



ASRT Hardware Manual

Revision: 1.01.00



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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 ASRT 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 ASRT stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.
5. Use care when moving the ASRT stage. Lifting or transporting the ASRT stage improperly can result in injury or damage to the ASRT.
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:
ASRT 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
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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 Numbers and Ordering Options

ASRT Mechanical-Bearing Direct-Drive Sealed Rotary Stage	
ASRT185DR	185 mm wide frame
ASRT245DR	245 mm wide frame
ASRT300DR	300 mm wide frame
Aperture (Optional)	
-A	Clear aperture through stage; 30 mm (ASRT185DR); 80 mm (ASRT245DR); 130 mm (ASRT300DR)
Feedback (Required)	
-E1	Incremental optical encoder, 1 Vpp
-E2	Absolute optical encoder
-E3	Incremental magnetic encoder, 1 Vpp
Note: -E3 feedback option not available with ASRT300DR	
Exterior Paint Color (Required)	
-PNT1	Desert tan
-PNT2	Black
-PNT3	White
Mounting Orientation (Required)	
-MT1	Vertical axis of rotation
-MT2	Horizontal axis of rotation
Air Purge (Optional)	
-PR	Air purge
Desiccant Cartridge (Optional)	
-DSC	Desiccant cartridge
Flange Mounting (Optional)	
-F	Flange mounting kit
Note: Flange mounting kit available only with -MT1 mounting orientation	
Cover (Optional)	
-CV	Cover shroud kit
Note: Cover shroud kit only available with -MT2 mounting orientation	
Metrology (Required)	
-PL1	Metrology, uncalibrated with performance plots
-PL2	Metrology, calibrated (HALAR) with performance plots

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: 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.
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	IP66: No ingress of dust. Water projected in powerful jets shall not enter the enclosure in harmful quantities
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: ASRT Series Specifications

Basic Model			ASRT185DR	ASRT245DR	ASRT300DR
Travel			360° Continuous		
Accuracy ⁽¹⁾	Optical Encoder (-E1, -E2)	Standard	194 μrad (40 arc sec)	145 μrad (30 arc sec)	97 μrad (20 arc sec)
		Calibrated	10 μrad (2 arc sec)	10 μrad (2 arc sec)	10 μrad (2 arc sec)
	Optical Encoder (-E3)	Standard	243 μrad (50 arc sec)	218 μrad (45 arc sec)	N/A
		Calibrated	97 μrad (20 arc sec)	97 μrad (20 arc sec)	N/A
Resolution (Minimum Incremental Motion)	Optical Encoder (-E1)		0.5 μrad (0.1 arc sec)	0.4 μrad (0.08 arc sec)	0.3 μrad (0.06 arc sec)
	Optical Encoder (-E2)		0.8 μrad (0.16 arc sec)	0.8 μrad (0.16 arc sec)	0.8 μrad (0.16 arc sec)
	Magnetic Encoder (-E3)		12.1 μrad (4 arc sec)	11.2 μrad (3 arc sec)	N/A
Bidirectional Repeatability ⁽¹⁾			7.3 μrad (1.5 arc sec)	7.3 μrad (1.5 arc sec)	7.3 μrad (1.5 arc sec)
Total Tilt Error Motion ⁽¹⁾			24 μrad (5 arc sec)	24 μrad (5 arc sec)	24 μrad (5 arc sec)
Maximum Speed ⁽²⁾			200 rpm	150 rpm	100 rpm
Maximum Acceleration ⁽²⁾			930 rad/s ²	635 rad/s ²	425 rad/s ²
Aperture			30 mm	80 mm	130 mm
Maximum Torque (Continuous)			2.85 N·m	5.99 N·m	10.73 N·m
Load Capacity	Axial		30 kg	105 kg	130 kg
	Radial		25 kg	90 kg	110 kg
Inertia (Unloaded)	No Aperture		0.009 kg·m ²	0.034 kg·m ²	0.091 kg·m ²
	Aperture		0.011 kg·m ²	0.036 kg·m ²	0.100 kg·m ²
Stage Mass	No Aperture		9.5 kg	17 kg	22.5 kg
	Aperture		12.0 kg	20.5 kg	27.0 kg
Material			Polymer-Painted Aluminum / Aluminum Hardcoat		
Mean Time Between Failure (MTBF) ^(3,4)			10,000 Hours		
<p>1. Certified with each stage.</p> <p>2. Application dependent. Requires the selection of an appropriate amplifier with sufficient voltage and current.</p> <p>3. Application dependent. Dry environments between 0° and 70°C up to 10,000 hours.</p> <p>4. Long-term exposure to temperature cycles and wet environments will require periodic maintenance.</p>					

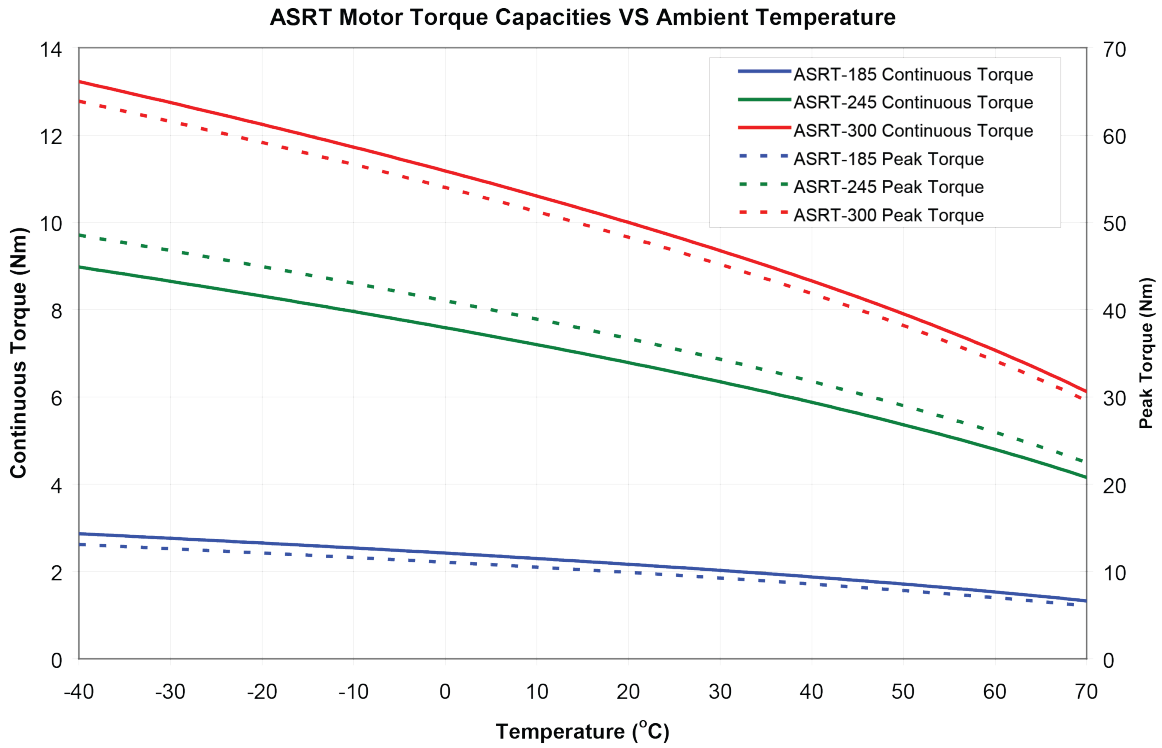


Figure 1-1: ASRT Series Torque Capacity

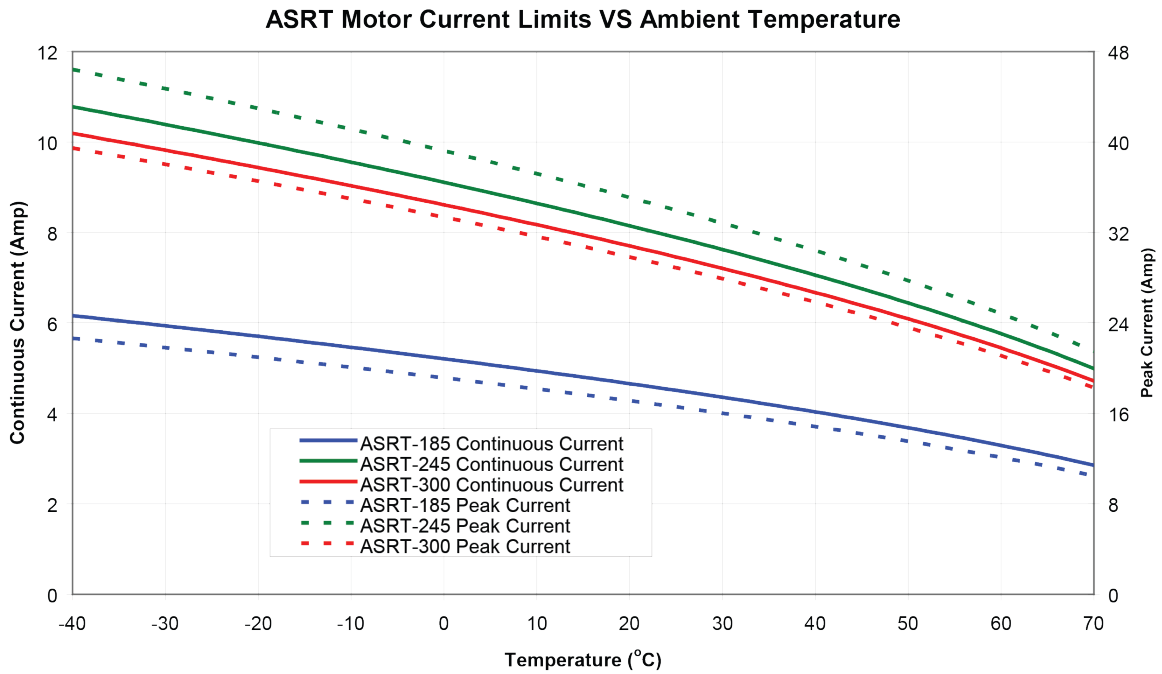


Figure 1-2: ASRT Series Current Capacity

Chapter 2: Mechanical Specifications and Installation



WARNING: ASRT 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



DANGER/HEAVY: Do not attempt to manually lift a stage that is too heavy (in excess of 18 kg). Refer to [Section 1.3](#) for stage mass specifications.

- Do not attempt to manually lift heavy loads single handed.
- Lift only from the base.
- Do not use any of the cables as lifting points.
- Do not use the tabletop as a lifting point.
- Use a fork lift or cart to transport the stage.



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

- Make sure that all moving parts are secure before moving the ASRT. Unsecured moving parts may shift and cause bodily injury.
- Improper handling could adversely affect the performance of the ASRT. Use care when moving the ASRT.

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

Before operating the ASRT, 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 ASRT 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

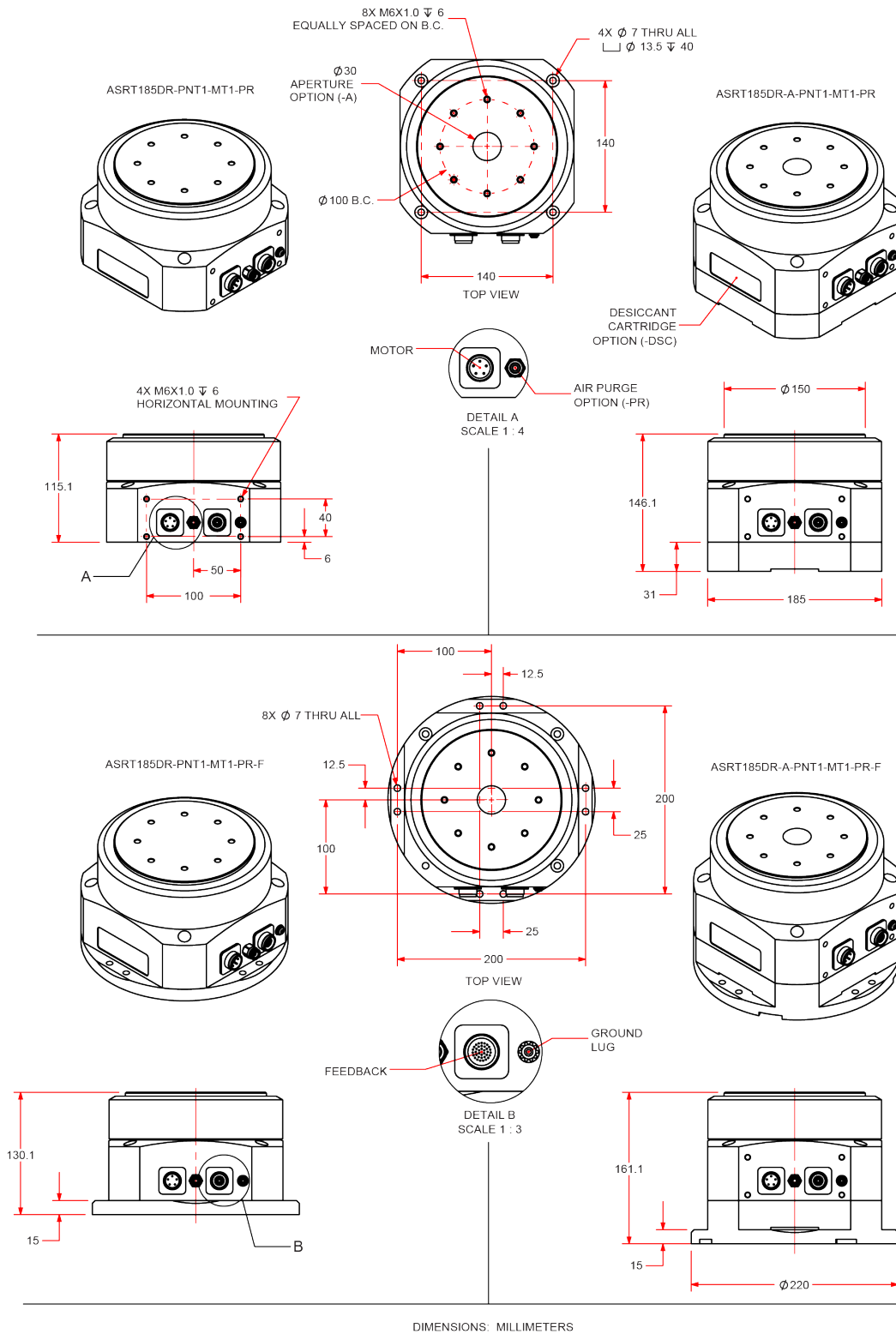


Figure 2-1: ASRT185 Dimensions

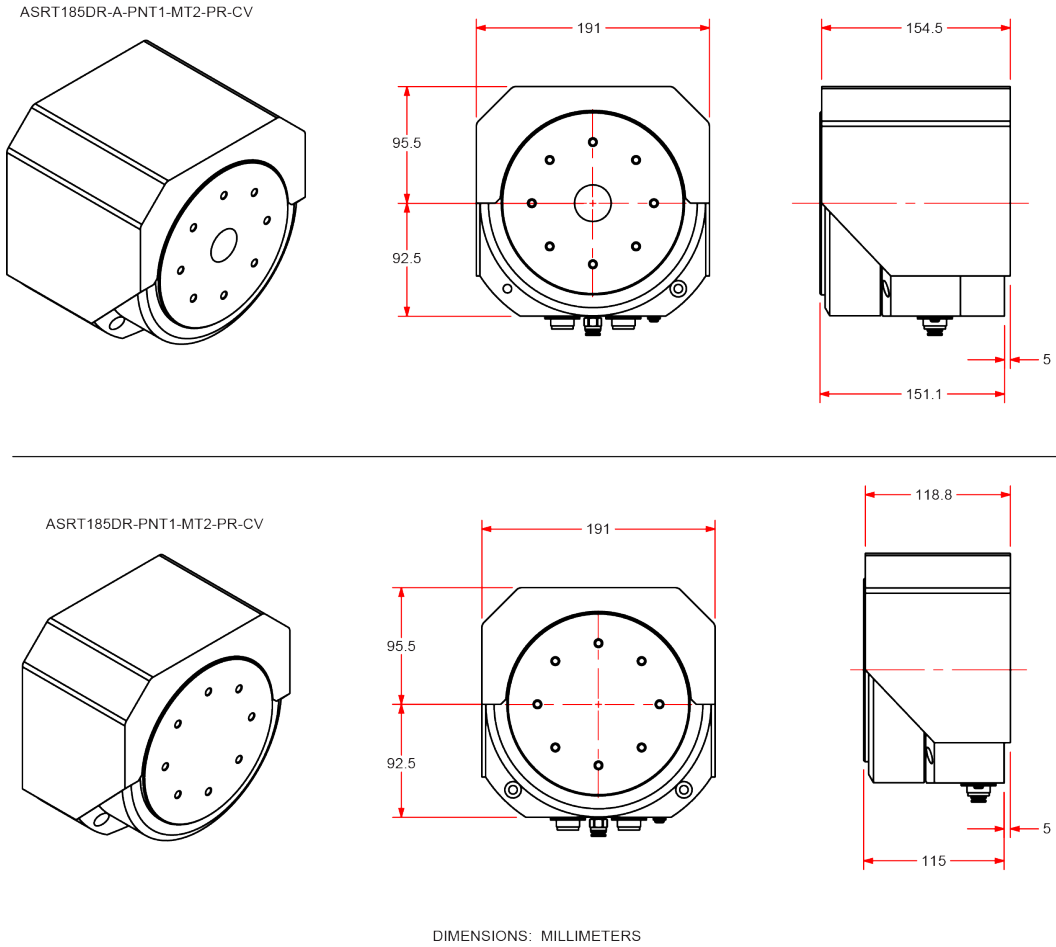


Figure 2-2: ASRT185 Dimensions (Horizontal Mounting with Shroud)

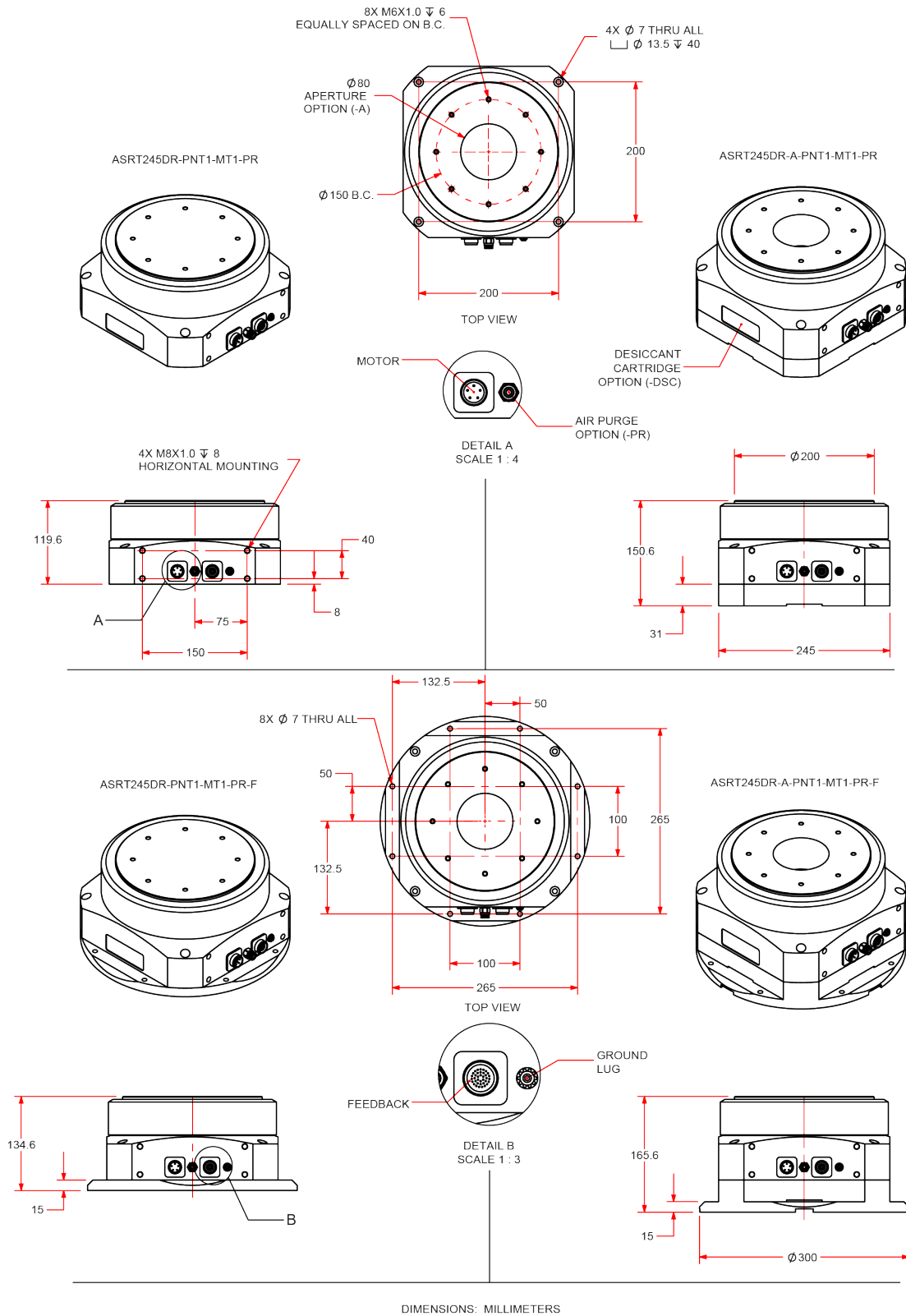
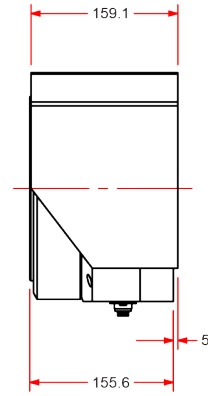
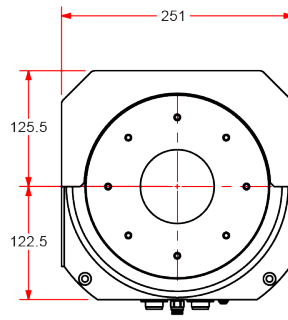
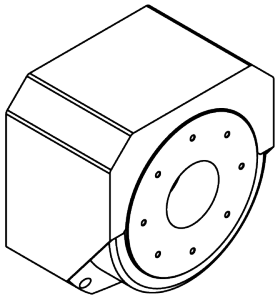
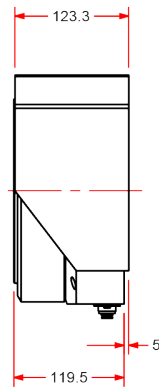
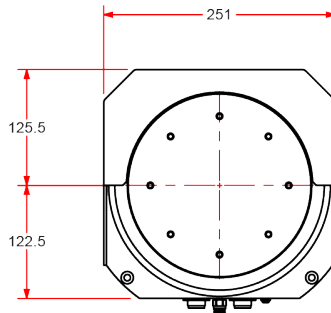
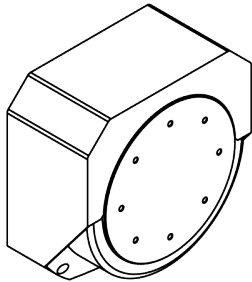


Figure 2-3: ASRT245 Dimensions

ASRT245DR-A-PNT1-MT2-PR-CV



ASRT245DR-PN1-MT2-PR-CV



DIMENSIONS: MILLIMETERS

Figure 2-4: ASRT245 Dimensions (Horizontal Mounting with Shroud)

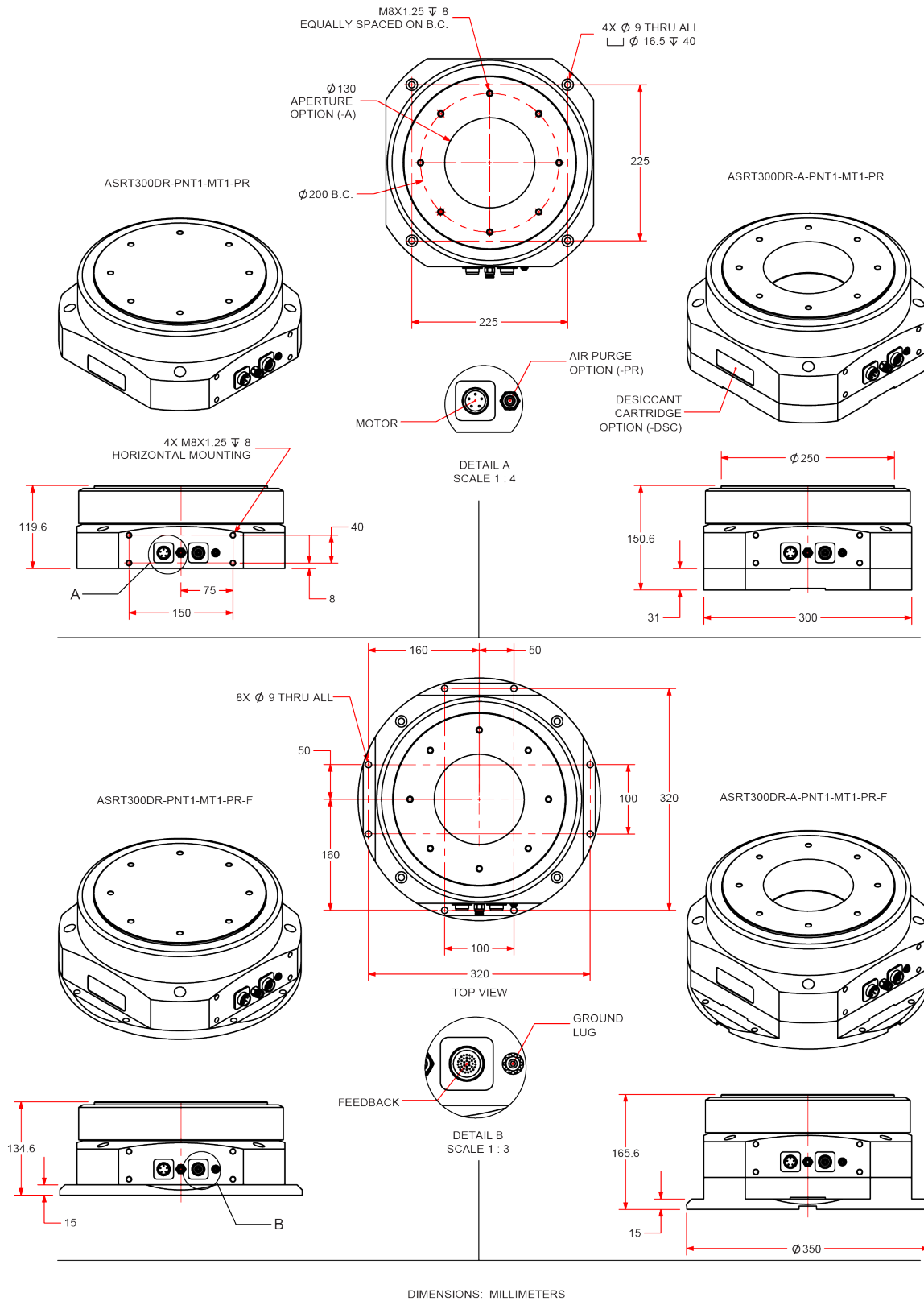


Figure 2-5: ASRT300 Dimensions

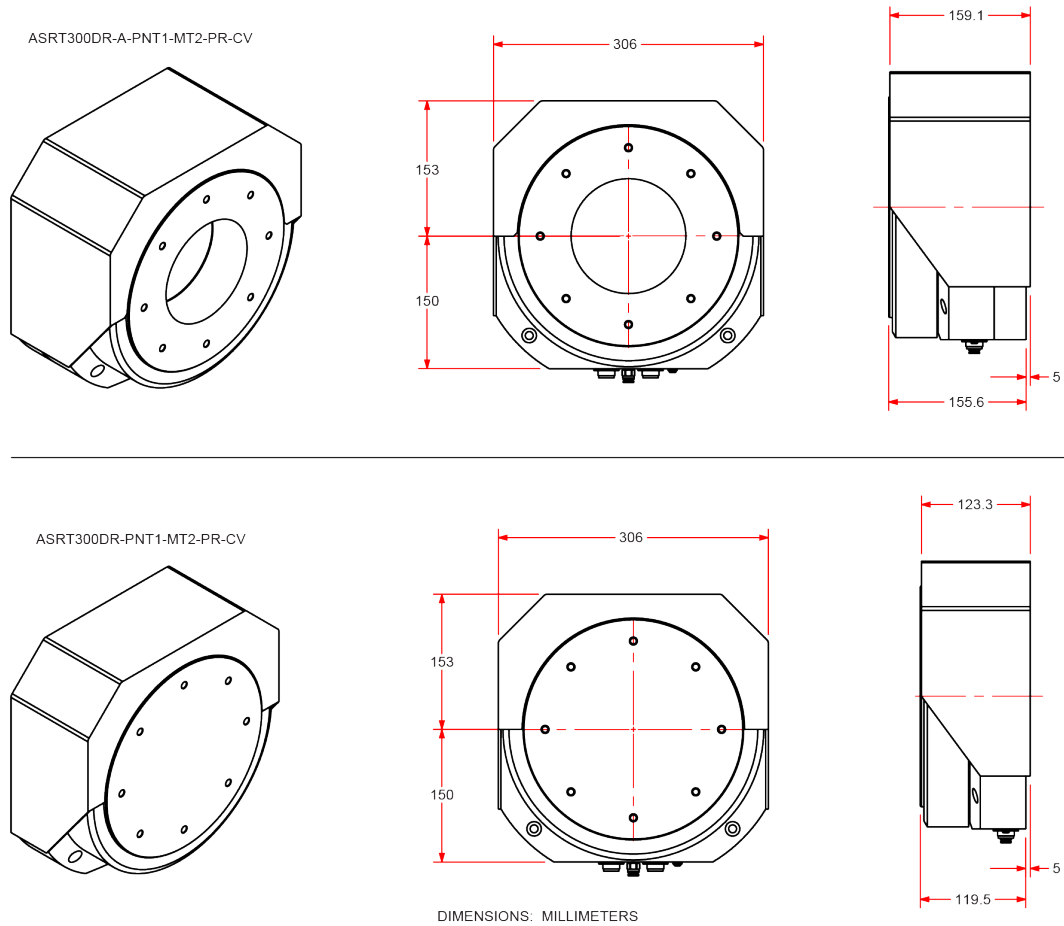


Figure 2-6: ASRT300 Dimensions (Horizontal Mounting with Shroud)

2.3. Securing the Stage to the Mounting Surface



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



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



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



DANGER: PINCH POINT! Keep Hands Clear while the stage is in motion.

The mounting surface must be flat and have adequate stiffness in order to achieve the maximum performance from the ASRT 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 $\pm 13 \mu\text{m}$.

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

ASRT series stages have a fixed mounting pattern (as shown in [Figure 2-7](#)).

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
Standard Mounting (counter-bored)	
ASRT-185: M6 SHCS	8 N·m
ASRT-245: M6 SHCS	8 N·m
ASRT-300: M8 SHCS	20 N·m
Standard Mounting (through holes)	
ASRT-185: M6 SHCS	8 N·m
ASRT-245: M6 SHCS	8 N·m
ASRT-300: M8 SHCS	20 N·m
Side Mounting	
ASRT-185: M6x1	8 N·m
ASRT-245: M8x1.25	20 N·m
ASRT-300: M8x1.25	20 N·m

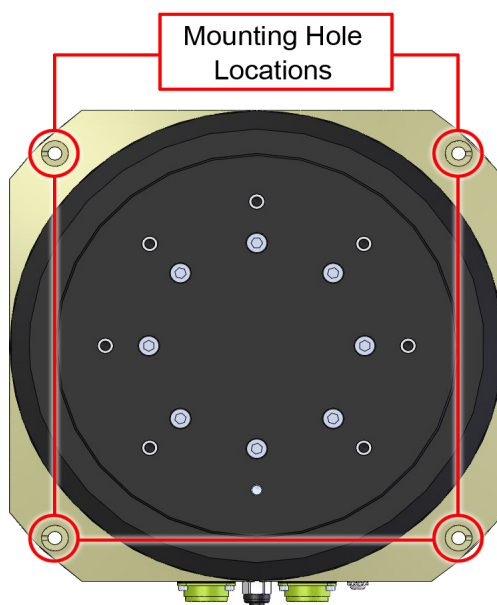


Figure 2-7: Vertical Axis of Rotation Mounting Counter-bored Holes

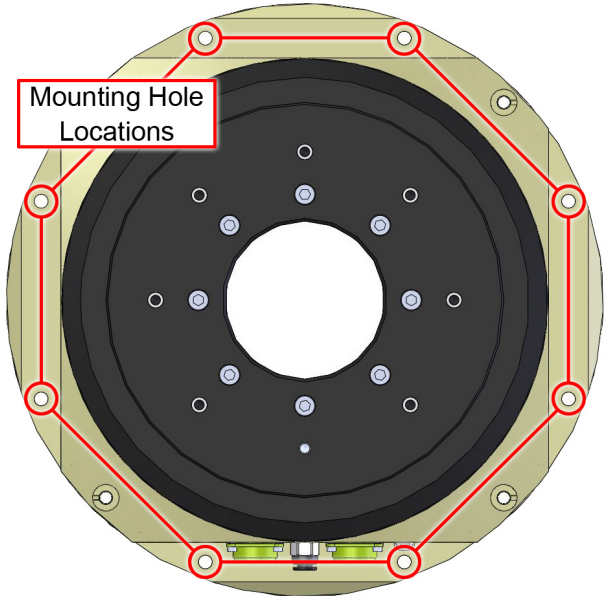


Figure 2-8: Vertical Axis of Rotation Flange Mounting Through Holes

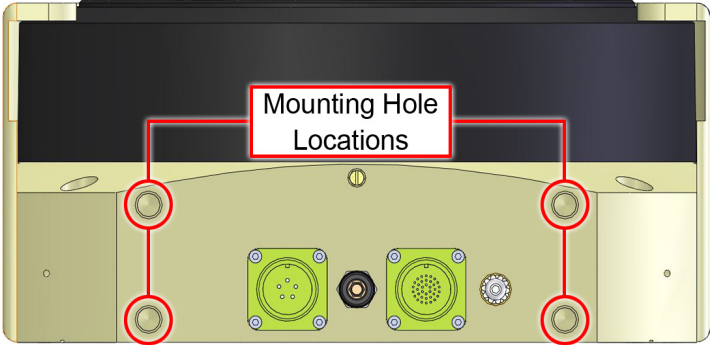


Figure 2-9: Horizontal Axis of Rotation Side Mounting Tapped Holes

2.4. Attaching the Payload to the Stage

To prevent damage to the payload or stage, test the operation of the stage before the payload is attached. Aerotech recommends that customers use a representative payload during start-up to prevent accidental damage to the stage and the payload. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. Document all results for future reference. For information on electrical installation refer to [Chapter 3](#) and the documentation delivered with the stage.

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

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

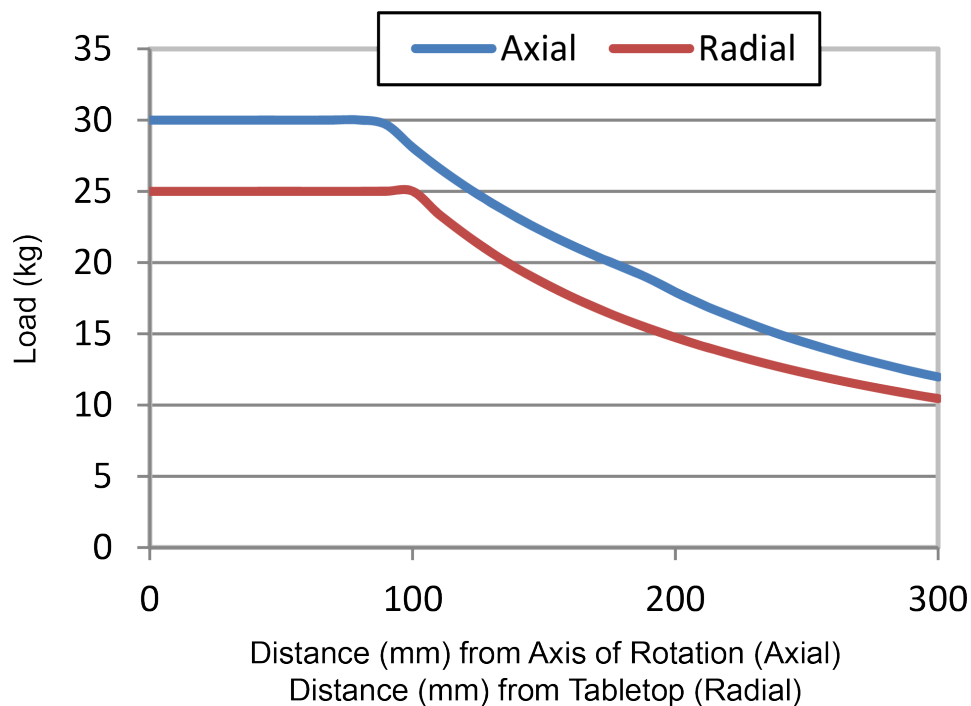


Figure 2-10: ASRT185 Load Curves

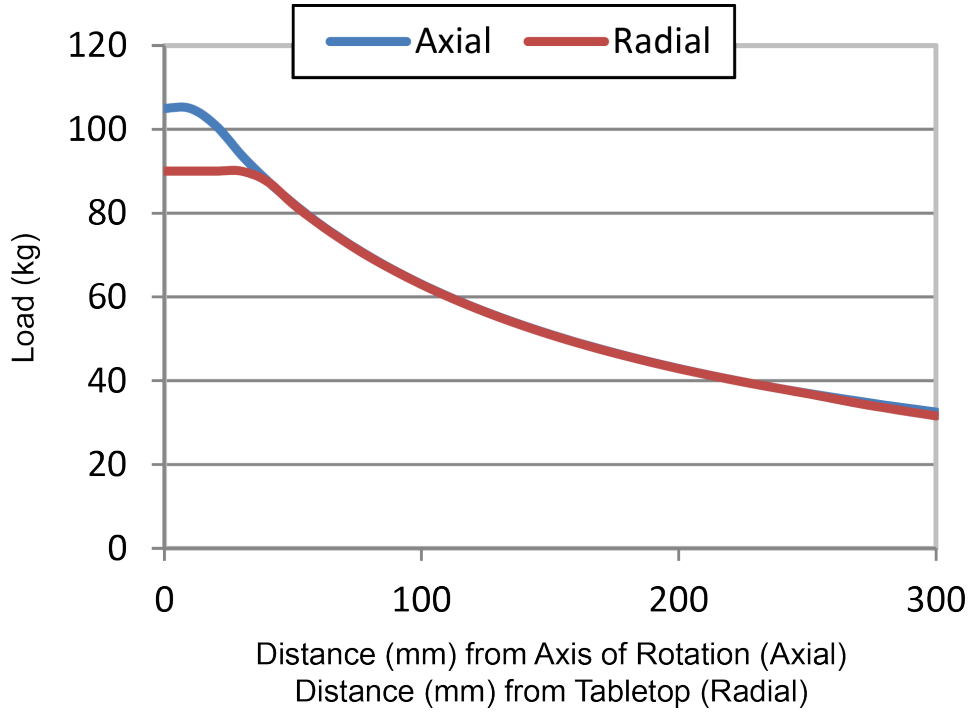


Figure 2-11: ASRT245 Load Curves

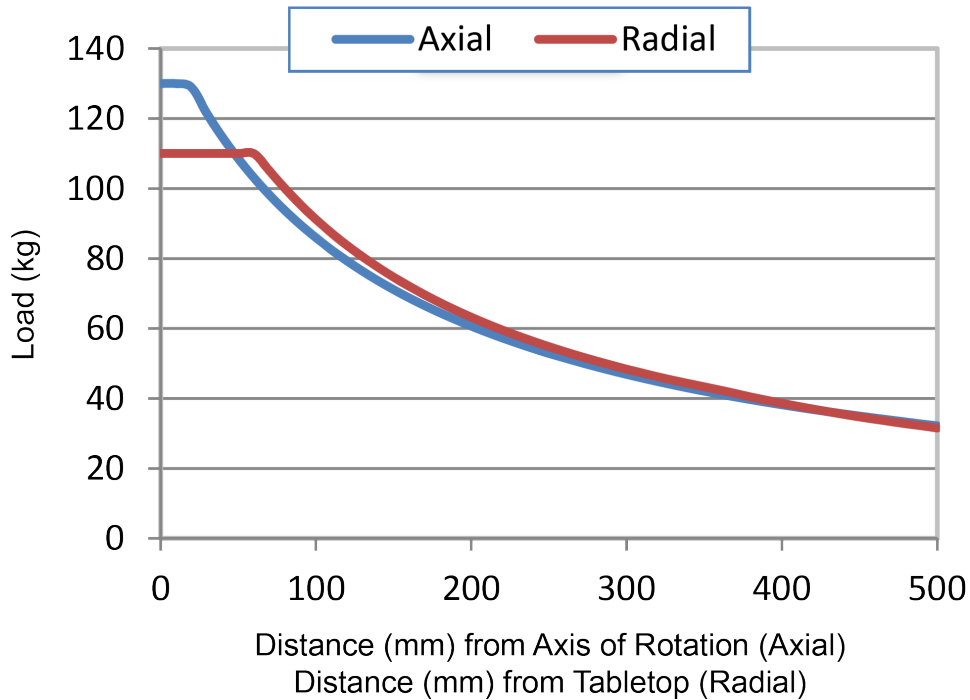


Figure 2-12: ASRT300 Load Curves

2.5. Horizontal Axis of Rotation Mounting

In applications requiring a horizontal axis of rotation in hostile environments, a set of external covers are available. These covers are factory installed and are necessary to protect the ASRT from ingress of dust and water. The mounting surface for the ASRT in this orientation is also the connector face. This keeps contaminants away from the connectors. To remove the external covers, remove the screws shown in [Figure 2-13](#).

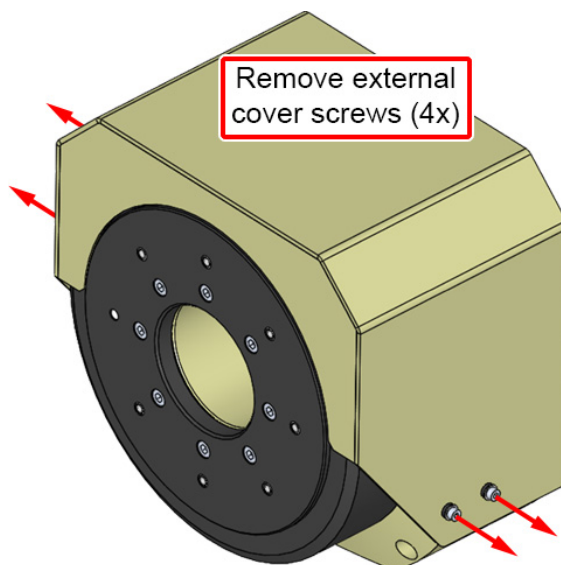


Figure 2-13: External Cover Removal

When mounting the ASRT in this orientation, remove the drainage plug on the mounting surface. This will allow any water built up inside the stage to drain off. Any mounting fixtures should leave access to the connectors, air fitting, and ground lug. The fixtures should also have a water channel around the hole plug to allow adequate drainage.

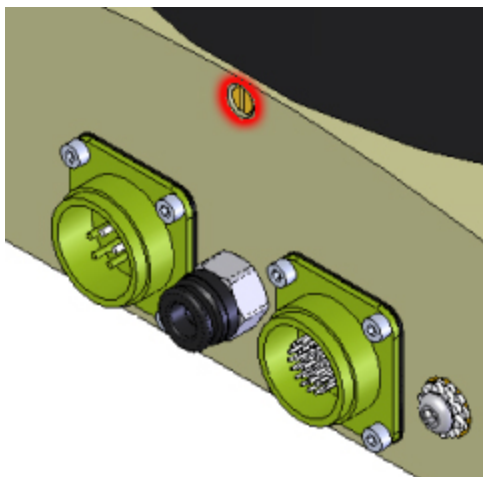


Figure 2-14: Drainage Plug Location

2.6. Air Purge Fitting

The optional Air Purge fitting is located between the motor and feedback connectors. The fitting is threaded with a 1/8 NPT pipe thread. Without this option, the ASRT ships with a 1/8 NPT plug. All threads are wrapped with Teflon tape at the factory to ensure good sealing.

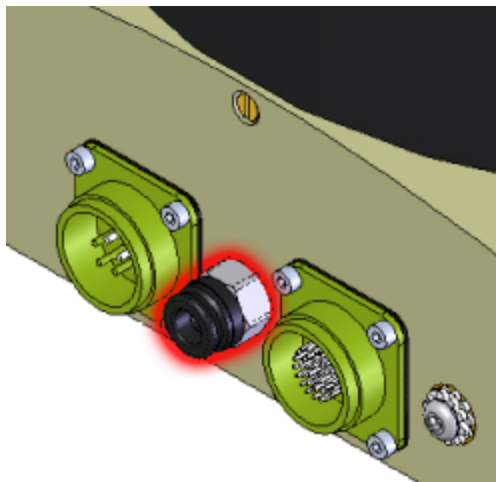


Figure 2-15: Air Purge Fitting Accessory

Chapter 3: Electrical 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 ASRTs 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 ASRT is part of a complete Aerotech motion control system, setup usually involves connecting the ASRT 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.

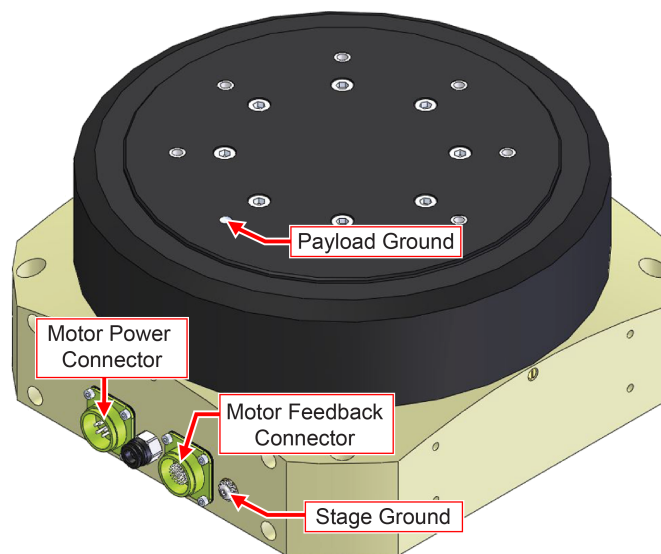


Figure 3-1: Electrical Connectors and Grounds

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 ASRT provides motor frame ground protection only. Additional grounding and safety safeguards 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.



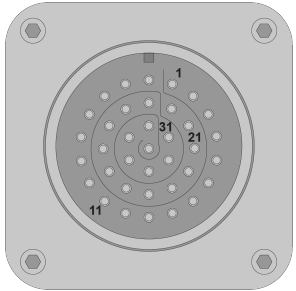
CAUTION: The stage controller must provide over-current and over-speed protection. Failure to do so may result in permanent damage to the motor and stage components.

Table 3-1: Motor Wiring Connector

Pin	Description	Connector
A	Motor Phase A	
B	Motor Phase B	
C	Motor Phase C	
D	Shield for motor wiring connector	
E	Ground to stage base	

Mating Connector	Aerotech P/N	Third Party P/N
Connector	ECK01820	PEI, MS27473T14F5S-CG
O-Ring	ECK01822	Conta-Clip, 23233.9
Cord Grip	ECK01817	Conta-Clip, 21658.6

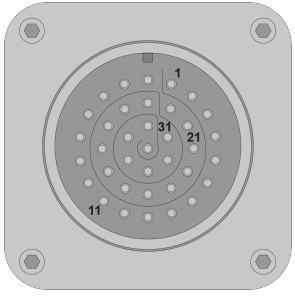
Table 3-2: Feedback Connector (-E1 or -E3 Encoder Option)

Pin	Description	Connector
1	Cosine	
2	Cosine-N	
3	Sine	
4	Sine-N	
5	Marker	
6	Marker-N	
9	Hall Effect sensor, phase A	
10	Hall Effect sensor, phase B	
11	Hall Effect sensor, phase C	
12	Over-Temperature Thermistor sensor	
15	Positive (CW) hardware limit	
16	Negative (CCW) hardware limit	
19	Outer Signal shield connection	
20	Encoder +5 V power supply input (internally connected to Pin 31)	
21	Encoder Common (internally connected to Pin 32)	
22	Inner Signal shield connection [-E1 Encoder option]	
24	Hall Signal Common	
25	Hall Signal +5 V power supply input	
26	Thermistor Common	
28	Limit Common	
29	+5 V power supply limit input	
31	Encoder +5 V power supply input (internally connected to Pin 20)	
32	Encoder Common (internally connected to Pin 21)	

NOTE: Pins not listed are RESERVED.

Mating Connector	Aerotech P/N	Third Party P/N
Connector	ECK01821	PEI, MS27473T14F35S-CG
O-Ring	ECK01822	Conta-Clip, 23233.9
Cord Grip	ECK01817	Conta-Clip, 21658.6

Table 3-3: Feedback Connector (-E2 Encoder Option)

Pin	Description	Connector
7	BiSS® C serial data signal	
8	Differential compliment of DATA signal	
9	Hall Effect sensor, phase A	
10	Hall Effect sensor, phase B	
11	Hall Effect sensor, phase C	
12	Over-Temperature Thermistor sensor	
15	Positive (CW) hardware limit	
16	Negative (CCW) hardware limit	
19	Outer Signal shield connection	
20	Encoder +5 V power supply input (internally connected to Pin 31)	
21	Encoder Common	
22	Inner Signal shield connection	
23	BiSS® C clock signal	
24	Hall Signal Common	
25	Hall Signal +5 V power supply input	
26	Thermistor Common	
28	Limit Common	
29	+5 V power supply limit input	
31	Encoder +5 V power supply input (internally connected to Pin 20)	
32	Encoder Common	
33	Differential compliment of CLK signal	
NOTE: Pins not listed are RESERVED.		

Mating Connector	Aerotech P/N	Third Party P/N
Connector	ECK01821	PEI, MS27473T14F35S-CG
O-Ring	ECK01822	Conta-Clip, 23233.9
Cord Grip	ECK01817	Conta-Clip, 21658.6

3.1.1. Ground Attachments

ASRT series stages come with two ground lugs: one for stage ground and one for payload ground. The stage ground is located adjacent to the connectors, and the payload ground is located on the tabletop.

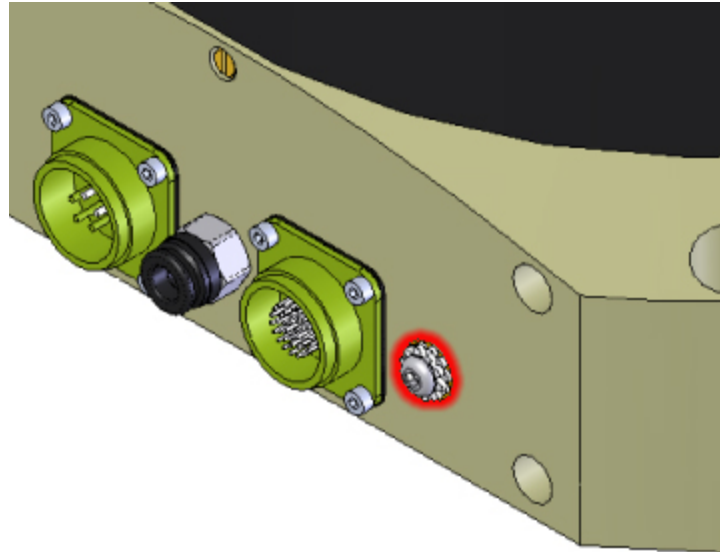


Figure 3-2: Housing Ground Lug Location

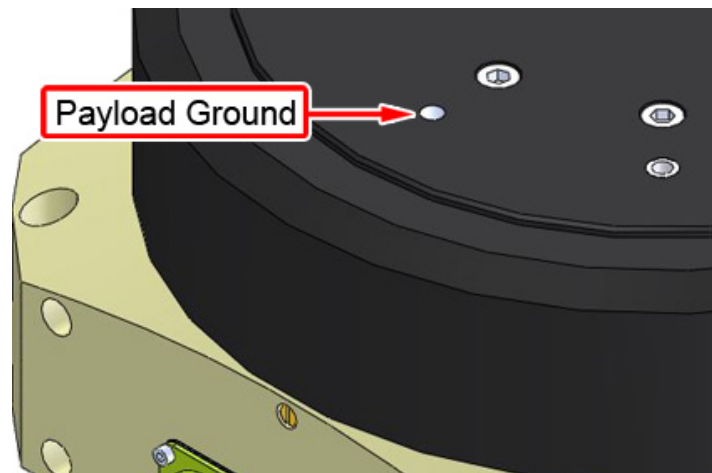


Figure 3-3: Tabletop Ground Lug Location

3.2. Motor and Feedback Wiring

Shielded cables are required for the motor and feedback connections.

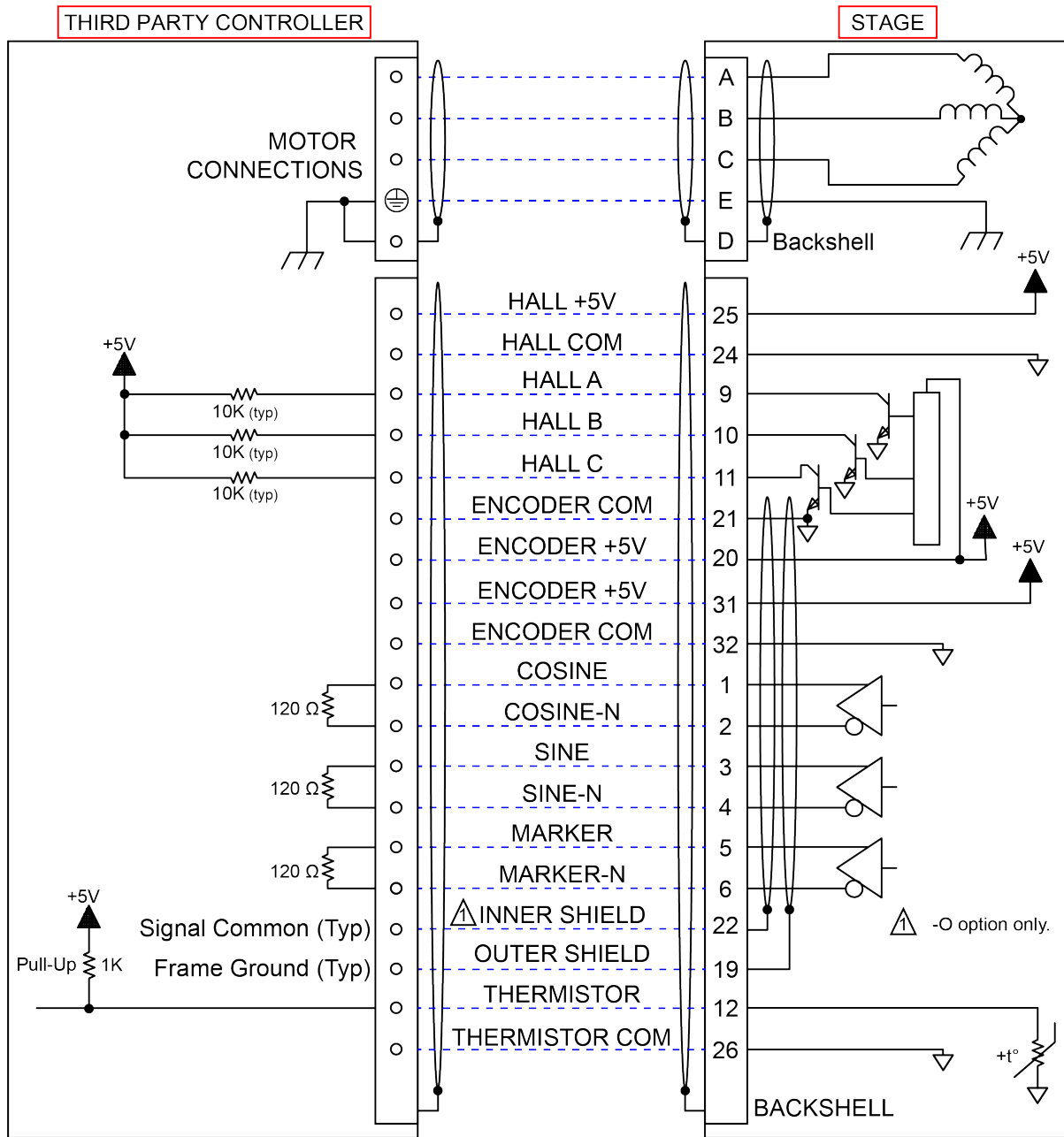


Figure 3-4: Motor and Feedback Wiring (Encoder Option -E1 or -E3)

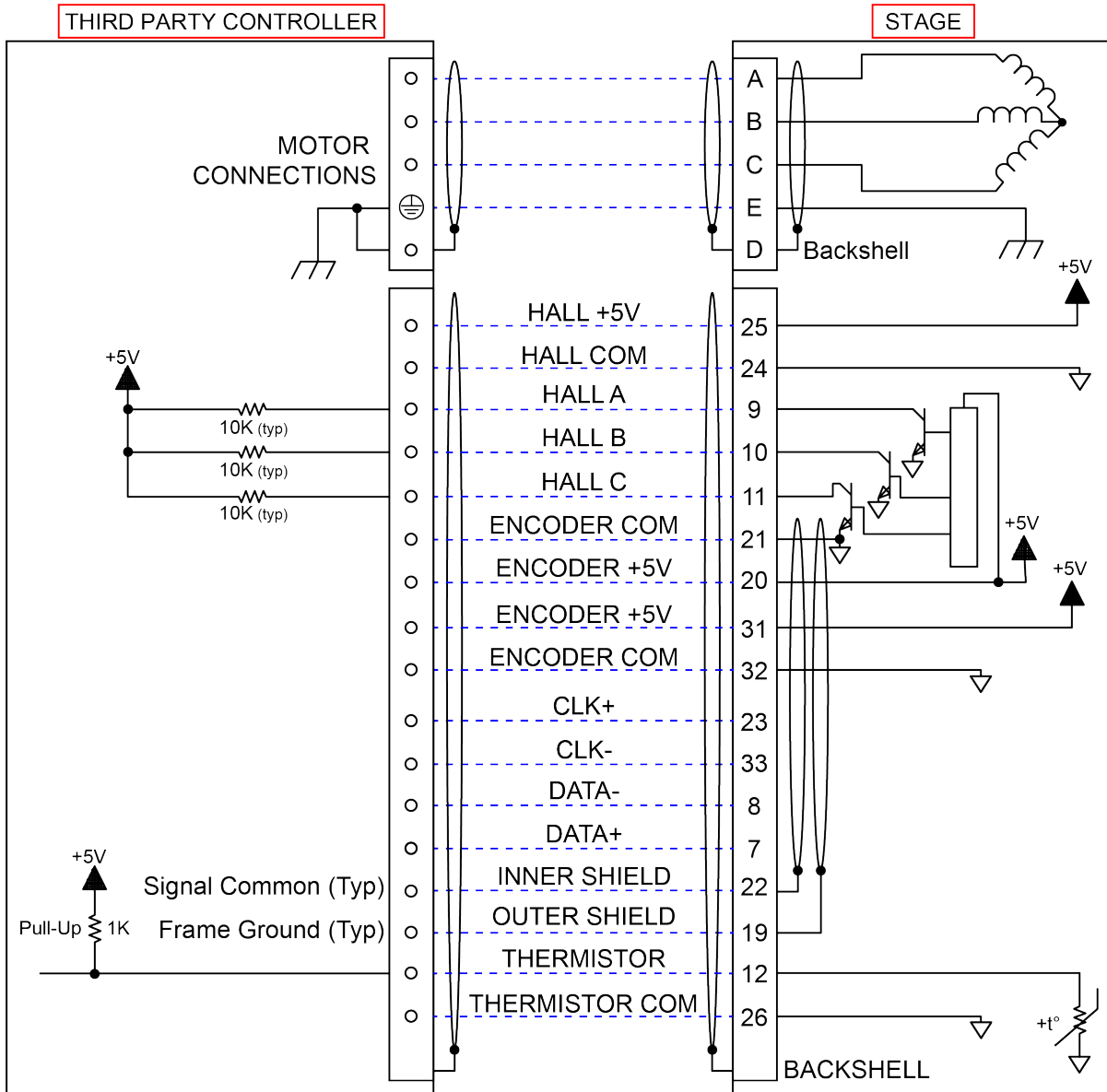


Figure 3-5: Motor and Feedback Wiring (Encoder Option -E2)

3.3. Motor and Feedback Specifications

Table 3-4: Feedback Specifications

Hall-Effect Sensors Specifications	
Supply Voltage	5 V \pm 5%
Supply Current	50 mA
Output Type	Open Collector
Output Voltage	24 V max (pull up)
Output Current	5 mA (sinking)
Thermistor Specifications	
Polarity	Logic "0" (no fault)
	Logic "1" (over-temperature fault)
Cold Resistance	\sim 100 Ω
Hot Resistance	\sim 10 K
Note: 1K pull-up to +5V recommended.	
Encoder Specifications	
Supply Voltage	5 V \pm 5%
Supply Current	250 mA
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.)
	Digital Output (Incremental Encoder): RS422/485 compatible
	Serial Output (Absolute Encoder): Biss C (unidirectional)

Table 3-5: S-130-39-A Motor Specifications (for ASRT185DR)

		S-130-39
Performance Specifications (1,5)		
Winding Designation		-A
Stall Torque, Cont. (2)	N·m	2.36
Peak Torque (3)	N·m	9.42
Electrical Specifications (5)		
Winding Designation		-A
BEMF Const., line-line, Max	$V_{pk}/krpm$	75.1
Continuous Current, Stall (2)	A_{pk}	3.8
	A_{rms}	2.7
Peak Current, Stall (2)	A_{pk}	15.2
	A_{rms}	10.7
Torque Constant (4, 9)	$N·m/A_{pk}$	0.62
	$N·m/A_{rms}$	0.88
Motor Constant (2, 4)	$N·m/\sqrt{W}$	0.265
Resistance, 25°C, line-line	Ω	5.6
Inductance, line-line	mH	1.70
Maximum Bus Voltage	V_{DC}	340
Thermal Resistance	$^{\circ}C/W$	0.95
Number of Poles	--	18
<p>1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature</p> <p>2. Values shown @ 75°C rise above a 25 °C ambient temperature, with housed motor mounted to a 330 mm x 330 mm x 13 mm aluminum heat sink</p> <p>3. Peak force assumes correct rms current; consult Aerotech.</p> <p>4. Torque constant and motor constant specified at stall</p> <p>5. All performance and electrical specifications $\pm 10\%$</p> <p>6. Specifications given are for the motor only. When integrated into a housing with bearings additional losses should be considered.</p> <p>7. Maximum winding temperature is 100 °C (thermistor trips at 100 °C)</p> <p>8. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures</p> <p>9. All Aerotech amplifiers are rated A_{pk}; use torque constant in $N·m/A_{pk}$ when sizing</p>		

Table 3-6: S-180-44-B Motor Specifications (for ASRT245DR)

		S-180-44	
Performance Specifications (1,5)			
Winding Designation		-A	-B
Stall Torque, Cont. (2)	N·m	5.99	
Peak Torque (3)	N·m	23.98	
Electrical Specifications (5)			
Winding Designation		-A	-B
BEMF Const., line-line, Max	$V_{pk}/krpm$	268.7	134.4
Continuous Current, Stall (2)	A_{pk}	2.7	5.4
	A_{rms}	1.9	3.8
Peak Current, Stall (2)	A_{pk}	10.8	21.6
	A_{rms}	7.6	15.3
Torque Constant (4, 9)	$N·m/A_{pk}$	2.22	1.11
	$N·m/A_{rms}$	3.14	1.57
Motor Constant (2, 4)	$N·m/\sqrt{W}$	0.628	0.628
Resistance, 25°C, line-line	Ω	12.8	3.2
Inductance, line-line	mH	3.40	0.85
Maximum Bus Voltage	V_{DC}	340	
Thermal Resistance	°C/W	0.82	
Number of Poles	--	18	
<p>1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature</p> <p>2. Values shown @ 75°C rise above a 25 °C ambient temperature, with housed motor mounted to a 330 mm x 330 mm x 13 mm aluminum heat sink</p> <p>3. Peak force assumes correct rms current; consult Aerotech.</p> <p>4. Torque constant and motor constant specified at stall</p> <p>5. All performance and electrical specifications $\pm 10\%$</p> <p>6. Specifications given are for the motor only. When integrated into a housing with bearings additional losses should be considered.</p> <p>7. Maximum winding temperature is 100 °C (thermistor trips at 100 °C)</p> <p>8. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures</p> <p>9. All Aerotech amplifiers are rated A_{pk}; use torque constant in $N·m/A_{pk}$ when sizing</p>			

Table 3-7: S-240-43-A Motor Specifications (for ASRT300DR)

		S-240-43
Performance Specifications (1,5)		
Winding Designation		A
Stall Torque, Cont. (2)	N·m	10.73
Peak Torque (3)	N·m	42.90
Electrical Specifications (5)		
Winding Designation		A
BEMF Const., line-line, Max	$V_{pk}/krpm$	209.4
Continuous Current, Stall (2)	A_{pk}	6.2
	A_{rms}	4.4
Peak Current, Stall (2)	A_{pk}	24.8
	A_{rms}	17.5
Torque Constant (4, 9)	$N·m/A_{pk}$	1.73
	$N·m/A_{rms}$	2.45
Motor Constant (2, 4)	$N·m/\sqrt{W}$	0.845
Resistance, 25°C, line-line	Ω	4.3
Inductance, line-line	mH	2.15
Maximum Bus Voltage	V_{DC}	340
Thermal Resistance	$^{\circ}C/W$	0.47
Number of Poles	--	26
<p>1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature</p> <p>2. Values shown @ 75°C rise above a 25 °C ambient temperature, with housed motor mounted to a 330 mm x 330 mm x 13 mm aluminum heat sink</p> <p>3. Peak force assumes correct rms current; consult Aerotech.</p> <p>4. Torque constant and motor constant specified at stall</p> <p>5. All performance and electrical specifications $\pm 10\%$</p> <p>6. Specifications given are for the motor only. When integrated into a housing with bearings additional losses should be considered.</p> <p>7. Maximum winding temperature is 100 °C (thermistor trips at 100 °C)</p> <p>8. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures</p> <p>9. All Aerotech amplifiers are rated A_{pk}; use torque constant in $N·m/A_{pk}$ when sizing</p>		

Table 3-8: Encoder Specifications

Encoder Option	ASRT185DR	ASRT245DR	ASRT300DR
Fundamental	79.10 arc sec/count	54.91 arc sec/count	39.55 arc sec/count
with Quadrature	19.77 arc sec/count	13.72 arc sec/count	9.88 arc sec/count
x1000	0.079 arc sec/count	0.054 arc sec/count	0.039 arc sec/count
x4000	0.019 arc sec/count	0.013 arc sec/count	0.009 arc sec/count

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 3.5](#) 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 3-6](#) shows the machine direction of ASRT stages.

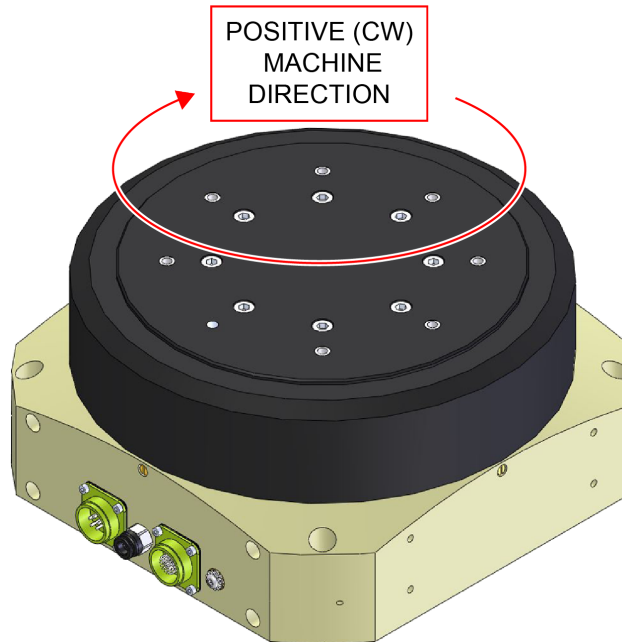


Figure 3-6: Machine Direction

3.5. Motor and Feedback Phasing

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

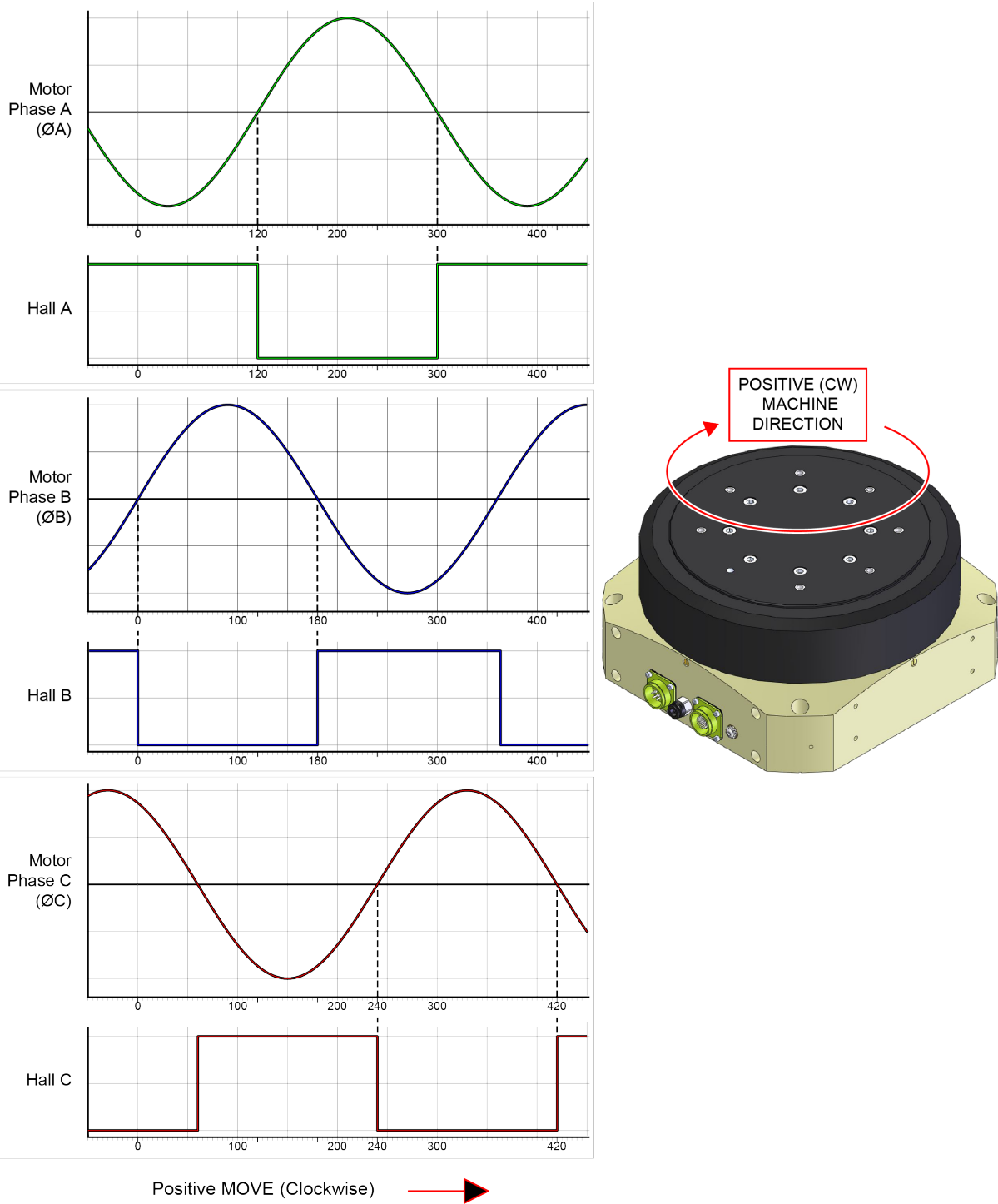


Figure 3-7: Hall Phasing

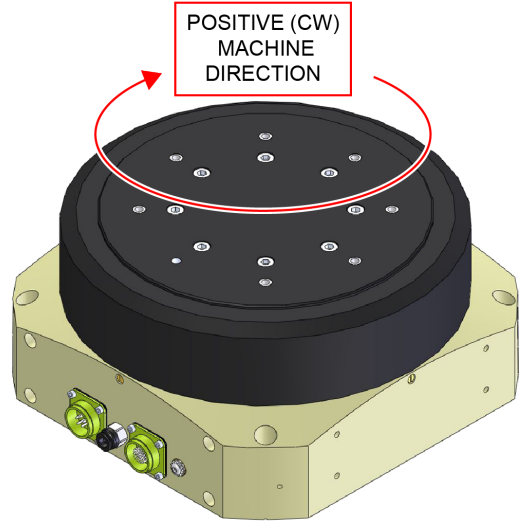
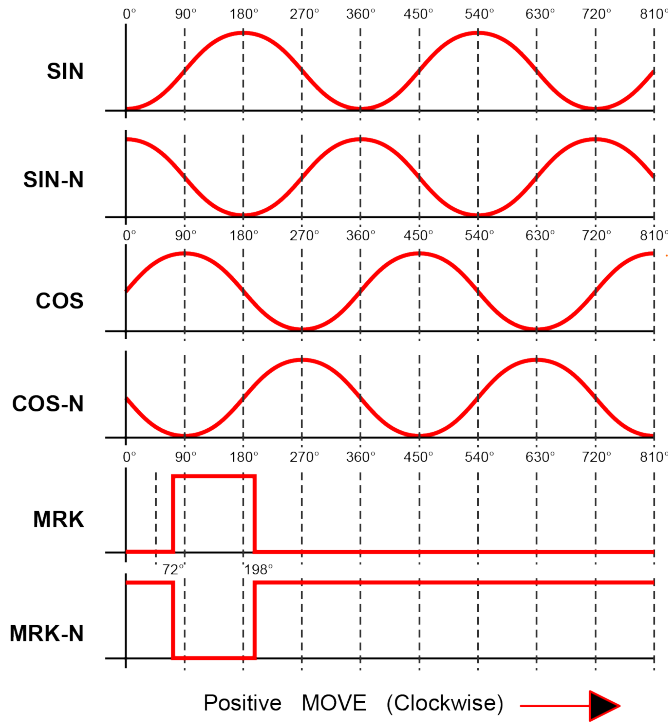


Figure 3-8: Analog Encoder Phasing Reference Diagram

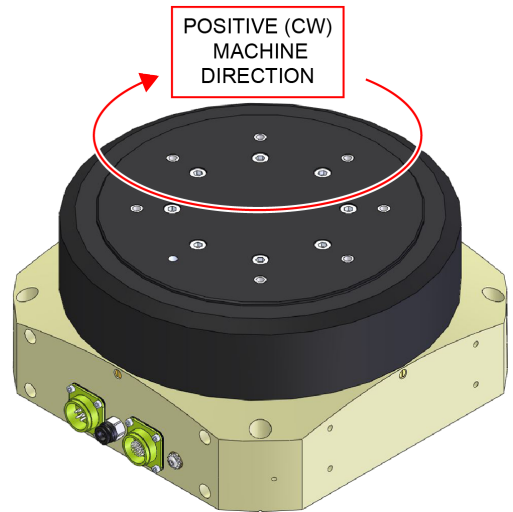
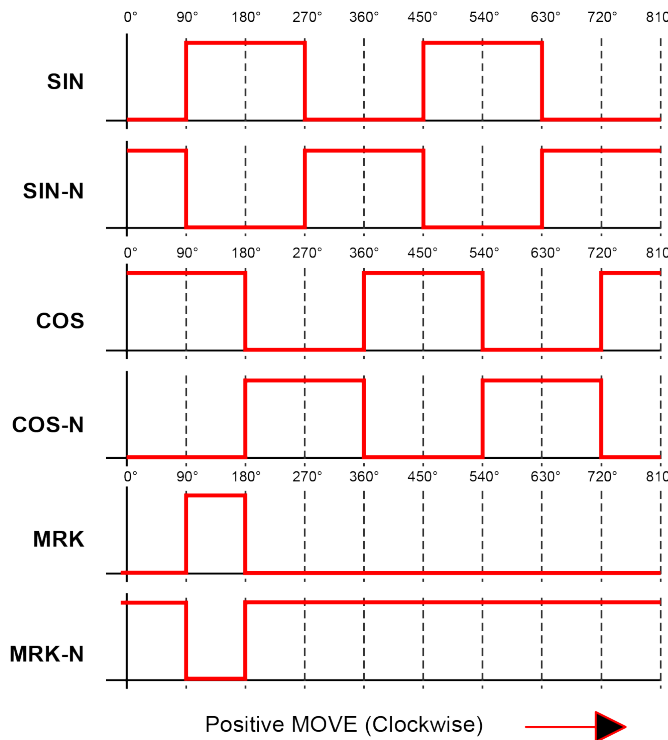


Figure 3-9: Encoder Phasing Reference Diagram (Standard)

Chapter 4: Maintenance

The ASRT series stages are designed to require minimum 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.

4.1. Service and Inspection Schedule

Inspect the ASRT once per month. A longer or shorter inspection interval may be required depending on the specific 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 ASRT and any components and cables as needed
- Repair any damage before operating the ASRT
- Inspect and perform an operational check on all safeguards and protective devices

4.1.1. Ground Brushes

Periodic inspection and replacement of the ground brushes is necessary to maintain adequate electrical protection. The grounding brushes differ depending on the options purchased.

ASRT Without Aperture: Plunger style spring loaded brushes are used with the standard ASRT rotary table. You can access them by removing the screws securing the housing rear cover. The brushes are located on the inside surface of the cover. Replace brushes if the brush stroke is less than 1/8". To replace a brush, remove the support bracket from the cover, loosen the set screws securing the brush assemblies, and slide the brushes out of the holder. Clean surrounding parts of brush debris with isopropyl alcohol and install new brushes.

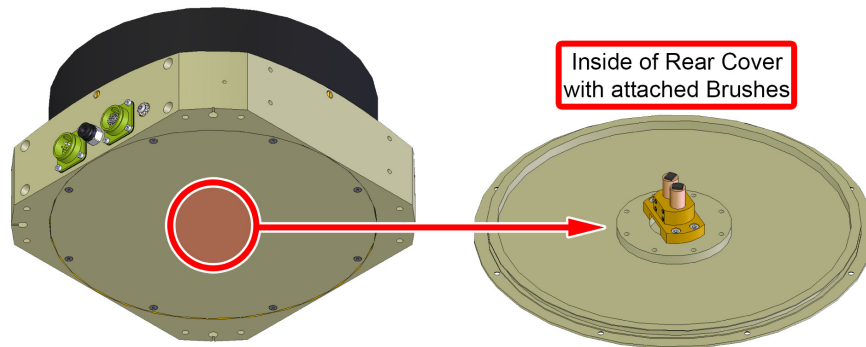


Figure 4-1: Rear Cover and Brushes Location

ASRT With Aperture: Leaf style spring loaded brushes are used with the ASRT rotary table with the aperture option. You can access them by removing the screws securing the shaft rear cover. The brushes are mounted to the inside surface of the rear housing. Replace brushes if the brush contact material is less than 1/16" thick. To replace a brush, remove the two screws securing each leaf spring brush. Clean surrounding parts of brush debris with isopropyl alcohol and install new brushes. Replace the rear shaft cover by applying pressure while twisting the cover. Insert screws but do not tighten them. Rotate the shaft one turn to make sure the cover does rub against the housing, and then tighten the screws.

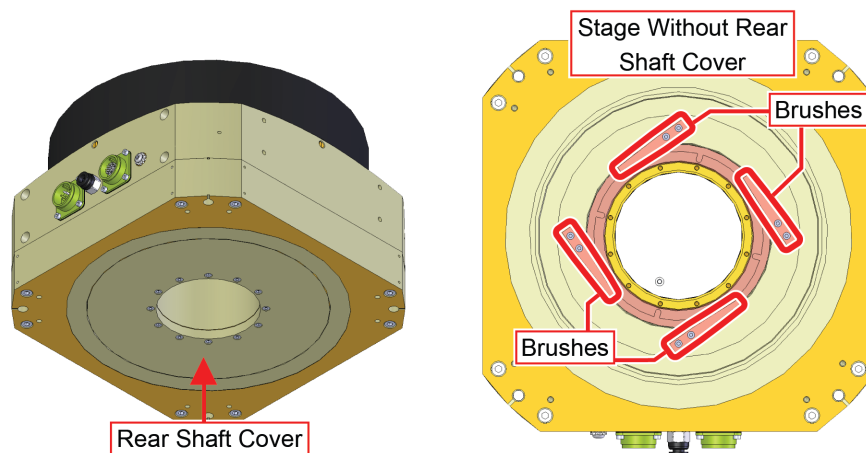


Figure 4-2: Rear Shaft Cover and Brushes Location

4.1.2. Drainage Plumbing

The ASRT rotary table has an internal channel to allow water buildup that can occur in some environments. You should purge water from this area by removing four drainage plugs located on the four sides of the ASRT housing (see [Figure 4-3](#)). Supply dry nitrogen at a minimum pressure of 10 psi to the interior of the stage by means of the factory supplied optional air purge fitting or by removing the 1/8 NPT plug (see [Figure 4-3](#)) and supplying nitrogen to the opening. Reinstall all plugs after flushing trapped water.

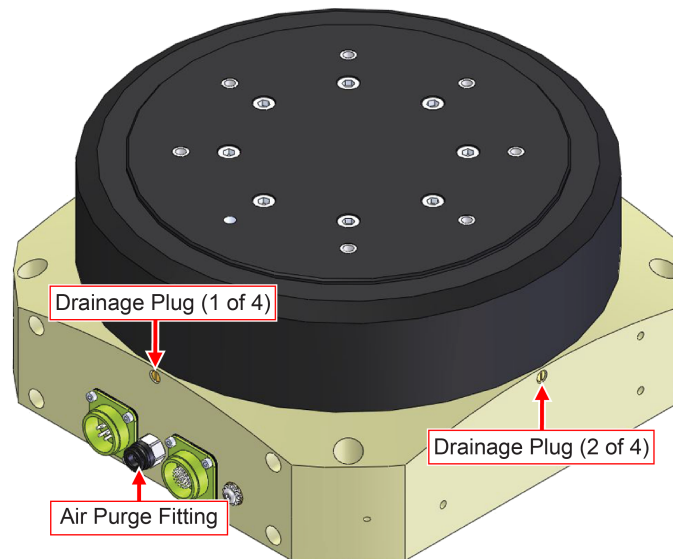


Figure 4-3: Drainage Plug Locations

4.1.3. Desiccant Cartridge

The desiccant inside the cartridge will become saturated over time, turning from blue to beige, depending on the humidity levels of the application. Saturated desiccant will need to be replaced or reconditioned. Remove the cartridge by removing the four M4 button head screws securing the unit on the side of the housing as shown in [Figure 4-4](#). The cartridge is sealed to the stage with a gasket between the housing and the cartridge flange. Refer to [Table 4-1](#) for desiccant and desiccant cartridge replacement part numbers. Recondition the desiccant by baking the beads at 450 °F for one hour or until the desiccant turns blue again.



WARNING: The cartridge is sealed via a gasket. The gasket must be in place between the cartridge flange and housing to assure adequate water jet and dust protection. Contact the factory for replacement if the gasket is damaged.

NOTE: If you have purchased the cover option, it must be removed before you can access the cartridge (refer to [Section 2.5](#) for cover removal).

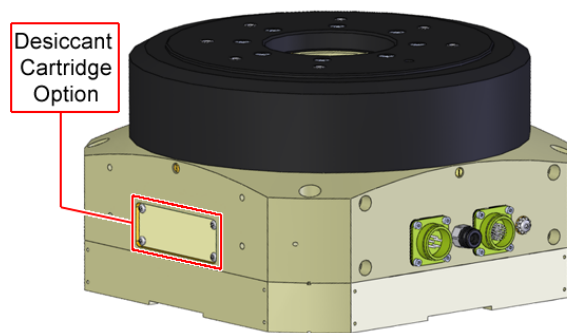


Figure 4-4: Desiccant Cartridge Option (ASRT shown with Vertical Axis of Rotation)

NOTE: When installing the desiccant cartridge (vertical axis of rotation) verify that the screen is facing downward. This will prevent water from collecting inside the cartridge saturating the desiccant.

Table 4-1: Desiccant Replacement

<p>Desiccant Type</p>	<p>Molecular Sieve</p> <ul style="list-style-type: none"> Type 4A (excludes molecules of effective diameter > 4Å) 4x8 Mesh Beaded Blue indicating Sodium alumina silicate with an inorganic metal salt moisture indicator. 	
<p>Aerotech P/Ns</p>	<p>MCA55623: Desiccant beads</p> <hr/> <p>MPH27012-01: Desiccant Cartridge Kit, ASRT185DR</p> <p>MPH27012-02: Desiccant Cartridge Kit, ASRT245DR</p> <p>MPH27012-03: Desiccant Cartridge Kit, ASRT300DR</p>	
<p>Manufacturer's P/N</p>	<p>LabSorbents mSORB® Item # L-4A48B-IMS-800GB</p>	

4.2. Cleaning and Lubrication



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.

Cleaning

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

Any external metal surface of the ASRT can be cleaned with isopropyl alcohol on a lint-free cloth.



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

Lubrication

There are no elements on ASRT stages that require lubrication.

4.3. Troubleshooting

This section provides some information regarding typical problems.

Table 4-2: Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	Controller trap or fault. See controller documentation.
Stage moves uncontrollably	Encoder (sine and cosine) signals connections. See Chapter 3 and Controller documentation. Motor Connections. See Chapter 3 and Controller documentation.
Stage oscillates or squeals	Gains misadjusted. See Controller documentation. Encoder signals. See Controller documentation.

Appendix A: Warranty and Field Service

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

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

Return Products Procedure

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

Visit <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 B: Revision History

Revision	General Information
1.01.00	Complete manual update for redesigned ASRT series
1.00.00	New Manual

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