ANT95-L Series Stage
User's Manual

P/N: EDS146 (Revision 1.03.00)

Dedicated to the Science of Motion
Aerotech, Inc.
101 Zeta Drive,
Pittsburgh, PA, 15238
Phone: 412-963-7470
Fax: 412-963-7459
www.aerotech.com

Product Registration

Register online at: http://www.-aerotech.com/prodreg.cfm

Technical Support

United States Headquarters:
Phone: (412) 967-6440
Fax: (412) 967-6870
Email: service@aerotech.com

United Kingdom:
Phone: +44 118 940 9400
Fax: +44 118 940 9401
Email: service@aerotech.co.uk

Germany:
Phone: +49 911 967 9370
Fax: +49 911 967 93720
Email: service@aerotechgmbh.de

Japan:
Phone: +81(0)47-489-1741 (Sales)
Phone: +81(0)47-489-1742 (Service)
Fax: +81(0)47-489-1743
Email: service@aerotechkk.com.jp

China:
Phone: +852-3793-3488
Email: saleschina@aerotech.com

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Chapter 1: Overview

This chapter introduces standard and optional features of the ANT95-L, explains the model numbering system, and gives general safety precautions.

NOTE: Aerotech continually improves its product offerings, and listed options may be superseded at any time. Refer to the most recent edition of the Aerotech Motion Control Product Guide for the most current product information at www.aerotech.com.

1.1. Standard Features

The ANT95-L is a compact, high performance stage for use in applications where a small footprint is required. The linear motor is completely cog free, allowing for extremely tight velocity control.

Figure 1-1: Typical ANT95-L Stage

1.1.1. Optional Features

An adapter place, available from Aerotech, is required to mount the ANT95-L stages on breadboard mounting tables. Contact Aerotech for more details on optional features and configurations.

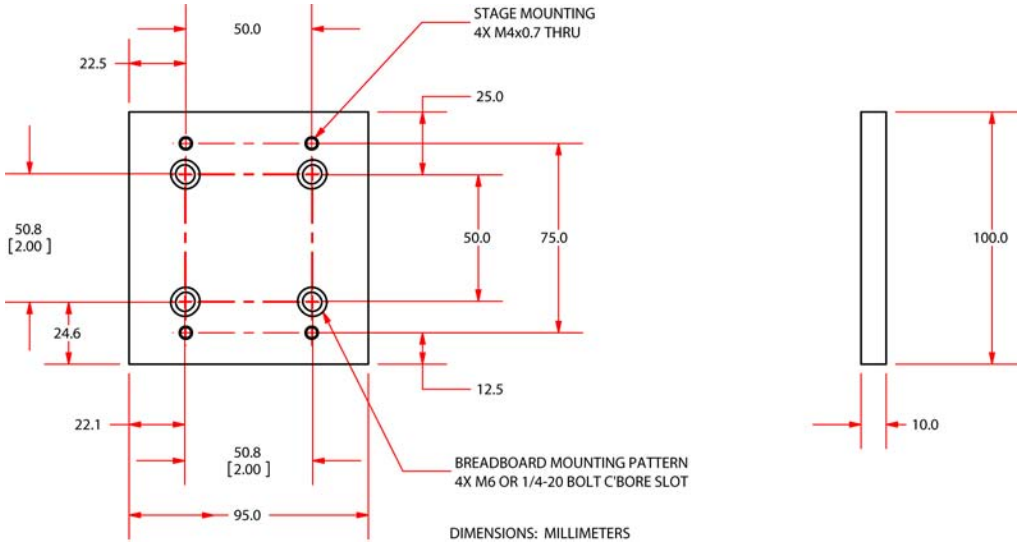

Figure 1-2: MP Option Dimensions, ANT95-25-L

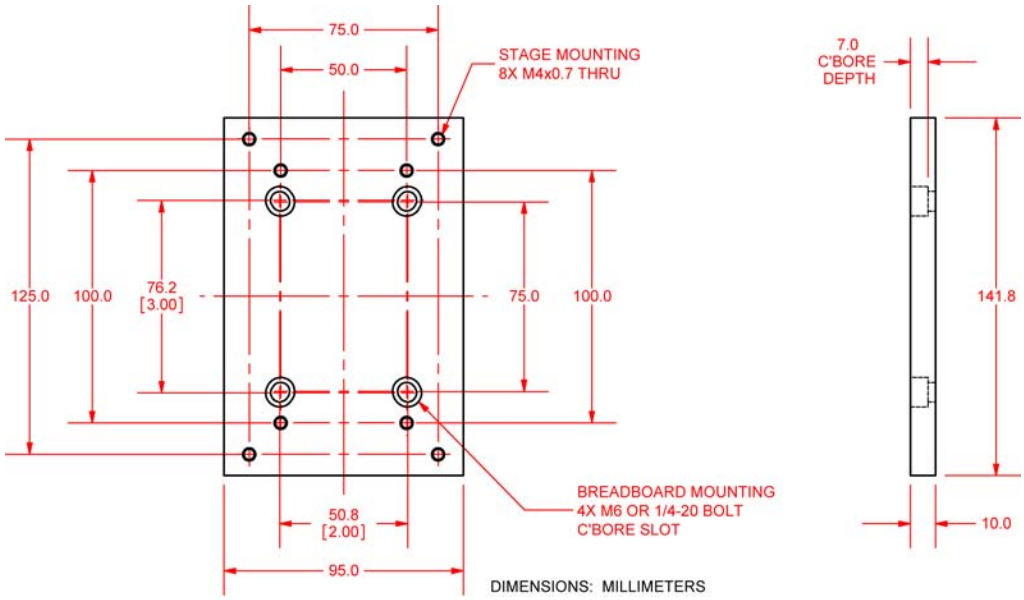

Figure 1-3: MP Option, ANT95-50-L

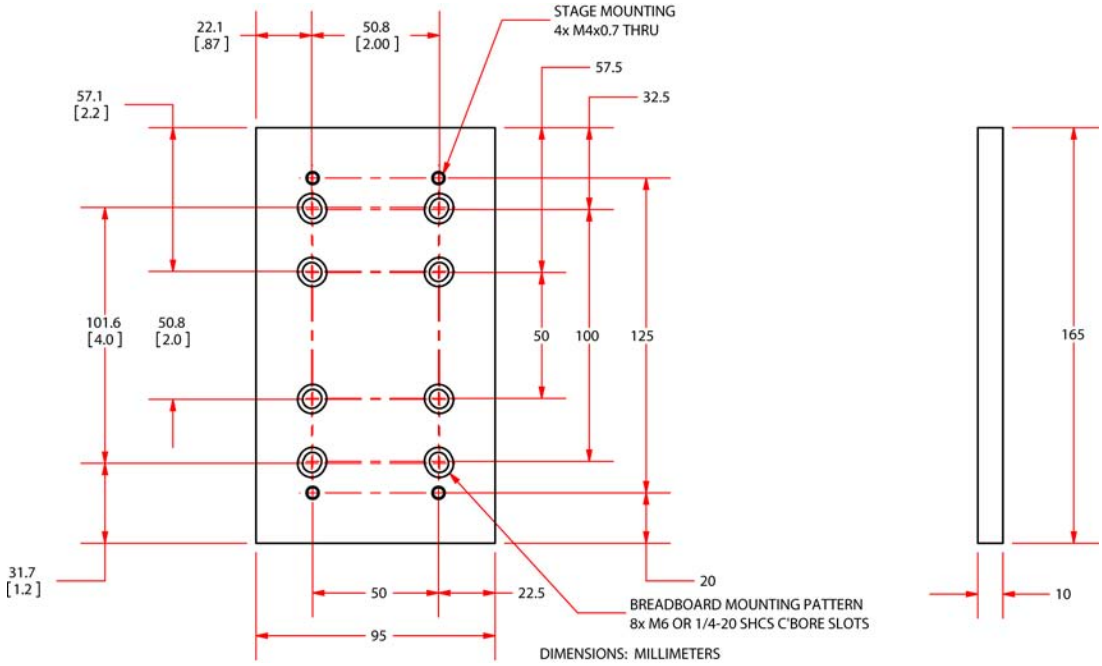

Figure 1-4: MP Option. ANT95-75-L

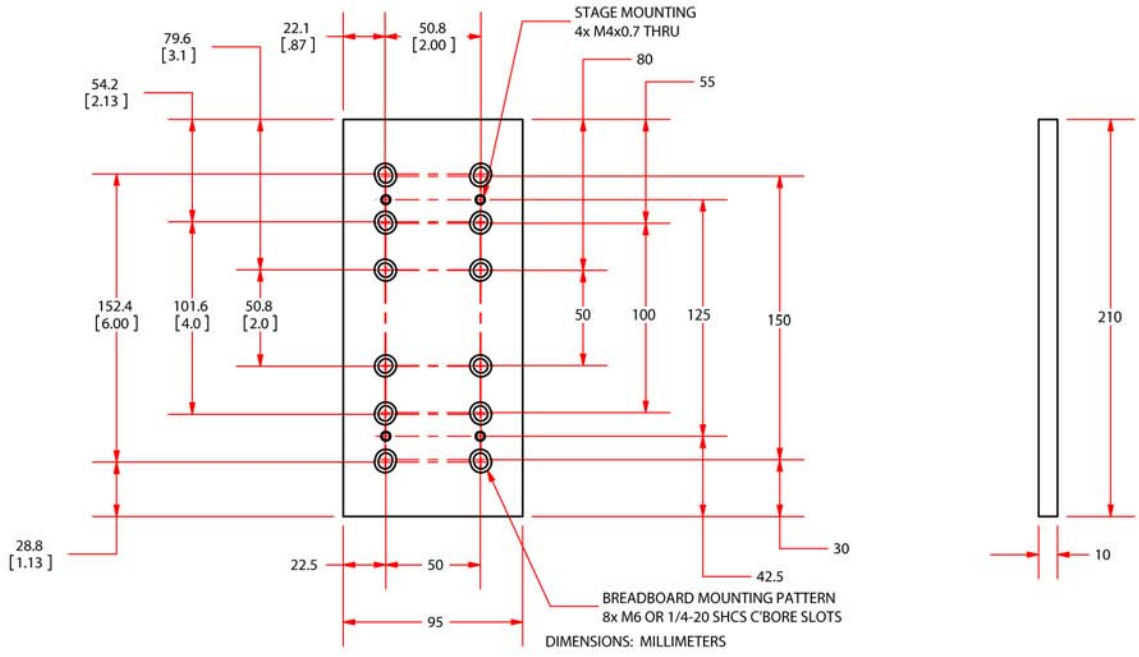

Figure 1-5: MP Option, ANT95-100-L

The ANT95-L 25 mm and 50 mm travel stages are designed to be easily joined together in X-Y configurations. Precision Alignments can also be performed by Aerotech if required. A 6 mm thick mounting plate, available from Aerotech, is required to use the ANT95-50-L as the top (Y-axis) stage in an X-Y configuration.

At this time, the ANT95-L 75 mm and 100 mm travel stages are only available for lower (X-axis) stages in any configuration. Custom configurations, such as X-Z and X-Y-Z systems are also common and readily available. Contact Aerotech for more details on optional features and configurations.

Figure 1-6: ANT95-50-L-XY Configuration

1.1.2. Model Numbers

The stage model number indicates the optional features on a particular stage. To determine the options on your stage, refer to Table 1-1 for an explanation of the numbering system.

Aerotech continually improves its product offerings, and listed options may be superseded at any time. Refer to the most recent edition of the Aerotech Motion Control Product Guide for the most current product information at www.aerotech.com.

Table 1-1: Model Numbering System

ANT95-L Series Linear Motor Stage	
-25-L	25 mm (1 in) travel stage with linear motor and limits
-50-L	50 mm (2 in) travel stage with linear motor and limits
-75-L	75 mm (3 in) travel stage with linear motor and limits
-100-L	100 mm (4 in) travel stage with linear motor and limits
Limits	
-NC	Normally closed end of travel and home limit switches (standard)
Options	
-MP	Breadboard mounting plate
Accessories (to be ordered as a separate line item)	
-PLUS	High Accuracy Option

NOTE: Internal signal multipliers are available with A3200 amplifier products.

1.2. Dimensions

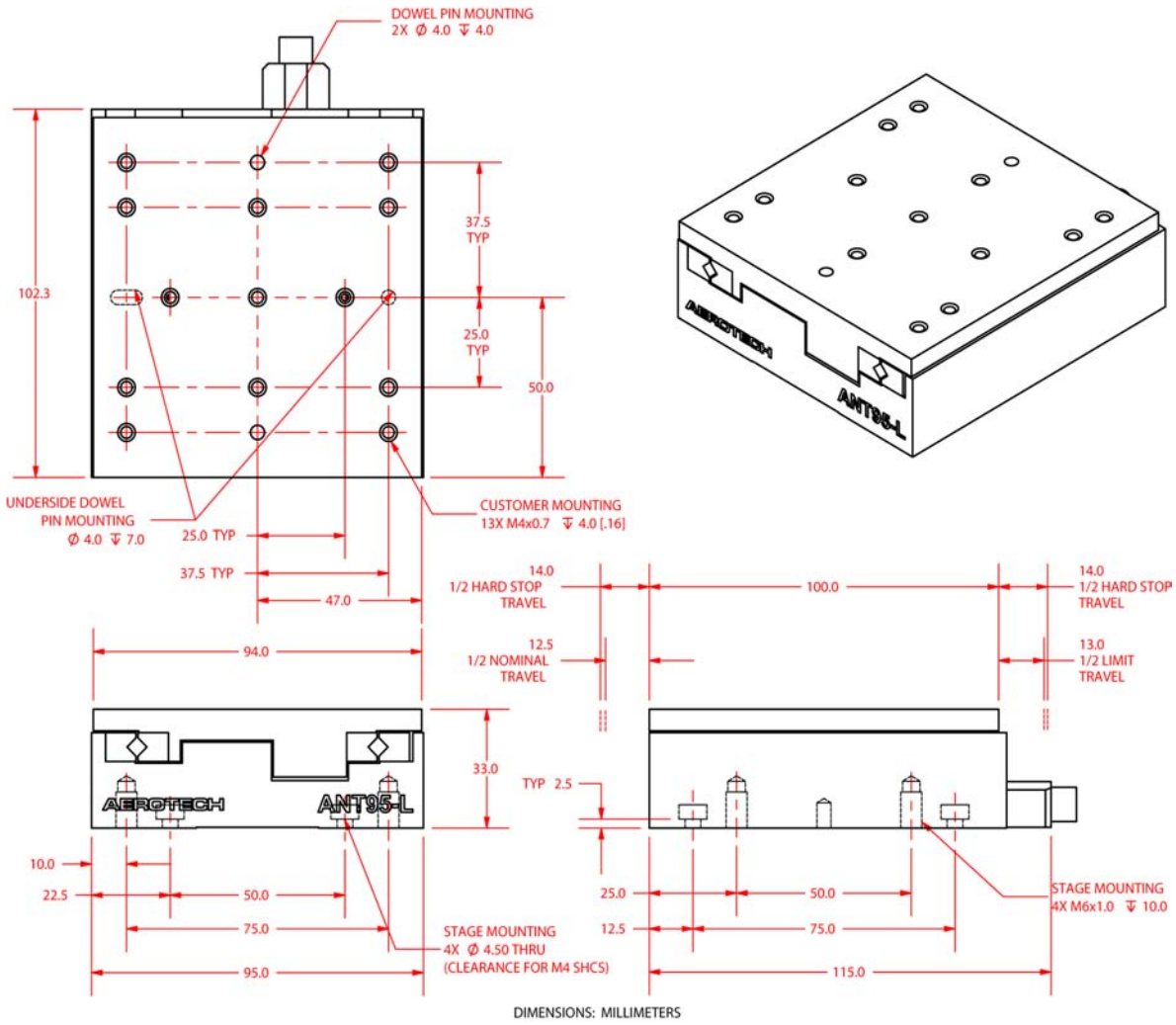

Figure 1-7: ANT95-25-L Dimensions

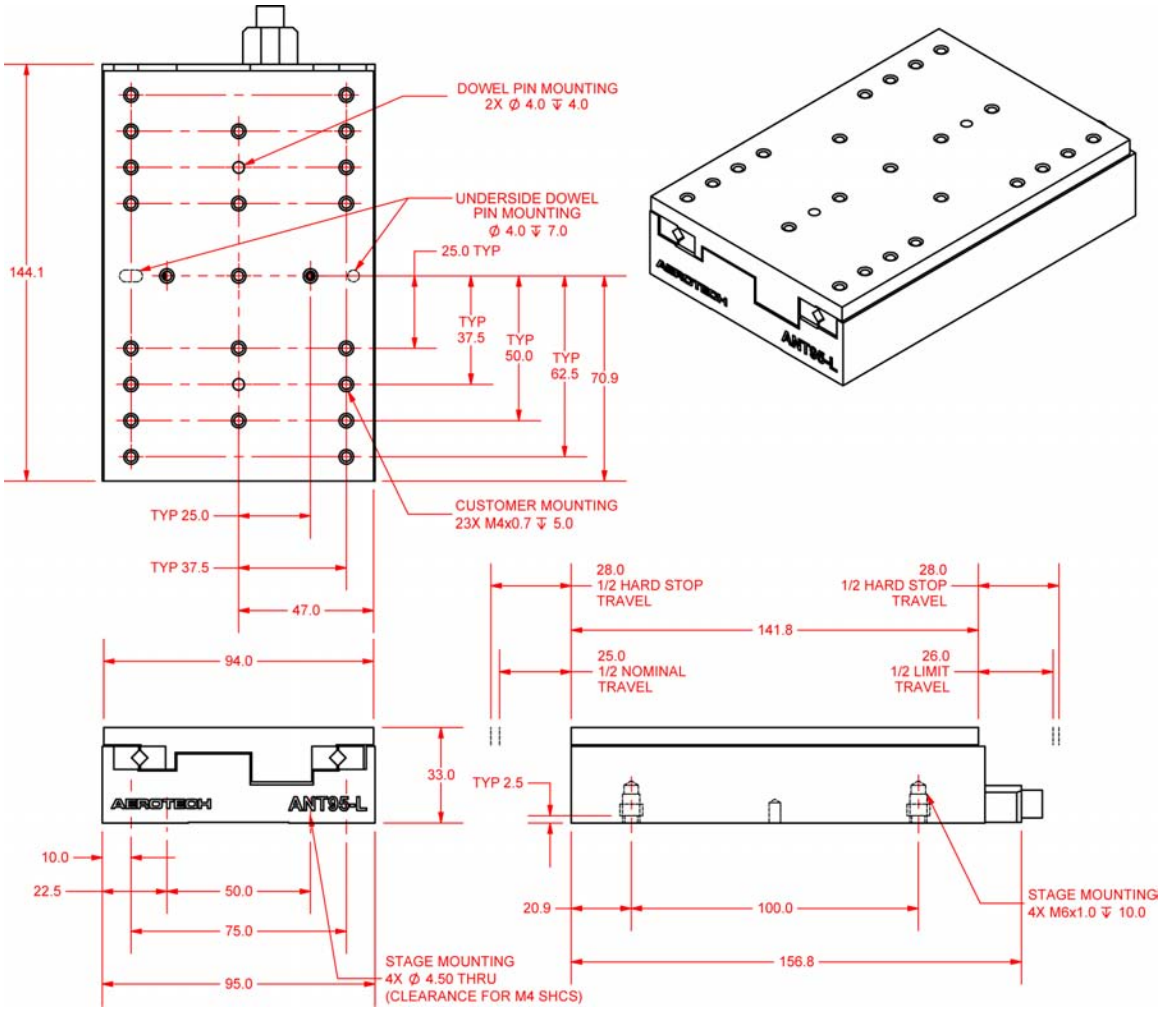

Figure 1-8: ANT95-50-L Dimensions

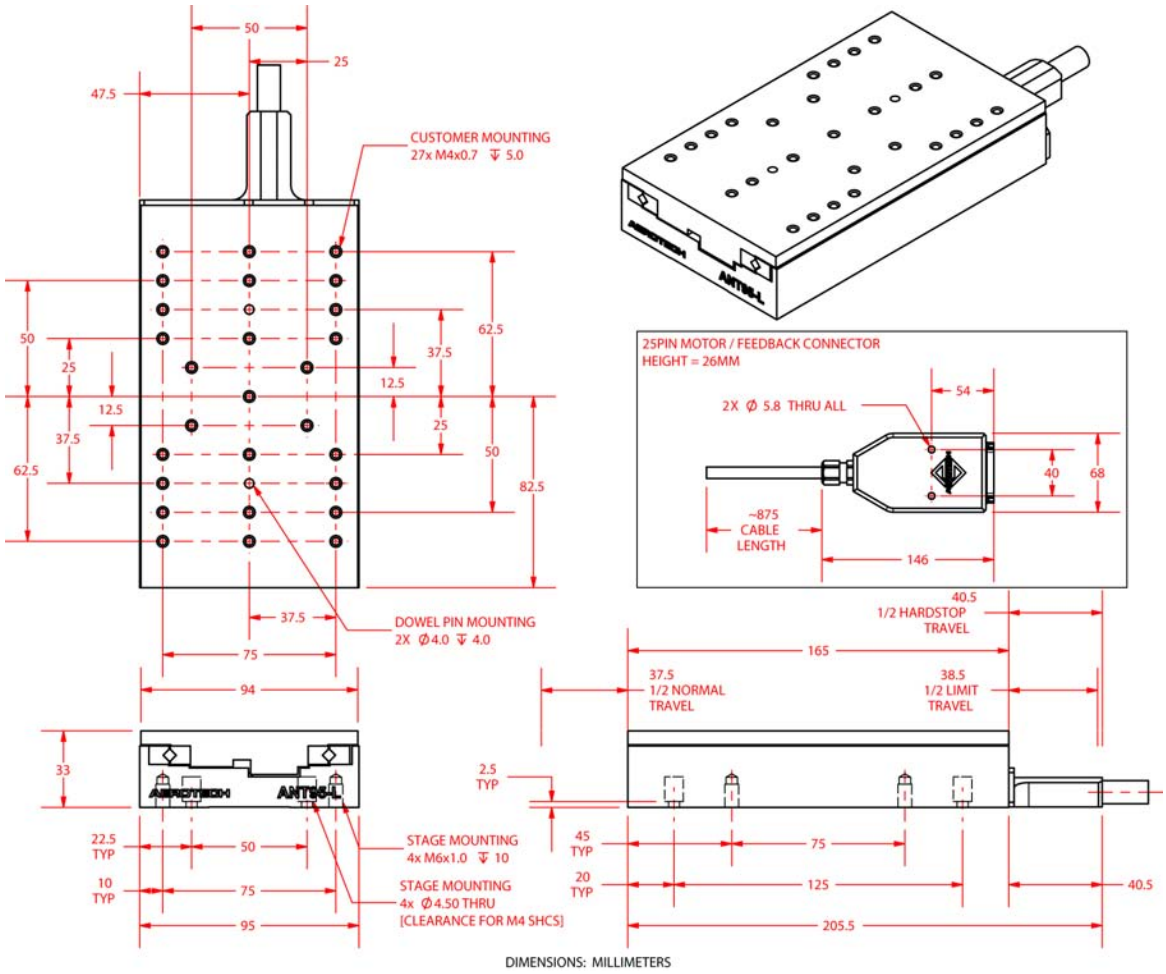

Figure 1-9: ANT95-75-L Dimensions

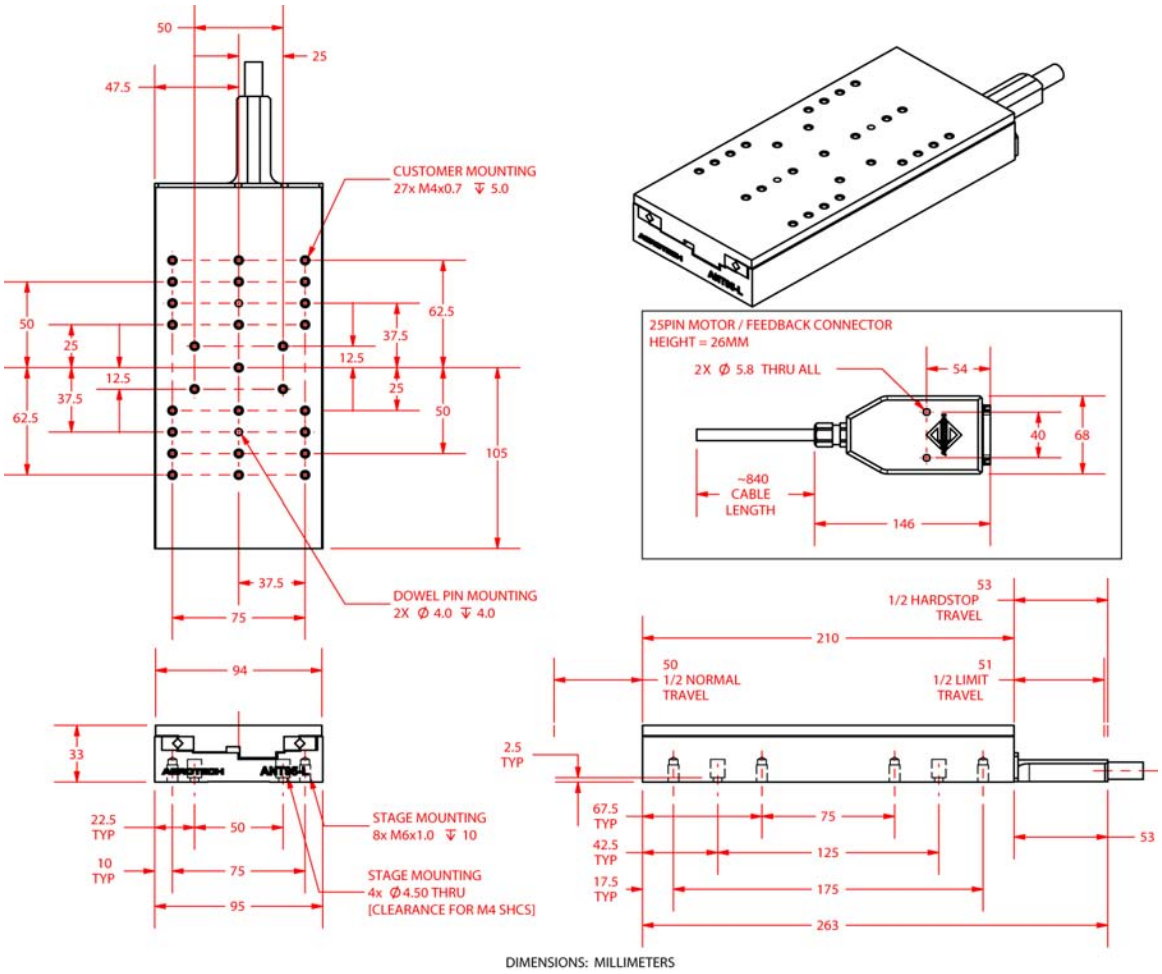

Figure 1-10: ANT95-100-L Dimensions

1.3. Safety Procedures and Warnings

The following statements apply throughout this manual. Failure to observe these precautions could result in serious injury to those performing the procedures and damage to the equipment.

This manual and any additional instructions included with the stage should be retained for the lifetime of the stage.

	To minimize the possibility of electrical shock and bodily injury or death, disconnect all electrical power prior to making any electrical connections.
	To minimize the possibility of electrical shock and bodily injury or death when any electrical circuit is in use, ensure that no person comes in contact with the circuitry when the stage is connected to a power source.
	To minimize the possibility of bodily injury or death, disconnect all electrical power prior to making any mechanical adjustments.
	Moving parts of the stage can cause crushing or shearing injuries. All personnel must remain clear of any moving parts.
	Improper use of the stage can cause damage, shock, injury, or death. Read and understand this manual before operating the stage.
	If the stage is used in a manner not specified by the manufacturer, the protection provided by the stage can be impaired.
	Stage cables can pose a tripping hazard. Securely mount and position all stage cables to avoid potential hazards.

	Do not expose the stage to environments or conditions outside the specified range of operating environments. Operation in conditions other than those specified can cause damage to the equipment.
	The stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.
	Use care when moving the stage. Manually lifting or transporting stages can result in injury.
	Only trained personnel should operate, inspect, and maintain the stage.
	This stage is intended for light industrial manufacturing or laboratory use. Use of the stage for unintended applications can result in injury and damage to the equipment.
	Before using this stage, perform an operator risk assessment to determine the needed safety requirements.

1.4. EC Declaration of Incorporation

Manufactorer: Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA 15238
USA

herewith declares that the product:
Aerotech, Inc. ANT95-L Stage
is intended to be incorporated into machinery to constitute machinery covered by the Directive 2006/42/EC as amended;

does therefore not in every respect comply with the provisions of this directive;

and that the following harmonized European standards have been applied:
EN ISO 12100-1,-2:2003+A1:2009
Safety of machinery - Basic concepts, general principles for design
ISO 14121-1:2007
Safety of machinery - Risk assessment - Par 1: Principles
EN 60204-1:2005
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.

Authorized Representative: Manfred Besold
Address: AEROTECH GmbH
Süd-West-Park 90
D-90449 Nürnberg

Name: Alex Weibel /
Position: Engineer Verifying Compliance
Location: Pittsburgh, PA
Date: November 4, 2010

Chapter 2: Installation

This chapter describes the installation procedure for the ANT95-L stage, including handling the stage properly, preparing the mounting surface to accept the stage, securing the stage to the mounting surface, attaching the payload, and making the electrical connections.

Installation must follow the instruction in this chapter. Failure to follow these instructions could result in injury and damage to the equipment.

2.1. Unpacking and Handling the Stage

Carefully remove the stage from the protective shipping container. Set the stage on a smooth, flat, and clean surface. Before operating the stage, it is important to let the stage stabilize at room temperature.

All ANT95-L series stages are packaged with a shipping clamp installed to prevent stage table movement. Locate and remove the red anodized bracket that bolts the stage table to the base.

Each stage 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. If any damage has occurred during shipping, report it immediately.

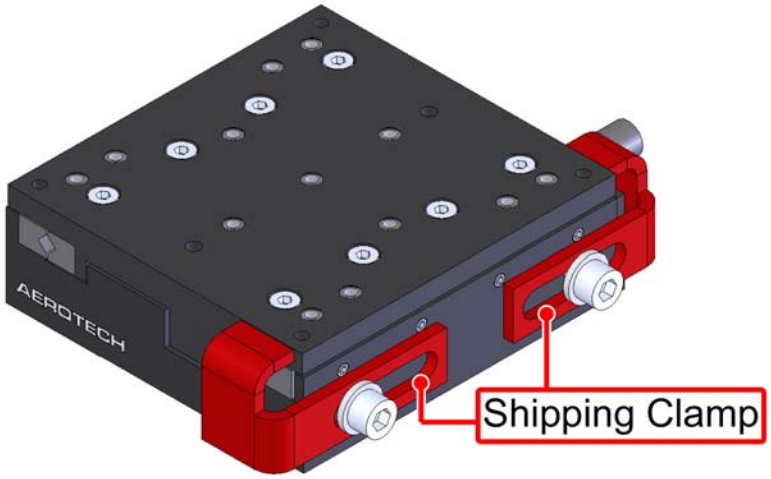

Figure 2-1: Shipping Clamp on ANT95-25-L

WARNING	Improper stage handling could adversely affect the stage's performance. Use care when moving the stage.
WARNING	Lift the stage only by the base.
WARNING	Do not use the stage table as a lifting point.

2.2. Preparing the Mounting Surface

The mounting surface should be flat and have adequate stiffness in order to achieve the maximum performance from the ANT95-L. When an ANT95-L series stage is mounted to a non-flat surface, the stage can be distorted as the mounting screws are tightened (see Figure 2-2 and Figure 2-3). Any distortion will decrease the overall accuracy of the stage. Adjustments to the mounting surface must be done before the stage is secured.

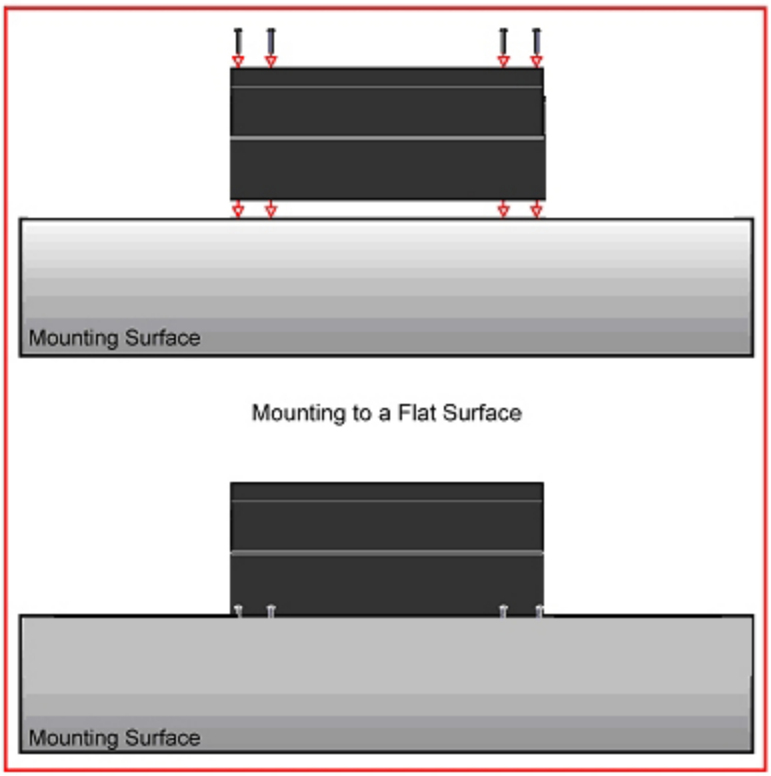

Figure 2-2: Mounting to a Flat Surface

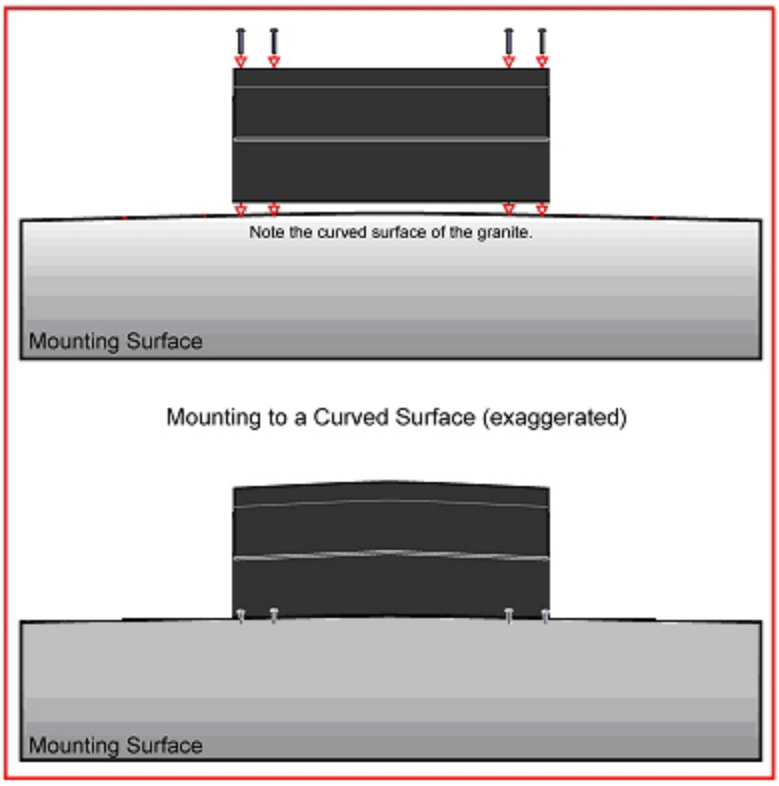

Figure 2-3: Mounting to a Curved Surface

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

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

2.3. Securing the Stage to the Mounting Surface

To access the mounting holes of the ANT95-L stage, slide the carriage all the way to either end of travel as shown in Figure 2-4. The stage is designed to use four M4 by 8 mm long or #8 by 3/8 in long socket head cap screws (SHCS) to secure it to the mounting surface. For X-Y configurations, the upper stage should mount to the tabletop of the lower stage with M4 by 6 mm long SHCS. A mounting plate is necessary if an ANT95-50-L is used as the upper axis.

Torque the mounting screws to 2.3 N-m (20 in-lb). The ANT95-L stages also have four M6X1.0 by 10 mm deep threaded holes in the base for mounting if desired. Refer to Section 1.2. for dimensions. If used, M6 screws should be tightened to 8 N-m or 71 in-lb.

NOTE: The ANT95-L 75 mm and 100 mm travel stages are only available for lower axis (X-axis) configurations.

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

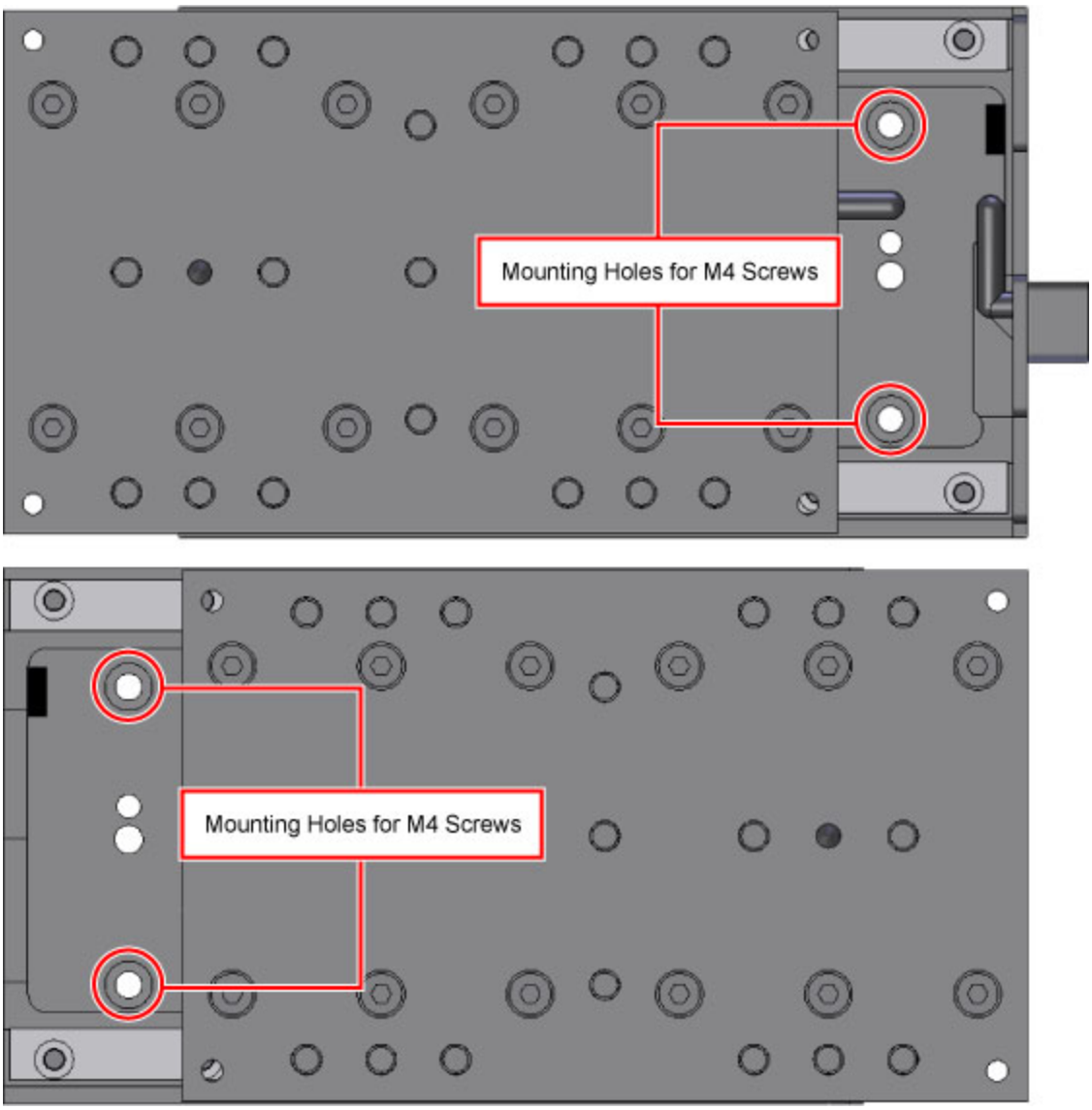

Figure 2-4: Mounting Hole Locations

2.4. Attaching the Payload to the Stage

To prevent damage to delicate payloads, test the operation of the stage before attaching any payload to the stage tabletop. 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 connections, refer to the Electrical Installation section later in this chapter, the documentation of the motion control system delivered with the stage, and the wiring drawings in Chapter 3: Operating Specifications.

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

NOTE: Aerotech recommends using 3-point mounting, if possible, when attaching the payload to the stage.

NOTE: For valid accuracies, the mounting interface should be flat within 2 µm - 5 µm.

Refer to Section 3.4. for information on cantilevered loads and load positioning.

Do not attach a payload to the stage table with screws that are too long. A screw passing through the stage table can come into contact with internal parts, affecting travel and possibly damaging the stage.

2.5. Electrical Installation

Electrical installation requirements will vary depending on stage options. Instructions in this manual are for stages equipped with standard Aerotech motors intended for use with an Aerotech motion control system. Contact Aerotech for further information regarding stages that are otherwise configured.

Aerotech motion control systems are adjusted at the factory for optimum performance. When the ANT95-L series stage is part of a complete Aerotech motion control system, setup involves connecting the stage to the appropriate drive chassis with the cable provided. Connect the provided cable to the 25 pin connector on the stage. Labels on the drive indicate the appropriate connections. Refer to your drive manual for additional installation and operation information. In some cases, if the system is uniquely configured, a drawing showing system interconnects is supplied.

The electrical wiring from the motor and encoder are integrated into one main connector at the factory. Refer to Chapter 3: Operating Specifications for standard motor wiring and connector pin outputs.

Never connect or disconnect any electrical component or connecting cable while power is applied, or serious damage may result.

The stage's protective ground is located on pin 10 and 22 of the 25 pin connector on the stage. If you are using cables other than those provided by Aerotech, you must connect pin 10 and 22 to a ground connection.

Chapter 3: Operating Specifications

The surrounding environment and operating conditions can affect the performance and service life of the stage. This chapter provides information on ideal environmental and operating conditions. Also included are instructions for estimating load capability given various loading situations.

3.1. Environmental Specifications

The environmental specifications for the ANT95-L are listed in the following table.

Table 3-1: 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. Contact Aerotech for information regarding your specific application and environment.
	Storage: 0° to 40° C (32° to 104° F) in original shipping packaging
Humidity	Operating: 40 percent to 50 percent RH The optimal operating humidity is 50 percent RH.
	Storage: 30 percent to 60 percent RH, non-condensing in original packaging
Altitude	Operating: 0 to 2,000 m (0 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 stage and system performance. Contact Aerotech for information regarding your specific application.
Dust Exposure	The ANT95-L stages are not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
Use	Indoor use only

Do not expose the stage to environments or conditions outside the specified range of operating environments. Operation in conditions other than those specified can cause damage to the equipment.

3.2. Accuracy and Temperature Effects

The accuracy specification of ANT95-L series stages is measured at the center of travel 25 mm above the table with the stage in a horizontal position. Aerotech ANT95-L stages are designed for and built in a 20°C (68°F) environment. The environmental temperature must be controlled to within 0.25ºC per 24 hours to ensure the stage specifications are repeatable over an extended period of time. Contact the factory for more details.

3.3. Basic Specifications

Basic ANT95-L series positioning stage specifications are shown in Table 3-2. Resolution is dependent on encoder resolution and controller interpolation. Specifications for the standard motor are given in Table 3-3.

Specifications listed in this manual are for your reference. For the latest product information see the Aerotech website.

Table 3-2: ANT95-L Series Specifications

Mechanical Specifications		ANT95-25-L	ANT95-25-L-PLUS	ANT95-50-L	ANT95-50-L-PLUS
Travel		25 mm (1 in)		50 mm (2 in)	
Accuracy(1)		±3.0 µm (±120 µin)	±250 nm (±10 µin)	±3.0 µm (±120 µin)	±250 nm (±10 µin)
Resolution		1 nm		1 nm	
Repeatability (Bi-Directional) (1)		±100 nm	±50 nm	±100 nm	±50 nm
Straightness(1)		±1.5 µm (±60 µin)		±2.0 µm (±80 µin)	
Flatness(1)		±2.0 µm (±80 µin)		±2.5 µm (±100 µin)	
Pitch		10 arc sec		10 arc sec	
Roll		10 arc sec		10 arc sec	
Yaw		5 arc sec		5 arc sec	
Maximum Speed		500 mm/s (20 in/s)		500 mm/s (20 in/s)	
Maximum Acceleration		5 g - 50 m/s^2 (No Load)		4 g - 40 m/s^2 (No Load)	
In-Position Stability(2)		3 nm		3 nm	
Maximum Force (Continuous)		7.75 N		9.5 N	
Load Capacity(3)	Horizontal	5.0 kg (11 lb)		7.0 kg (15.4 lb)	
	Side	5.0 kg (11 lb)		5.0 kg (11 lb)	
Moving Mass		0.46 kg (1.0 lb)		0.52 kg (1.1 lb)	
Stage Mass		0.8 kg (1.8 lb)		1.2 kg (2.7 lb)	
Material		Aluminum Body/Black Hardcoat Finish			
MTBF (Mean Time Between Failure)		30,000 Hours			

1. Certified with each stage.

2. In-Position Jitter listing is 3 sigma value.

3. Axis orientation for on-axis loading is listed.

4. Specifications are for single-axis systems measured 25 mm above the tabletop. Performance of multi-axis systems is payload and workpoint dependent. Consult the factory for multi-axis or non-standard applications.

5. -PLUS requires the use of an Aerotech controller.

Table 3-2: ANT95-L Series Specifications (continued)

Mechanical Specifications		ANT95-75-L	ANT95-75-L-PLUS	ANT95-100-L	ANT95-100-L-PLUS
Travel		75 mm (3 in)		100 mm (4 in)	
Accuracy(1)		4.0 µm (±160 µin)	±275 nm (±11 µin)	±5.0 µm (±200 µin)	±275 nm (±11 µin)
Resolution		1 nm		1 nm	
Repeatability (Bi-Directional) (1)		±100 nm	±50 nm	±100 nm	±50 nm
Straightness(1)		±2.5 µm (±100 µin)		±3.0 µm (±120 µin)	
Flatness(1)		±3.0 µm (±120 µin)		±3.5 µm (±140 µin)	
Pitch		10 arc sec		10 arc sec	
Roll		10 arc sec		10 arc sec	
Yaw		5 arc sec		5 arc sec	
Maximum Speed		500 mm/s (20 in/s)		500 mm/s (20 in/s)	
Maximum Acceleration		5 g - 50 m/s^2 (No Load)		4 g - 40 m/s^2 (No Load)	
In-Position Stability(2)		3 nm		3 nm	
Maximum Force (Continuous)		9.5 N		12.9 N	
Load Capacity(3)	Horizontal	7.0 kg (15.4 lb)		7.0 kg (15.4 lb)	
	Side	5.0 kg (11 lb)		5.0 kg (11 lb)	
Moving Mass		0.72 kg (1.6 lb)		0.91 kg (2.0 lb)	
Stage Mass		1.64 kg (3.6 lb)		2.1 kg (4.6 lb)	
Material		Aluminum Body/Black Hardcoat Finish			
MTBF (Mean Time Between Failure)		30,000 Hours			

1. Certified with each stage.

2. In-Position Jitter listing is 3 sigma value.

3. Axis orientation for on-axis loading is listed.

4. Specifications are for single-axis systems measured 25 mm above the tabletop. Performance of multi-axis systems is payload and workpoint dependent. Consult the factory for multi-axis or non-standard applications.

5. -PLUS requires the use of an Aerotech controller.

Table 3-3: ANT95-L Motor Specifications

Model		ANT95-25-L	ANT95-50-L	ANT95-75-L	ANT95-100-L
Performance Specifications(1,5)					
Continuous Force, No Cooling(2)	N (lb)	7.7 (1.72)	9.7 (2.18)	9.7 (2.18)	12.9 (2.90)
Peak Force(3)	N (lb)	30.7 (6.9)	38.7 (8.7)	38.7 (8.7)	43.7 (9.8)
Electrical Specifications(5)					
Winding Designation		-A	-A	-A	-A
BEMF Constant (Line to Line, Max)	V/m/s (V/in/s)	2.86 (0.07)	3.78 (0.10)	3.78 (0.10)	4.77 (0.12)
Continuous Current, No Cooling(2)	Amp_{pk} (Amp_{rms})	3.10 (2.19)	2.94 (2.08)	2.94 (2.08)	2.62 (1.86)
Peak Current, Stall(3)	Amp_{pk} (Amp_{rms})	12.40 (8.77)	11.76 (8.31)	11.76 (8.31)	10.49 (7.42)
Force Constant, Sine Drive(5,6)	N/Amp_{pk} (lb/Amp_{pk})	2.48 (0.56)	3.28 (0.74)	3.28 (0.74)	4.13 (0.93)
	N/Amp_{rms} (lb/Amp_{rms})	3.51 (0.79)	4.64 (1.04)	4.64 (1.04)	5.85 (1.32)
Motor Constant(2,4)	$N/\sqrt{W}$ ($lb/\sqrt{W}$)	1.21 (0.27)	1.40 (0.31)	1.40 (0.31)	1.58 (0.36)
Resistance, 25°C (Line to Line)	ohms	4.0	5.2	5.2	6.5
Inductance (Line to Line)	mH	0.51	0.70	0.70	0.87
Thermal Resistance, No Cooling	°C/W	2.48	2.12	2.12	1.52
Maximum Bus Voltage	VDC	160	160	160	160
Mechanical Specifications					
Magnetic Pole Pitch	mm (in)	16.00 (0.63)	16.00 (0.63)	16.00 (0.63)	16.00 (0.63)

(1) Performance is dependant 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) All Aerotech amplifiers are rated A_{pk}; use torque constant in $N\text{-}m/A_{pk}$ when sizing.

3.4. Load Capability

Symmetrically distribute application loads whenever possible (the payload should be centered on the stage table and the entire stage should be centered on the support structure). With the stage lying flat (horizontal) and the application load vertically applied and symmetrically distributed, the maximum vertical load carrying capacity of ANT95-L stages with a 25 mm travel is 5 kg, and the maximum vertical load carrying capacity of ANT95-L stages with a 50, 75, and 100 mm travel is 7 kg.. Figure 3-2 through Figure 3-5 show the rated loading for the –25-L, –50-L, -75-L, and -100-L stages for various cantilever distances and application forces. Figure 3-1 depicts the three loading conditions used in Figure 3-2 and Figure 3-3..

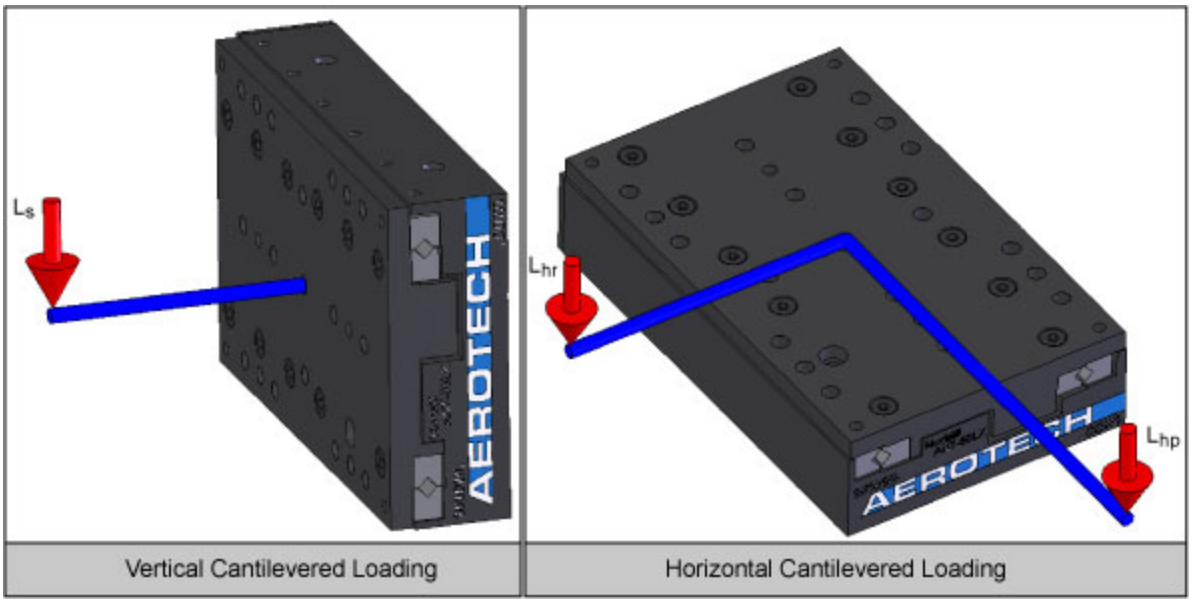

Figure 3-1: Stage Orientations for L_{hr}, L_{hp}, and L_s

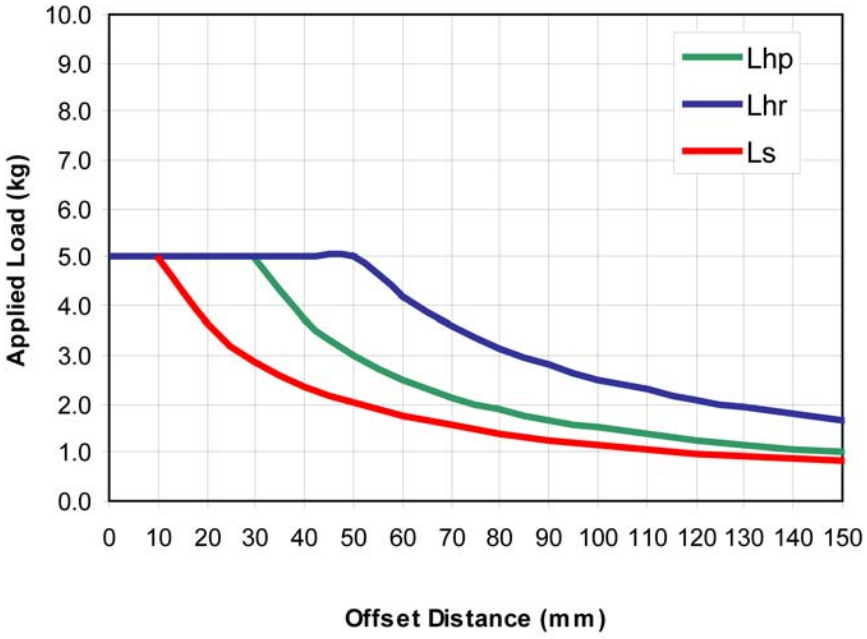

Figure 3-2: Load Capability of ANT95-25-L Stage

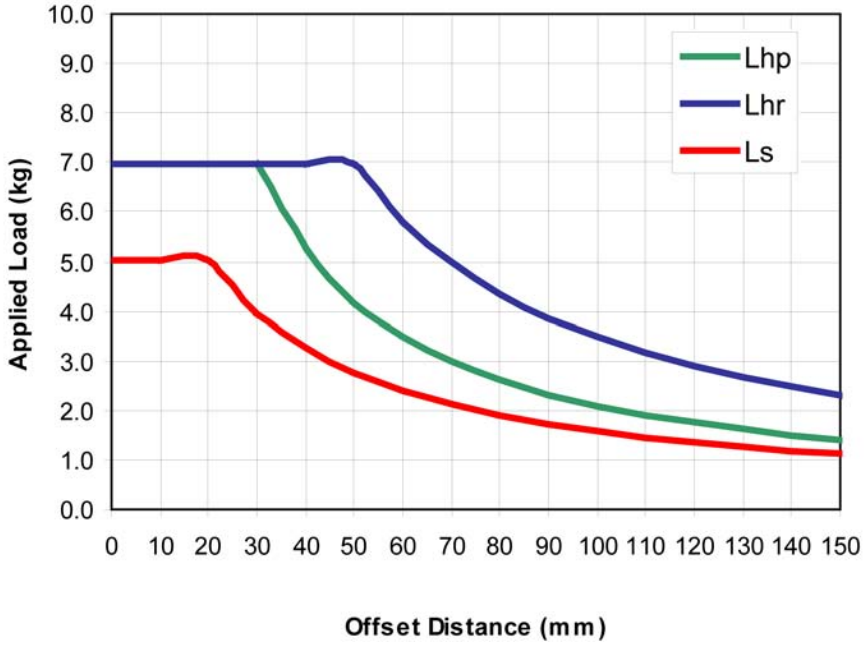

Figure 3-3: Load Capability of ANT95-50-L Stage

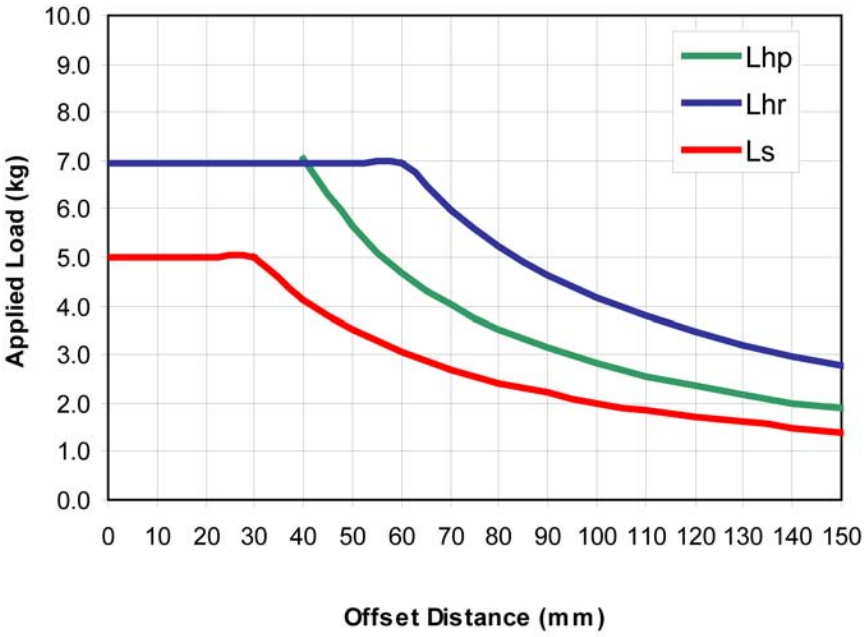

Figure 3-4: Load Capability of ANT95-75-L Stage

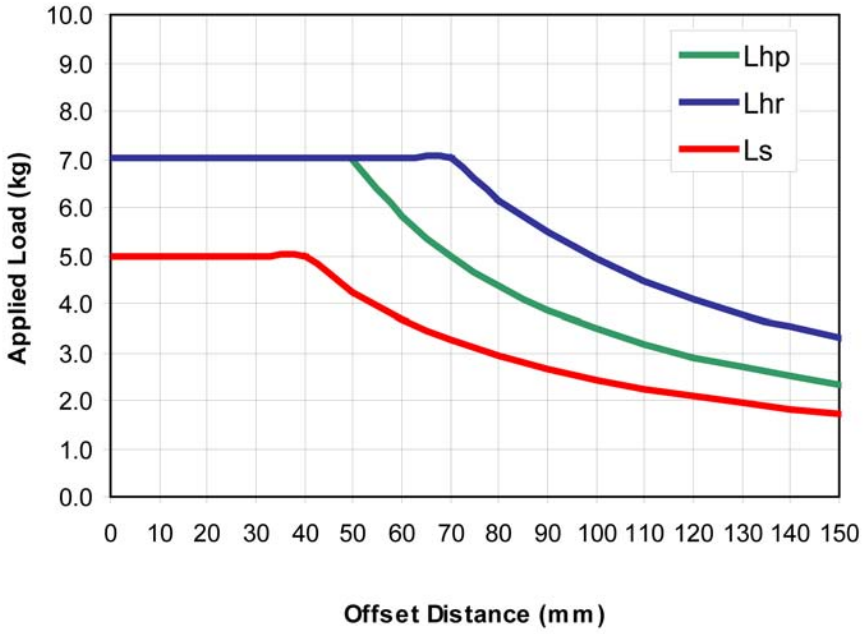

Figure 3-5: Load Capability of ANT95-100-L Stage

3.5. Magnetic Actuator Limit

3.5.1. Actuator Limit Operation

ANT95-L series stages are provided with a magnetic limit switch. The limit switch signals when the stage has reached its maximum useable travel distance in either direction. The limit switches on the ANT95-25-L and the ANT95-50-L are mounted on a small printed circuit board. On the ANT95-75-L and the ANT95-100-L, the limits are integral to the optical encoder feedback device. The triggers on the ANT95-L series are two magnets that are mounted to the bottom of the stage table.

If the stage is driven beyond the electrical limit, it will encounter the mechanical stop. Although the operating speed of the stage may be relatively slow, damage to the stage could result.

3.5.2. Limit Switch Wiring

Standard ANT95-L stages include limit switch wiring integrated into the main wiring connector. Limit switches on ANT95-L stages are configured normally closed. The input to the controller is seen as a logic 0 (typical 0.4 V @ 12.8 mA) when no limit condition is present. When the limit switch is activated, a 5 V source through a pull-up resistor causes a logic 1 (typically 4.8-5 V) to be seen by the controller input.

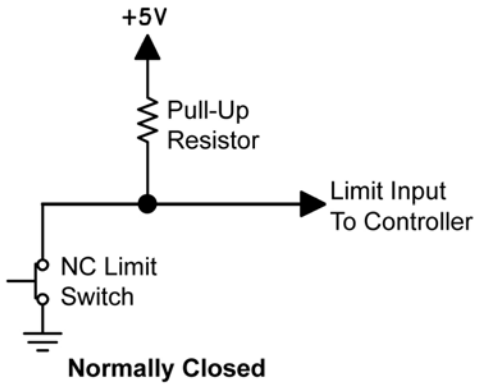

Figure 3-6: Limit Switch Wiring

3.6. Standard Motor Wiring

Stages fitted with standard motors and encoders come from the factory completely wired and assembled. For reference, connector pin outputs and general wiring information is given in Table 3-4 and the following figures. Pin outputs are defined in 3.6.

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

NOTE: If you are using your own cables to connect the stage, ensure that the motor and ground wires can handle current higher than the continuous current listed in Table 3-3. The voltage rating of the wire insulation must be greater than the maximum bus voltage listed in Table 3-3.

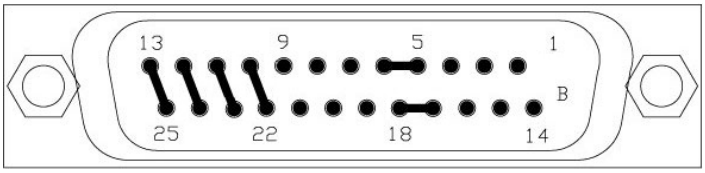

Table 3-4: Feedback and Motor Pin Assignments

Pin	Label	Description
1	KEYED	Connector has key to prevent improper connection
2	COS-N	Incremental encoder output. Complement of cos.
3	SIN-N	Incremental encoder output. Complement of sin.
4	MKR-N	Incremental encoder output; either the complement of Marker with a line driven, TTL type encoder or 2.5 VDC bias level with amplified sine wave type encoder.
5	COM	Common ground for feedback connector wiring
6	COM	Common ground for feedback connector wiring
7	-LMT	Active high signal indicating stage maximum travel produced by negative stage direction.
8	HALL A	Hall Effect A. Brushless motor commutation track output.
9	HALL C	Hall Effect C. Brushless motor commutation track output.
10	FRM GND	Motor common ground
11	MTR ØA	Motor Phase A
12	MTR ØB	Motor Phase B
13	MTR ØC	Motor Phase C
14	COS	Cosine. Incremental encoder output; either TTL line driven or amplified sine wave type signal.
15	SIN	Sine. Incremental encoder output; either TTL line driven or amplified sign wave type signal.
16	MKR	Marker
17	ENC +5V	+5 V supply input for optical encoders. Typical requirement is 250 mA.
18	LMT +5V	+ 5 V supply input for optical limit switch boards. Typical requirement is 50 mA.
19	+LMT	Active high signal indicating maximum travel produced by positive stage direction.
20	HM LMT	
21	HALL B	Hall Effect B. Brushless motor commutation track output.
22	FRM GND	Motor common ground
23	MTR ØA	Motor Phase A
24	MTR ØB	Motor Phase B
25	MTR ØC	Motor Phase C

3.7. Vacuum Operation

Please contact the factory for information regarding operation in a vacuum environment.

Chapter 4: Maintenance

This chapter will cover information about the lubrication and inspection process and cover which lubricants are recommended for use.

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.

To minimize the possibility of bodily injury, confirm that all electrical power is disconnected prior to making any mechanical adjustments.

4.1. Service and Inspection Schedule

Lubricant inspection and replenishment in ANT95-L series stages depends on conditions such as duty cycle, speed, and the environment. An inspection interval of once per month is recommended until a trend develops for the application. Longer or shorter intervals may be required to maintain the film of lubricant on the bearing surfaces.

In general, it is recommended that stages operating in a clean environment be lubricated annually, or every 500 km, whichever comes first. For stages operating under conditions involving excessive debris, lubricated every six months is recommended.

If the application process uses only a small portion of travel for most of the duty cycle, it is recommended that the stage be periodically driven through full travel to redistribute the lubrication in the bearings. The motor is completely non-contact and requires no lubrication.

4.2. Cleaning and Lubrication

4.2.1. Recommended Cleaners and Lubricants

For standard linear roller bearings, Kluberplex BEM 34-132 grease is recommended.

For high-speed applications (those near max speed at a duty cycle of 50%),frequent maintenance with standard lubricants is required.

4.2.2. Important Notes on Lubrication

When cleaning and/or lubricating components of the ANT95-L series stages:

1. Be sure to use a clean, dry, soft, lint–free cloth for cleaning.
2. Take the opportunity during the lubrication procedure to inspect the linear motion guides for any damage or signs of wear.

4.2.3. Lubrication and Cleaning Process

The lubrication and cleaning process is outlined in the steps that follow. Before beginning lubrication, see Section 4.2.1. for recommended lubricants.

To minimize the possibility of bodily injury, confirm that all electrical power is disconnected prior to making any mechanical adjustments.

1. Drive the stage table to one end of travel and 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 linear bearing rails. Use a clean, lint-free cloth with a side-to-side motion.A swab soaked in isopropyl alcohol may be used 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.

Chapter 5: ANT95-L-Z

This chapter covers the standard features of the ANT95-L-Z series. Because the ANT95-L-Z incorporates the ANT95-25-L and ANT95-50-L, many of the topics covered previously in this manual still apply to the ANT95-L-Z.

NOTE: Aerotech continually improves its product offerings, and listed options can be superseded at any time. Refer to the most recent edition of the Aerotech Motion Control Product Guide for the most current product information at www.aerotech.com.

5.1. Standard Features

The ANT95-L-Z series takes the compact ANT95-25-L and ANT95-50-L stages and integrates them with a vertical angle bracket and pneumatic counterbalance system.

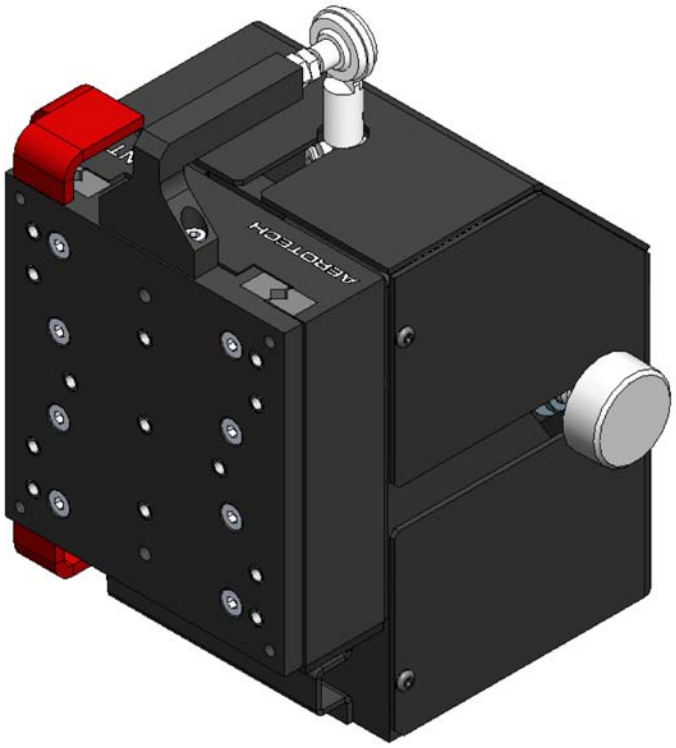

Figure 5-1: Typical ANT95-L-Z Series Positioning Stage

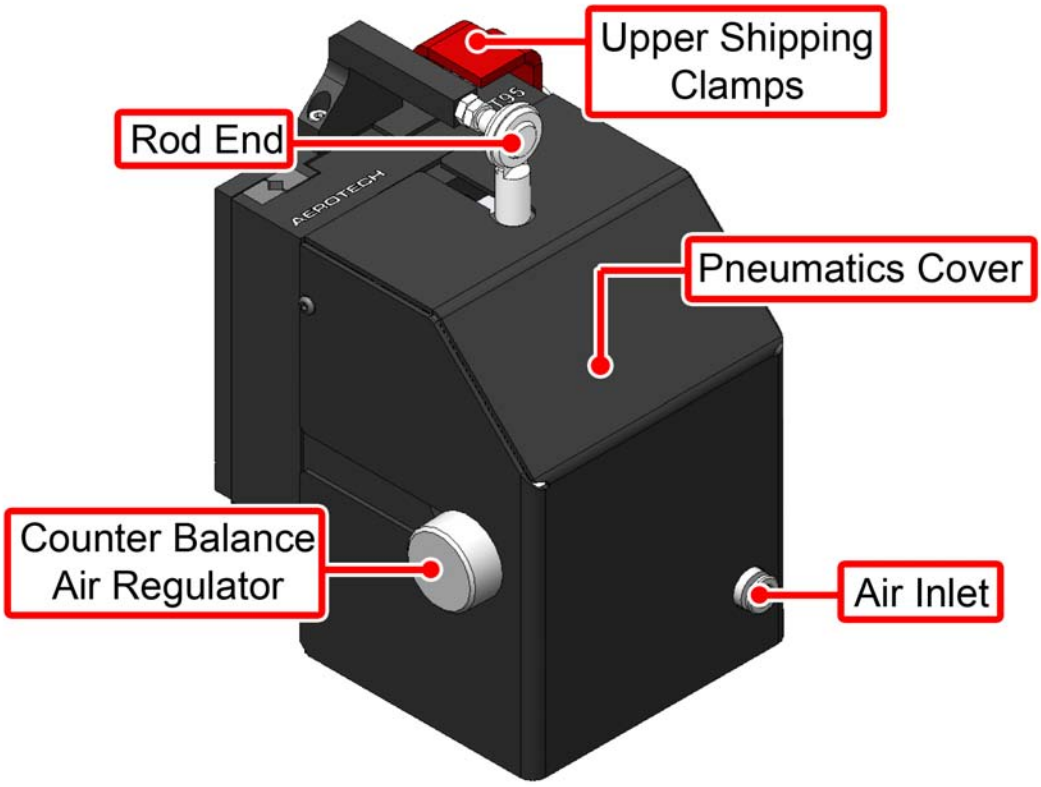

Figure 5-2: ANT95-L-Z with Component Labeling

5.1.1. Model Numbers

The stage model number indicates the features on a particular stage. To determine the options on your stage, refer to Table 5-1 for an explanation of the numbering system.

Table 5-1: Model Numbering System

ANT95-Z Series Linear Motor Stage	
-25-L-Z	25 mm (1 in) vertical travel stage with linear motor and limits
-50-L-Z	50 mm (2 in) vertical travel stage with linear motor and limits
Accessories (to be ordered as a separate line item)	
-PLUS	High Accuracy Option

5.2. Dimensions

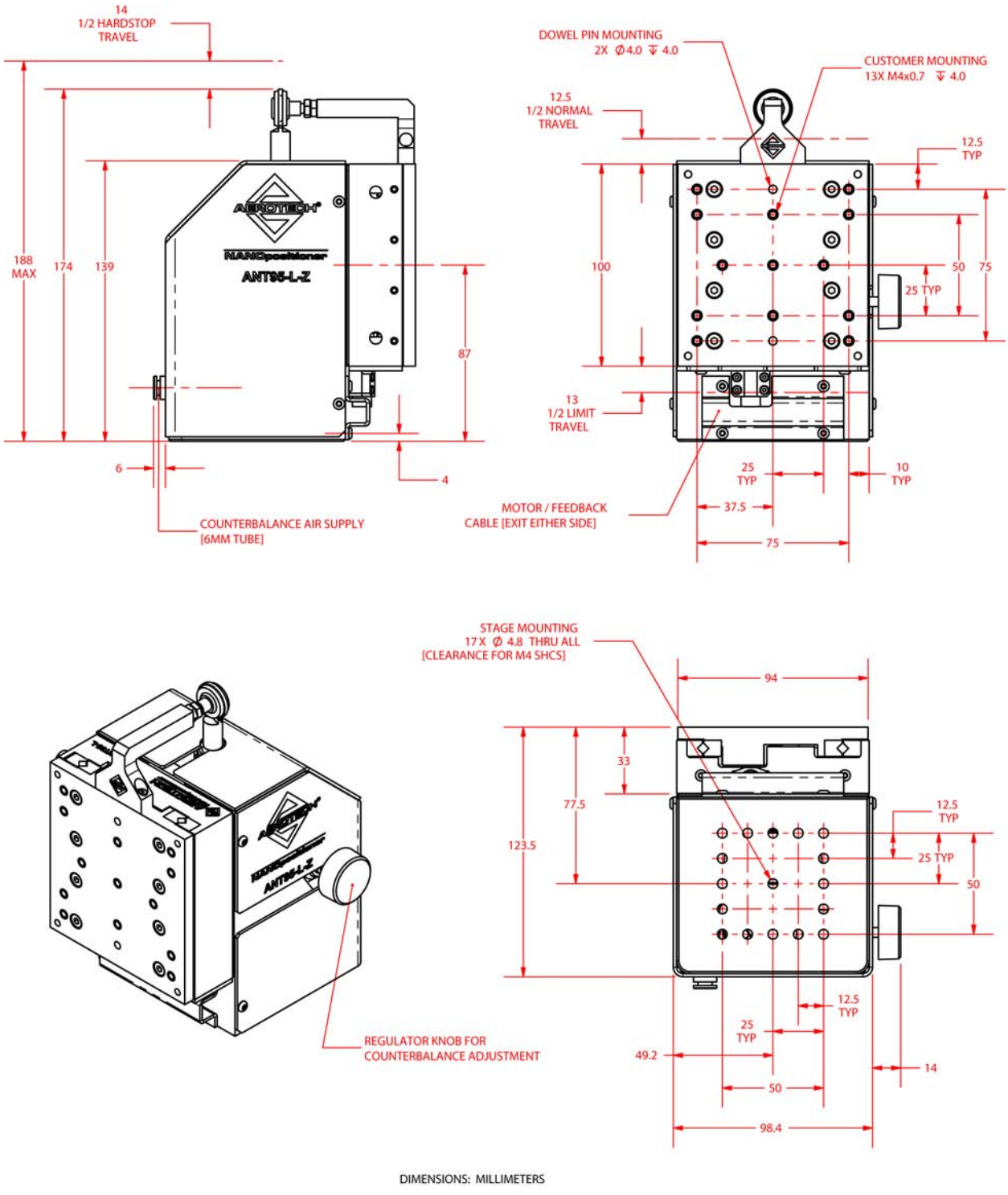

Figure 5-3: ANT95-25-L-Z Dimensions

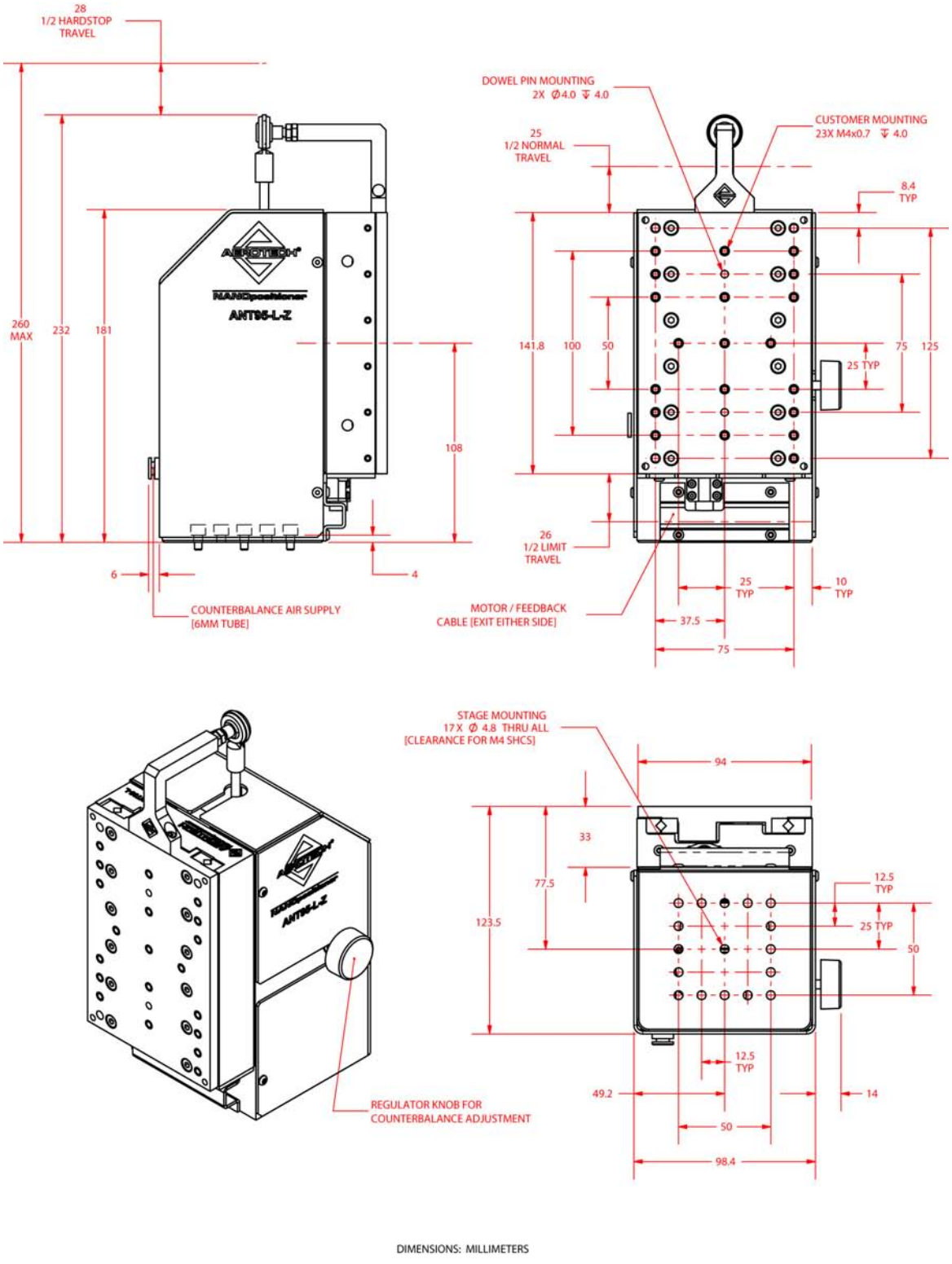

Figure 5-4: ANT95-50-L-Z Dimensions

5.3. Basic Specifications

Basic ANT95-L-Z series positioning stage specifications are shown in Table 5-2. Resolution is dependent on the encoder resolution and controller interpolation.

Table 5-2: ANT95-L-Z Series Specifications

Mechanical Specifications	ANT95-25-L-Z	ANT95-25-L-Z-PLUS	ANT95-50-L-Z	ANT95-50-L-Z-PLUS
Travel	25 mm (1 in)	25 mm (1 in)	50 mm (2 in)	50 mm (2 in)
Accuracy(1)	±4.0 µm (±160 µin)	±300 nm (±12 µin)	±4.0 µm (±160 µin)	±300 nm (±12 µin)
Resolution	2 nm	2 nm	2 nm	2 nm
Repeatability (Bidirectional)(1)	±100 nm	±75 nm	±100 nm	±75 nm
Straightness(1)	±2.25 µm (±90 µin)	±2.25 µm (±90 µin)	±3.0 µm (±120 µin)	±3.0 µm (±120 µin)
Flatness(1)	±3.5 µm (±140 µin)	±3.5 µm (±140 µin)	±4.0 µm (±160 µin)	±4.0 µm (±160 µin)
Pitch	10 arc sec	10 arc sec	10 arc sec	10 arc sec
Roll	10 arc sec	10 arc sec	10 arc sec	10 arc sec
Yaw	5 arc sec	5 arc sec	5 arc sec	5 arc sec
Maximum Speed	200 mm/s (8 in/s)	200 mm/s (8 in/s)	200 mm/s (8 in/s)	200 mm/s (8 in/s)
Maximum Acceleration	1 g - 10 m/s^2 (No Load)	1 g - 10 m/s^2 (No Load)	1 g - 10 m/s^2 (No Load)	1 g - 10 m/s^2 (No Load)
In-Position Stability(2)	5 nm	5 nm	5 nm	5 nm
Maximum Force (Continuous)	7.75 N	7.75 N	9.5 N	9.5 N
Load Capacity(3) (Vertical)	5.0 kg (11 lb)	5.0 kg (11 lb)	5.0 kg (11 lb)	5.0 kg (11 lb)
Moving Mass	0.46 kg (1.0 lb)	0.46 kg (1.0 lb)	0.52 kg (1.1 lb)	0.52 kg (1.1 lb)
Stage Mass	0.8 kg (1.8 lb)	0.8 kg (1.8 lb)	1.2 kg (2.7 lb)	1.2 kg (2.7 lb)
Material	Aluminum Body/Black Hardcoat Finish			
MTBF (Mean Time Between Failure)	30,000 Hours			

(1) Certified with each stage.
(2) In-Position Jitter listing is 3 sigma value.
(3) Axis orientation for on-axis loading is listed.
(4) Specifications are for single-axis systems measured 25 mm above the tabletop. Performance of multi-axis systems is payload and workpoint dependent. Consult factory for multi-axis or non-standard applications.
(5) -PLUS requires the use of an Aerotech controller.

5.4. Z-Axis Installation

The following statements apply to the ANT95-L-Z. Failure to observe these precautions could damage equipment.

Improper stage handling could adversely affect the stage's performance. Use care when moving the stage

5.4.1. Securing the Stage to the Mounting Surface

The following steps outline the stage mounting procedure. Refer to Figure 5-5 for part location and description.

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

1. Verify that the lower shipping bracket is secure.
2. Remove the upper shipping bracket. It is attached to the linear axis base with a M6 socket head cap screw.
3. Remove the pneumatics cover. It is attached to the vertical angle bracket with four M3 button head screws.
4. (25mm travel only) Manually lift the Z-Axis tabletop while sliding off the pneumatics cover so that the cylinder rod end does not catch on the cover slot.
5. Manually set the Z-Axis tabletop back down on the lower shipping bracket.
6. Mount the Z-Axis assembly using one of the available customer mounting patterns shown in Section 5.2. You can manually move the base of the pneumatics cylinder to the left or right to gain access to mounting holes in the vertical angle bracket. A long ball end T-handle is recommended.

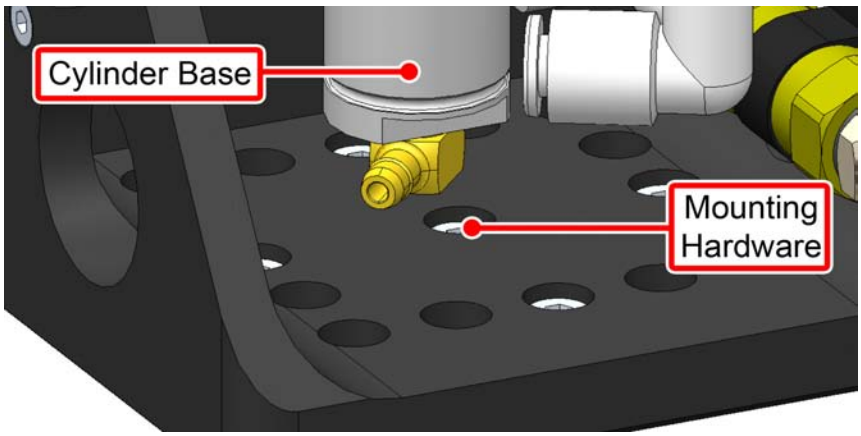

Figure 5-5: ANT95-L-Z Mounting Pattern / Pneumatics Cylinder Clearance

7. Torque the mounting screws to 2.3 N-m (20 in-lbs).

NOTE: If the Z-Axis assembly is mounted to the tabletop of any ANT95 series stage, you must use M4 hardware.

Do not attach the Z-Axis assembly to another ANT95 series stage with hardware that is too long. It will bottom out and deform the lower axis tabletop.

8. Verify that the pneumatics cylinder is again centered vertically in the assembly. To verify this, manually lift and lower the stage while watching the base of the cylinder. If you see the cylinder shifting around from front to back or from right to left, adjust until movement is minimized.
9. Reattach the pneumatics cover by reversing steps 3 and 4.

NOTE: To prevent damage to delicate payloads, test the operation of the stage before attaching the payload to the stage table.

10. Connect and turn on the air supply to the counterbalance. The tabletop should still be resting on the lower axis-shipping clamp. If the tabletop starts to slowly rise, dial back the air supply pressure using the regulator knob.
11. Manually lift the tabletop and then slowly allow gravity to lower the tabletop while adjusting the air supply pressure until the tabletop reaches equilibrium.
12. The system is now balance.
13. Remove the lower shipping bracket.
14. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. For information on electrical connections, refer to Section 3.6. Standard Motor Wiring.

5.4.2. Attaching the Payload to the Stage

The following steps outline the payload mounting procedure.

1. Complete the steps outlined in Section 5.4.1.
2. Confirm that all electrical power is disconnected prior to making any mechanical adjustments. Do not turn off air supply to system. Adjustments to the pneumatic pressure will be required in later steps.
3. Manually center the tabletop and reattach the lower shipping bracket. This bracket was removed in Step 13 of Section 5.4.1.
4. Attach the payload to the stage. The tabletop should still be resting on the lower axis-shipping clamp.

NOTE: Use three point mounting if possible when attaching the payload to the stage.

NOTE: For valid accuracies, the mounting interface should be flat within 2 µm to 5 µm.

Do not attach payload to the stage table with screws that are too long. It can bottom out and deform the lower axis tabletop.

5. Repeat Step 11 of Section 5.4.1. with the payload attached.
6. Remove the lower shipping bracket.
7. Reconnect electrical power.

Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from 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, where 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 or 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.

Laser Products

Aerotech, Inc. warrants its laser products to the original purchaser for a minimum period of one year from date of shipment. This warranty covers defects in workmanship and material and is voided for all laser power supplies, plasma tubes and laser systems subject to electrical or physical abuse, tampering (such as opening the housing or removal of the serial tag) or improper operation as determined by Aerotech. This warranty is also voided for failure to comply with Aerotech's return procedures.

Return Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within (30) days of shipment of incorrect materials. 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. Any returned product(s) must be accompanied by a return authorization number. The return authorization number may be obtained by calling an Aerotech service center. 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 (30) days after the issuance of a return authorization number will be subject to review.

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 airfreight return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Returned Product Non-warranty Determination

After Aerotech's examination, 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 (30) days of notification will result in the product(s) being returned as is, at the buyer's expense. Repair work is warranted for (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 service 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.

Company Address

Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA
15238-2897

Phone: (412) 963-7470

Fax: (412) 963-7459

Appendix B: Technical Changes

Table B-1: Current Changes (1.03.00)

Section(s) Affected	General Information
Section 1.4.	Added section
Section 3.1.	Added section
Chapter 2: Installation, Section 2.3. , Section 2.5. , Section 5.4.1. , and Section 1.3.	Added safety information and warnings
Section 3.6.	Added note about current requirements of motor and ground wires

Table B-2: Archived Changes

Revision	Section(s) Affected	General Information
1.02.00	Section 1.1.1.	ANT95-50-L mounting plate modified for compatibility with ANT95-3-V
1.01.00	Section 1.2.	Added stage limit travel dimension
1.01.00	Section 5.2.	Added stage limit travel dimension
1.00.00	--	New manual

Index

Reader's Comments

ANT95-L Series Stage Manual **P/N: EDS146, November 4, 2010** **Revision 1.03.00** Please answer the questions below and add any suggestions for improving this document.	

Is the manual:	Yes	No
Adequate to the subject		
Well organized		
Clearly presented		
Well illustrated		

How do you use this document in your job? Does it meet your needs? What improvements, if any, would you like to see? Please be specific or cite examples.

	Stage/Product Details		Name	
Model #			Title	
Serial #			Company Name	
Date Shipped			Address	
Customer Order #				
Aerotech Subsidiary Order #			Email	

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	Email:
	service@aerotech.com