ASR1000 Rotary Stage Hardware Manual

Revision: 1.00.00

Global Technical Support

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Safety Procedures and Warnings

Read this manual in its entirety before installing, operating, or servicing this product. If you do not understand the information contained herein, contact an Aerotech representative before proceeding. Strictly adhere to the statements given in this section and other handling, use, and operational information given throughout the manual to avoid injury to you and damage to the equipment.

The following statements apply wherever the Warning or Danger symbol appears within this manual. Failure to observe these precautions could result in serious injury to those individuals performing the procedures and/or damage to the equipment.

DANGER: This product contains potentially lethal voltages. To reduce the possibility of electrical shock, bodily injury, or death the following precautions must be followed.

1. Access to the ASR1000 and component parts must be restricted while connected to a power source.
2. Do not connect or disconnect any electrical components or connecting cables while connected to a power source.
3. Disconnect electrical power before servicing equipment.
4. All components must be properly grounded in accordance with local electrical safety requirements.
5. Operator safeguarding requirements must be addressed during final integration of the product.

WARNING: To minimize the possibility of electrical shock, bodily injury or death the following precautions must be followed.

1. Moving parts can cause crushing or shearing injuries. Access to all stage and motor parts must be restricted while connected to a power source.
2. Cables can pose a tripping hazard. Securely mount and position all system cables to avoid potential hazards.
3. Do not expose this product to environments or conditions outside of the listed specifications. Exceeding environmental or operating specifications can cause damage to the equipment.
4. The ASR1000 must be mounted securely. Improper mounting can result in injury and damage to the equipment.
5. Use care when moving the ASR1000 . Lifting or transporting the ASR1000 improperly can result in injury or damage to the ASR1000.
6. This product is intended for light industrial manufacturing or laboratory use. Use of this product for unintended applications can result in injury and damage to the equipment.
7. If the product is used in a manner not specified by the manufacturer, the protection provided by the product can be impaired and result in damage, shock, injury, or death.
8. Operators must be trained before operating this equipment.
9. All service and maintenance must be performed by qualified personnel.

EU Declaration of Incorporation

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

herewith declares that the product:
ASR1000 Stage

is intended to be incorporated into machinery to constitute machinery covered by the Directive 2006/42/EC as amended;
and that the following harmonized European standards have been applied:
EN ISO 12100:2010
Safety of machinery - Basic concepts, general principles for design
EN 60204-1:2010
Safety of machinery - Electrical equipment of machines - Part 1: General requirements

and further more declares that
it is not allowed to put the equipment 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, i.e., as a whole, including the equipment referred to in this Declaration.

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following Directive(s):

2011/65/EU RoHS 2 Directive

Authorized Representative: Simon Smith, European Director
Address: Aerotech Ltd
The Old Brick Kiln
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Position Engineer Verifying Compliance
Location Pittsburgh, PA

CE

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Chapter 1: Overview

NOTE: Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to www.aerotech.com for the most up-to-date information.

Table 1-1: Model Options

ASR1000 Direct Drive Rotary Stage	
Connector (Required)	
-CN1	4-pin HPD motor and 25-pin D feedback connectors
-CN2	25-pin D motor and 25-pin D feedback connectors
Mounting Plate (Optional)	
-MP1	Mounting plate

1.1. Environmental Specifications

WARNING: Do not expose this product to environments or conditions outside of the listed specifications. Exceeding environmental or operating specifications can cause damage to the equipment.

Table 1-2: Environmental Specifications

Ambient Temperature	Operating: 16° to 25° C (61° to 77° 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° to 40° C (32° 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. Excessive floor or acoustical vibration can affect system performance. Contact Aerotech for information regarding your specific application.
Protection Rating	The ASR1000 stages have limited protection against dust, but not water. This equates to an ingress protection rating of IP50.
Use	Indoor use only

1.2. Accuracy and Temperature Effects

Extreme temperature changes could cause a decrease in performance or permanent damage to the stage. Aerotech stages are designed for and built in a 20°C (68°F) environment. Any deviation from standard operating temperature will affect stage accuracy. The severity of temperature effects on all stage specifications depends on many different environmental conditions, including how the stage is mounted. Contact the factory for more details.

1.3. Basic Specifications

NOTE: Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to www.aerotech.com for the most up-to-date information.

Table 1-3: ASR1000 Series Specifications

		ASR1000
Travel		±360° continuous
Shaft Diameter		19 mm
Shaft Thread		0.7500-32NS-3
Maximum Aperture Diameter		14 mm ±0.5 mm
Drive System		Direct-Drive Brushless Servomotor
Feedback		8192 cycles/rev; analog output encoder (standard)
Maximum Rotary Speed (1)		2000 rpm
Accuracy(1)		±72.8 µrad (±15 arc sec)
Repeatability(1)		±14.6 µrad (±3 arc sec)
Inertia		9.0×10^{-5} kg·m^2
Nominal Stage Weight		4.4 kg
Maximum Load	Axial	3.0 kg
	Moment	5 N·m
Continuous Current, Stall	Apk	10
	Arms	7.1
Bus Voltage		Up to 320 VDC
Axis Error Motion	Axial	2.5 µm
	Radial	5.0 µm
Material	Stage Shaft	Stainless Steel
	Stage Body	Aluminum
Finish	Stage Shaft	Stainless Steel
	Stage Body	Black Anodize

1. Maximum speed based on stage capability; maximum application velocity may be limited by system data rate and system resolution.

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Chapter 2: Installation

WARNING: ASR1000 installation must be in accordance to 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. Unpacking and Handling the Stage

WARNING: It is the customer's responsibility to safely and carefully lift and move the ASR1000.

- Make sure that all moving parts are secure before moving the ASR1000. Unsecured moving parts may shift and cause bodily injury.
- Improper handling could adversely affect the performance of the ASR1000. Use care when moving the ASR1000
- Lift only by the base.Do not use the tabletop or cables as lifting points.

NOTE: If any damage has occurred during shipping, report it immediately.

Carefully remove the ASR1000 from its protective shipping container. Gently set the ASR1000 on a smooth, flat, and clean surface.

Before operating the ASR1000, it is important to let it stabilize at room temperature for at least 12 hours. Allowing it to stabilize to room temperature will ensure that all of the alignments, preloads, and tolerances are the same as they were when tested at Aerotech. Use compressed nitrogen or clean, dry, oil-less air to remove any dust or debris that has collected during shipping.

Each ASR1000 has a label listing the system part number and serial number. These numbers contain information necessary for maintaining or updating system hardware and software. Locate this label and record the information for later reference.

2.2. Dimensions

NOTE: All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. The most recent system drawings and schematics can be found on your software DVD or on www.aerotech.com.

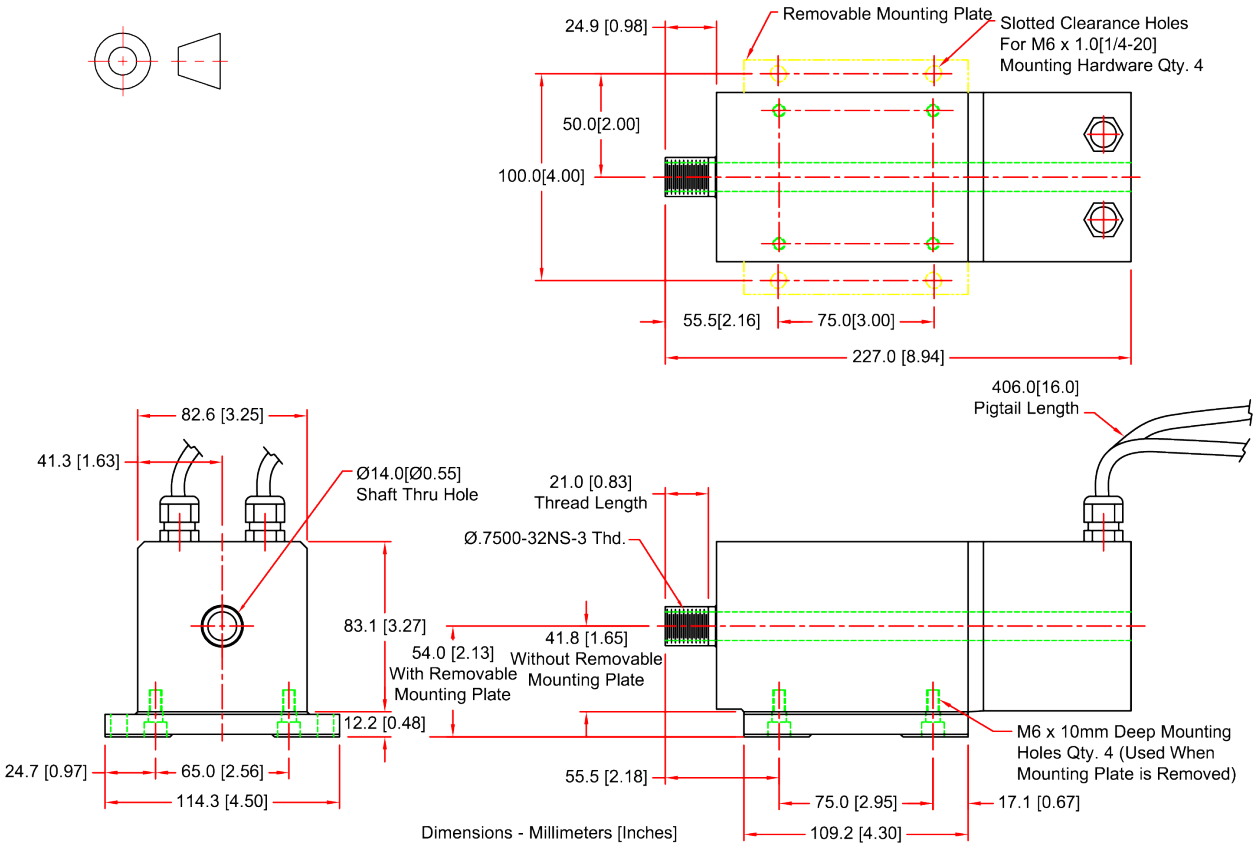


Figure 2-1: ASR1000 Dimensions

2.3. Securing the Stage to the Mounting Surface

WARNING: Do not attempt to manually move the ASR1000 if it is connected to a power source.

WARNING: Make sure that all moving parts are secure before moving the ASR1000. Unsecured moving parts may shift and cause bodily injury.

WARNING: The ASR1000 must be mounted securely. Improper mounting can result in injury and damage to the equipment.

The mounting surface must be flat and have adequate stiffness in order to achieve the maximum performance from the ASR1000 stage. When it is mounted to a non-flat surface, the stage can be distorted as 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.

NOTE: To maintain accuracy, the mounting surface must be flat to within 1 µm per 50 mm.

NOTE: The ASR1000 is precision machined and verified for flatness prior to product assembly at the factory. If machining is required to achieve the desired flatness, it should be performed on the mounting surface rather than the ASR1000. Shimming should be avoided if possible. If shimming is required, it should be minimized to retain maximum rigidity of the system.

ASR1000 series stages have a fixed mounting pattern as shown in Figure 2-2 and Figure 2-3.

If a mounting plate is included on the stage, mount using [QTY-4] M6 or 1/4-20 bolts (refer to Figure 2-2). If the stage is configured without a mounting plate, use the [QTY-4] M6 tapped holes on the bottom of the stage to attach an alternative means of mounting (see Figure 2-3). Refer to Section 2.2. Dimensions for mounting dimensions.

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 2-1 are typical values and may not be accurate for your mounting surface. Refer to Section 2.2. for specific model mounting locations and dimensions.

Table 2-1: Stage to Mounting Surface Hardware

Mounting Hardware	Typical Screw Torque
M6 or 1/4-20 SHCS	7 N·m

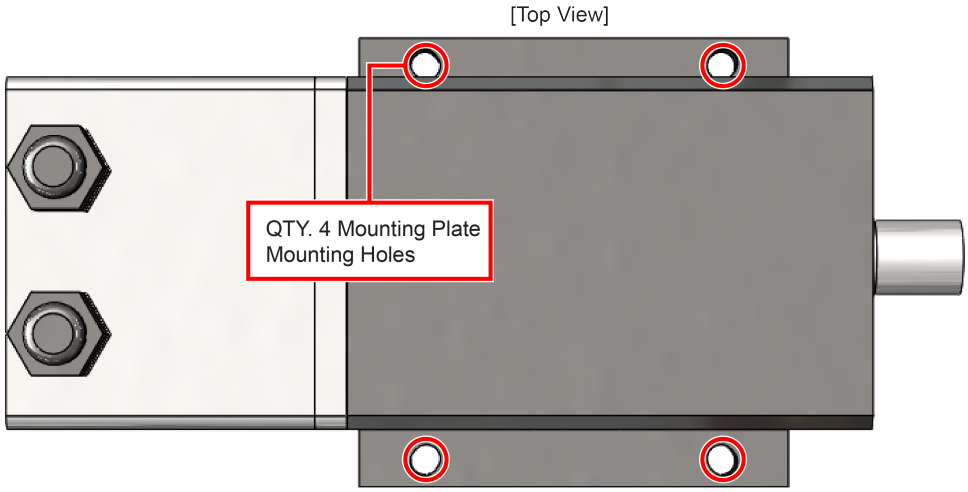


Figure 2-2: ASR1000 Stage Showing Mounting Plate (Top View)

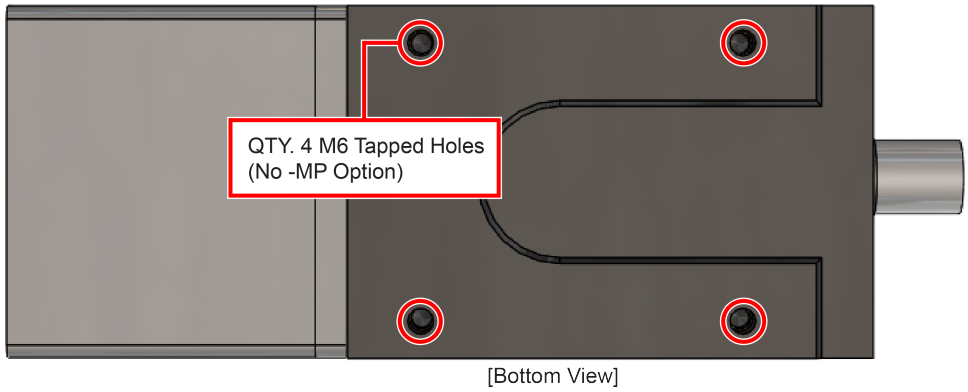


Figure 2-3: ASR1000 Stage Without Mounting Plate (Bottom View)

2.4. General Mechanical Setup

2.5. Load Capability

The ASR1000 is designed for tubular manufacturing applications.

NOTE: Maximum loads are mutually exclusive.

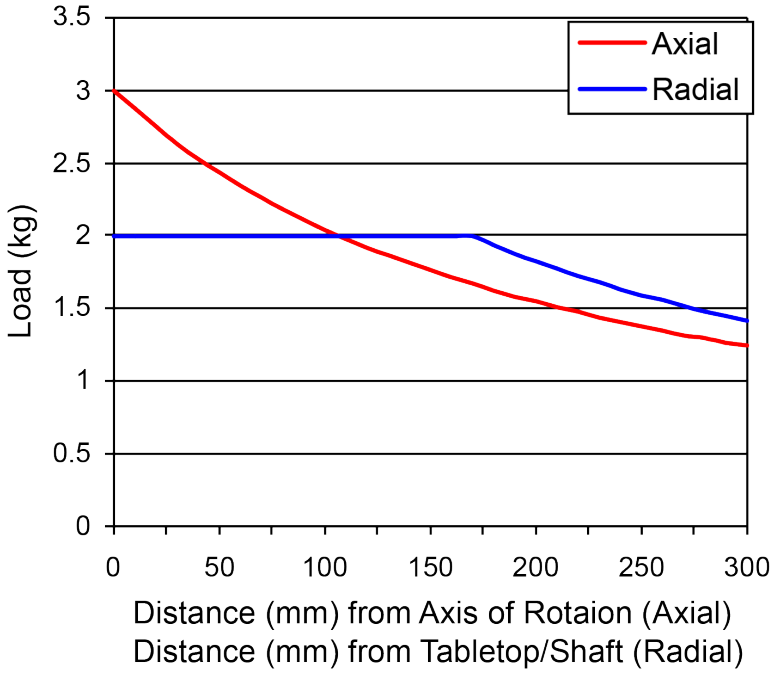


Figure 2-4: Load Capability

Chapter 3: Electrical Specifications and Installation

WARNING: Electrical installation must be performed by properly qualified personnel.

Electrical installation requirements will vary depending on product options. Installation instructions in this section are for ASR1000 stages equipped with standard Aerotech motors intended for use with an Aerotech motion control system. Contact Aerotech for further information regarding products that are otherwise configured.

Aerotech motion control systems are adjusted at the factory for optimum performance. When the ASR1000 is part of a complete Aerotech motion control system, setup usually involves connecting the ASR1000 to the appropriate drive chassis with the cables provided. Labels on the system components usually indicate the appropriate connections.

If system level integration was purchased, an electrical drawing showing 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 pin assignments.

WARNING: Applications requiring access to the stage while it is energized will require additional grounding and safeguards. 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: Remove power before connecting or disconnecting electrical components or cables. Failure to do so may cause electric shock.

WARNING: Operator access to the base and tabletop must be restricted while connected to a power source. Failure to do so may cause electric shock.

3.1. Motor and Feedback Connectors

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

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

The protective ground connection of the ASR1000 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: Remove power before connecting or disconnecting electrical components or cables. Failure to do so may cause electric shock.

WARNING: The protective ground connection must be properly installed to minimize the possibility of electric shock.

WARNING: Operator access to the base and tabletop must be restricted while connected to a power source. Failure to do so may cause electric shock.

CAUTION: The stage controller must provide over-current and over-speed protection. Failure to do so may result in permanent damage to the motor and stage components.

Table 3-1: 4-Pin HPD Motor Connector Pinouts (-CN1 Option)

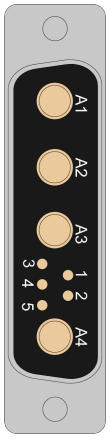
Pin	Description	Connector
A1	Motor Phase A	
A2	Motor Phase B	
A3	Motor Phase C	
1	Motor Shield (EMI shield)	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
A4	Frame ground (motor protective ground)	

Table 3-2: 4-Pin D Motor Mating 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 #DBMM9W4SA197

Table 3-3: 25-Pin D Motor Connector Pinouts (-CN2 Option)

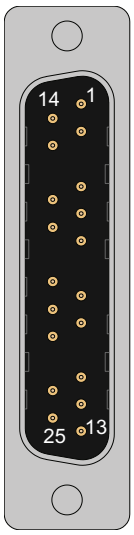
Pin	Description	Connector
1	Motor Shield (EMI shield)	
2	Frame ground	
14	Frame ground	
15	Frame ground	
4	Motor Phase C	
5		
6		
17		
18		
8	Motor Phase B	
9		
20		
21		
22		
11	Motor Phase A	
12		
13		
24		
25		
Pins 3, 7, 10, 16, 19, and 23 have been removed.		

Table 3-4: 25-Pin D Motor Mating Connector

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

Table 3-5: 25-Pin D Feedback Connector Pinouts

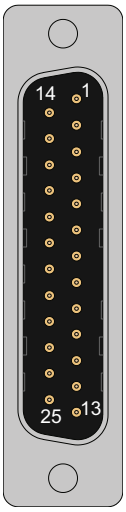
Pin	Description	Connector
1	Signal shield connection	
2	Reserved	
3	+5 V power supply (the typical requirement is 250 mA).	
4	Reserved	
5	Reserved	
6	Marker-N	
7	Marker	
8	Reserved	
9	Reserved	
10	Reserved	
11	Reserved	
12	Reserved	
13	Reserved	
14	Cosine	
15	Cosine-N	
16	+5 V power supply	
17	Sine	
18	Sine-N	
19	Reserved	
20	Common ground	
21	Common ground	
22	Reserved	
23	Reserved	
24	Reserved	
25	Reserved	

Table 3-6: 25-Pin D Feedback Mating Connector

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

3.2. Motor and Feedback Wiring

Shielded cables are required for the motor and feedback connections.

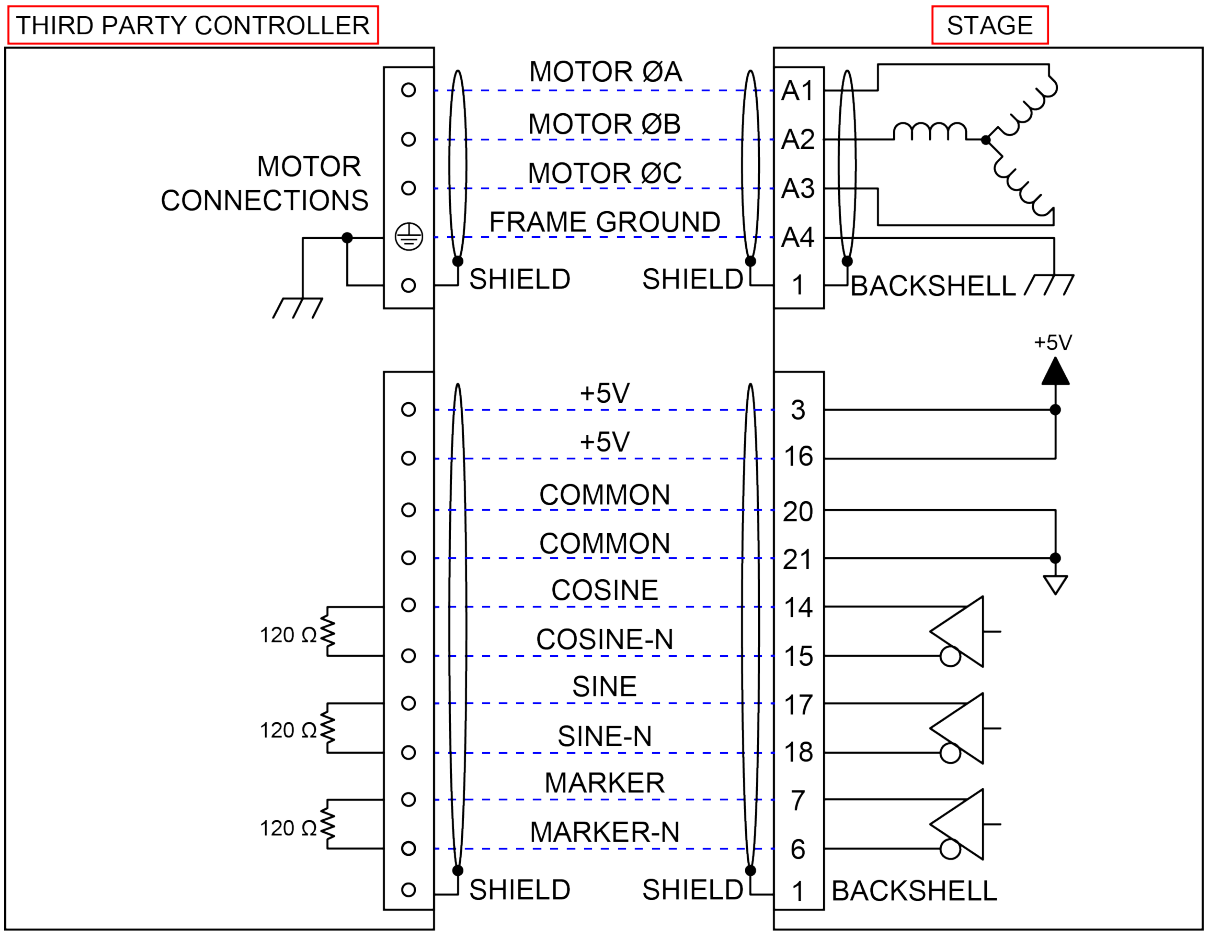


Figure 3-1: Motor and Feedback Wiring (-CN1 Option)

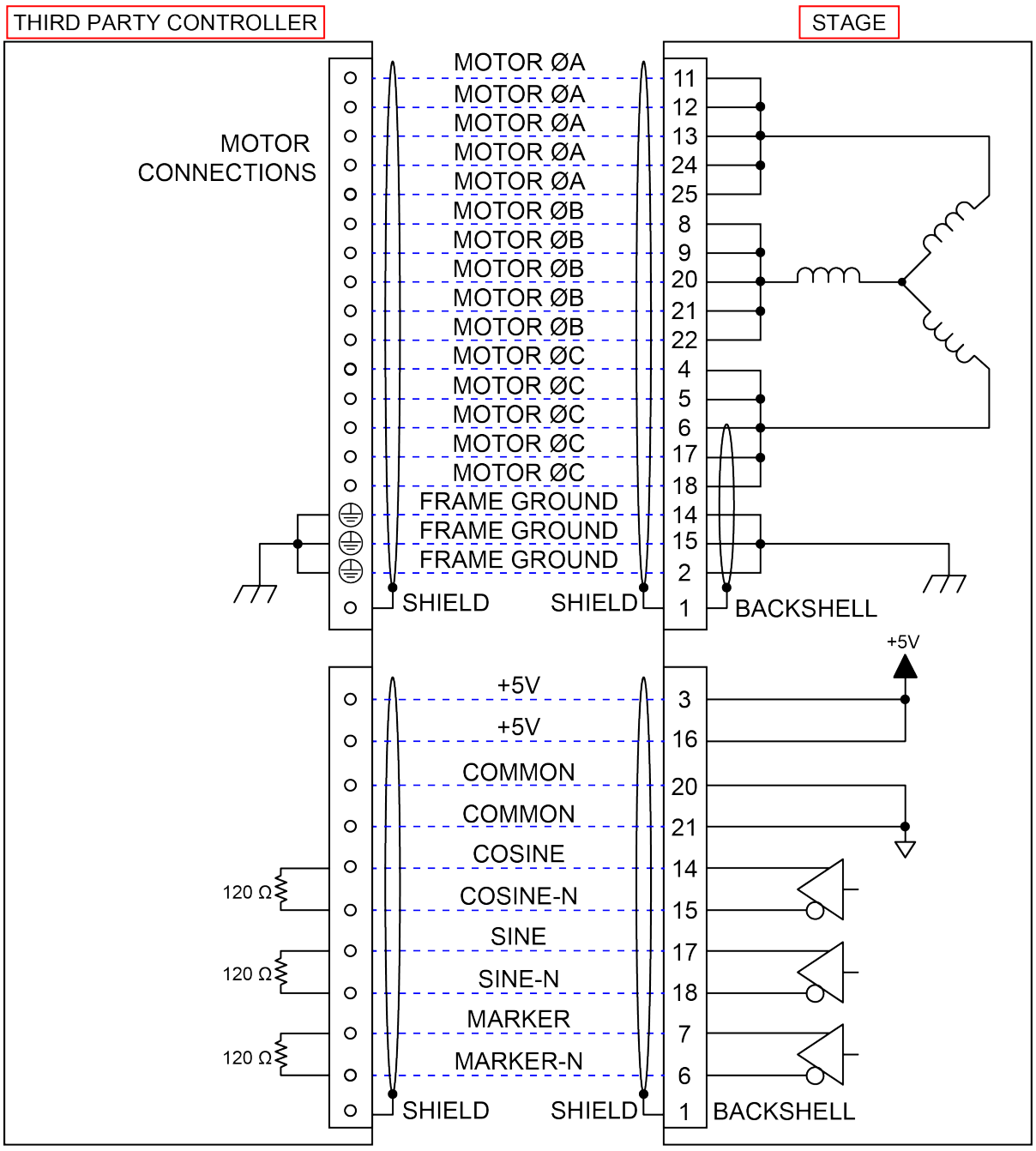


Figure 3-2: Motor and Feedback Wiring (-CN2 Option)

3.3. Motor and Feedback Specifications

Table 3-7: Feedback Specifications

Encoder Specifications	
Supply Voltage	5 V ±5%
Supply Current	250 mA max
Output Signals	**Sinusoidal Type (Incremental Encoder)**: 1 V_{pk-pk} into 120 Ω Load (differential signals SIN+, SIN-, COS+, COS- are .5 V_{pk-pk} relative to ground.)

Table 3-8: Encoder Specifications

	Resolution
	8,192 lines/rev
Fundamental	158.73 arc sec/count
x1000	0.16 arc sec/count
x4000	0.04 arc sec/count

Table 3-9: BM250 Motor Specifications

		BM250
Performance Specifications (1,2)		
Stall Torque, Continuous(3)	N·m (oz·in)	2.3 (322)
Peak Torque (4)	N·m (oz·in)	5.7 (805)
Rated Power Output, Continuous	W	739
Electrical Specifications (2)		
BEMF Constant (Line-Line, Max)	V_{pk}/k_{rpm}	28
Continuous Current, Stall (3)	A_{pk} (A_{rms})	10.3 (7.2)
Peak Current, Stall (4)	A_{pk} (A_{rms})	25.6 (18.1)
Torque Constant (5)	N·m/A_{pk} (oz·in/A_{pk})	0.22 (31.4)
	N·m/A_{rms} (oz·in/A_{rms})	0.31 (44.4)
Motor Constant (3,5)	N·m/√W (oz·in/√W)	0.198 (28.04)
Resistance, 25°C (Line-Line)	Ω	1.1
Inductance (Line-Line)	mH	2.74
Maximum Bus Voltage	V_{DC}	340
Thermal Resistance	°C/W	0.99
Number of Poles	--	8

1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature
2. All performance and electrical specifications ±10%
3. Values shown @ 105°C rise above a 25 °C ambient temperature, with housed motor mounted to a 250 mm x 250 mm x 6 mm aluminum heat sink
4. Peak torque assumes correct rms current; consult Aerotech
5. Torque constant and motor constant specified at stall
6. Maximum winding temperature is 130 °C
7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures
8. All Aerotech amplifiers are rated A_{pk}; use torque constant in N·m/A_{pk} when sizing

3.4. 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 3.5. for Motor and Feedback phasing information). 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 3-3 shows the machine direction of ASR1000 stages.

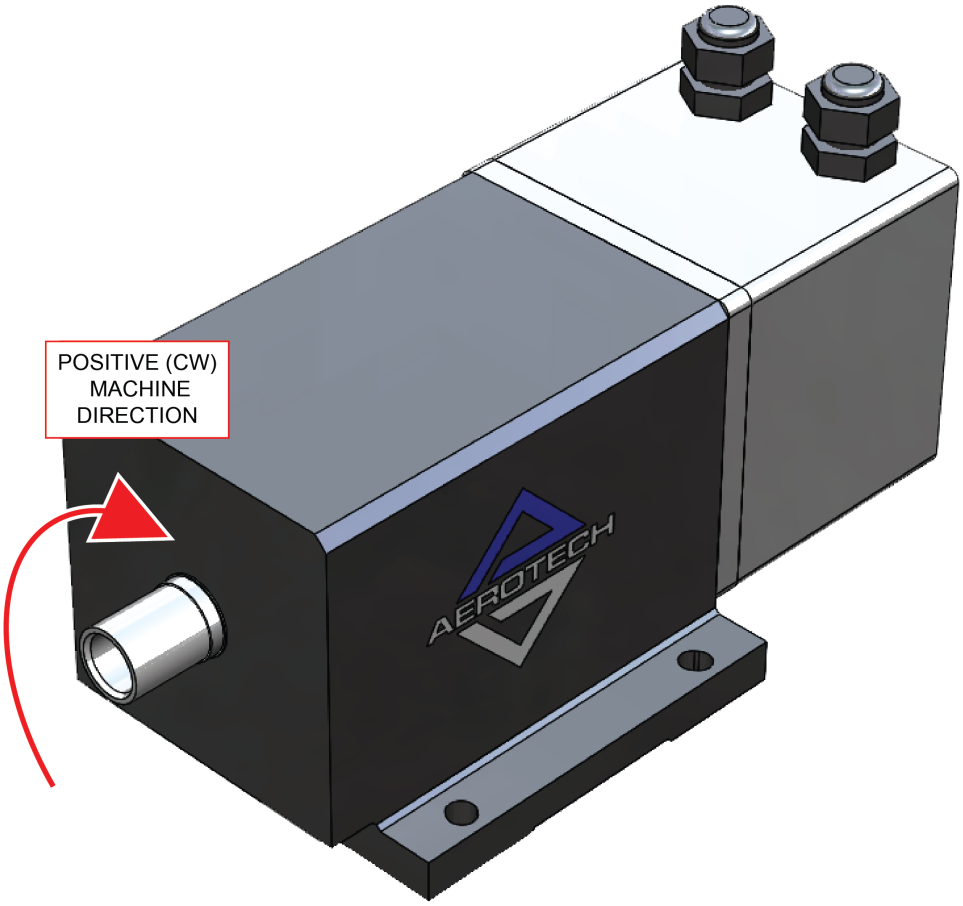


Figure 3-3: Machine Direction

3.5. Motor and Feedback Phasing

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

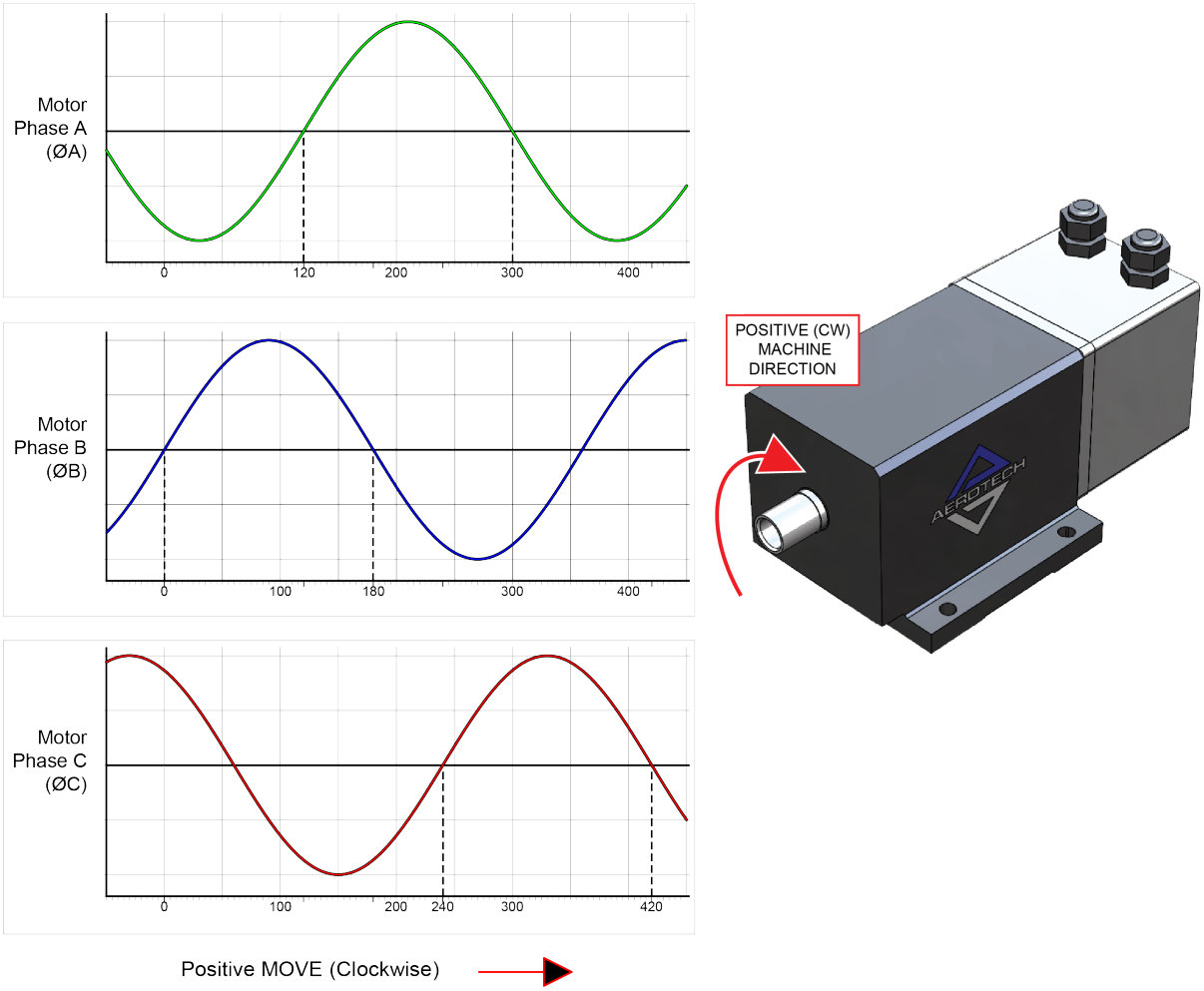


Figure 3-4: Motor Phasing

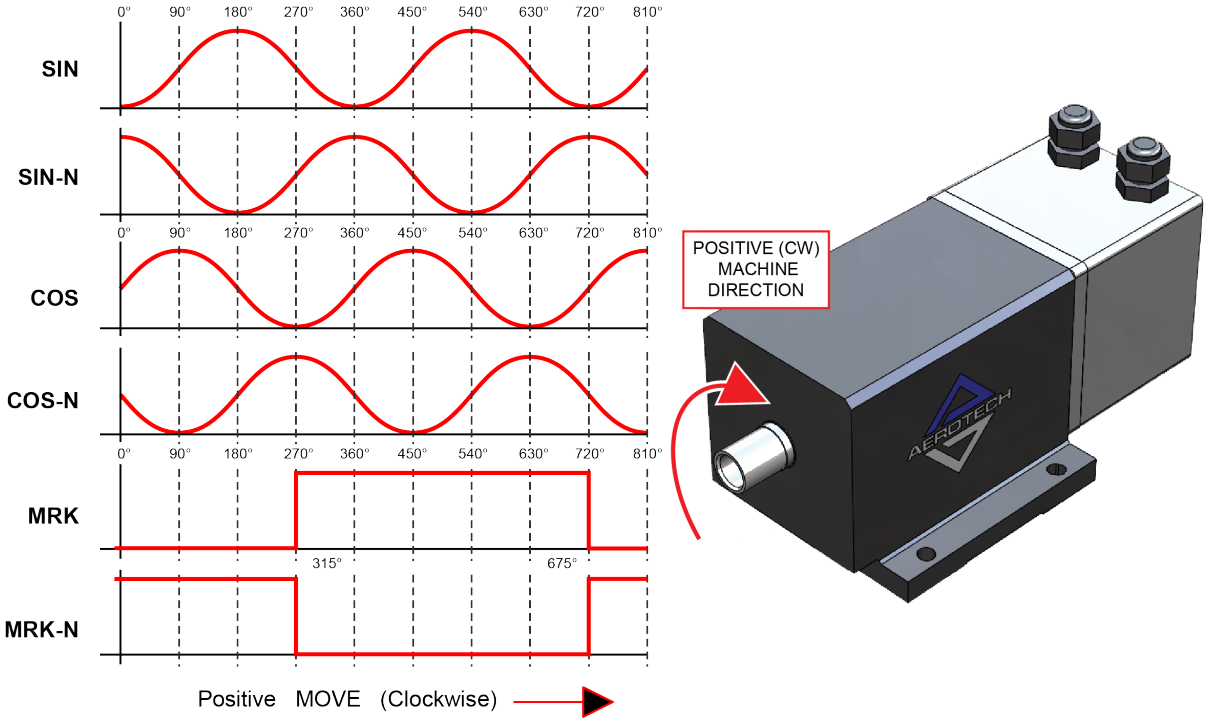


Figure 3-5: Analog Encoder Phasing Reference Diagram

Chapter 4: Maintenance

DANGER: To minimize the possibility of bodily injury or death, disconnect all electrical power prior to performing any maintenance or making adjustments to the equipment.

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

4.1. Service and Inspection Schedule

A frequent inspection and cleaning interval of the ASR1000 series stages is recommended until a trend develops for the application. The inspection and cleaning interval depends on application conditions such as duty cycle, speed, and environment. As part of the inspection process, the stage, cables, and seals should be examined for wear and damage. 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
- 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.

NOTE: The bearing area must be kept free of foreign matter and moisture; otherwise, the performance and life expectancy of the stage will be reduced.

4.2. Cleaning and Lubrication

Before using a cleaning solvent on any part of the ASR1000, blow away small particles and dust with nitrogen or, less preferably, clean, dry, compressed air.

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: Make sure that all solvent has completely evaporated before attempting to move the stage.

WARNING: Acetone should never be used to clean the o-rings or seals.

4.3. Troubleshooting

This section provides some information regarding typical problems.

Table 4-1: Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	Controller trap or fault (refer to controller documentation).
Stage moves uncontrollably	• Encoder (sine and cosine) signal connections (refer to Chapter 1 and Controller documentation). • Motor Connections (refer to Chapter 1 and Controller documentation).
Stage oscillates or squeals	• Gains misadjusted (refer to the controller documentation). • Encoder signals (refer to the controller documentation).

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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 https://www.aerotech.com/global-technical-support.aspx 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

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

USA, CANADA, MEXICO	CHINA	GERMANY
Aerotech, Inc. Global Headquarters Phone: +1-412-967-6440 Fax: +1-412-967-6870	Aerotech China Full-Service Subsidiary Phone: +86 (21) 3319 7715	Aerotech Germany Full-Service Subsidiary Phone: +49 (0)911 967 9370 Fax: +49 (0)911 967 93720

JAPAN	TAIWAN	UNITED KINGDOM
Aerotech Japan Full-Service Subsidiary Phone: +81 (0)50 5830 6814 Fax: +81 (0)43 306 3773	Aerotech Taiwan Full-Service Subsidiary Phone: +886 (0)2 8751 6690	Aerotech United Kingdom Full-Service Subsidiary Phone: +44 (0)1256 855055 Fax: +44 (0)1256 855649

Have your customer order number ready before calling.

Appendix C: Revision History

Revision	General Information
1.00.00	New manual

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