FiberMax$_{HP}$ Hardware Manual

Revision: 1.01.00

Global Technical Support

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Safety Procedures and Warnings

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

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

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

1. Access to the FiberMax$_{HP}$ 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 FiberMax$_{HP}$ stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.
5. Use care when moving the FiberMax$_{HP}$ stage. Lifting or transporting the FiberMax$_{HP}$ stage improperly can result in injury or damage to the FiberMax$_{HP}$.
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.

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.

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EU Declaration of Incorporation

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

herewith declares that the product:

FiberMax$_{HP}$

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 Options

FiberMax$_{HP}$ Series Linear Motor Stage	
-ZXY	3-axis fiber alignment platform with non-contact, direct-drive motor. Travels – Z: 50 mm; X: 50 mm; Y: 3 mm
-ZXYT	4-axis fiber alignment platform with non-contact, direct-drive motor. Travels – Z: 50 mm; X: 50 mm; Y: 3 mm; Theta: 20°
-ZXYP	4-axis fiber alignment platform with non-contact, direct-drive motor. Travels – Z: 50 mm; X: 50 mm; Y: 3 mm; Pitch: 20°
-ZXYR	4-axis fiber alignment platform with non-contact, direct-drive motor. Travels – Z: 50 mm; X: 50 mm; Y: 3 mm; Roll: 20°
-ZXYTP	5-axis fiber alignment platform with non-contact, direct-drive motor. Travels – Z: 50 mm; X: 50 mm; Y: 3 mm; Theta: 20°; Pitch: 20°
-ZXYTR	5-axis fiber alignment platform with non-contact, direct-drive motor. Travels – Z: 50 mm; X: 50 mm; Y: 3 mm; Theta: 20°; Roll: 20°
-ZXYTPR	6-axis fiber alignment platform with non-contact, direct-drive motor. Travels – Z: 50 mm; X: 50 mm; Y: 3 mm; Theta: 20°; Pitch: 20°; Roll: 20°
Manual Adjustment (Optional)	
-ADJ1	3-axis; ±2° manual angular adjustment, yaw/pitch/roll
-ADJ2	2-axis; ±2° manual angular adjustment, pitch/roll
-ADJ3	2-axis; ±2° manual angular adjustment, yaw/pitch
-ADJ4	2-axis; ±2° manual angular adjustment, yaw/roll
-ADJ5	1-axis; ±2° manual angular adjustment, pitch
-ADJ6	1-axis; ±2° manual angular adjustment, roll
Mounting Plate (Optional)	
-MP	Mounting plate for optical table mounting
Performance Level (Required)	
-PL1	Base performance
-PL3	High-accuracy performance, PLUS
Accessories (To be Ordered as a Separate Line Item)	
MADJ-AT1	1-axis; manual [pitch or roll] adjustment; ±2°
MADJ-AT2	2-axis; manual [pitch/roll] adjustment; ±2° per axis
MADJ-AT3	2-axis; manual [yaw/pitch or yaw/roll] adjustment; ±2° per axis
MADJ-AT4	3-axis; manual [yaw/pitch/roll] adjustment; ±2° per axis
AP-ANT95R-ANT20G-50	Adapter plate kit; mounts ANT95R to ANT20G-50
AP-ANT95R-ANT20G-90	Adapter plate kit; mounts ANT95R to ANT20G-90

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 machine 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	FiberMax$_{HP}$ stages are not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
Use	Indoor use only

1.1.1. 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 FiberMax$_{HP}$. At a minimum, the environmental temperature must be controlled to within 0.25ºC per 24 hours to ensure the FiberMax$_{HP}$ 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 FiberMax$_{HP}$ is mounted. Contact the factory for more details.

The thermal expansion coefficient of the Z, X, and Y axes encoder scale glass is 3.25 ppm/°C. (Note: The thermal expansion coefficient of the Y-axis scale is translated through a wedge angle of 7.70°, becoming an effective thermal expansion coefficient of 0.44 ppm/°C.) Travel will increase or decrease at this rate as the temperature of the encoder scale temperature deviates from 20°C (68°F).

The accuracy specification of FiberMax$_{HP}$ series stages are measured 20 mm above the top mounting platform with the stage in an unloaded condition. The stage is assumed to be fully supported by a mounting surface meeting or exceeding the specification in Section 2.3.

1.2. Basic Specifications

Resolution is dependent on encoder resolution and controller interpolation.

Table 1-3: FiberMax$_{HP}$ Series Specifications

			-ZXY	-ZXYT	-ZXYR	-ZXYP	-ZXYTR	-ZXYTP	-ZXYTPR
Travels		X	50 mm	50 mm	50 mm	50 mm	50 mm	50 mm	50 mm
		Y	3 mm	3 mm	3 mm	3 mm	3 mm	3 mm	3 mm
		Z	50 mm	50 mm	50 mm	50 mm	50 mm	50 mm	50 mm
		T		20°			20°	20°	20°
		R			20°		20°		20°
		P				20°		20°	20°
Accuracy (1,2)	-PL1	X	±3.0 µm	±4.2 µm	±4.2 µm	±4.2 µm	±5.5 µm	±5.5	±6.5 µm
		Y	±2.0 µm	±2.0 µm	±2.0 µm	±2.0 µm	±2.0 µm	±2.0 µm	±2.0 µm
		Z	±3.5 µm	±4.7 µm	±4.7 µm	±4.7 µm	±6.0 µm	±6.0 µm	±7.0 µm
		T		±25 µrad			±25 µrad	±25 µrad	±25 µrad
		R			±90 µrad		±90 µrad		±90 µrad
		P				±90 µrad		±90 µrad	±90 µrad
	-PL3	X	±300 nm	±300 nm	±300 nm	±300 nm	±350 nm	±350 nm	±400 nm
		Y	±200 nm	±200 nm	±200 nm	±200 nm	±200 nm	±200 nm	±200 nm
		Z	±300 nm	±300 nm	±300 nm	±300 nm	±350 nm	±350 nm	±400 nm
		T		± 8 µrad			±8 µrad	±8 µrad	±8 µrad
		R			±30 µrad		±30 µrad		±30 µrad
		P				±30 µrad		±30 µrad	±30 µrad
Resolution (Minimum Incremental Motion)		X	2 nm	2 nm	2 nm	2 nm	3 nm	3 nm	4 nm
		Y	2 nm	2 nm	2 nm	2 nm	2 nm	2 nm	2 nm
		Z	2 nm	2 nm	2 nm	2 nm	3 nm	3 nm	4 nm
		T		0.05 µrad			0.05 µrad	0.05 µrad	0.05 µrad
		R			0.25 µrad		0.25 µrad		0.25 µrad
		P				0.25 µrad		0.25 µrad	0.25 µrad
Bidirectional Repeatability(2)		X	±150 nm	±175 nm	±175 nm	±175 nm	±200 nm	±200 nm	±250 nm
		Y	±150 nm	±150 nm	±150 nm	±150 nm	±150 nm	±150 nm	±150 nm
		Z	±150 nm	±175 nm	±175 nm	±175 nm	±200 nm	±200 nm	±250 nm
		T		±3.5 µrad			±3.5 µrad	±3.5 µrad	±3.5 µrad
		R			±18 µrad		±18 µrad		±18 µrad
		P				±18 µrad		±18 µrad	±18 µrad
Maximum Speed(3)		X	400 mm/s	400 mm/s	400 mm/s	400 mm/s	400 mm/s	400 mm/s	400 mm/s
		Y	75 mm/s	75 mm/s	75 mm/s	75 mm/s	75 mm/s	75 mm/s	75 mm/s
		Z	200 mm/s	20 mm/s	200 mm/s	200 mm/s	200 mm/s	200 mm/s	200 mm/s
		T		120°/s			120°/s	120°/s	120°/s
		R			150°/s		150°/s		150°/s
		P				150°/s		150°/s	150°/s
Load Capacity(4)			2 kg	1.5 kg	1.5 kg	1.5 kg	1 kg	1 kg	1 kg
Stage Mass			6.0 kg	7.5 kg	6.5 kg	6.5 kg	8.0 kg	8.0 kg	9.0 kg
Material			Anodized Aluminum						
MTBF			30,000 Hours						

1. Requires the use of an Aerotech controller.
2. Certified with each stage.
3. Requires the selection of an appropriate amplifier with sufficient voltage and current.
4. On-axis loading is listed.

Values listed are per axis measured 20 mm off of top mounting platform.

1.3. Air Requirements

It is important to the operation of the FiberMax$_{HP}$ that the air supply meets Aerotech specifications. The air must be filtered to 0.25 microns, dry to 0°F dew point, and oil free (nitrogen at 99.99% purity is recommended). Filtration is required to prevent particles from clogging internal components of the FiberMax$_{HP}$.

Chapter 2: Mechanical Specifications and Installation

WARNING: FiberMax$_{HP}$ installation must be in accordance to instructions provided by this manual and any accompanying documentation. Failure to follow these instructions could result in injury or damage to the equipment.

2.1. Unpacking and Handling the Stage

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

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

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

Carefully remove the FiberMax$_{HP}$ from its protective shipping container. Gently set the FiberMax$_{HP}$ on a smooth, flat, and clean surface.

Before operating the FiberMax$_{HP}$, 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 FiberMax$_{HP}$ 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.

Shipping Brackets

Red, anodized aluminum shipping brackets have been installed to prevent unwanted motion and potential damage from occurring during shipment. The brackets must be removed before the FiberMax$_{HP}$ can be operated. The Y-axis shipping clamp is integrated into the design and only requires the removal of [QTY. 2] socket head cap screws. Retain the brackets and hardware for future use.

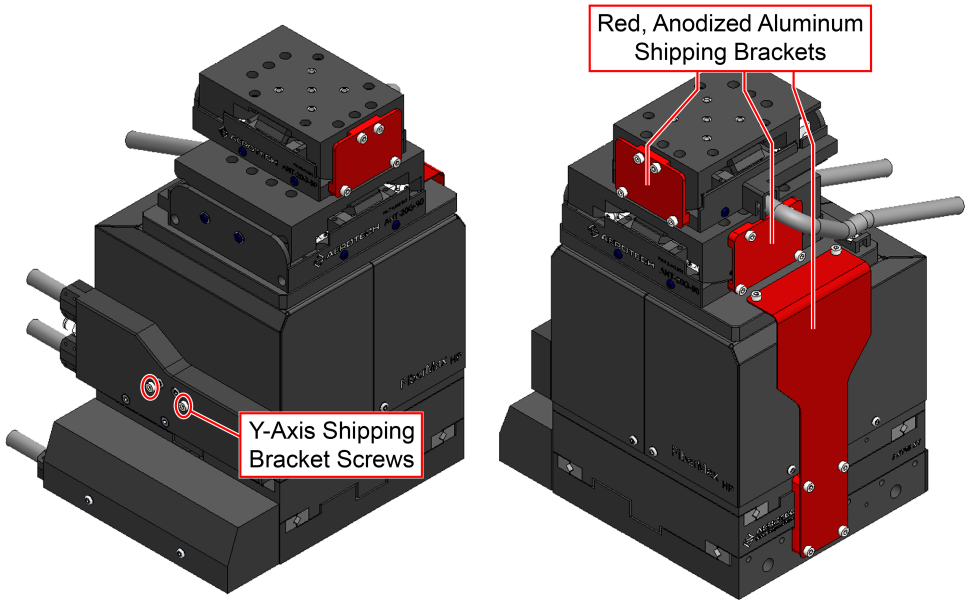

Figure 2-1: Shipping Brackets and Bracket Screw Locations

2.2. Dimensions

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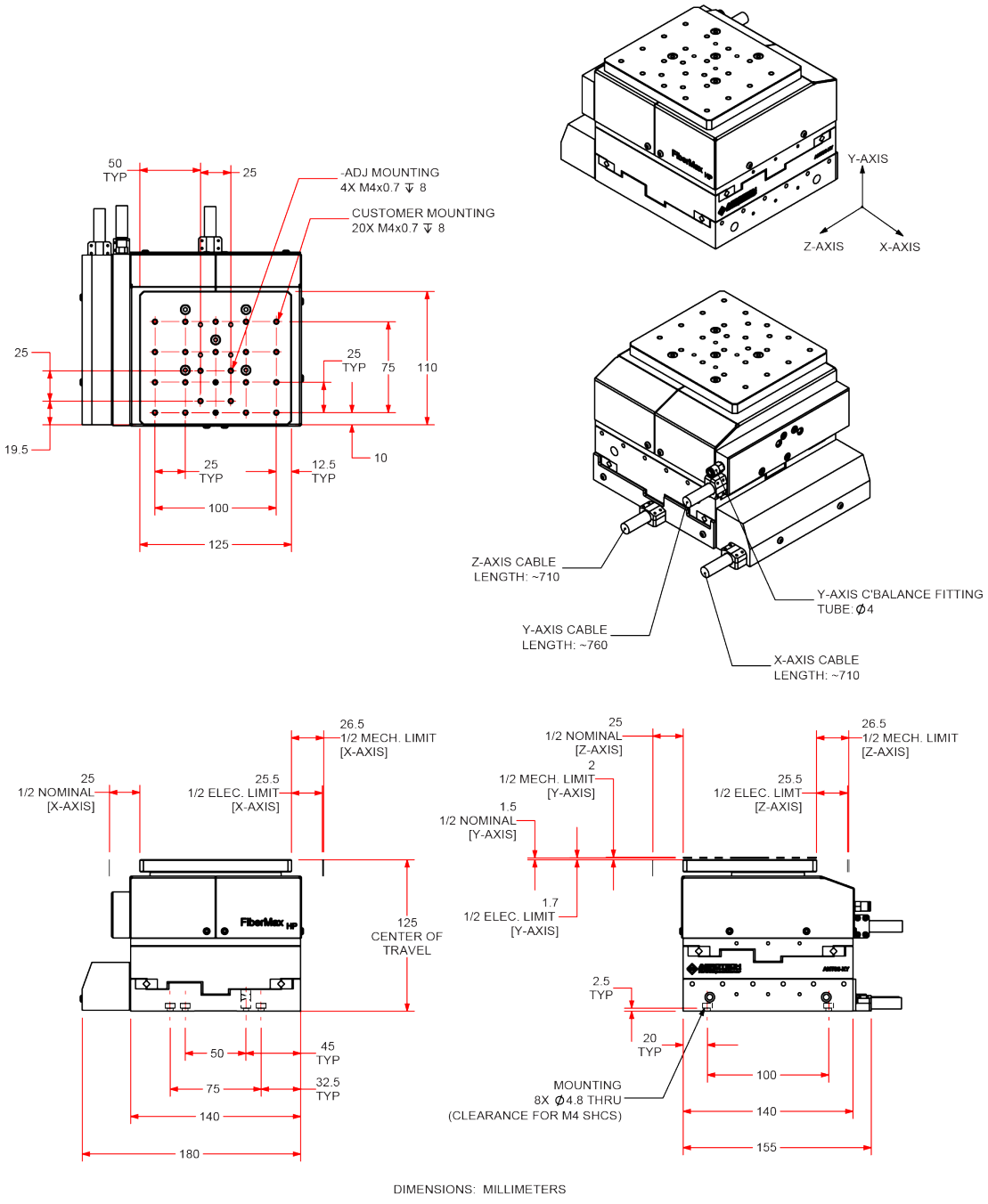


Figure 2-2: FiberMax$_{HP}$-ZXY Dimensions

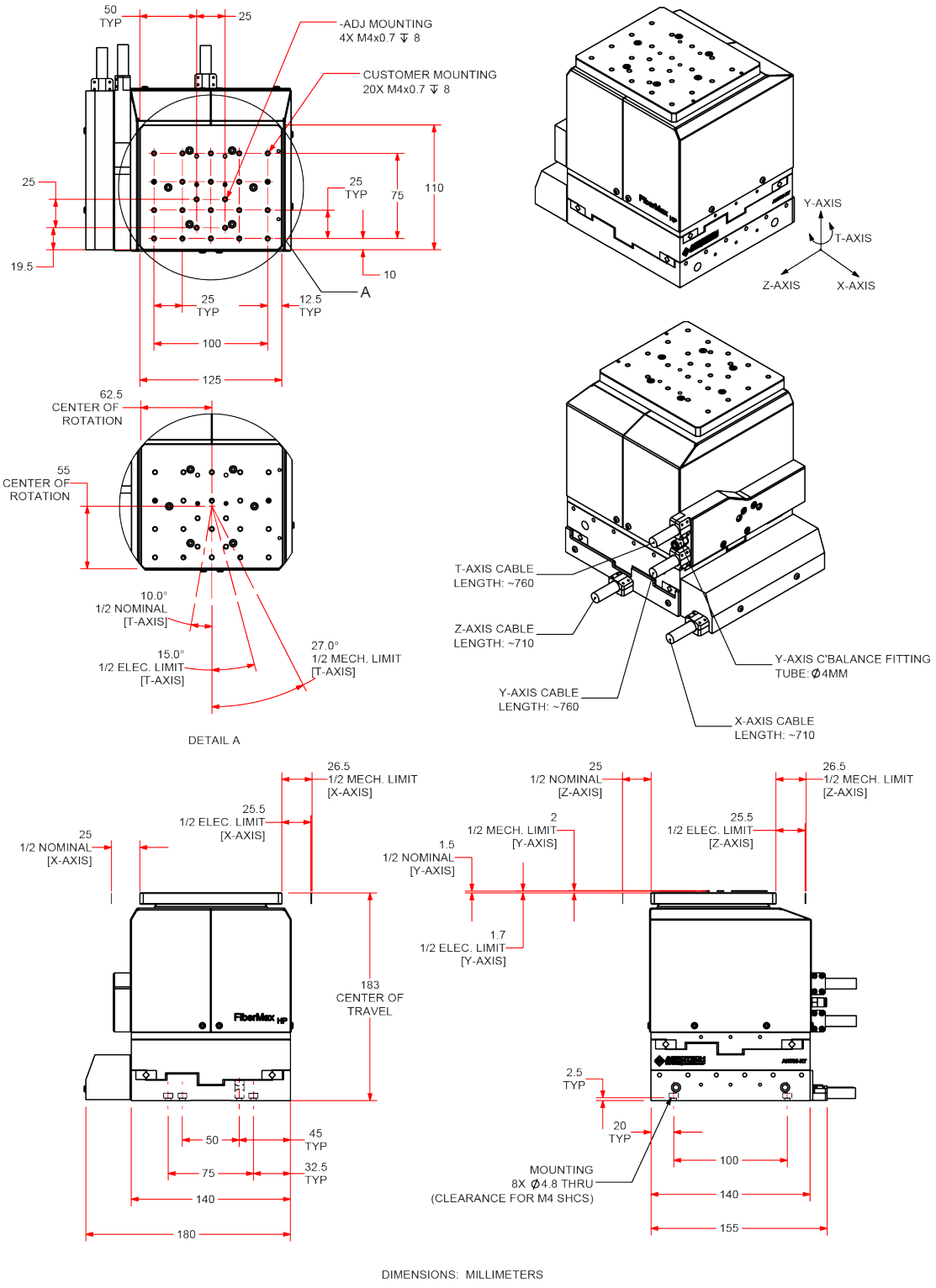


Figure 2-3: FiberMax$_{HP}$-ZXYT Dimensions

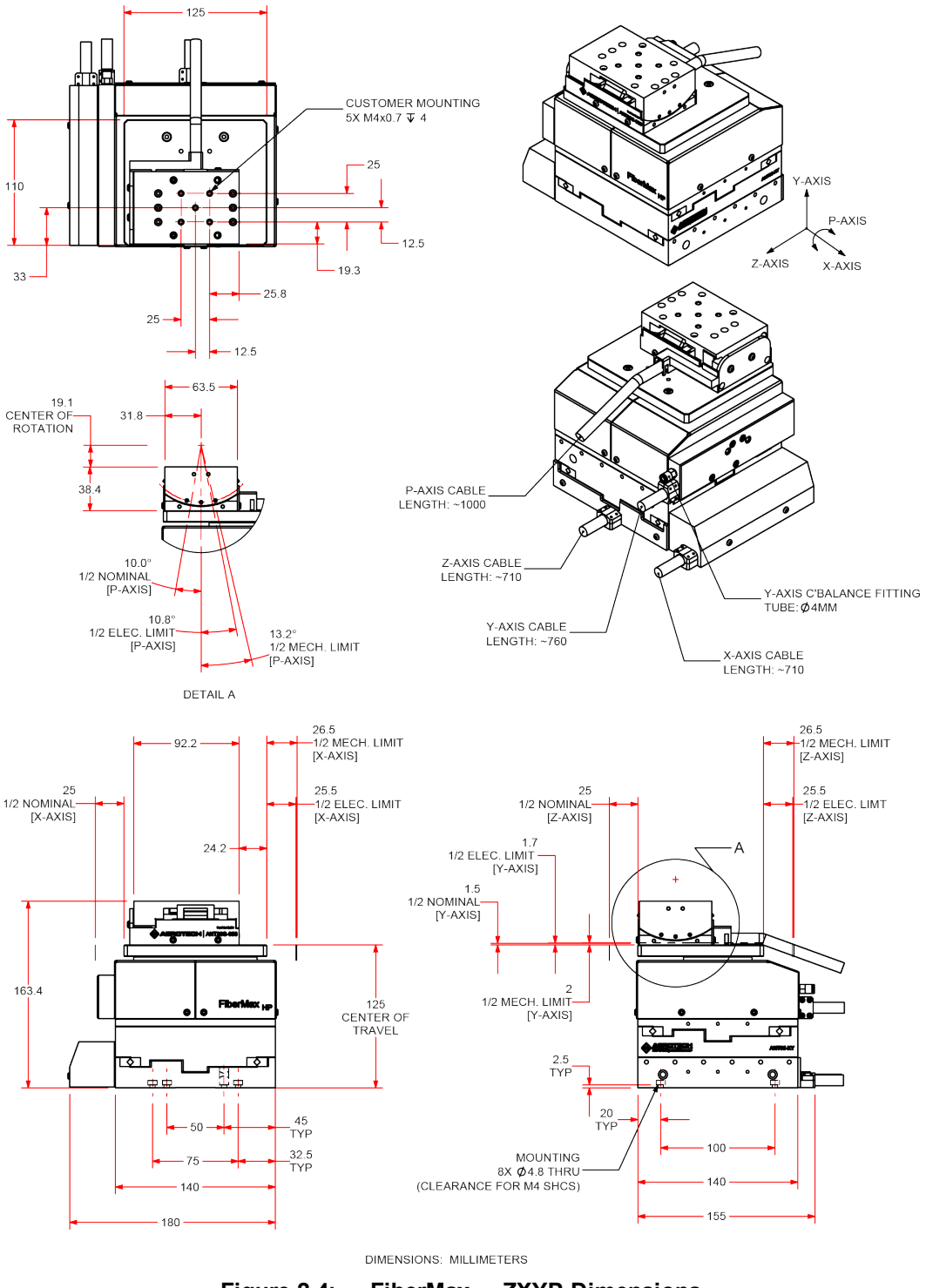


Figure 2-4: FiberMax$_{HP}$-ZXYP Dimensions

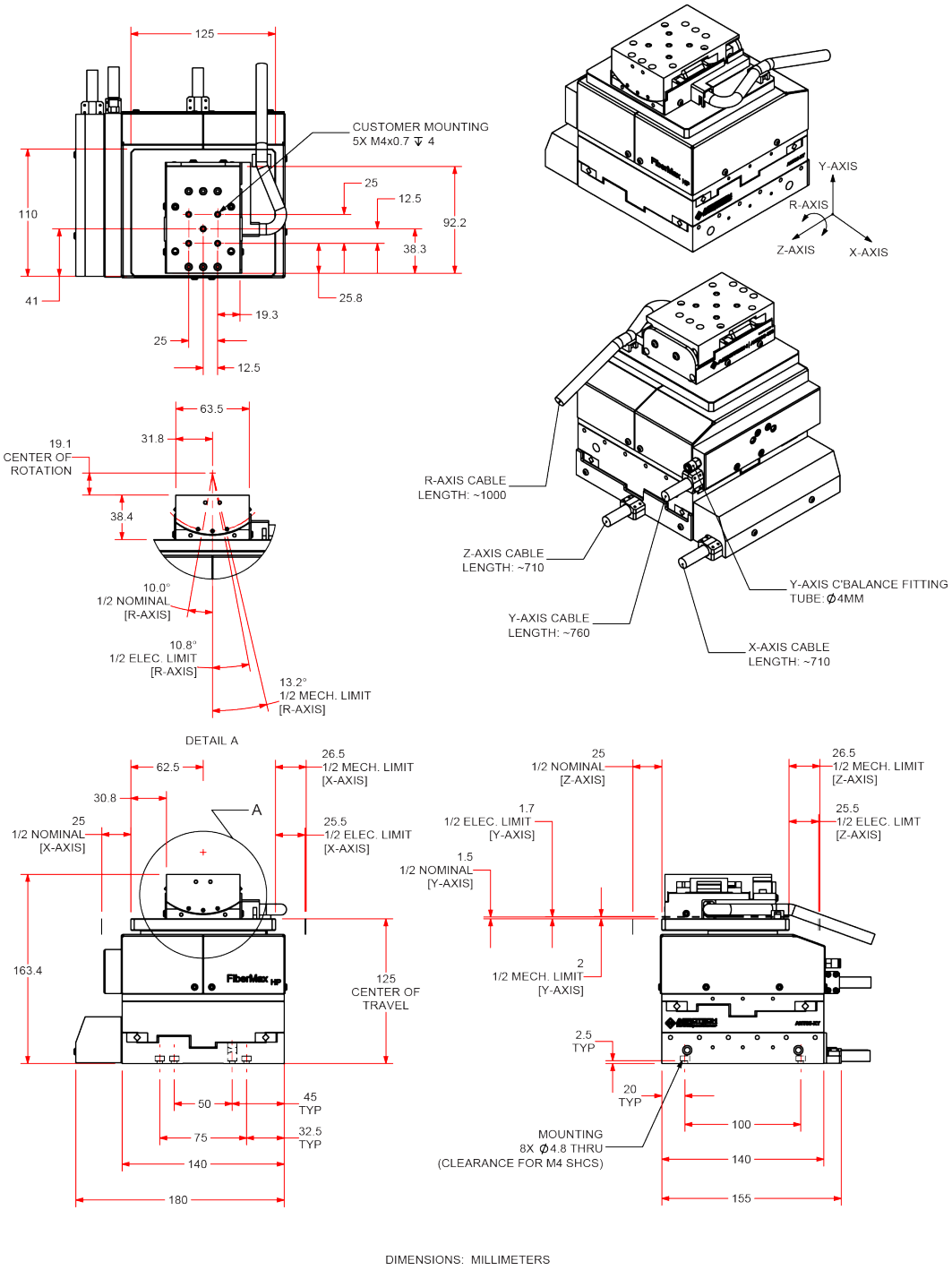


Figure 2-5: FiberMax$_{HP}$-ZXYR Dimensions

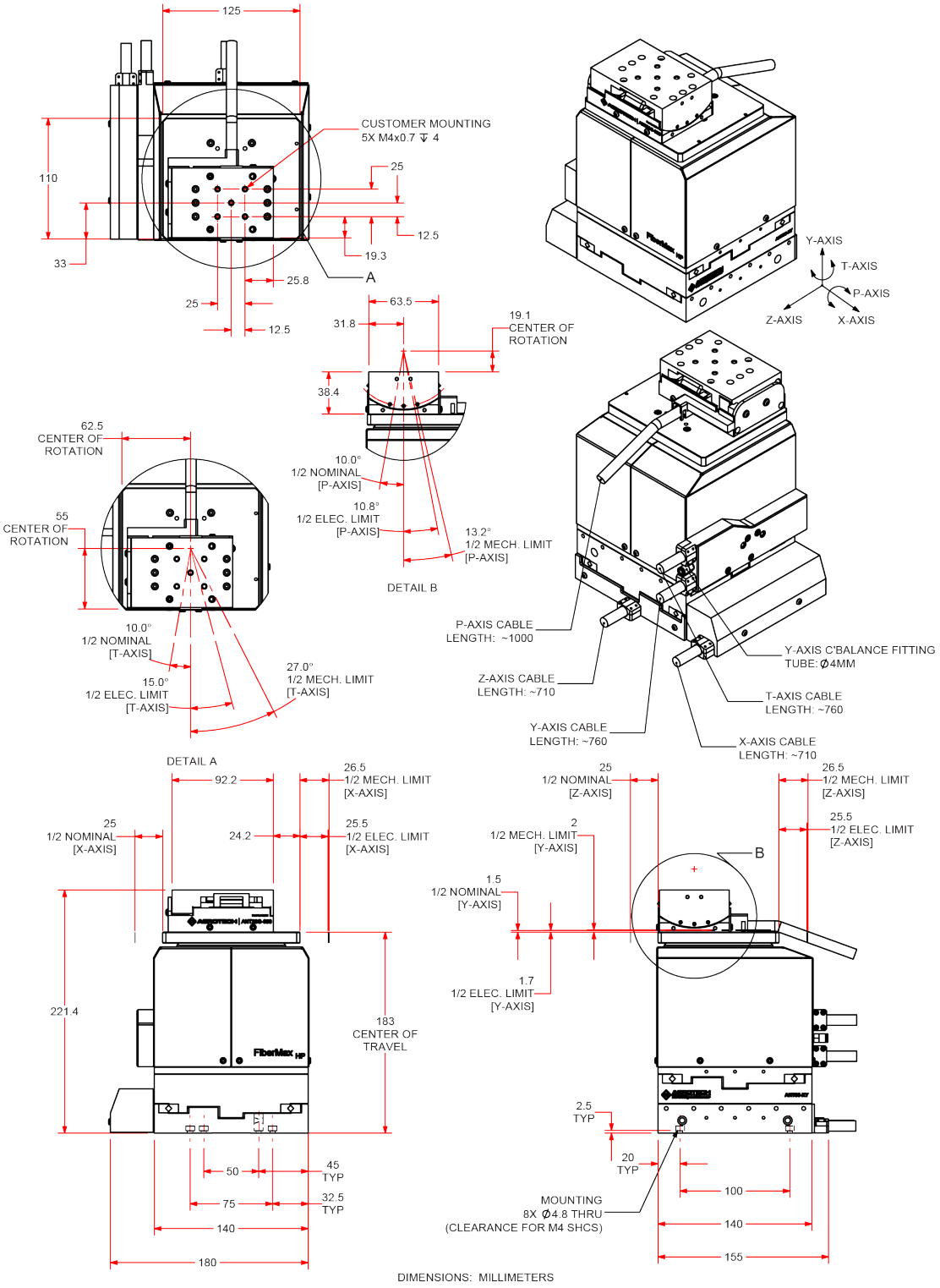


Figure 2-6: FiberMax$_{HP}$-ZXYTP Dimensions

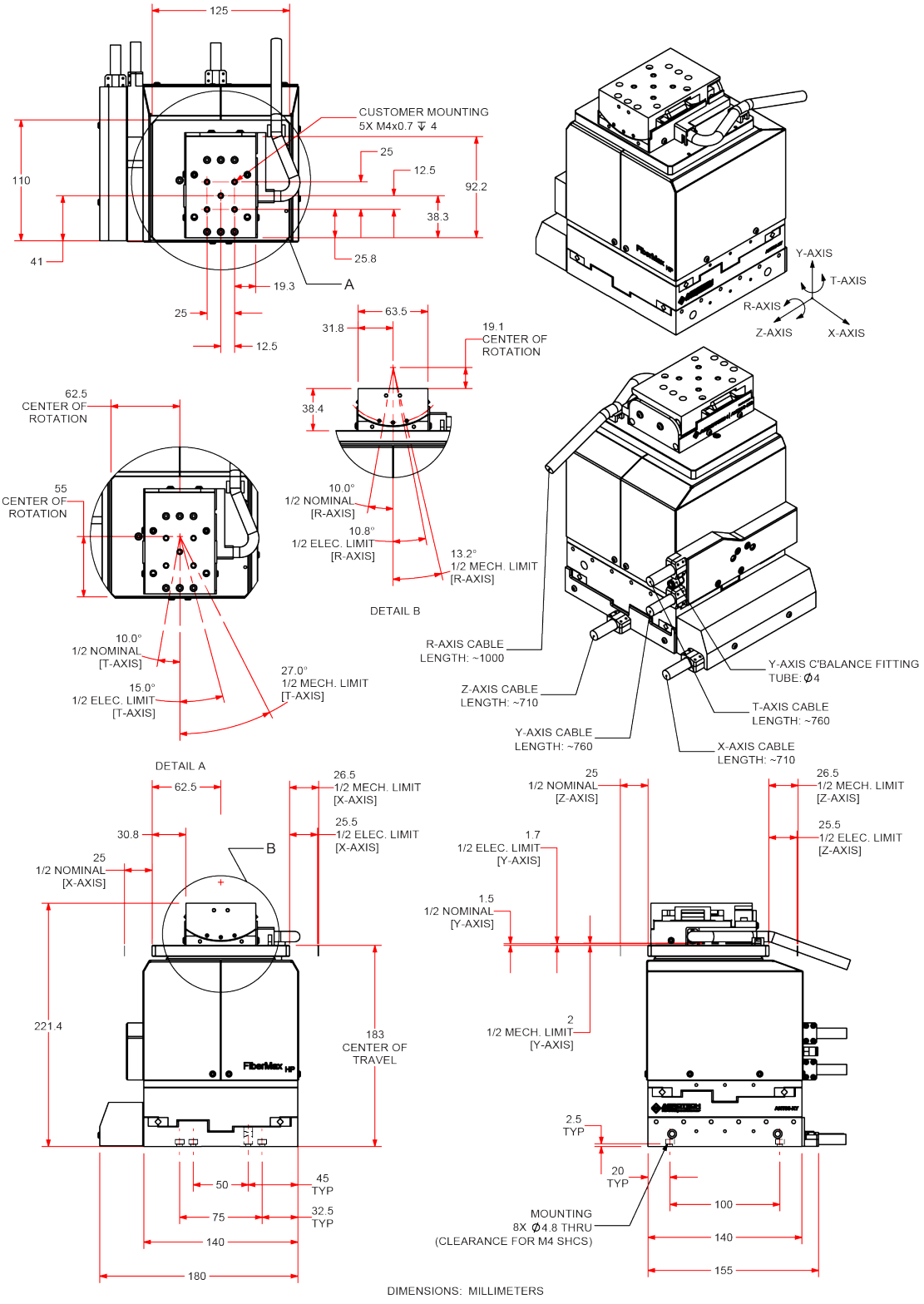


Figure 2-7: FiberMax$_{HP}$-ZXYTR Dimensions

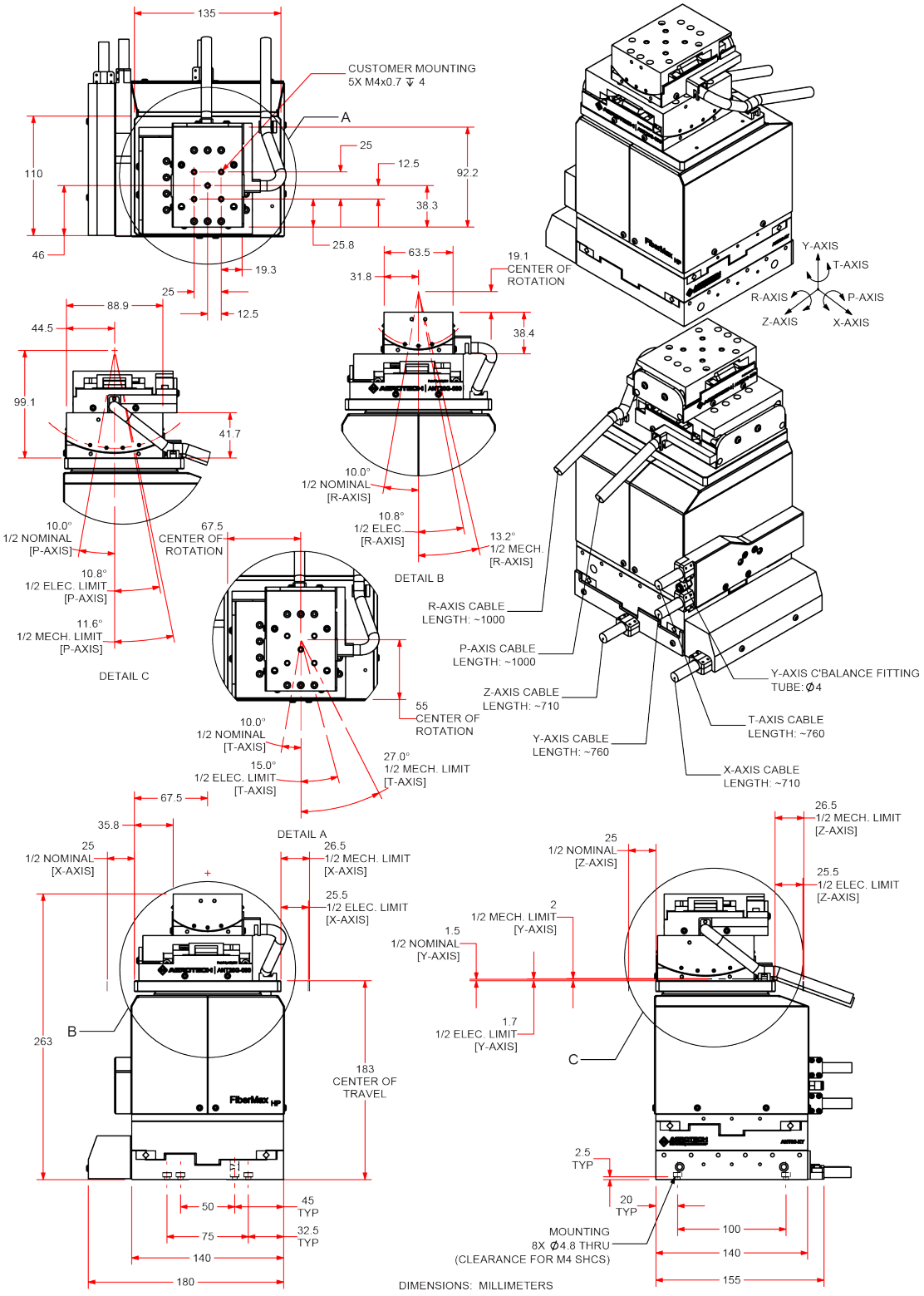


Figure 2-8: FiberMax$_{HP}$-ZXYTPR Dimensions

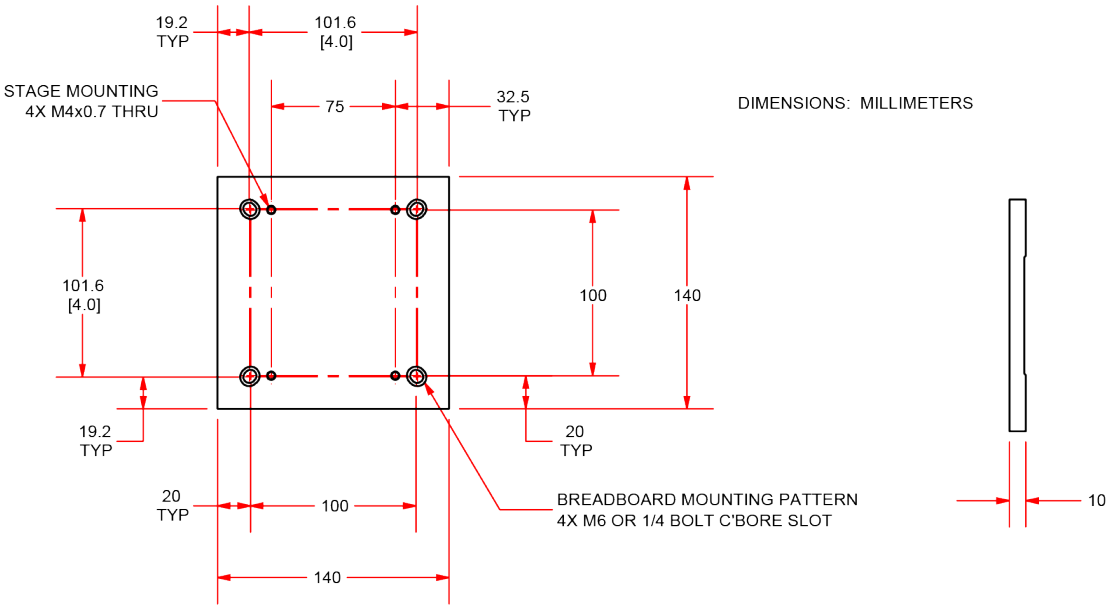
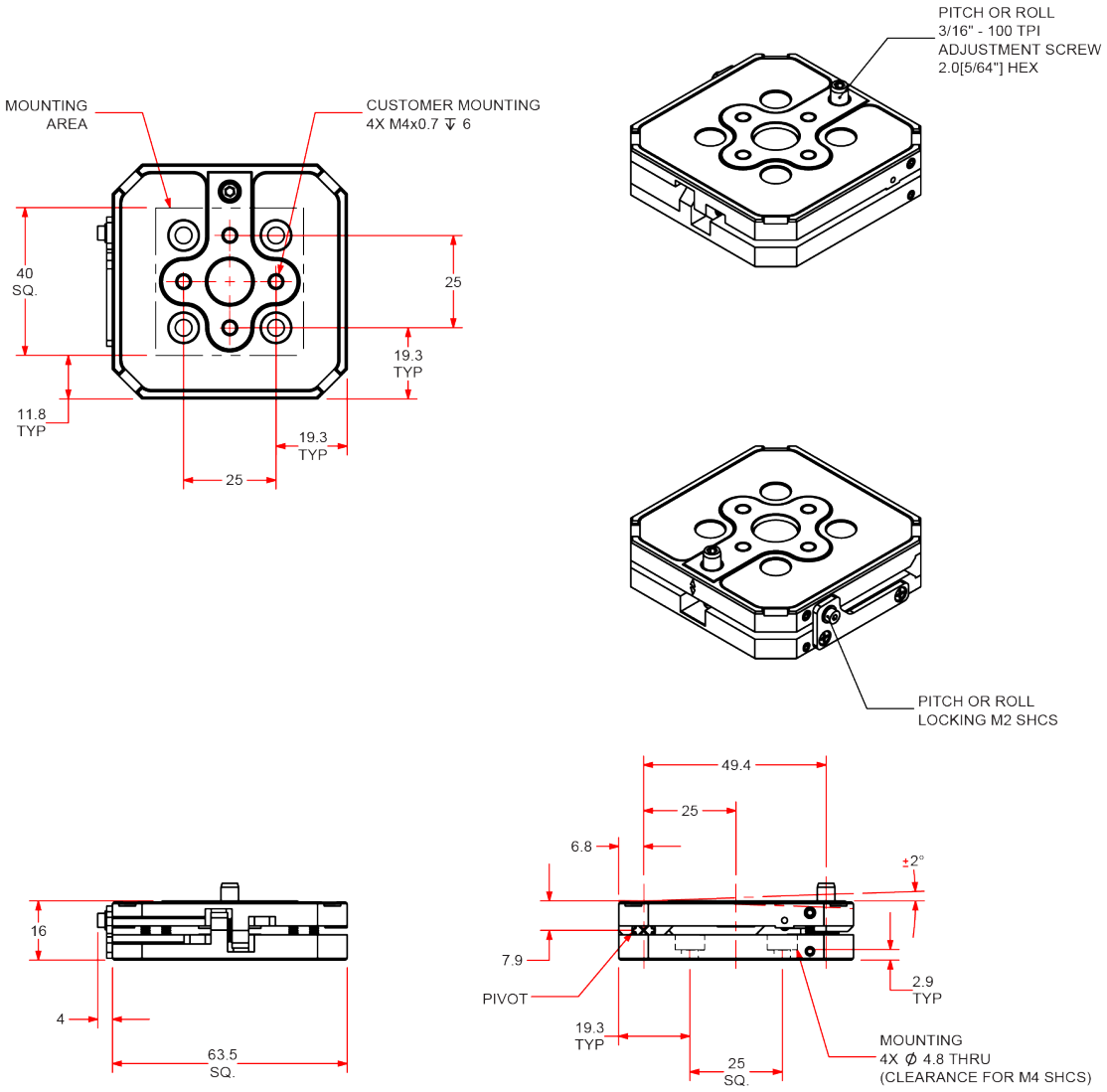


Figure 2-9: FiberMax$_{HP}$ Mounting Plate (-MP Option) Dimensions



DIMENSIONS: MILLIMETERS

Figure 2-10: MADJ-AT1 (-ADJ5 or -ADJ6 Option) Dimensions

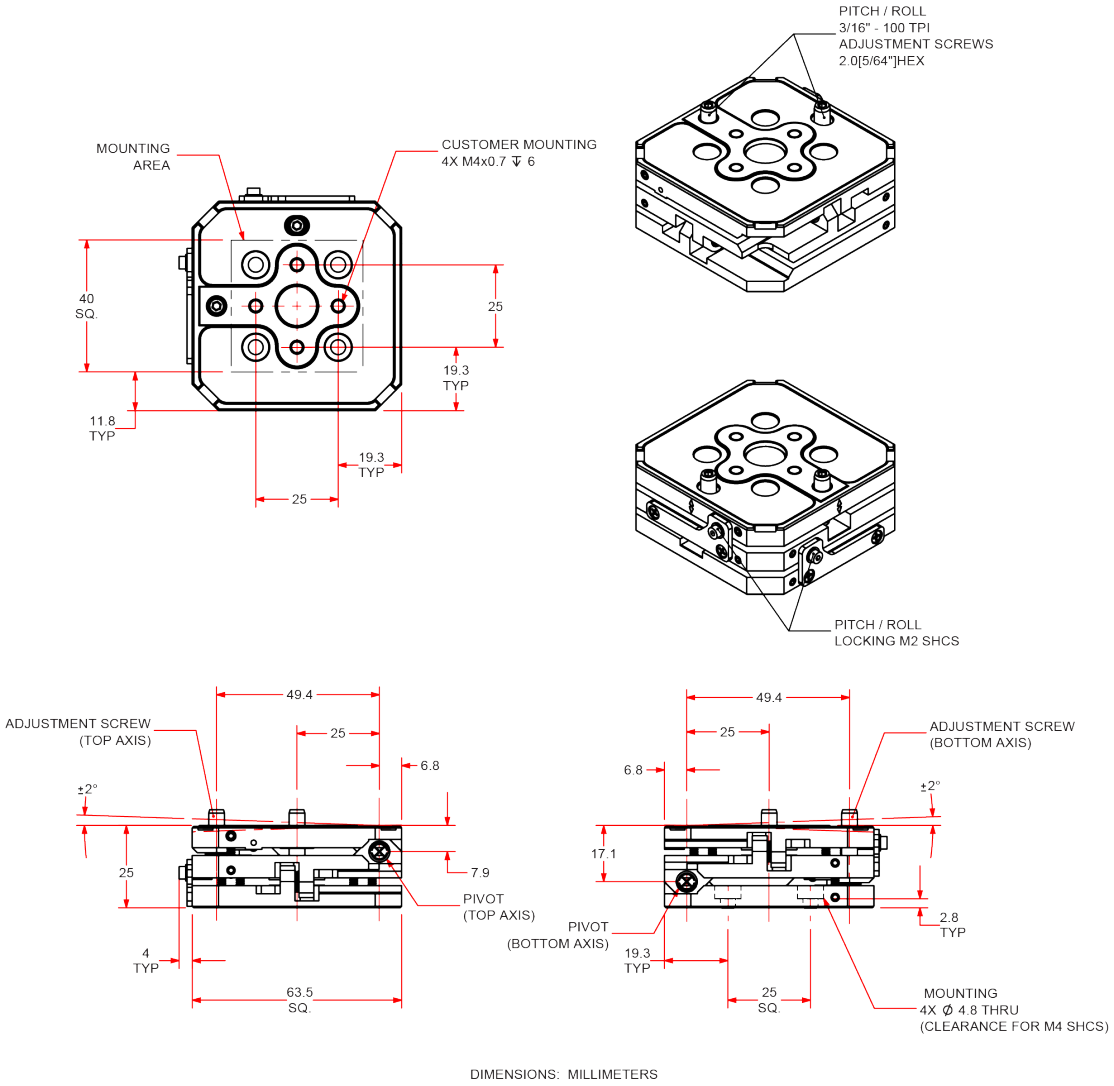


Figure 2-11: MADJ-AT2 (-ADJ2 Option) Dimensions

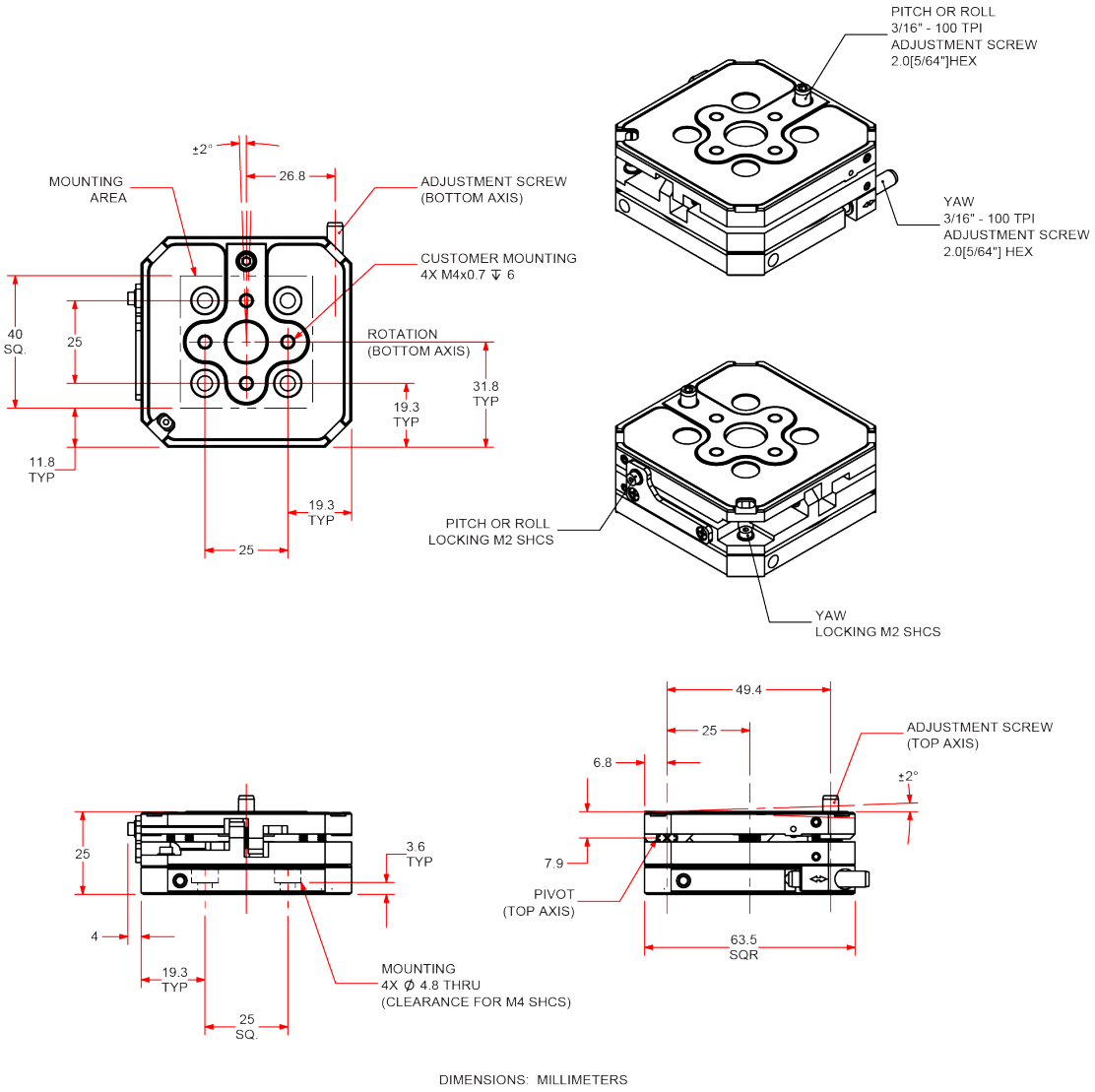


Figure 2-12: MADJ-AT3 (-ADJ3 or -ADJ4 Option) Dimensions

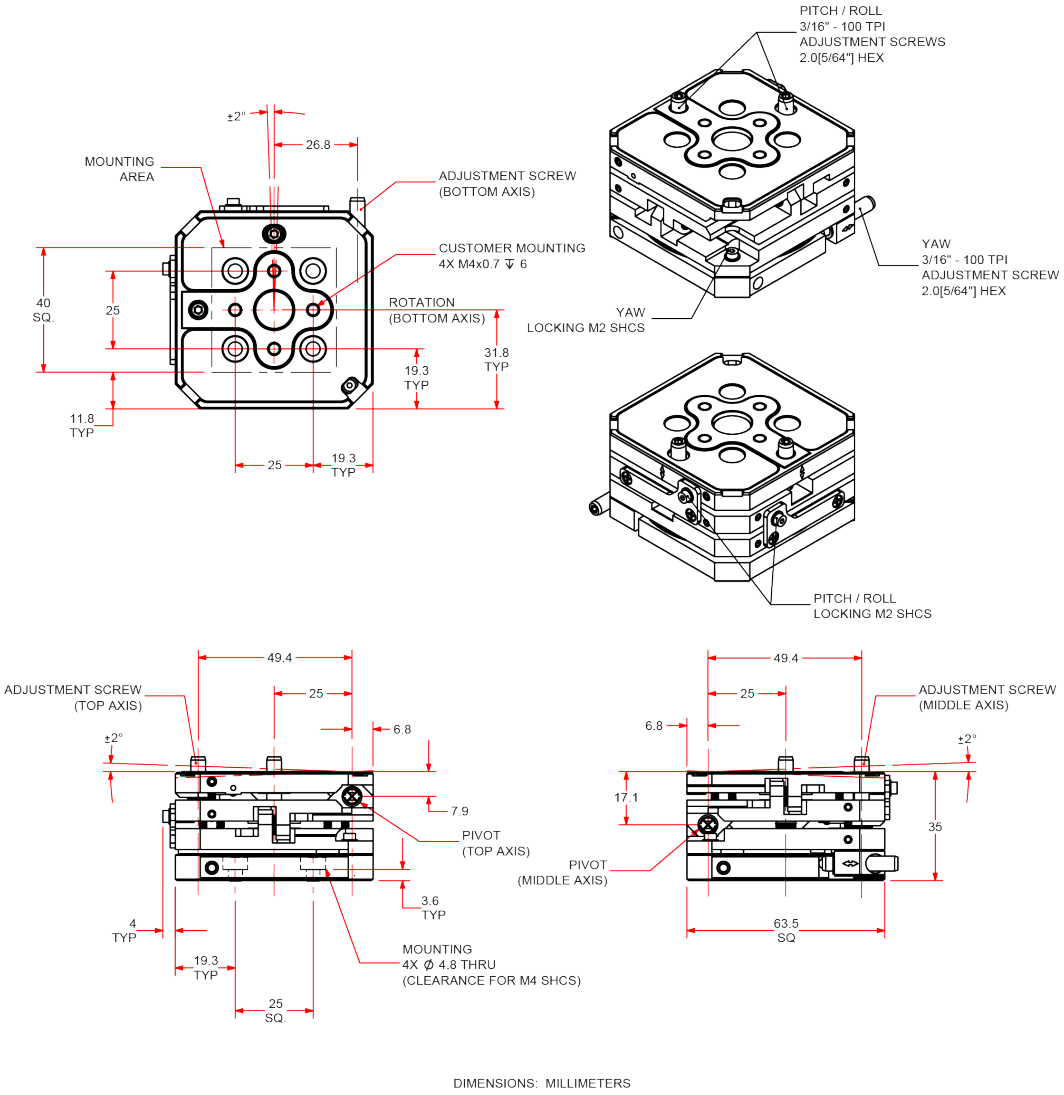


Figure 2-13: MADJ-AT4 (-ADJ1 Option) Dimensions

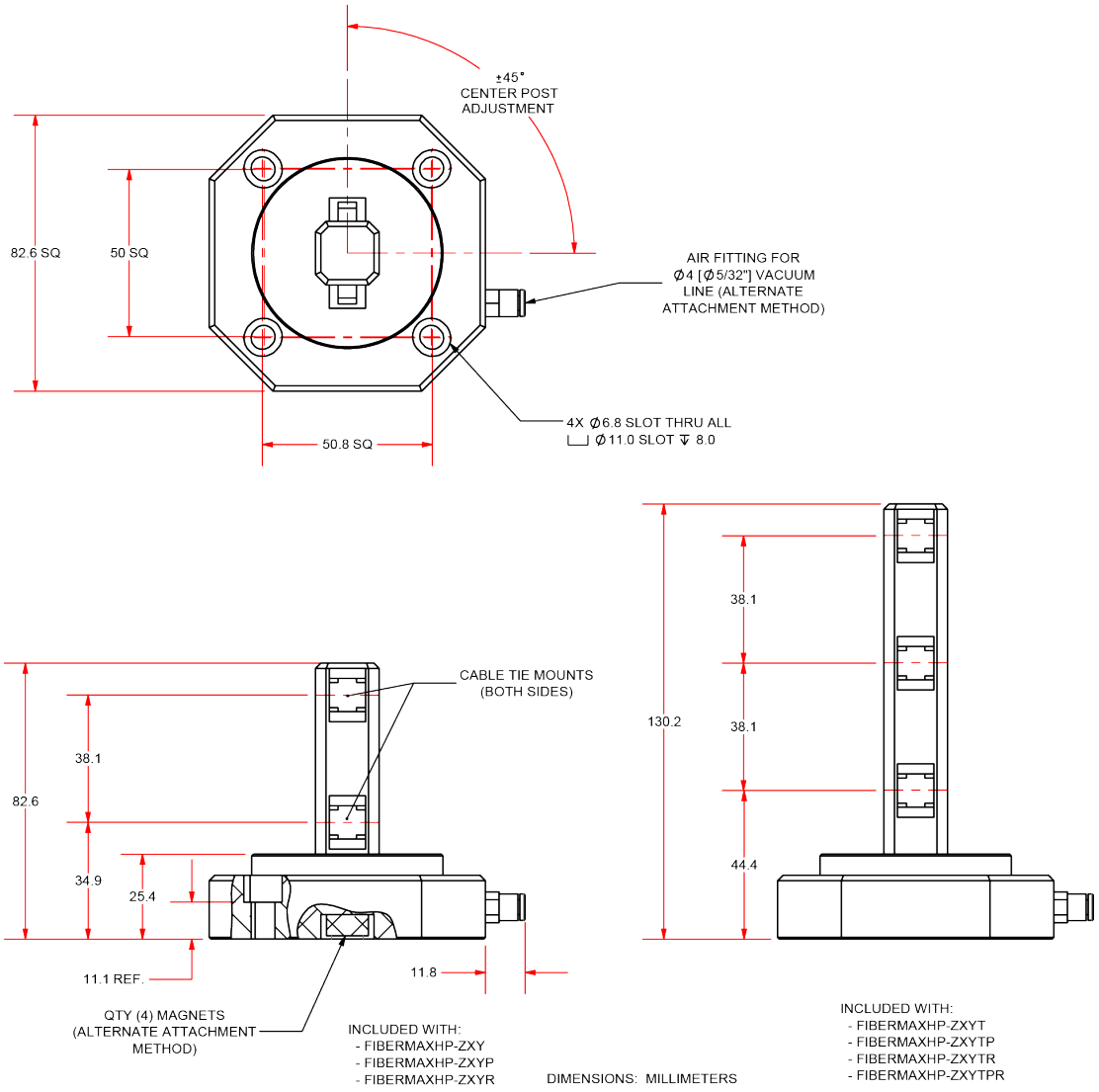


Figure 2-14: FiberMax$_{HP}$ CMS Post Dimensions (included with all configurations)

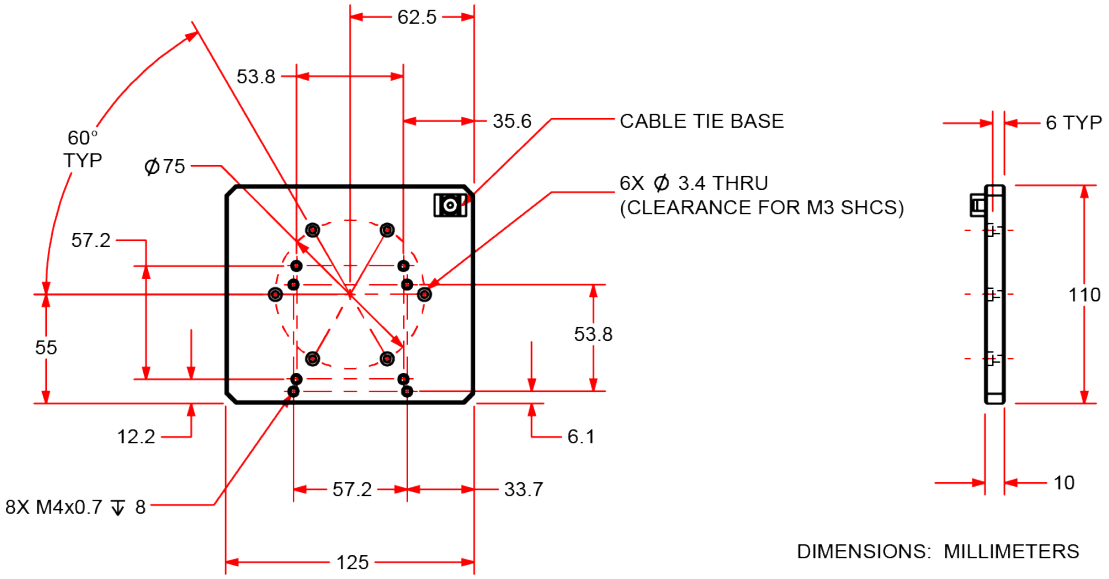


Figure 2-15: Adapter Plate Dimensions (AP-ANT95R-50G)

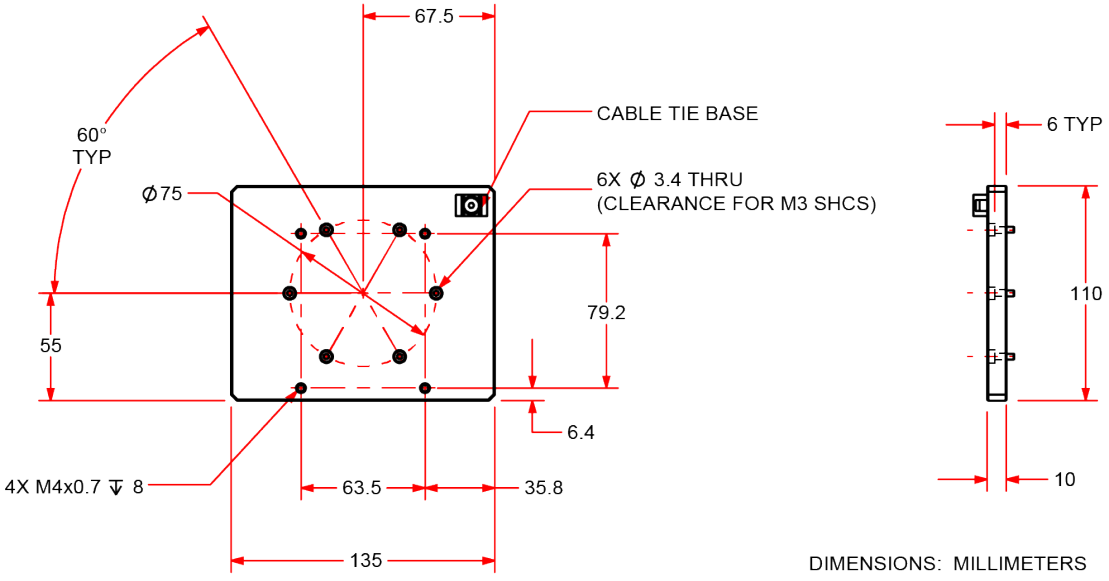


Figure 2-16: Adapter Plate Dimensions (AP-ANT95R-90G)

2.3. Securing the FiberMax$_{HP}$ to the Mounting Surface

WARNING: The FiberMax$_{HP}$ must be mounted securely. Improper mounting can result in injury and damage to the equipment.

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

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

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

NOTE: The FiberMax$_{HP}$ 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 FiberMax$_{HP}$. Shimming should be avoided if possible. If shimming is required, it should be minimized to retain maximum rigidity of the system.

Access the mounting holes in the base of the FiberMax$_{HP}$ stage by sliding the carriage all the way to either end of travel (as shown in Figure 2-17 and Section 2.2.).

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
M4 by 8 mm [#8 by 3/8 in] SHCS	2.3 N·m

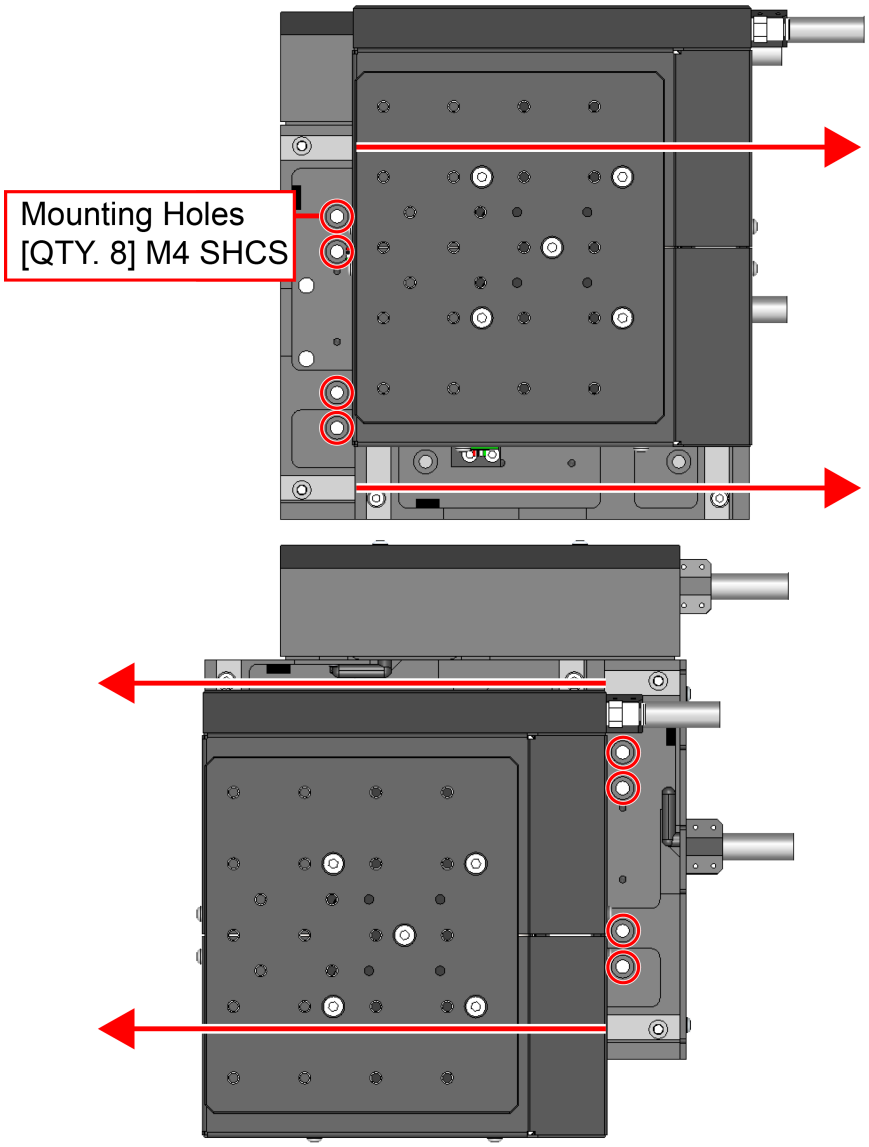


Figure 2-17: Mounting Hole Locations (FiberMax$_{HP}$-ZXY Shown)

2.4. Attaching the Payload to the FiberMax$_{HP}$

Inspect the mounting surface for dirt or unwanted residue and clean if necessary. Clean the mounting surface with a lint free cloth and 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 (including setting up the pneumatic counterbalance) and test the motion control system in accordance with the system documentation. Refer to Section 2.5. for counterbalance setup procedure. 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 FiberMax$_{HP}$ 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 FiberMax$_{HP}$ 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: Use 3-point mounting, if possible, when attaching the payload to the stage.

NOTE: For valid system performance, the mounting interface should be flat within 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 counterbalance setup instructions if the payload on the stage is changed (refer to Section 2.5.).

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

2.5. Setting up the Pneumatic Counterbalance

WARNING: Failure to adjust the counterbalance per the following instructions could result in bodily injury as well as stage and payload damage.

WARNING: Sudden loss of pressure to the pneumatic counterbalance will cause the lift stage to drop. This could result in bodily injury as well as stage and payload damage.

By default, the FiberMax$_{HP}$ pneumatic counterbalance is factory set to operate in the as-shipped condition. For systems that ship without payload, the counterbalance is set for the moving mass of the FiberMax$_{HP}$ lift stage. For systems that ship with payloads, the counterbalance is set for the moving mass of the FiberMax$_{HP}$ lift stage plus the additional mass. Any adjustment to the mass that is carried by the lift stage counterbalance cylinders, either by adding or subtracting payload, necessitates an adjustment to the counterbalance pressure supplied to the pneumatic cylinders.

Procedure for Setting up the Pneumatic Counterbalance

NOTE: Refer to Section 1.3. for air requirements. Be sure that the air supply meets specifications prior to continuing.

1. Make sure that:
   a. the shipping brackets have been removed (refer to Section 2.1.).
   b. the stage and payload are securely attached (refer to Section 2.3. and Section 2.4.).
2. Remove the right side cover by removing [QTY. 4] M3 button head screws (refer to Figure 2-18).

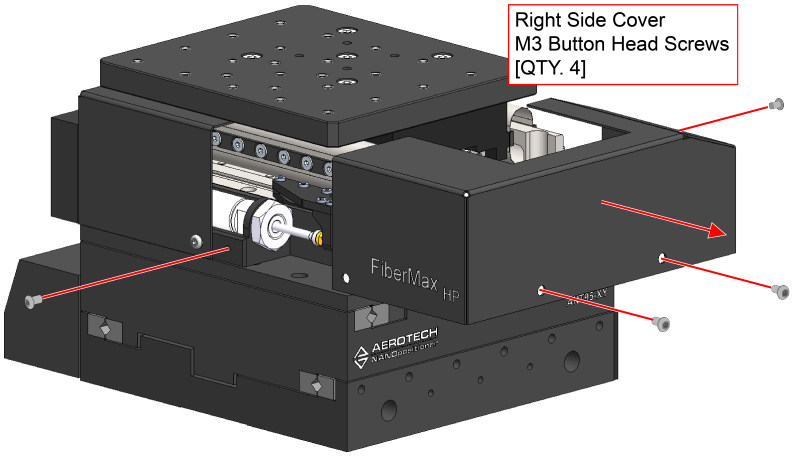


Figure 2-18: Cover Removal

3. Connect the pneumatics components to the air supply (refer to Figure 2-19).

NOTE: The regulated output pressure to the FiberMax$_{HP}$ should be set to zero.

NOTE: Counterclockwise rotation of the regulator knob decreases the pressure to the counterbalance cylinder. Clockwise rotation increases the pressure to the counterbalance cylinder.

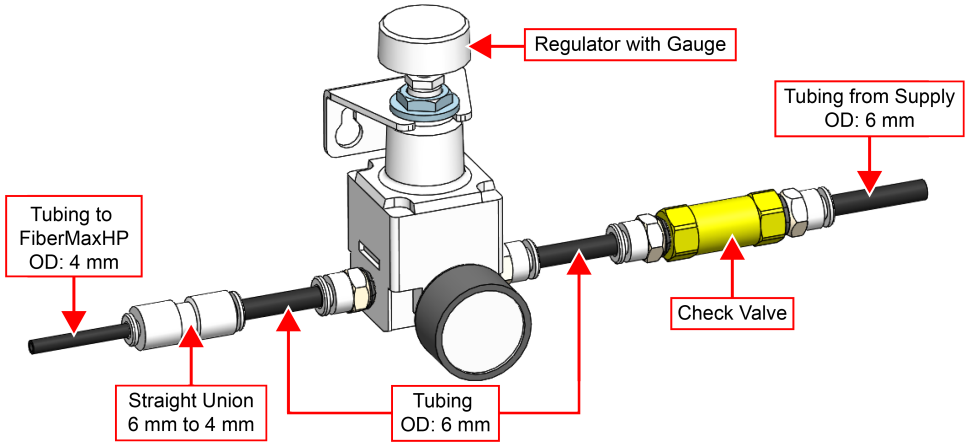


Figure 2-19: Counterbalance Pneumatics

4. With the system electrically disabled, adjust the pressure from zero, slowly increasing, while watching the position of the cross roller bearings of the lift stage.
5. The lift stage is balanced when the carriage (or wedge) is centered in travel.

NOTE: The faces of the cross roller bearings will be coplanar (refer to Figure 2-19).

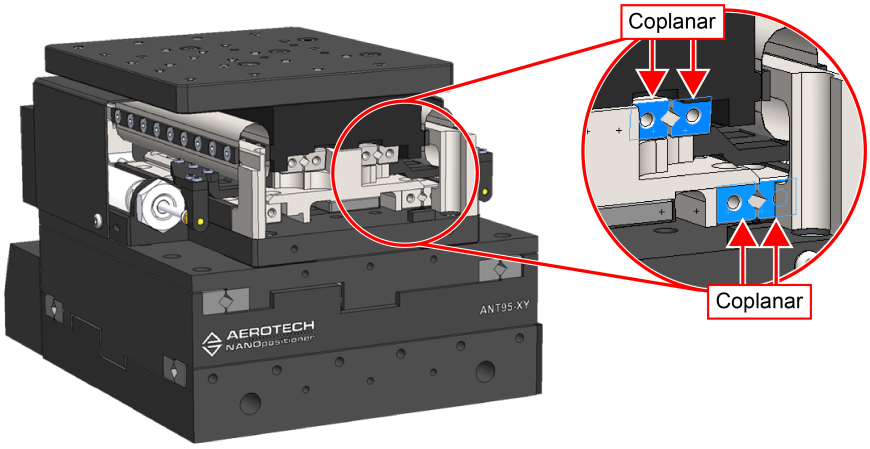


Figure 2-20: Counterbalance Bearing Rail Alignment (FiberMax$_{HP}$-ZXY Shown)

6. Reattach the right side lift stage cover removed in Step 2.

NOTE: Manually check for interferences between the cover and FiberMax$_{HP}$ system.

7. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. For information on electrical connections, refer to Chapter 3.

2.6. Manual Adjustment Stage (-ADJ Option)

For applications that require manual adjustment of fixtures and parts, the FiberMax$_{HP}$ can be configured with one- to three- axes of manual angular alignment. These adjustment axes mount directly to the FiberMax$_{HP}$ platform and offer a more economical approach for alignments when adjustment is not frequently required.

Procedure for Making Manual Adjustments

1. Loosen but do not remove the axis-locking M2 socket head cap screws (SHCS) (Figure 2-21).

NOTE: Do not remove the axis-locking M2 SHCS from the locking plates because the hardware is also used to limit the angular travel of each axis.

2. Tighten or loosen the Adjustment Screws to make up to three axes of angular adjustment (Figure 2-21).
3. Tighten the axis-locking M2 SHCS to secure the angular adjustments.

NOTE: Torque M2 SHCS to ~0.27 N·m [2.4 in·lb]

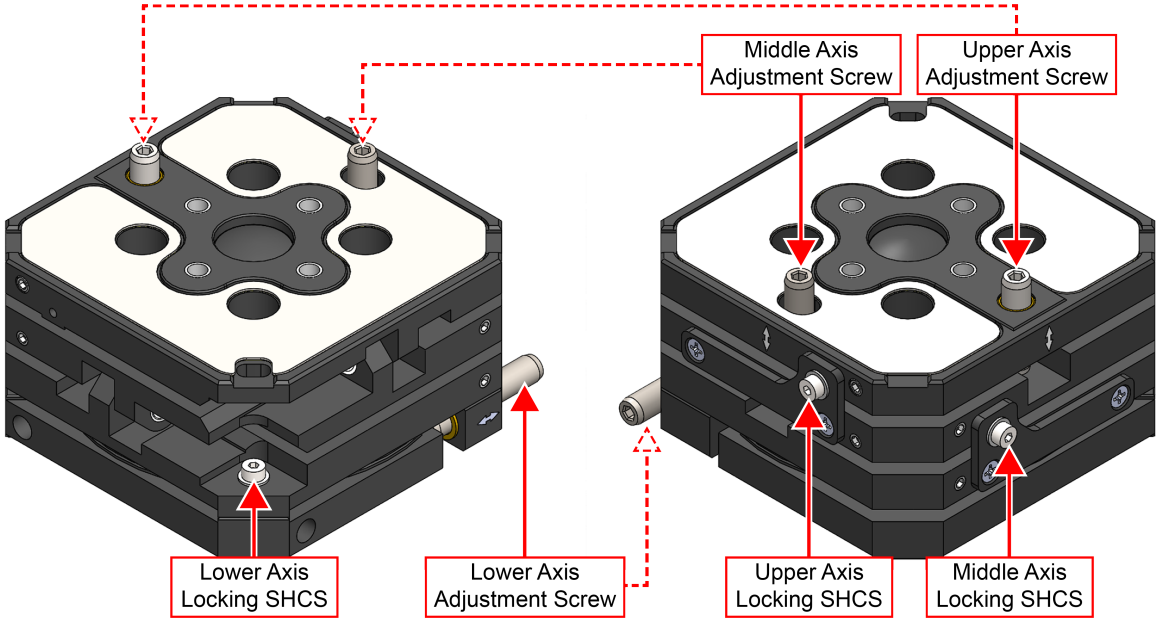


Figure 2-21: Manual Adjustment Stage (-ADJ1 Option Shown)

Table 2-2: Table 2-2: MADJ Series (-ADJ Option) Specifications

Specification	Value
Max Load(1)	2 kg [4.4 lbf]
Adjustment Range	±2°
Screw Pitch	0.254 mm/rev [100 threads/inch]
1. On Axis Loading	

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 FiberMax$_{HP}$ is part of a complete Aerotech motion control system, setup usually involves connecting the FiberMax$_{HP}$ 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.

WARNING: The T-axis of the FiberMax$_{HP}$ does not have Hall sensor signals. The controller has to initialize motor commutation through the use of a software algorithm.

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.

The protective ground connection of the FiberMax$_{HP}$ 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.

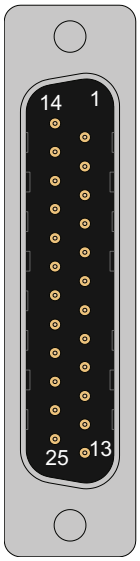
DANGER: Remove power before connecting or disconnecting electrical components or cables. Failure to do so may cause electric shock or damage to the equipment.

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.

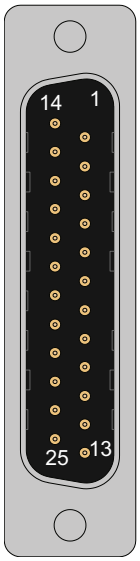
CAUTION: The stage controller must provide over-current and over-speed protection. Failure to do so may result in permanent damage to the motor and stage components.

Table 3-1: Motor and Feedback Pinouts, X and Z Axes (FiberMax$_{HP}$-50-XY)

Pin	Description	Connector
1	Key (Ensures that correct cable is plugged into the correct jack)	
2	Cosine-N	
3	Sine-N	
4	Marker-N	
5	Common ground	
6	Common ground	
7	Negative (CCW) hardware limit	
8	Hall Effect sensor, phase A	
9	Hall Effect sensor, phase C	
10	Frame ground	
11	Motor Phase A	
12	Motor Phase B	
13	Motor Phase C	
14	Cosine	
15	Sine	
16	Marker	
17	+5 V supply input for feedback devices	
18	Reserved	
19	Positive (CW) hardware limit	
20	Reserved	
21	Hall Effect sensor, phase B	
22	Reserved	
23	Motor Phase A	
24	Motor Phase B	
25	Motor Phase C	

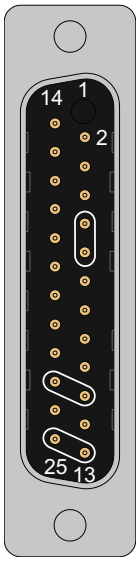
Mating Connector	Aerotech P/N	Third Party P/N
Backshell	ECK00656	Amphenol 17E-1726-2
Connector	ECK00300	FCI DB25S064TLF

Table 3-2: Motor and Feedback Pinouts, Y Axis (FiberMax$_{HP}$-3-V)

Pin	Description	Connector
1	Key (Ensures that correct cable is plugged into the correct jack)	
2	Cosine-N	
3	Sine-N	
4	Marker-N	
5	Common ground	
6	Common ground	
7	Negative (CCW) hardware limit	
8	Hall Effect sensor, phase A	
9	Hall Effect sensor, phase C	
10	Frame ground	
11	Motor Phase A	
12	Motor Phase B	
13	Motor Phase C	
14	Cosine	
15	Sine	
16	Marker	
17	+5 V supply input for feedback devices	
18	Reserved	
19	Positive (CW) hardware limit	
20	Reserved	
21	Hall Effect sensor, phase B	
22	Reserved	
23	Motor Phase A	
24	Motor Phase B	
25	Motor Phase C	

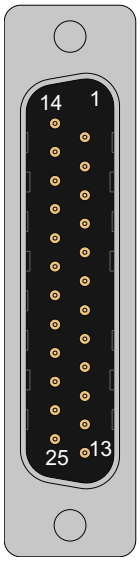
Mating Connector	Aerotech P/N	Third Party P/N
Backshell	ECK00656	Amphenol 17E-1726-2
Connector	ECK00300	FCI DB25S064TLF

Table 3-3: Motor and Feedback Pinouts, T Axis (FiberMax$_{HP}$-20-R)

Pin	Description	Connector
1	Key (Ensures that correct cable is plugged into the correct jack)	
2	Cosine-N	
3	Sine-N	
4	Marker-N	
5	Common ground	
6	Common ground	
7	Negative (CCW) hardware limit	
8	Reserved	
9	Reserved	
10	Frame ground	
11	Motor Phase A	
12	Motor Phase B	
13	Motor Phase C	
14	Cosine	
15	Sine	
16	Marker	
17	+5 V supply input for feedback devices	
18	Reserved	
19	Positive (CW) hardware limit	
20	Motor Thermistor	
21	Reserved	
22	Reserved	
23	Motor Phase A	
24	Motor Phase B	
25	Motor Phase C	

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

Table 3-4: Motor and Feedback Pinouts, P and R Axes (FiberMax$_{HP}$-20G-50 and FiberMax$_{HP}$-20G-90)

Pin	Description	Connector
1	Key (Ensures that correct cable is plugged into the correct jack)	
2	Cosine-N	
3	Sine-N	
4	Marker-N	
5	Common ground	
6	Common ground	
7	Negative (CCW) hardware limit	
8	Hall Effect sensor, phase A	
9	Hall Effect sensor, phase C	
10	Frame ground	
11	Motor Phase A	
12	Motor Phase B	
13	Motor Phase C	
14	Cosine	
15	Sine	
16	Marker	
17	+5 V supply input for feedback devices	
18	Reserved	
19	Positive (CW) hardware limit	
20	Reserved	
21	Hall Effect sensor, phase B	
22	Reserved	
23	Motor Phase A	
24	Motor Phase B	
25	Motor Phase C	

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.

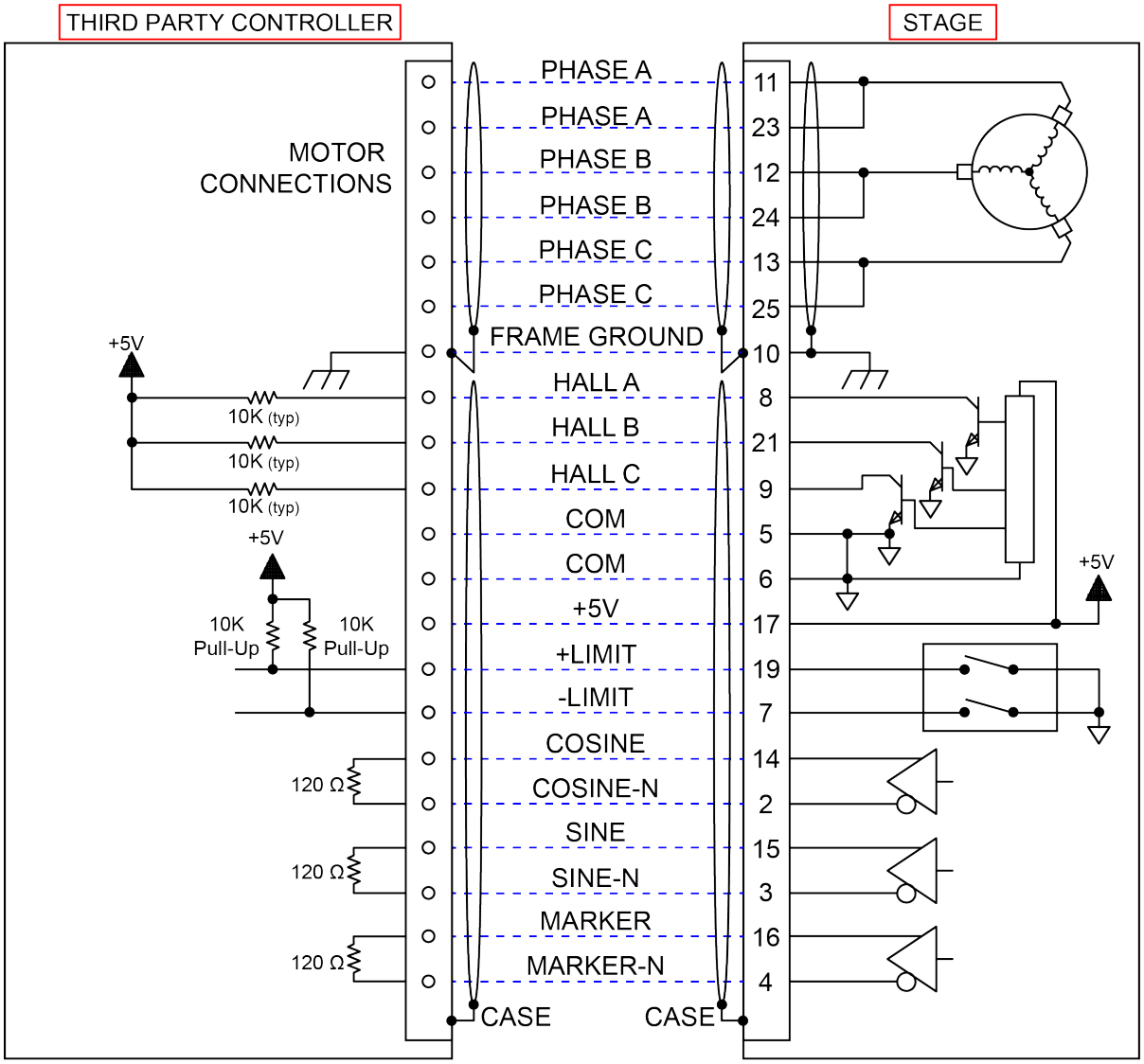


Figure 3-1: Motor and Feedback Wiring for the Z, X, Y, P, and R Axes

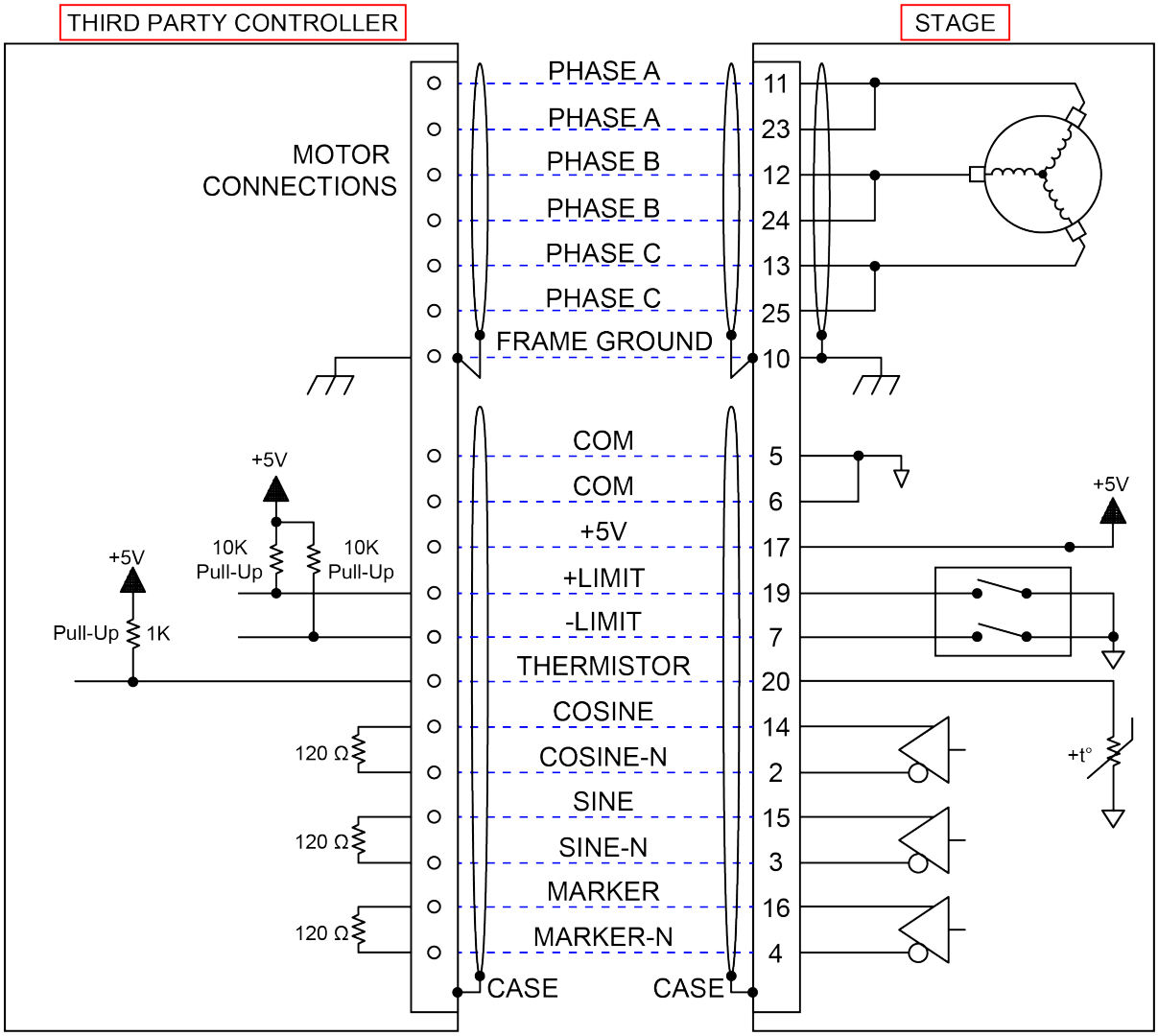


Figure 3-2: Motor and Feedback Wiring for the T Axis

3.3. Motor and Feedback Specifications

Table 3-5: Feedback Specifications for the Z, X, P, and R Axes

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)

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

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)

1. If the FiberMax$_{HP}$ is driven beyond the electrical limit, it will encounter a mechanical stop. Impacting the mechanical stop could cause damage to the stage even at low speeds.

Table 3-6: Feedback Specifications for the Y Axis

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)

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

Limit Switch Specifications	
Supply Voltage	Generated by the encoder
Supply Current	
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)
	Normally Open (NO) • Sinks current to ground (Logic "0") when in limit • High impedance (Logic "1") when not in limit • Requires external pull-up to +5 V (10 kΩ recommended)

1. If the FiberMax$_{HP}$ is driven beyond the electrical limit, it will encounter a mechanical stop. Impacting the mechanical stop could cause damage to the stage even at low speeds.

Table 3-7: Feedback Specifications for the T Axis

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

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

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)
1. If the FiberMax$_{HP}$ is driven beyond the electrical limit, it will encounter a mechanical stop. Impacting the mechanical stop could cause damage to the stage even at low speeds.	

Table 3-8: Motor Specifications for the X and Z Axes (FiberMax$_{HP}$-50-XY)

		X and Z Axes (FiberMax$_{HP}$-50-XY)
Performance Specifications (1,5)		
Continuous Force (2)	N (lb)	9.7 (2.17)
Electrical Specifications (5)		
Winding Designation		-A
BEMF Constant (Line to Line, Max)	V/m/s (V/in/s)	3.78 (0.10)
Continuous Current (2)	A_{pk} (A_{rms})	2.94 (2.08)
Peak Current, Stall (3)	A_{pk} (A_{rms})	11.76 (8.31)
Force Constant, Sine Drive (4, 8)	N/A_{pk} (lb/A_{pk})	3.28 (0.74)
	N/A_{rms} (lb/A_{rms})	4.65 (1.05)
Motor Constant (2,4)	$N/\sqrt{W}$ ($lb/\sqrt{W}$)	1.41 (0.32)
Resistance, 25°C (Line to Line)	ohms	5.2
Inductance (Line to Line)	mH	0.70
Thermal Resistance	°C/W	2.12
Maximum Bus Voltage	VDC	80
Magnetic Pole Pitch	mm (in)	16.00 (0.63)

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. Force constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. Maximum winding temperature is 125°C.
7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures
8. All Aerotech amplifiers are rated Apk; use force constant in N·m/Apk when sizing.

Table 3-9: Encoder Specifications for the Upper X and Lower Z Axes (FiberMax$_{HP}$-50-XY)

	Upper X Axis (FiberMax$_{HP}$-50-XY)	Lower Z Axis (FiberMax$_{HP}$-50-XY)
Fundamental Resolution	20 µm	
with x4000 Interpolation[1]	5 nm	
with x16000 Interpolation[1]	1.25 nm	

1. Quadrature decoding included in interpolated resolution calculations

Table 3-10: Motor Specifications for the Y Axis (FiberMax$_{HP}$-3-V)

		Y Axis (FiberMax$_{HP}$-3-V)
Performance Specifications(1,5)		
Continuous Force (2)	N (lb)	9.7 (2.17)
Electrical Specifications(5)		
Winding Designation		-A
BEMF Constant (Line to Line, Max)	V/m/s (V/in/s)	3.78 (0.10)
Continuous Current (2)	A_{pk} (A_{rms})	2.94 (2.08)
Peak Current, Stall (3)	A_{pk} (A_{rms})	11.76 (8.31)
Force Constant, Sine Drive (4, 8)	N/A_{pk} (lb/A_{pk})	3.28 (0.74)
	N/Amp_{rms} (lb/A_{rms})	4.65 (1.05)
Motor Constant (2,4)	$N/\sqrt{W}$ ($lb/\sqrt{W}$)	1.41 (0.32)
Resistance, 25°C (Line to Line)	ohms	5.2
Inductance (Line to Line)	mH	0.70
Thermal Resistance	°C/W	2.12
Maximum Bus Voltage	VDC	80
Magnetic Pole Pitch	mm (in)	16.00 (0.63)

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. Force constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. Maximum winding temperature is 125°C.
7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures
8. All Aerotech amplifiers are rated Apk; use force constant in N·m/Apk when sizing.

The encoder for the Y axis (FiberMax$_{HP}$-3-V) has a 20 µm fundamental resolution. The encoder reads the horizontally driven wedge motion, not the vertical tabletop motion. This increases the fundamental resolution seen at the tabletop. The angle of the drive wedge is 7.70º, which results in a fundamental encoder resolution of 2.704 µm.

The fundamental resolution is not the same as the electrical resolution. The encoder signal is multiplied inside Aerotech's controller to yield a much smaller resolution. Consult the system documentation included with the stage to determine this value.

The mechanical resolution, which is listed in the stage specification table in Section 1.2., is distinct from the electrical and fundamental resolution. It is the smallest motion increment Aerotech can consistently measure using an external measurement device such as a laser or a capacitance probe. The mechanical resolution can never be smaller than the electrical resolution of the stage.

Table 3-11: Encoder Specifications, Y Axis (FiberMax$_{HP}$-3-V)

	Y Axis
Fundamental Resolution	2.70 µm
with x4000 Interpolation[1]	0.68 nm
with x16000 Interpolation[1]	0.17 nm

1. Quadrature decoding included in interpolated resolution calculations

Table 3-12: Motor Specifications, T Axis (FiberMax$_{HP}$-20-R)

		T Axis
Performance Specifications(1,6)		
Stall Torque, Continuous	N·m (oz·in)	0.27 (38.4)
Peak Torque(4)	N·m (oz·in)	1.08 (153.6)
Rated Power Output, Continuous	watts	113.6
Electrical Specifications(6)		
Winding Designation		-B
BEMF Constant (Line to Line, Max)	V_{pk}/krpm	10.9
Continuous Current, Stall	A_{pk} (A_{rms})	3.00 (2.12)
Peak Current, Stall(4)	A_{pk} (A_{rms})	12.00 (8.49)
Torque Constant(5,7)	N·m/A_{pk} (oz·in/A_{pk})	0.09 (12.8)
	N·m/A_{rms} (oz·in/A_{rms})	0.13 (18.1)
Motor Constant(5)	N/√W (lb/√W)	0.042 (5.92)
Resistance, 25°C (Line to Line)	ohms	4.8
Inductance (Line to Line)	mH	0.45
Maximum Bus Voltage	VDC	80
Thermal Resistance	°C/W	1.78
Number of Poles	P	8

1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature
2. Values shown @ 68°C rise above a 25 °C ambient temperature, with housed motor mounted to a 250 mm x 250 mm x 6 mm aluminum heat sink
3. Peak torque assumes correct rms current; consult Aerotech
4. Torque constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. All Aerotech amplifiers are rated A_{pk}; use torque constant in N·m/A_{pk} when sizing

Table 3-13: Encoder Specifications, T Axis (FiberMax$_{HP}$-20-R)

	T Axis
Fundamental Resolution	109.4594595 arc·sec/count
After Quadrature	27.36486486 arc·sec/count
MXH x250	0.1094595 arc·sec/count
MXH x500	0.0547297 arc·sec/count
MXH x1000	0.02736486 arc·sec/count
MXH x4000	0.00684122 arc·sec/count

Table 3-14: Motor Specifications, P and R Axes (FiberMax$_{HP}$-20G-50 and FiberMax$_{HP}$-20G-90)

		P and R Axes (FiberMax$_{HP}$-20G-50)	P Axis (FiberMax$_{HP}$-20G-90)
Performance Specifications(1,5)			
Stall Torque, Continuous (2)	N·m (oz·in)	0.4 (54.54)	0.9 (123.21)
Peak Torque (3)	N·m (oz·in)	1.5 (218.2)	3.5 (492.8)
Electrical Specifications(5)			
Winding Designation		-A	-A
BEMF Constant (Line to Line, Max)	V/krpm (V/in/s)	14.95 (0.073	35.62 (0.096)
Continuous Current (2)	A_{pk} (A_{rms})	3.10 (2.19)	2.94 (2.08)
Peak Current, Stall (3)	A_{pk} (A_{rms})	12.40 (8.77)	11.76 (8.32)
Force Constant, Sine Drive (4, 8)	N·m/A_{pk} (oz·in/A_{pk})	0.12 (17.59)	0.30 (41.91)
	N·m/A_{rms} (oz·in/A_{rms})	0.18 (24.88)	0.42 (59.27)
Motor Constant (2,4)	N·m/$\sqrt{W}$ (oz·in/$\sqrt{W}$)	0.06 (8.58)	0.13 (17.93)
Resistance, 25°C (Line to Line)	ohms	4.0	5.2
Inductance (Line to Line)	mH	0.51	0.70
Thermal Resistance	°C/W	2.48	2.12
Maximum Bus Voltage	VDC	80	80
Mechanical Specifications(5)			
Motor Radius	mm (in)	50.00 (1.97)	90.00 (3.54)
Magnetic Pole Pitch	degree	22.4	11.3

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. Force constant and motor constant specified at stall
5. All performance and electrical specifications ±10%
6. Maximum winding temperature is 125°C.
7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures
8. All Aerotech amplifiers are rated Apk; use force constant in N·m/Apk when sizing.

Table 3-15: Encoder Specifications, P and R Axes (FiberMax$_{HP}$-20G-50 and FiberMax$_{HP}$-20G-90)

	P and R Axes FiberMax$_{HP}$-20G-50	P Axis FiberMax$_{HP}$-20G-90
Fundamental Resolution	116.2791 arc·sec/count	53.7637 arc·sec/count
After Quadrature	29.069775 arc·sec/count	13.440925 arc·sec/count
MXH x250	0.4626 arc·sec/count	0.2152 arc·sec/count
MXH x500	0.2313 arc·sec/count	0.1076 arc·sec/count
MXH x1000	0.1157 arc·sec/count	0.0538 arc·sec/count
MXH x4000	0.0289 arc·sec/count	0.0134 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 3-3 shows the machine direction of FiberMax$_{HP}$ stages.

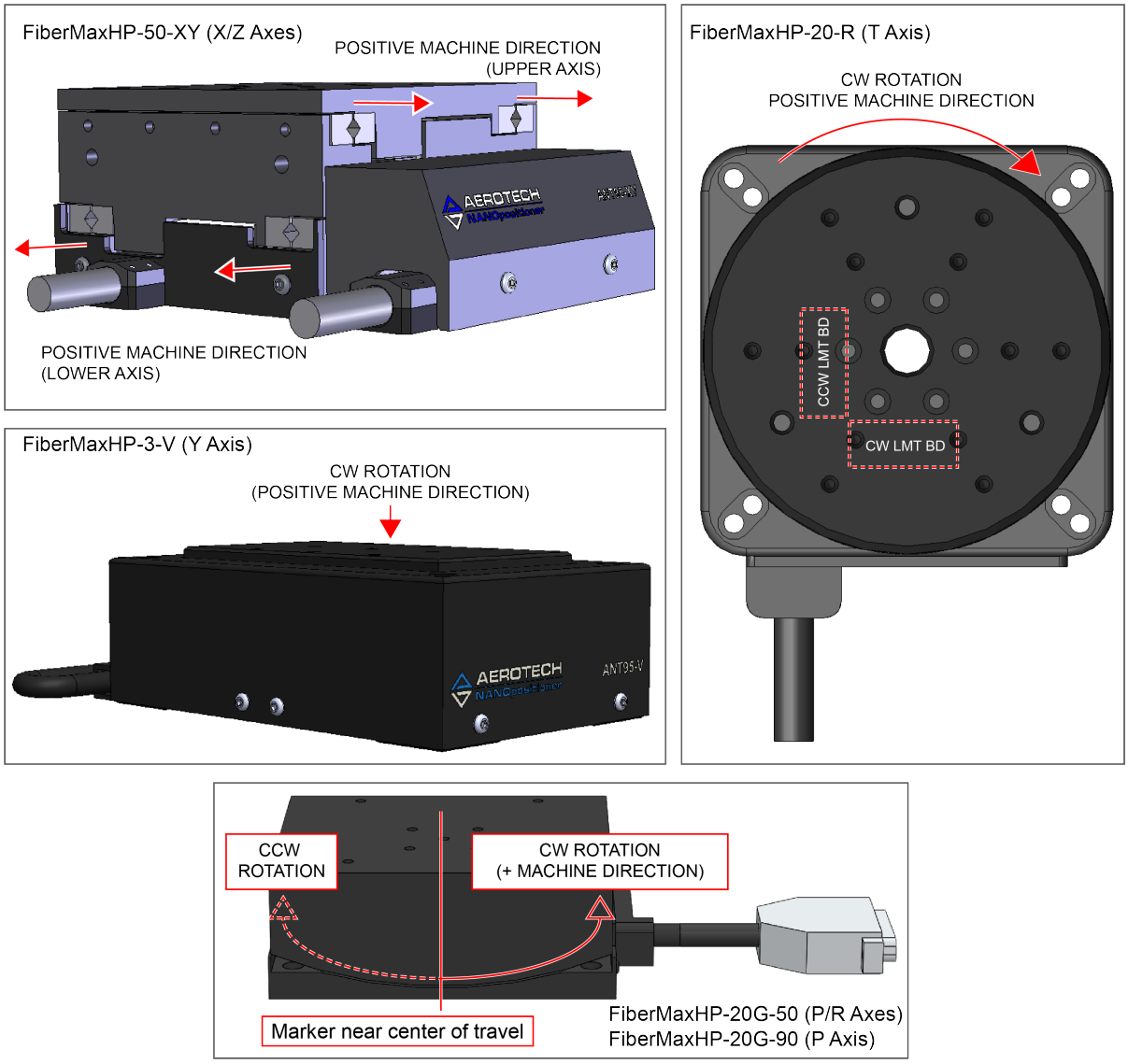


Figure 3-3: Machine Direction

3.5. Motor and Feedback Phasing

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

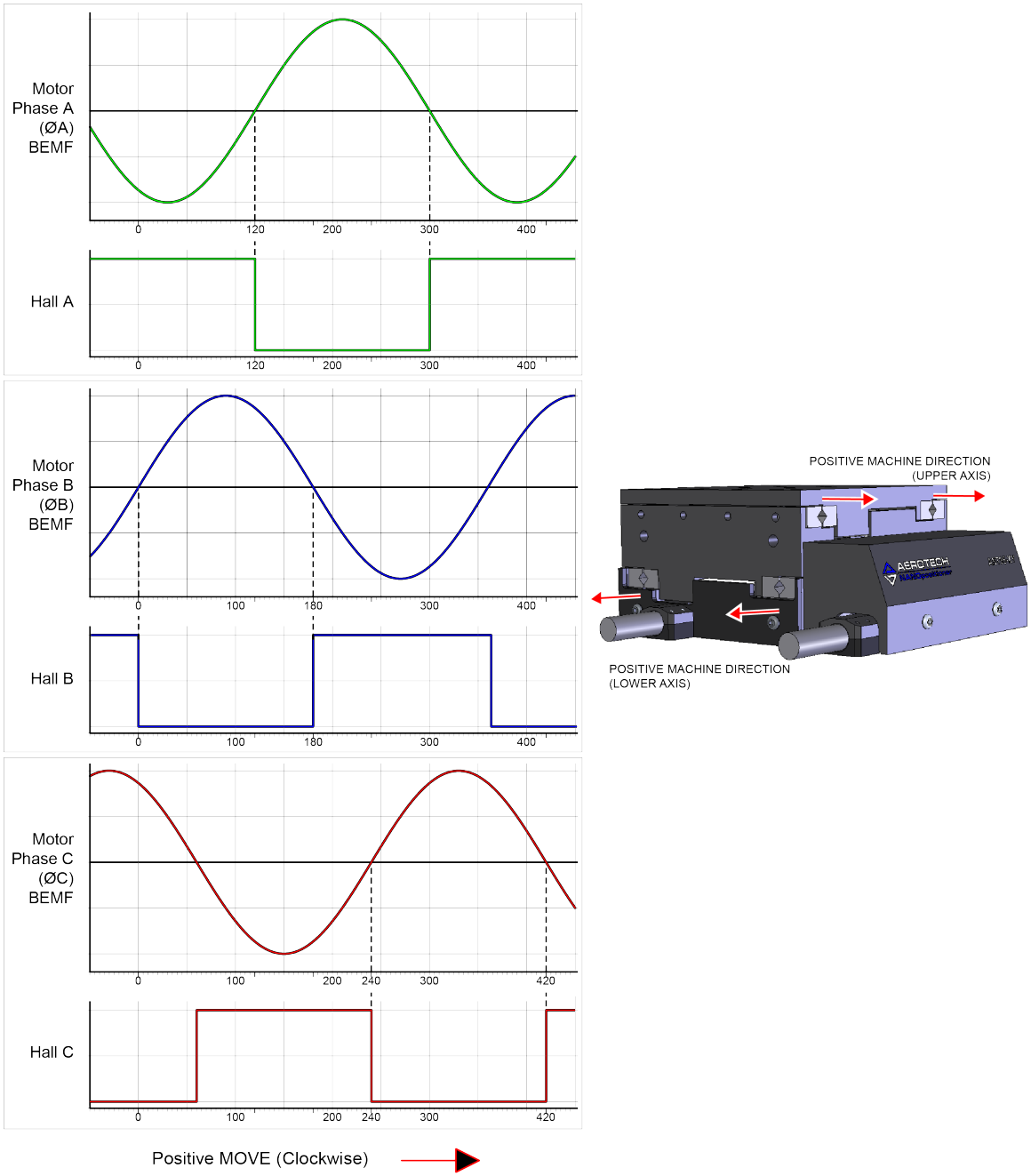


Figure 3-4: Hall Phasing, X and Z Axes (FiberMax$_{HP}$-50-XY)

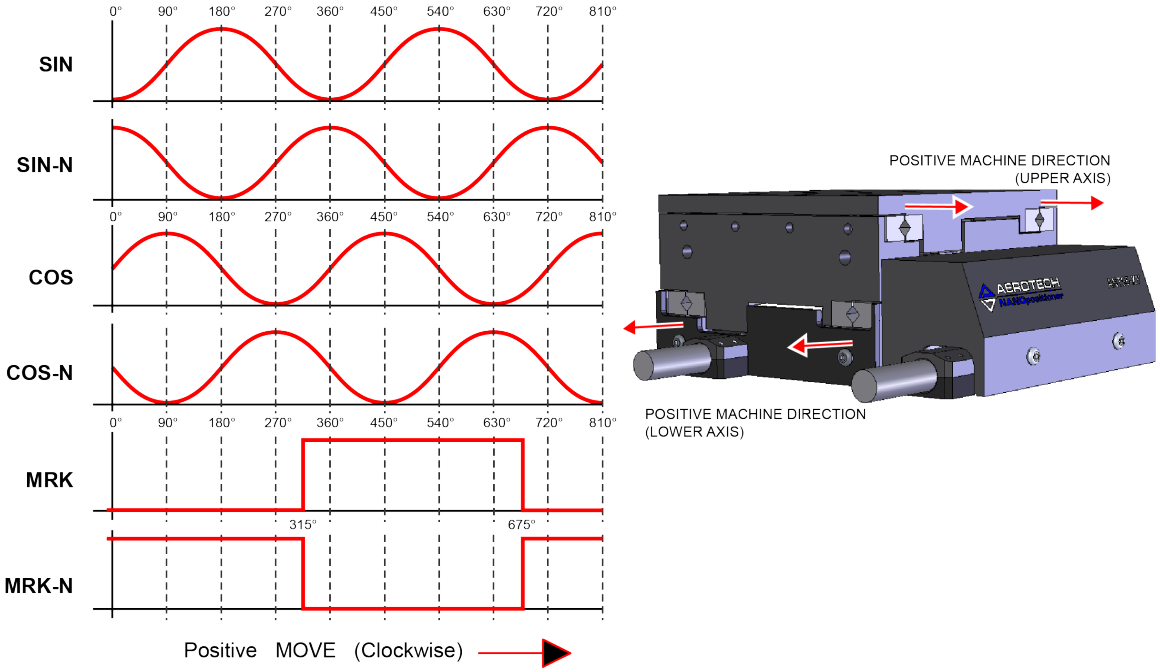


Figure 3-5: Analog Encoder Phasing Reference Diagram, X and Z Axes (FiberMax$_{HP}$-50-XY)

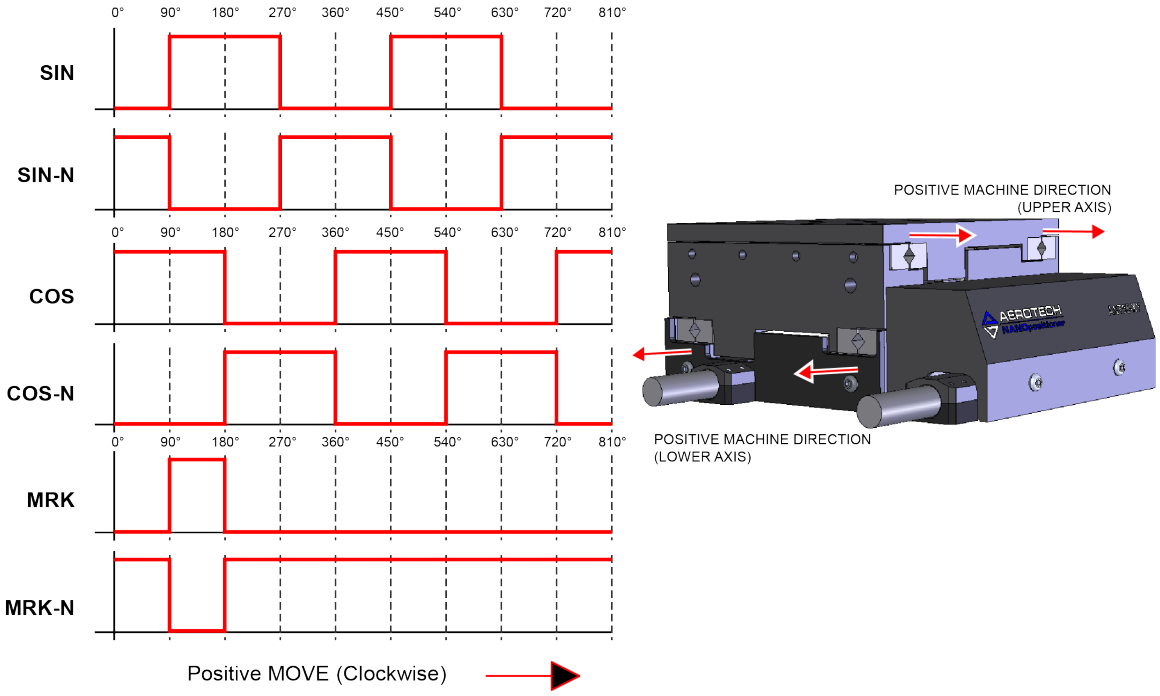


Figure 3-6: Standard Encoder Phasing Reference Diagram, X and Z Axes (FiberMax$_{HP}$-50-XY)

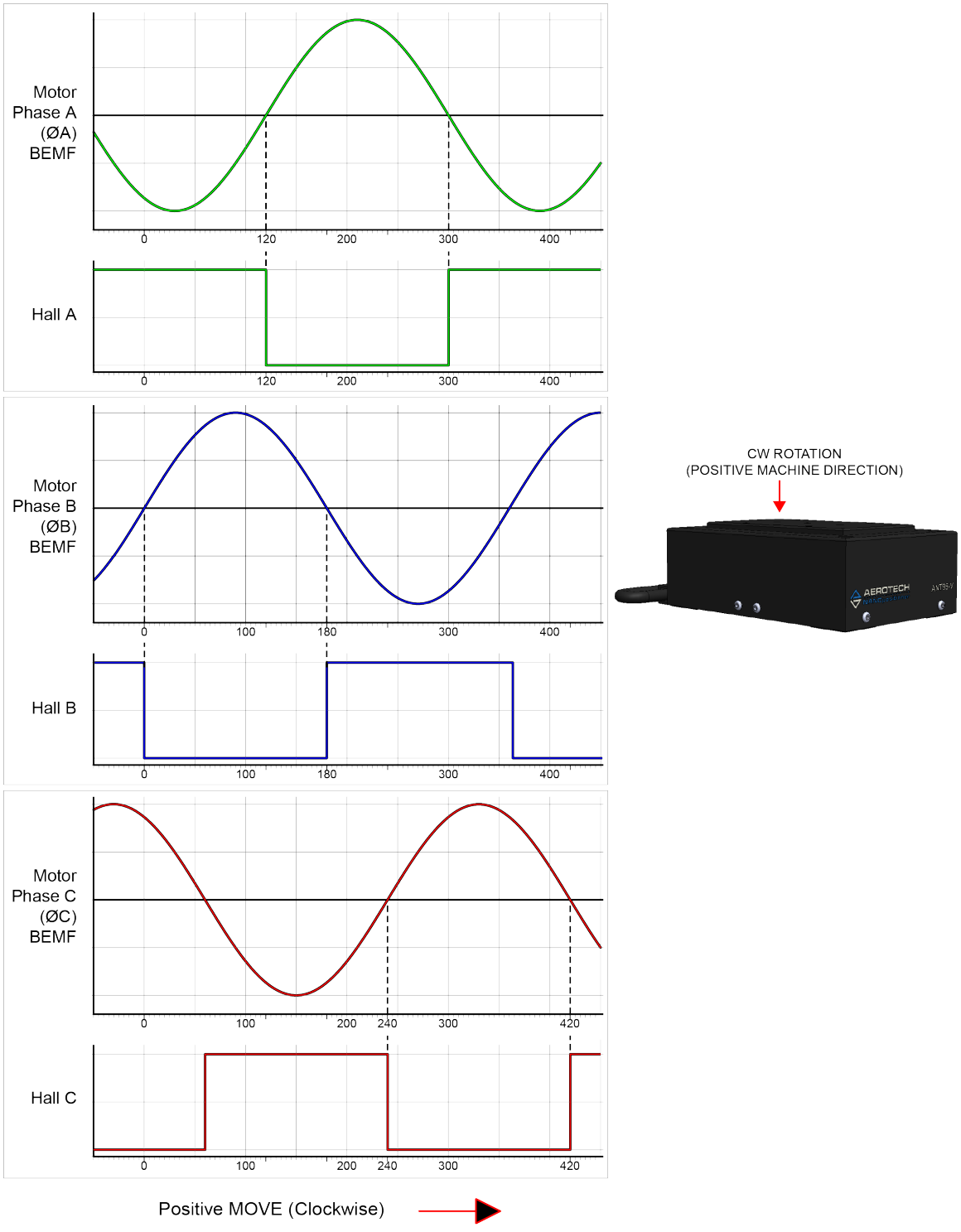


Figure 3-7: Hall Phasing, Y Axis (FiberMax$_{HP}$-3-V)

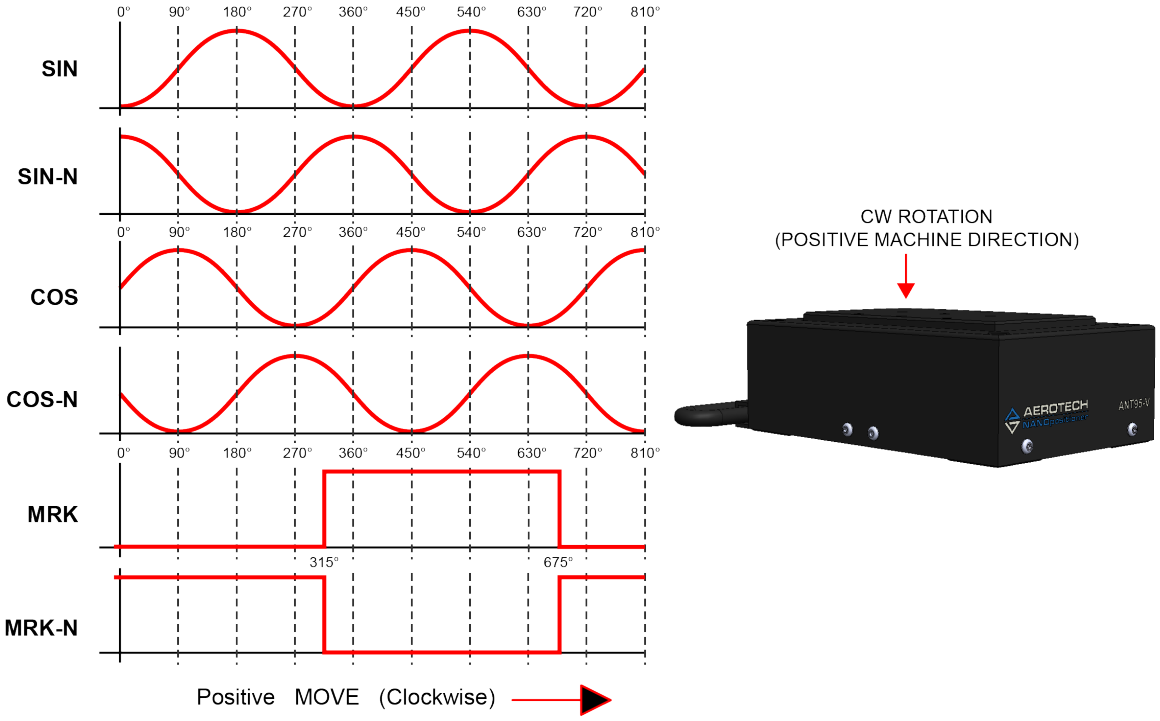


Figure 3-8: Analog Encoder Phasing Reference Diagram, Y Axis (FiberMax$_{HP}$-3-V)

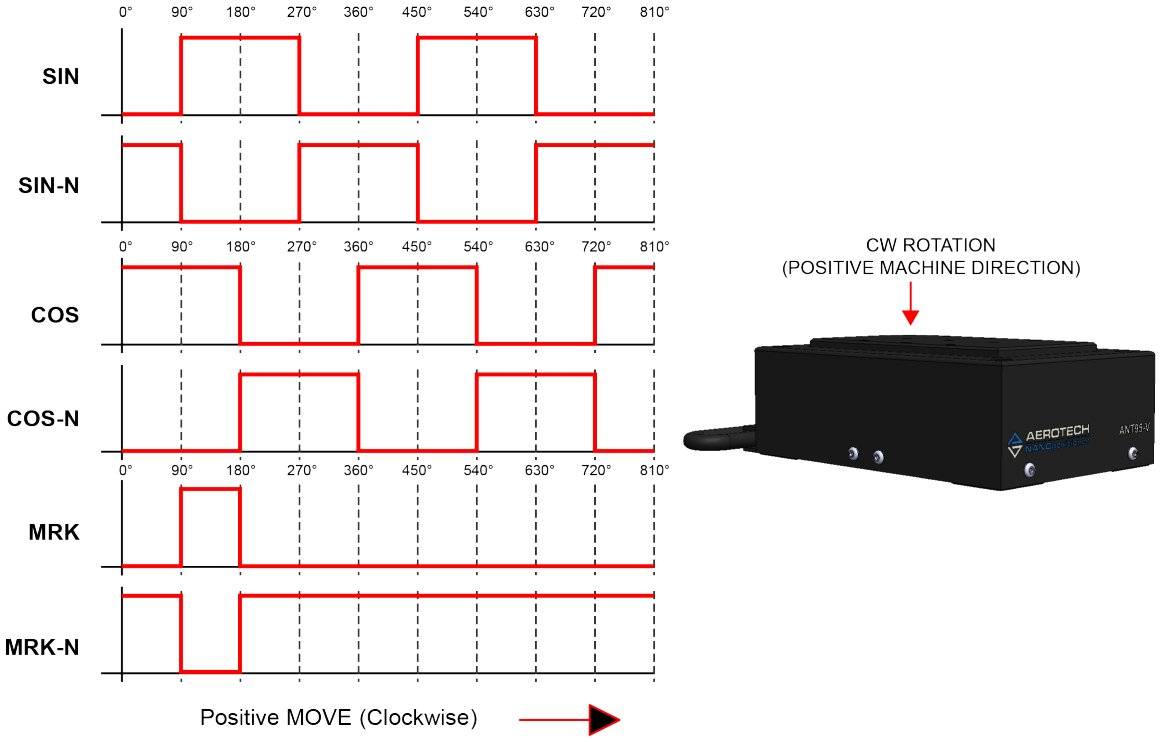


Figure 3-9: Standard Encoder Phasing Reference Diagram, Y Axis (FiberMax$_{HP}$-3-V)

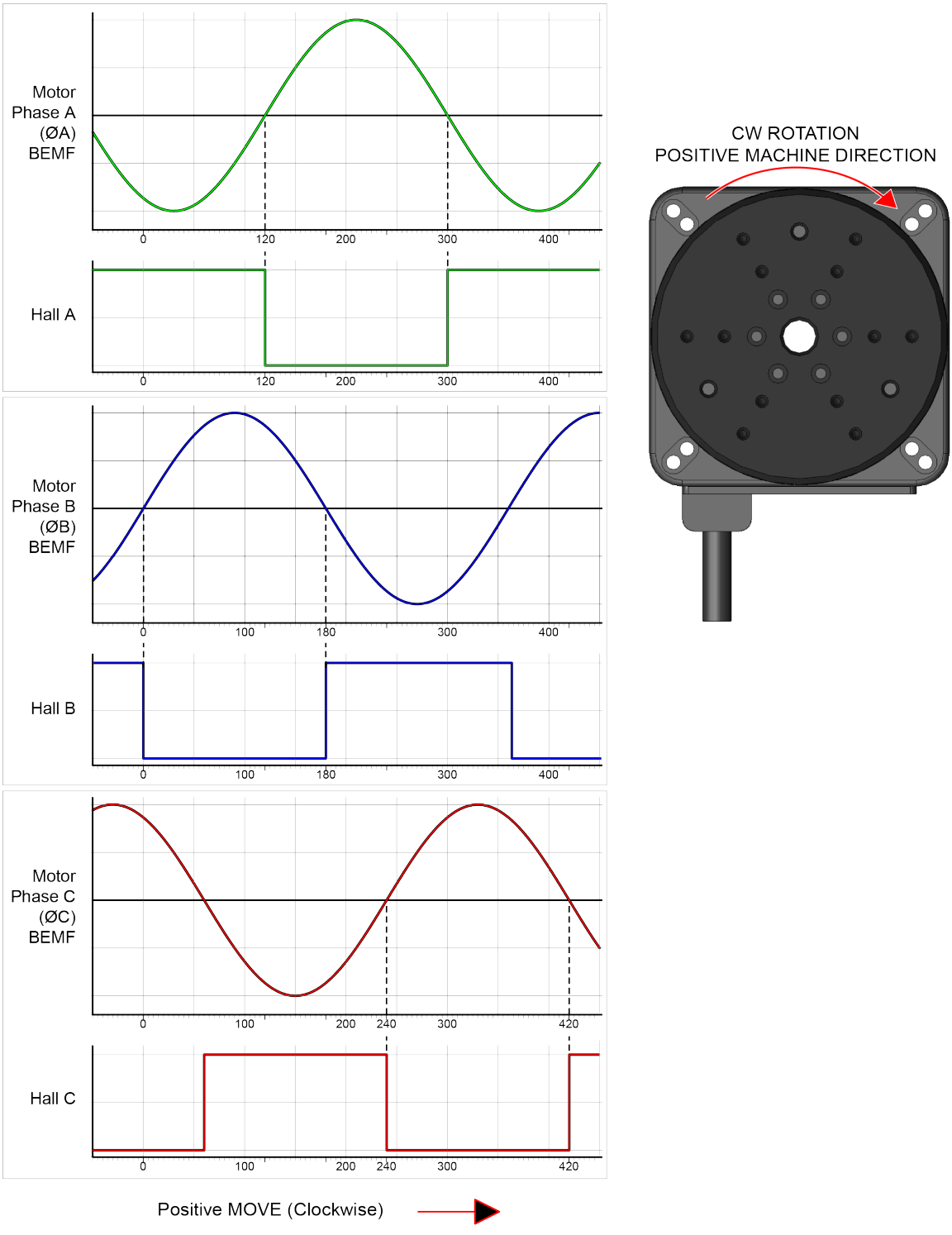


Figure 3-10: Motor Phasing, T Axis (FiberMax$_{HP}$-20-R)

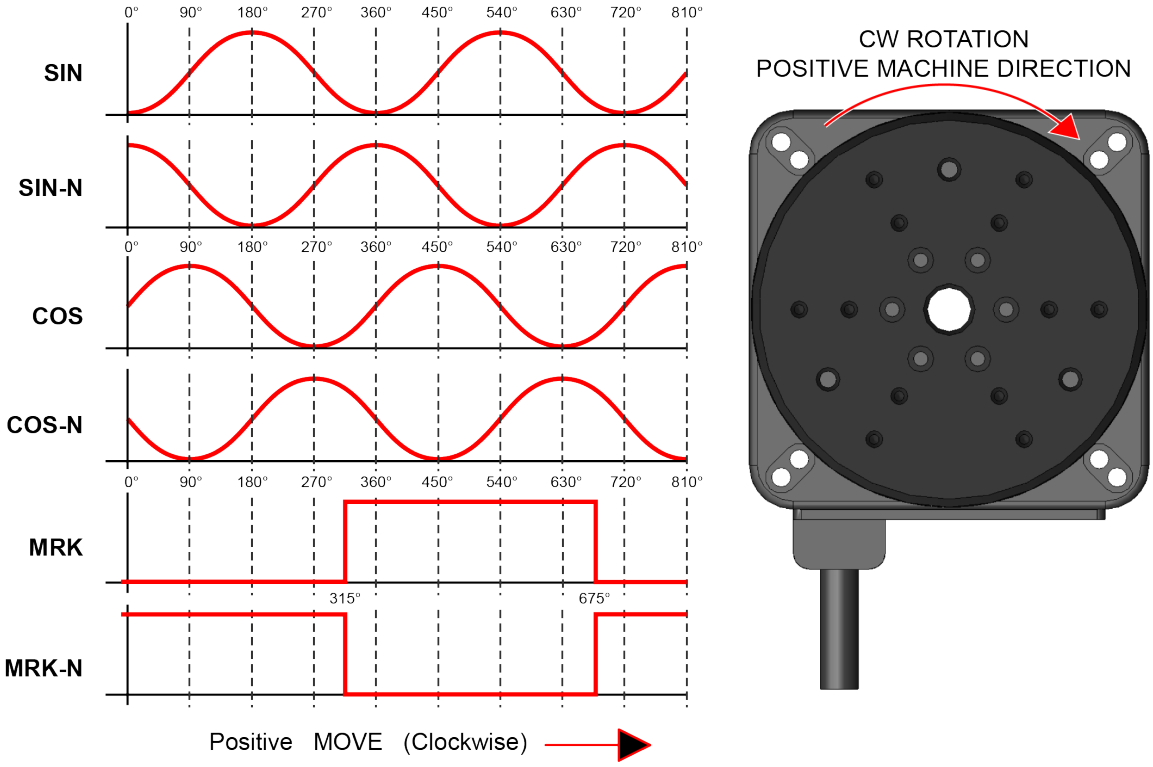


Figure 3-11: Analog Encoder Phasing Reference Diagram, T Axis (FiberMax$_{HP}$-20-R)

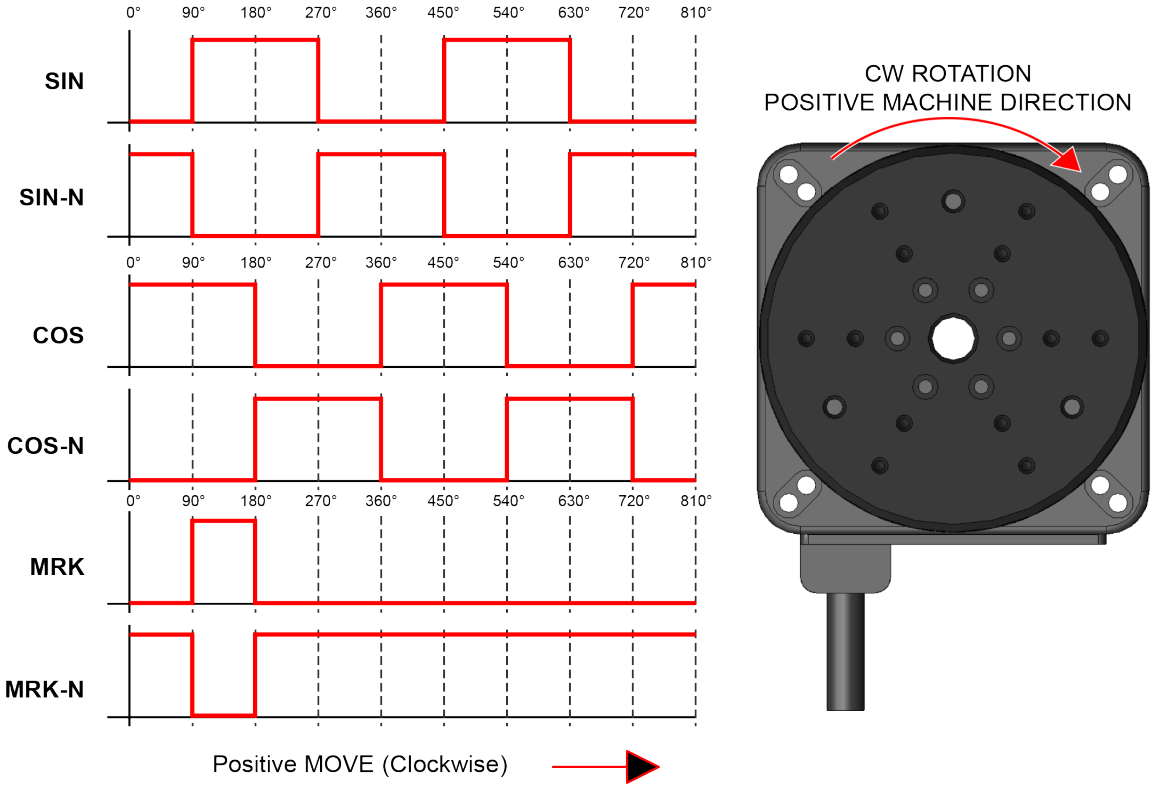


Figure 3-12: Standard Encoder Phasing Reference Diagram, T Axis (FiberMax$_{HP}$-20-R)

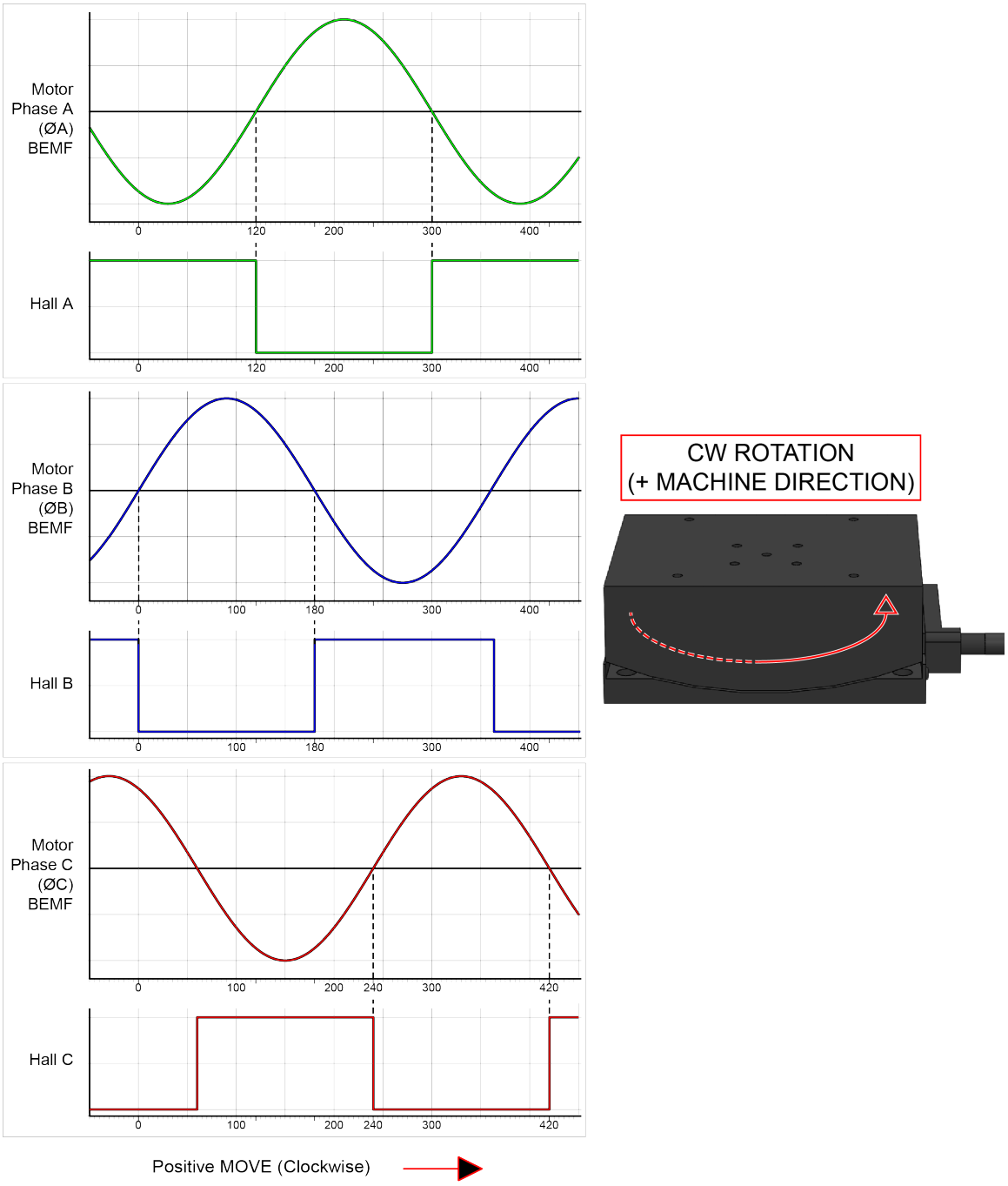


Figure 3-13: Hall Phasing, P and R Axes (FiberMax$_{HP}$-20G-50 and FiberMax$_{HP}$-20G-90)

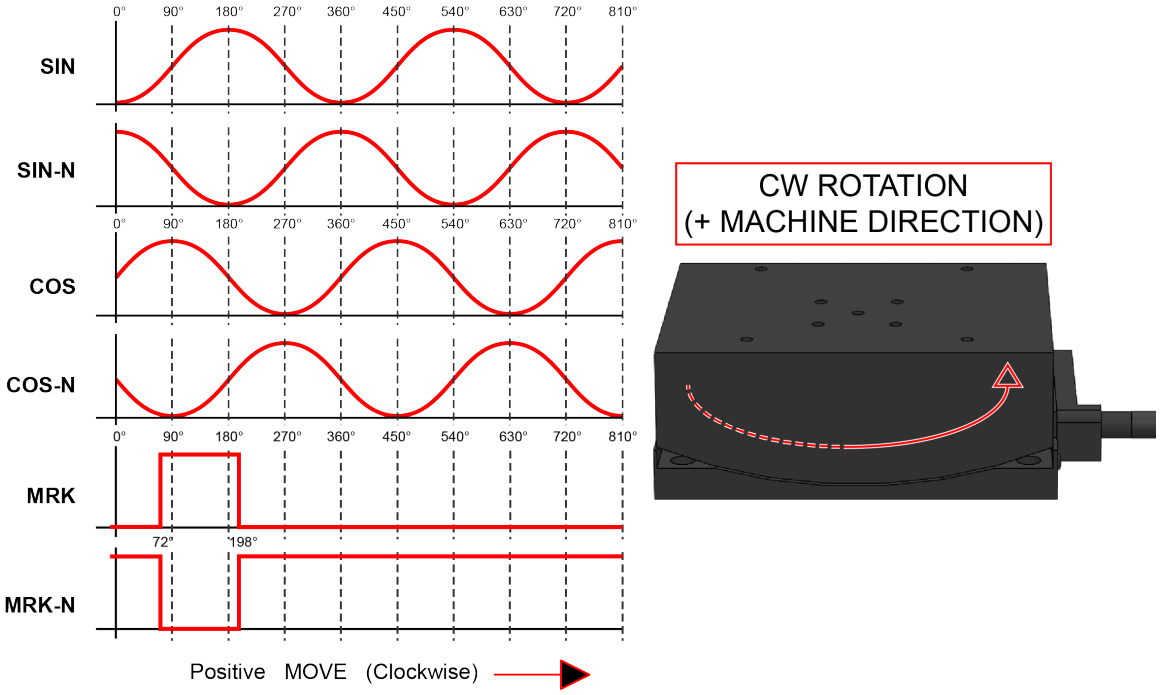


Figure 3-14: Analog Encoder Phasing Reference Diagram, P and R Axes (FiberMax$_{HP}$-20G-50 and FiberMax$_{HP}$-20G-90)

Chapter 4: Maintenance

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

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 FiberMax$_{HP}$ at least 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.

In general, stages operating in a clean environment should be cleaned and lubricated annually or every 500 km (whichever comes first). For stages operating under conditions involving excessive debris, the stage should be cleaned every six months. For high-speed applications (those near max speed at a duty cycle of 50%), frequent maintenance with standard lubricants is required.

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 FiberMax$_{HP}$ and any components and cables as needed.
- Repair any damage before operating the FiberMax$_{HP}$.
- Inspect and perform an operational check on all safeguards and protective devices.

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.

WARNING: In applications that have multiple stages bolted together to form multi-axis systems, the orthogonality may be lost if the stage tables of the support stages are loosened. Precision aligned stages should not be loosened or disassembled.

WARNING: Further disassembly of the stage is not recommended because proper assembly and calibration can only be done at the factory. In addition, a laser interferometer is required for post assembly verification to maintain warranties. Contact Aerotech for more information.

Cleaning

Before using a cleaning solvent on any part of the FiberMax$_{HP}$, blow away small particles and dust with nitrogen or, less preferably, clean, dry, compressed air.

Any external metal surface of the FiberMax$_{HP}$ can be cleaned with isopropyl alcohol on a lint-free cloth.

NOTE: The vertical axis (Y-Axis) covers are painted aluminum. Do not clean with acetone or harsh solvents or paint damage will occur.

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

Lubrication

For the bearings found in the X, Z, Y, P, and R axes use Kluberplex BEM 34-132 grease. Only use the specified grease as other greases may be incompatible. There are no elements on the T axis that requires lubrication.

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. The motor is completely non-contact and requires no lubrication.

NOTE: During the lubrication procedure, inspect the linear motion guides for any damage or signs of wear.

Lubrication Procedure for the Z, X, Y , P, and R Axes

1. Remove power to the stage.
2. Remove any accumulated dust or debris that is visible inside of the assembly.
3. Remove any dirty or dried lubricant from the v-channels of the bearing rails. Use a clean, lint-free cloth with a side-to-side motion. Use a swab soaked in isopropyl alcohol to remove stubborn debris.
4. Apply a thin, continuous film of lubricant to the exposed v-channels of the cross rollers on both ends of the stage. A good quality, natural bristle artist's brush makes an excellent applicator. Do not use any applicator that could scratch or otherwise damage the v-channels.
5. Manually move the stage to the opposite end of travel. This will work the grease into the linear bearing guides. The stage table should move freely with little resistance.
6. Repeat steps 2 through 4 for any areas covered by the original table position.
7. Restore power to the stage; drive the stage table back to its original position to redistribute lubricants.

Lubrication Procedure for the T Axis

1. There are no elements that require lubrication.

4.3. Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	• Shipping brackets still installed. Remove the red anodized shipping brackets and, if applicable, the lifting hardware (refer to Section 2.1.). • In Limit condition. Check limits (refer to Chapter 3) and refer to the Controller documentation for polarity and compatibility requirements (Example: voltage requirements). • Controller trap or fault (refer to the Controller documentation).
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

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	Description
1.01.00	Updated cover image
1.00.00	New Manual

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Index

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