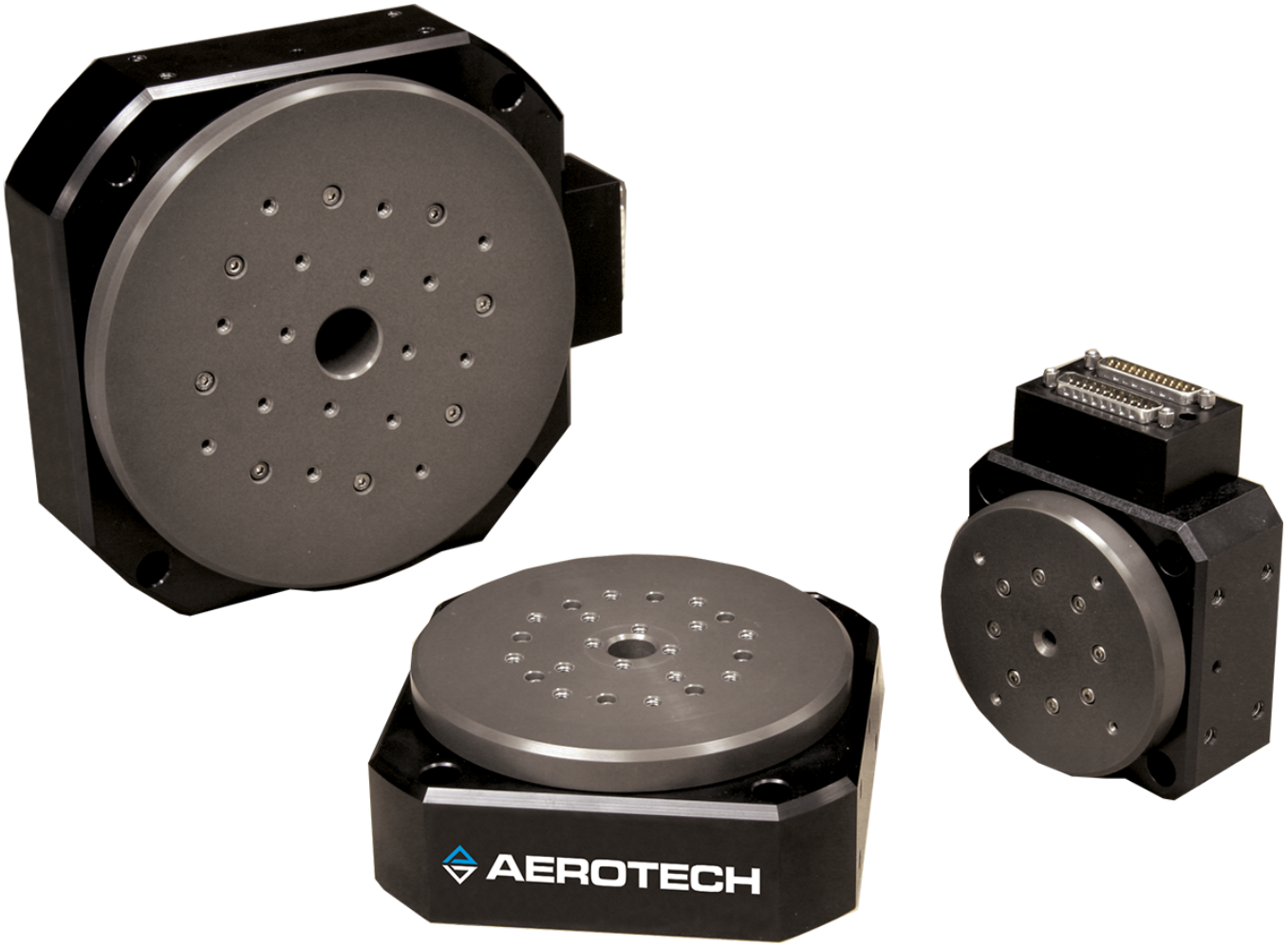
ADRS150 High-Precision Mechanical Bearing Direct-Drive Rotary Stage

HARDWARE MANUAL

Revision 2.02



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EU Declaration of Incorporation

Manufacturer:	Aerotech, Inc.
Address:	101 Zeta Drive Pittsburgh, PA 15238-2811 USA
Product:	ADRS - rotary positioning stage
Models:	All

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following directive.

2006/42/EC
Machinery Directive (partially completed machinery)
1.1 General Remarks
1.1.2 Principles of safety integration
1.1.5 Design of machinery to facilitate handling
1.2 Control Systems
1.2.1 Safety and reliability of control systems
1.3 Protection against mechanical hazards
1.3.1 Risk of loss of stability
1.3.2 Risk of breakup during operation
1.3.3 Risks due to falling or ejected objects
1.3.4 Risks due to surfaces, edges, or angles
1.5 Risks due to other hazards
1.5.4 Error of fitting
1.5.9 Vibrations
1.6 Maintenance
1.6.5 Cleaning of internal parts
1.7 Instructions
1.7.4.1 Instructions

and that the following harmonized European standards have been applied:

EN ISO 12100
Safety of machinery – Basic concepts, general principles for design

EN 60204-1:2018
Safety of machinery – Electrical equipment of machines – Part 1: General requirements

and furthermore declares that

the equipment shall not be put into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of the Directive 2006/42/EC and with national implementing legislation, for example, as a whole, including the equipment referred to in this Declaration. Technical documentation showing compliance with this declaration in accordance with Annex VII part B will be provided in digital format upon request.

Authorized Representative:

Managing Director
Aerotech GmbH
Gustav-Weißkopf-Str. 18
90768 Fürth
Germany

Stephan Schech

Engineer Verifying Compliance:

Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA
15238-2811
USA

Alex Weibel

Date: 3/11/2026

UKCA Declaration of Incorporation

Manufacturer: Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA 15238-2811
USA

herewith declares that the following Aerotech stage series:

ADRS

To which this declaration relates, meets the essential health and safety requirements and is in conformity with the relevant UK legislation listed below:

Supply of Machinery (Safety) Regulations 2008

Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
Restricted Substances Directive

Using the relevant section of the following UK designated standards and other normative documents when installed in accordance with the installation instructions supplied by the manufacturer:

EN ISO 12100
Safety of machinery – Basic concepts, general principles for design

EN 60204-1:2018
Safety of machinery – Electrical equipment of machines – Part 1: General requirements

and furthermore declares that

it is not allowed to put the product into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of the Supply of Machinery (Safety) Regulations 2008 UK Legislation and with national implementing legislation, for example, as a whole, including the equipment referred to in this Declaration.

Authorized Representative:
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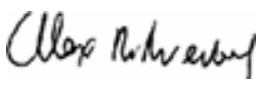


Alex Weibel

RoHS Conformity Declaration

Manufacturer:	Aerotech, Inc.
Address:	101 Zeta Drive Pittsburgh, PA 15238-2811 USA
Product:	ADRS - rotary positioning stage
Models:	All

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following directive:

(EU) 2015/863 restriction of the use of hazardous substances (RoHS3)

Safety Procedures and Warnings

IMPORTANT: This manual tells you how to carefully and correctly use and operate the stage.

- Read all parts of this manual before you install or operate the stage or before you do maintenance to your system.
- To prevent injury to you and damage to the equipment, obey the precautions in this manual.
- All specifications and illustrations are for reference only and were complete and accurate as of the release of this manual. To find the newest information about this product, refer to www.aerotech.com.

If you do not understand the information in this manual, contact Aerotech Global Technical Support.

IMPORTANT: This product has been designed for light industrial manufacturing or laboratory environments. If the product is used in a manner not specified by the manufacturer:

- The protection provided by the equipment could be impaired.
- The life expectancy of the product could be decreased.

Safety notes and symbols are placed throughout this manual to warn you of the potential risks at the moment of the safety note or if you fail to obey the safety note.

Shock/Electrocution Hazard

Pinch, Shear, or Crush Hazard

General/Conditional Awareness

Rotational Machinery Hazard

Hot Surface Hazard

Pinch/Entanglement Hazard

Magnetic Field Hazard

Trip Hazard

Heavy, Bulky Lifting Hazard

Appropriate Equipment Required

Pressure/Explosive Atmosphere Hazard

Electrostatic Discharge Hazard

A blue circle symbol is an action or tip that you should obey. Some examples include:

General tip

Read the manual/section

Wear personal protective equipment (PPE): Safety Glasses

If applicable, do not lift unassisted

Wear personal protective equipment (PPE): Gloves

Wear personal protective equipment (PPE): Hearing Protection

Installation and Operation

To decrease the risk of damage to the equipment, you must obey the precautions that follow.

DANGER: General Hazard Warning!

This product can produce high forces and move at velocities that could cause injury. The user is responsible for its safe operation. The following general equation is provided to assist with risk assessments in regards to contact and pinch points:

$$Pressure_{Max}\left[\frac{N}{mm^2}\right] = \frac{Force_{Peak}[N]}{Area_{Contact}[mm^2]}$$

WARNING: General Hazard Warning!

- Only trained operators should operate this equipment.
- All service and maintenance must be done by approved personnel.
- Use this product only in environments and operating conditions that are approved in this manual.
- Never install or operate equipment that appears to be damaged.
- Make sure that the product is securely mounted before you operate it.
- Use care when you move the stage or you could negatively affect the performance of it.

WARNING: **Trip Hazard!**

Route, house, and secure all cables, duct work, air, or water lines. Failure to do so could introduce trip hazards around the system that could result in physical injury or could damage the equipment.

Electrical Warnings

To decrease the risk of electrical shock, injury, death, and damage to the equipment, obey the precautions that follow.

DANGER: Electrical Shock Hazard!

- Stage motor phase voltage levels could be hazardous live.
- Personnel are protected from hazardous voltages unless electrical interconnections, protective bonding (safety ground), or motor/stage enclosures are compromised.
- Do not connect or disconnect stage/motor interconnections while connected to a live electrical power source.
- Before you set up or do maintenance, disconnect electrical power.
- It is the responsibility of the End User/System Integrator to make sure that stages are properly connected and grounded per Engineering Standards and applicable safety requirements.
- It is the responsibility of the End User/System Integrator to configure the system drive or controller within the Aerotech motor/stage electrical and mechanical specifications.

Motor-Related Warnings

Aerotech motors are capable of producing high forces and velocities. Obey all warnings and all applicable codes and standards when you use or operate a stage or system that incorporates Aerotech motors.

DANGER: Mechanical Hazard!

Personnel must be made aware of the mechanical hazards during set up or when you do service to the stage.

Stage movement could create pinch points, entanglement hazards, or rotational mechanical hazards.

DANGER: Hot Surface Hazard!

- The stage/motor frame temperature could exceed 70°C in some applications.
- Do not touch the stage/motor frame while it is in operation.
- Wait until the stage/motor has cooled before you touch it.

DANGER: **Risk in Explosive Atmosphere!**

- Standard Aerotech stage/motors are not rated for applications with explosive atmospheres such as airborne dust or combustible vapors.
- Do not operate stage/motors outside of Aerotech environmental specifications.

DANGER: Magnetic Field Hazard!

Aerotech stage/motors contain magnets which can present a Magnetic Field Hazard.

- Do not disassemble a stage motor under any circumstances.
- Strong magnetic fields could interfere with external/internal medical devices.
- Strong magnetic fields could present mechanical hazards such as pinch points.

Pinch Points

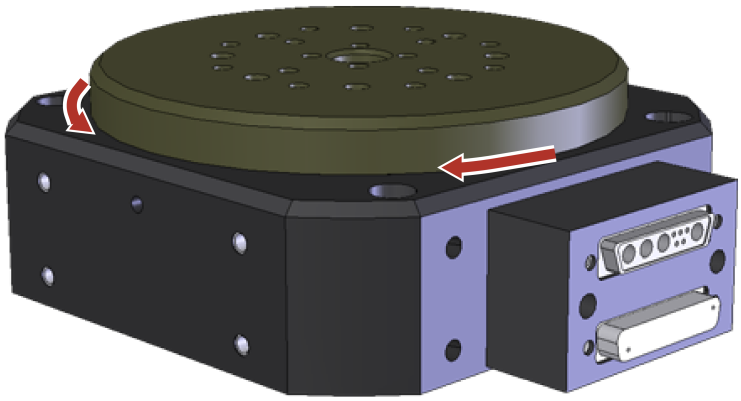
A pinch point is a mechanical hazard that can occur when there are exposed parts of the stage or system that can move. For example, the travel of a stage tabletop could expose the user to a pinch point between the tabletop and the stage housing. The images that follow will show you typical external and internal pinch point locations.

DANGER: Mechanical Hazard!

- System travel can cause crush, shear, or pinch injuries.
- Only trained operators should operate this equipment.
- Do not put yourself in the travel path of machinery.
- Restrict access to all motor and stage parts
  - when the system moves under power (during normal operation, for example).
  - when the system is moved manually (during the installation process or when you do maintenance, for example).
- Motors are capable of very high speeds and acceleration rates.

Figure 1: Typical Pinch Point Locations

DANGER: Rotating Machinery Hazard!
Keep hands and loose objects away from the stage while it is in motion.



Handling and Storage

IMPORTANT: It is the responsibility of the customer to safely and carefully lift and move the stage.

- Be careful when you move or transport the stage.
- Retain the shipping materials for future use.
- Transport or store the stage in its protective packaging.

WARNING: Electrostatic Discharge (ESD) Sensitive Components!

Wear an ESD wrist strap when you handle, install, or do service to the system assembly.

Failure to observe the correct ESD practices could cause ESD damage to stage electronics, system drives, and/or power supplies.

Inspect the shipping container for any evidence of shipping damage. If any damage exists, notify the shipping carrier immediately.

Remove the packing list from the shipping container. Make sure that all the items specified on the packing list are contained within the package.

The documentation for the stage is on the included installation device. The documents include manuals, interconnection drawings, and other documentation pertaining to the system. Save this information for future reference.

Each stage has a label listing the system part number and serial number. These numbers contain information necessary for maintenance or system hardware and software updates. Locate this label and record the information for later reference.

Unpacking and Handling

It is the responsibility of the customer to safely and carefully lift and move the stage.

IMPORTANT: All electronic equipment and instrumentation is wrapped in antistatic material and packaged with desiccant. Ensure that the antistatic material is not damaged during unpacking.

DANGER: **Lifting Hazard!** Use care when you move the stage or you could negatively affect the performance of it.

- Use the correct lifting techniques, mechanical assistance, or additional help to lift or move this product.
- Do not use the cables or the connectors to lift or move this product.
- Make sure that all moving parts are secure before you move the stage. Unsecured moving parts could shift and cause injury or damage to the equipment.
- If the stage is heavy, a single person lift could cause injury. Use assistance when you lift or move it.
  - Refer to Section 2.1. Dimensions for dimensions
  - Refer to Section 1.3. Basic Specifications for weight specifications.

Carefully remove the stage from its protective shipping container.

- Lift this product only by the base.
- For multi-axis assemblies, always lift the system by the lower axis.
- Use a cart, dolly, or similar device to move the stage to a new location.

Gently set the stage on a smooth, flat, and clean surface. Use compressed nitrogen or clean, dry, oil-free air to remove any dust or debris that has collected during shipping.

Before you operate the stage, let it stabilize at room temperature for at least 12 hours. This will ensure that all of the alignments, preloads, and tolerances are the same as they were when they were tested at Aerotech.

Shipping Brackets

If the ADRS has shipped as part of a system, shipping brackets (typically red, anodized aluminum) might have been installed to secure the system prior to shipment. The shipping clamps, if installed, will need to be removed prior to machine start up.

Storage

Store the stage in the original shipping container. If the original packaging included ESD protective packaging, make sure to store the stage in it. The storage location must be dry, free of dust, free of vibrations, and flat.

Refer to Section 1.1. Environmental Specifications

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Chapter 1: Overview

Table 1-1: Model Numbers and Ordering Options

ADRS Series	
ADRS100	Mechanical-bearing direct-drive rotary stage
ADRS150	Mechanical-bearing direct-drive rotary stage
ADRS200	Mechanical-bearing direct-drive rotary stage
Feedback (Required)	
-E6	Incremental encoder, 1 Vpp
-E7	Incremental encoder, digital RS422, electrical resolution 6.48 arc sec
-E8	Incremental encoder, digital RS422, electrical resolution 3.24 arc sec
-E9	Incremental encoder, digital RS422, electrical resolution 1.62 arc sec
-E10	Incremental encoder, digital RS422, electrical resolution 0.65 arc sec
Motor (Required)	
-M1	Low current, -A winding
-M2	Low voltage, -B winding
Tabletop (Required)	
-TT1	Metric tabletop
-TT2	English tabletop
Lower Seal (Optional)	
-	No lower seal
-SL	Lower Seal
Metrology (Required)	
-PL1	Metrology, uncalibrated with performance plots
-PL2	Metrology, calibrated (HALAR) with performance plots
Integration (Required)	
-TAS	Test as system: Testing, integration, and documentation of a group of components as a complete system that will be used together.
-TAC	Test as components: Testing and integration of individual items as discrete components that ship together.

1.1. Environmental Specifications

WARNING: **General Hazard Warning!** Do not expose this product to environments or conditions outside of the listed specifications. You could damage the equipment if you exceed the environmental or operating specifications.

DANGER: **Risk in Explosive Atmosphere!**

- Standard Aerotech stage/motors are not rated for applications with explosive atmospheres such as airborne dust or combustible vapors.
- Do not operate stage/motors outside of Aerotech environmental specifications.

Table 1-2: Environmental Specifications

Ambient Temperature	Operating: 10 °C to 35 °C (50 °F to 95 °F) The optimal operating temperature is 20 °C ±2 °C (68 °F ±4 °F). If at any time the operating temperature deviates from 20 °C degradation in performance could occur.
	Storage: 0 °C to 40 °C (32 °F to 104 °F) in original shipping packaging
Humidity	Operating: 20% to 60% RH
	Storage: 10% to 70% RH, non-condensing in original packaging. The stage should be packaged with desiccant if it is to be stored for an extended time.
Altitude	Operating: 0 m to 2,000 m (0 ft to 6,562 ft) above sea level Contact Aerotech if your specific application involves use above 2,000 m or below sea level.
Vibration	Use the system in a low vibration environment. Floor or acoustical vibration can affect system performance. Contact Aerotech for information regarding your specific application.
Protection Rating	These stages have limited protection against dust, but not water. This equates to an ingress protection rating of IP40.
Use	Indoor use only

1.2. Accuracy and Temperature Effects

Aerotech products are designed for and built in a 20 °C (68 °F) environment. Temperature changes could cause a decrease in performance or permanent damage to the stage. At a minimum, the environmental temperature must be controlled to within 0.25 ºC per 24 hours to ensure the stage specifications are repeatable over an extended period of time. The severity of temperature effects on all specifications depends on many different environmental conditions, which include how the stage is mounted. Contact the factory for more details.

1.3. Basic Specifications

Table 1-3: ADRS150 Series Specifications

		ADRS150
Tabletop Diameter		140 mm
Aperture		15 mm
Bus Voltage		340 VDC max
Maximum Torque (Continuous)		2.36 N·m
Maximum Speed(1)		600 rpm
Accuracy(2)	Uncalibrated	388 µrad (80 arc sec)
	Calibrated (3)	29.1 µrad (6 arc sec)
Repeatability(2)		14.6 µrad (3 arc sec)
Max Load (4)	Axial	20 kg
	Radial	10 kg
Axial Error Motion		5 µm
Radial Error Motion		5 µm
Tilt Error Motion		48.5 µrad (10 arc sec)
Inertia (Unloaded)		0.00264 kg-m^2
Total Mass		4.5 kg
Finish	Tabletop	Hardcoat
	Stage	Black Anodize

(1) Maximum speed listed is stage and motor dependent (and assumes a 340 V bus). The actual speed could be lower due to motor back emf or encoder bandwidth. Consult an Aerotech Applications Engineer for more details.
(2) Repeatability and accuracy are dependent on encoder resolution. To achieve the listed specifications, encoder resolution must be 0.36 arc sec or less.
(3) Calibrated accuracy requires the -PL2 option and Aerotech controls.
(4) Maximum loads are mutually exclusive.
(5) The maximum speed is limited to 1400 rpm with the -E10 feedback option.

1.4. Vacuum Operation

Vacuum option preparations are available as special orders. Contact Aerotech for more information.

There are two vacuum preparation options:

- Low Vacuum (for use in environments from atmospheric pressure, down to 10^{-3} Torr)
- High Vacuum (for use in environments from 10^{-3} Torr, down to 10^{-6} Torr)

Special preparations include:

- Parts are lubricated with vacuum-compatible lubricants.
- Materials, fasteners, and coatings are selected to be compatible with the specified level of vacuum.
- High-vacuum systems are designed to eliminate trapped volumes.
- Prior to assembly, stage parts are thoroughly cleaned in a clean environment.
- The stage is packaged in a special polyethylene bag.

Vacuum Guidelines

To ensure that the stage will continue to perform well in the vacuum environment, use the guidelines that follow (in addition to standard handling, installation, and lubrication guidelines outlined in this manual).

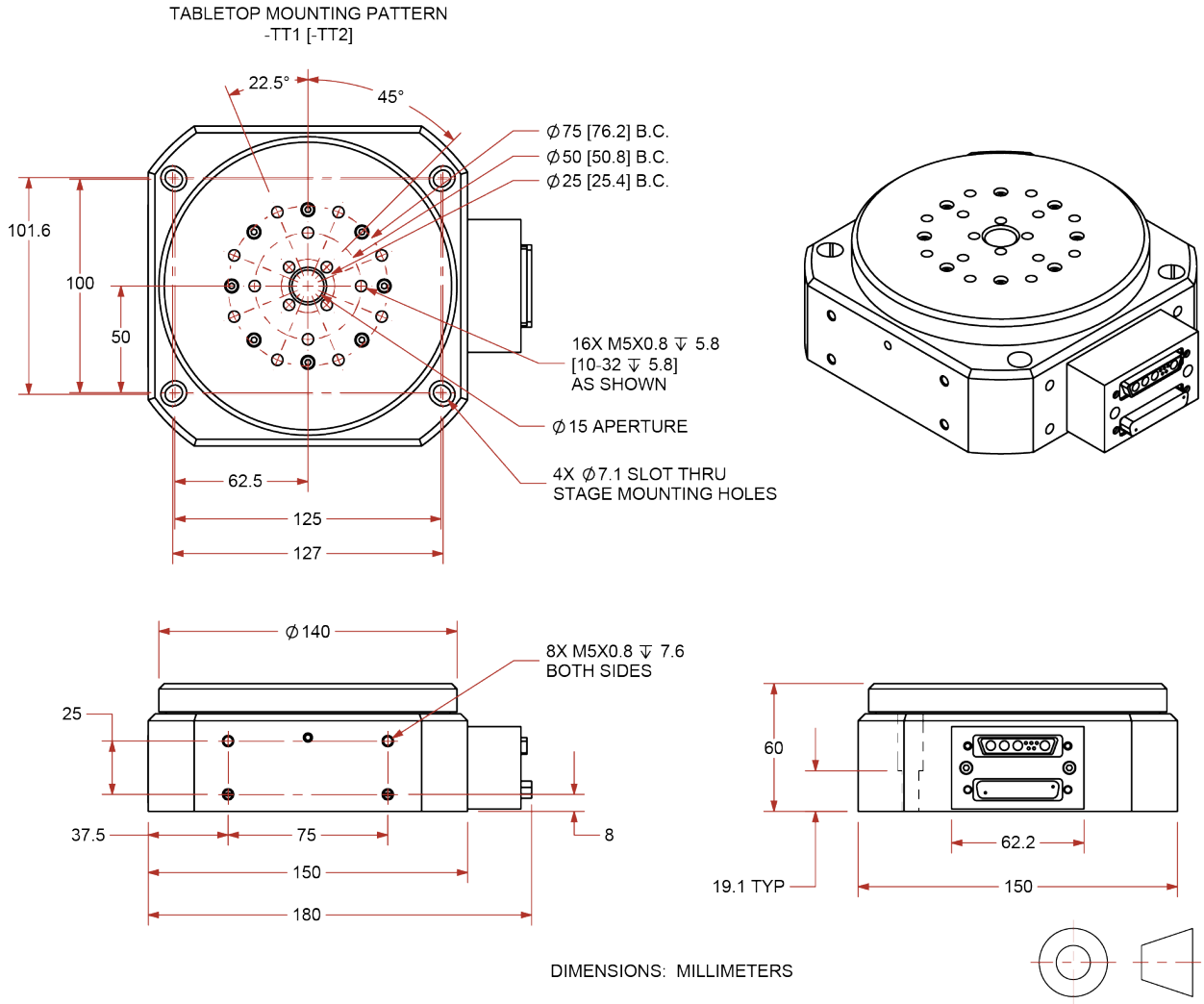
1. Do not remove the stage from its sealed bag until it is ready to use.
2. Always handle the stage in a clean environment and use powder-free polyethylene gloves to prevent any contaminants from adhering to the surface of the stage.
3. During installation, use cleaned, vented, stainless steel fasteners to secure the stage.
4. Reduced air pressure eliminates significant convective heat transfer. This, coupled with the viscous vacuum-compatible lubricants, could result in excessive motor operating temperatures. Because of this, consider all continuous torque ratings to be 40 to 60% lower than the value specified for operation in normal atmospheric environment. Reduce motor usage accordingly.
5. We recommend that you use a small quantity of Braycote® 602EF grease or a compatible substitute of equal quality lubricant in vacuum applications.
6. To reduce outgassing during the initial pump-down to vacuum pressure, Aerotech recommends that you bake out vacuum systems when you first install them into the vacuum chamber. Bake the vacuum components at 60 °C for 24 to 48 hours to desorb water vapor from surfaces and degas polymers (such as cable insulation).

Chapter 2: Installation

The stage installation must be in accordance with the instructions provided by this manual and any accompanying documentation. Failure to follow these instructions could result in injury or damage to the equipment.

2.1. Dimensions

Figure 2-1: ADRS150 Dimensions



2.2. Securing the Stage to the Mounting Surface

DANGER: Mechanical Hazard!

Personnel must be made aware of the mechanical hazards during set up or when you do service to the stage.

- Do not manually rotate the stage if it is connected to a power source.
- The stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.
- When you move the tabletop to do maintenance, this could expose the operator to pinch points. Refer to Pinch Points on Page 13.

The mounting surface must be flat and have adequate stiffness to achieve the maximum performance from the stage. When it is mounted to a non-flat surface, the stage can be distorted while the mounting screws are tightened. This distortion will decrease overall accuracy. Adjustments to the mounting surface must be done before the stage is secured.

Inspect the mounting surface for dirt or unwanted residue and clean if necessary. Use precision flatstones on the mounting surface to remove any burrs or high spots. Clean the mounting surface with a lint-free cloth and acetone or isopropyl alcohol and allow the cleaning solvent to completely dry. Gently place the stage on the mounting surface.

IMPORTANT: The stage is precision machined and verified for flatness at the factory.

- Do not machine the stage housing. If you must machine a surface to achieve a required flatness, machine the mounting surface.
- Keep the use of shims to a minimum when you mount the stage to the mounting surface. The use of shims could reduce the rigidity of the system.

Table 2-1: Stage Mounting Surface Flatness Requirement

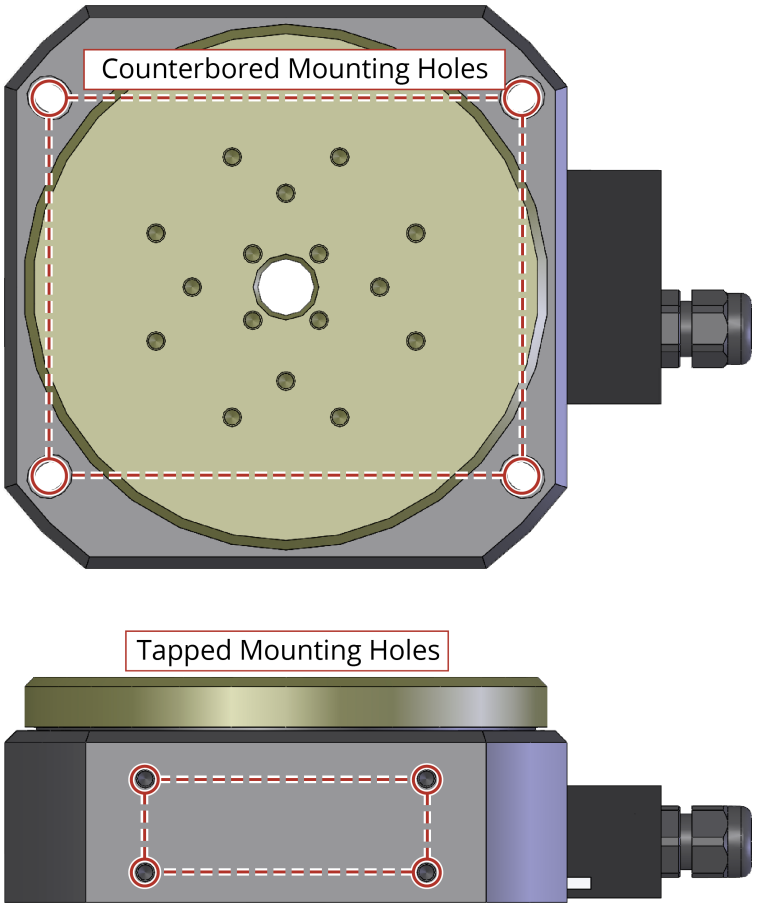
Stage	Flatness Requirement
All Frame Sizes	5 µm

ADRS series stages have a fixed mounting pattern available to secure the stage to a mounting surface. Figure 2-2 shows the main mounting holes in the base of the stage. Tightening torque values for the mounting hardware are dependent on the properties of the surface to which the stage is being mounted. Values provided in Table 2-2 are typical values and may not be accurate for your mounting surface. Refer to Section 2.1. for specific model mounting locations and dimensions.

Table 2-2: Stage to Mounting Surface Hardware

Mounting Hardware		Typical Screw Torque
Top	6 mm or 1/4" SHCS	7 N·m
Side	M5 x 0.8 tapped holes	4 N·m

Figure 2-2: Stage Mounting Holes



2.3. Attaching the Payload or Fixturing to the Tabletop

Inspect the mounting surfaces for dirt or unwanted residue and clean them if necessary (refer to Section 4.2. Cleaning and Lubrication). Gently place the payload on the tabletop.

Use a representative payload during start-up to prevent accidental damage to the stage and the payload. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. Document all results for future reference. For information on electrical installation refer to Chapter 3: Electrical Installation and the documentation delivered with the stage.

WARNING: General Hazard Warning!

Be careful when you attach the payload to the stage table.

- Refer to the dimensions in Section 2.1. for maximum allowable thread engagement.

IMPORTANT: If your ADRS was purchased with Aerotech controls, it could have been tuned with a representative payload based on the information provided at the time of order. If you start the ADRS without a payload, the servo gains provided by Aerotech with the shipment may not be appropriate and servo instability can occur. Refer to the controller help file for tuning assistance.

The payload must be flat, rigid, and comparable to the stage in quality to maintain optimum performance.

Table 2-3: Mounting Interface Flatness Requirement

Stage Travel	Flatness Requirement
All Travels	8 µm

Applied loads should be symmetrically distributed whenever possible. The payload should be centered on the stage table and the entire stage should be centered on the support structure. Refer to the dimension drawing in Section 2.1. for mounting hole locations.

For a cantilevered load, first determine if it is an Axial or a Radial cantilever system.

- The Axial curve assumes a horizontal stage orientation with the payload offset extending upwards.
- The Radial curve is for situations where the stage is mounted on its side and the offset load extends outwards.

Refer to Section 1.3. for maximum load carrying capacity specifications. If cantilevered loads are applied, refer to the Figure 2-4 to find the maximum allowable load.

IMPORTANT: Where possible, use 3-point mounting when you attach the payload to the stage.

Figure 2-3: Load Orientations

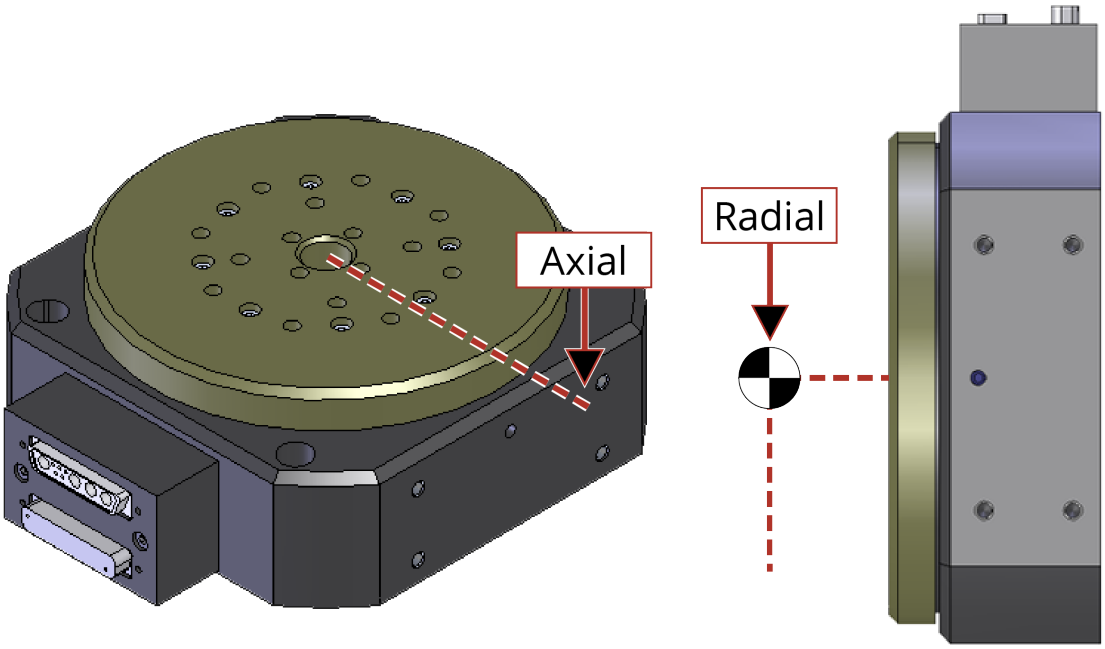
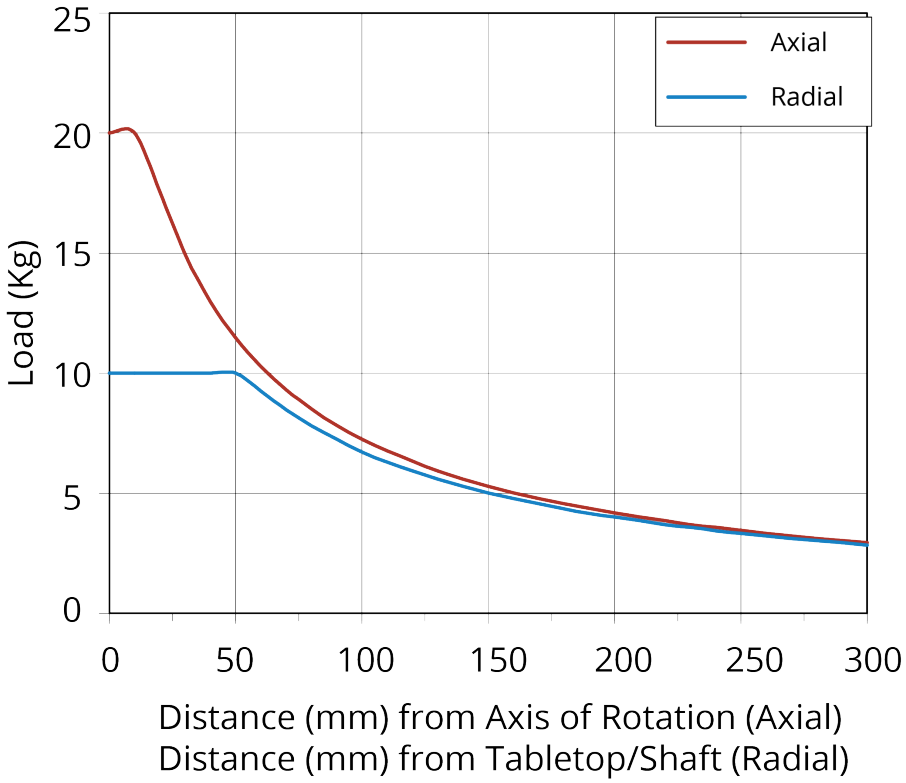


Figure 2-4: Cantilevered Load Capabilities



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Chapter 3: Electrical Installation

DANGER: Electrical Shock Hazard!

- Stage motor phase voltage levels could be hazardous live.
- Personnel are protected from hazardous voltages unless electrical interconnections, protective bonding (safety ground), or motor/stage enclosures are compromised.
- Do not connect or disconnect stage/motor interconnections while connected to a live electrical power source.
- Before you set up or do maintenance, disconnect electrical power.
- It is the responsibility of the End User/System Integrator to make sure that stages are properly connected and grounded per Engineering Standards and applicable safety requirements.
- It is the responsibility of the End User/System Integrator to configure the system drive or controller within the Aerotech motor/stage electrical and mechanical specifications.

WARNING: General Hazard Warning!

Applications that require access to the ADRS must be restricted to qualified and trained personnel. The system integrator or qualified installer is responsible for determining and meeting all safety and compliance requirements when they integrate the ADRS into a completed system. Failure to do so could expose the operator to electrical or mechanical hazards.

Electrical installation requirements will depend on the ordered product options. Installation instructions in this section are for Aerotech products equipped with standard Aerotech motors intended for use with an Aerotech motion control system. Contact Aerotech for further information on products that are otherwise configured.

Aerotech motion control systems are adjusted at the factory for optimum performance. When the ADRS is part of a complete Aerotech motion control system, setup should only require that you connect the stage to the appropriate drive chassis with the cables provided. Labels on the system components should indicate the appropriate connections.

If system level integration was purchased, an electrical drawing that shows the system interconnects has been supplied with the system (separate from this documentation).

The electrical wiring from the motor and encoder are integrated at the factory. Refer to the sections that follow for standard motor wiring and connector pinouts.

IMPORTANT: Refer to the controller documentation to adjust servo gains for optimum velocity and position stability.

3.1. Motor and Feedback Connectors

Stages equipped with standard motors and encoders come from the factory completely wired and assembled.

IMPORTANT: Refer to the other documentation accompanying your Aerotech equipment. Call your Aerotech representative if there are any questions on system configuration.

IMPORTANT: If you are using standard Aerotech motors and cables, motor and encoder connection adjustments are not required.

The protective ground connection of the ADRS provides motor frame ground protection only. Additional grounding and safety precautions are required for applications requiring access to the stage while it is energized. The System Integrator or qualified installer is responsible for determining and meeting all safety and compliance requirements necessary for the integration of this stage into the final application.

DANGER: Electrical Shock Hazard!

- The protective ground connection must be properly installed to minimize the possibility of electric shock.
- The stage controller must provide over-current and over-speed protection. Failure to do so could cause unsafe mechanical and thermal hazards resulting in injury and/or damage to equipment.
- Never plug-in or unplug Motor and Feedback Connectors with power applied to stage controller. Failure to do so can expose operator to electrical shock hazards and/or damage to equipment.

Table 3-1: High Power D-Style Motor Connector Pinout

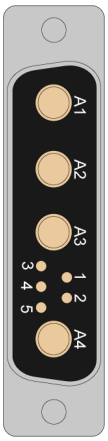
Pin	Description	Connector
Case	Shield Connection	
A1	Motor Phase A	
A2	Motor Phase B	
A3	Motor Phase C	
1	Reserved	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
A4	Frame Ground (motor protective ground)	

Table 3-2: Mating Connector Part Numbers for the Motor Connector

Mating Connector	Aerotech P/N	Third Party P/N
Backshell	ECK00656	Amphenol #17E-1726-2
Sockets [QTY. 4]	ECK00659	ITT Cannon #DM53744-6
Connector	ECK00657	ITT Cannon #DBM9W4SA197

Table 3-3: Feedback Connector Pinout

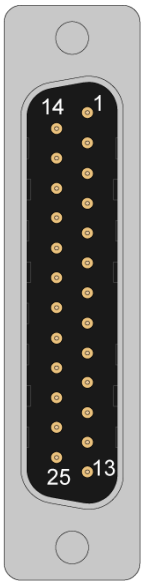
Pin	Description	Connector
Case	Shield Connection	
1	Reserved	
2	Over-Temperature Thermistor Sensor	
3	5V Power Supply Input	
4	Reserved	
5	Hall Effect Sensor (Phase B)	
6	MRK- (Encoder Marker-)	
7	MRK+ (Encoder Marker+)	
8	Reserved	
9	Reserved	
10	Hall Effect Sensor (Phase A)	
11	Hall Effect Sensor (Phase C)	
12	Reserved	
13	Reserved	
14	COS+ (Encoder Cosine+)	
15	COS- (Encoder Cosine-)	
16	5V Power Supply Input	
17	SIN+ (Encoder Sine+)	
18	SIN- (Encoder Sine-)	
19	Reserved	
20	Common ground	
21	Common ground	
22	Reserved	
23	ENC FLT (fault output from the encoder)	
24	Reserved	
25	Reserved	

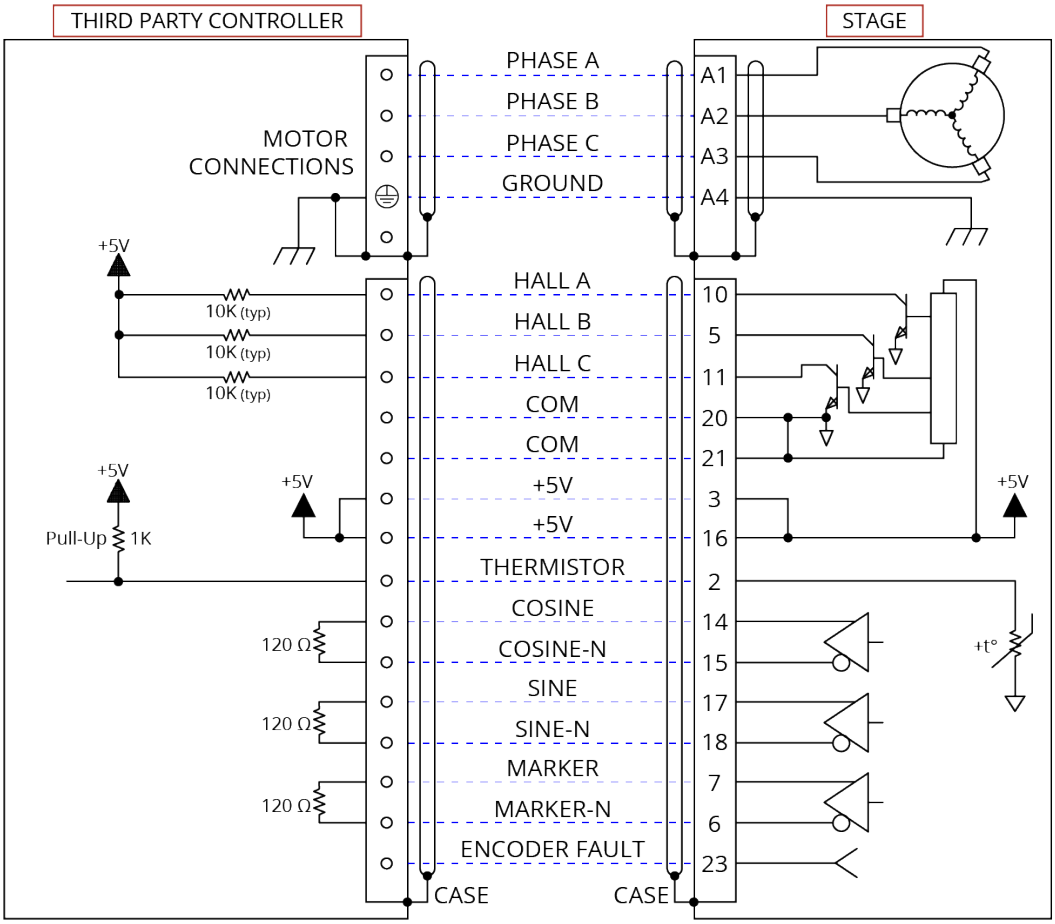
Table 3-4: Mating Connector Part Numbers for the Feedback Connector

Mating Connector	Aerotech P/N	Third Party P/N
25-Socket D-Connector	ECK00300	FCI DB25S064TLF
Backshell	ECK00656	Amphenol 17E-1726-2

3.2. Motor and Feedback Wiring

Shielded cables are required for the motor and feedback connections.

Figure 3-1: ADRS Motor and Feedback Wiring



3.3. Motor and Feedback Specifications

Hall Effect and Encoder wiring share a common 5V supply connection inside the feedback connector.

Table 3-5: Hall-Effect Sensor Specifications

	Specification
Supply Voltage	5 V ±5%
Supply Current	50 mA
Output Type	Open Collector
Output Voltage	24 V max (pull up)
Output Current	5 mA (sinking)

Table 3-6: Thermistor Specifications

	Specification
Polarity	Logic "0" (no fault)
	Logic "1" (over-temperature fault)
Cold Resistance	~100 Ω
Hot Resistance	~10 K
Note: 1K pull-up to +5V recommended.	

Table 3-7: Encoder Specifications

	Specification
Supply Voltage	5 V ±5%
Supply Current	250 mA (typical)
Output Signals (-E6)	**Sinusoidal Type (Incremental Encoder)**: Analog: SIN+, SIN-, COS+, COS-, $1V_{pk-pk}$; Digital (RS422): MRK+, MRK- signals.
Output Signals (-E7, -E8, -E9, -E10)	**Digital Output (Incremental Encoder)**: Digital encoder line-driver signals; RS422/485 compatible

The encoders used on all ADRS series stages come standard with a 40 MHz clock rate. Aerotech can provide slower or faster clock rates to match your controller. Contact the Aerotech for more information.

Table 3-8: Encoder Resolution

Model	ADRS150
Fundamental Resolution	10000 lines/rev
-E6	.032 / .008 arc sec
-E7	6.48 arc sec
-E8	3.24 arc sec
-E9	1.62 arc sec
-E10	0.65 arc sec
(1) -E6 shows x4000 / x16000 total interpolation. Other interpolation factors are available. (2) Quadrature decoding included in all resolution calculations.	

Table 3-9: Maximum Speed Per Encoder Option

Resolution Speed	ADRS150
-E6, -E7, -E8, -E9	600 rpm
-E10	600 rpm

Table 3-10: ADRS150 Motor Specifications

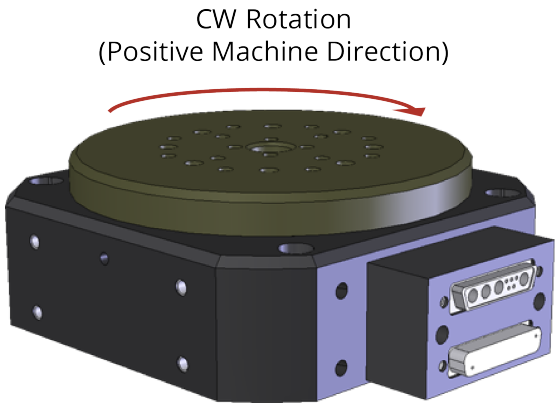
		S-130-39	
Performance Specifications			
Winding Designation		-A	-B
Stall Torque, Cont.	N·m	2.81	
Peak Torque	N·m	11.2	
Electrical Specifications			
Winding Designation		-A	-B
BEMF Const., line-line	V/krpm	89.3	44.6
Continuous Current, Stall	A	3.8	7.6
Peak Current, Stall	A	15.2	30.4
Torque Constant	N·m/A	0.738	0.369
Motor Constant	N·m/√W	0.299	
Resistance, 25 °C, line-line	Ω	6.26	1.57
Inductance, line-line	mH	1.61	0.40
Thermal Resistance	°C/W	0.85	
Number of Poles	--	18	
Maximum Coil Temperature	°C	100	

(1) Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature.
(2) Values shown at maximum coil temperature, with housed motor mounted to a 250×250×6 mm aluminum heat sink.
(3) Peak torque assumes correct rms current; consult Aerotech.
(4) Torque constant and motor constant specified at stall.
(5) All performance and electrical specifications have a tolerance of ±10%.
(6) Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures.
(7) All Aerotech motors and amplifiers are rated using vector amplitude values. For sinusoidal signals, use sine wave peak value.

3.4. Limits, Marker, and Machine Direction

Aerotech stages are configured to have positive and negative "machine" directions. The machine direction defines the phasing of the feedback and motor signals and is dictated by the stage wiring (refer to Section 3.2.). Programming direction of a stage is set by the controller that is used to move the stage. Programming direction is typically selectable in the controller, while machine direction is hardwired in the stage. Figure 3-2 shows the machine direction of ADRS stages.

Figure 3-2: Machine Direction



3.5. Motor and Feedback Phasing

Motor phase voltage is measured relative to the virtual wye common point.

Figure 3-3: Hall Phasing Diagram

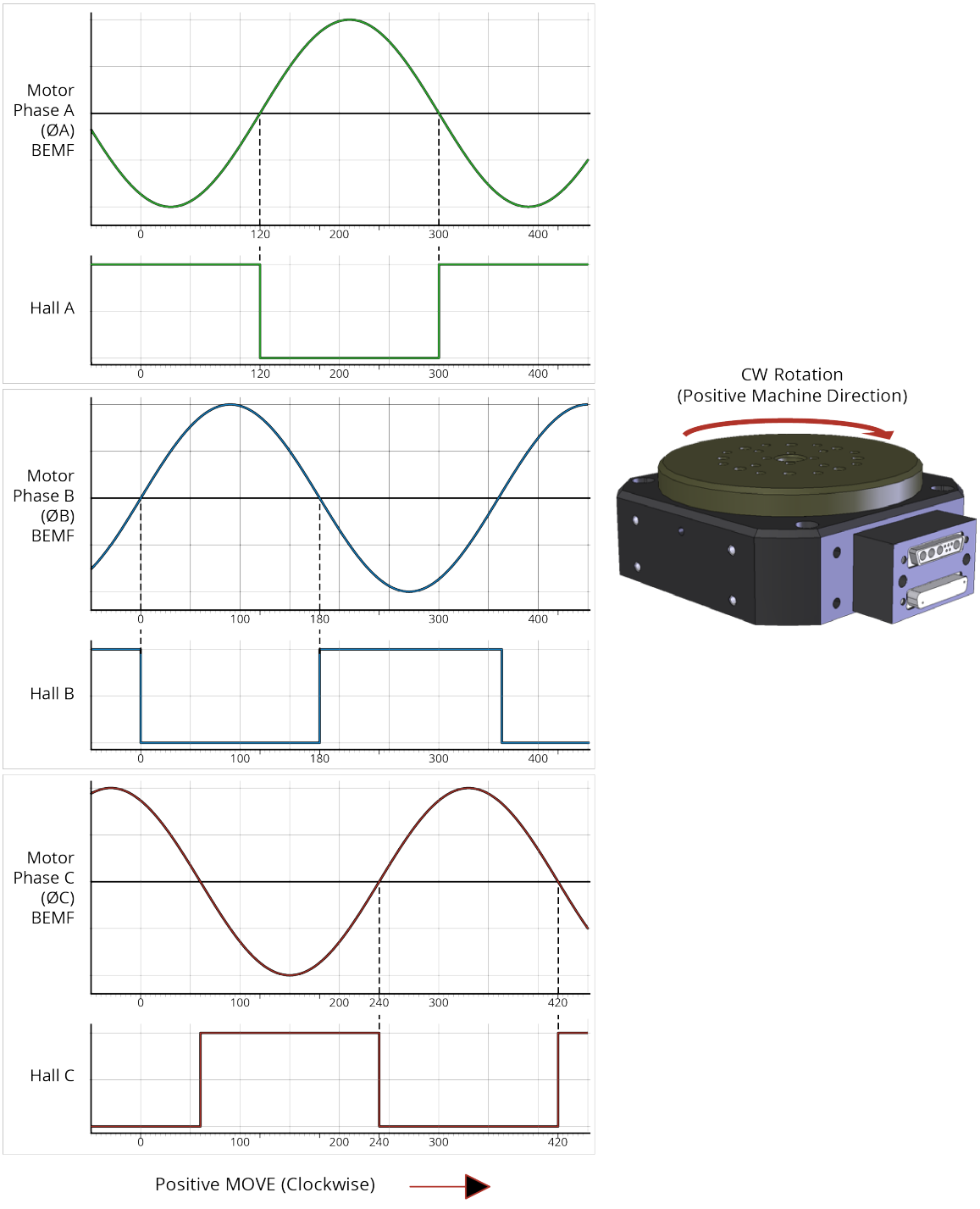
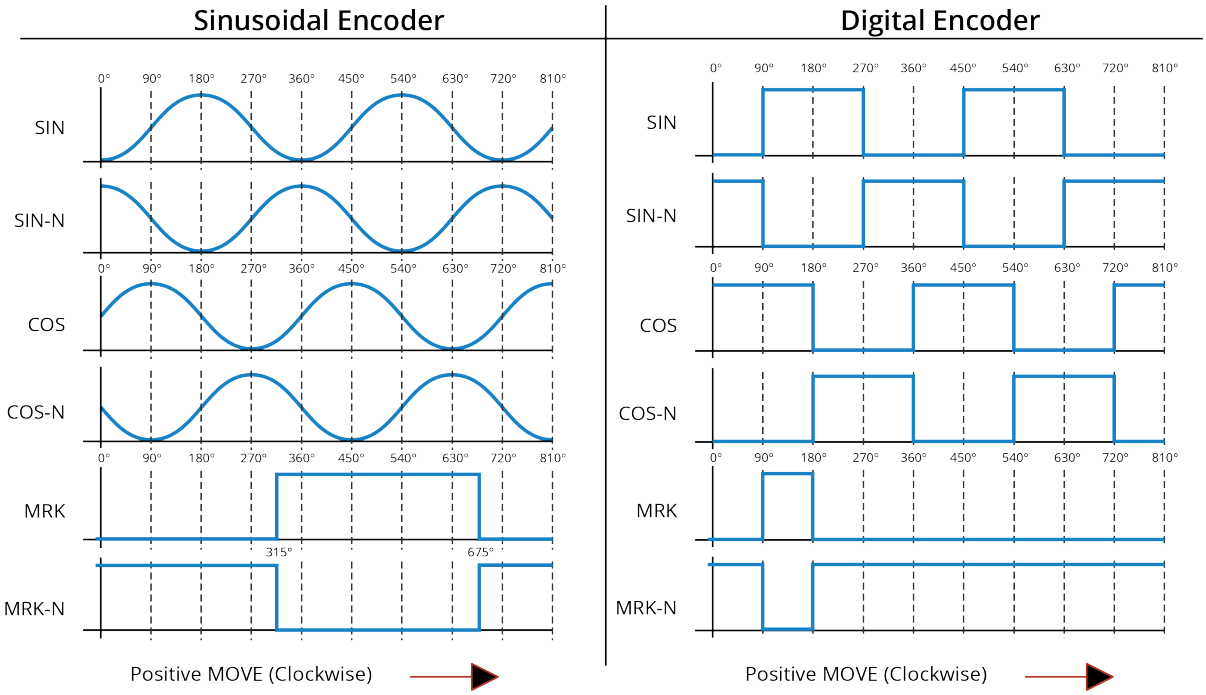


Figure 3-4: Encoder Phasing Reference Diagram



Chapter 4: Maintenance

IMPORTANT: Read the Safety Procedures and Warnings (on Page 9) before you do maintenance to the stage.

IMPORTANT: Keep the bearing area free of foreign matter and moisture or the performance and life expectancy of the stage will be reduced.

DANGER: Electrical Shock Hazard!

- Do not connect or disconnect stage/motor interconnections while connected to a live electrical power source.
- Before you set up or do maintenance, disconnect electrical power.

The ADRS series stages are designed to require minimum maintenance.

WARNING: Failure to follow the maintenance procedures outlined in this section will result in voiding stage warranty.

4.1. Service and Inspection Schedule

Inspect the ADRS at least once per month. The need for a longer or shorter inspection interval will depend on the application and conditions, such as the duty cycle, speed, and environment.

Monthly inspections should include but not be limited to:

- Visually inspect the stage and cables.
- Re-tighten loose connectors.
- Replace or repair damaged cables.
- Clean the ADRS and any components and cables as needed.
- Repair any damage before operating the ADRS.
- Inspect and perform an operational check on all safeguards and protective devices.

If the stage is equipped with a rear seal, the seal should be examined for excessive wear as part of this inspection interval. The application will determine the required replacement interval for the seal. The bearings, motor, and encoder for the ADRS series require no lubrication or maintenance.

4.2. Cleaning and Lubrication

DANGER: **Electrical Shock Hazard!** Before you do maintenance to the equipment, disconnect the electrical power.

IMPORTANT: Wear appropriate personal protective equipment (PPE) when you use cleaning solvents or lubricants.

In normal operating conditions and with proper cleanliness of the stage, the bearing will not require lubrication or maintenance for the life of the stage. The motor is completely non-contact and requires no lubrication under normal circumstances.

If the application process uses only a small portion of travel for most of the duty cycle, periodically drive the stage through full travel to redistribute the lubrication in the bearings.

When you clean components of the ADRS series stage:

1. Use a clean, dry, soft, lint-free cloth.
2. Before you use a cleaning solvent on any part of the stage, blow away small particles and dust with clean, dry, compressed air.
3. In applications that have multiple stages bolted together to form multi-axis systems, the orthogonality can be lost if the stage tables of the support stages are loosened. Precision aligned stages should not be loosened or disassembled.
4. We recommend that you do not disassemble the stage beyond the instructions given in this manual. Proper assembly and calibration can only be done at the factory. Contact Aerotech for more information.

Cleaning

Use isopropyl alcohol on a lint-free cloth to clean any external metal surface of the ADRS.

WARNING: **General Hazard Warning!** Make sure that all solvent has completely evaporated before you move the stage.

If the seals need to be cleaned, use a small amount of isopropyl alcohol. Do not use acetone to clean the seals.

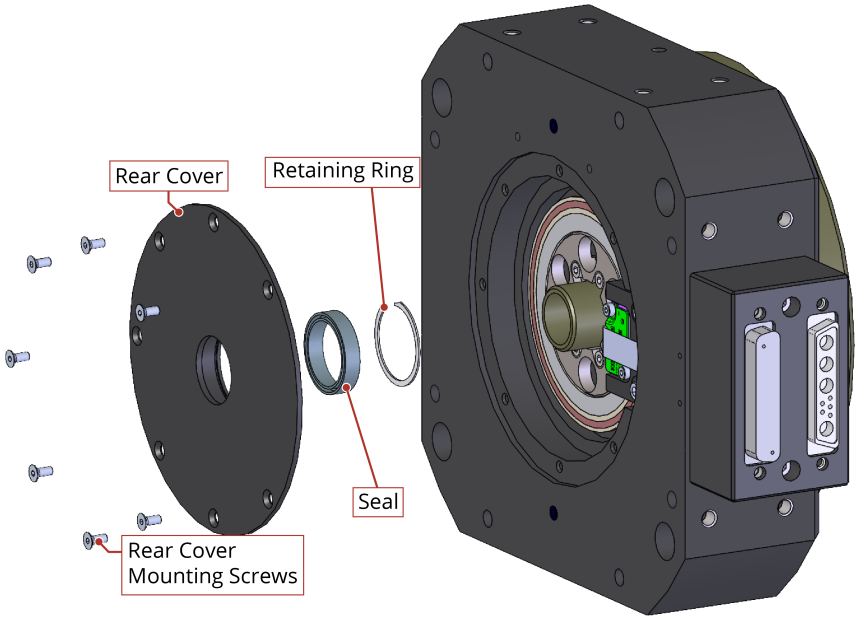
Lubrication

Lubricate seals with Dow Corning Molykote 55 O-ring Lubricant or an equivalent O-ring lubricant.

4.3. Rear Seal Change Procedure

The seals on ADRS stages could need to be replaced because of excess wear. Figure 4-1 shows an exploded view of the assembly and includes all parts involved in the process.

Figure 4-1: Exploded View of Seal Assembly



DANGER: Electrical Shock Hazard!

To decrease the risk of electrical shock, injury, death, and damage to the equipment, obey the precautions that follow.

- Do not connect or disconnect electrical components, wires, and cables while this product is connected to a power source.
- Before you do maintenance to the equipment, disconnect the electrical power.
- Uncouple or otherwise prevent motion of motor-coupled machinery when you do service to the equipment.

1. Remove power from the stage.
2. Remove the rear cover mounting screws (refer to Figure 4-1).
3. Remove the rear cover.
4. Carefully pull the seal off of the shaft.
   - CAUTION: Do not scratch the sealing surfaces.
   - Note the orientation of the seal.
5. The retaining ring does not have to be removed unless it has been damaged.
6. Clean the rear cover and shaft of all debris and old lubricant.
7. Carefully stretch the new seal over the shaft.
   - Make sure to replace the seal in the correct orientation.
   - The flanged end of the seal should face away from the stage tabletop.
8. Lubricate the flanged lip of the new seal with O-ring lubricant (see Section 4.2.).
9. Replace the rear cover back onto the stage.
10. Replace the rear cover mounting screws.
11. Restore power to the stage.

4.4. Troubleshooting

Table 4-1: Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	• Shipping restraints still installed. Remove the red anodized shipping brackets. • Controller trap or fault (refer to the Controller documentation). • Stage cables not connected (or incorrectly connected) to controller (refer to system documentation).
Stage moves uncontrollably	• Encoder (sine and cosine) signal connections (refer to Chapter 3: Electrical Installation and Controller documentation). • Motor Connections (refer to Chapter 3: Electrical Installation and the Controller documentation).
Stage oscillates or squeals	• Gains misadjusted (refer to the Controller documentation). • Encoder signals (refer to the Controller documentation).

Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from harmful defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products that are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale, or use of any of its products shall in no event exceed the selling price of the unit.

THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE. IN NO EVENT SHALL AEROTECH BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

Return Products Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within thirty (30) days of shipment of incorrect material. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. A "Return Materials Authorization (RMA)" number must accompany any returned product(s). The RMA number may be obtained by calling an Aerotech service center or by submitting the appropriate request available on our website (www.aerotech.com). Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than thirty (30) days after the issuance of a return authorization number will be subject to review.

Visit Global Technical Support Portal for the location of your nearest Aerotech Service center.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an expedited method of return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Fixed Fee Repairs - Products having fixed-fee pricing will require a valid purchase order or credit card particulars before any service work can begin.

All Other Repairs - After Aerotech's evaluation, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within thirty (30) days of notification will result in the product(s) being returned as is, at the buyer's expense.

Repair work is warranted for ninety (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following “On-Site Non-Warranty Repair” section apply.

On-site Non-Warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Service Locations

https://www.aerotech.com/contact-sales.aspx?mapState=showMap

USA, CANADA, MEXICO
Aerotech, Inc.
Global Headquarters

CHINA
Aerotech China
Full-Service Subsidiary

GERMANY
Aerotech Germany
Full-Service Subsidiary

TAIWAN
Aerotech Taiwan
Full-Service Subsidiary

UNITED KINGDOM
Aerotech United Kingdom
Full-Service Subsidiary

Appendix B: Revision History

Revision	General Information
2.02	Declaration of Incorporation updates.
2.01	Updated Rear Seal Change Procedure (Section 4.3.)
2.00	• New encoder specifications • Updated safety information • Updated EU Declaration of Incorporation • Added UKCA Declaration of Incorporation
1.04	Revision changes have been archived. If you need a copy of this revision, contact Aerotech Global Technical Support.
1.03	
1.02	
1.01	
1.00	

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