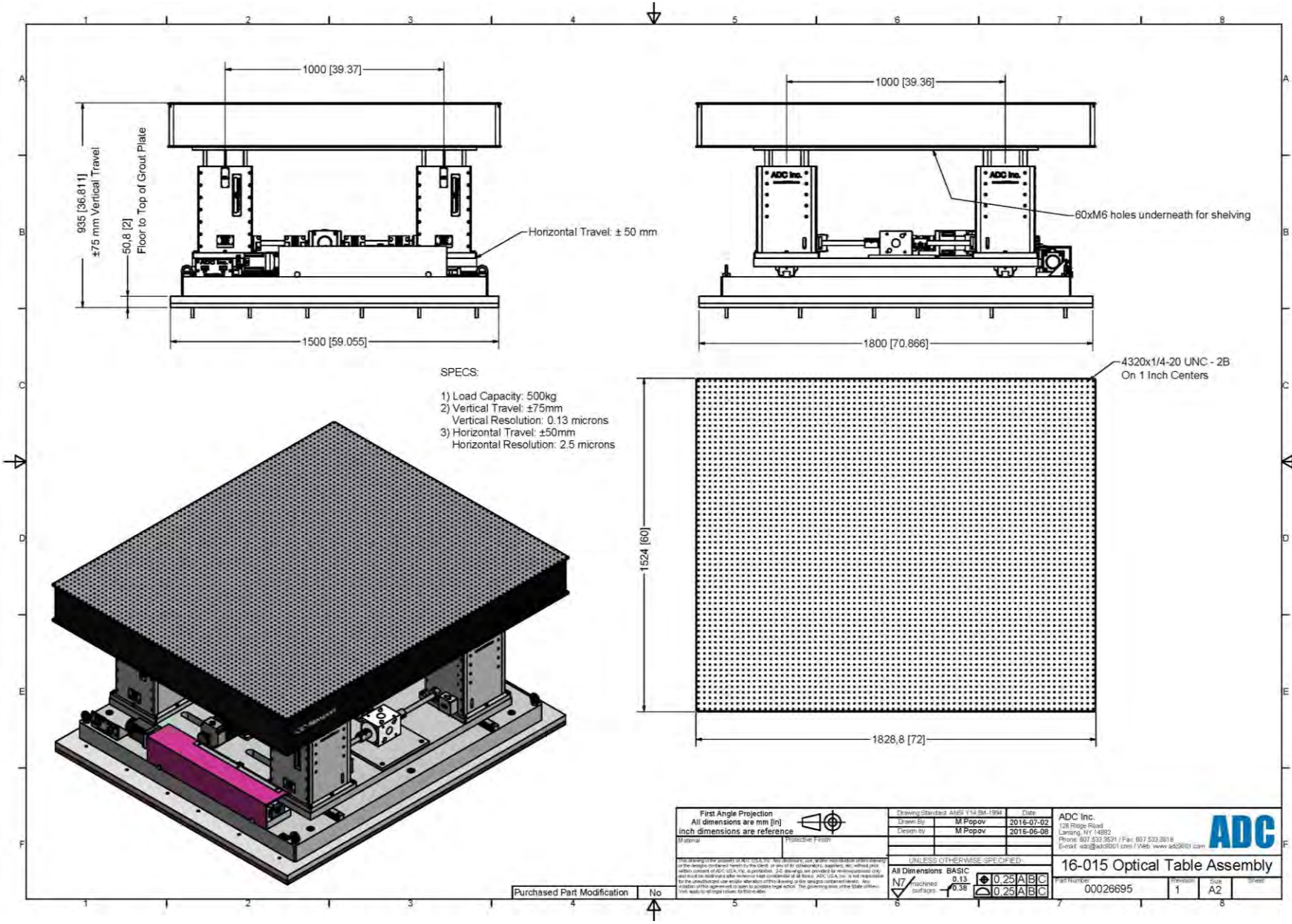
Stockholm Optical Table Assembly

Part Number	Risk	Revision	Size	Sheet
00027500	D0/S1	0	A2	2 / 2

APS 2-Degrees of Freedom EET

Customer:
Argonne National Laboratory
9700 S. Cass Avenue
Lemont, IL 60439

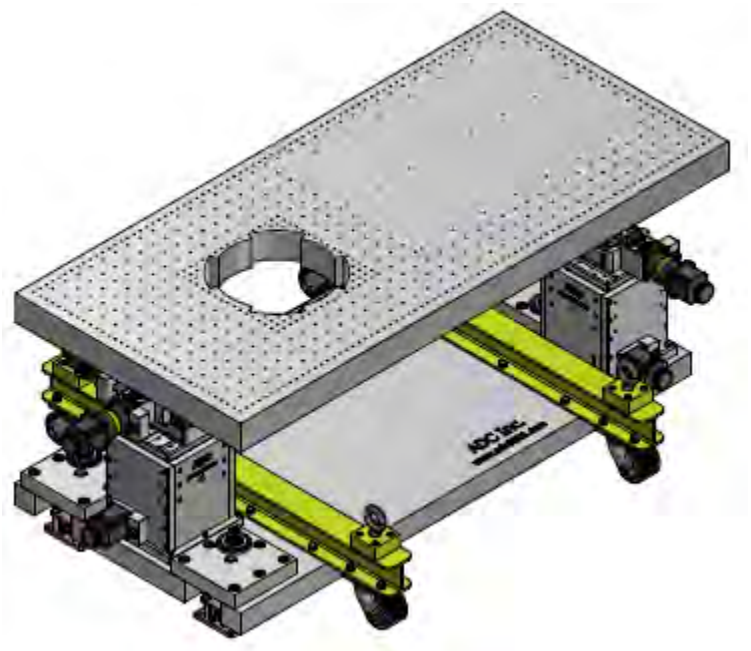
This EET was designed for Argonne National Laboratory (ANL), for use with their KB microprobe. This table has two degrees of motion. It is capable of 75 mm of vertical travel in both directions from the neutral location with the use of four DJ450-150 jacks driven by a single TS43B torque stepper motor. Additionally, the slide allows for 50 mm of horizontal travel in both directions parallel to the short axis of the table. The table is equipped with a custom 8-inch-thick breadboard for stable equipment mounting. The motor, limit switches and control panel are located on the same side of the table for maintenance convenience. This table also grants the capability for shelving to be installed on the underside plate, while the design allows for easy installation of Renishaw encoders.


1000 [39.37]
935 [36.811]
±75 mm Vertical Travel
50,8 [2]
Floor to Top of Grout Plate
Horizontal Travel: ± 50 mm
1500 [59.055]
1000 [39.36]
60xM6 holes underneath for shelving
1800 [70.866]
SPECS:
1) Load Capacity: 500kg
2) Vertical Travel: ±75mm
Vertical Resolution: 0.13 microns
3) Horizontal Travel: ±50mm
Horizontal Resolution: 2.5 microns
4320x1/4-20 UNC - 2B
On 1 Inch Centers
1524 [60]
1828,8 [72]
Purchased Part Modification
No
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish
Drawing Standard: ANSI Y14.5M-1994
Drawn By M Popov 2016-07-02
Design by M Popov 2016-06-08
UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
N7 machined surfaces
0.13 0.38
0.25 A B C
0.25 A B C
ADC Inc.
128 Ridge Road
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3818
E-mail: adc@adc9001.com / Web: www.adc9001.com
ADC
16-015 Optical Table Assembly
Part Number 00026695
Revision 1
Size A2
Sheet

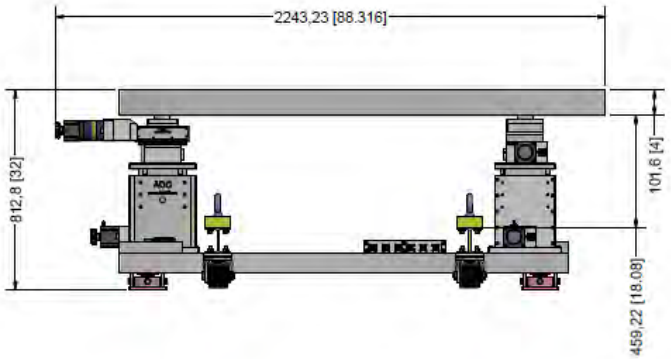
SLAC 6-Degrees of Freedom EET

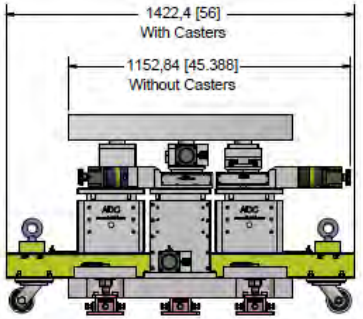
Customer:
SLAC National Accelerator Laboratory
2575 Sand Hill Road M/S 1
Menlo Park, CA 94025

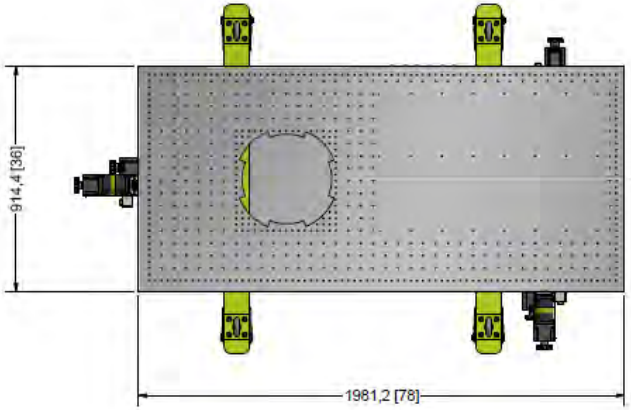
ADC designed this EET for SLAC National Accelerator Laboratory to both support and accurately position research equipment. The EET was designed to have 6 degrees of freedom with sufficient travel, resolution, and repeatability in each direction to meet all of SLAC's specifications. The overall dimensions of the table, as well as the features machined into the surface of the table, have been custom designed to support SLAC's microscope, chambers, and related components. Additionally, the EET has been engineered to support the load of the microscope and its related equipment without any significant deflections, helping to ensure the accuracy of the table.

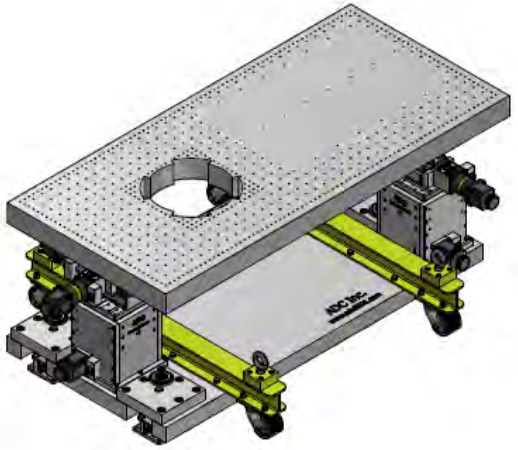


REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	2015-09-04	B Hoza









Specifications:

Degrees of Freedom: 6
Travel: +/- 25.4 [1] Vertically, +/- 37.5 [1.48] Horizontally
Resolution: 0.001 mm in each direction
Designed Load: 2,200 lbs. (1,000 lb table.)
Approximate Weight: 1185 kg [2612.5 lbs.]

Purchased Part Modification	No

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

Material:
Protective Finish: None

Drawing Standard: ANSI Y14.5M-1994		Date
Drawn By	B Hoza	9/4/2015
Design by	B Hoza	6/11/2015

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

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

ADC

SLAC Optical Table 2D Overview

Part Number	Revision	Size	Sheet
00026700	0	A2	1 / 1

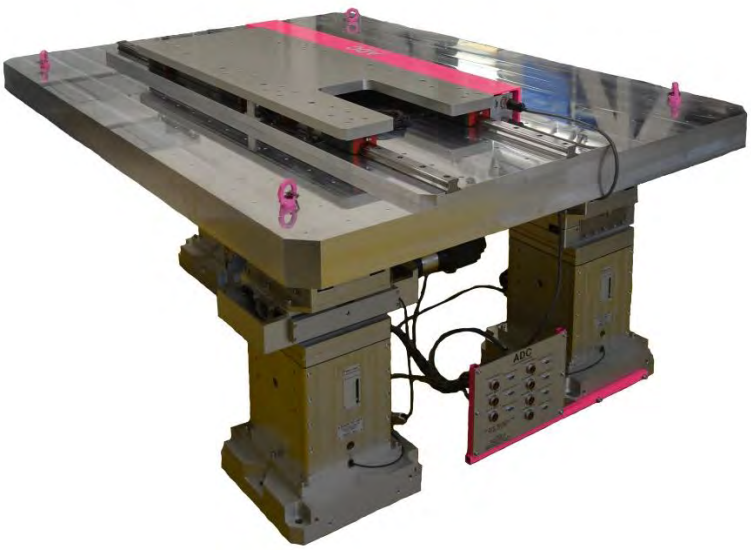
Paul Scherrer Institut (PSI) High-Capacity, 6-Axis EET

Customer:

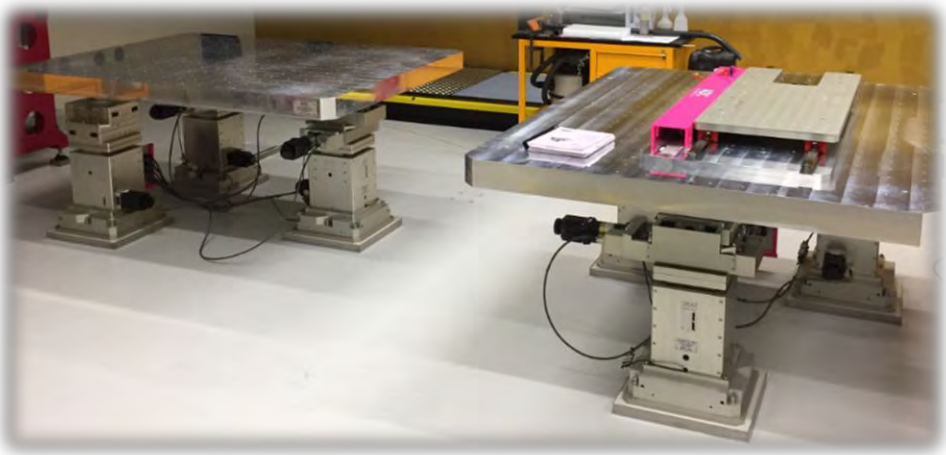
PAUL SCHERRER INSTITUT

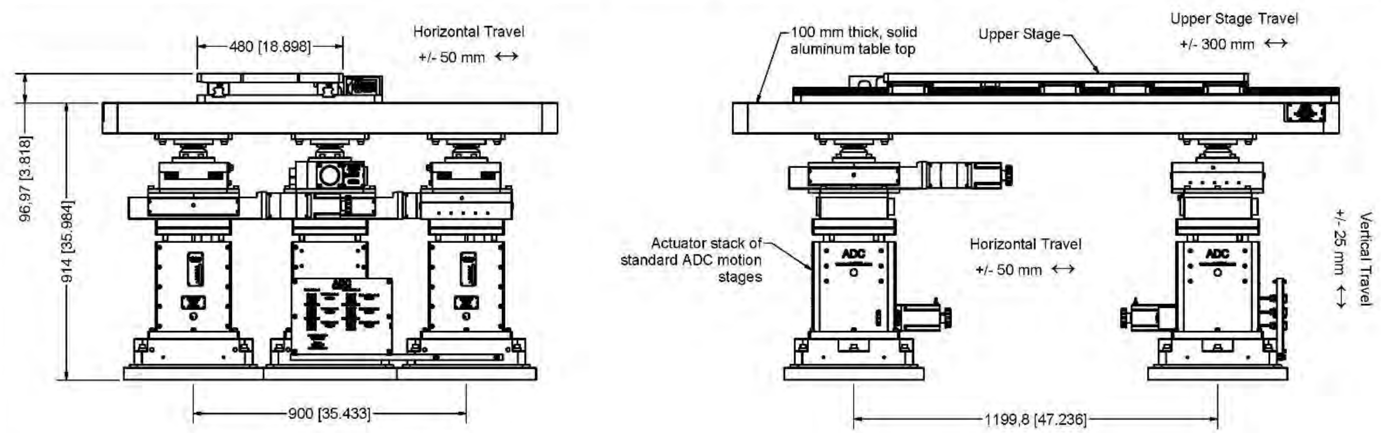
Warenannahme Ost

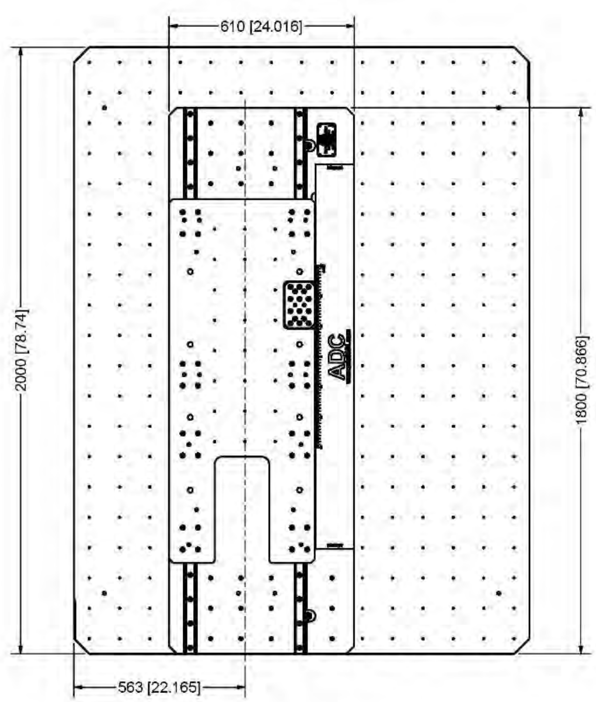
CH-5232 Villigen PSI; Schweiz



A pair of identical EETs was designed for Paul Scherrer Institut (PSI), to be installed in the Swiss Free Electron Laser (FEL) as large-scale manipulators for optical equipment. One of the two tables was topped with an additional horizontal axis to provide additional travel for the 2000 kg PRIME instrument and its surrounding vacuum chamber. From the crane capacity limitations in the hutch and the customer's desire for grouted foundations, it was decided to forgo the traditional base plate with casters and instead build the table in place, carting in each actuation stack separately and then placing the table atop the three stacks. All motions were driven by stepper motors through ball screws, and feedback was provided by absolute encoders.

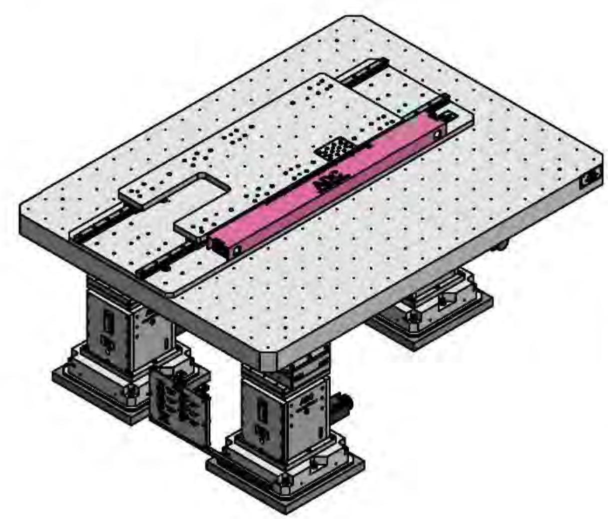






Notes:

1. PRIME table shown, FLEX table identical but without upper stage.
2. Travel Ranges - 6 controlled degrees of freedom
   Upper Stage Horizontal: 600 mm [~23.6"]
   Horizontal: 100 mm [~4"]
   Vertical: 50 mm [~2"]
   Rotation: +/- 2°
3. All axes equipped with 50 nm resolution absolute encoders (relative available on request)
4. Mechanical resolutions: 1 micron / step for all axes
5. Load capacity: 2000 kg [~4400 lb]
6. System Mass: 2869 kg [~6312 lb]

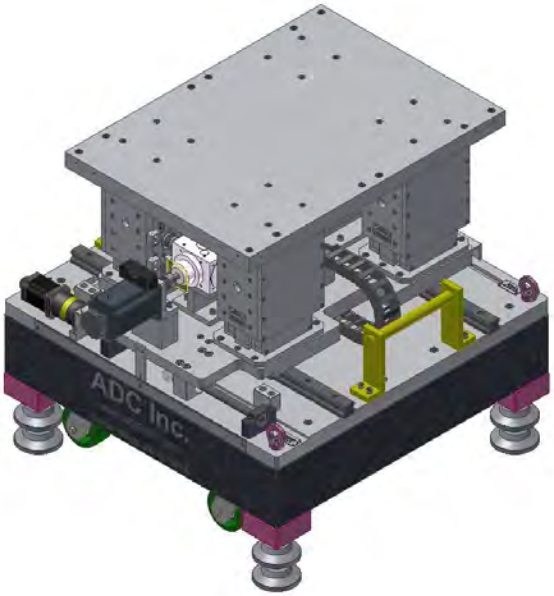


First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date	ADC Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3618 E-mail: adc@adc9001.com / Web: www.adc9001.com ISO 9001:2008 Certified
Material	Drawn By: T Shea	2016-02-18	
Protective Finish: None	Design by: T Shea	2016-02-11	Motion Systems Top Assembly, 15-041 for PSI
Purchased Part Modification: No	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: 00027260 / Risk: D2/S2 / Revision: 2 / Size: A2

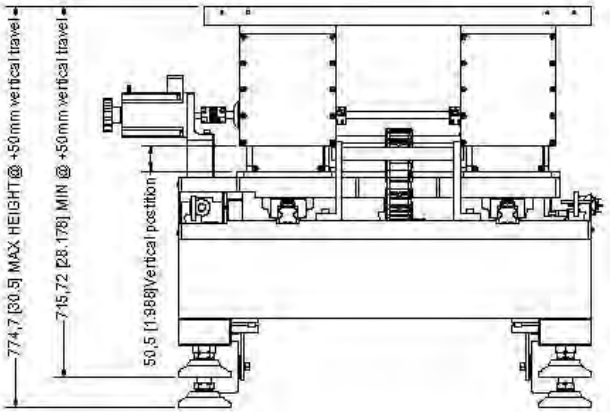
APS 2-Degrees of Freedom EET

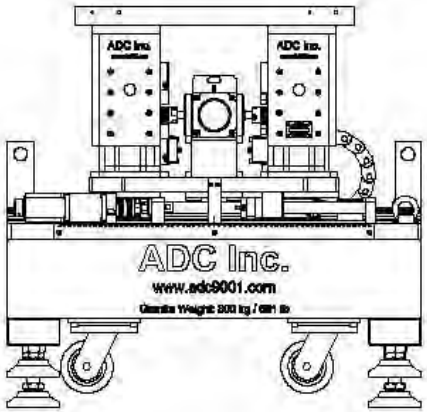
Customer:
Argonne National Laboratory
9700 S. Cass Avenue
Lemont, IL 60439

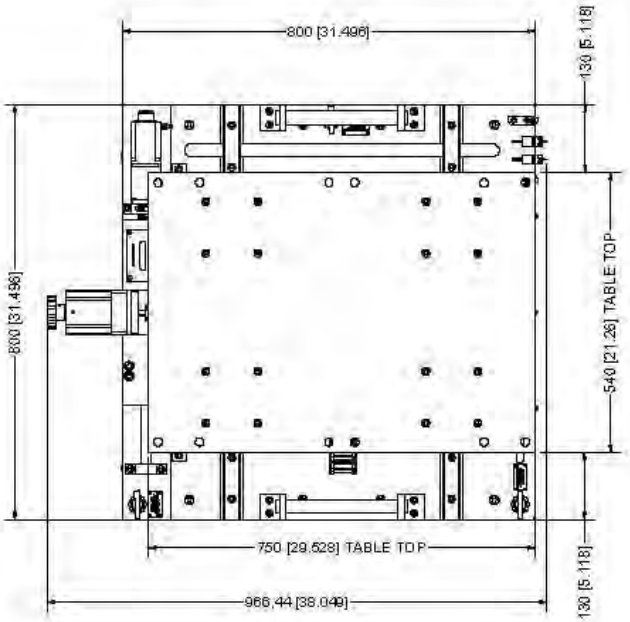
This EET for the Advanced Photon Source at Argonne National Lab has two degrees of driven motion, vertical and horizontal. The vertical motion is accomplished by four ADC 5-kN utility jacks driven by a single NEMA 34 stepper motor to prevent binding. The horizontal motion is supported on THK HSR35 rails and driven by a 20x5 mm ball screw from NSK with a NEMA 23 stepper motor and 10:1 planetary gearbox. All motions have adjustable limit switches to change the travel within the maximum range. Adjustable feet were used to meet the customer's height requirements, placing the table top at 725 mm from the floor while sitting on the feet at mid vertical travel. The addition of handles to the system, in conjunction with large, durable casters, makes the system easy to move around the facility as needed. The table is designed to have a full range of horizontal travel without having the overall dimensions exceed 825 mm in the direction of horizontal travel.

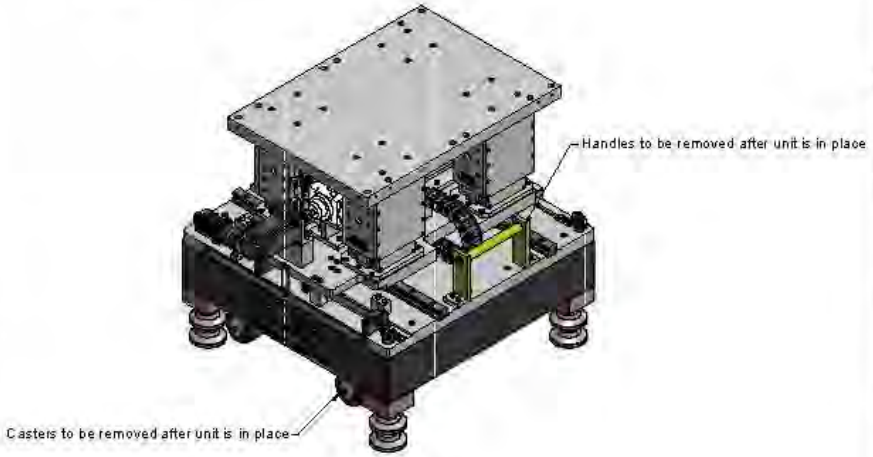


REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Approval Drawing	2014-12-12	K McAfee









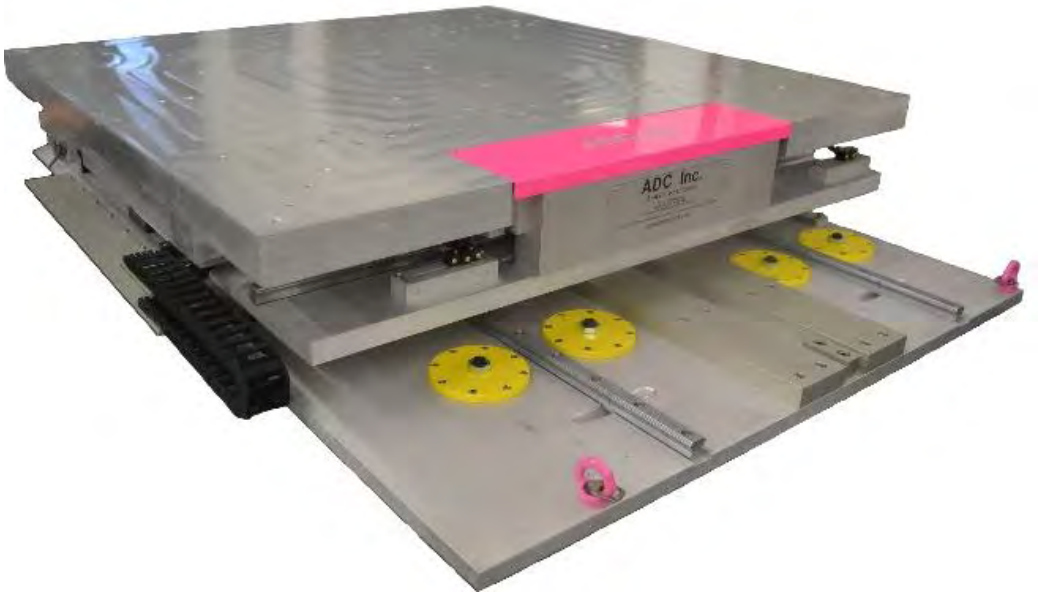
Note:
Table height at center of vertical travel, Max: 775mm Min: 716mm
Table length at end of travel: 800mm either direction
Approximate weight: 577kg [1272 lbs]

First Angle Projection All dimensions are mm [in] Inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994	Date	ADC Inc. 128 Ridge Road Lansing, NY 14882 Phone: 607 533 3581 | Fax: 607 533 3582 E-mail: adc@adc9001.com | Web: www.adc9001.com
	Drawn by: K McAfee	2014-11-21	
	Design by: K McAfee	2014-11-21	
Material: None Protective Finish: None	UNLESS OTHERWISE SPECIFIED All Dimensions: BASIC N7 machined surfaces 3,13 / 0,38 ⌖ 0,25 A B C ⏥ 0,25 A B C		CIW Optical Table Assembly Part Number: 00024920_2Doverview Revision: 0 Size: A2 Sheet: 1 / 1

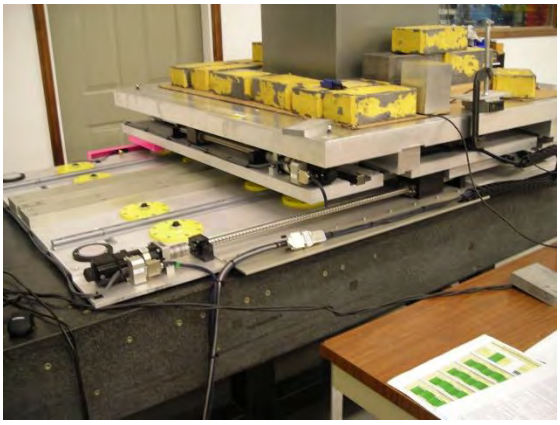
Purchased Part Modification	No

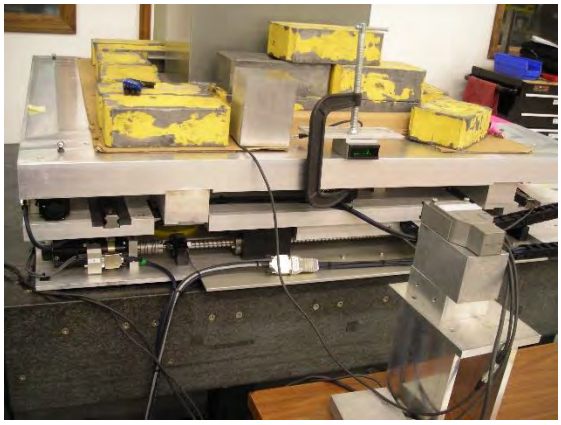
3-Axis Motorized Positioner

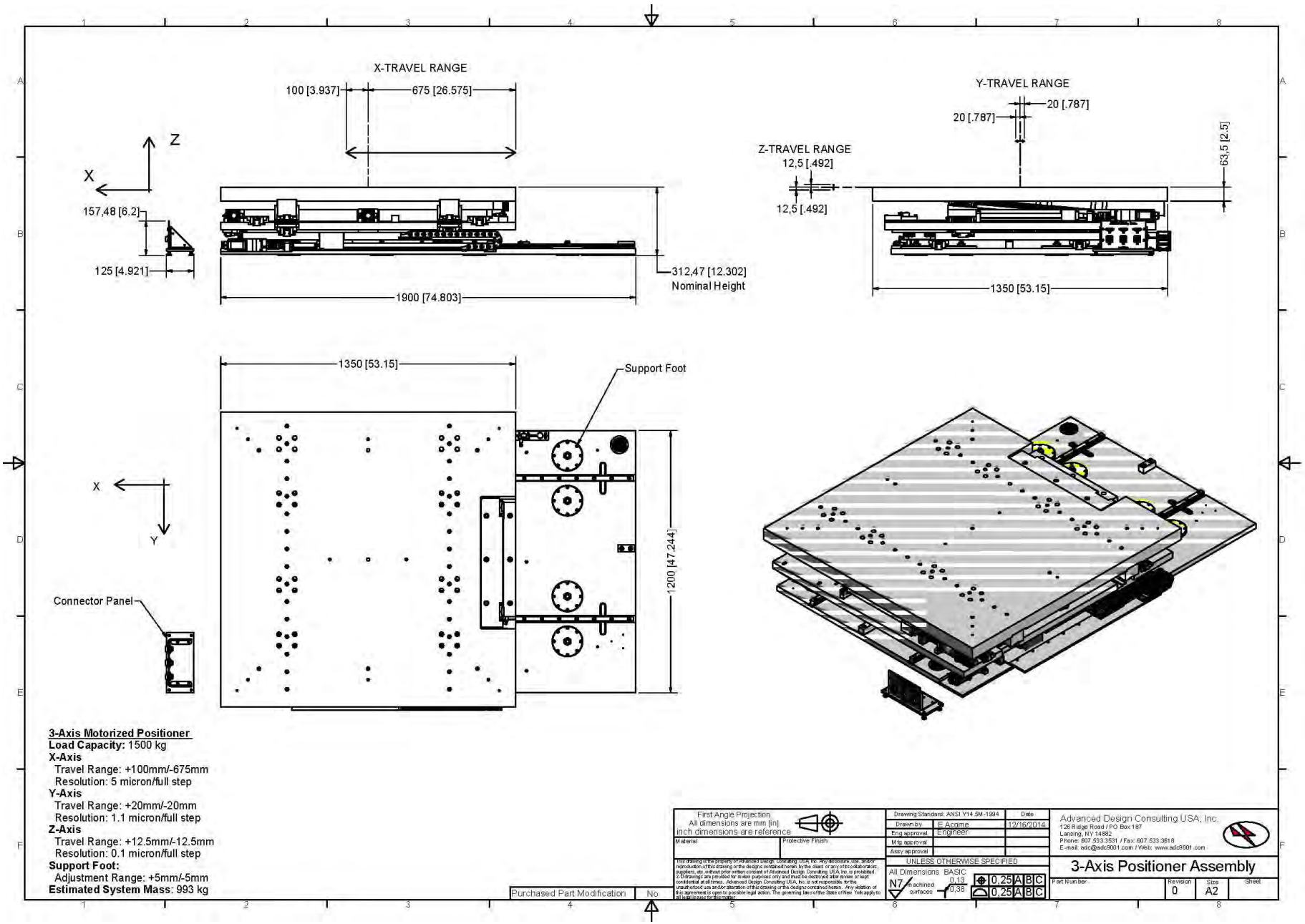
Customer:
National Synchrotron Radiation Center
SOLARIS
U1. Czerwone Maki 98
30-392 Krakow, Poland



This custom high load, high precision 3-axis motorized system was designed for one of the first two beamlines at SOLARIS. 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
Material | Protective Finish
Drawing Standard: ANSI Y14.5M-1994 | Date
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
Purchased Part Modification | No.

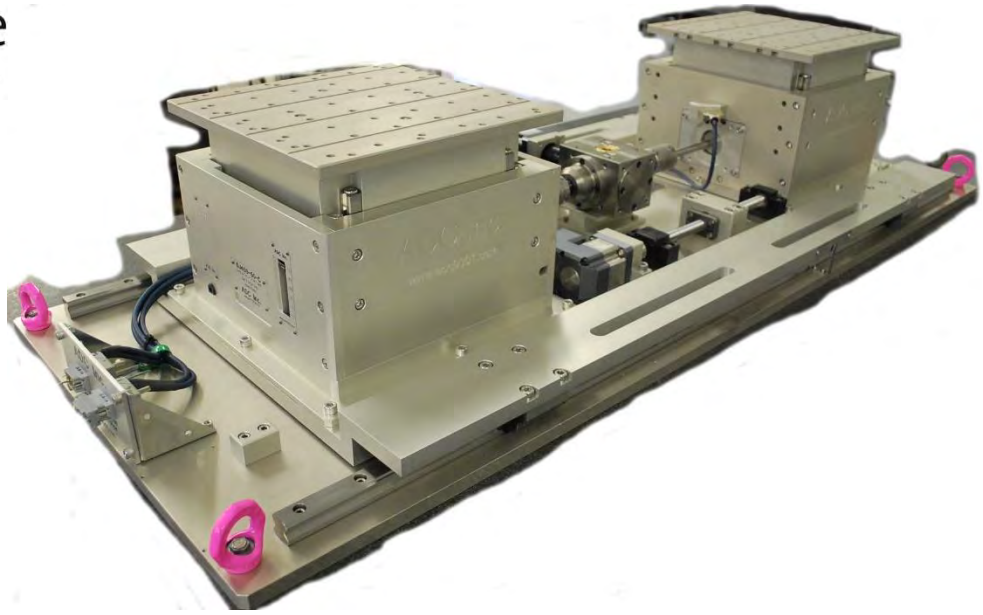
Advanced Design Consulting USA, Inc.
126 Ridge Road / P.O. Box 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3618
E-mail: adc@adc9001.com / Web: www.adc9001.com

3-Axis Positioner Assembly

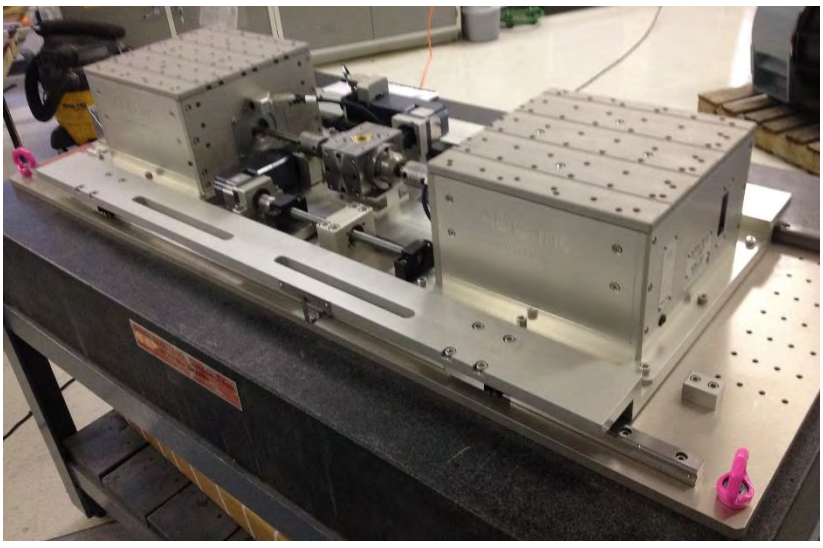
Part Number | Revision: 0 | Size: A2 | Sheet

APS 2-Degrees of Freedom EET

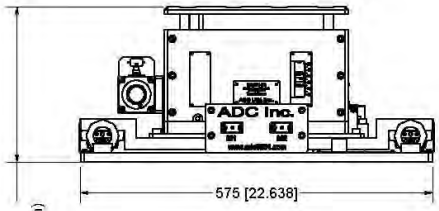
Customer:
Argonne National Laboratory
9700 S. Cass Avenue
Lemont, IL 60439

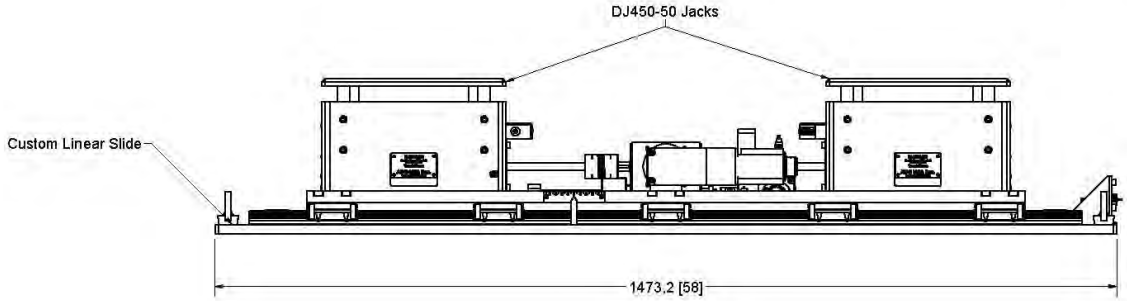


This v is a 2-axis motion system designed to lift a 250 lb load and move +/- 25 mm both horizontally and vertically for Argonne National Lab. The horizontal motion is based on a linear slide design that ADC has continually improved in the past few years to meet the high demands of the industry. The linear motion is supported by THK HSR25 guide rails and bearings. A preloaded 16x2 mm ball screw coupled to a NEMA 23 motor and a 20:1 gear reduction allows the unit to have a 0.5 µm resolution. The vertical motion consists of 2 ADC DJ450-50 jacks that are driven by one Nema 23 motor and a 20:1 gear reduction, which is then coupled to a Tandler spiral bevel gear box which allows the jacks move simultaneously. The simultaneous motion is preferred to avoid potential binding of the jacks which is common with driving each jack individually. NB SVS 6100 crossed roller bearings provide a stable and smooth platform for the vertical motion. A 2” thick Newport bread board will be mounted on top of the jacks, by the customer, and will provide a stable base for mounting equipment as necessary.



REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Prelimenary Design Release	6/27/2012	M Popov





Specifications:

Linear Stage:

Travel: ±25 mm, 1 In

Resolution: 0.5 micron

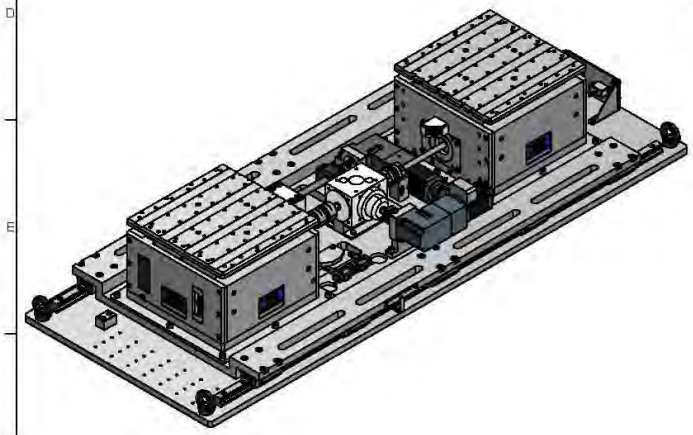
Vertical Stage:

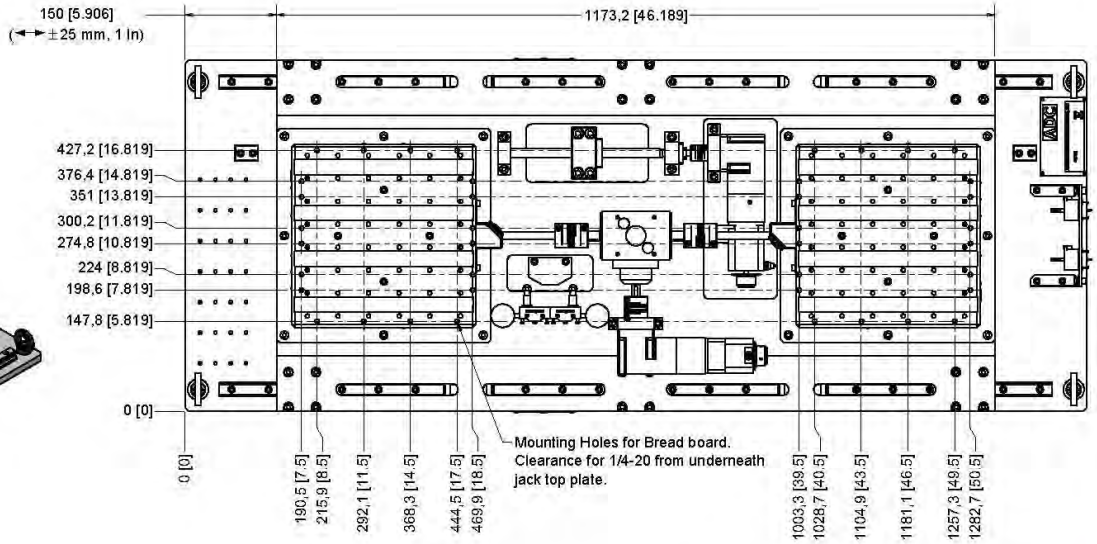
Travel: ±25 mm, 1 In

Resolution: 0.25 micron

Load Capacity: 1112.5N, 250 lbs

Weight: 180 kg, 400 lbs



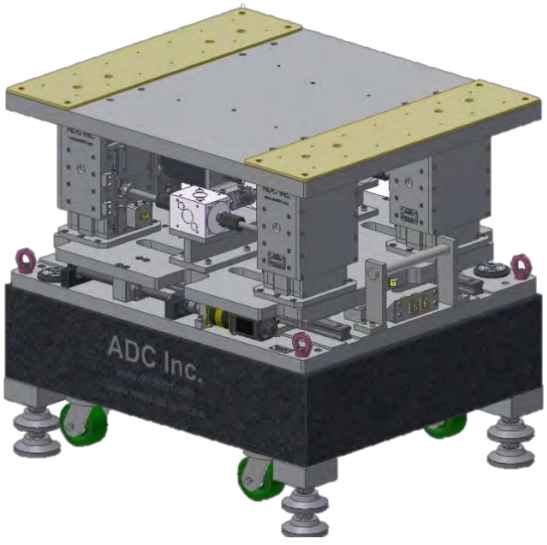


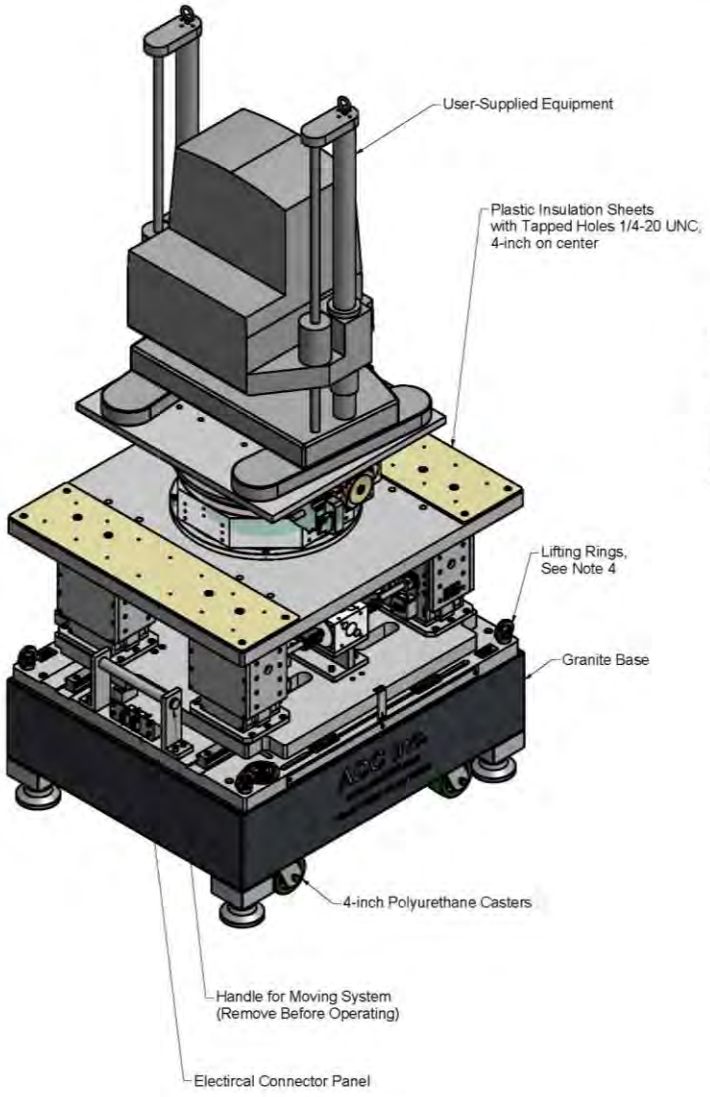
First Angle Projection All dimensions are mm [in] Inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994		Date	ADC USA, Inc. 126 Ridge Road Lansing, NY 14882 Phone: 607.533.3631 / Fax: 607.533.3619 E-mail: adc@adc9001.com / Web: www.adc9001.com
		Drawn by	M Popov	6/27/2013	
		Eng approval	M Popov	6/27/2013	
		Mfg approval			
Material	Protective Finish	Assy approval			
This drawing is the property of ADC USA, Inc. Any disclosure, use, and/or reproduction of this drawing or the design it describes by the client or any of its subsidiaries, suppliers, etc. without prior written consent of ADC USA, Inc. is prohibited. 2-D drawings are provided for review purposes only. Such not be disclosed to third parties or kept on the client's intranet. ADC USA, Inc. is not responsible for the manufacture and/or calibration of this drawing or the design it controlled herein. Any violation of this agreement will be upon its possible legislation. The governing laws of the State of New York apply to all legislations 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: APS Custom IR Optical Table Revision: 0 Size: A2 Sheet: 1 / 1
Purchased Part Modification	No				APS Custom IR Optical Table

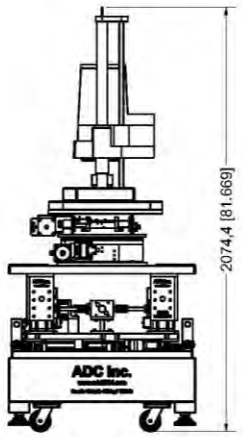
Cornell High Energy Synchrotron Source (CHESS) 2-Degrees of Freedom EET

Customer:
Cornell University
Wilson Synchrotron Lab and Ring
161 Synchrotron Dr
Ithaca NY, 14853

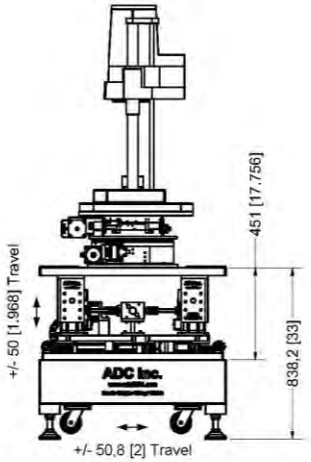
This EET for Cornell's CHESS facility has two degrees of driven motion, vertical and horizontal. The vertical motion is accomplished by four ADC 5 kN utility jacks driven by a single NEMA 34 stepper motor to prevent binding. The horizontal motion is supported on THK HSR35 rails and driven by a 20x5 mm ball screw from NSK with a NEMA 23 stepper motor and 10:1 planetary gearbox. All motions have adjustable limit switches to change the travel within the maximum range. Adjustable feet were used to meet the customer's height requirements, placing the table top at 33 inches from the floor while sitting on the feet, but keeping the overall system shorter than 80 inches while resting on the casters. The addition of handles to the system, in conjunction with large, durable casters, makes the system easy to move around the facility as needed.



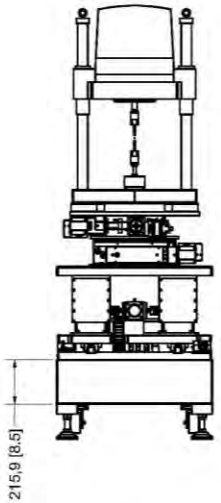


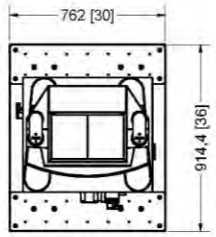


Transport Position



Experiment Position





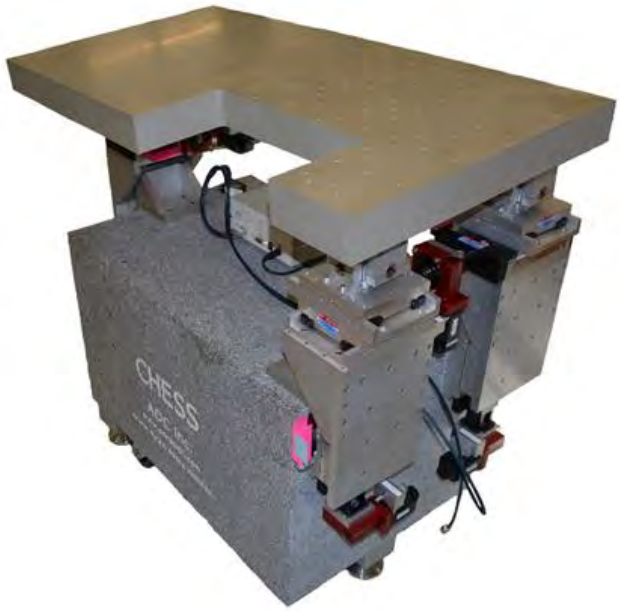
Notes:

1. System shown with motions at mid-travel
   Horizontal Travel: +/- 50.8 mm (2 in.), 4 in. total
   Vertical Travel: +/- 50 mm (~2 in.), ~4 in. total
2. System Mass/Weight
   Mass/Weight of ADC System Only: 806 kg (~1780 lb)
   Weight with User Equipment: ~2380 lb
3. See Sheet 2 for height specifications
4. Lift from beneath granite with straps or forklift, using spreader bar to keep straps off table top. Only use lifting rings to lift aluminum table components.

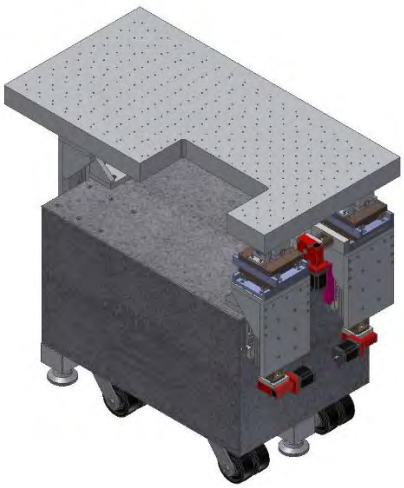
First Angle Projection All dimensions are mm [in] inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994
Material / Protective Finish	Drawn by: T Shea 8/30/2013 Eng approval: M Popov 8/30/2013 Mfg approval Assy approval
UNLESS OTHERWISE SPECIFIED: All Dimensions BASIC N7 machined surfaces 0,13 0,38 ⌖ 0,25 A B C ⏥ 0,25 A B C	ADC USA, Inc. 135 Ridge Road Lansing, NY 14882 Phone: 607.533.3531 / Fax: 607.533.3618 E-mail: adc@adc9001.com / Web: www.adc9001.com
Purchased Part Modification: No	Custom Optical Table Assembly, Cornell
	Part Number: 00022107 · Revision: 0 · Size: A2 · Sheet:

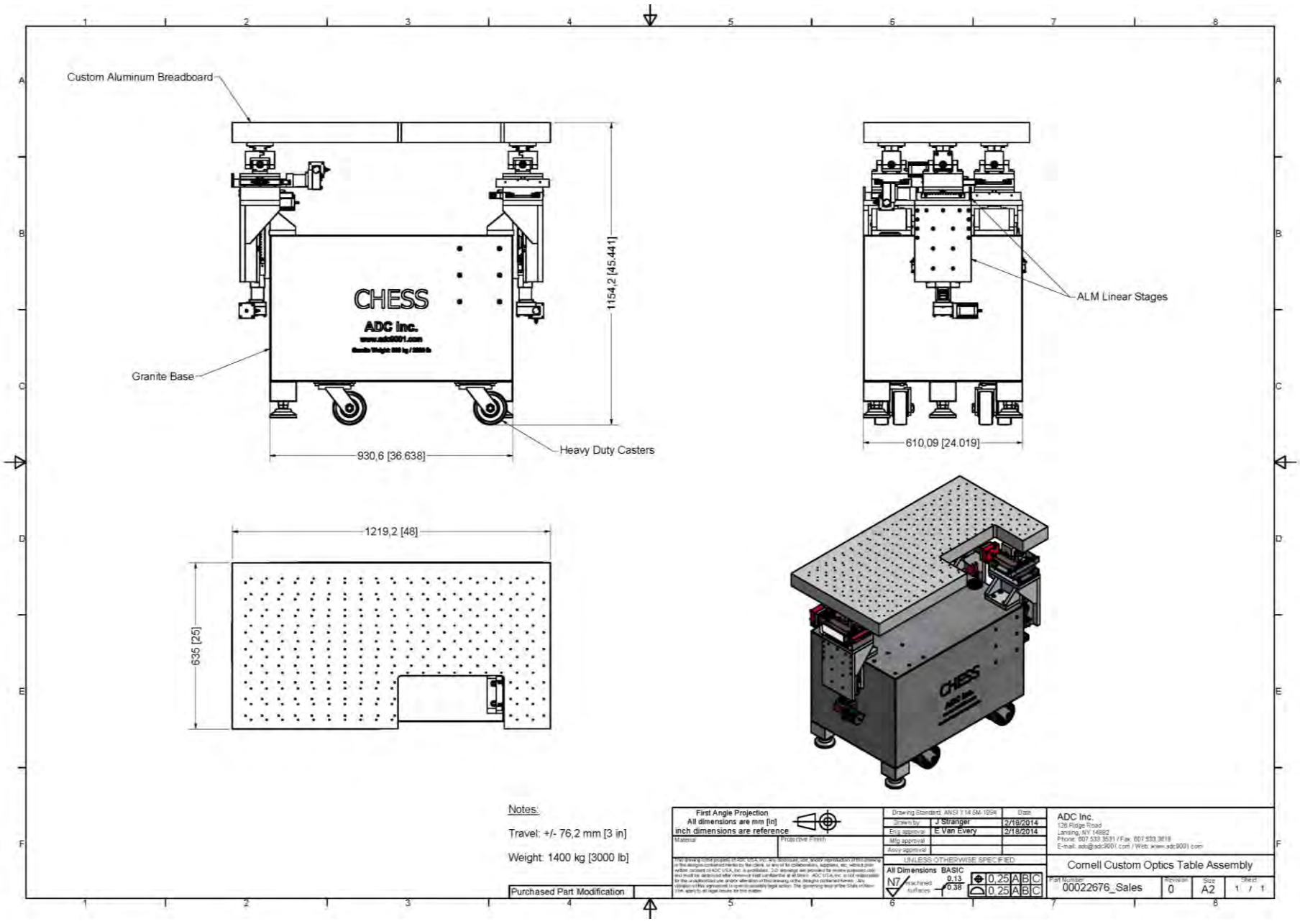
Cornell High Energy Synchrotron Source (CHESS) Custom EET

Customer:
Cornell University
Wilson Synchrotron Lab and Ring
161 Synchrotron Dr
Ithaca NY, 14853



A system was designed for CHESS that contains three vertical stages and three horizontal stages. This allows for six degrees of freedom for the system. The vertical [y] stages are a custom design based on standard ALM MLP6-10/GB10 MM stages and have a range of motion of +/- 76 mm [3”]. These vertical stages use a Lin Engineering NEMA 23 triple stack stepper motor with a 60:1 right angle gearbox. The horizontal stages [x & z] use the same motor with a 20:1 right angle gearbox. They are custom designs based on standard ALM PGA6-8-2/GB2MM stages and have a range of motion of +/- 19 mm [0.75 in]. The system also has a base made of granite that weighs around 9.6 kN [2200 lb]. The base has four heavy duty casters and three adjustable feet for positioning and leveling. The table top is a custom-made aluminum breadboard with a custom hole pattern. The aluminum is 635 mm [25”] wide, 1220 mm [48”] long, and 76 mm [3”] thick.

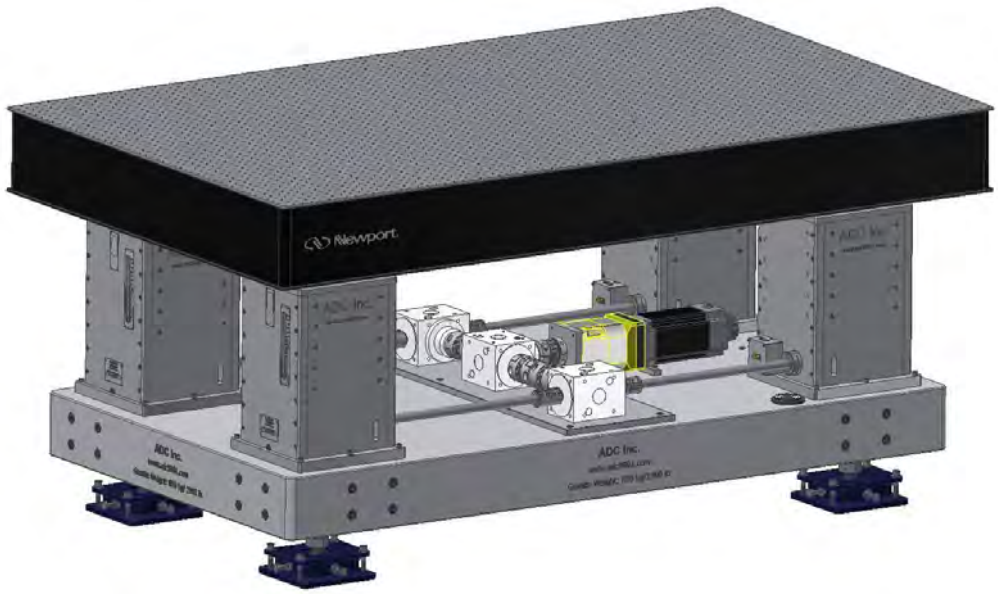


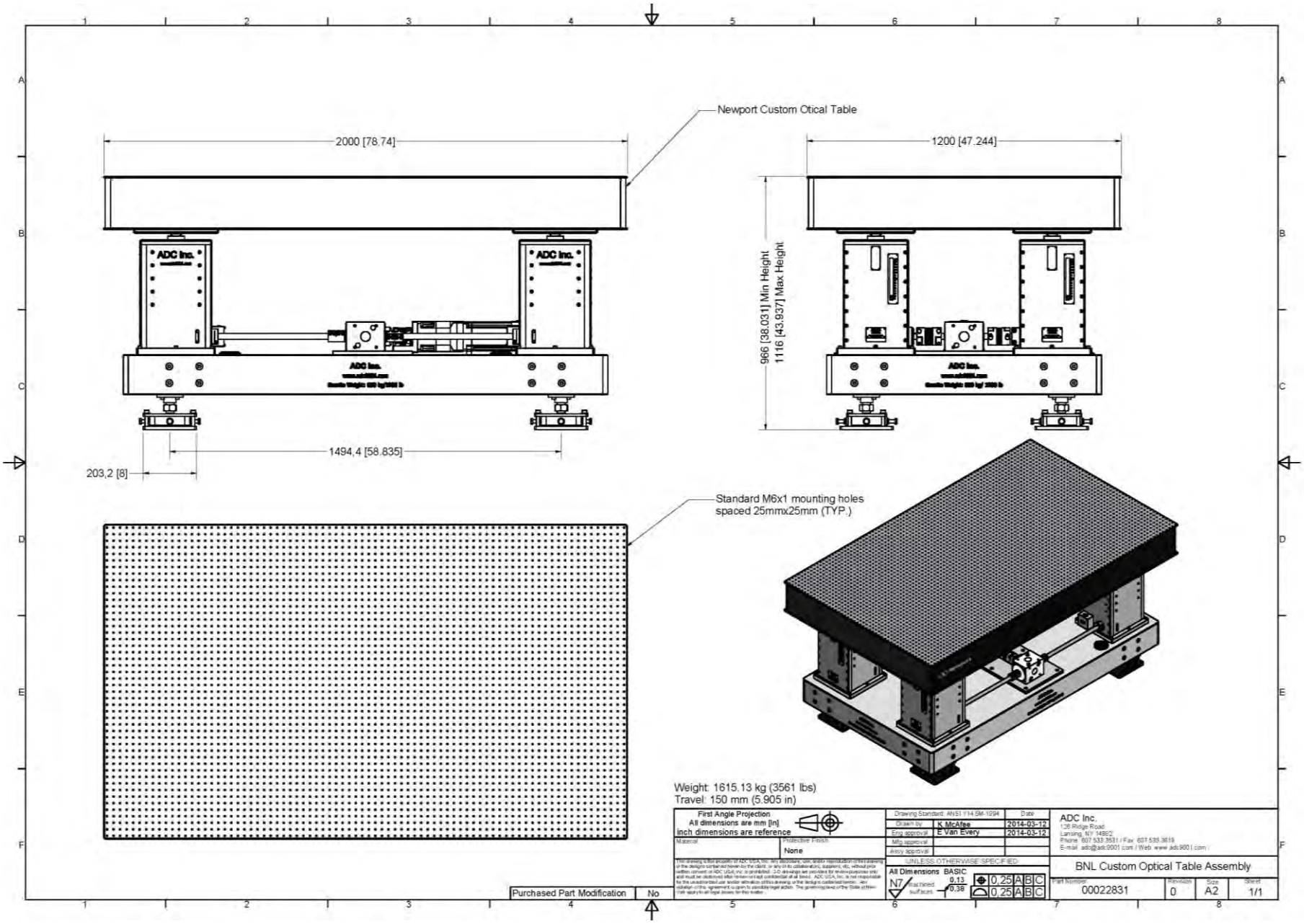

Custom Aluminum Breadboard
CHESS
ADC Inc.
www.adc9001.com
Granite Base
1154,2 [45.441]
930,6 [36.638]
Heavy Duty Casters
ALM Linear Stages
610,09 [24.019]
1219,2 [48]
635 [25]
Notes:
Travel: +/- 76,2 mm [3 in]
Weight: 1400 kg [3000 lb]
Purchased Part Modification
First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Projective Finish
Drawing Standard: ANSI Y14.5M-1994
Drawn by J Stranger 2/18/2014
Eng approval E Van Every 2/18/2014
Mfg approval
Assy approval
UNLESS OTHERWISE SPECIFIED:
All Dimensions BASIC
N7 machined surfaces
0.13
0.38
0.25 A B C
0.25 A B C
ADC Inc.
126 Ridge Road
Lansing, NY 14882
Phone: 607 533 3631 / Fax: 607 533 3818
E-mail: adc@adc9001.com / Web: www.adc9001.com
Cornell Custom Optics Table Assembly
Part Number 00022676_Sales
Revision 0
Size A2
Sheet 1 / 1

Brookhaven National Laboratory 1-Degree of Freedom EET

Customer:
Brookhaven National Lab
Receiving: Bldg. 98 Rochester Street
Upton, NY 11973

This EET is a one axis motion system designed to lift a 3,500 lbs load and move +/- 50 mm vertically for Brookhaven National Lab. The vertical motion consists of 4 ADC DJ600-50 jacks that are driven by one Nema 34 motor and a 20:1 gear reduction, which is then coupled to a Tandler spiral bevel gear box which allows the jacks to move simultaneously. The simultaneous motion is preferred to avoid potential binding of the jacks which is common with driving each jack individually. An 8” thick Newport bread board is mounted on top of the jacks and will provide a stable base for mounting equipment as necessary.



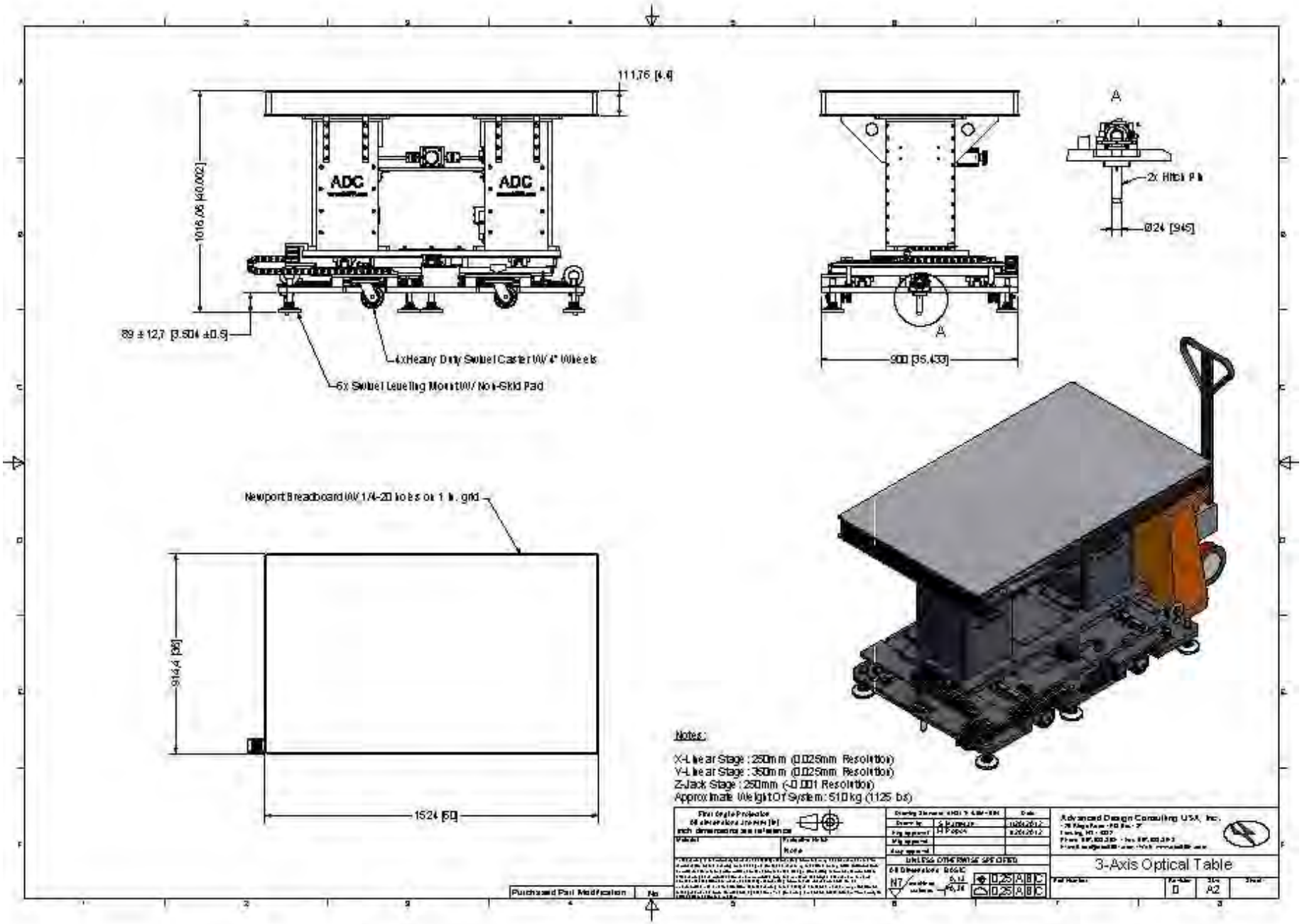


The Air Force Office of Scientific Research (AFOSR) 3-Axis EET

Customer:
AFRL – Jacobs Technology Inc.
2145 Fifth Street
Building 24 C, Area B
Wright-Patterson AFB OH, 45433

This 3-axis EET built for The Air Force Research Laboratory (AFRL-Jacobs Tech) was designed for use in PIV experiments. The Newport optical breadboard provides a rigid surface for mounting and supporting measurement equipment. Utility jacks each have a load capacity of 25 kN. Each linear slide is actuated by precision ground ball screws and supported by caged ball linear guide rails.

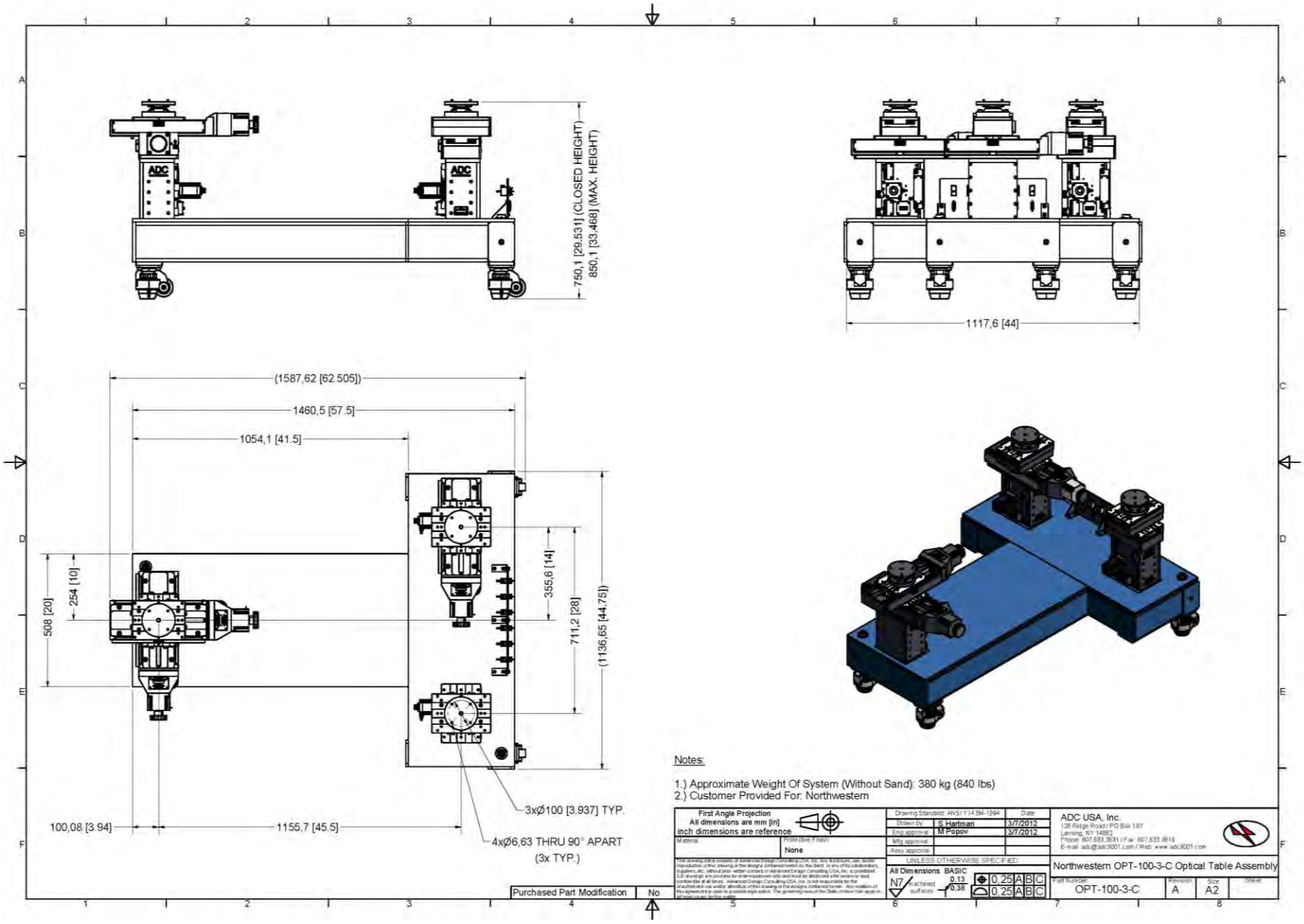
This custom controller driver can be controlled in either of two modes. The first mode uses a 3-axis analogue joystick interfaced directly to a Galil DMC-4133 controller. In this mode a personal computer is not required. The second mode uses a custom graphical user interface control written in LabVIEW for the project. This software is compatible with Windows XP through Windows 7.



APS 6-Degrees of Freedom Custom EET

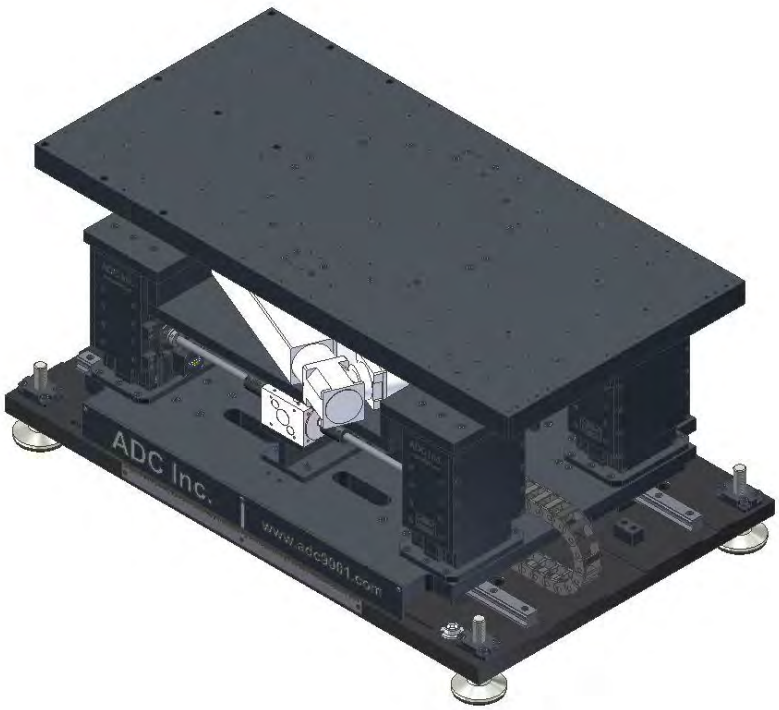
Customer:
Argonne National Laboratory
9700 S. Cass Avenue
Lemont, IL 60439

ADC's 6-Degrees of Freedom High Precision Motorized EETs employ an arrangement of standard products to create a table with 6 DOF (degrees of freedom) positioning capabilities. The system base is comprised of welded tubular steel with a powder coated finish. To lower the natural frequency and provide passive damping, the base is also filled with sand. When in use, the table rests on four integral leveling feet. When in transport, the feet are retracted, and four integral casters allow for easy handling. These precision tables comprise of crossed-roller bearings and ballscrew drive for use in experimental stations.

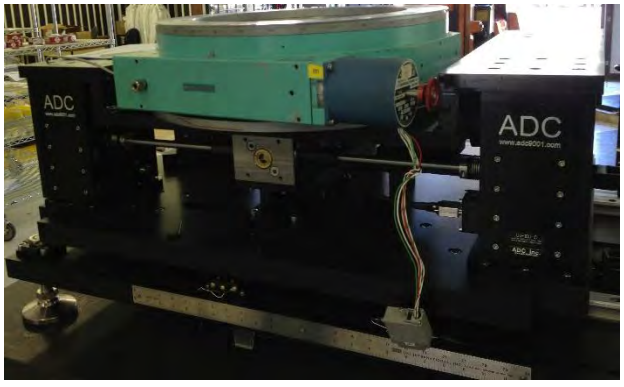


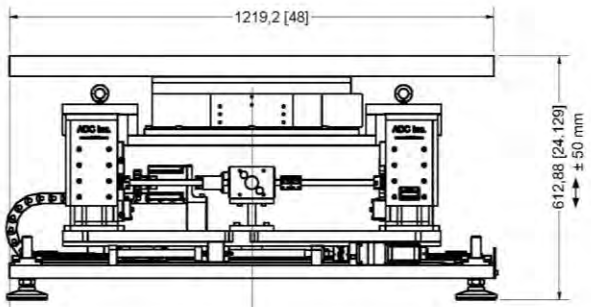
Cornell High Energy Synchrotron Source (CHESS) 3-Degrees of Freedom EET

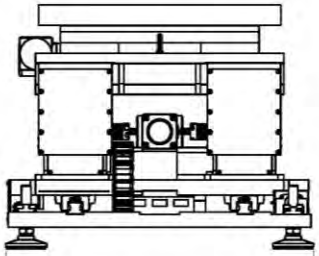
Customer:
Cornell University
Wilson Synchrotron Lab and Ring
161 Synchrotron Dr
Ithaca NY, 14853

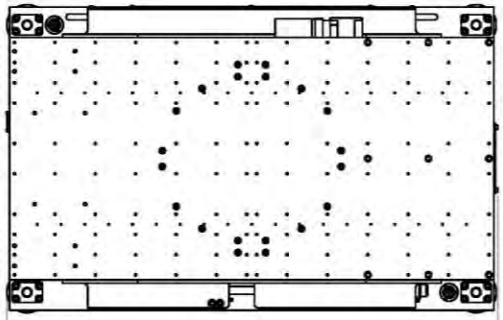


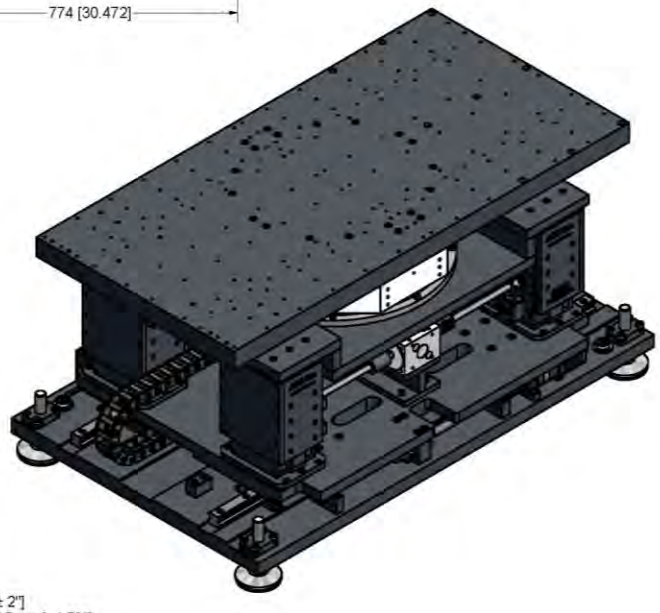
This EET is a 3-axis motion system was designed for G-Line at CHESS. The horizontal motion is based on a linear slide that ADC has continually improved in the past few years to meet the high demands of the industry. The linear motion is supported by THK HSR35 guide rails and bearings. A preloaded 20x5 mm ball screw coupled to a NEMA 23 motor and a 10:1 gear reduction allows the unit to have a 2.5 µm resolution. The vertical motion consists of 4 ADC 5-kN utility jacks that are geared to be driven off one motor. The one motor approach is preferred to avoid the potential binding of the jacks that is common with driving each jack individually. NB SVS 4160 crossed roller bearings provide a stable and smooth platform for the vertical motion. The rotary motion for this EET provides a full 360° rotation and is equipped with fully adjustable limit switches to set travel limits as necessary. A 2” thick aluminum bread board is mounted on top of the rotary stage which provides a stable base for mounting equipment as necessary.











Specifications:

Vertical Travel: ±50 [± 2"]
Horizontal Travel: ±115mm [±4.53"]
Rotation: Huber 440

Approximate Weight of System: 600 kg (1325 lbs)

First Angle Projection All dimensions are mm [in] inch dimensions are reference		Drawing Standard: ANSI Y14.5M-1994	Date
		Drawn by: S Hartman	2/3/2013
		Eng approval: M Popov	2/3/2013
		Mfg approval	
		Assy approval	
Material	Protective Finish: None	UNLESS OTHERWISE SPECIFIED: All Dimensions BASIC N7 Machined surfaces 0,13 / 0,38 ⌖ 0,25 A B C ⏥ 0,25 A B C	

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3818
E-mail: adc@adc9001.com / Web: www.adc9001.com

Cornell Custom Optical Table Assembly

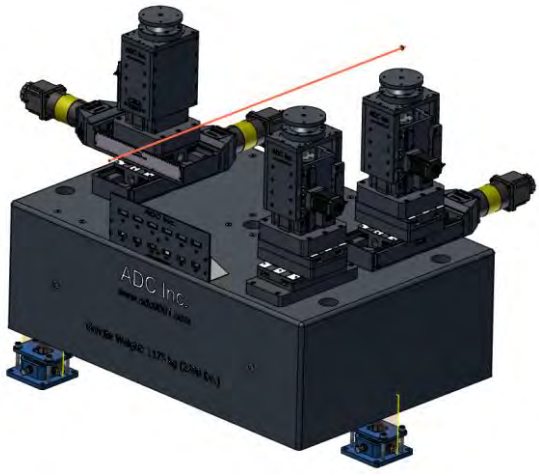
Part Number	Revision	Size	Sheet
OPT-1000-3-C	0	A2	

Purchased Part Modification	No

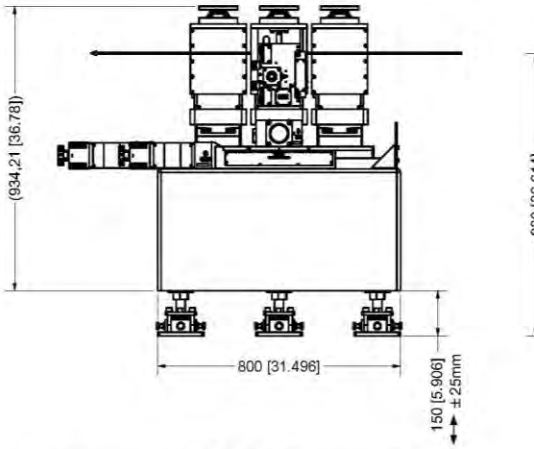
NSRRC 3-Legs Motorized Table

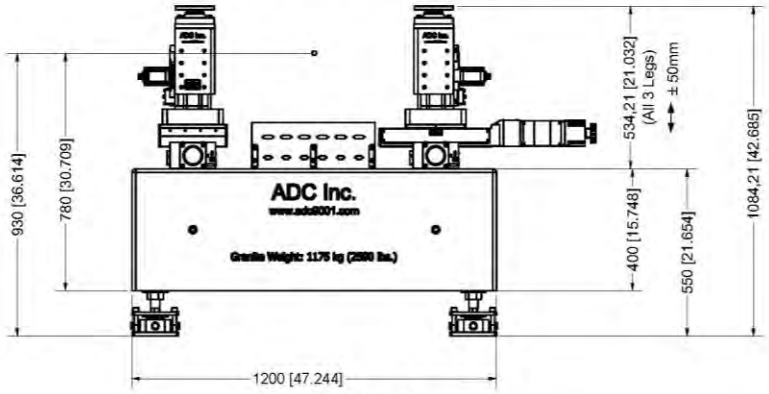
Customer:
National Radiation Research Center
101 Hsin-Ann Road
Hsin-Chu Science Park
30076 Hsin-Chu, Taiwan

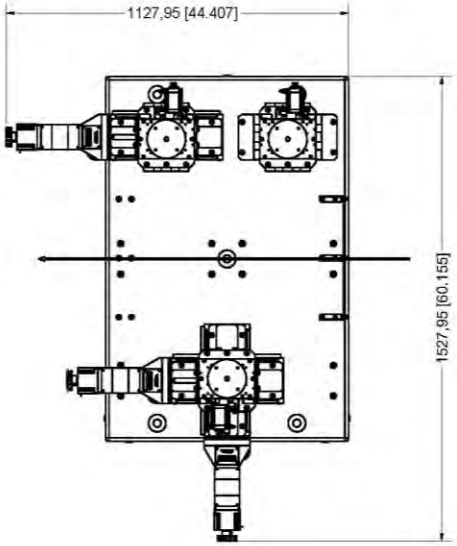
This 3-Motorized Leg system is a 6 degrees of freedom system which will allow the user to manipulate a work surface in x, y, z directions as well as in pitch, roll and yaw. The vertical motion is provided by ADC's UJ 5-kN jacks. The rugged black anodized aluminum housing features a precision ground base and top plate, each with multiple utility holes for easy integration into the user's system. The vertical stage is driven by a high class preloaded ballscrew coupled to a high torque 200 step per revolution stepper motor which can be run in full, half, or micro stepping mode to meet your resolution requirements. Maximum rigidity is assured using preloaded crossed roller linear bearings. Each jack also features two adjustable, normally closed limit switches at the end of travel. The horizontal motions are driven by ADC's DS400-100 slides which have a 55:1 gear reduction for increased resolution. The horizontal stage is driven by a high class preloaded ballscrew coupled to a high torque 200 step per revolution stepper motor which can be run in full, half, or micro stepping mode to meet your resolution requirements. Maximum rigidity is assured using preloaded crossed roller linear bearings. Each slide also features two fully adjustable, normally closed limit switches to define the extents of travel. Adjustable leveling feet are placed at the base of the unit to allow the user to level the system to be parallel with the beam. A granite base is used to mount the motions.



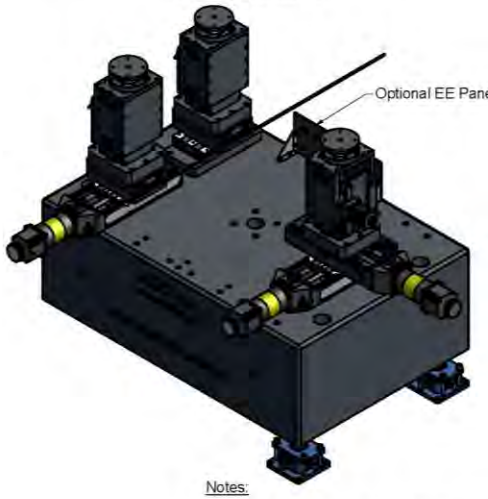
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	A	For Review Purposes Only	1/3/2013	S Hartman
all	B	Added Configuration 2; Removed Feet; Changed Height	1/9/2013	S Hartman
all	C	Made Base 400mm; Added Light Beam, Rotated Jacks	1/15/2013	S Hartman
all	D	Added Adjustable Feet; Added Optional EE Panel	1/22/2013	E Acome
all	E	Changed Gearbox on Slide to Double Stack, Removed Gearbox on Jack	2/7/2013	M Popov



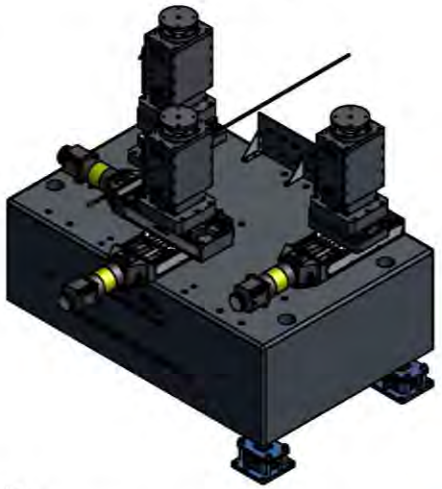




Configuration 1



Configuration 2



Notes:

1.) Approximate Weight Of System: 1300 kg (2865 lbs)

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: S Hartman	1/3/2013	
	Eng approval: M Popov	1/3/2013	
	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			3 Motorized Leg Optical Table
			Part Number: OPT-5kN-DS400 / Revision: E / Size: A2 / Sheet: 1 / 1

Purchased Part Modification: No

CAMD Custom Optics Table

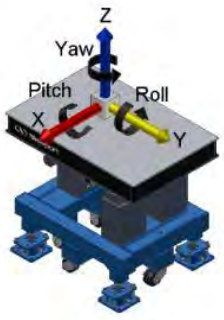
Customer:
LSU - CAMD
6980 Jefferson Hwy
Baton Rouge, LA 70806

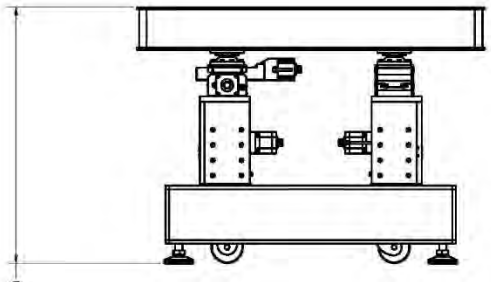
This CAMD 6 degrees of freedom High Precision Motorized EET used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted and casters allow for easy handling.

Key Specifications:

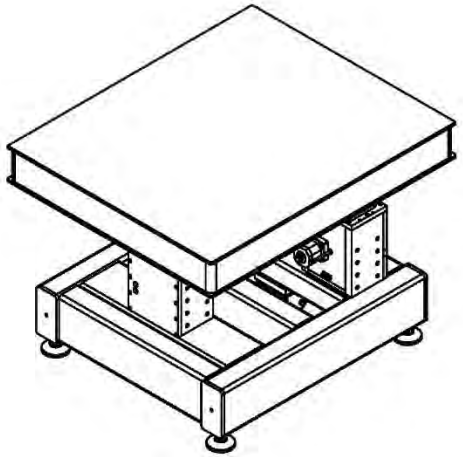
Degrees of Freedom:	6
Table Size:	3' x 3' (914mm x 914mm)
Vertical Travel (X, Y, Z):	4" (100 mm), 4" (100 mm), 4" (100 mm)
Load Capacity:	1000 lbs. (454 Kg)
Motion Repeatability:	≤ 1 µm (with encoder)
Work Surface Holes:	M6 Grid
Breadboard:	100 mm Newport

*** Comes with large casters.**



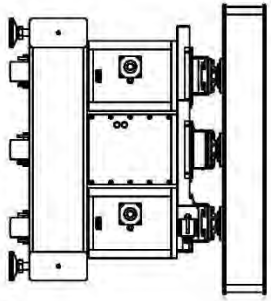


673 [26.496] (RETRACTED HEIGHT)



914,4 [36]

762 [30]



Purchased Part Modification

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

Material:

Protective Finish:

		Date
Drawing Standard: ANSI Y14.5M-1994		
Drawn by:	S Hartman	4/11/2007
Eng approval:	A Lyndaker	4/11/2007
Mfg approval:	R Serva	
Assy approval:	R Jayne	

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 167
Lansing, NY 14882
Phone: 607.533.3531 / Fax: 607.533.3619
E-mail: adc@adc9001.com / Web: www.adc9001.com

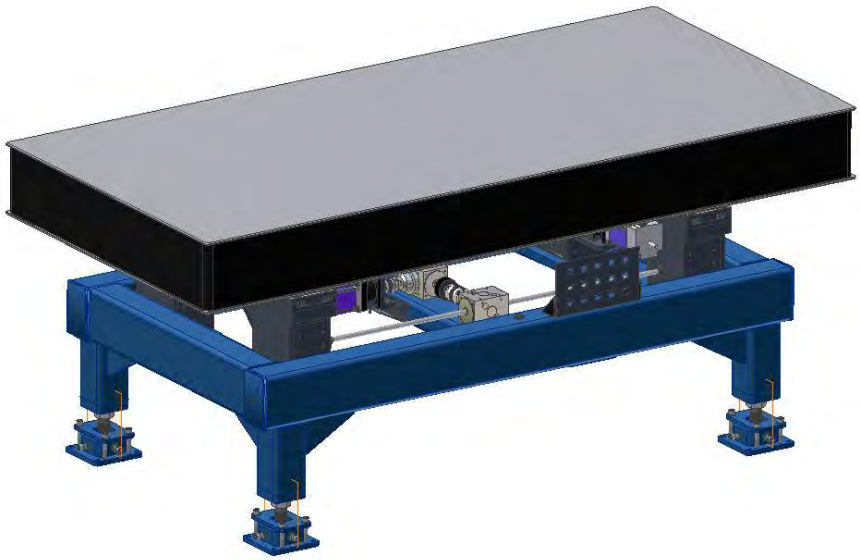
LSU Optical Table Layout

Part Number	Rev/ECO	Size	Sheet
LSU-OT-001	A	A2	1 / 1

DLS 2-Degrees of Freedom Custom EET

Customer:
Diamond Light Source Limited
Finance Department
Diamond House
Chilton, Didcot
Oxon OX11, 0DE United Kingdom

This DLS 2 degrees of freedom High Precision Motorized EET used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport the feet are retracted and casters allow for easy handling.



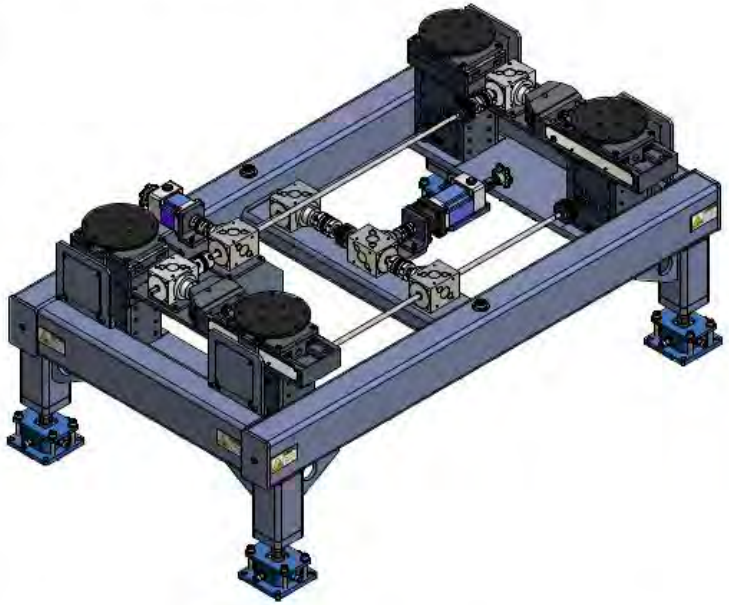
Parts List

ITEM	QTY	PART #	REV	DESCRIPTION	MATERIAL	MOD	VENDOR
1	1	00014255	0	ST1 Frame Assembly		No	ADC
2	2	00014283	0	FS400-100 Free Slide Assembly		No	ADC
3	1	00014314	1	ST1 Jack Drive Assembly		No	ADC
4	1	00014315	1	ST1 Slide Drive Assembly		No	ADC
5	4	00014808	0	Hard Stop Pin Weldment	Weldment, Steel, Mild	No	ADC
6	2	00014286	0	FS400-100 Spacer Block	Aluminum-6061	No	ADC
7	4	00014290	0	Table Support Spacer	Aluminum-6061	No	ADC
8	4	00014384	1	Breadboard Support Plate	Steel, Mild	No	ADC
9	1	00014212	1	ST1 Custom RS2000 Table Top, 8" Thick	Various	No	Newport (See Drawing)
10	16	00006057	0	SHCS M5x14 SS	Stainless Steel, 304		MSC 68015742
11	32	00014385	0	HHCS M5x16 SS	Stainless Steel, 304		McMaster-Carr 91287A124
12	12	00006074	0	SHCS M6x16 SS	Stainless Steel, 304		MSC 68015965
13	24	00005417	0	SHCS M6x35 SS	Stainless Steel, 304		MSC 68016120
14	16	00005387	0	SHCS M8x16 SS	Stainless Steel, 304		MSC 68016302
15	8	00006095	0	SHCS M8x22 SS	Stainless Steel, 304		McMaster-Carr 91292A082
16	16	00005535	0	SHCS M8x30 SS	Stainless Steel, 304		MSC 68016401
17	8	00005549	0	SHCS M8x40 SS	Stainless Steel, 304		MSC 68016484
18	32	00012865	0	M5 Lock Washer, DIN172B	Stainless Steel, 304	No	McMaster-Carr 92148A170
19	36	00006732	0	Flat Washer, M6 SS	Stainless Steel, 304		McMaster-Carr 93475A250

REVISION HISTORY

ZONE	REV	DESCRIPTION	DATE	APPROVED
n/a	0	Initial Release	12/9/2008	S Hartman

Table Top Removed From This View For Clarity.



Notes:

1.) All phase adjusters to be blue-marked with Glyptol after factory adjustment.

First Angle Projection All dimensions are mm [in] Inch dimensions are reference	Drawing Standard: ANSI Y14.5M-1994
Material: None	Protective Finish: None
Drawn by: S Hartman	Date: 9/16/2008
Eng approval: D Waterman	9/16/2008
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: 607.533.3831 / Fax: 607.533.3818
E-mail: adc@adc9001.com / Web: www.adc9001.com

DLS Optical Table Assembly ST1

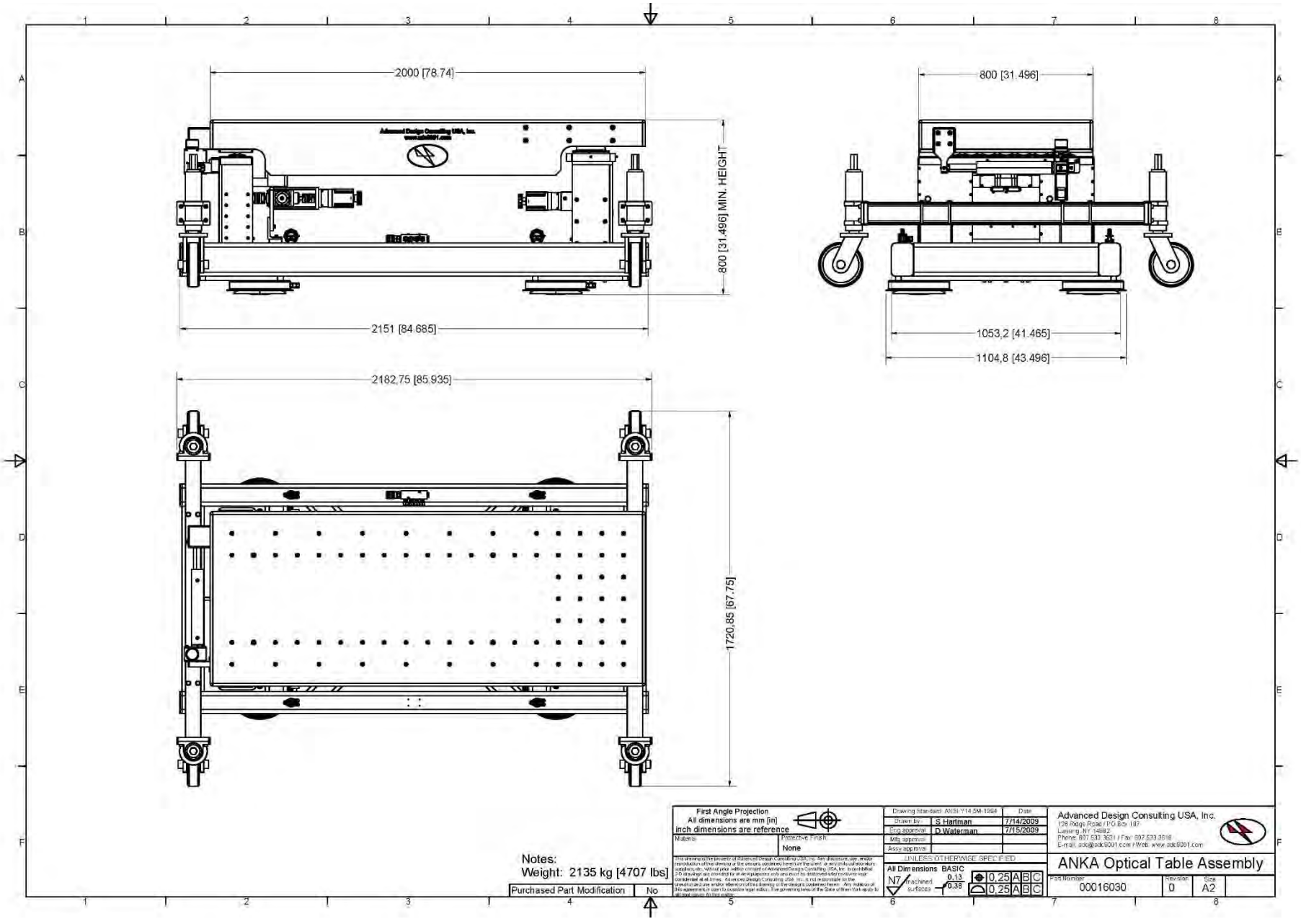
Part Number	Revision	Size	Sheet
00014253	0	A2	1 / 4

Purchased Part Modification	No

ANKA 3-Axis EET

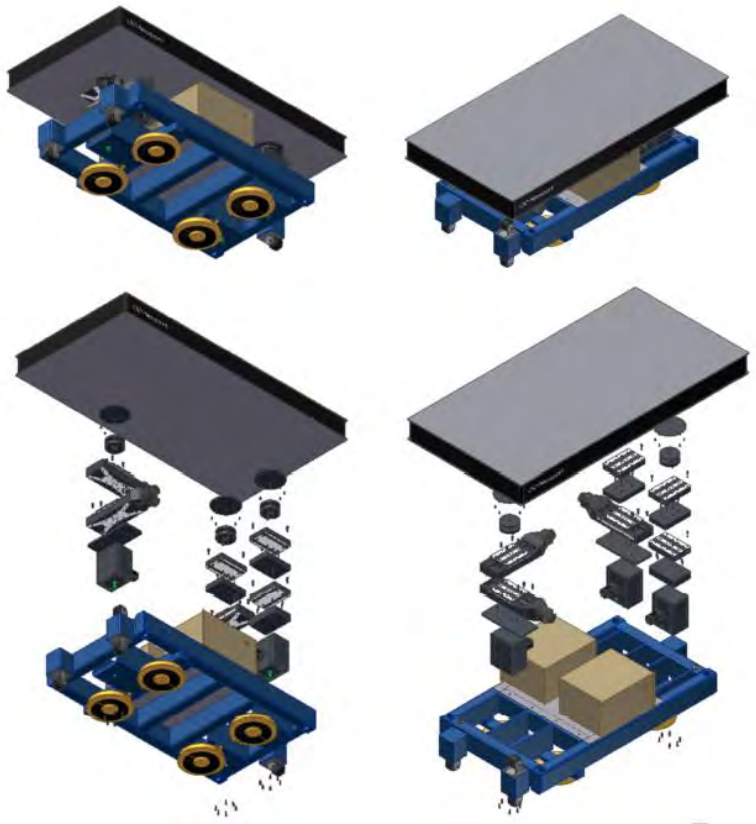
Customer:
Karlsruher Institut für Technologie
Hermann-von-Helmholtz-Platz 1
D-76344 EGGENSTEIN-LEOPOLDSHAFEN
Germany

This high precision table consists of a large, black granite top, with working surface measuring 2000 mm by 800 mm, flat within 0.1 mm, and containing a grid of M6 holes for mounting required items. The granite is 254 mm thick and weighs 1200 kg, thus providing a highly stable platform for sample stages, detector, 205 kg detector translation system, and the fast sample exchange system. Total loading on the table is 1500 kg. It remains stable within 1 µm for up to 3 hours. Removable jacking casters are provided for transporting the system from receiving areas to test and acceptance areas and then to the final destination. Within the hutch, the table will be periodically moved off line when other kinds of experiments are scheduled. For this purpose, air bearing supports are provided under the frame for ease of movement on the smooth marble floor.

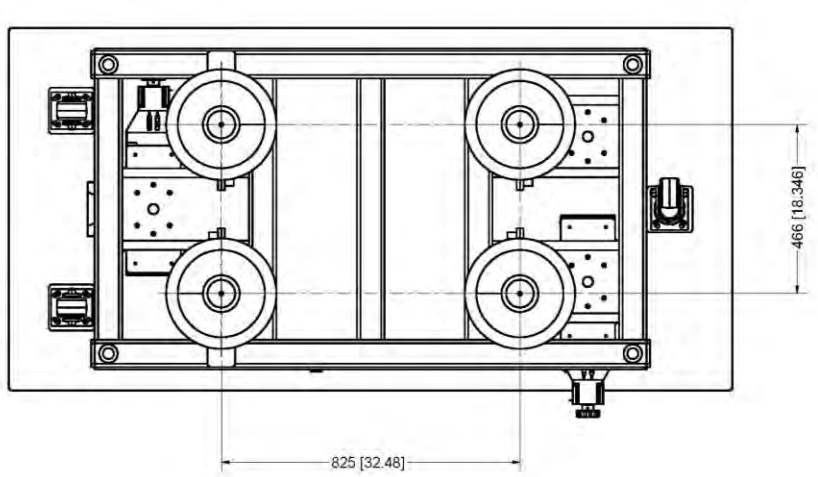


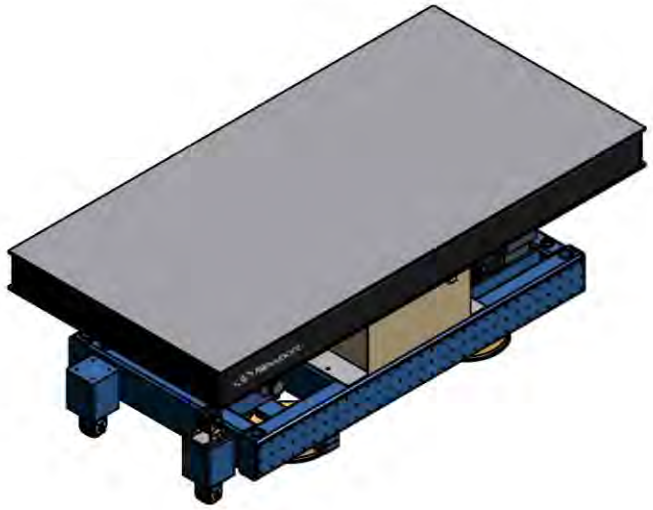
ANKA 6-Axis EET

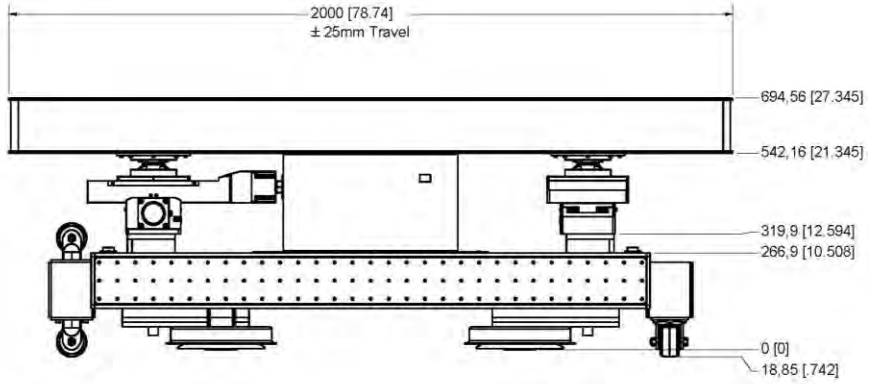
Customer:
Karlsruher Institut für Technologie
Hermann-von-Helmholtz-Platz 1
D-76344 EGGENSTEIN-LEOPOLDSHAFEN
Germany

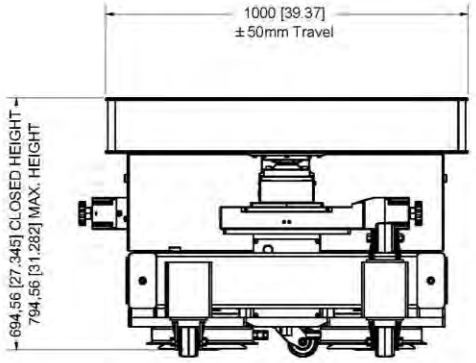


This ANKA 6 degrees of freedom High Precision Motorized EET used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. This table incorporated “air pads” for ease of table motion inside the hutch (experimental area). The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted, and casters allow for easy handling.









Notes:

1.) Approximate Weight Of System (Without Sand): 640 kg (1410 lbs)
2.) Customer Provided For: ANKA

First Angle Projection
All dimensions are mm [in]
inch dimensions are reference
Material
Protective Finish: None

Drawing Standard: ANSI Y14.5M-1994

		Date
Drawn by	S Hartman	6/13/2010
Eng approval	D Waterman	6/13/2010
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

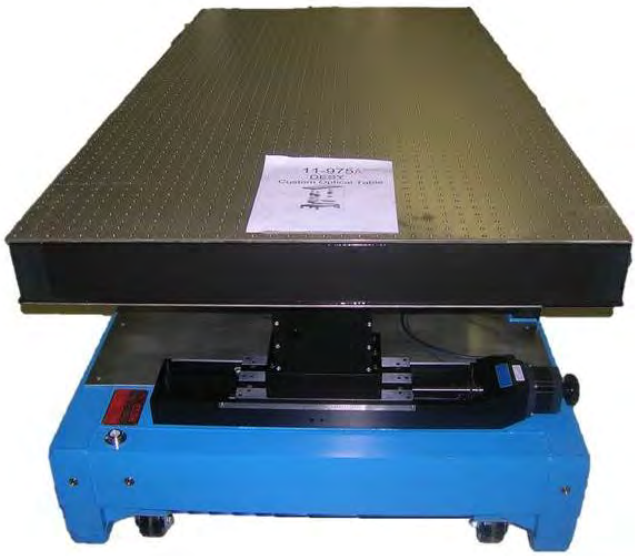
Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 187
Lansing, NY 14882
Phone: 607.533.3631 / Fax: 607.533.3619
E-mail: adc@adc9001.com / Web: www.adc9001.com

ANKA Optical Table Assembly

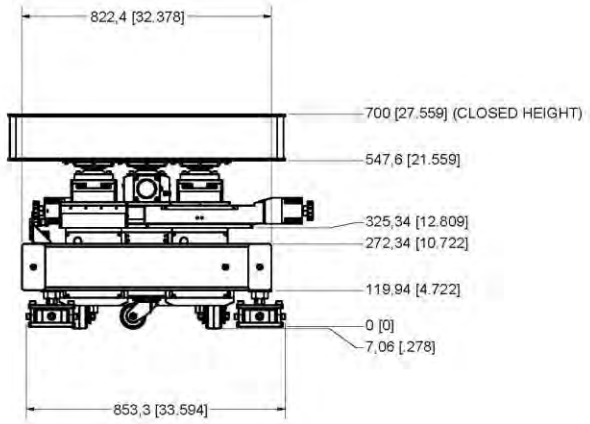
Part Number	Revision	Size
00017777	0	A2

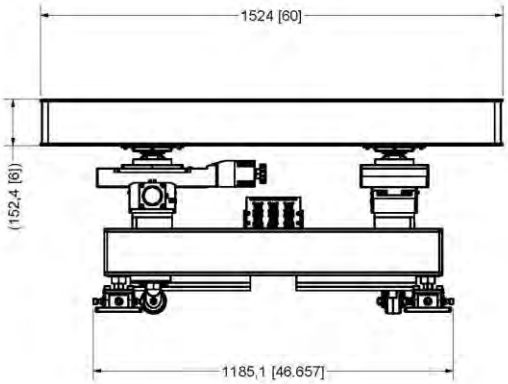
DLS Custom EET

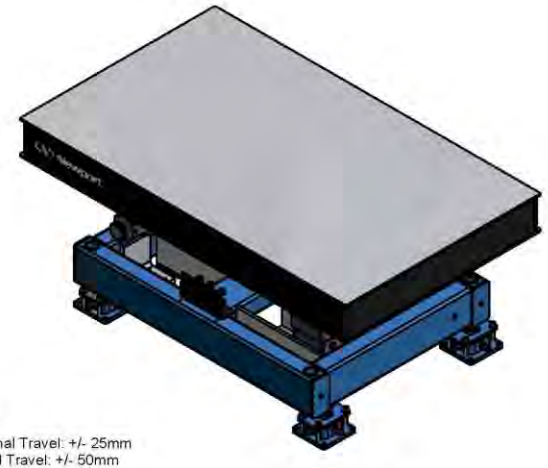
Customer:
Diamond Light Source Limited
Finance Department
Diamond House
Chilton, Didcot
Oxon OX11, 0DE United Kingdom

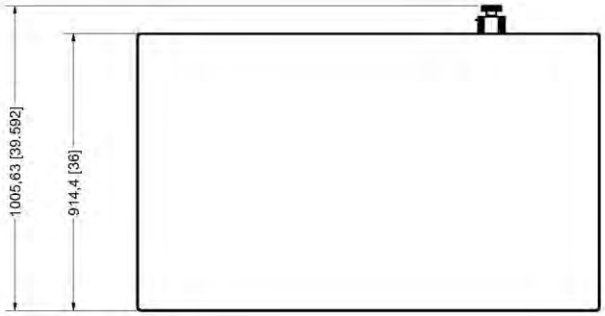


This DLS 6 degrees of freedom High Precision Motorized EET used Newport Corporation Research Grade breadboards with a grid of M6 tapped holes. This table had a requirement for long Y axis travel. The system base was made of a welded steel frame with a powder coated finish. Frames were filled with sand to reduce the table natural frequency and provide passive damping. When in use, the table rests on four machinery feet. When in transport, the feet are retracted, and casters allow for easy handling.









Travels:

Longitudinal Travel: +/- 25mm
Horizontal Travel: +/- 50mm
Vertical Travel: 100mm

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

Material: None
Protective Finish: None

Drawing Standard: ANSI-Y14.5M-1994

		Date
Drawn by:	S Hartman	6/28/2010
Eng approval:	D Waterman	6/28/2010
Mfg approval:		
Assy approval:		

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

Advanced Design Consulting USA, Inc.
126 Ridge Road / PO Box 197
Lansing, NY 14882
Phone: 607.533.3671 / Fax: 607.533.3814
E-mail: adc@adc9001.com / Web: www.adc9001.com

DESY Optical Table Assembly

Part Number	Revision	Size	Sheet
11-983_Layout	A	A2	1 / 2

Purchased Part Modification	No

Engineered Systems

Elettra 2-Axis System with Controller

SOLARIS-3-Axis Motorized System

NASA-Positioning System

CHESS-3-Axis Stage Stack

APS-Press Manipulation System

Colorado-Gimbal System

XYZ & O Multistage
UHV Manipulators

Spectrometer

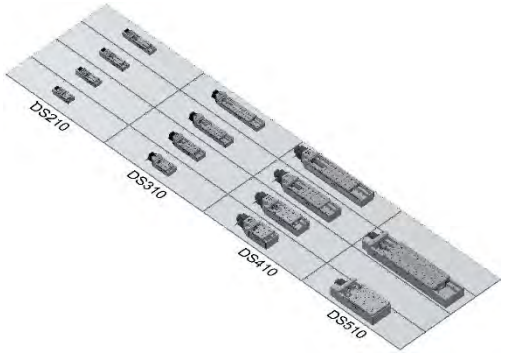
Cryostat Dilution Refrigerator

Motion Stages

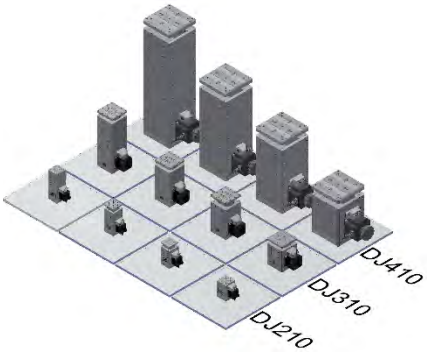
ADC manufactures high quality motion control products and systems that are qualified for Semi-conductor, Automation, and Aerospace industries. Our extensive product line includes linear stages (slides), lift stages (jacks), rotation stages, and tilt stages (goniometers).

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.



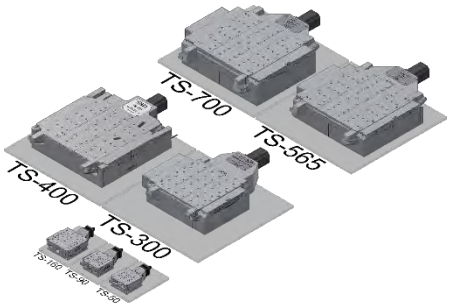
Lift Stages



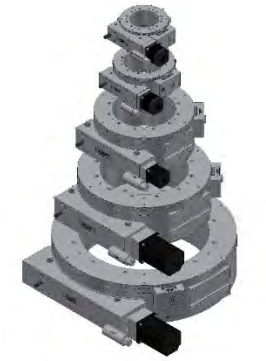
ADC's lift stages are driven by a high class preloaded ballscrew coupled to a high torque 200 step per revolution stepper motor which can be run in full, half, or micro stepping mode to meet customer resolution requirements. Maximum rigidity is assured through the use of preloaded crossed roller linear 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.

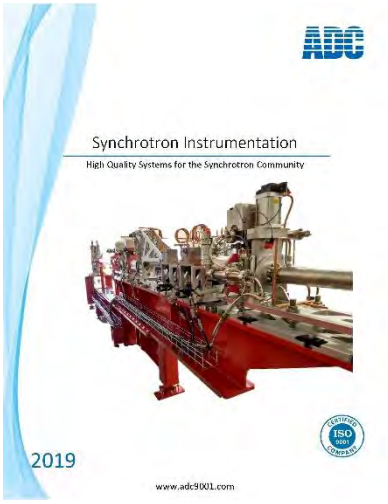


Rotation Stages

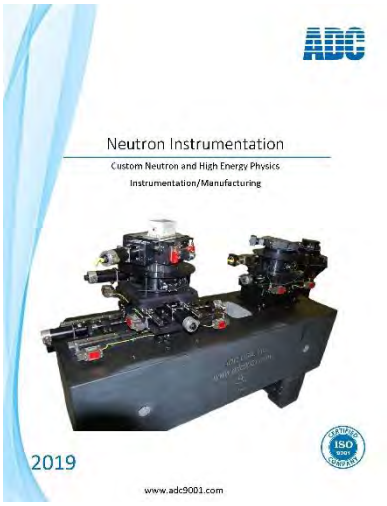


ADC's rotation stages are built upon an industry leading, preloaded, duplexed angular contact bearing set. These stages not only give an exceptionally high running accuracy but allow for large radial and thrust loads as well. Each stage is driven by a precision ground worm gear set and a high resolution, 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.

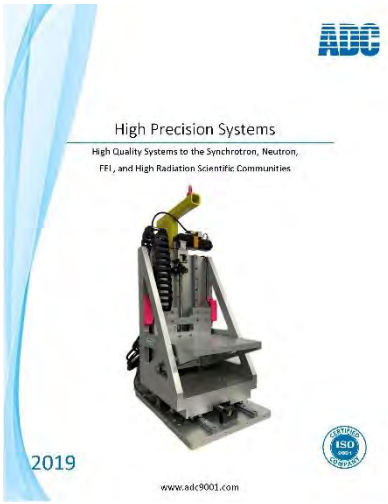


Synchrotron Instrumentation

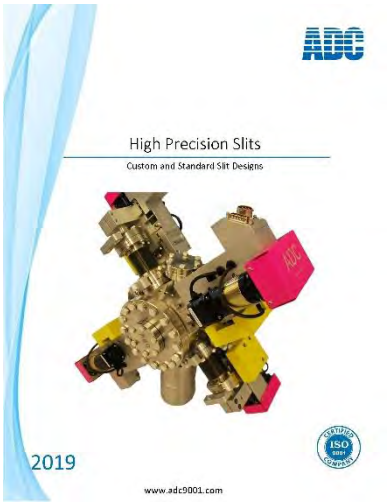


Neutron Instrumentation

Motion Stages



High Precision Systems



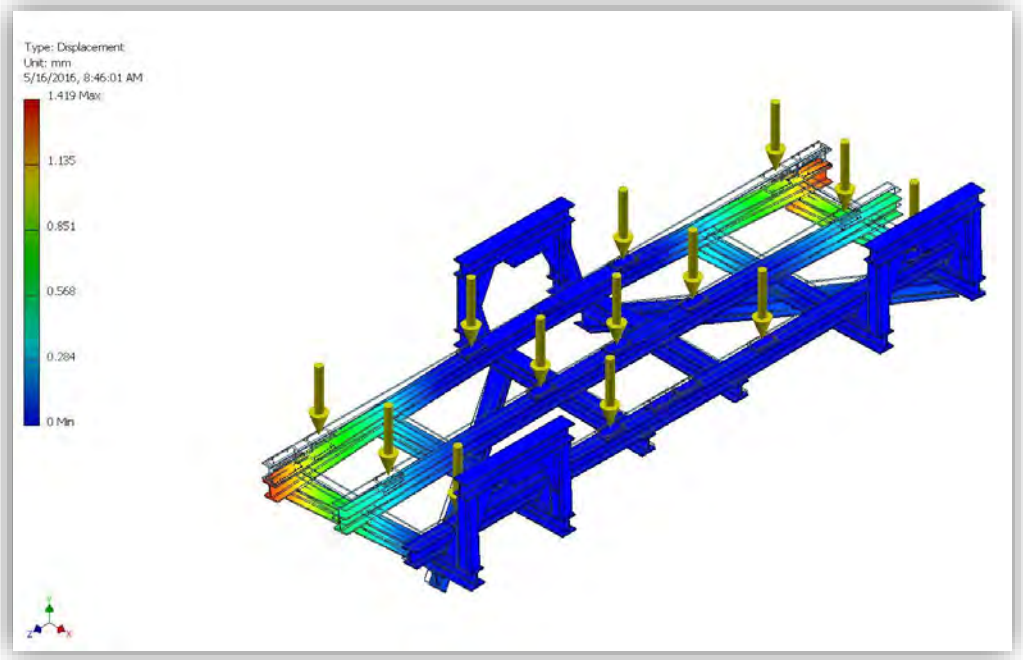
High Precision Slits

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 are 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 of this include state-of-the-art, high-resolution, extreme-ultraviolet-light (EUV) microscope making measurements in Nano range for Lawrence Berkeley National Laboratory (LBNL); 26 tone, 20-meter-long, 2.3 meter in diameter complex Time-of-Flight Small Angle Neutron Scattering (ToF SANS) instrument for ANSTO, Australia; and Jefferson Lab 12 GeV Upgrade Cavity Parts Project.

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

Advanced Manufacturing

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

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

Equipment

We use precision equipment to verify each order and are committed to delivering precision machined parts. We are very proud of our shop and the capabilities we can offer because of our state-of-the-art precision CNC milling and CNC turning machines. Equipment used for inspections include a Brown & Sharpe CMM, a Jones & Lamson Optical Comparator, and an extensive selection of gauges. We ensure calibrations are performed and are traceable to meet our customers' 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

ADC's ISO Certification

BUREAU VERITAS
Certification

ADVANCED DESIGN CONSULTING USA, INC.

126 RIDGE RD
LANSING, NY 14882 USA

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

ISO 9001:2015

Scope of certification

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

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

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

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

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

Signed on behalf BVCH SAS – UK Branch

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

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

UKAS MANAGEMENT SYSTEMS
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