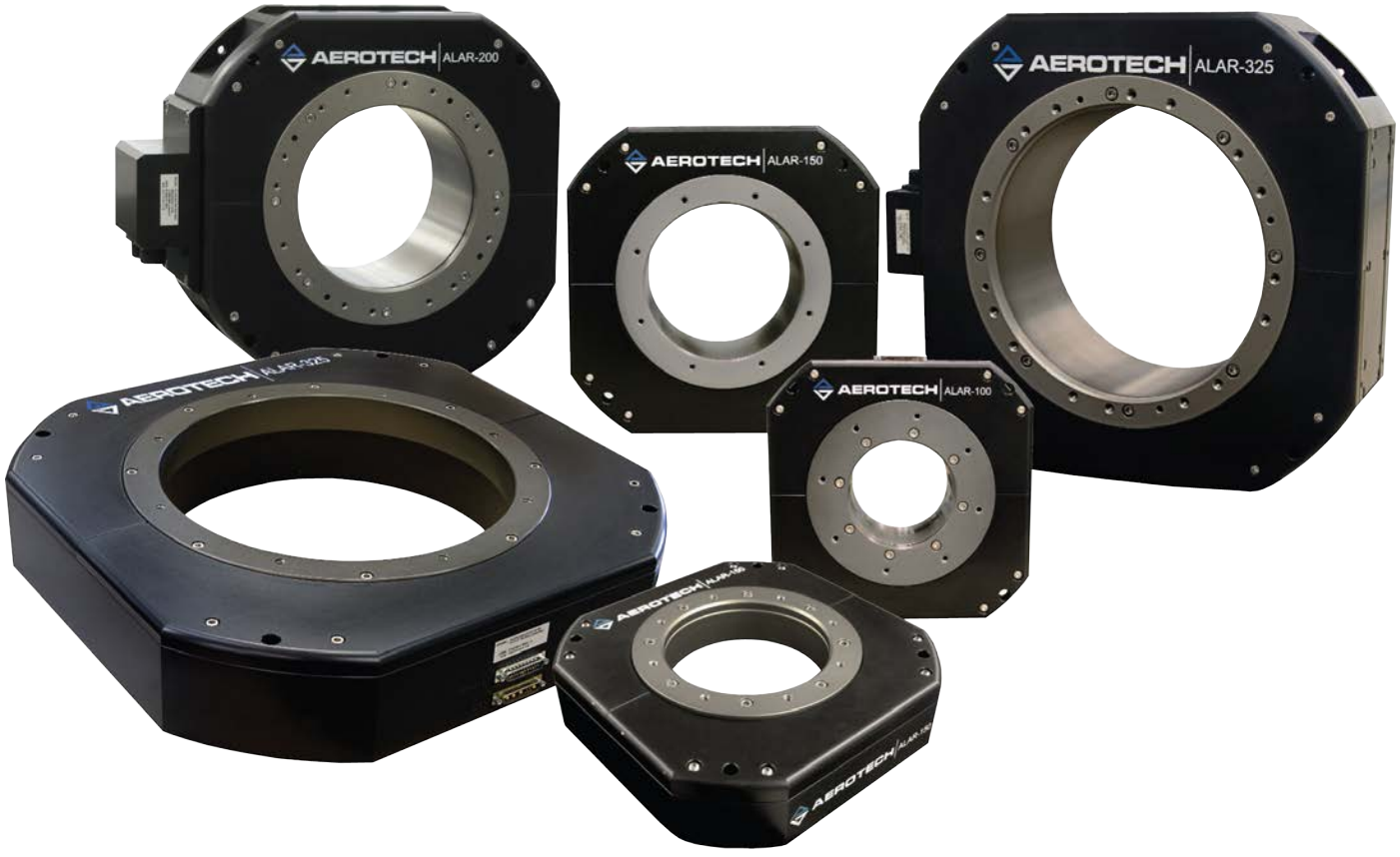
ALAR Hardware Manual

Revision: 1.09.00



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Safety Procedures and Warnings

This manual tells you how to carefully and correctly use and operate the ALAR. Read all parts of this manual before you install or operate the ALAR or before you do maintenance to your system. To prevent injury to you and damage to the equipment, obey the precautions in this manual. The precautions that follow apply when you see a Danger or Warning symbol in this manual. If you do not obey these precautions, injury to you or damage to the equipment can occur. If you do not understand the information in this manual, contact Aerotech Global Technical Support.

This product has been designed for light industrial manufacturing or laboratory environments. The protection provided by the equipment could be impaired if the product is used in a manner not specified by the manufacturer.

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 ALAR 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 ALAR stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.
5. Use care when moving the ALAR stage. Lifting or transporting the ALAR stage improperly can result in injury or damage to the ALAR.
6. 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.
7. Operators must be trained before operating this equipment.
8. All service and maintenance must be performed by qualified personnel.

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EU Declaration of Incorporation

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

herewith declares that the product:
ALAR 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, Ramsdell, Tadley
Hampshire RG26 5PR
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Position Engineer Verifying Compliance
Location Pittsburgh, PA
Date 7/24/2019

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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

ALAR Series Mechanical-Bearing Direct-Drive Rotary Stage	
ALAR100SP/LP	100 mm clear aperture
ALAR150SP/LP	150 mm clear aperture
ALAR200SP/LP	200 mm clear aperture
ALAR250SP/LP/XP	250 mm clear aperture
ALAR325SP/LP/XP	325 mm clear aperture
NOTE: LP stages are best for vertical axis applications. SP/XP stages are good for both horizontal and vertical applications.	
Motor (Required, SP and XP only)	
-M1	Standard motor
-M2	High power motor
NOTE: -M1 and -M2 motor options only apply to the 250 mm and 325 mm aperture SP and XP stages.	
Travel (Required)	
-	Continuous travel
-TR010	Limited travel, ±5 degrees
-TR020	Limited travel, ±10 degrees
-TR030	Limited travel, ±15 degrees
-TR060	Limited travel, ±30 degrees
-TR090	Limited travel, ±45 degrees
-TR120	Limited travel, ±60 degrees
-TR180	Limited travel, ±90 degrees
-TR240	Limited travel, ±120 degrees
-TR300	Limited travel, ±150 degrees
-TR340	Limited travel, ±170 degrees
Feedback (Required)	
-E1	Incremental encoder, 1 Vpp sine [SP/LP/XP]
-E2	Incremental encoder, x4 interpolation [SP/LP]
-E3	Incremental encoder, x20 interpolation [SP/LP]
-E4	Incremental encoder, x40 interpolation [SP/LP]
-E5	Incremental encoder, x100 interpolation [SP/LP]
-E6	Incremental encoder, x200 interpolation [SP/LP/XP]
-E7	Absolute encoder [SP/LP/XP]

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: 10° to 35° C (50° 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° 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 ALAR stages are not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
Use	Indoor use only

1.2. Accuracy and Temperature Effects

Aerotech products are designed for and built in a 20°C (68°F) environment. Extreme temperature changes could cause a decrease in performance or permanent damage to the ALAR. At a minimum, the environmental temperature must be controlled to within 0.25ºC per 24 hours to ensure the ALAR specifications are repeatable over an extended period of time. The severity of temperature effects on all specifications depends on many different environmental conditions, including how the ALAR 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: ALAR-SP Series Specifications (ALAR100SP, ALAR150SP, and ALAR200SP)

	ALAR100SP	ALAR150SP	ALAR200SP
Aperture	100 mm	150 mm	200 mm
Motor	Brushless Slotless		
Continuous Current	2.7 A_{pk}	6.2 A_{pk}	5.3 A_{pk}
	1.9 A_{rms}	4.4 A_{rms}	3.75 A_{rms}
Peak Current, Stall	10.8 A_{pk}	24.8 A_{pk}	34.8 A_{pk}
	7.6 A_{rms}	17.5 A_{rms}	24.6 A_{rms}
Bus Voltage	Up to 340 VDC		
Unlimited Travel	Yes		
Maximum Limited Travel	±170°		
Maximum Velocity @ 160 V Bus(1)	300 rpm	250 rpm	90 rpm
Maximum Acceleration	1364 rad/s^2	1330 rad/s^2	361 rad/s^2
Resolution (Minimum Incremental Motion)(2)	0.1 µrad (0.02 arc-sec)	0.08 µrad (0.016 arc-sec)	0.06 µrad (0.012 arc-sec)
Incremental Encoder Line Count	31,488 lines/rev	40,000 lines/rev	55,040 lines/rev
Maximum Torque	23.9 N·m	42.9 N·m	126.8 N·m
Continuous Torque	6.0 N·m	10.7 N·m	19.3 N·m
Stage Mass	16.3 kg	18.6 kg	40.4 kg
Stage Mass with Limits	17 kg	19.6 kg	43.1 kg
Shaft Inertia	0.022 kg·m^2	0.040 kg·m^2	0.320 kg·m^2
Shaft Inertia with Limits	0.026 kg·m^2	0.051 kg·m^2	0.359 kg·m^2
Axial Load	1550 N (348 lb)	1950 N (438 lb)	4675 N (1051 lb)
Radial Load	1350 N (303 lb)	1925 N (433 lb)	4775 N (1073 lb)
Moment Load	250 N·m	450 N·m	1600 N·m
Repeatability	±2.4 µrad (±0.5 arc sec)		
Accuracy(3)	±9.7 µrad (±2 arc sec)		
Tilt-Error Motion	9.7 µrad (2.0 arc sec)		

1. Square-wave digital encoder options will limit maximum speed below the listed value.
2. Resolution assumes -E1 encoder with 2000X controller multiplication.
3. Certified with each stage. Requires the use of an Aerotech controller.

Table 1-4: ALAR-SP Series Specifications (ALAR250SP and ALAR325SP)

	ALAR250SP-M1	ALAR250SP-M2	ALAR325SP-M1	ALAR325SP-M2
Aperture	250 mm		325 mm	
Motor	Brushless Slotless			
Continuous Current	5.3 A_{pk}	7.95 A_{pk}	5.1 A_{pk}	7.65 A_{pk}
	3.75 A_{rms}	5.62 A_{rms}	3.63 A_{rms}	5.41 A_{rms}
Peak Current, Stall	34.8 A_{pk}	52.2 A_{pk}	31.2 A_{pk}	46.8 A_{pk}
	24.6 A_{rms}	36.9 A_{rms}	22.1 A_{rms}	33.1 A_{rms}
Bus Voltage	Up to 340 VDC			
Unlimited Travel	Yes			
Maximum Limited Travel	±170°			
Maximum Velocity(1)	140 rpm		150 rpm	
Maximum Acceleration	287 rad/s^2		185 rad/s^2	
Resolution (Minimum Incremental Motion)(2)	0.05 µrad (0.01 arc-sec)		0.04 µrad (0.009 arc-sec)	
Incremental Encoder Line Count	64,800 lines/rev		76,800 lines/rev	
Maximum Torque	137.8 N·m	206.7 N·m	213.8 N·m	320.8 N·m
Continuous Torque	21.0 N·m	31.5 N·m	35.0 N·m	52.4 N·m
Stage Mass	51.3 kg		61.2 kg	
Stage Mass with Limits	54.5 kg		64.9 kg	
Shaft Inertia	0.500 kg·m^2		1.01 kg·m^2	
Shaft Inertia with Limits	0.573 kg·m^2		1.2 kg·m^2	
Axial Load	4950 N (1113 lb)		5825 N (1310 lb)	
Radial Load	5200 N (1169 lb)		6650 N (1495 lb)	
Moment Load	1825 N·m		2650 N·m	
Repeatability	±2.4 µrad (±0.5 arc sec)			
Accuracy(3)	±9.7 µrad (±2 arc sec)			
Tilt-Error Motion	9.7 µrad (2.0 arc sec)			

1. Square-wave digital encoder options will limit maximum speed below the listed value.
2. Resolution assumes -E1 encoder with 2000X controller multiplication.
3. Certified with each stage.Requires the use of an Aerotech controller.

Table 1-5: ALAR-LP Series Specifications (ALAR100LP, ALAR150LP, and ALAR200LP)

	ALAR100LP	ALAR150LP	ALAR200LP
Aperture	100 mm	150 mm	200 mm
Motor	Brushless Slotless		
Continuous Current	5.76 A_{pk}	5.41 A_{pk}	5.3 A_{pk}
	4.1 A_{rms}	4.1 A_{rms}	3.75 A_{rms}
Peak Current, Stall	33.5 A_{pk}	31.4 A_{pk}	34.8 A_{pk}
	23.7 A_{rms}	22.2 A_{rms}	24.6 A_{rms}
Bus Voltage	Up to 340 VDC		
Unlimited Travel	Yes		
Maximum Limited Travel	±170°		
Maximum Velocity @ 160 V Bus(1)	50 rpm	45 rpm	90 rpm
Maximum Acceleration	1009 rad/s^2	829 rad/s^2	570 rad/s^2
Resolution (Minimum Incremental Motion)(2)	0.1 µrad (0.02 arc-sec)	0.09 µrad (0.018 arc-sec)	0.07 µrad (0.015 arc-sec)
Incremental Encoder Line Count	31,488 lines/rev	36,000 lines/rev	47,200 lines/rev
Maximum Torque	17.5 N·m	22.9 N·m	126.8 N·m
Continuous Torque	3.0 N·m	4.0 N·m	19.3 N·m
Stage Mass	8.3 kg	9.8 kg	28.2 kg
Stage Mass with Limits	8.9 kg	10.8 kg	30.1 kg
Shaft Inertia	0.022 kg·m^2	0.031 kg·m^2	0.190 kg·m^2
Shaft Inertia with Limits	0.026 kg·m^2	0.042 kg·m^2	0.229 kg·m^2
Axial Load	1175 N (264 lb)	1325 N (298 lb)	4350 N (978 lb)
Radial Load	950 N (214 lb)	1275 N (287 lb)	4125 N (927 lb)
Moment Load(3)	150 N·m	225 N·m	1075 N·m
Repeatability	±2.4 µrad (±0.5 arc sec)		
Accuracy(4)	±9.7 µrad (±2 arc sec)		
Tilt-Error Motion	19.4 µrad (4.0 arc sec)		

1. Square-wave digital encoder options will limit maximum speed below the listed value.
2. Resolution assumes -E1 encoder with 2000X controller multiplication.
3. The ALAR-LP base must be fully supported by a rigid mounting plate to achieve this moment load.
4. Certified with each stage.Requires the use of an Aerotech controller.

Table 1-6: ALAR-LP Series Specifications (ALAR250LP and ALAR325LP)

	ALAR250LP	ALAR325LP
Aperture	250 mm	325 mm
Motor	Brushless Slotless	
Continuous Current	5.3 A_{pk}	5.1 A_{pk}
	3.75 A_{rms}	3.63 A_{rms}
Peak Current, Stall	34.8 A_{pk}	31.2 A_{pk}
	24.6 A_{rms}	22.1 A_{rms}
Bus Voltage	Up to 340 VDC	
Unlimited Travel	Yes	
Maximum Limited Travel	±170°	
Maximum Velocity(1)	90 rpm	120 rpm
Maximum Acceleration	407 rad/s^2	339 rad/s^2
Resolution (Minimum Incremental Motion)(2)	0.05 µrad (0.01 arc-sec)	0.04 µrad (0.009 arc-sec)
Incremental Encoder Line Count	55,040 lines/rev	64,800 lines/rev
Maximum Torque	147.9 N·m	213.8 N·m
Continuous Torque	22.5 N·m	35.0 N·m
Stage Mass	35.0 kg	44.5 kg
Stage Mass with Limits	37.4 kg	49.9 kg
Shaft Inertia	0.310 kg·m^2	0.55 kg·m^2
Shaft Inertia with Limits	0.383 kg·m^2	0.675 kg·m^2
Axial Load	4950 N (1113 lb)	5825 N (1310 lb)
Radial Load	5050 N (1135 lb)	6450 N (1450 lb)
Moment Load(3)	1475 N·m	2200 N·m
Repeatability	±2.4 µrad (±0.5 arc sec)	
Accuracy(4)	±9.7 µrad (±2 arc sec)	
Tilt-Error Motion	19.4 µrad (4.0 arc sec)	

1. Square-wave digital encoder options will limit maximum speed below the listed value.
2. Resolution assumes -E1 encoder with 2000X controller multiplication.
3. The ALAR-LP base must be fully supported by a rigid mounting plate to achieve this moment load.
4. Certified with each stage. Requires the use of an Aerotech controller.

Table 1-7: ALAR-XP Series Specifications (ALAR250XP and ALAR325XP)

	ALAR250XP-M1	ALAR250XP-M2	ALAR325XP-M1	ALAR325XP-M2
Travel	Continuous (Limited Travel options up to 340° max)			
Aperture	250 mm		325 mm	
Motor	Brushless Slotless			
Continuous Current	11.2 A_{pk}	14.9 A_{pk}	11.3 A_{pk}	15.1 A_{pk}
	7.9 A_{rms}	10.6 A_{rms}	8.0 A_{rms}	10.7 A_{rms}
Peak Current, Stall	95.7 A_{pk}	127.6 A_{pk}	87.8 A_{pk}	117.1 A_{pk}
	67.7 A_{rms}	90.2 A_{rms}	62.1 A_{rms}	82.8 A_{rms}
Bus Voltage	up to 340 VDC			
Resolution (Minimum Incremental Motion)(1)	0.05 µrad (0.01 arc sec)		0.04 µrad (0.009 arc sec)	
Incremental Encoder Line Count	64,800 lines/rev		76,800 lines/rev	
Accuracy(2)	±9.7 µrad (±2 arc sec)			
Bidirectional Repeatability	±2.4 µrad (±0.5 arc sec)			
Tilt-Error Motion	9.7 µrad (2.0 arc sec)			
Maximum Speed(3)	180 rpm		100 rpm	
Maximum Acceleration	500 rad/s^2	700 rad/s^2	400 rad/s^2	550 rad/s^2
Maximum Torque	548.6 N·m	731.5 N·m	833.0 N·m	1110.7 N·m
Continuous Torque	64.2 N·m	85.6 N·m	107.4 N·m	143.1 N·m
Axial Load	4950 N		5825 N	
Radial Load	5200 N		6650 N	
Moment Load	1825 N·m		2650 N·m	
Shaft Inertia	0.89 kg·m^2		1.71 kg·m^2	
Shaft Inertia with Limits	0.96 kg·m^2		1.82 kg·m^2	
Stage Mass	100 kg	104 kg	125 kg	130 kg
Stage Mass with Limits	104 kg	108 kg	129 kg	134 kg

1. Resolution assumes -E1 encoder with 2000X controller multiplication.
2. Certified with each stage. Requires the use of an Aerotech controller.
3. Maximum speed assumes a bus voltage of 320 VDC.

1.4. Vacuum Operation

Contact the factory for information regarding operation in a vacuum environment.

Preparation and considerations for operation in a vacuum environment:

- Lubrication with vacuum-compatible lubricants
- Use of materials, fasteners, and coatings with vacuum outgas performance compatible with the level of vacuum specified
- For high vacuum stages, elimination of situations that may allow gases to become temporarily trapped during pump down
- Extensive cleaning prior to assembly in a clean environment and packaging in a special polyethylene bag
- Use of components able to withstand elevated temperatures (non-operating) for bake-out performances

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.

Chapter 2: Mechanical Specifications and Installation

WARNING: ALAR 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: Unassisted lifting could cause injury.

- Use lifting aids and proper lifting techniques when moving or placing.
- ALAR200, 250, and 325: Mechanical lift only.
- Do not use any of the cables as lifting points.

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 ALAR. Unsecured moving parts may shift and cause bodily injury.
- Improper handling could adversely affect the performance of the ALAR. Use care when moving the ALAR.

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

Lifting Instructions

Manually lifting or moving a stage that exceeds 18 kg [40 lbs] is not recommended. Refer to Section 1.3. for stage mass specifications. Smaller stages can be lifted at the base, by their sides.

Larger stages (200, 250, or 325 models) should be lifted the factory installed eye bolts. Refer to Figure 2-1.

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

Before operating the ALAR, 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 ALAR 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.

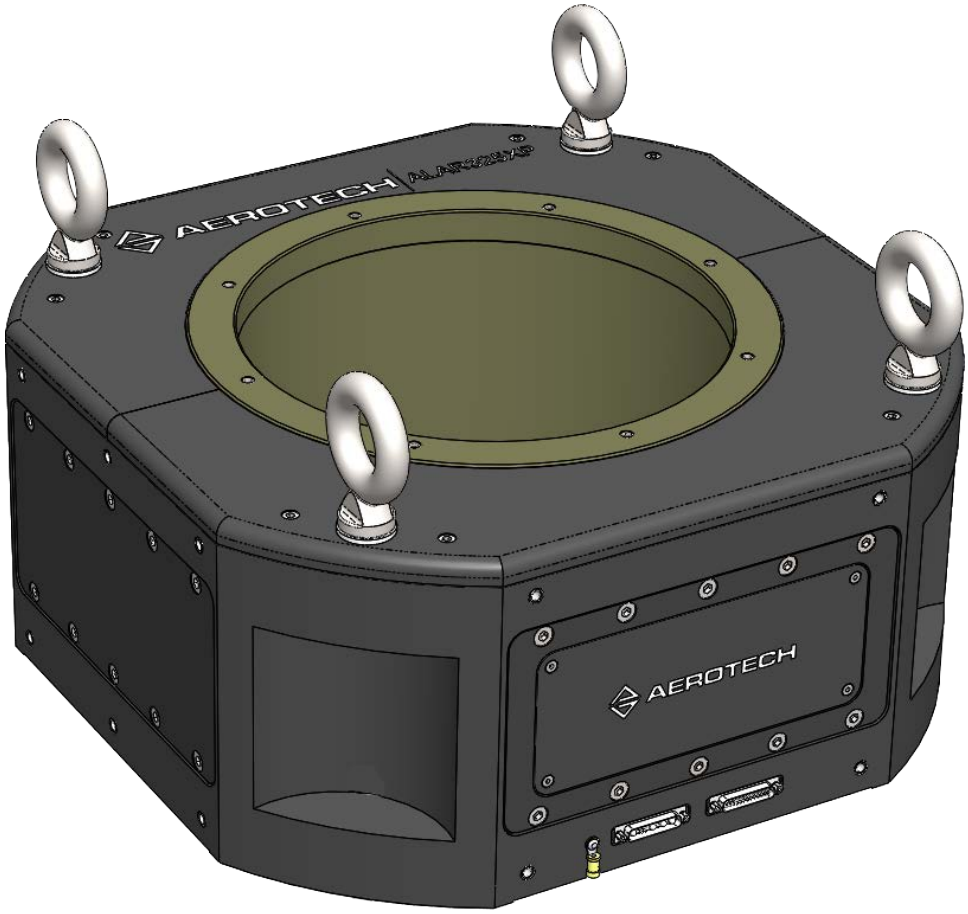


Figure 2-1: ALAR with Lifting Bolts

2.2. Dimensions

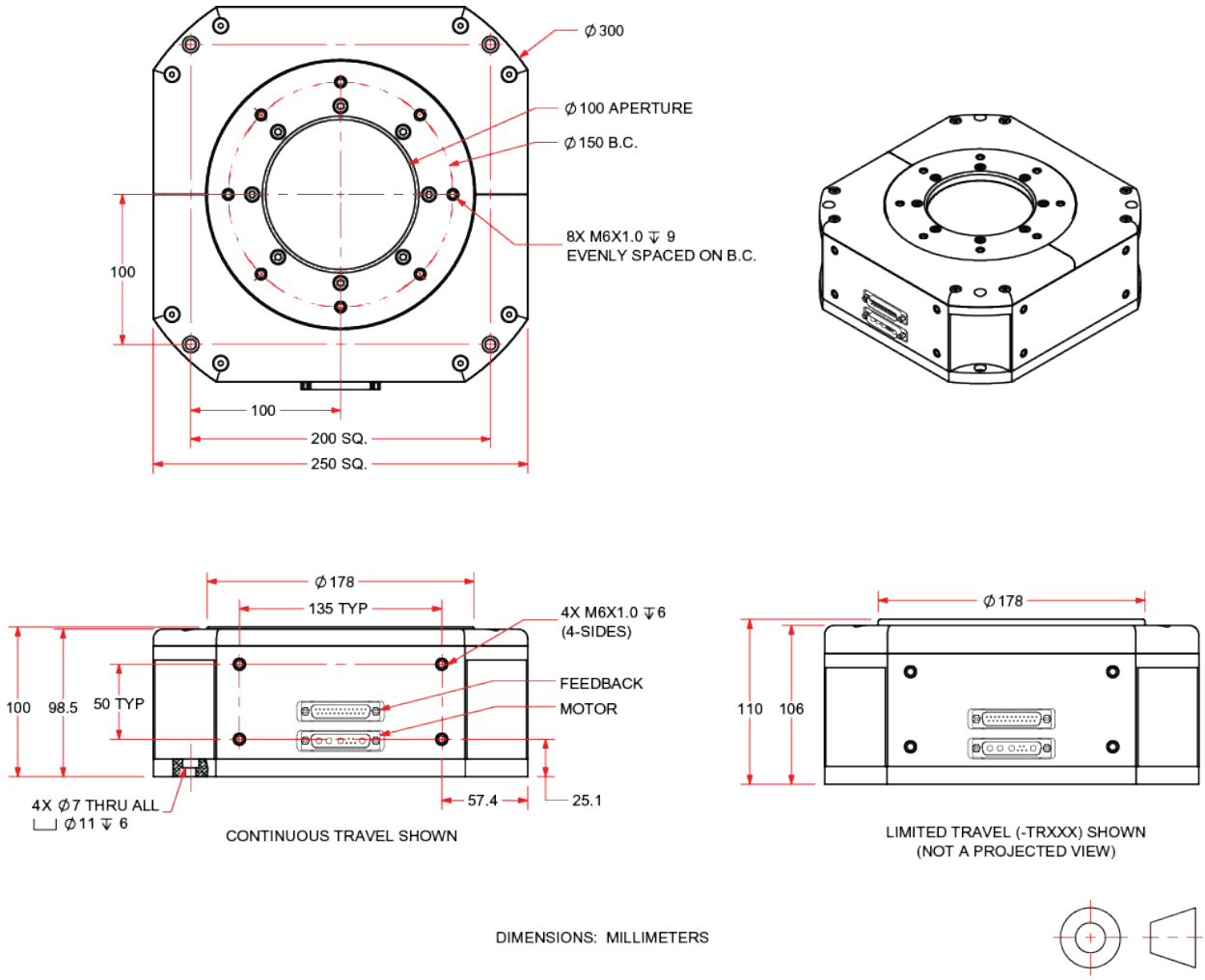


Figure 2-2: ALAR100SP Dimensions

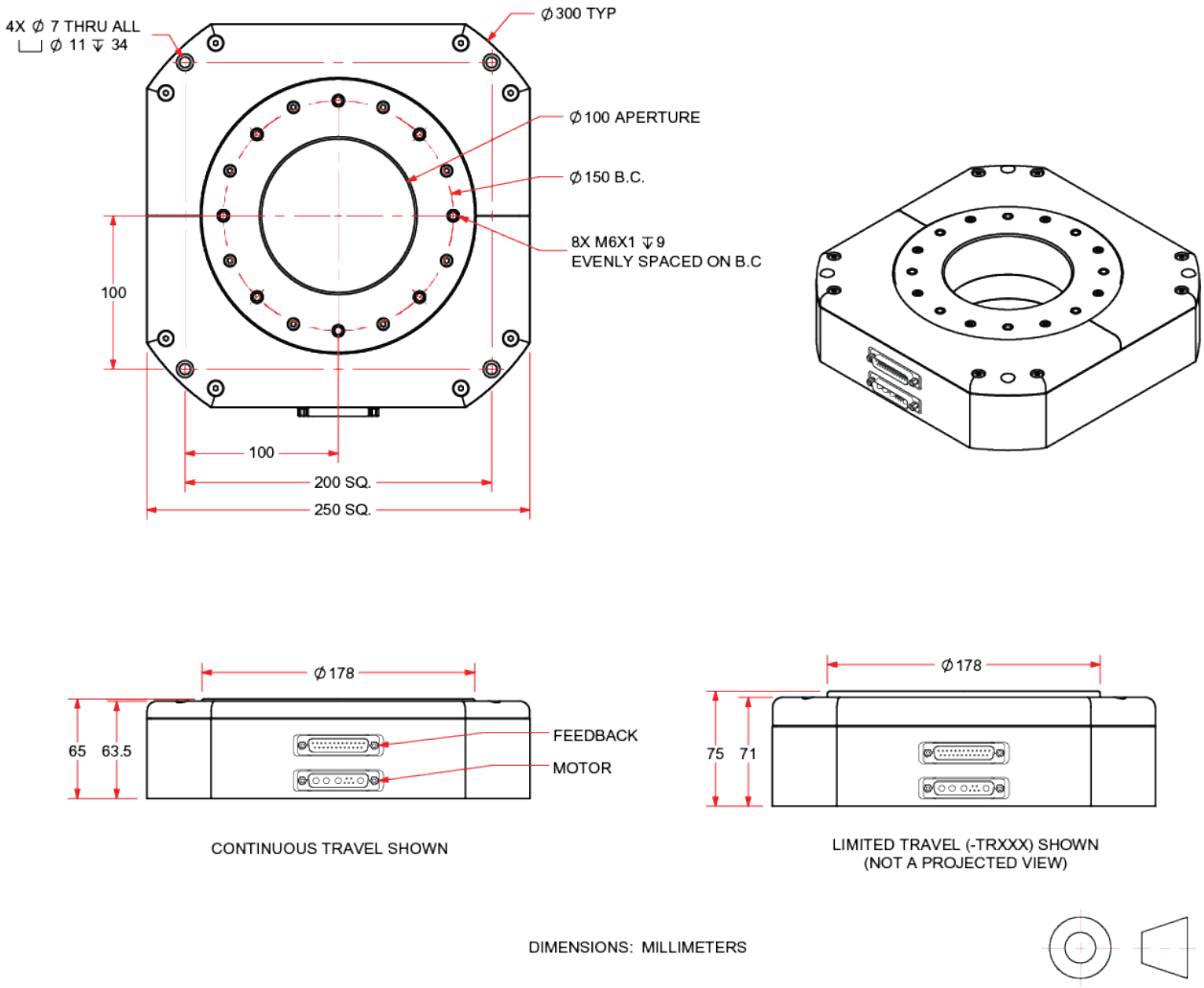


Figure 2-3: ALAR100LP Dimensions

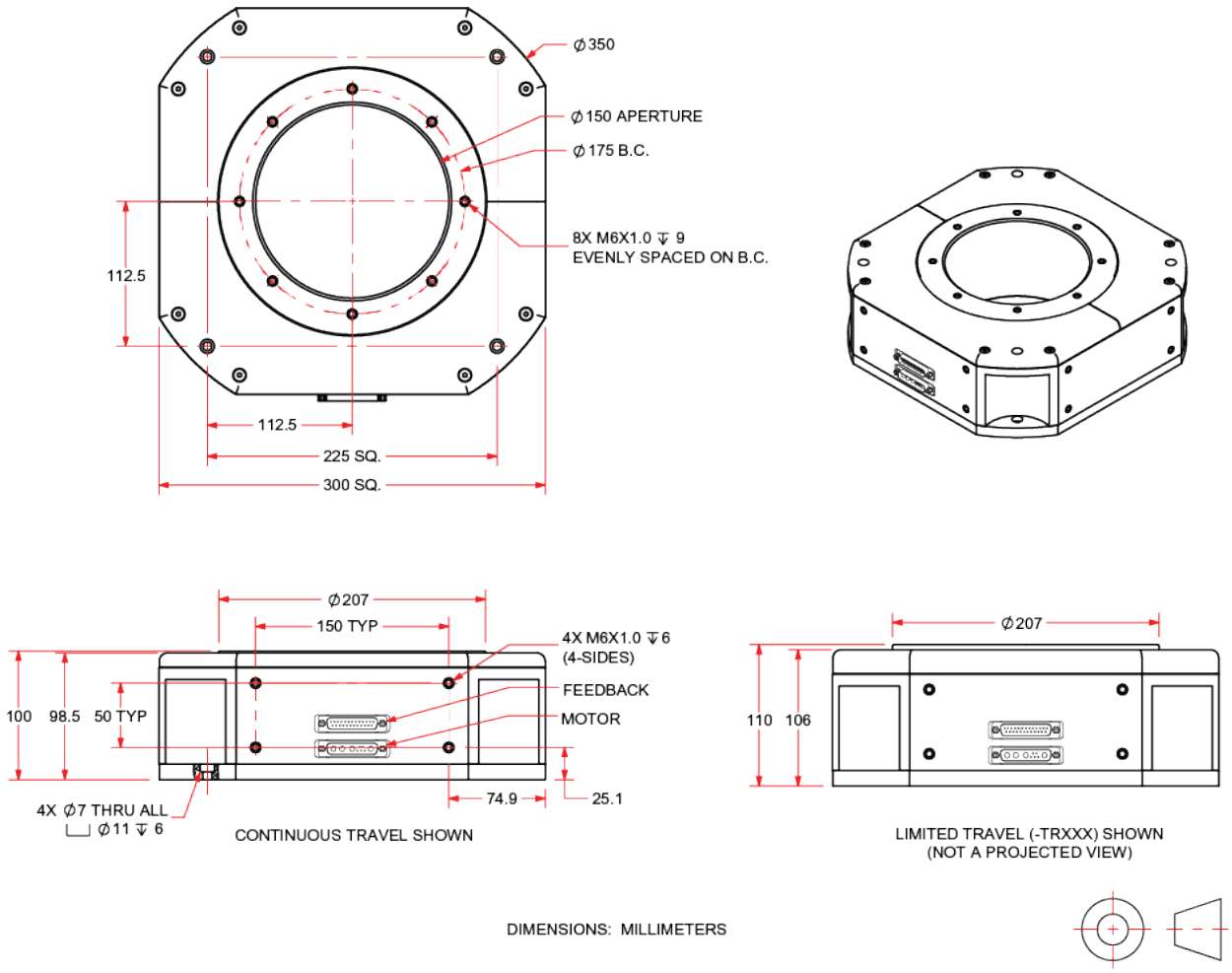


Figure 2-4: ALAR150SP Dimensions

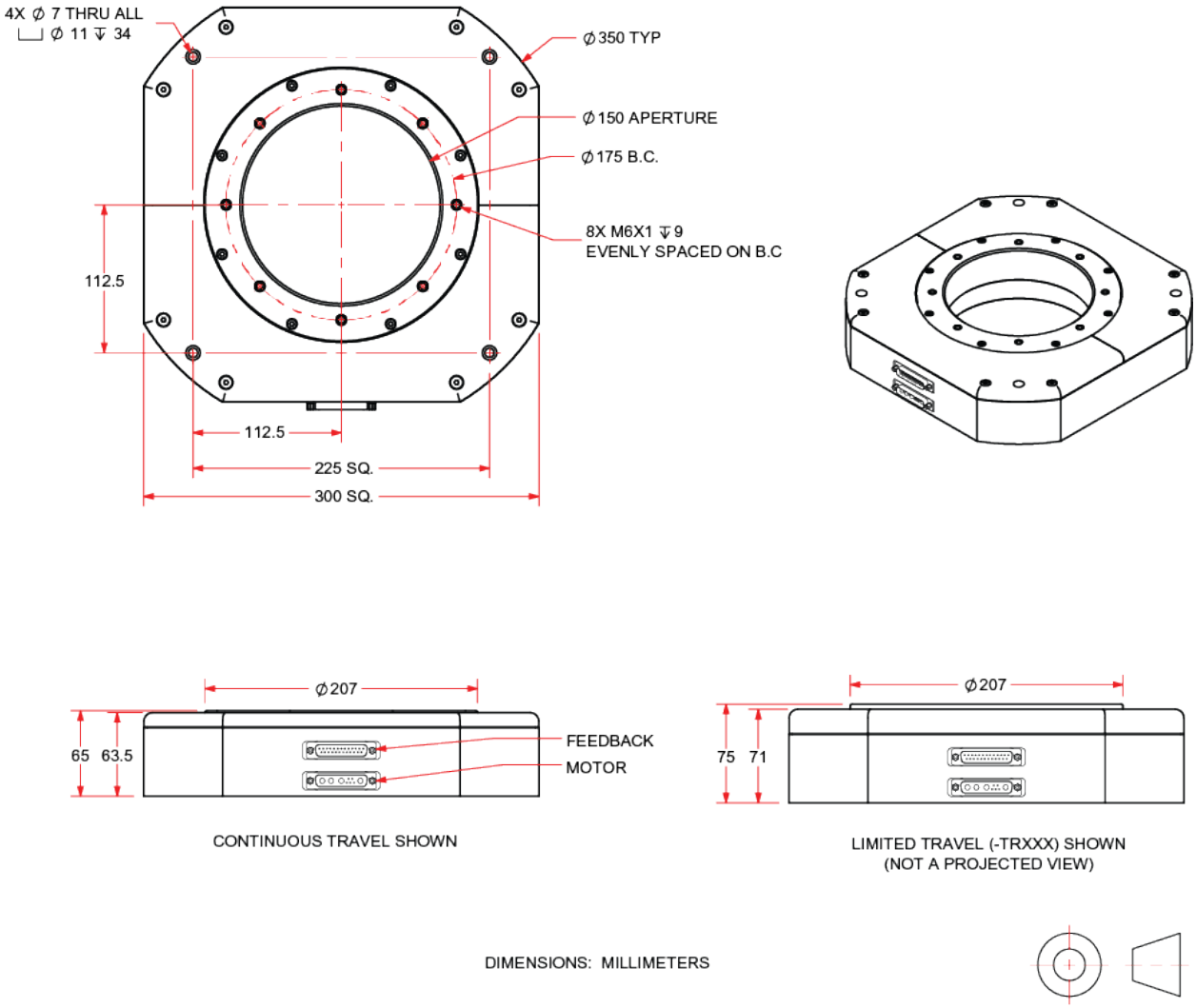


Figure 2-5: ALAR150LP Dimensions

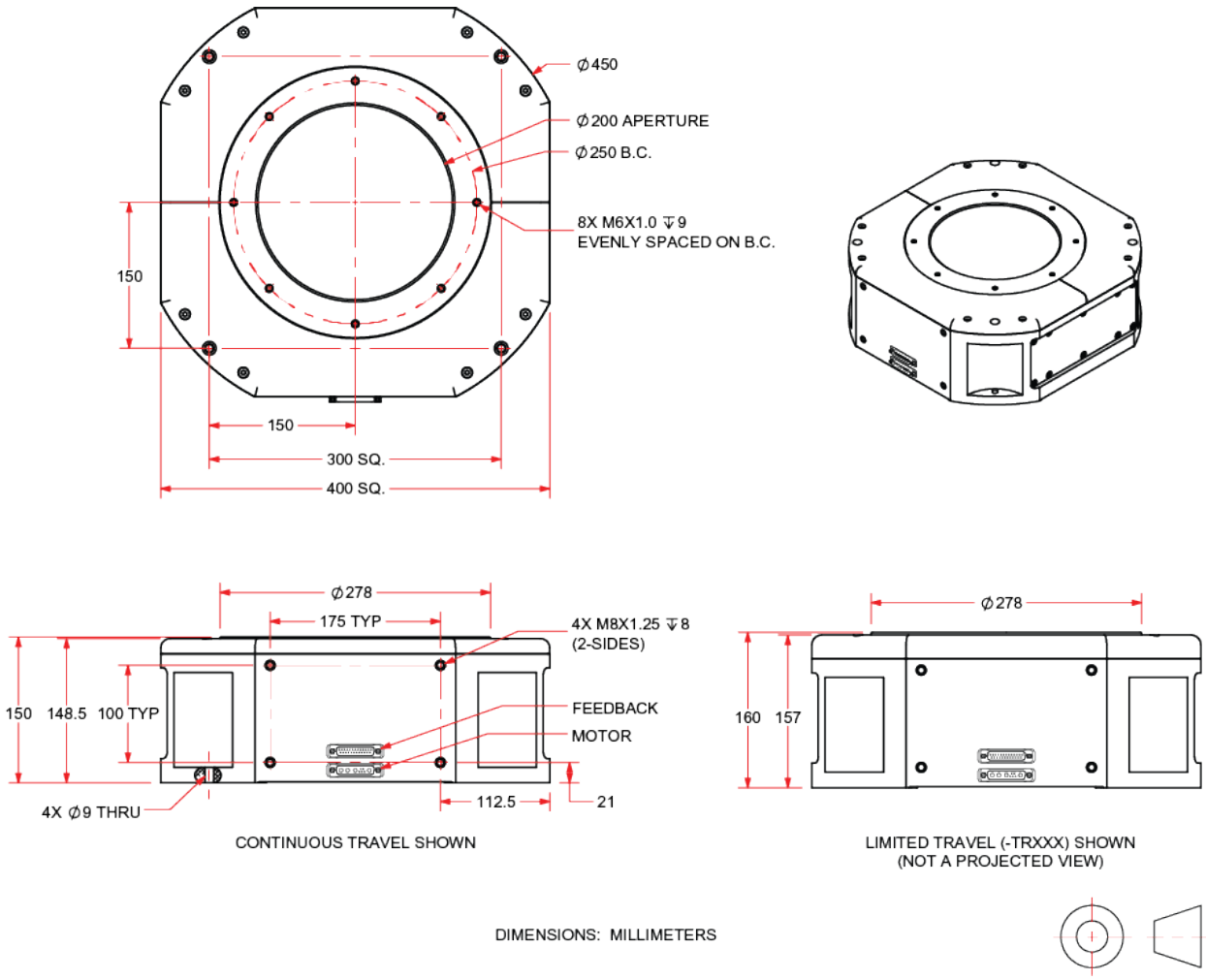


Figure 2-6: ALAR200SP Dimensions

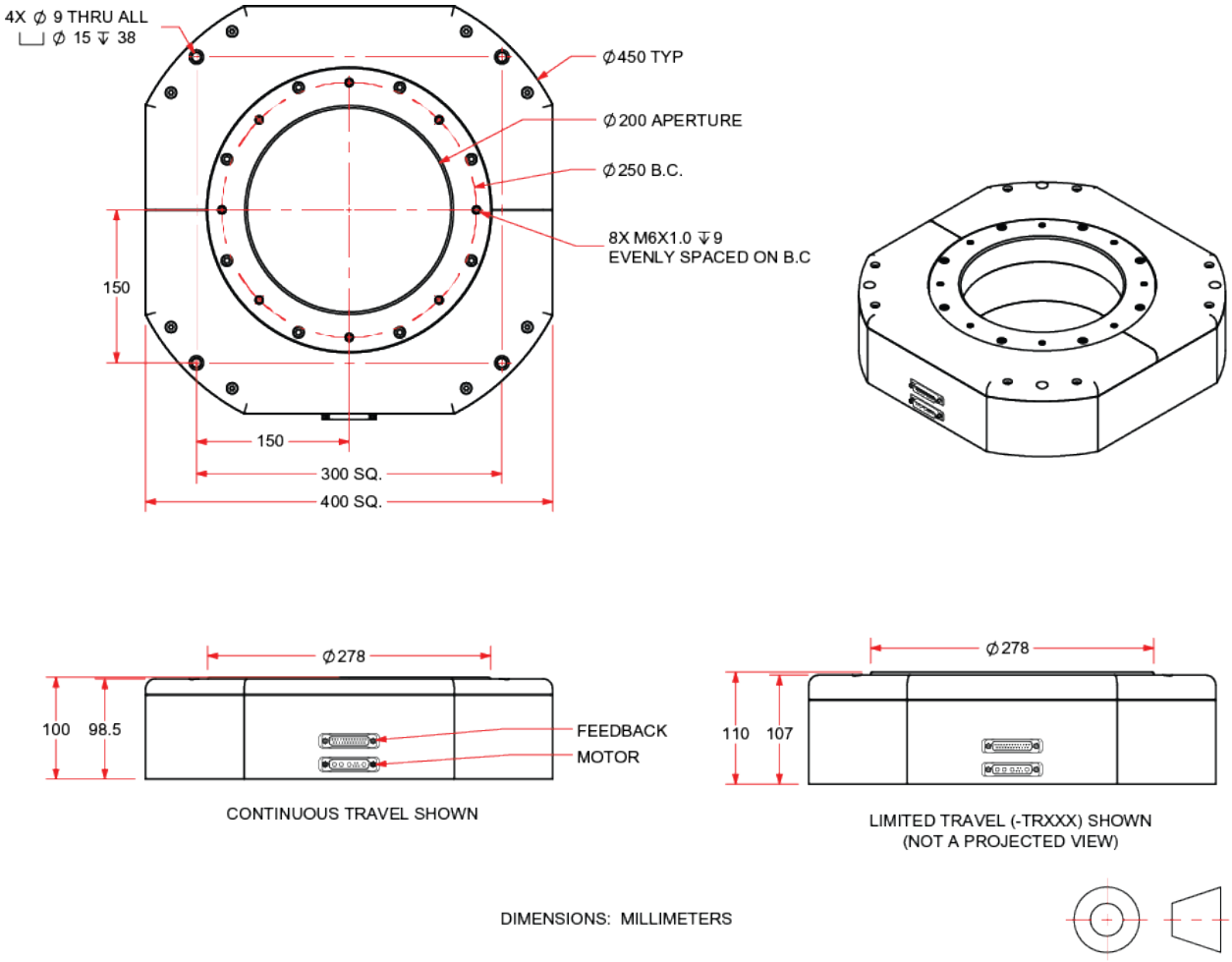


Figure 2-7: ALAR200LP Dimensions

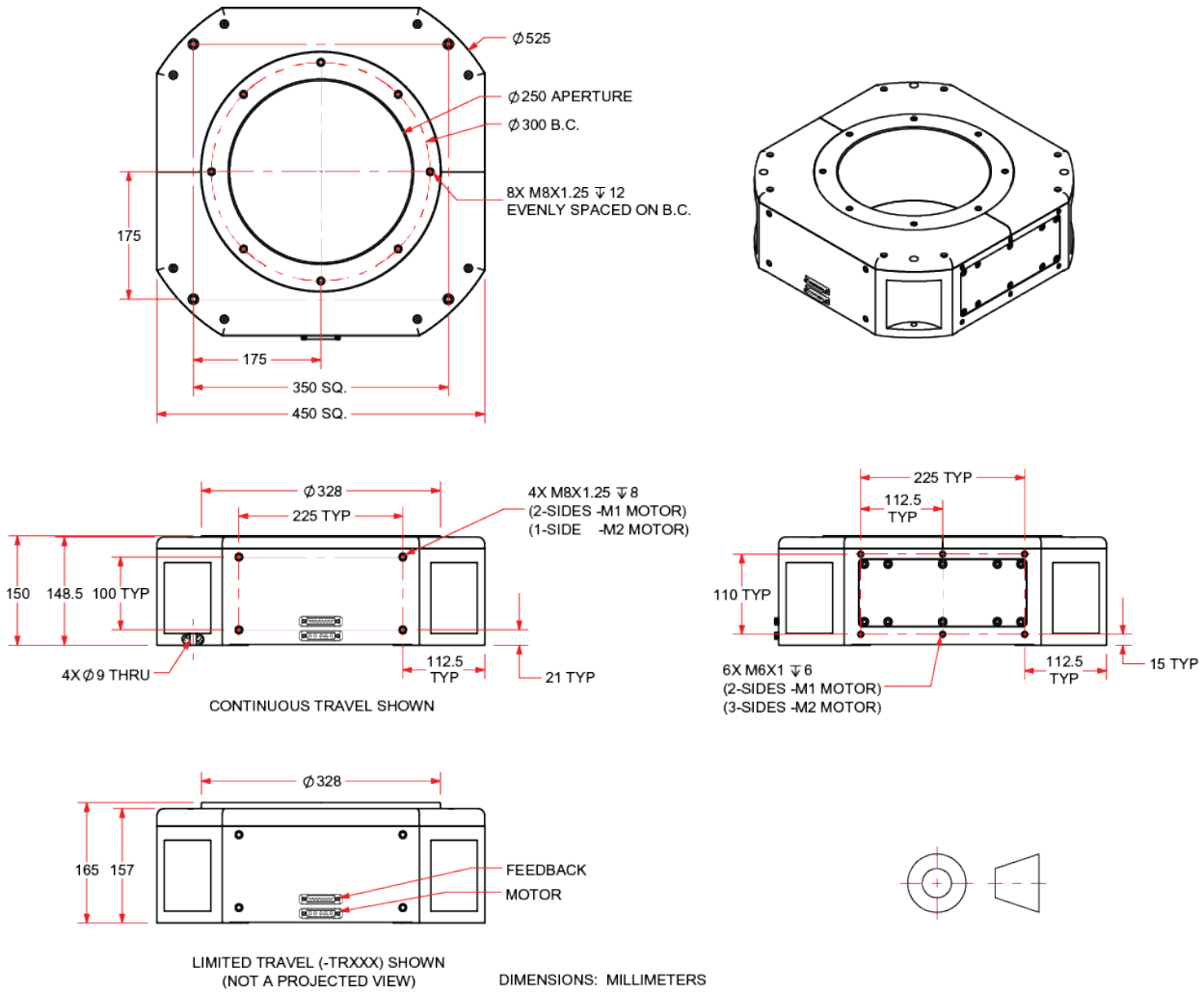


Figure 2-8: ALAR250SP Dimensions

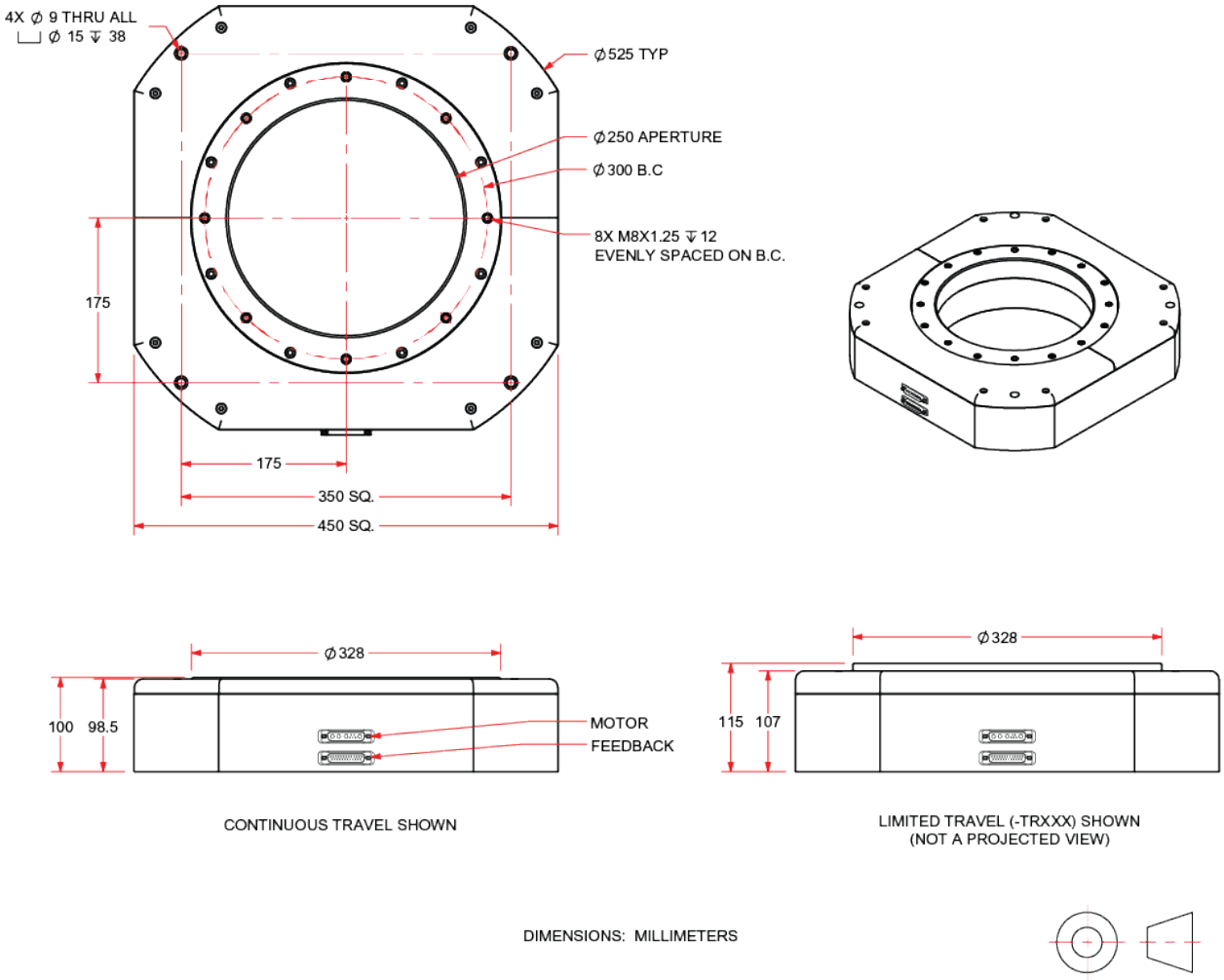


Figure 2-9: ALAR250LP Dimensions

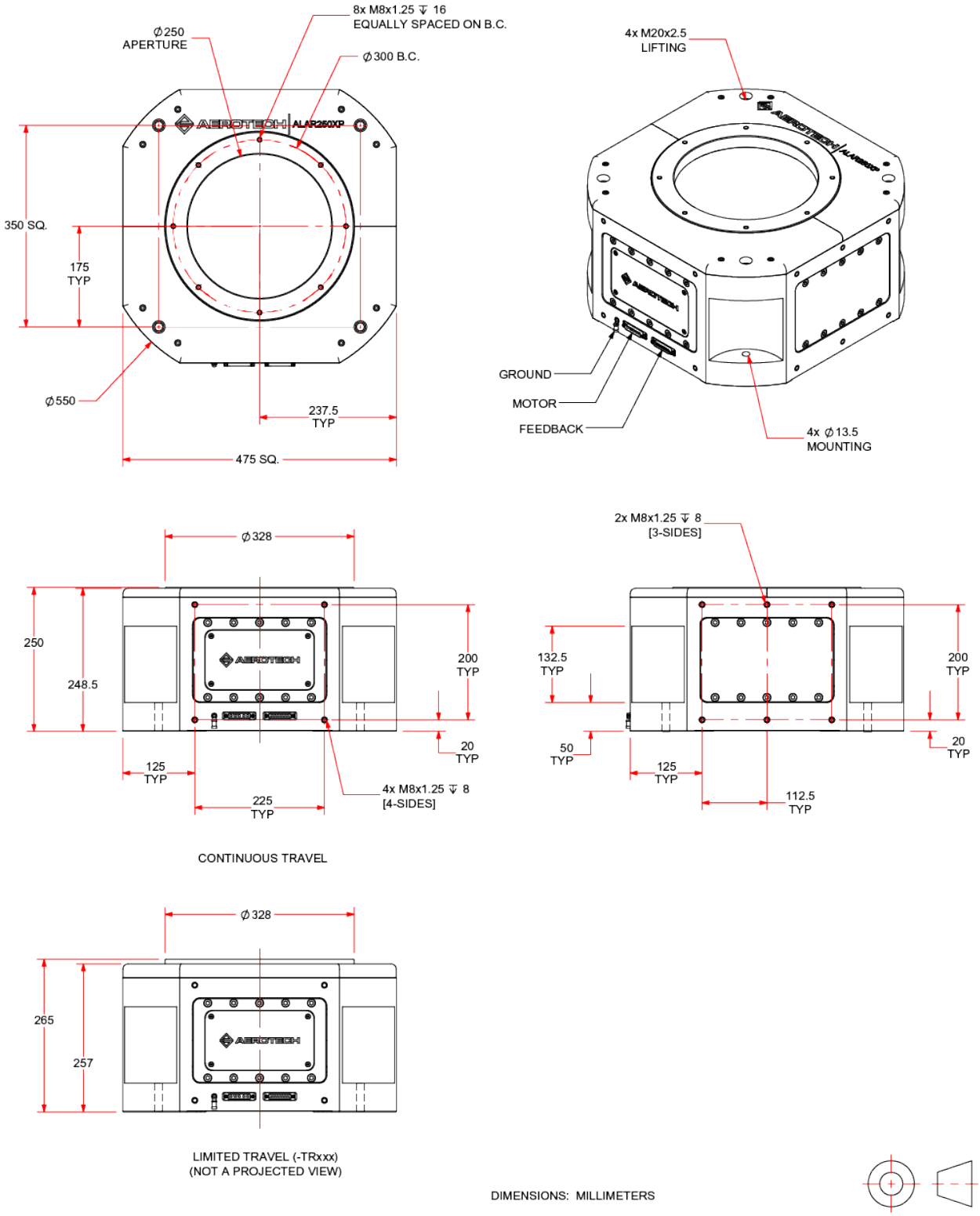


Figure 2-10: ALAR250XP Dimensions

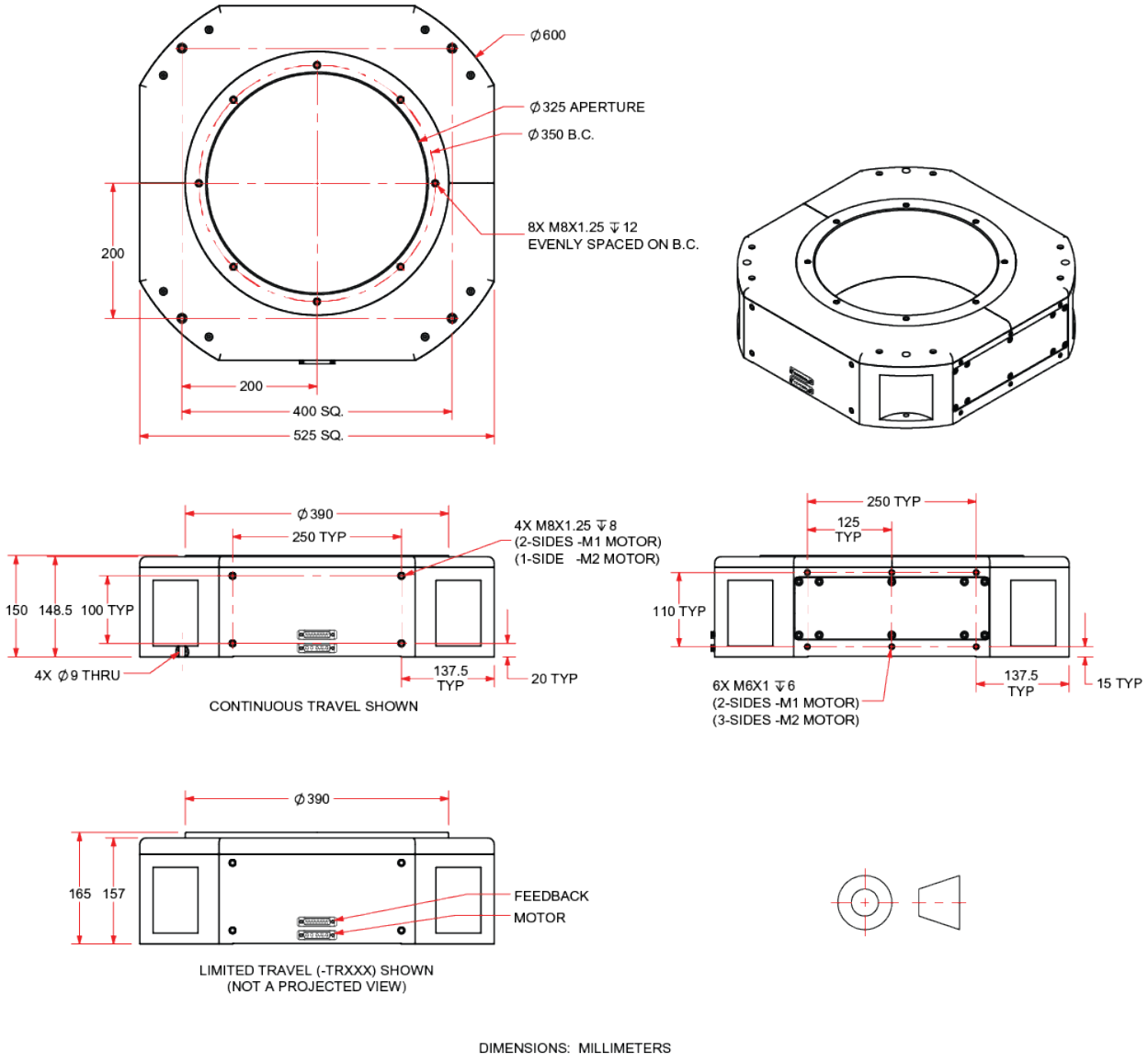


Figure 2-11: ALAR325SP Dimensions

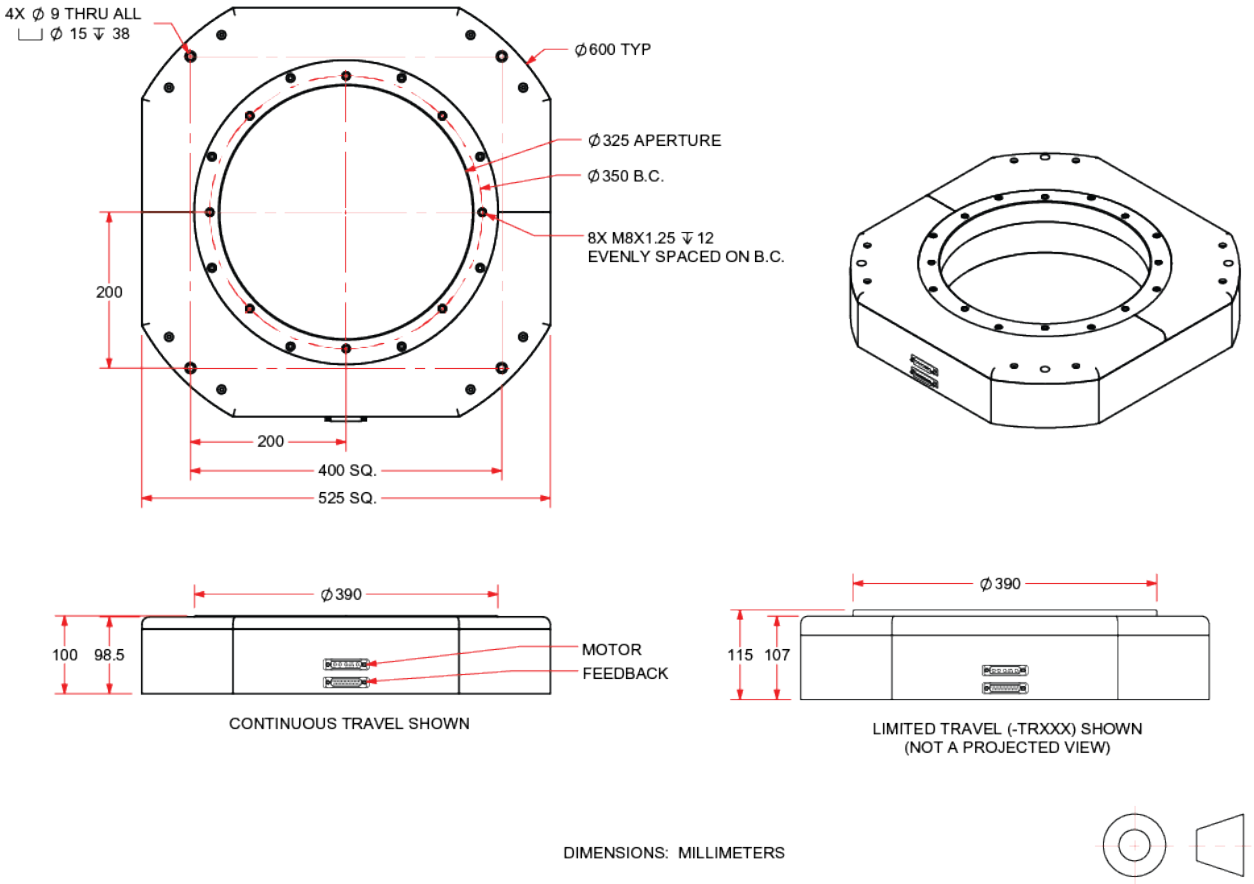


Figure 2-12: ALAR325LP Dimensions

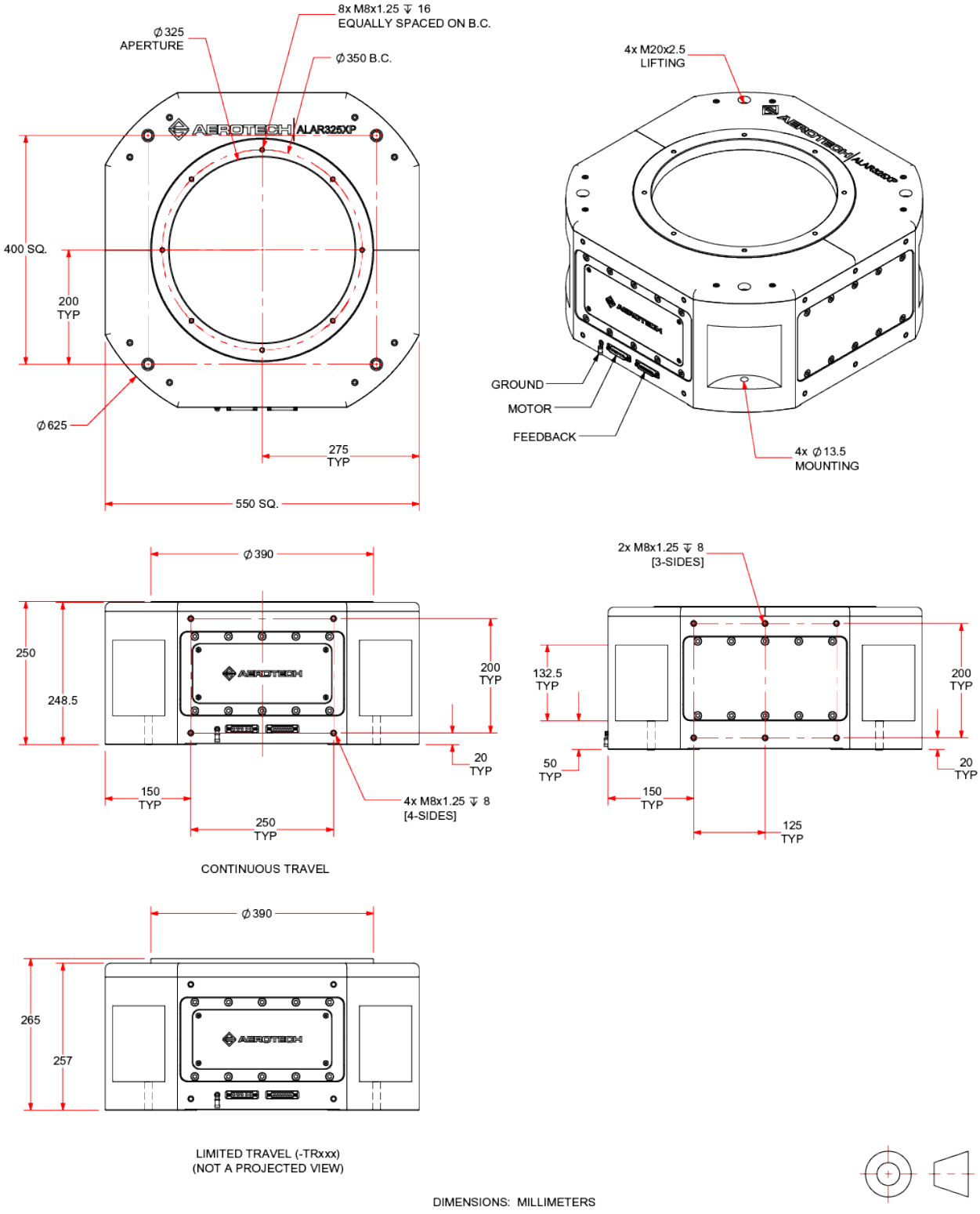


Figure 2-13: ALAR325XP Dimensions

2.3. Securing the Stage to the Mounting Surface

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

WARNING: The ALAR 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 to achieve the maximum performance from the ALAR 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.

NOTE: To maintain accuracy, the mounting surface must be flat to within 12 µm over the stage mounting area.

NOTE: The ALAR 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 ALAR. Shimming should be avoided if possible. If shimming is required, it should be minimized to retain maximum rigidity of the system.

ALAR series stages have a fixed mounting pattern available to secure the stage to a mounting surface. Figure 2-14 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 2-1 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 SHCS (ALAR100SP/LP, ALAR150SP/LP)	7 N·m
M8 SHCS (ALAR200SP/LP, ALAR250SP/LP, ALAR325SP/LP)	17 N·m
M12 SHCS (ALAR250XP, and ALAR325XP models)	57 N·m

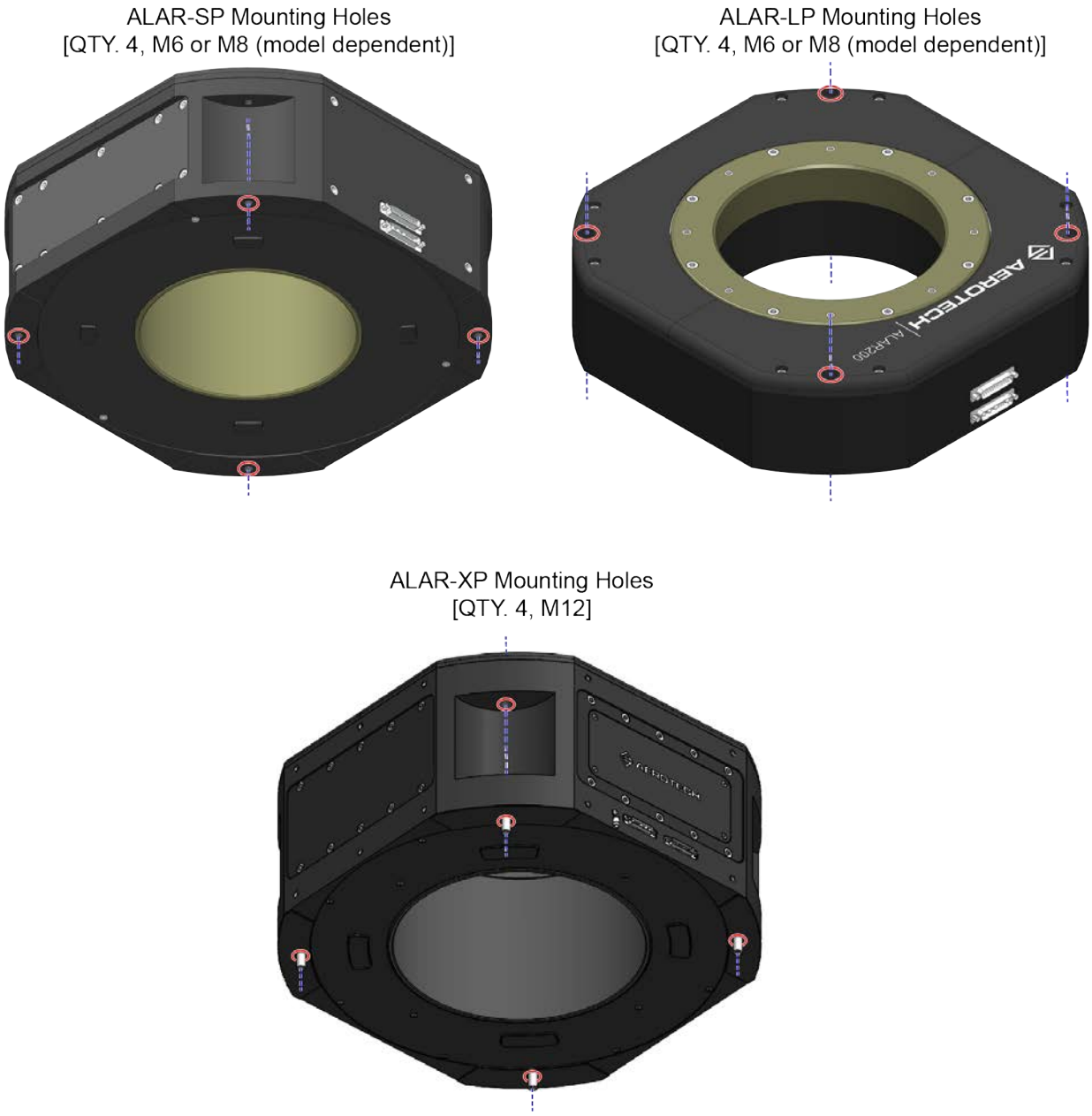


Figure 2-14: ALAR Stage Mounting Holes

2.4. Attaching the Payload to the Stage

Inspect the mounting surface for dirt or unwanted residue and clean if necessary. Clean the mounting surface with a lint-free cloth and acetone or isopropyl alcohol and allow the cleaning solvent to completely dry.

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 ALAR 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 ALAR 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.

NOTE: For valid system performance, the mounting interface should be flat within 7.5 µm.

Applied loads should be symmetrically distributed whenever possible (i.e., the payload should be centered on the stage table and the entire stage should be centered on the support structure).

WARNING: Refer to the dimensions in Section 2.2. for maximum allowable thread engagement. A screw extending through the stage table can affect travel and damage the stage.

The payload mounting pattern on ALAR stages is the same for continuous or limited travel stages. Refer to Section 2.2. for the payload mounting hole locations.

2.5. Travel Adjustment

2.5.1. Mechanical Hard Stop Limits

ALAR-SP and ALAR-LP:

The mechanical hard stop-to-hard stop limit travel is not adjustable in the field and must be sent back to the factory to change. Contact Aerotech for details.

ALAR-XP:

The internal hard stop is used at the factory to set the electrical and mechanical limit travels. It is not a functional hard stop.

Aerotech recommends that you install external hard stops (not supplied) after you receive the stage. The hard stops will need to be designed around application specific parameters such as payload and acceleration.

NOTE: The internal hard stop can be used as a reference point while setting up the external hard stops but should be removed prior to running the stage. Refer to Figure 2-15.

2.5.2. Electrical Limits

You can not adjust the electrical limit-to-limit stops in the field unless your stage is equipped with the -TR340 travel option. To adjust the electrical limits on a stage equipped with the -TR340 option, refer to the procedure below.

All other limited travel options have set mounting locations. These travel limit locations can only be changed in the factory. Contact Aerotech for details.

WARNING: If you set the limit incorrectly, you can cause a crash condition and do damage to the stage, payload, and personnel.

- If you set the electrical limits to an angle greater than the mechanical hard stop, the stage will hit the hard stop before it is able to safely stop at the electrical limit.
- If you set the electrical limits so that there is too much distance between the electrical limit and the hard stop, you can create a situation where the stage travel could exceed the electrical limit. The stage can then continue into the hard stop or do so the next time it is enabled.

If you are unsure how to adjust the electrical limit, contact Aerotech for support.

ALAR-SP and ALAR-LP:

Stages shipped with the -TR340 option can be retrofitted to achieve a different limit travel. Determine the amount of travel required and use the procedure that follows.

ALAR-XP:

Stages shipped with the -TR340 option can be retrofitted to achieve a different limit travel. Determine the amount of travel required on a -TR340-equipped stage to relocate the limit flags and install external hard stops.

DANGER: Disconnect electrical power before making any mechanical adjustments or performing maintenance.

The procedure that follows describes how to adjust the electrical limits.

1. Disconnect the motor cable from stage for safety purposes.
2. Remove the [QTY. 8] button head cap screws to remove the top covers from the stage (refer to Figure 2-15).
3. Note the orientation of the limit flags with respect to the stage shaft. Temporarily mark the shaft with tape or a marker to indicate the locations of the limit flags.
4. Remove the socket head cap screws securing the limit flags to the shaft.
5. Move the limits to the new locations on the shaft and secure with the socket head cap screws.
6. Verify travel with the controller by hand, and adjust the limit flag locations as necessary.
7. Reattach the top covers to the stage with the button head cap screws removed in Step 2.
8. Reconnect the motor cable.

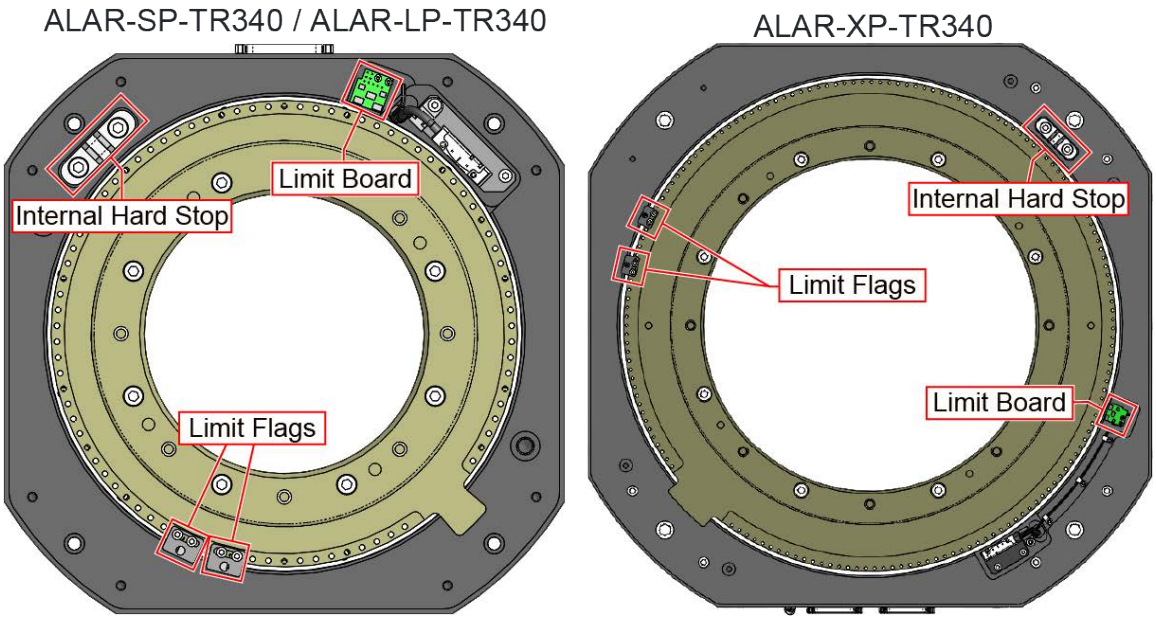


Figure 2-15: ALAR Limit Flag Adjustment

Chapter 3: Electrical Specifications and Installation

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

Aerotech motion control systems are adjusted at the factory for optimum performance. When the ALAR is part of a complete Aerotech motion control system, setup usually involves connecting the ALAR 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 pinouts.

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 or damage to the equipment.

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.

NOTE: 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.

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

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

The protective ground connection of the ALAR 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 or damage to the equipment.

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.

Figure 3-1: Electrical Connections

Table 3-1: 4-Pin Motor Connector Pinout

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

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

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

Table 3-3: 25-Pin Feedback Connector Pinout for the -E1 to -E6 Encoder Options

Pin	Description	Connector
Case	Signal shield connection (to case)	
1	Reserved	
2	Over-Temperature Thermistor sensor	
3	+5 V power supply	
4	Reserved	
5	Hall Effect sensor, phase B	
6	Marker-N	
7	Marker	
8	Reserved	
9	Reserved	
10	Hall Effect sensor, phase A	
11	Hall Effect sensor, phase C	
12(1)	Signal indicating maximum travel produced by positive/CW stage direction.	
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(1)	Signal indicating maximum travel produced by negative/CCW stage direction	
25	Reserved	

1. Only available on stages with limit option (otherwise RESERVED).

Table 3-4: Mating Connector Part Numbers for the Feedback 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 Feedback Connector Pinout for the -E7 Encoder Option

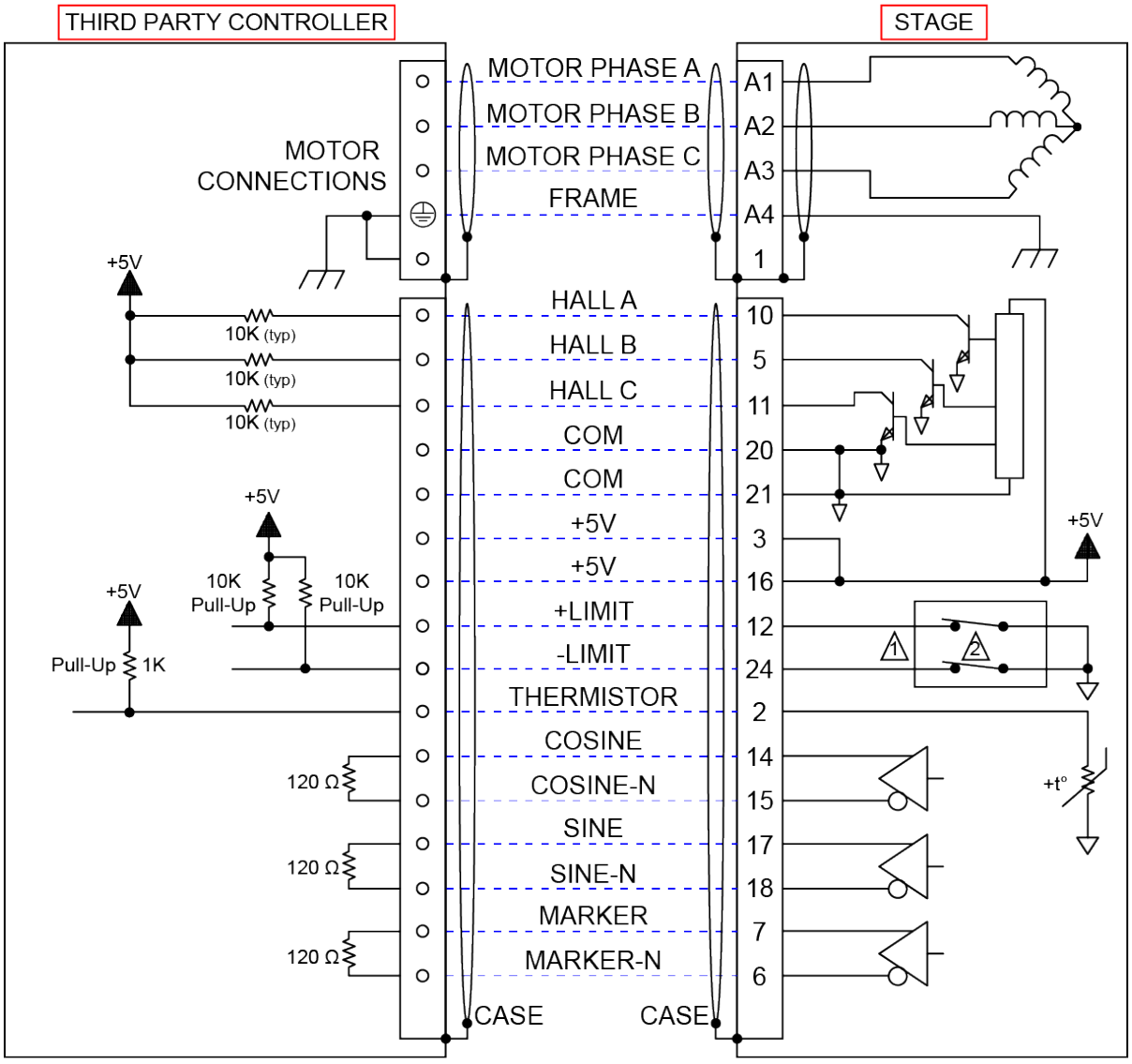
Pin	Description	Connector
1	Reserved	
2	Over-Temperature Thermistor sensor	
3	+5 V power supply	
4	Reserved	
5	Hall Effect sensor, phase B	
6	Clock -	
7	Clock +	
8	Data -	
9	Reserved	
10	Hall Effect sensor, phase A	
11	Hall Effect sensor, phase C	
12	Signal indicating maximum travel produced by positive/CW stage direction	
13	Reserved	
14	Reserved	
15	Reserved	
16	+5 V power supply	
17	Reserved	
18	Reserved	
19	Data +	
20	Common ground	
21	Common ground	
22	Reserved	
23	Reserved	
24	Signal indicating stage maximum travel produced by negative/CCW stage direction	
25	Reserved	

Table 3-6: Mating Connector Part Numbers for the Feedback 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

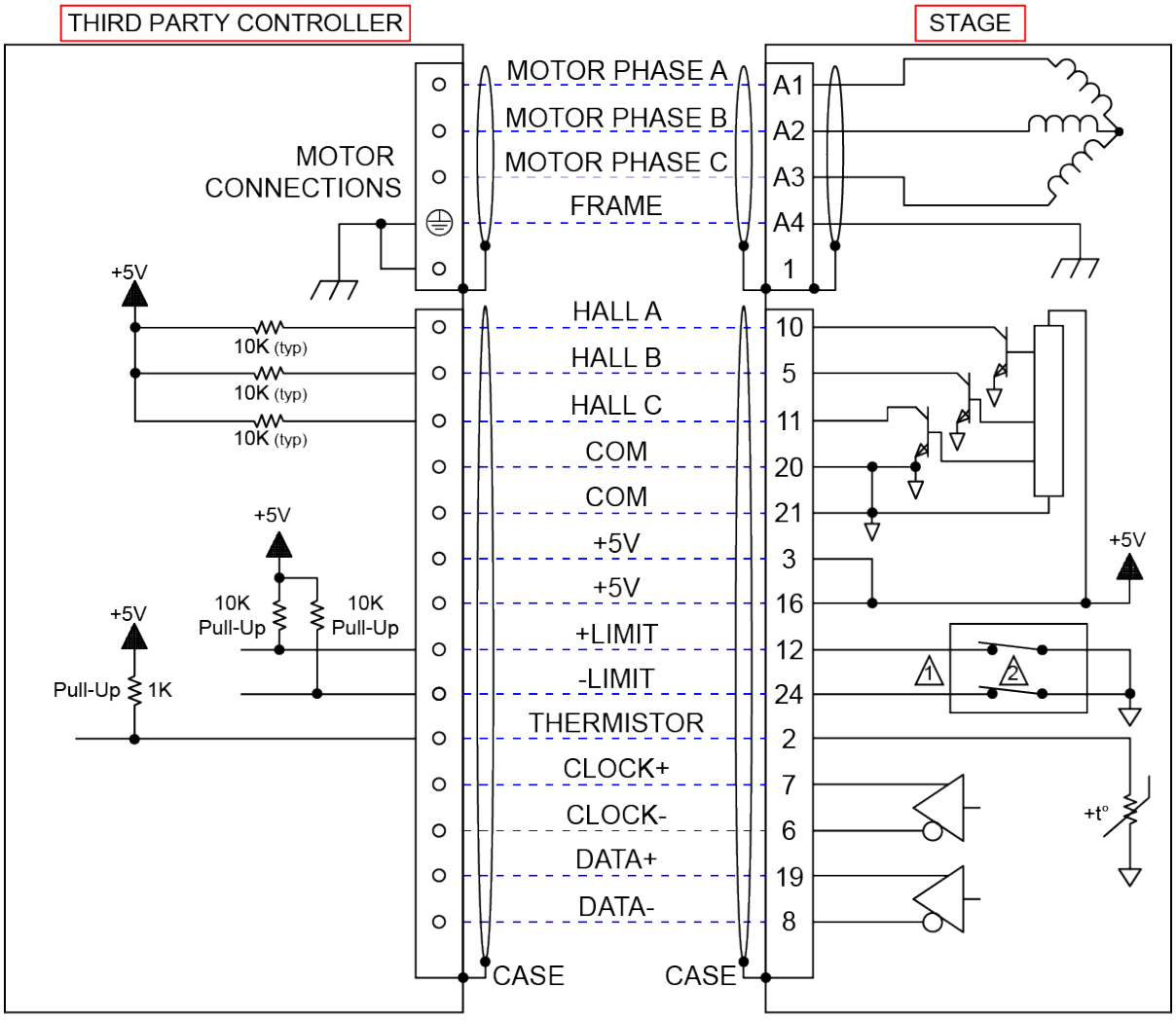
All motor and controller manufacturers have their own designations for motor phases A/B/C and Hall signals A/B/C (refer to Section 3.5. for motor phasing). Shielded cables are required for the motor and feedback connections.



⚠1 Over-Travel limit switches are present in -TRxxx option (Limited Travel) models only (continuous travel models do not have this feature).

⚠2 Limit switches are Normally Closed (NC) type.

Figure 3-2: Motor and Feedback Wiring (-E1 to -E6 Encoder Options)



1 Over-Travel limit switches are present in -TRxxx option (Limited Travel) models only (continuous travel models do not have this feature).

2 Limit switches are Normally Closed (NC) type.

Figure 3-3: Motor and Feedback Wiring (-E7 Encoder Option)

3.3. Motor and Feedback Specifications

Table 3-7: Feedback Specifications

Hall-Effect Sensors Specifications	
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)

Thermistor Specifications	
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.	

Encoder Specifications	
Supply Voltage	5 V ±5%
Supply Current	250 mA (typical)
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

Limit Switch Specifications	
Supply Voltage	5 V ±5%
Supply Current	25 mA
Output Type	Open Collector
Output Voltage	5 V
Output Current	10 mA (sinking)
Output Polarity	Normally Closed (NC) • Sinks current to ground (Logic "0") when not in limit • High impedance (Logic "1") when in limit • Requires external pull-up to +5 V (10 kΩ recommended)

Notes:

- **WARNING**: If you set the electrical limits to an angle greater than the mechanical hard stop, the stage will hit the hard stop before it is able to safely stop at the electrical limit.
- **WARNING**: If you set the electrical limits so that there is too much distance between the electrical limit and the hard stop, you can create a situation where the stage travel could exceed the electrical limit. The stage can then continue into the hard stop or do so the next time it is enabled.
- Hall-Effect Sensors, Encoder, and (if present) Limit Switches are connected to one common 5 VDC supply. Refer to Figure 3-2 or Figure 3-3.

Table 3-8: ALAR-SP Encoder Specifications

Encoder Option	ALAR100SP	ALAR150SP	ALAR200SP	ALAR250SP	ALAR325SP
Fundamental Resolution (lines/rev)(1)	31488	40000	55040	64800	76800
-E1 (arcsec / line)(2)	0.005	0.004	0.003	0.003	0.002
-E2 (arcsec / line)	10.29	8.1	5.888	5	4.22
-E3 (arcsec / line)	2.058	1.62	1.178	1	0.845
-E4 (arcsec / line)	1.03	0.81	0.588	0.5	0.423
-E5 (arcsec / line)	0.413	0.325	0.235	0.2	0.17
-E6 (arcsec / line)	0.205	0.163	0.118	0.1	0.084
-E7 (arcsec / line)	0.0003	0.0003	0.0003	0.0003	0.0003
1. E1-E6 resolutions include quadrature 2. Resolution assumes 2000X controller multiplication.					

Table 3-9: ALAR-LP Encoder Specifications

Encoder Option	ALAR100LP	ALAR150LP	ALAR200LP	ALAR250LP	ALAR325LP
Fundamental Resolution (lines/rev)(1)	31488	36000	47200	55040	64800
-E1 (arcsec / line)(2)	0.005	0.005	0.003	0.003	0.003
-E2 (arcsec / line)	10.29	9	6.87	5.888	5
-E3 (arcsec / line)	2.058	1.8	1.37	1.178	1
-E4 (arcsec / line)	1.03	0.9	0.69	0.588	0.5
-E5 (arcsec / line)	0.413	0.36	0.28	0.235	0.2
-E6 (arcsec / line)	0.205	0.18	0.14	0.118	0.1
-E7 (arcsec / line)	0.0003	0.0003	0.0003	0.0003	0.0003
1. E1-E6 resolutions include quadrature 2. Resolution assumes 2000X controller multiplication.					

Table 3-10: ALAR-XP Encoder Specifications

Encoder Option	ALAR250XP	ALAR325XP
Fundamental Resolution (lines/rev)	64800	76800
-E1 (arcsec / line)(1)	0.003	0.002
-E6 (arcsec / line)	0.1	0.084
-E7 (arcsec / line)	0.0003	0.0003
1. Resolution assumes 2000X controller multiplication.		

Table 3-11: ALAR-SP Maximum Speed Per Encoder Option

Encoder Option	ALAR100SP	ALAR150SP	ALAR200SP	ALAR250SP	ALAR325SP
-E1	300 rpm	250 rpm	90 rpm	140 rpm	150 rpm
-E2	300 rpm	250 rpm	90 rpm	140 rpm	150 rpm
-E3	300 rpm	250 rpm	90 rpm	140 rpm	150 rpm
-E4	300 rpm	250 rpm	90 rpm	140 rpm	150 rpm
-E5	300 rpm	250 rpm	90 rpm	140 rpm	150 rpm
-E6	300 rpm	250 rpm	90 rpm	140 rpm	142 rpm
-E7	300 rpm	250 rpm	90 rpm	140 rpm	150 rpm

Table 3-12: Maximum Speed Per Encoder Option (ALAR-LP)

Encoder Option	ALAR100LP	ALAR150LP	ALAR200LP	ALAR250LP	ALAR325LP
-E1	50 rpm	45 rpm	90 rpm	90 rpm	120 rpm
-E2	50 rpm	45 rpm	90 rpm	90 rpm	120 rpm
-E3	50 rpm	45 rpm	90 rpm	90 rpm	120 rpm
-E4	50 rpm	45 rpm	90 rpm	90 rpm	120 rpm
-E5	50 rpm	45 rpm	90 rpm	90 rpm	120 rpm
-E6	50 rpm	45 rpm	90 rpm	90 rpm	120 rpm
-E7	50 rpm	45 rpm	90 rpm	90 rpm	120 rpm

Table 3-13: Maximum Speed Per Encoder Option (ALAR-XP)

Encoder Option	ALAR250XP	ALAR325XP
-E1	180 rpm	100 rpm
-E6 (1)	134 rpm	100 rpm
-E7	180 rpm	100 rpm
1. Digital encoder option (-E6) will limit max speed.		

Table 3-14: ALAR-SP Motor Specifications (ALAR100SP, ALAR150SP, and ALAR200SP)

Model		ALAR100SP	ALAR150SP	ALAR200SP
Performance Specifications				
Stall Torque, Continuous	N·m	6.0	10.7	19.3
Peak Torque	N·m	24	42.9	126.8
Electrical Specifications				
BEMF Constant (line to line, max)	V/krpm	268.7	209.4	438.63
Continuous Current	A_{pk}	2.7	6.2	5.3
	A_{rms}	1.9	4.4	3.8
Peak Current, Stall	A_{pk}	10.8	24.8	34.8
	A_{rms}	7.6	17.5	24.6
Torque Constant	$N·m/A_{pk}$	2.22	1.73	3.64
	$N·m/A_{rms}$	3.14	2.45	5.15
Motor Constant	N·m/√W	0.63	0.85	1.26
Resistance, 25 C° (line to line)	Ω	12.8	4.3	8.0
Inductance (line to line)	mH	3.40	2.15	6.40
Thermal Resistance, No Cooling	°C/W	0.82	0.47	0.42
Maximum Bus Voltage	VDC	340	340	340
Mechanical Specifications				
Motor Radius	mm	90	120	150
Magnetic Pole Pitch	deg	20	13.85	12
Pole per Rev	--	18	26	30

1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature
2. Values shown @ 75°C rise above a 25 °C ambient temperature.
3. Peak force assumes correct rms current; consult Aerotech.
4. Torque constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. Specifications given are for the motor only. When integrated into a housing with bearings additional losses should be considered.
7. Maximum winding temperature is 100 °C (thermistor trips at 100 °C)
8. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures
9. All Aerotech amplifiers are rated A_{pk}; use torque constant in $N·m/A_{pk}$ when sizing

Table 3-15: ALAR-SP Motor Specifications (ALAR250SP and ALAR325SP)

Model		ALAR250SP (-M1)	ALAR250SP (-M2)	ALAR325SP (-M1)	ALAR325SP (-M2)
Performance Specifications					
Stall Torque, Continuous	N·m	21.0	31.5	35.0	52.4
Peak Torque	N·m	137.8	206.7	213.8	320.8
Electrical Specifications					
BEMF Constant (line to line, max)	V/krpm	476.64	476.64	825.12	825.12
Continuous Current	A_{pk}	5.3	8.0	5.1	7.6
	A_{rms}	3.8	5.6	3.6	5.4
Peak Current, Stall	A_{pk}	34.8	52.2	31.2	46.8
	A_{rms}	24.6	36.8	22.1	33.1
Torque Constant	$N·m/A_{pk}$	3.96	3.96	6.85	6.85
	$N·m/A_{rms}$	5.60	5.60	9.69	9.69
Motor Constant	$N·m/\sqrt{W}$	1.37	1.67	2.05	2.52
Resistance, 25 C (line to line)	Ω	8.0	5.3	10.6	7.1
Inductance (line to line)	mH	6.4	4.3	8.4	5.6
Thermal Resistance, No Cooling	°C/W	0.42	0.28	0.35	0.23
Maximum Bus Voltage	VDC	340	340	340	340
Mechanical Specifications					
Motor Radius	mm	163	163	211	211
Magnetic Pole Pitch	deg	10.59	10.59	8.18	8.18
Pole per Rev	--	34	34	44	44

1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature
2. Values shown @ 75°C rise above a 25 °C ambient temperature.
3. Peak force assumes correct rms current; consult Aerotech.
4. Torque constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. Specifications given are for the motor only. When integrated into a housing with bearings additional losses should be considered.
7. Maximum winding temperature is 100 °C (thermistor trips at 100 °C)
8. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures
9. All Aerotech amplifiers are rated A_{pk}; use torque constant in $N·m/A_{pk}$ when sizing

Table 3-16: ALAR-LP Motor Specifications

Model		ALAR100LP	ALAR150LP	ALAR200LP	ALAR250LP	ALAR325LP
Performance Specifications						
Stall Torque, Continuous	N·m	3.0	4.0	19.3	22.5	35.0
Peak Torque	N·m	17.5	22.9	126.8	147.9	213.8
Electrical Specifications						
BEMF Constant (line to line, max)	V/krpm	62.94	87.92	438.63	511.73	825.12
Continuous Current	A_{pk}	5.8	5.4	5.3	5.3	5.1
	A_{rms}	4.1	3.8	3.8	3.8	3.6
Peak Current, Stall	A_{pk}	33.5	31.4	34.8	34.8	31.2
	A_{rms}	23.7	22.2	24.6	24.6	22.1
Torque Constant	$N·m/A_{pk}$	0.52	0.73	3.64	4.25	6.85
	$N·m/A_{rms}$	0.74	1.03	5.15	6.01	9.69
Motor Constant	$N·m/\sqrt{W}$	0.24	0.32	1.26	1.47	2.05
Resistance, 25 C (line to line)	Ω	4.5	5.1	8.0	8.0	10.6
Inductance (line to line)	mH	0.55	0.63	6.40	6.4	8.4
Thermal Resistance, No Cooling	°C/W	0.65	0.64	0.42	0.42	0.35
Maximum Bus Voltage	VDC	340	340	340	340	340
Mechanical Specifications						
Motor Radius	mm	90	110	150	175	211
Magnetic Pole Pitch	deg	10	8.18	12	10	8.18
Pole per Rev	--	36	44	30	36	44

1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature
2. Values shown @ 75°C rise above a 25 °C ambient temperature.
3. Peak force assumes correct rms current; consult Aerotech.
4. Torque constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. Specifications given are for the motor only. When integrated into a housing with bearings additional losses should be considered.
7. Maximum winding temperature is 100 °C (thermistor trips at 100 °C)
8. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures
9. All Aerotech amplifiers are rated A_{pk}; use torque constant in $N·m/A_{pk}$ when sizing

Table 3-17: ALAR-XP Motor Specifications

Model		ALAR250XP (-M1)	ALAR250XP (-M2)	ALAR325XP (-M1)	ALAR325XP (-M2)
Performance Specifications					
Stall Torque, Continuous (2)	N·m	64.20	85.60	107.36	143.14
Peak Torque (3)	N·m	548.60	731.46	833.00	1110.67
Electrical Specifications					
Number of Motors (in parallel)	--	3	4	3	4
BEMF Constant (line to line, max)	V/krpm	689.89	689.89	1141.55	1141.55
Continuous Current (no forced cooling) (2)	A_{pk}	11.20	14.93	11.32	15.09
	A_{rms}	7.92	10.56	8.00	10.67
Peak Current, Stall (3)	A_{pk}	95.72	127.62	87.84	117.11
	A_{rms}	67.68	90.24	62.11	82.81
Torque Constant (sinusoidal drive) (4,8)	$N·m/A_{pk}$	5.73	5.73	9.48	9.48
	$N·m/A_{rms}$	8.11	8.11	13.41	13.41
Motor Constant (2,4)	$N·m/\sqrt{W}$	3.75	4.33	5.38	6.22
Resistance, 25 C (line to line)	Ω	2.23	1.67	2.95	2.22
Inductance (line to line)	mH	2.11	1.58	2.56	1.92
Thermal Resistance, No Cooling	°C/W	0.34	0.26	0.25	0.19
Maximum Bus Voltage	VDC	340	340	340	340
Mechanical Specifications					
Motor Radius	mm	175	175	213.5	213.5
Magnetic Pole Pitch	deg	10	10	8.182	8.182
Pole per Rev	--	36	36	44	44

1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature
2. Values shown @ 100°C rise above a 25°C ambient temperature, with motor mounted to the specified aluminum heat sink.
3. Peak force assumes correct rms current; consult Aerotech.
4. Torque constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. Maximum winding temperature is 100 °C (thermistor trips at 100 °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. 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 3-4 shows the machine direction of ALAR stages.

The home marker is located near the center of travel on stages with a linear encoder (SLE models). For stages without the linear encoder option (SL models), the marker is located in the rotary motor and will be triggered near the designated home limit.

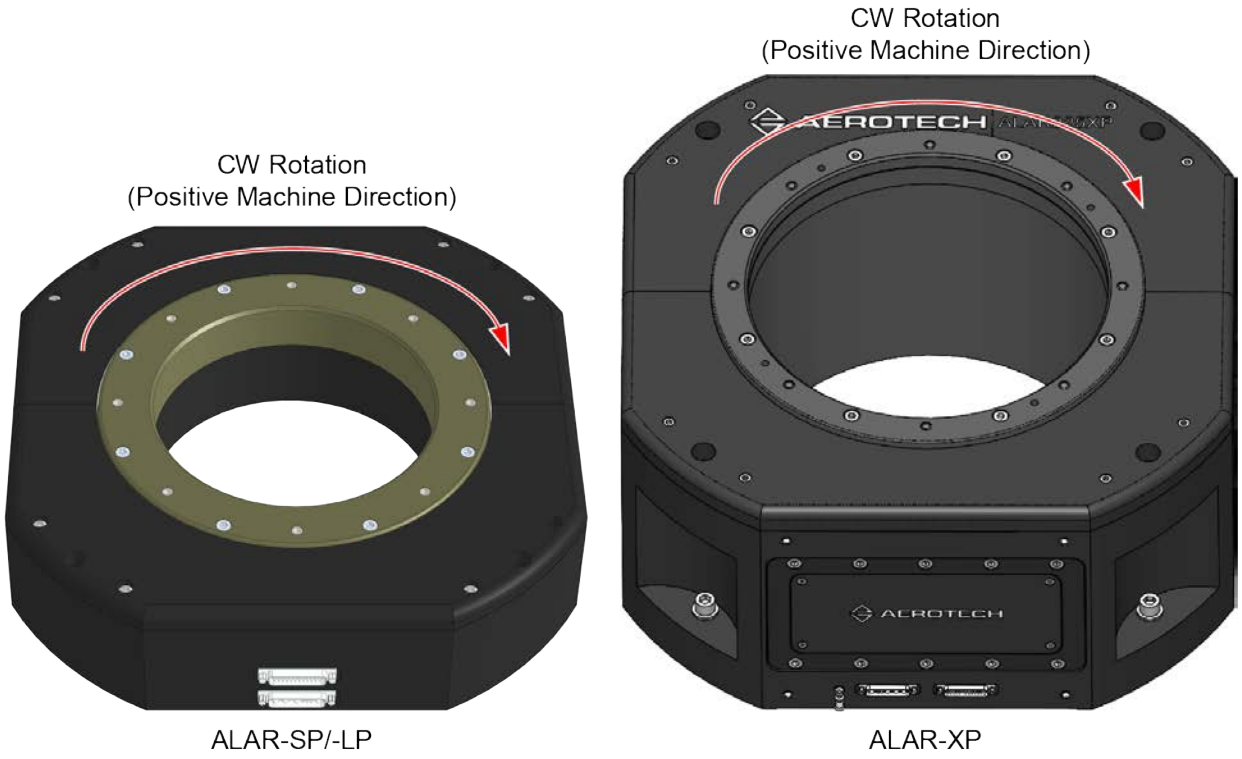


Figure 3-4: Machine Direction

3.5. Motor and Feedback Phasing

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

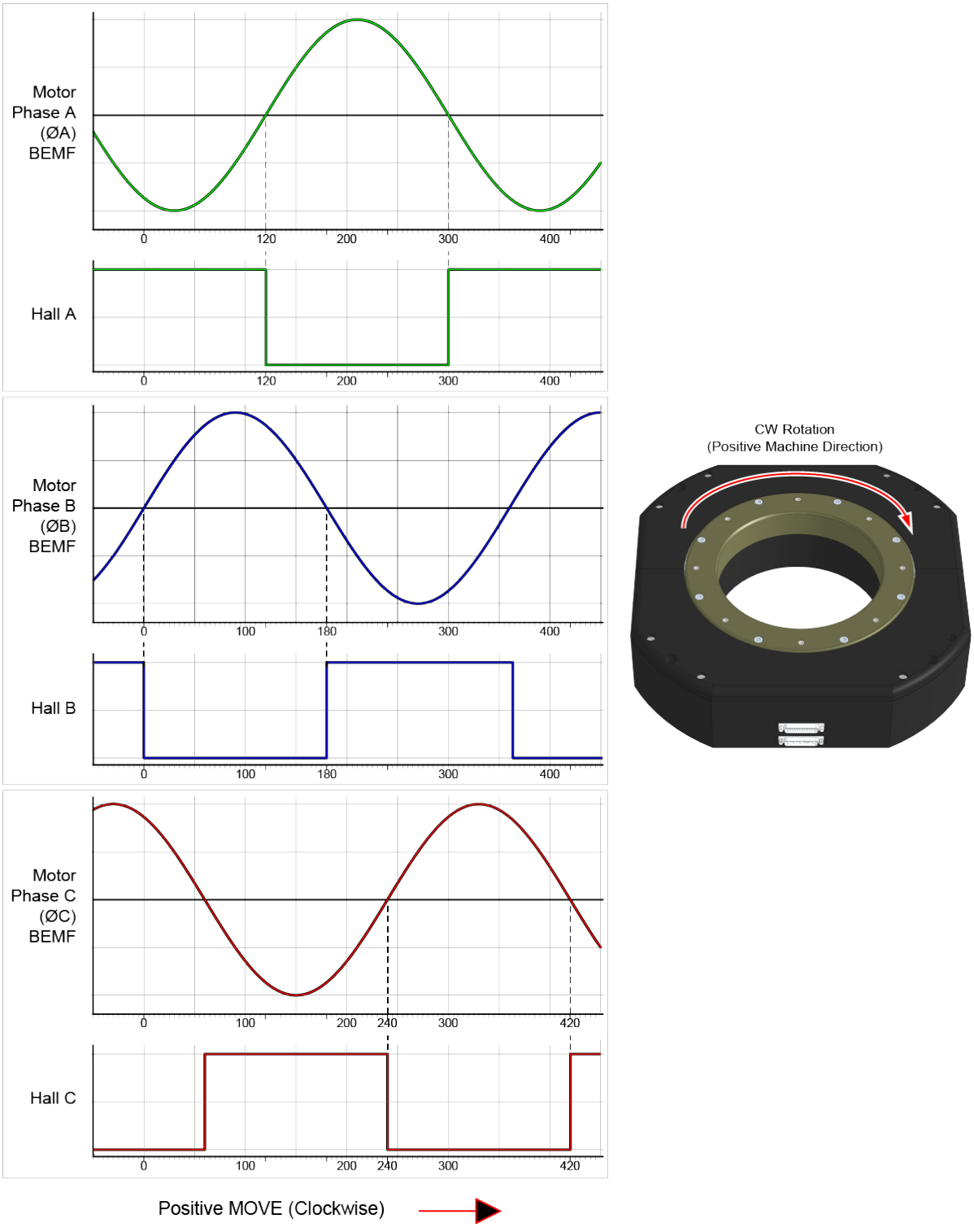


Figure 3-5: Hall Phasing

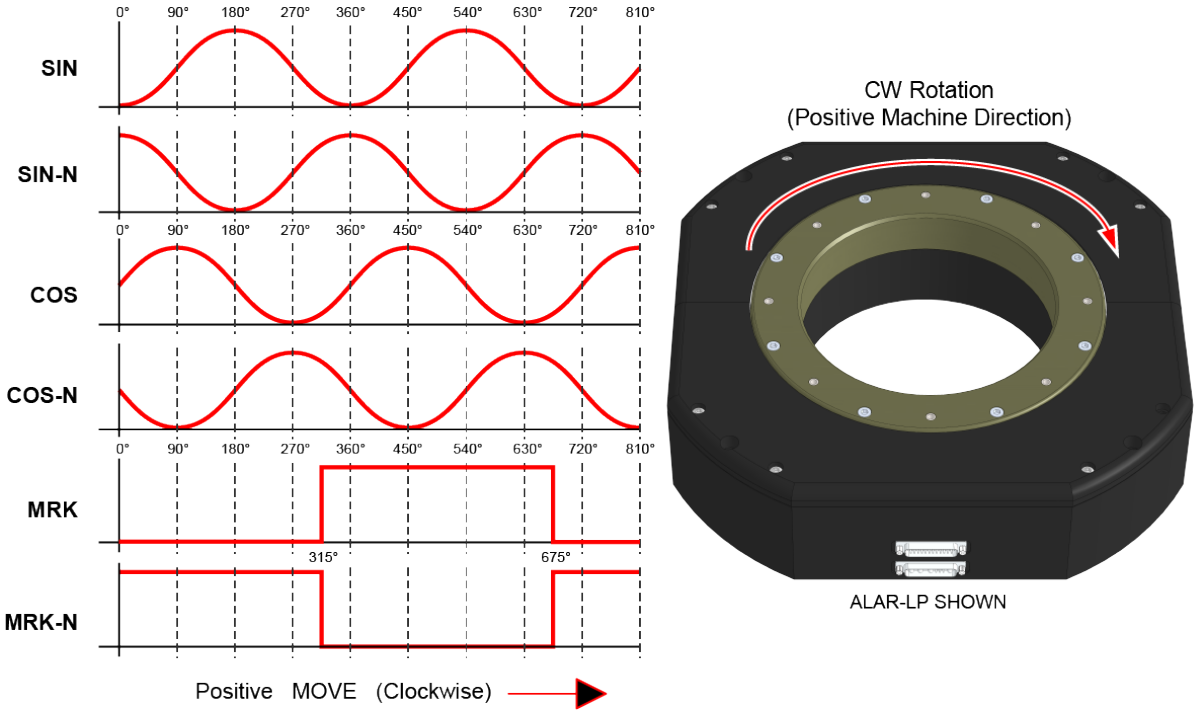


Figure 3-6: Analog Encoder Phasing Reference Diagram

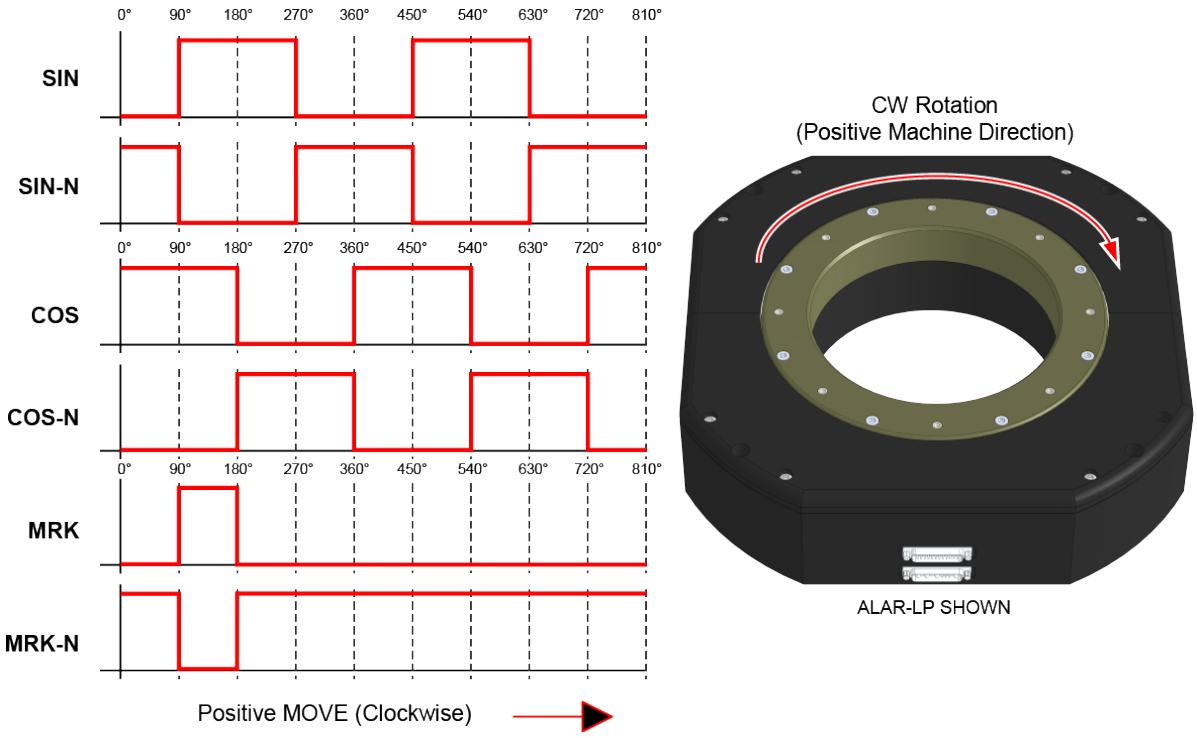


Figure 3-7: Encoder Phasing Reference Diagram (Standard)

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Chapter 4: Maintenance

The ALAR 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 ALAR at least once per month. A longer or shorter inspection interval may be required depending on the application and conditions, such as the duty cycle, speed, and environment.

In general, stages operating in a clean environment should be cleaned annually. For stages operating under conditions involving excessive debris, stages should be cleaned every six months. In normal operating conditions and with proper cleanliness of the stage, the bearing will not require lubrication or maintenance for the life of the stage.

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.

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

4.2. Cleaning

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.

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

Any external metal surface of the ALAR can be cleaned with isopropyl alcohol on a lint-free cloth. Avoid getting excess cleaning solvent on the surfaces, as it could damage the delicate electronics inside.

4.3. Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	• Controller trap or fault (refer to the Controller documentation). • In Limit condition. Check limits (refer to Chapter 3) and refer to the Controller documentation for polarity and compatibility requirements (Example: voltage requirements).
Stage moves uncontrollably	• Encoder (sine and cosine) signal connections (refer to Chapter 3 and Controller documentation). • Motor Connections (refer to Chapter 3 and the Controller documentation).
Stage oscillates or squeals	• Gains misadjusted (refer to the Controller documentation). • Encoder signals (refer to the Controller documentation).

Appendix A: Warranty and Field Service

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

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

Return Products Procedure

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

Visit 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) 5508 6731	Aerotech Germany Full-Service Subsidiary Phone: +49 (0)911 967 9370 Fax: +49 (0)911 967 93720

TAIWAN	UNITED KINGDOM
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
1.09.00	• Added ALAR-XP model • Updated Section 2.5. Travel Adjustment • Updated Section 2.5.1. Mechanical Hard Stop Limits • Updated Section 2.5.2. Electrical Limits
1.08.00	Updated dimension drawings: Section 2.2.
1.07.00	• Product update • Added Encoder Specifications tables, Section 3.3. • Updated safety and warning information • General revision
1.06.00	Updated motor and stage specifications
1.05.00	• Added Declaration of Incorporation • Added Environmental Specifications • Added safety information and warnings • Added note about motor wire current and voltage requirements
1.04.00	Added information about payload mounting holes for limited travel stages
1.03.00	Basic Specifications table updated, new Motor Specifications table added
1.02.00	• ALAR325SP dimensions updated • Model Numbering System updated • Socket head cap screw specification changed from 6 mm to M6 • Basic Specifications table updated • Added clarification on which models contain hall effect limit switches
1.01.00	Dimensions Section added
1.00.00	New Manual

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