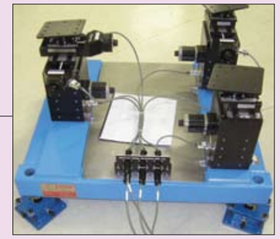
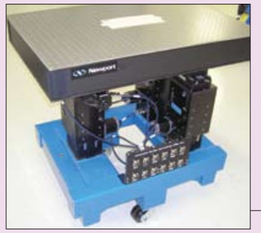
Six Degrees of Freedom to SLAC National Accelerator Laboratory



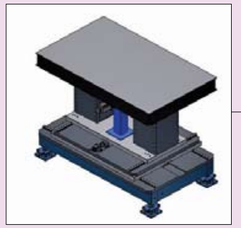
Two Degrees of Freedom to Diamond Light Source (DLS)

Six Degrees of Freedom to Canadian Light Source (CLS)



Two Degrees of Freedom to Diamond Light Source (DLS)

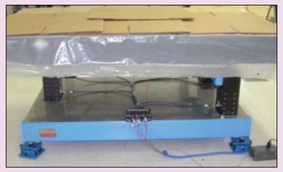
Six Degrees of Freedom to NASA



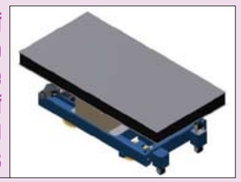
Three Degrees of Freedom to Air Force

Six Degrees of Freedom to Elettra Synchrotron Light Source

Six Degrees of Freedom to Advanced Photon Source (APS)



Six Degrees of Freedom to Karlsruhe Institute of Technology (ANKA) With Air Pads



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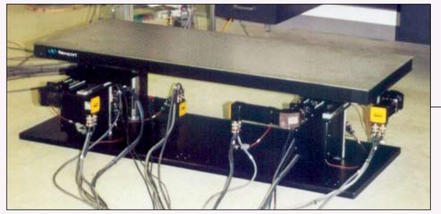

Six Degrees of Freedom to MAX-Lab

Six Degrees of Freedom to Deutsches Elektronen-Synchrotron DESY

Six Degrees of Freedom to Center for Advanced Microstructures and Devices (CAMD)

Six Degrees of Freedom to Brookhaven National Lab (BNL)

ADC USA, Inc. is a hands-on engineering company with over 15 years of experience. We custom design devices, integrated systems and a broad array of high-precision components and instruments for commercial, academic and government agencies worldwide. Our work covers mechanical design, control instrumentation, control software, manufacturing and assembly, and installation and training.

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Optical Tables

Six Degrees of Freedom to Center for Advanced Microstructures and Devices - CAMD

Six Degrees of Freedom to Diamond Light Source (DLS)

Six Degrees of Freedom to NASA

Six Degrees of Freedom to SLAC National Accelerator Laboratory

EQUIPMENT with REALIABLITY and DEPENDABILITY

High-Precision Motorized Optical Tables

ADC's High Precision Motorized Optical Tables (crossed-roller bearings and ballscrew drive) come in two series; **Six Degrees of Freedom** and **Three Degrees of Freedom.** The breadboard used is the highest grade from Newport Corporation with a grid of mounting M6 holes. The system base is comprised of welded tubular steel with a powder coated finish (Base can be designed using granite stone). To lower the natural frequency and provide passive damping, the base is also filled with sand. When in use, the table rests on three or four machinery feet. When in transport, the feet are retracted and three casters allow for easy handling.

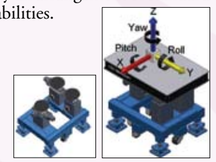
Our High Precision Motorized Optical Tables are being used at many of the world class research facilities around the world. This list includes: NASA, Los Alamos National Lab, Argonne, Brookhaven, CAMD, SLAC, ELETTRA, BESSY, DESY, MAX-Lab, ANKA, CLS, Spring-8, DLS and many other world class facilities around the world. Each actuator may be equipped with an optional linear encoder.

For more information on ADC's optical tables visit our web site at **http://www.adc9001.com/products/show_list/id/105**

Six Degrees of Freedom High Precision Motorized Optical Tables

ADC's Six Degrees of Freedom High Precision Motorized Optical Tables employ an arrangement of standard products to create a table with 6° DOF (degrees of freedom) positioning capabilities.

- Load capacity 1000 1lbs (454 Kg) & 2000 1lbs (908 Kg)
- Motion Repeatability: < 1 Micron (encoder), <10 Micron (No encoder)
- Manual adjustments and lock down for feet
- Comes with large casters
- Can be custom built to customer specification
- Six Standard Sizes for Two Load Capacities



Model Number 1000 1lbs (454 Kg)	Model Number 2000 1lbs (908 Kg)	Description
OPT-4-6-1-X-1000	OPT-4-6-1-X-2000	2′ x 3′ (609 x 914mm), 4″ (100mm) Vertical travel
OPT-4-6-2-X-1000	OPT-4-6-2-X-2000	3′ x 5′ (914 x 1524mm), 4″ (100mm) Vertical travel
OPT-4-6-3-X-1000	OPT-4-6-3-X-2000	4′ x 6′ (1219 x 1828mm), 4″ (100mm) Vertical travel
OPT-10-6-1-X-1000	OPT-10-6-1-X-2000	2′ x 3′ (609 x 914mm), 10″ (250mm) Vertical travel
OPT-10-6-2-X-1000	OPT-10-6-2-X-2000	3′ x 5′ (914 x 1524mm), 10″ (250mm) Vertical travel
OPT-10-6-3-X-1000	OPT-10-6-3-X-2000	4′ x 6′ (1219 x 1828mm), 10″ (250mm) Vertical travel

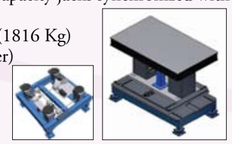
System is much more flexible than the 3 degree of freedom table. It is capable of X, Y and Z translations as well as Pitch, Roll and Yaw rotations. Offset slides and jacks complicates programing of movements.

Note: "X" denotes with (E) or without (N) encoder.

Three Degrees of Freedom High Precision Motorized Optical Tables

ADC's Three Degrees of Freedom High Precision Motorized Optical Tables employ an arrangement of standard products to create a table with 3° DOF (degrees of freedom) positioning capabilities. Depending on the table size and/or weight ADC uses 2 or 4 high precision high load capacity jacks synchronized with each other.

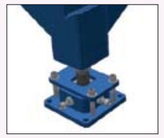
- Load capacity 1000 lbs. (454 Kg) & 2000 lbs. (908 Kg) & 4000 lbs. (1816 Kg)
- Motion Repeatability: < 1 Micron (encoder), <10 Micron (No encoder)
- Manual adjustments and lock down for feet
- Comes with large casters
- Can be custom built to customer specification
- Six Standard Sizes for Three Load Capacities:

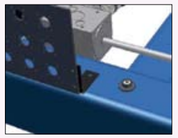
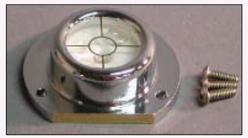


Model Number 1000 1lbs (454 Kg)	Model Number 2000 1lbs (908 Kg)	Model Number 4000 1lbs (1,816 Kg)	Description
OPT-4-3-1-X-1000	OPT-4-3-1-X-2000	OPT-4-3-1-X-4000	2′ x 3′ (609 x 914mm), 4″ (100mm) Vertical travel
OPT-4-3-2-X-1000	OPT-4-3-2-X-2000	OPT-4-3-2-X-4000	3′ x 5′ (914 x 1524mm), 4″ (100mm) Vertical travel
OPT-4-3-3-X-1000	OPT-4-3-3-X-2000	OPT-4-3-3-X-4000	4′ x 6′ (1219 x 1828mm), 4″ (100mm) Vertical travel
OPT-10-3-1-X-1000	OPT-10-3-1-X-2000	OPT-10-3-1-X-4000	2′ x 3′ (609 x 914mm), 10″ (250mm) Vertical travel
OPT-10-3-2-X-1000	OPT-10-3-2-X-2000	OPT-10-3-2-X-4000	3′ x 5′ (914 x 1524mm), 10″ (250mm) Vertical travel
OPT-10-3-3-X-1000	OPT-10-3-3-X-2000	OPT-10-3-3-X-4000	4′ x 6′ (1219 x 1828mm), 10″ (250mm) Vertical travel

System is capable of X, Y and Z translations.
Much higher load capacity due to the larger jacks.
Vertical motion is synchronized to avoid ball screw buckling.
More stable and more rigid due to less degrees of freedom.
Maintenance is easier due to less degrees of freedom.
Note: "X" denotes with (E) or without (N) encoder.

Floor Mounting



ADC's tables come with the ability to anchor to the floor and adjust and lock the parallelism of the table with respect to the floor (pitch and roll) within ±50 µrad. The table can be aligned in height and transverse position with an accuracy of 0.25mm. The frame is fitted with x-y-z adjustable shoes and bubble levels for adjusting roll, pitch, and yaw, x, y, and z position.

Motors

ADC uses standard NEMA bi-polar (2-phase) stepper motors and provides all motors, limit switches, and encoders for the equipment. The wiring and cables for such components are fitted with a connector panel as described below. These motors could be controlled with the majority of off the shelf controller/drivers on the market. ADC also offers the option of using a 5 phase stepper motors or servo motor on the optical tables.

Limit Switches

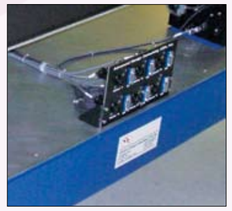
All axis of motion are equipped with limit switches to prevent failure in case of a problem. All limit switches are mechanical. These limit switches are calibrated and tested by ADC's engineers to ensure proper operation and travel. Limit switches are mounted in slots so they can be adjusted if a different travel is required.

Encoders

ADC offers linear encoders as an option. We use Renishaw Tonic T1000-30A series encoders. Optical Tables may come with or without encoders. Encoders are purchased from Renishaw.

- Extremely small dimensions of scanning head for crowded installation conditions
- High insensitivity to contamination of scale tapes due to two optical sensors in the scanning head
- High resolution and accuracy
- High interpolation accuracy due to electronic offset and amplitude control
- Signal processing in the 15 pin D-Sub-connector
- Square wave (RS422) output with 10x interpolation
- Supply voltage 5V DC ±10%

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.

The connectors are firmly mounted on the overall equipment frame by the use of patch panels/bulkhead plates. This provides a safe and easy connection and disconnection of all field/control cables to the equipment. ADC provides a customized connector panel that exactly matches the type of connectors and wiring used at the customer's facility. This facilitates ease of installation and operation at a customer's site.

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.

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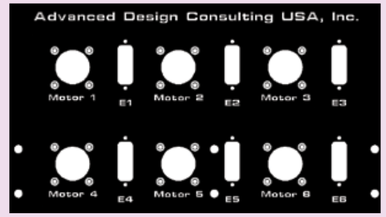
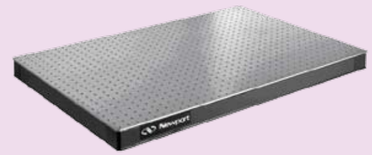
Electrical Panel Mount

All optical tables come with a panel mount for the motors and encoders to terminate to. Standard panel with encoders is shown below.



Breadboard

ADC uses the Newport's Research Grade Breadboard to provide rock-solid stability and rigidity to support demanding research applications. It is available in two and four-in. thickness, and demonstrates an outstanding <±0.004 in. flatness over two square feet. The RG Breadboard also offers a 3/16 in. ferromagnetic steel surface, two types of constrained layer damping, sealed holes, steel honeycomb core, self-damping side panels, and optional microlocks.



Description	Specifications
Working Surface	400 Series ferromagnetic stainless steel 3/16 in. (4.8 mm) thick with integrated damping layer
Thickness [in. (mm)]	2.4 (59); 4.4 (112)
Surface Flatness [in. (mm)]	±0.004 (±0.1), over 2 ft (600 mm) square
Core Design	Trussed honeycomb, vertically bonded closed cell construction, 0.010 in. (0.25 mm) Steel sheet materials, 0.030 in. (0.76 mm) triple core interface
Broadband Damping	Constrained layer dampers and Integrated Damping*
Mounting Hole Type	Cut (not rolled) threads with countersink 1/4-20 holes on 1 in. grid (M6-1.0 holes on 25 mm grid), 0.5 in. borders (12.5 mm borders)
Hole/Core Sealing	Easy clean conical cup 0.75 in. (19 mm) deep Non-corrosive high impact polymer material
Microlocks Option	
Number of Microlocks	4 for breadboards ≤3 ft2 (0.27 m2) 5 for breadboards >3 ft2 (0.27 m2)
Locations	W/6 from long side; L/6 from short side
Typical Performance Values	
Maximum Dynamic Deflection Coefficient	<9.4 x 10-4
Maximum Relative Motion Value [in. (mm)	<7.3 x 10-7 (<1.9 x 10-5)
Deflection Under Load [in. (mm)]†	<7.8 x 10-5 (<2.0 x 10-3)

Note: All performance values are for 2 ft x 3 ft x 2.31 in. (600 x 900 x 59 mm) breadboards.
†50 lb (22.7 kg) centered
* Integrated Damping includes constrained layer core, damped working surface and composite edge finish.

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