ACS100LP Direct-Drive Rotary Collet Stage

HARDWARE MANUAL

Revision 2.01

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EU Declaration of Incorporation

Manufacturer: Aerotech, Inc.
Address: 101 Zeta Drive
Pittsburgh, PA 15238-2811
USA
Product: ACS100LP - 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
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Stephan Schech

Engineer Verifying Compliance:

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

Alex Weibel

Date: 5/22/2026

UKCA Declaration of Incorporation

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

herewith declares that the following Aerotech stage series:

ACS100LP

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.

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Simon Smith

Date: 5/22/2026

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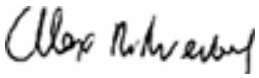


Alex Weibel

RoHS Conformity Declaration

Manufacturer:	Aerotech, Inc.
Address:	101 Zeta Drive Pittsburgh, PA 15238-2811 USA
Product:	ACS100LP - 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.

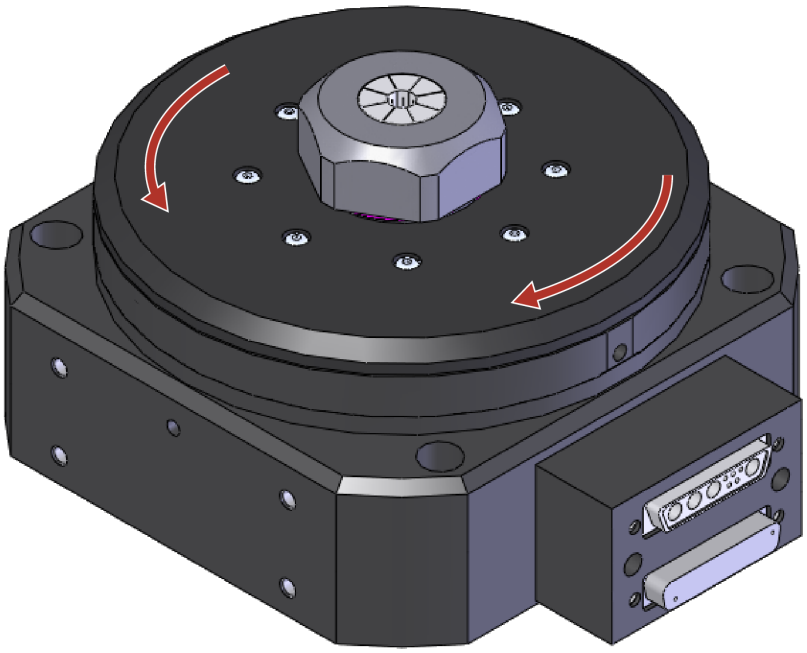
DANGER: Mechanical Hazard!

- 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: Pinch Hazard!
Keep hands and loose objects away from the collet .

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 ACS100LP 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

ACS Mechanical-Bearing Direct-Drive Rotary Collet Stage, 100 mm diameter	
Chuck Style (Required)	
-ER8	ER8 ultra-precision collet
-ER8MB	ER8 microbore collet
Feedback (Required)	
-E1	Incremental encoder, 1 Vpp, sine wave output
-E2	Incremental encoder, digital RS422 line-driver, x5 interpolation
-E3	Incremental encoder, digital RS422 line-driver, x10 interpolation
-E4	Incremental encoder, digital RS422 line-driver, x25 interpolation
-E5	Incremental encoder, digital RS422 line-driver, x50 interpolation
NOTE: Digital output encoder signals are synthesized with a 16 MHz clock. Ensure that the encoder sample rate on the controller is at least 16 MHz or higher (slower clock rates are available on request).	
Wrench (Optional)	
-WR	Wrench for changing the collet Aerotech P/N: MFB25378-01 [Qty-2]
Metrology (Required)	
-PL1	Uncalibrated with performance plots
-PL2	Calibrated (HALAR) with performance plots
Accessories (To be Ordered as a Separate Line Item)	
Collet-ER8-CLTxx	ER8 DIN6499AA electropolished collet, 0.5 mm to 5 mm part sizes diameter available
Collet-ER8MB-CLTxx	ER8 DIN6499AA electropolished mircro-bore collet, 0.2 mm to 0.9 mm part sizes diameter available
CGF	Collet and gripper filtration kit

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	Limited protection against dust, but not water (IP40 equivalent ingress protection rating).
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: ACS100LP Series Specifications

		ACS100LP
Total Travel		±360° Continuous
Collet(1,6)		ER8/MicroBore
Aperture		ER8: 5 mm MicroBore: 0.9
Maximum Torque (Continuous)		0.64 N·m
Bus Voltage		up to 340 VDC
Max Speed(2)		1500 rpm
Accuracy(3)	Uncalibrated	388 µrad (80 arc sec)
	Calibrated	29.1 µrad (6 arc sec)
Repeatability(3)		14.6 µrad (3 arc sec)
Max Load(4)	Axial	1.5 kg
	Radial	0.5 kg
	Moment	0.75 N·m
Pin/Collet Runout(5)		<25 µm
Tilt Error Motion		48.5 µrad (10 arc sec)
Inertia Unloaded		0.00038 kg·m^2
Total Mass		2.0 kg
Finish	Tabletop	Hardcoat
	Stage	Black Anodize

(1) Collet chuck accepts Rego-Fix ER collets manufactured to DIN6499 specifications only.
(2) Maximum speed based on stage capability; maximum application velocity may be limited by system data rate, system resolution and load.
(3) Repeatability and accuracy are dependent on encoder resolution. To achieve the listed specifications, encoder resolution must be 0.36 arc sec or less.
(4) Maximum loads are mutually exclusive. Loading limits are due to the collet chuck mechanism. Contact Aerotech directly if part load requirement exceeds specifications.
(5) Measured TIR of precision gage pin chucked with an ultra-precision ER collet (DIN6499) 6 mm away from collet face with no load.
(6) Collet chuck mechanism is normally-closed. Collet mechanism requires air to open collet chuck. Air supply must be dry (0ºF dew point) oil-less air OR 99.99% pure nitrogen. Air or nitrogen must be filtered to 1 micron particle size or better.

1.4. Air Requirements

DANGER: Compressed Gas

Lock out source and bleed off pressure before servicing.

Do not operate without eye protection.

The air pressure supplied to the collet chuck is important in ensuring that the material or tool is released properly.

- If compressed air is used, it must be filtered to 1 micron, dry to 0º F dew point, and oil free.
- If nitrogen is used, it must be 99.99% pure and filtered to 1 micron.

The chuck becomes fully open at approximately 4-7 bar (60-100 psig) depending on the collet size. Higher pressures will not cause damage to the rotary union, but high flow rates will result. Because of the noncontact rotary union design on collet-equipped stages, a small amount of leakage will occur. Approximate leakage rates of between 10 Lpm (0.5 CFM) and 40 Lpm (1.4 CFM), depending on pressure, will be observed when the collet is open.

1.5. 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).

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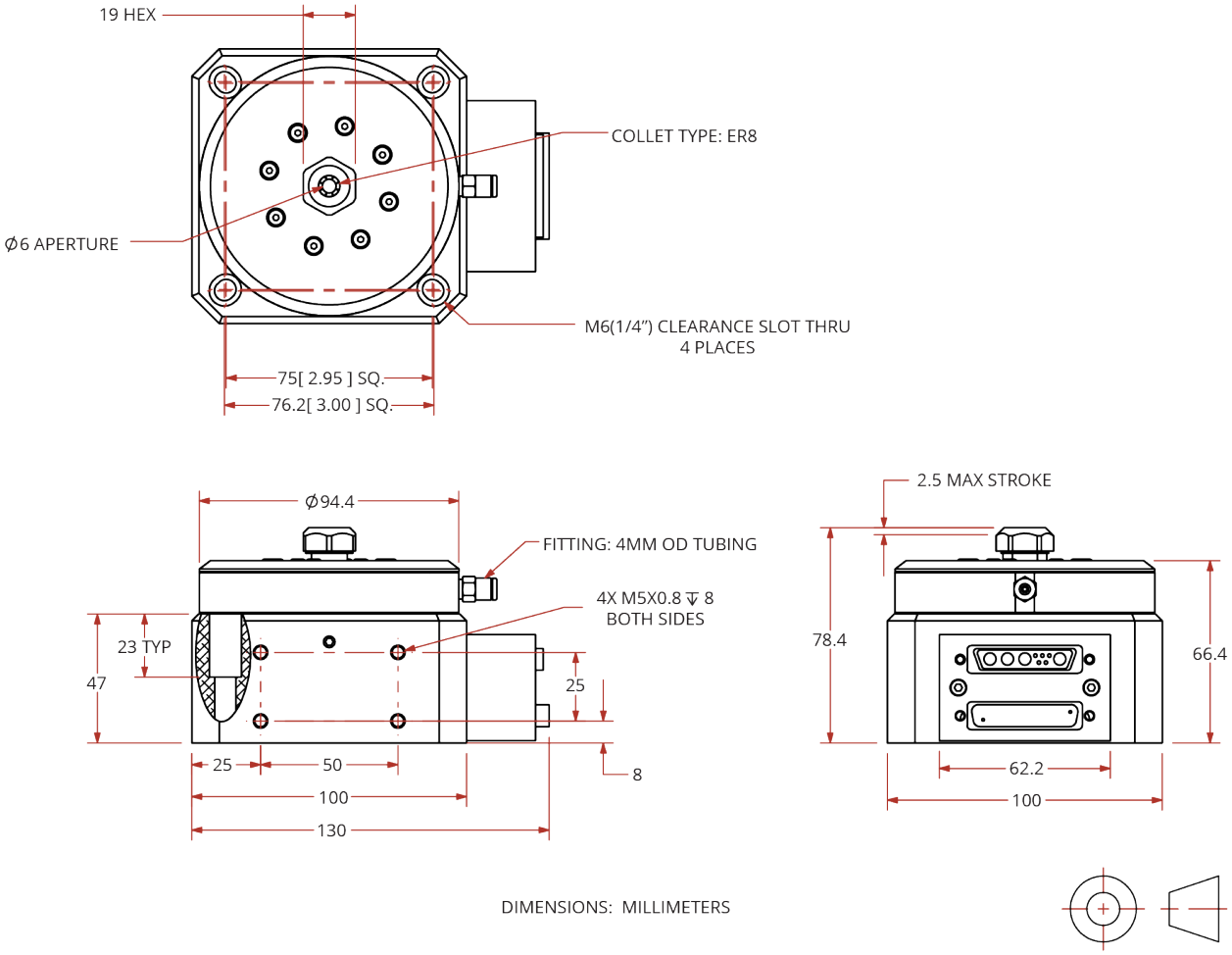
Chapter 2: Installation

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: ACS100LP 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

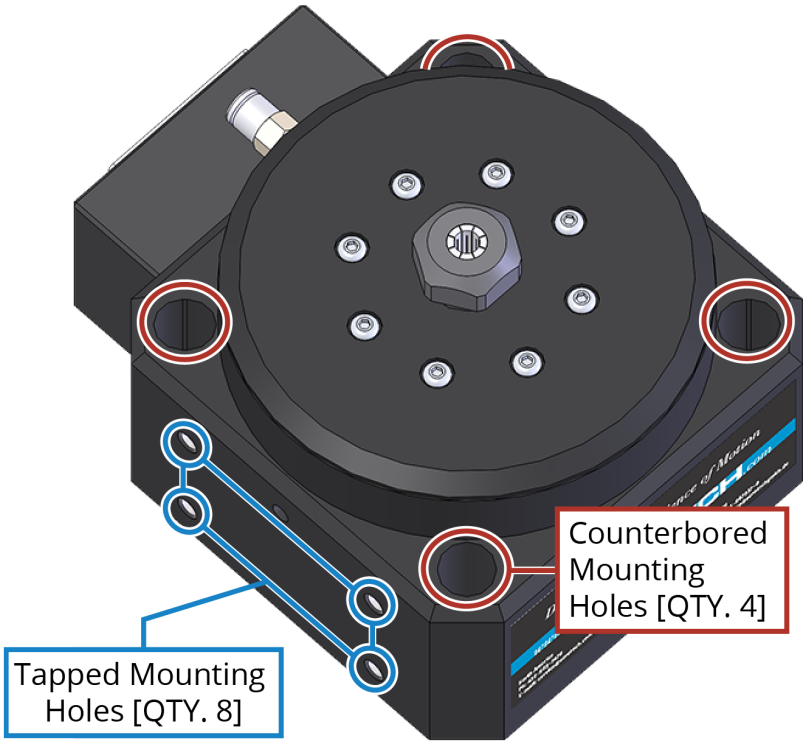
Stage	Flatness Requirement
All Frame Sizes	5 µm

ACS100LP 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
Standard	6 mm or 1/4" SHCS	7 N·m
Side	M5 x 0.8 THD x 6.4 [0.25] DP	4 N·m

Figure 2-2: Stage Mounting Holes



2.3. Mechanical Setup

To prevent damage to the stage or parts, test the operation of the stage before any material is held in the collet.

To operate the collet, clean compressed air or nitrogen must be supplied to the stage (refer to Section 1.4.). Simply push the air line into the fitting and supply air to the stage. The CGF accessory kit is available from Aerotech and contains the required air supply components, such as valves, filters, and airlines.

The one-touch air inlet fitting accepts 1/4 inch OD plastic air line.

Once an air supply is connected to the stage, the collet chuck can be actuated to check for proper operation. The ACS100LP stage features a normally-closed, air actuated collet chuck. Therefore, the collet chuck will remain closed until air pressure is supplied to the stage. Turn the air supply on and off to check for proper operation of the collet chuck on this stage. The stage requires 60-100 psig to open.

Once you have verified that the collet chuck operates properly, a collet can be installed into the stage (refer to Section 2.5.). Appropriately sized material can then be inserted in to the collet. The collet chuck should again be checked for proper operation using the same procedures as before.

When the collet is closed, 5 psi should be continuously supplied to the collet. This will act as an air purge and help prevent contaminants from entering rotary union. To open the collet, Aerotech recommends turning the air pressure supply to 60 psi using a precision regulator and slowly increasing pressure until the collet is open and material can easily be removed from the collet. Only the minimum amount of air pressure which fully opens the collet should be used and should not exceed the maximum system air pressure.

IMPORTANT: The size of material should match the collet size and be inserted into the collet at least 2/3 the length of the collet bore. Material that is larger or smaller than the collet or not inserted far enough into the collet will affect system performance, particularly material runout. In worst-case scenarios, the collet could be damaged and have to be replaced.

2.4. Load Capability

The ACS100LP is designed for tubular manufacturing applications. With this in mind, the tubes loaded into the collet chuck of the rotary axis must fall within the maximum load parameters in Section 1.3.

IMPORTANT: Maximum loads are mutually exclusive. Loading limits are due to the collet chuck mechanism. Contact Aerotech directly if part load requirement exceeds specifications.

2.5. Changing the Workholding Devices

ACS100LP stages are equipped with a Rego-Fix style collet (ER8). It is important that only the collets designed for a particular collet holder are used. Aerotech collet chucks are designed for use with ER collets manufactured to DIN6499 specifications. Aerotech recommends the use of ultra precision electroplated collets only. Contact the factory for more details. Refer to Section 2.5.1. for the collet change procedure.

2.5.1. Collet Change Procedure

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.

DANGER: **Pinch Hazard!** Air pressure must be connected and supplied to the stage when the collet is being installed or removed.

Collet Nut Removal Procedure

1. Remove power to the stage.
2. Apply air pressure to loosen the collet chuck.
3. Turn the collet nut counterclockwise. If necessary, use a spanner wrench (available from Aerotech).

Collet Installation Procedure

1. Clean the collet housing, collet nut threads, collet nut, and new collet.
   NOTE: Use acetone or isopropyl alcohol to clean the metal components. Apply a small amount of any general purpose, high viscosity grease to the collet taper to help reduce friction and decrease wear. Refer to Section 4.2.1.
2. Guide the collet into the collet nut. Refer to Figure 2-3.
   a. Tilt the collet to hook the edge of the collet under the lip of the collet nut.
   b. When the collet is engaged in the collet nut groove, tilt the collet in the opposite direction.

Collet Nut Installation Procedure

1. Remove power to the stage.
2. Use the collet nut to guide the collet into the stage (Figure 2-4). Make sure that the collet is installed properly in its taper.
   NOTE: Air pressure needs to be supplied to the stage so the collet chuck is in the open position.
3. Tighten the collet nut by hand.
   NOTE: The clamping force is not determined by the torque of the nut, but by the force of internal springs. Spanner wrenches may be used if needed.
4. Restore power to the stage.

Collet Removal Procedure

1. Remove the collet nut and collet assembly (refer to the Collet Nut Removal Procedure)
2. Apply pressure to the front of the collet while tilting it towards collet nut groove.

Figure 2-3: Installation/Removal of the Collet from the Collet Nut

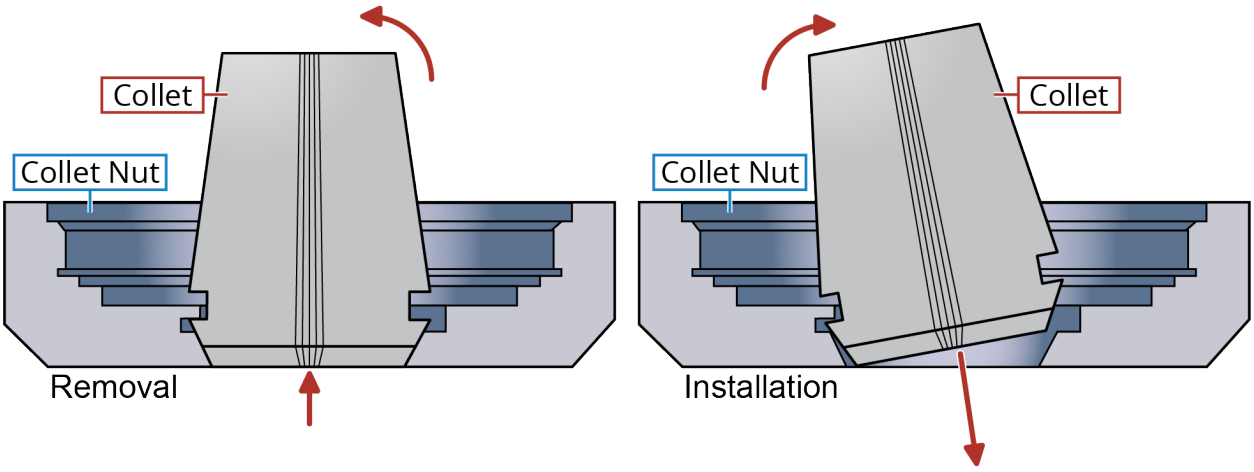
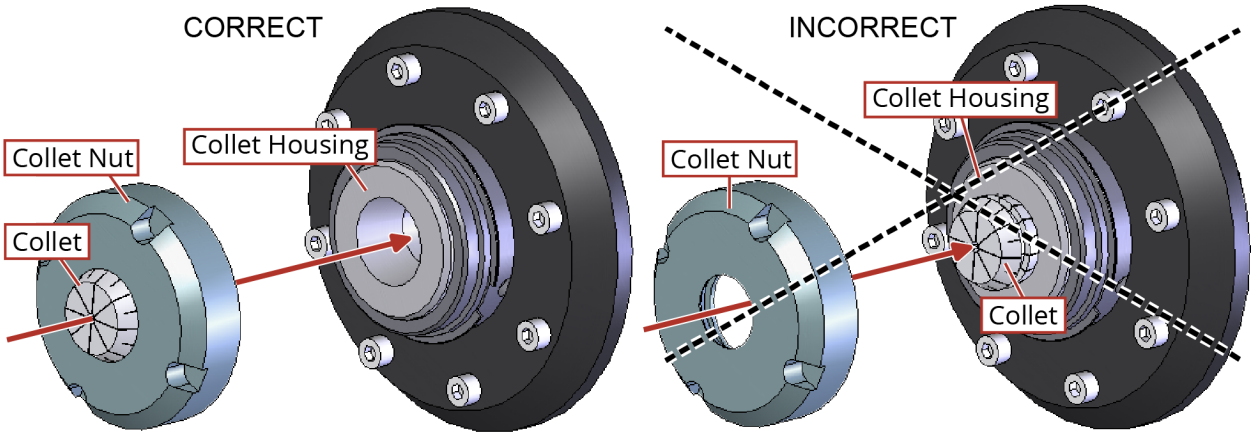


Figure 2-4: Installing the Collet and and Collet Nut into the Collet Housing



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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 ACS100LP 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 ACS100LP 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 ACS100LP 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 ACS100LP 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 electric shock or damage to the equipment.

Table 3-1: Motor Connector Pinout

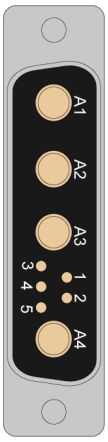
Pin	Description	Connector
Case	Shield Connection	
A1	Motor Phase A	
A2	Motor Phase B	
A3	Motor Phase C	
1	Reserved	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
A4	Frame Ground (motor protective ground)	

Table 3-2: Mating Connector Part Numbers for D-Style Motor Connectors

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

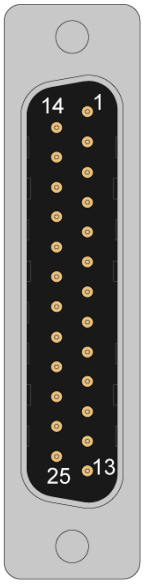
Pin	Description	Connector
Case	Shield Connection	
1	Reserved	
2	Over-Temperature Thermistor Sensor	
3	5V Power Supply Input (internally connected to Pin 16)	
4	Reserved	
5	Reserved	
6	MRK- (Encoder Marker-)	
7	MRK+ (Encoder Marker+)	
8	Reserved	
9	Reserved	
10	Hall Effect Sensor (Phase A)	
11	Hall Effect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

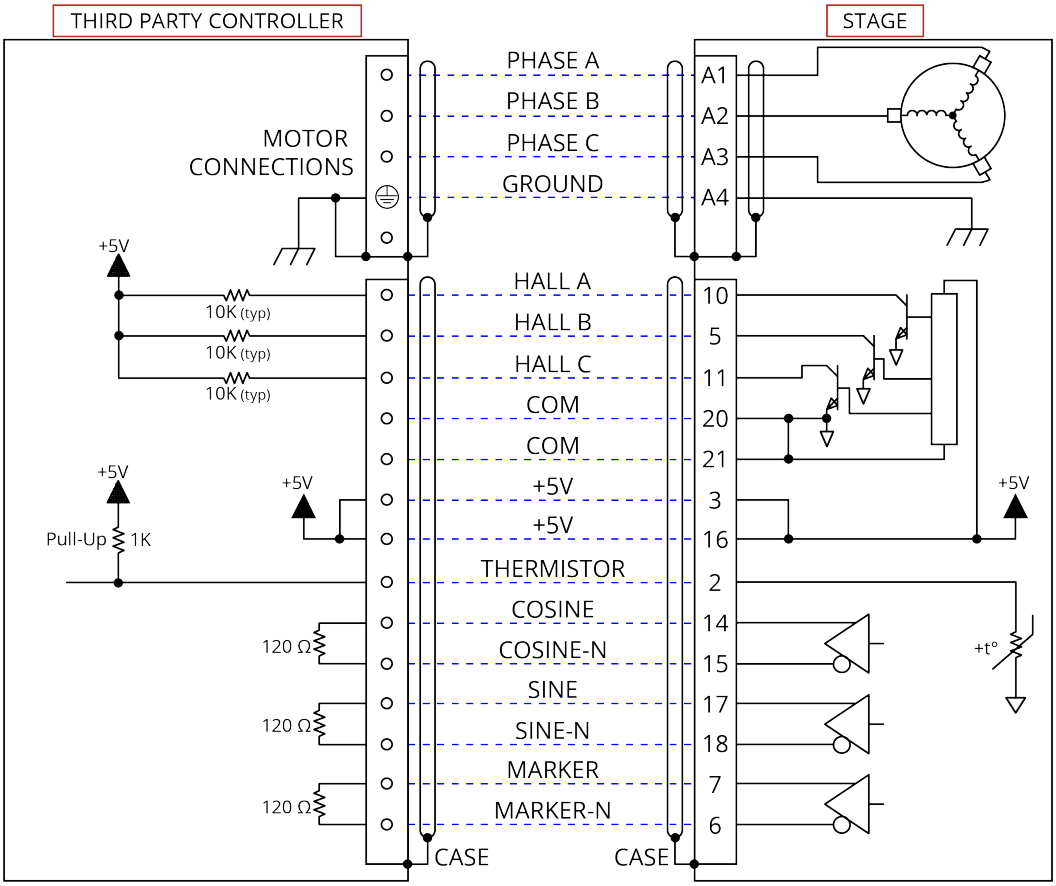
Table 3-4: Mating Connector Part Numbers for D-Style Feedback Connectors

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: ACS100LP Motor and Feedback Wiring



3.3. Motor and Feedback Specifications

All 5 V supplies share one common connection within the stage.

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.	

The encoders used on all ACS100LP 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 3-7: Encoder Specifications

	Specification
Supply Voltage	5 V ±5%
Supply Current	250 mA (typical)
Output Signals (-E1)	**Sinusoidal Type (Incremental Encoder)**: Analog: SIN+, SIN-, COS+, COS-, $1V_{pk-pk}$; Digital (RS422): MRK+, MRK- signals.
Output Signals (-E2, -E3, -E4, -E5)	**Digital Output (Incremental Encoder)**: Digital encoder line-driver signals; RS422/485 compatible

Table 3-8: Encoder Specifications

	ACS100LP
Fundamental Resolution	3600 lines/rev
-E1[1]	0.09/0.0225 arc sec/line
-E2	18 arc sec/line
-E3	9 arc sec/line
-E4	3.6 arc sec/line
-E5	1.8 arc sec/line
1. -E1 shows x4000/x16000 total interpolation	

Table 3-9: Maximum Speed (rpm) Per Encoder Option

	ACS100LP
-E1, -E2, -E3, -E4	1500 rpm
-E5	800 rpm

Table 3-10: Motor Specifications

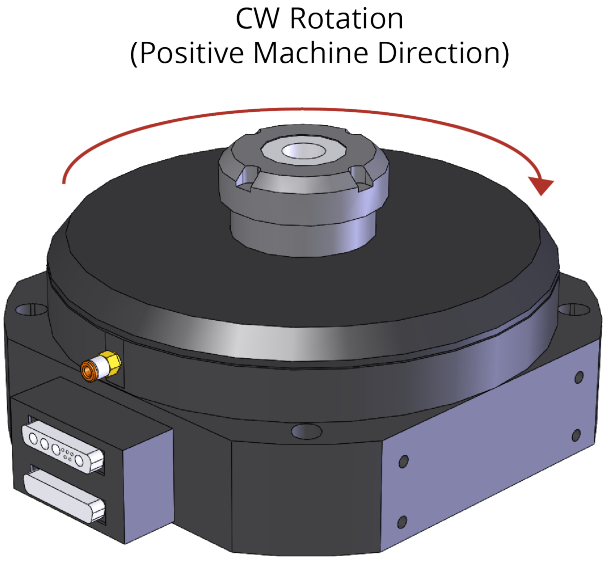
		S-76-35 (ACS100LP)
Performance Specifications		
Winding Designation		-A
Stall Torque, Cont.	N·m	0.48
Peak Torque	N·m	1.9
Electrical Specifications		
Winding Designation		-A
BEMF Const., line-line	V/krpm	29.3
Continuous Current, Stall	A	2.0
Peak Current, Stall	A	8.0
Torque Constant	N·m/A	0.242
Motor Constant	N·m/√W	0.075
Resistance, 25 °C, line-line	Ω	10.71
Inductance, line-line	mH	1.97
Thermal Resistance	°C/W	1.80
Maximum Bus Voltage	VDC	340
Number of Poles	--	14
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 ACS100LP stages.

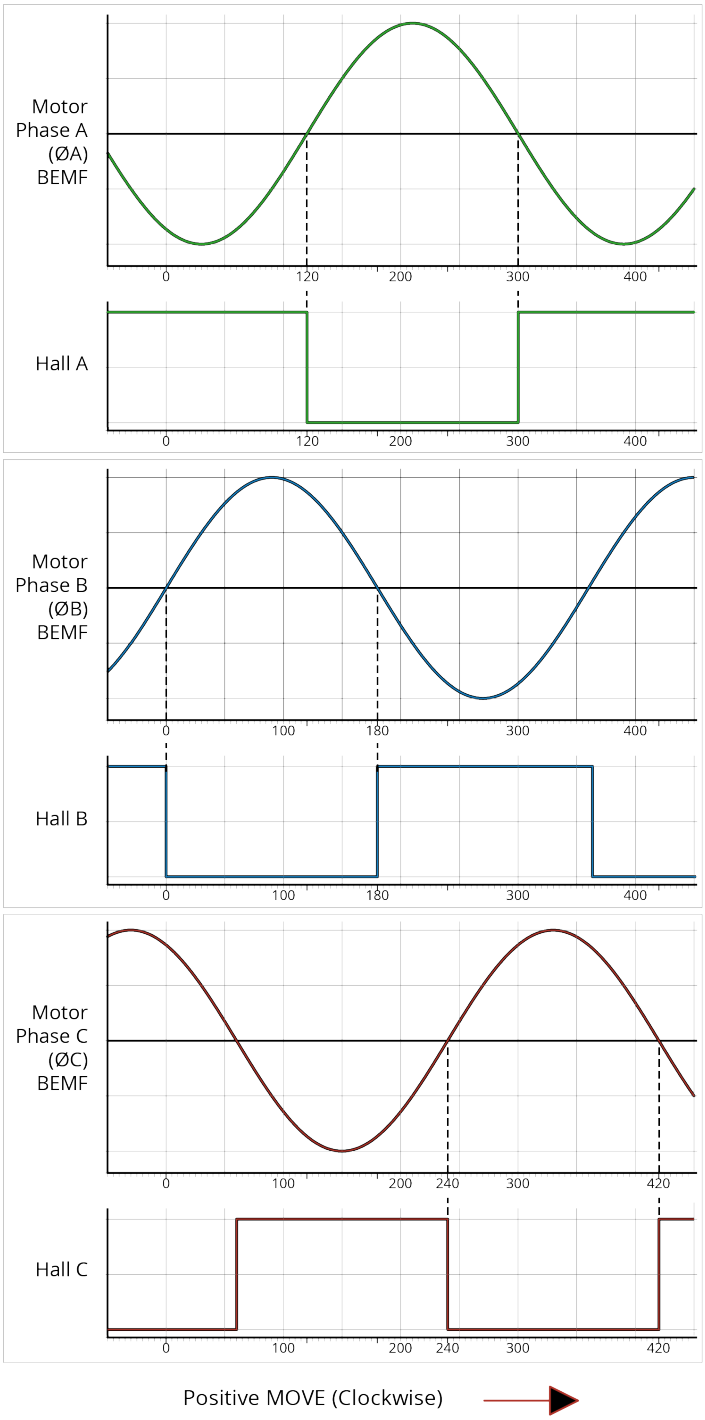
Figure 3-2: Machine Direction



3.5. Motor and Feedback Phasing

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

Figure 3-3: Hall Phasing Diagram



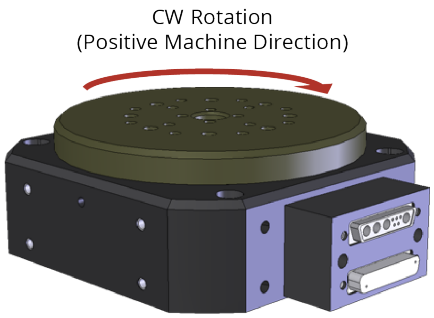
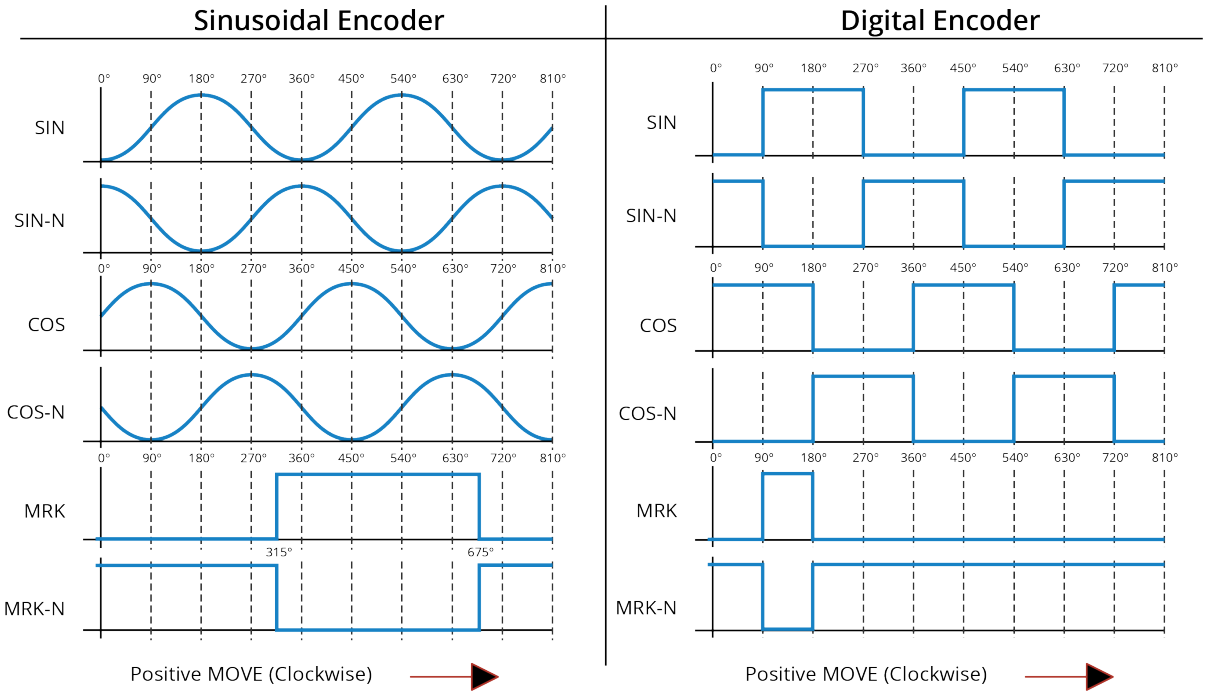


Figure 3-4: Encoder Phasing Reference Diagram



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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.

DANGER: **Pinch Hazard!** Air pressure must be connected and supplied to the stage when the collet is being installed or removed.

The ACS100LP series stages are designed to require minimum maintenance. There are some items that may require preventative maintenance during the lifetime of the stage. This chapter will cover information about component maintenance and replacement, intervals between lubrication, detail the lubrication and inspection process, and specify recommended lubricants and cleaning solvents.

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 ACS100LP 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 ACS100LP and any components and cables as needed.
- Repair any damage before operating the ACS100LP.
- Inspect and perform an operational check on all safeguards and protective devices.

The inspection and cleaning interval depends on application conditions such as duty cycle, speed, and environment. You should frequently inspect and clean the ACS100LP series stage until a trend develops for the application. As part of the inspection process, the stage, cables, collet/collet chuck, and seals should be examined for wear, damage, and excessive air or water leakage. The bearings, motor, and encoder do not require any preventative maintenance. Once the stage condition has been assessed, the inspector should:

- Repair any damage before resuming operation of the stage
- Re-tighten loose connectors
- Replace or repair damaged cables
- Remove collet and inspect, clean, and relubricate collet and collet chuck
- Clean the stage and cables if needed

In general, repair and/or replacement of damaged or malfunctioning components by Aerotech field service personnel is not possible. Repair typically requires that the unit be returned to the factory. Please contact Aerotech Global Technical Support for more information.

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.

Cleaning

When you clean components of the ACS100LP 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.

Any metal surface on the stage can be cleaned with either acetone or isopropyl alcohol. Cleaning solvents, especially acetone, should not be used on any rubber components (o-rings and seals). If rubber components require cleaning, nitrogen or clean, dry, oil-less compressed air can be used to blow them off and a lint-free cloth or rag can be used to remove excess grease, oil, or other contaminates.

WARNING: **General Hazard Warning!**

- Make sure that all solvent has completely evaporated before you move the stage.
- DO NOT use acetone to clean the o-rings or seals.

Lubrication

O-rings and collet piston seals should be lubricated with Parker O-Lube lubricant or an equivalent o-ring lubricant.

The collet chuck taper should be lubricated with a general purpose, high viscosity grease or anti-seize lubricant (refer toTable 4-1).

Table 4-1: Recommended Lubricants

Vender	Product	Item #	Description
Henkel Technologies	Loctite	LB 8150	Silver Grade Anti-Seize
Henkel Technologies	Loctite	LB 8014	Food Grade Anti-Seize
Jet Lube	White Knight	16404	Food Grade Anti-Seize

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.

4.2.1. Collet and Collet Chuck Lubrication and Cleaning

DANGER: **Pinch Hazard!** Air pressure must be connected and supplied to the stage when the collet is being installed or removed.

WARNING: To prevent premature failure and wear that can void the warranty, lubricate and clean the collet interface surfaces as instructed in this section.

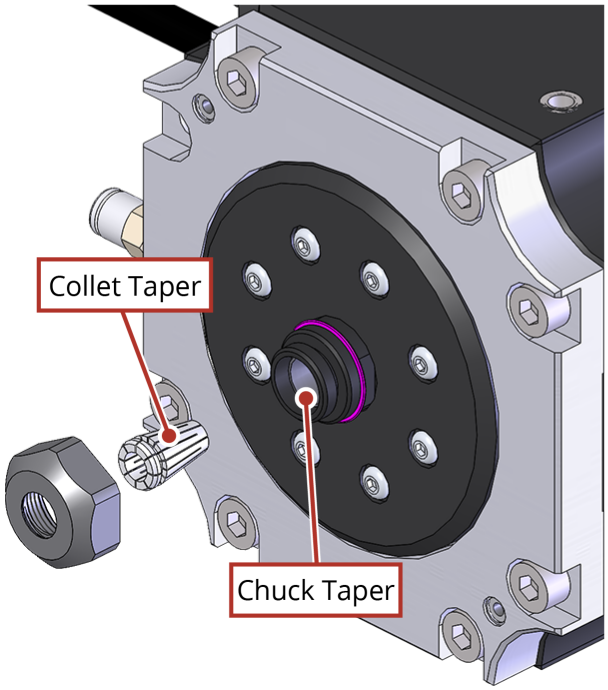
For the collet chuck and collet to operate properly, preventative maintenance and regular cleaning is required.

Before inserting any collet into the chuck, clean the chuck taper and the collet with acetone or isopropyl alcohol and a lint-free cloth. If required, nitrogen or clean, dry, oil-less compressed air can be used to clean out the collet grooves. Inspect the collet and the chuck interface surfaces to be sure no wear marks are present. If wear or fret marks (copper colored oxide marks) are present, the taper can be lightly polished with a fine-grit crocus cloth. The goal is to clean the surface of the taper and not to remove an excessive amount of material. If the wear marks are large, or excessive polishing is required to remove these marks, the collet chuck and collet may need to be replaced. Contact Aerotech Technical Support for more information. Wear and fretting can be prevented with proper lubrication and maintenance intervals.

After inspection and cleaning, grease the collet chuck taper and collet taper with a small amount of lubricant. Then, install the collet into the collet chuck (refer to Section 2.5.). Aerotech recommends using the lubricants listed in Table 4-1.

Lubricant inspection and replenishment depend on application conditions such as collet chuck duty cycle, clamping force (air pressure), and the machining environment. An inspection interval of once every 8 operational hours is recommended until a trend develops for the application. Longer or shorter intervals may be required to maintain a film of lubricant on the collet taper. The collet and chuck should also be cleaned and relubricated after sitting for an extended period of time without operation. If the lubrication sits for long periods of time, it can become dry and lose its lubrication properties. Insufficient lubrication will lead to wear, fretting corrosion, and sticking or lock-up of the collet closer. If this occurs, the machine should be immediately stopped and the collet and collet chuck cleaned and relubricated. It is also recommended that the collet and chuck interface surfaces be cleaned, inspected, and relubricated every time the collet is removed.

Figure 4-1: Collet and Collet Chuck Tapered Surfaces



4.3. Seal Replacement

4.3.1. Piston Seal Change Procedure

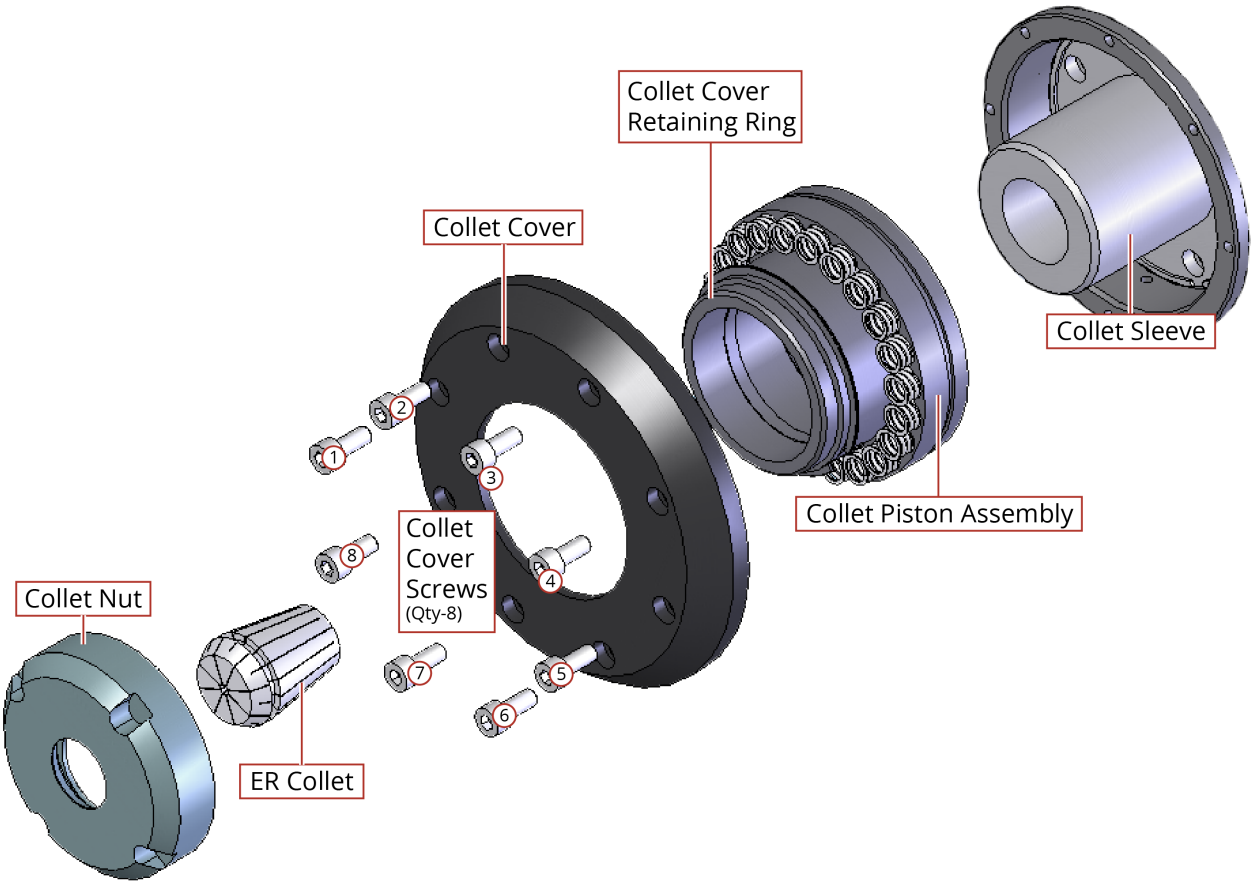
The seals on the collet piston can be replaced if a leak or excess wear becomes apparent. Figure 4-2 shows an exploded view of the assembly and includes all parts involved in the process. The procedure to change the seals is as follows.

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

Table 4-2: Piston Seal Replacement Part Numbers

	ACS100LP
Outer Piston Seal [QTY. 1]	MCA02051
Inner Piston Seal [QTY. 1]	MCA02052
NOTE: The steel labyrinth style rear seal should not need replacement.	

Figure 4-2: Piston Seal Change Parts



1. Remove power to the stage.
2. Supply air to the stage in order to release the collet.
3. Remove the collet nut by turning it counterclockwise. Spanner wrenches may be necessary for removal and are available from Aerotech.
4. Remove air pressure from the stage. This will allow the internal springs to relax slightly and ease further disassembly.

DANGER: Pinch/Crush Hazard! The collet cover is under tension from internal springs!

If you remove the collet covers screws incorrectly, it can result in personal harm and damage to the equipment.

The collet cover screws must be removed in the correct order to prevent physical and/or mechanical damage.

5. Remove every other collet cover screw (screws 1, 3, 5, and 7, for example) Refer to Figure 4-2..
6. Obtain four M3 x 0.7 x 12 mm long socket head cap screws and thread them into the holes where the previous screws were removed. Tighten each one until it bottoms out in its hole.
7. Loosen the four remaining collet cover screws, 1/4 turn at a time. Loosen the screws in a cross pattern (i.e., loosen screw number 2, then screw number 6, then screw number 8, then screw number 4, then return to screw number 2). Repeat this process until the longer screws are supporting the tension of the springs entirely. It is then safe to remove the remaining smaller collet cover screws completely.
8. Using the same method as in Step 7, remove the longer screws until the spring tension is completely relieved.
9. Carefully slide the collet piston assembly out from its housing. Use caution not to tilt the piston assembly in its housing as this could cause damage to the housing, seals, or piston.
10. It is now safe to remove the collet cover retaining ring. This can be done with a flat-head screwdriver or a pair of needle nosed pliers.
11. Remove the collet cover and the springs from the collet piston.
12. There are two seals on the piston itself. One is an external seal that seals the piston against its housing; the other is an internal seal that seals the piston against the collet sleeve. To remove the seals, carefully pry them out of their housings with a small screwdriver or pick. Use caution not to scratch the surface of the piston.
13. Thoroughly clean the seal mounting surfaces, the chamfers, and all surfaces that the new seals may come in contact with. Even small particles or debris can damage the seals during installation.
14. Lubricate the new seals with o-ring lubricant(refer to Section 4.2. Cleaning and Lubrication).
15. Press the new seals over the chamfer and into their respective grooves. Be sure to align the seals such that the open end (when looking at a cross section) is facing away from the collet, as shown in Figure 4-3. The direction of the seal is extremely important in sealing the piston. Make sure that the seals sit into their mounting grooves by running a fingernail around the edge. If the seal is tilted or twisted slightly its function will be severely compromised.
16. Reinstall the springs.
17. Place the collet cover over the piston and reinstall the collet cover retaining ring.
18. Reinstall the collet piston assembly into its housing. There are chamfers to help guide the piston into place, but use caution not to twist or damage the seals. It is recommended that a small amount of oring lubricant be used.
19. Installation of the collet cover is the reverse of removal. Begin by inserting the four 12 mm long screws in every other hole and tightening until they bottom out in their respective holes. Then install the shorter original screws into the remaining holes and tighten in a cross pattern until the collet cover is seated against the shaft. Install the remaining four original screws. Torque all screws to a final torque of 1.8 to 2.0 N-m (16 to 18 in-lbs).
20. Apply air pressure to the stage in order to install the collet.
21. Install the new collet as described in Section 2.5.1. Collet Change Procedure
22. Restore the air supply to the original settings and restore power to the stage.

Figure 4-3: Installing the Piston Seal

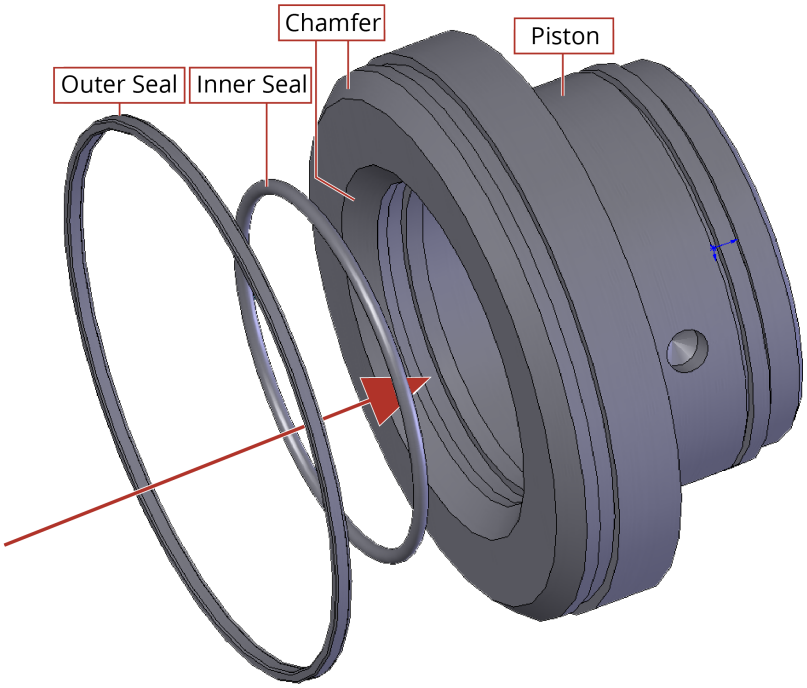
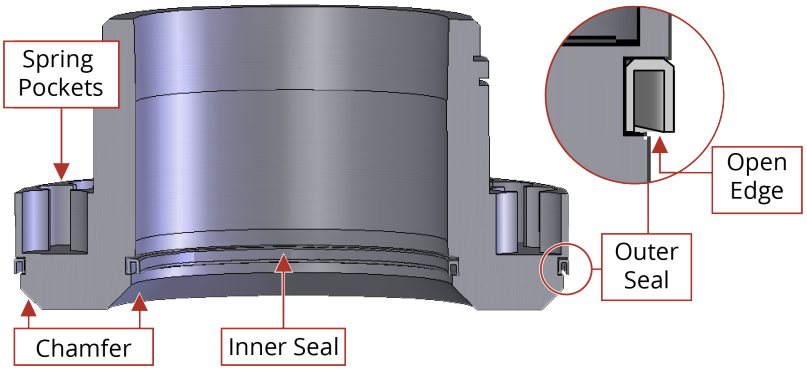


Figure 4-4: Cross-Section View of Piston Showing Seal Orientation



4.4. Troubleshooting

Table 4-3: Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	• 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).
Collet Chuck will not close	• Insufficient air pressure supplied to the stage. Make sure there are no blockages in the supply line and the pressure is high enough (refer to Section 1.4.). • Collet not threaded in all the way. Follow procedures in Section 2.5. to ensure collet is installed properly. • The collet is jammed due to debris, fretting, etc. Clean and lubricate the collet assembly (refer to Section 4.2.).
Collet Chuck will not open	• Insufficient air pressure supplied to the stage. Make sure there are no blockages in the supply line and the pressure is high enough (refer to Section 1.4.). • The collet has not been lubricated properly or the lubrication needs to be replenished (refer to Section 4.2.). • The collet is jammed due to debris, fretting, etc. Clean and lubricate the collet assembly (refer to Section 4.2.).

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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
2.01	Updated Recommended Lubricants (Table 4-1)
2.00	General manual update.
1.01	Revision changes have been archived. If you need a copy of this revision, contact Aerotech Global Technical Support.
1.00	

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