MPS130LM Single-Axis Miniature Linear Motor Stage

HARDWARE MANUAL

Revision 1.00

GLOBAL TECHNICAL SUPPORT

Go to the Global Technical Support Portal for information and support about your Aerotech, Inc. products. The website supplies software, product manuals, Help files, training schedules, and PC-to-PC remote technical support. If necessary, you can complete Product Return (RMA) forms and get information about repairs and spare or replacement parts. To get help immediately, contact a service office or your sales representative. Include your customer order number in your email or have it available before you call.

This manual contains proprietary information and may not be reproduced, disclosed, or used in whole or in part without the express written permission of Aerotech, Inc. Product names mentioned herein are used for identification purposes only and may be trademarks of their respective companies.

Copyright © 2025-2026, Aerotech, Inc. | All rights reserved.

See the latest version of Aerotech's Terms of Use, Privacy Policy, and Cookie Policy online at aerotech.com.

Table of Contents

MPS130LM Single-Axis Miniature Linear Motor Stage **1**
Table of Contents 3
List of Figures 4
List of Tables 5
EU Declaration of Incorporation 6
UKCA Declaration of Incorporation 7
RoHS Conformity Declaration 8
Safety Procedures and Warnings 9
Installation and Operation 10
Electrical Warnings 11
Motor-Related Warnings 12
Pinch Points 13
Magnetic Hazards 14
Handling and Storage 15

Chapter 1: Overview **17**
1.1. Environmental Specifications 18
1.2. Accuracy and Temperature Effects 18
1.3. Basic Specifications 19
1.4. Vacuum Operation 20

Chapter 2: Installation **21**
2.1. Dimensions 21
2.2. Securing the Stage to the Mounting Surface 23
2.3. Attaching the Payload to the Table Top or Carriage 25

Chapter 3: Electrical Installation **27**
3.1. Motor and Feedback Connectors 28
3.2. Motor and Feedback Wiring 30
3.3. Motor and Feedback Specifications 31
3.4. Limits, Marker, and Machine Direction 33
3.5. Motor and Feedback Phasing 34

Chapter 4: Maintenance **37**
4.1. Service and Inspection Schedule 37
4.2. Cleaning and Lubrication 38
4.3. Troubleshooting 40

Appendix A: Warranty and Field Service **41**

Appendix B: Revision History **43**

Index **45**

List of Figures

Figure 2-1: MPS130LM Dimensions 21
Figure 2-2: MPS130LM Mounting Plate (-MP) Dimensions 22
Figure 2-3: Mounting Hole Pattern 24
Figure 2-4: Load Orientations 26
Figure 2-5: Cantilevered Load Capabilities 26
Figure 3-1: MPS130LM Motor and Feedback Wiring 30
Figure 3-2: Machine Direction 33
Figure 3-3: Hall Phasing Diagram 34
Figure 3-4: Encoder Phasing Reference Diagram 35

List of Tables

Table 1-1: Model Numbers and Ordering Options 17
Table 1-2: Environmental Specifications 18
Table 1-3: MPS130LM Series Specifications 19
Table 2-1: Stage Mounting Surface Flatness Requirement 23
Table 2-2: Stage to Mounting Surface Hardware 24
Table 2-3: Payload Mounting Surface Flatness Requirement 25
Table 2-4: Payload to Stage Surface Hardware 25
Table 3-1: 25-Pin Motor and Feedback Connector Pinout 29
Table 3-2: 25-Pin Mating Connector Part Numbers 29
Table 3-3: Hall-Effect Sensor Specifications 31
Table 3-4: Thermistor Specifications 31
Table 3-5: Encoder Specifications 31
Table 3-6: Encoder Resolution 31
Table 3-7: Limit Switch Specifications 31
Table 3-8: MPS130LM Motor Specifications 32

EU Declaration of Incorporation

Manufacturer:	Aerotech, Inc.
Address:	101 Zeta Drive Pittsburgh, PA 15238-2811 USA
Product:	MPS130LM - linear positioning stage
Models:	All

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following directive.

2006/42/EC
Machinery Directive (partially completed machinery)
1.1 General Remarks
1.1.2 Principles of safety integration
1.1.5 Design of machinery to facilitate handling
1.2 Control Systems
1.2.1 Safety and reliability of control systems
1.3 Protection against mechanical hazards
1.3.1 Risk of loss of stability
1.3.2 Risk of breakup during operation
1.3.3 Risks due to falling or ejected objects
1.3.4 Risks due to surfaces, edges, or angles
1.5 Risks due to other hazards
1.5.4 Error of fitting
1.5.9 Vibrations
1.6 Maintenance
1.6.5 Cleaning of internal parts
1.7 Instructions
1.7.4.1 Instructions

and that the following harmonized European standards have been applied:

EN ISO 12100
Safety of machinery – Basic concepts, general principles for design

EN 60204-1:2018
Safety of machinery – Electrical equipment of machines – Part 1: General requirements

and furthermore declares that

the equipment shall not be put 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, for example, as a whole, including the equipment referred to in this Declaration. Technical documentation showing compliance with this declaration in accordance with Annex VII part B will be provided in digital format upon request.

Authorized Representative:

Managing Director
Aerotech GmbH
Gustav-Weißkopf-Str. 18
90768 Fürth
Germany

Stephan Schech

Engineer Verifying Compliance:

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

Alex Weibel

Date: 2/6/2026

UKCA Declaration of Incorporation

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

herewith declares that the following Aerotech stage series:

MPS130LM

To which this declaration relates, meets the essential health and safety requirements and is in conformity with the relevant UK legislation listed below:

Supply of Machinery (Safety) Regulations 2008

Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
Restricted Substances Directive

Using the relevant section of the following UK designated standards and other normative documents when installed in accordance with the installation instructions supplied by the manufacturer:

EN ISO 12100
Safety of machinery – Basic concepts, general principles for design

EN 60204-1:2018
Safety of machinery – Electrical equipment of machines – Part 1: General requirements

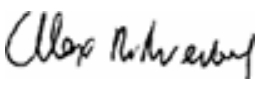
and furthermore declares that

it is not allowed to put the product 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 Supply of Machinery (Safety) Regulations 2008 UK Legislation and with national implementing legislation, for example, as a whole, including the equipment referred to in this Declaration.

Authorized Representative:
Managing Director
Aerotech Ltd.
The Old Brick Kiln
Ramsdell, Tadley
Hampshire RG26 5PR
UK

Simon Smith

Engineer Verifying Compliance:
Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA
15238-2811
USA



Alex Weibel

Date: 2/6/2026

RoHS Conformity Declaration

Manufacturer:	Aerotech, Inc.
Address:	101 Zeta Drive Pittsburgh, PA 15238-2811 USA
Product:	MPS130LM - linear positioning stage
Models:	All

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following directive:

(EU) 2015/863 restriction of the use of hazardous substances (RoHS3)

Safety Procedures and Warnings

IMPORTANT: This manual tells you how to carefully and correctly use and operate the stage.

- Read all parts of this manual before you install or operate the stage or before you do maintenance to your system.
- To prevent injury to you and damage to the equipment, obey the precautions in this manual.
- All specifications and illustrations are for reference only and were complete and accurate as of the release of this manual. To find the newest information about this product, refer to www.aerotech.com.

If you do not understand the information in this manual, contact Aerotech Global Technical Support.

IMPORTANT: This product has been designed for light industrial manufacturing or laboratory environments. If the product is used in a manner not specified by the manufacturer:

- The protection provided by the equipment could be impaired.
- The life expectancy of the product could be decreased.

Safety notes and symbols are placed throughout this manual to warn you of the potential risks at the moment of the safety note or if you fail to obey the safety note.

Shock/Electrocution Hazard

Pinch, Shear, or Crush Hazard

General/Conditional Awareness

Rotational Machinery Hazard

Hot Surface Hazard

Pinch/Entanglement Hazard

Magnetic Field Hazard

Trip Hazard

Heavy, Bulky Lifting Hazard

Appropriate Equipment Required

Pressure/Explosive Atmosphere Hazard

Electrostatic Discharge Hazard

A blue circle symbol is an action or tip that you should obey. Some examples include:

General tip

Read the manual/section

Wear personal protective equipment (PPE): Safety Glasses

If applicable, do not lift unassisted

Wear personal protective equipment (PPE): Gloves

Wear personal protective equipment (PPE): Hearing Protection

Installation and Operation

To decrease the risk of damage to the equipment, you must obey the precautions that follow.

DANGER: General Hazard Warning!

This product can produce high forces and move at velocities that could cause injury. The user is responsible for its safe operation. The following general equation is provided to assist with risk assessments in regards to contact and pinch points:

$$Pressure_{Max}\left[\frac{N}{mm^2}\right] = \frac{Force_{Peak}[N]}{Area_{Contact}[mm^2]}$$

WARNING: General Hazard Warning!

- Only trained operators should operate this equipment.
- All service and maintenance must be done by approved personnel.
- Use this product only in environments and operating conditions that are approved in this manual.
- Never install or operate equipment that appears to be damaged.
- Make sure that the product is securely mounted before you operate it.
- Use care when you move the stage or you could negatively affect the performance of it.

WARNING: **Trip Hazard!**

Route, house, and secure all cables, duct work, air, or water lines. Failure to do so could introduce trip hazards around the system that could result in physical injury or could damage the equipment.

Electrical Warnings

To decrease the risk of electrical shock, injury, death, and damage to the equipment, obey the precautions that follow.

DANGER: Electrical Shock Hazard!

- Stage motor phase voltage levels could be hazardous live.
- Personnel are protected from hazardous voltages unless electrical interconnections, protective bonding (safety ground), or motor/stage enclosures are compromised.
- Do not connect or disconnect stage/motor interconnections while connected to a live electrical power source.
- Before you set up or do maintenance, disconnect electrical power.
- It is the responsibility of the End User/System Integrator to make sure that stages are properly connected and grounded per Engineering Standards and applicable safety requirements.
- It is the responsibility of the End User/System Integrator to configure the system drive or controller within the Aerotech motor/stage electrical and mechanical specifications.

Motor-Related Warnings

Aerotech motors are capable of producing high forces and velocities. Obey all warnings and all applicable codes and standards when you operate a system that incorporates Aerotech motors.

DANGER: Mechanical Hazard!

Personnel must be made aware of the mechanical hazards during set up or when you do service to the stage.

- Unintentional manual movement into the stage "end-of-travel" stops could damage the stage or undo precision alignments.
- Stage movement could create pinch points, entanglement hazards, or rotational mechanical hazards.

DANGER: Hot Surface Hazard!

- The stage/motor frame temperature could exceed 70°C in some applications.
- Do not touch the stage/motor frame while it is in operation.
- Wait until the stage/motor has cooled before you touch it.

DANGER: **Risk in Explosive Atmosphere!**

- Standard Aerotech stage/motors are not rated for applications with explosive atmospheres such as airborne dust or combustible vapors.
- Do not operate stage/motors outside of Aerotech environmental specifications.

DANGER: Magnetic Field Hazard!

Aerotech stage/motors contain magnets which can present a Magnetic Field Hazard.

- Do not disassemble a stage motor under any circumstances.
- Strong magnetic fields could interfere with external/internal medical devices.
- Strong magnetic fields could present mechanical hazards such as pinch points.

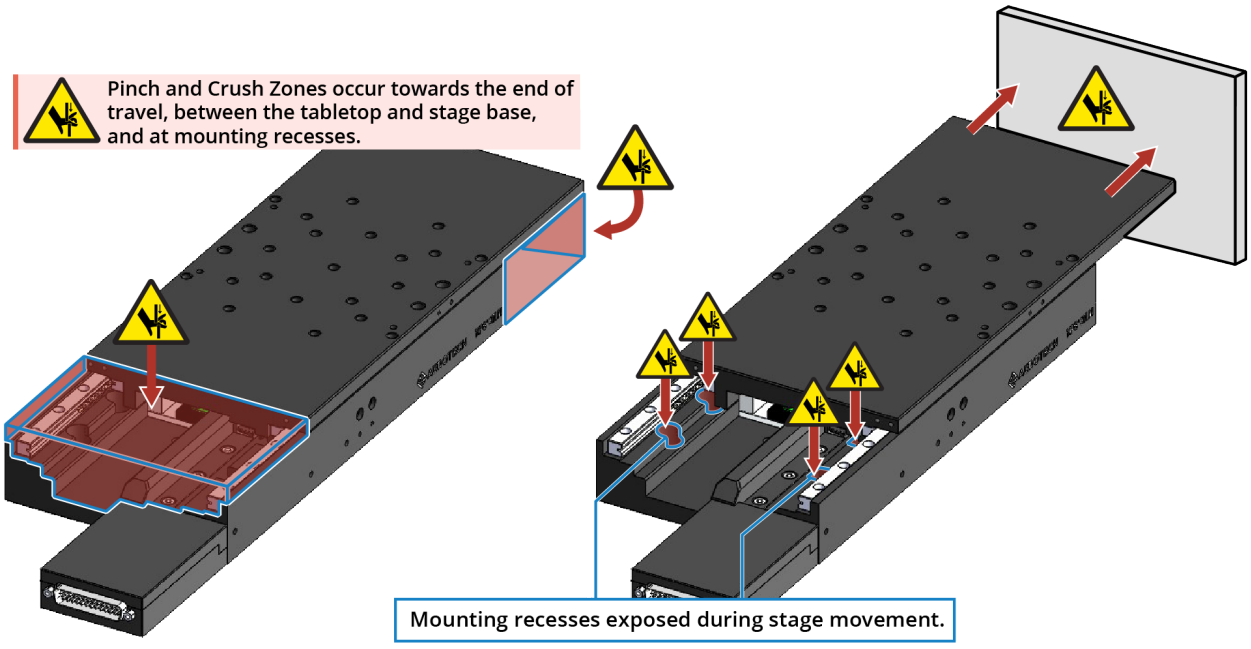
Pinch Points

A pinch point is a mechanical hazard that can occur when there are exposed parts of the stage or system that can move. For example, the travel of a stage tabletop could expose the user to a pinch point between the tabletop and the stage housing. The images that follow will show you typical external and internal pinch point locations.

DANGER: Mechanical Hazard!

- System travel can cause crush, shear, or pinch injuries.
- Only trained operators should operate this equipment.
- Do not put yourself in the travel path of machinery.
- Restrict access to all motor and stage parts
  - when the system moves under power (during normal operation, for example).
  - when the system is moved manually (during the installation process or when you do maintenance, for example).
- Motors are capable of very high speeds and acceleration rates.

Figure 1: Typical Pinch Point Locations



Magnetic Hazards

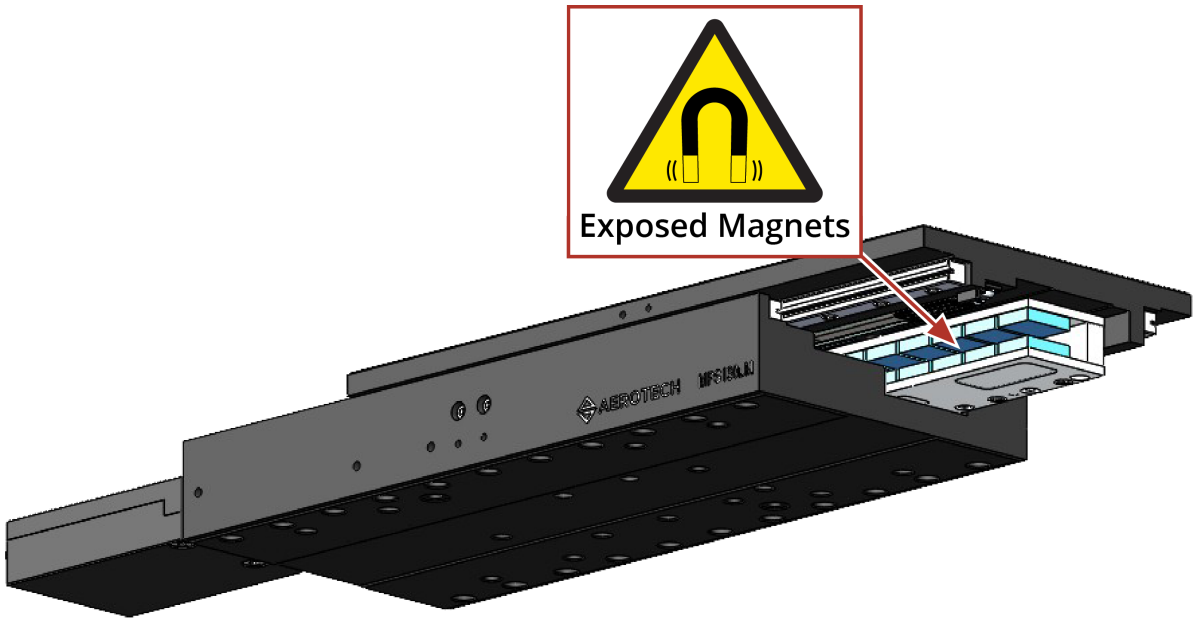
The magnet track will be exposed during normal operation or when you do maintenance to the system.

DANGER: Magnetic Field Hazard!

- Only qualified, trained personnel should be allowed to have access to exposed magnet tracks during setup or when you do maintenance.
- Strong magnetic fields are present near and inside the magnet track assembly.
- Do not disassemble the magnet track components. If you do so, you will expose yourself to mechanical crush, pinch, or impact hazards.
- Magnetic fields could interfere with external or internal medical devices (pacemakers, for example).
- Magnetic fields can create mechanical hazards (crush, impact, or pinch points, for example).
- Loose items such as metallic tools, watches, or keys could get drawn into and damage the magnet track assembly.

IMPORTANT: Use non-magnetic tools when you install or do service to the stage.

Figure 2: Exposed Magnet Locations



Handling and Storage

IMPORTANT: It is the responsibility of the customer to safely and carefully lift and move the stage.

- Be careful when you move or transport the stage.
- Retain the shipping materials for future use.
- Transport or store the stage in its protective packaging.

WARNING: Electrostatic Discharge (ESD) Sensitive Components!

Wear an ESD wrist strap when you handle, install, or do service to the system assembly.

Failure to observe the correct ESD practices could cause ESD damage to stage electronics, system drives, and/or power supplies.

Inspect the shipping container for any evidence of shipping damage. If any damage exists, notify the shipping carrier immediately.

Remove the packing list from the shipping container. Make sure that all the items specified on the packing list are contained within the package.

The documentation for the stage is on the included installation device. The documents include manuals, interconnection drawings, and other documentation pertaining to the system. Save this information for future reference.

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

Unpacking and Handling

It is the responsibility of the customer to safely and carefully lift and move the stage.

IMPORTANT: All electronic equipment and instrumentation is wrapped in antistatic material and packaged with desiccant. Ensure that the antistatic material is not damaged during unpacking.

DANGER: **Lifting Hazard!** Use care when you move the stage or you could negatively affect the performance of it.

- Use the correct lifting techniques, mechanical assistance, or additional help to lift or move this product.
- Do not use the cables or the connectors to lift or move this product.
- Make sure that all moving parts are secure before you move the stage. Unsecured moving parts could shift and cause injury or damage to the equipment.
- If the stage is heavy, a single person lift could cause injury. Use assistance when you lift or move it.
  - Refer to Section 2.1. Dimensions for dimensions
  - Refer to Section 1.3. Basic Specifications for weight specifications.

Carefully remove the stage from its protective shipping container.

- Lift this product only by the base.
- For multi-axis assemblies, always lift the system by the lower axis.
- Use a cart, dolly, or similar device to move the stage to a new location.

Gently set the stage on a smooth, flat, and clean surface. Use compressed nitrogen or clean, dry, oil-free air to remove any dust or debris that has collected during shipping.

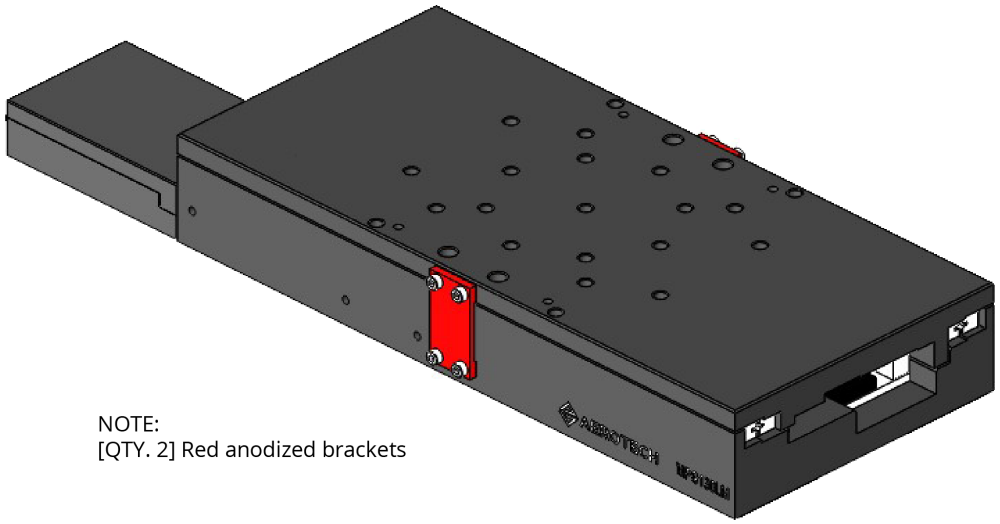
Before you operate the stage, let it stabilize at room temperature for at least 12 hours. This will ensure that all of the alignments, preloads, and tolerances are the same as they were when they were tested at Aerotech.

Red, anodized aluminum shipping brackets have been installed to prevent unwanted motion damage that could occur during shipment. The brackets must be removed before the MPS130LM can be operated. Retain the brackets and hardware for future use.

DANGER: Mechanical Hazard!

- The product can move manually without electrical power connected.
- When the shipping brackets are removed, the operator could be exposed to pinch points.

Figure 3: Shipping Brackets



Storage

Store the stage in the original shipping container. If the original packaging included ESD protective packaging, make sure to store the stage in it. The storage location must be dry, free of dust, free of vibrations, and flat.

Refer to Section 1.1. Environmental Specifications

Chapter 1: Overview

Table 1-1: Model Numbers and Ordering Options

MPS130LM Single-Axis Miniature Linear Motor Stage	
Travel (Required)	
-060	60 mm travel
-110	110 mm travel
-160	160 mm travel
Feedback (Required)	
-E1	Incremental linear encoder, 1 Vpp amplified sine output
-E2	Incremental linear encoder, digital RS422 output, 5 nm electrical resolution
Mounting Plate (Optional)	
-MP	Mounting Plate
Metrology (Required)	
-PL0	No metrology performance plots
-PL1	Metrology, Uncalibrated with performance plots
-PL2	Metrology, Calibrated (HALAR) with performance plots
Integration (Required)	
-TAS	Test as system: Testing, integration, and documentation of a group of components as a complete system that will be used together.
-TAC	Test as components: Testing and integration of individual items as discrete components that ship together.

1.1. Environmental Specifications

WARNING: **General Hazard Warning!** Do not expose this product to environments or conditions outside of the listed specifications. You could damage the equipment if you exceed the environmental or operating specifications.

DANGER: **Risk in Explosive Atmosphere!**

- Standard Aerotech stage/motors are not rated for applications with explosive atmospheres such as airborne dust or combustible vapors.
- Do not operate stage/motors outside of Aerotech environmental specifications.

Table 1-2: Environmental Specifications

Ambient Temperature	Operating: 10 °C to 35 °C (50 °F 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 °C to 40 °C (32 °F to 104 °F) in original shipping packaging
Humidity	Operating: 20% to 60% RH
	Storage: 10% to 70% RH, non-condensing in original packaging. The stage should be packaged with desiccant if it is to be stored for an extended time.
Altitude	Operating: 0 m to 2,000 m (0 ft to 6,562 ft) above sea level Contact Aerotech if your specific application involves use above 2,000 m or below sea level.
Vibration	Use the system in a low vibration environment. Floor or acoustical vibration can affect system performance. Contact Aerotech for information regarding your specific application.
Protection Rating	These stages are not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
Use	Indoor use only

1.2. Accuracy and Temperature Effects

Aerotech products are designed for and built in a 20 °C (68 °F) environment. Temperature changes could cause a decrease in performance or permanent damage to the stage. At a minimum, the environmental temperature must be controlled to within 0.25 ºC per 24 hours to ensure the stage specifications are repeatable over an extended period of time. The severity of temperature effects on all specifications depends on many different environmental conditions, which include how the stage is mounted. Contact the factory for more details.

The thermal expansion coefficient of the encoder scale is 3.25 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 stage is measured 25 mm above the table 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 2.2.

1.3. Basic Specifications

Specifications are for single-axis systems measured 25 mm above the tabletop; performance of multi-axis system depend upon the payload and workpoint. Consult the Aerotech factory for multi-axis or non-standard applications.

To ensure the achievement and repeatability of specifications over an extended period of time, environmental temperature must be controlled to within 0.25°C per 24 hours. Consult factory for more information.

Table 1-3: MPS130LM Series Specifications

Mechanical Specifications		MPS130LM-060	MPS130LM-110	MPS130LM-160
Travel		60 mm	110 mm	160 mm
Accuracy (1)	-PL1	±3.0 µm	±4.0 µm	±5.0 µm
	-PL2	±0.5 µm	±0.5 µm	±0.5 µm
Bidirectional Repeatability (1)		±0.2 µm		
Resolution (Minimum Incremental Motion)	-E1	1 nm		
	-E2	5 nm		
In-Position Stability (2)	-E1	<1 nm		
	-E2	<5 nm		
Straightness		±2.5 µm		
Flatness		±2.5 µm		
Pitch		24 arc sec	26 arc sec	28 arc sec
Roll		20 arc sec	22 arc sec	24 arc sec
Yaw		20 arc sec	22 arc sec	24 arc sec
Maximum Speed (3)		350 mm/s		
Maximum Acceleration (No Load)(3)		1 g		
Load Capacity (4)	Horizontal	12 kg		
	Side	10 kg		
Moving Mass		1.41 kg	1.90 kg	2.30 kg
Stage Mass		3.01 kg	3.86 kg	4.63 kg

(1) Certified with each stage using an Aerotech controller (excluding -PL0 metrology option).
(2) In-position stability is reported as 3-sigma value. Specification value depends on the selected encoder option.
(3) Requires the selection of an appropriate amplifier with sufficient voltage and current.
(4) Payload specifications assume payload is centered on-axis.

1.4. Vacuum Operation

There are two vacuum preparation options:

- Low Vacuum (for use in environments from atmospheric pressure, down to 10^{-3} Torr)
- High Vacuum (for use in environments from 10^{-3} Torr, down to 10^{-6} Torr)

Special preparations include:

- Parts are lubricated with vacuum-compatible lubricants.
- Materials, fasteners, and coatings are selected to be compatible with the specified level of vacuum.
- High-vacuum systems are designed to eliminate trapped volumes.
- Prior to assembly, stage parts are thoroughly cleaned in a clean environment.
- The stage is packaged in a special polyethylene bag.

Vacuum Guidelines

To ensure that the stage will continue to perform well in the vacuum environment, use the guidelines that follow (in addition to standard handling, installation, and lubrication guidelines outlined in this manual).

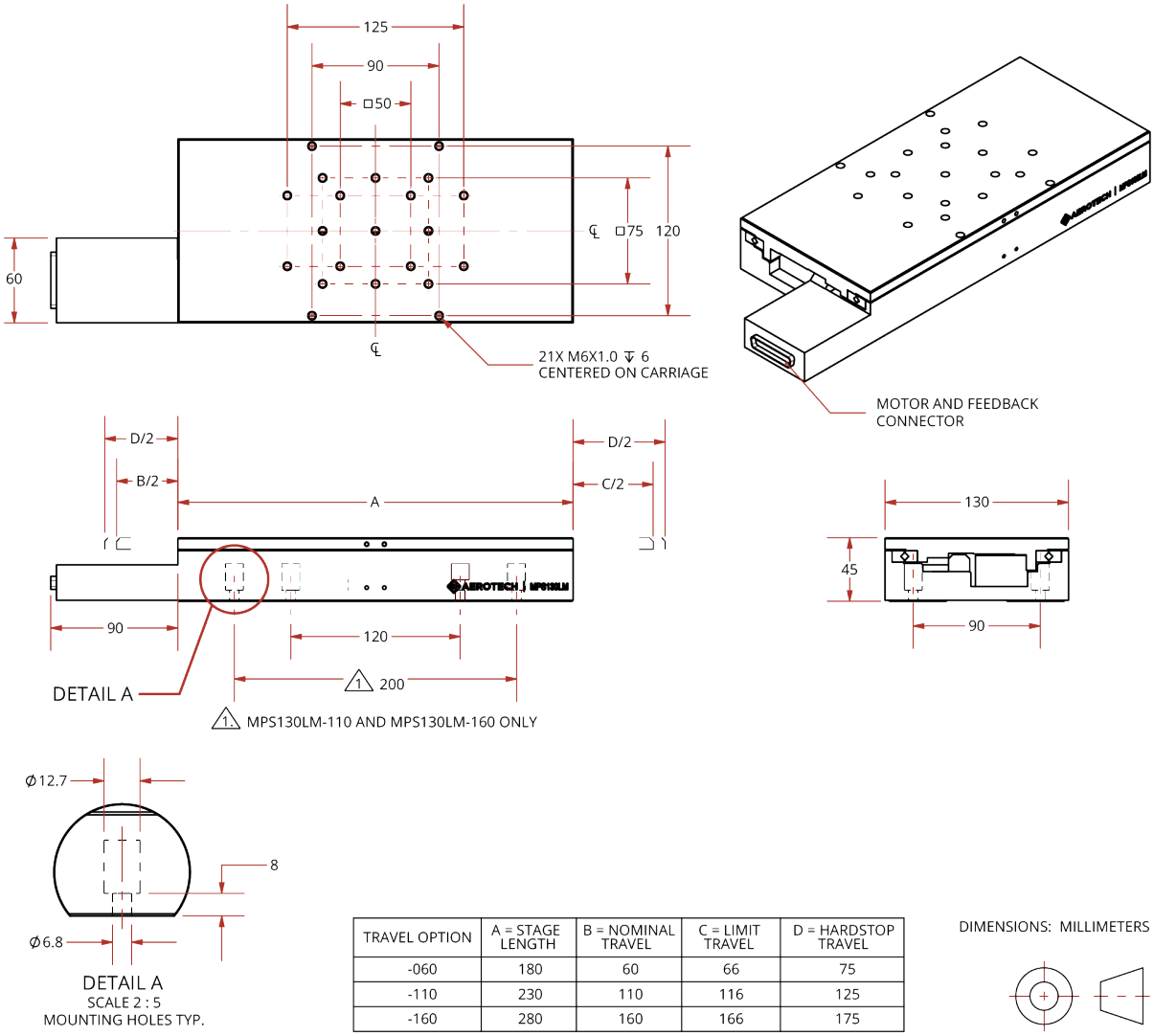
1. Do not remove the stage from its sealed bag until it is ready to use.
2. Always handle the stage in a clean environment and use powder-free polyethylene gloves to prevent any contaminants from adhering to the surface of the stage.
3. During installation, use cleaned, vented, stainless steel fasteners to secure the stage.
4. Reduced air pressure eliminates significant convective heat transfer. This, coupled with the viscous vacuum-compatible lubricants, could result in excessive motor operating temperatures. Because of this, consider all continuous torque ratings to be 40 to 60% lower than the value specified for operation in normal atmospheric environment. Reduce motor usage accordingly.
5. We recommend that you use a small quantity of Braycote® 602EF grease or a compatible substitute of equal quality lubricant in vacuum applications.
6. To reduce outgassing during the initial pump-down to vacuum pressure, Aerotech recommends that you bake out vacuum systems when you first install them into the vacuum chamber. Bake the vacuum components at 60 °C for 24 to 48 hours to desorb water vapor from surfaces and degas polymers (such as cable insulation).

Chapter 2: Installation

IMPORTANT: The stage installation must be in accordance with the 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. Dimensions

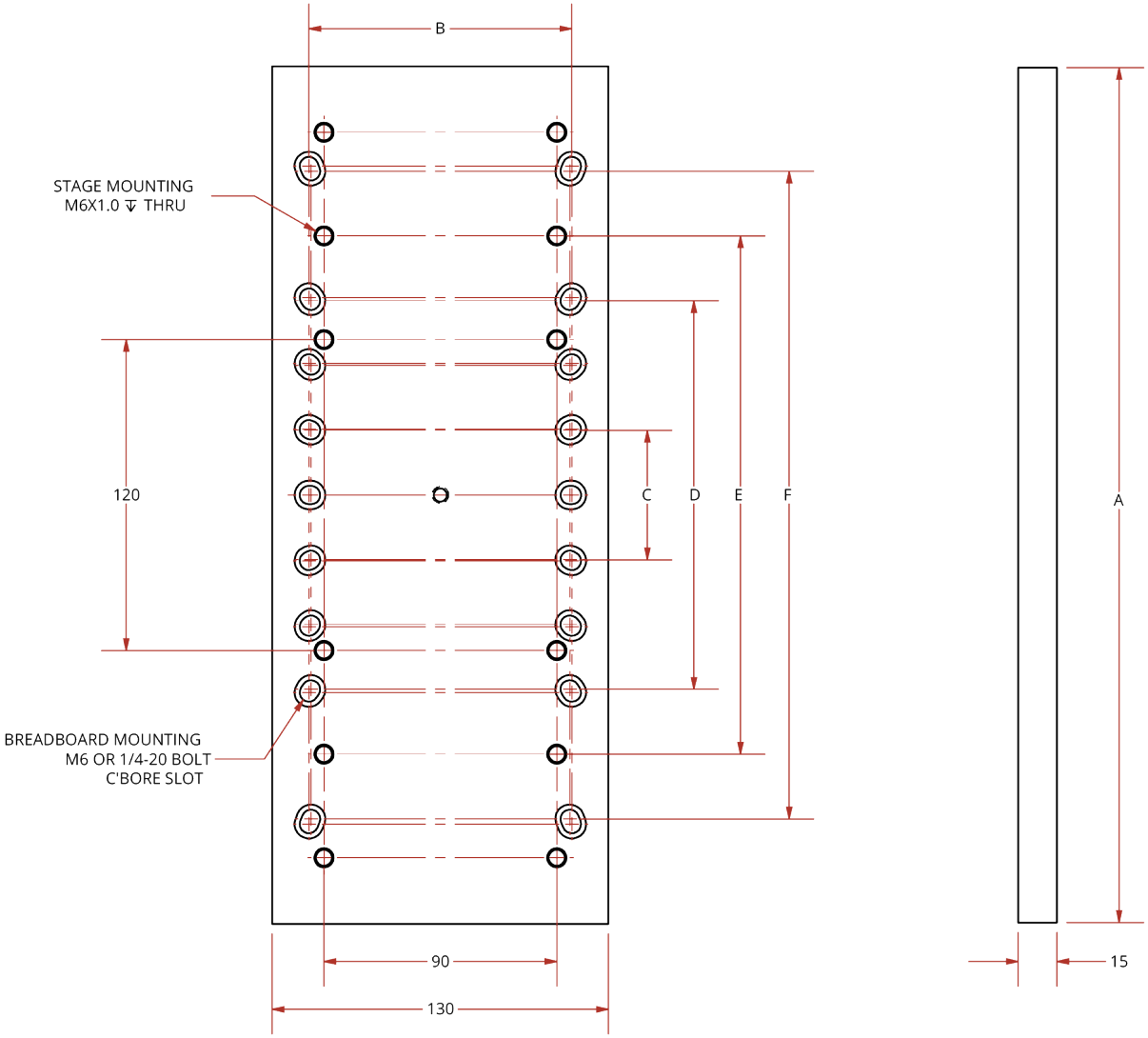
Figure 2-1: MPS130LM Dimensions



TRAVEL OPTION	A = STAGE LENGTH	B = NOMINAL TRAVEL	C = LIMIT TRAVEL	D = HARDSTOP TRAVEL
-060	180	60	66	75
-110	230	110	116	125
-160	280	160	166	175

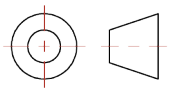
DIMENSIONS: MILLIMETERS

Figure 2-2: MPS130LM Mounting Plate (-MP) Dimensions



	LENGTH	MOUNTING				
TRAVEL OPTION	A	B	C	D	E	F
-060	180	100 [4.0]	50 [2.0]	150 [6.0]	--	--
-110	230	100 [4.0]	50 [2.0]	150 [6.0]	200	--
-160	280	100 [4.0]	50 [2.0]	150 [6.0]	200	250 [10.0]

DIMENSIONS: MILLIMETERS



2.2. Securing the Stage to the Mounting Surface

DANGER: Mechanical Hazard!

Personnel must be made aware of the mechanical hazards during set up or when you do service to the stage.

- Do not manually move the stage if it is connected to a power source.
- The stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.
- When you move the tabletop manually to do maintenance, this could expose the operator to pinch points. Refer to Pinch Points on Page 13.

DANGER: **Magnetic Field Hazard!** When you move the tabletop manually to do maintenance, this could expose the operator to the magnet track. Refer to Magnetic Hazards on Page 14.

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

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

IMPORTANT: The stage is precision machined and verified for flatness at the factory.

- Do not machine the stage housing. If you must machine a surface to achieve a required flatness, machine the mounting surface.
- Keep the use of shims to a minimum when you mount the stage to the mounting surface. The use of shims could reduce the rigidity of the system.

Table 2-1: Stage Mounting Surface Flatness Requirement

Stage Travel	Flatness Requirement
All Travels	7.6 µm

MPS130LM series stages have a fixed mounting pattern available to secure the stage to a mounting surface. Figure 2-3 shows the main mounting holes in the base of the stage. Tightening torque values for the mounting hardware are dependent on the properties of the surface to which the stage is being mounted. Refer to Section 2.1. Dimensions for specific model mounting locations and dimensions.

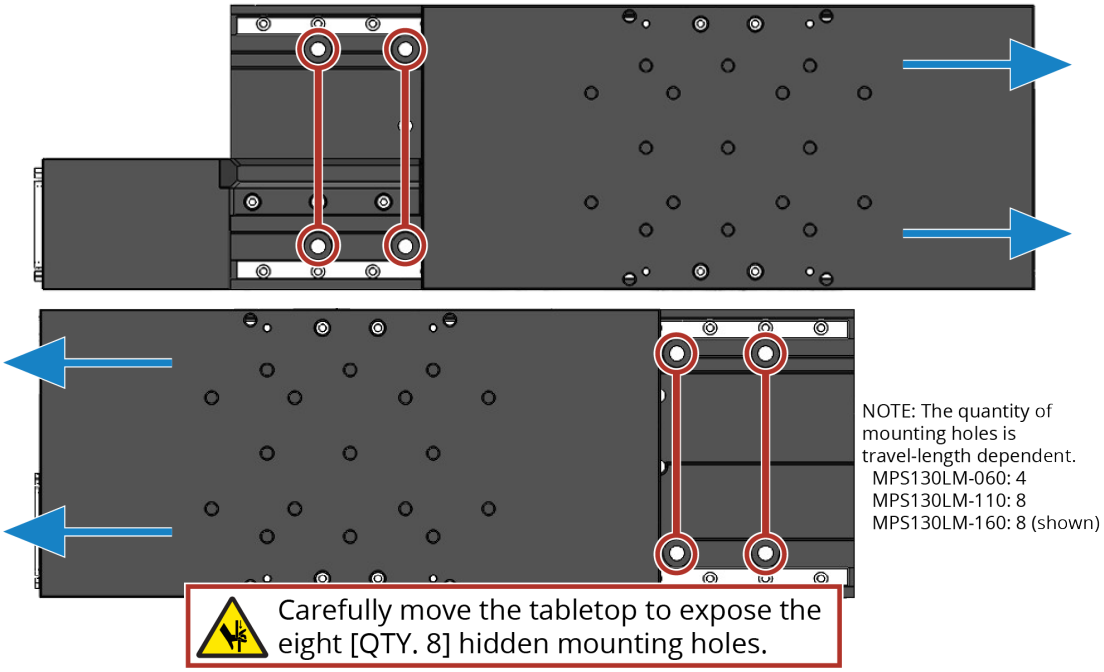
Access the mounting holes in the base of the stage by sliding the carriage all the way to either end of travel (shown in Figure 2-3).

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 2-2 are typical values and may not be accurate for your mounting surface. Refer to Section 2.1. for mounting locations and dimensions.

Table 2-2: Stage to Mounting Surface Hardware

Mounting Hardware	Typical Screw Torque
M6 x 18 mm (1/4 x 3/4 in) SHCS	7.0 N·m [61 lb·in]

Figure 2-3: Mounting Hole Pattern



2.3. Attaching the Payload to the Table Top or Carriage

Inspect the mounting surfaces for dirt or unwanted residue and clean them if necessary (refer to Chapter 4: Maintenance). Gently place the payload on the tabletop.

Use a representative payload during start-up to prevent accidental damage to the stage and the payload. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. Document all results for future reference. For information on electrical installation refer to Chapter 3: Electrical Installation and the documentation delivered with the stage.

IMPORTANT: If your MPS130LM was purchased with Aerotech controls, it could have been tuned with a representative payload based on the information provided at the time of order. If you start the MPS130LM 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.

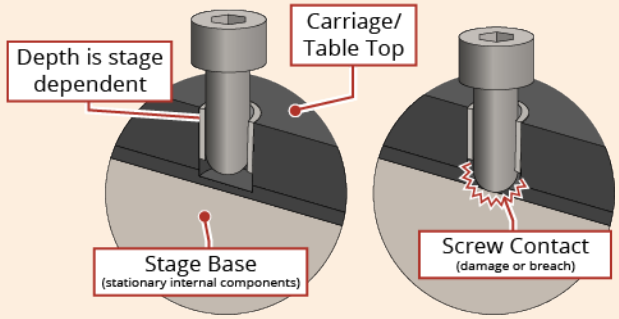
Table 2-3: Payload Mounting Surface Flatness Requirement

Stage Travel	Flatness Requirement
All Travels	1 µm per 50 mm

WARNING: General Hazard Warning!

Be careful when you attach the payload to stage table top or carriage mounting surfaces.

- If a mounting screw extends through the table top/carriage, it can affect travel and damage the stage.
- Refer to the dimensions in Section 2.1. for maximum allowable thread engagement.
- **Mounting Hole Cutaway:**



Applied loads should be symmetrically distributed whenever possible. The payload should be centered on the stage mounting surface and the entire stage should be centered on the support structure.

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 2-4 are typical values and may not be accurate for your mounting surface. Refer to Section 2.1. for mounting locations and dimensions.

Table 2-4: Payload to Stage Surface Hardware

Mounting Hardware	Typical Screw Torque
M6 SHCS	7.0 N·m [61 lb·in]

IMPORTANT: If possible, use 3-point mounting when you attach the payload to the stage.

If cantilevered loads are applied, refer to Figure 2-4 to find the loading condition. Refer to Figure 2-5 to find the maximum allowable load.

Figure 2-4: Load Orientations

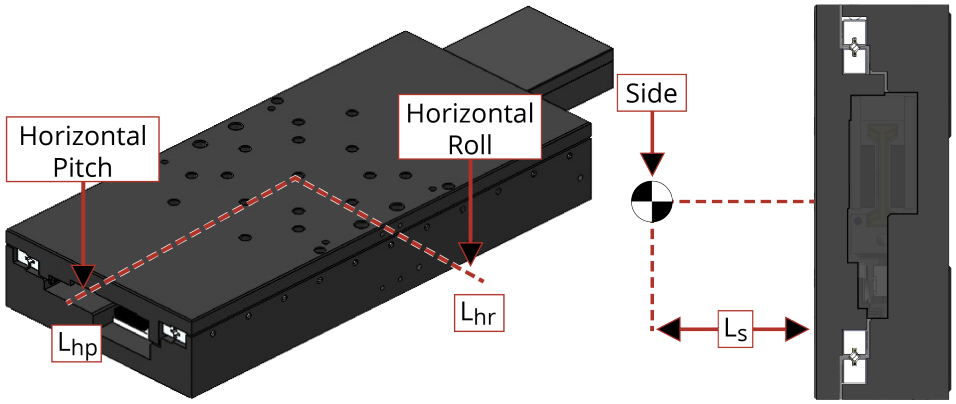
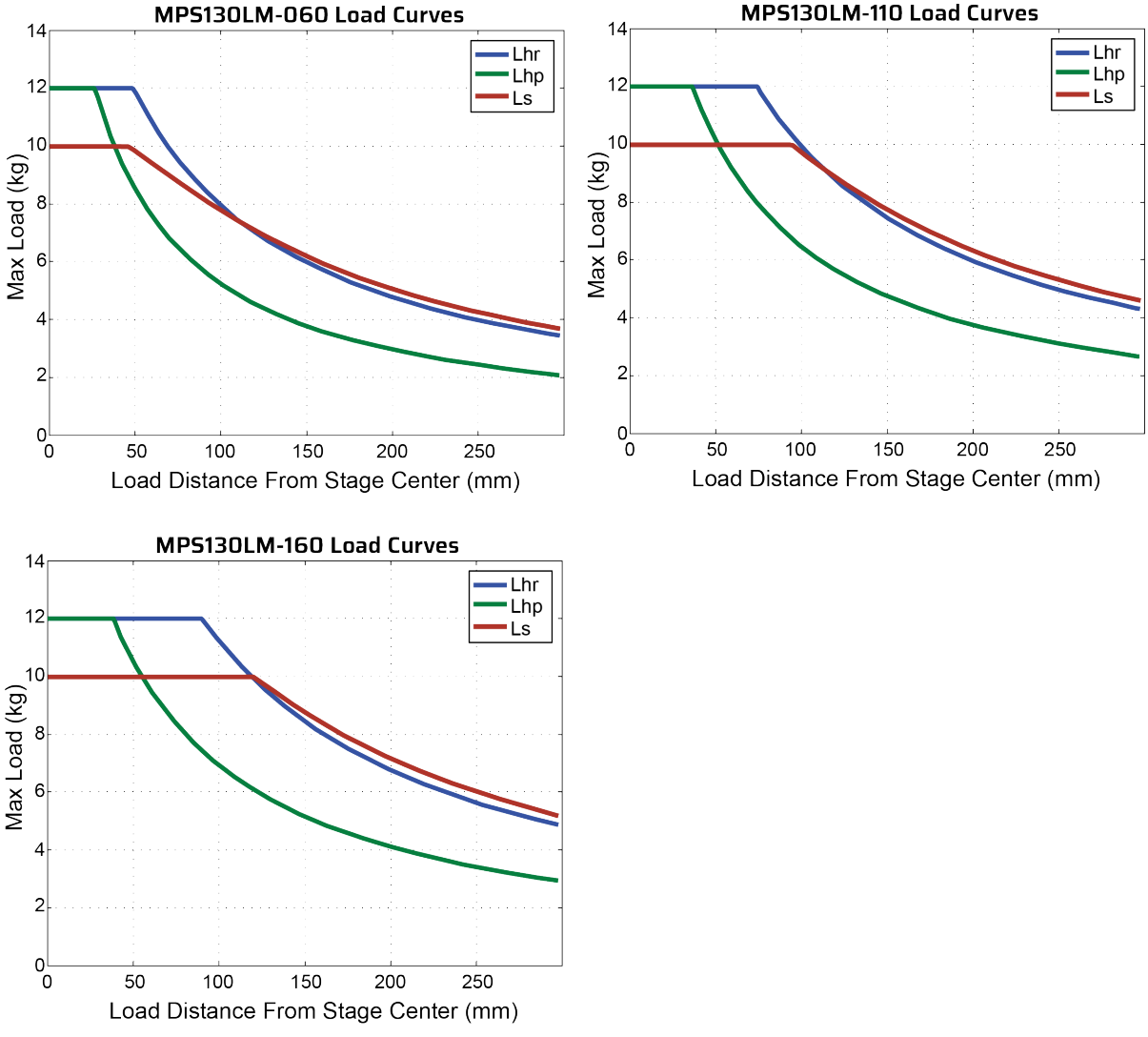


Figure 2-5: Cantilevered Load Capabilities



Chapter 3: Electrical Installation

DANGER: Electrical Shock Hazard!

- Stage motor phase voltage levels could be hazardous live.
- Personnel are protected from hazardous voltages unless electrical interconnections, protective bonding (safety ground), or motor/stage enclosures are compromised.
- Do not connect or disconnect stage/motor interconnections while connected to a live electrical power source.
- Before you set up or do maintenance, disconnect electrical power.
- It is the responsibility of the End User/System Integrator to make sure that stages are properly connected and grounded per Engineering Standards and applicable safety requirements.
- It is the responsibility of the End User/System Integrator to configure the system drive or controller within the Aerotech motor/stage electrical and mechanical specifications.

WARNING: General Hazard Warning!

Applications that require access to the MPS130LM must be restricted to qualified and trained personnel. The system integrator or qualified installer is responsible for determining and meeting all safety and compliance requirements when they integrate the MPS130LM into a completed system. Failure to do so could expose the operator to electrical or mechanical hazards.

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

Aerotech motion control systems are adjusted at the factory for optimum performance. When the MPS130LM is part of a complete Aerotech motion control system, setup should only require that you connect the stage to the appropriate drive chassis with the cables provided. Labels on the system components should indicate the appropriate connections.

If system level integration was purchased, an electrical drawing that shows the 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.

IMPORTANT: Refer to the controller documentation to adjust servo gains for optimum velocity and position stability.

3.1. Motor and Feedback Connectors

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

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

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

The protective ground connection of the MPS130LM 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: Electrical Shock Hazard!

- The protective ground connection must be properly installed to minimize the possibility of electric shock.
- The stage controller must provide over-current and over-speed protection. Failure to do so could cause electric shock or damage to the equipment.

Table 3-1: 25-Pin Motor and Feedback Connector Pinout

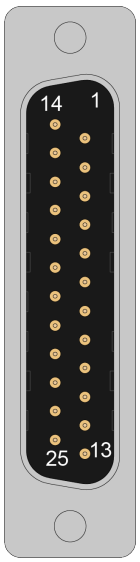
Pin	Description	Connector
Case	Shield Connection	
1	Reserved	
2	COS- (Encoder Cosine-)	
3	SIN- (Encoder Sine-)	
4	MRK- (Encoder Marker-)	
5	Common ground	
6	Common ground	
7	-/CCW LMT (End-of travel limit signal that indicates maximum permitted stage travel in the “machine negative” or “machine counter-clockwise” direction.)	
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	COS+ (Encoder Cosine+)	
15	SIN+ (Encoder Sine+)	
16	MRK+ (Encoder Marker+)	
17	5V Power Supply Input	
18	Reserved	
19	+/CW LMT (End-of travel limit signal that indicates maximum permitted stage travel in the “machine positive” or “machine clockwise” direction.)	
20	Over-Temperature Thermistor Sensor	
21	Hall Effect Sensor (Phase B)	
22	Frame Ground and Shield Connection	
23	Motor Phase A	
24	Motor Phase B	
25	Motor Phase C	

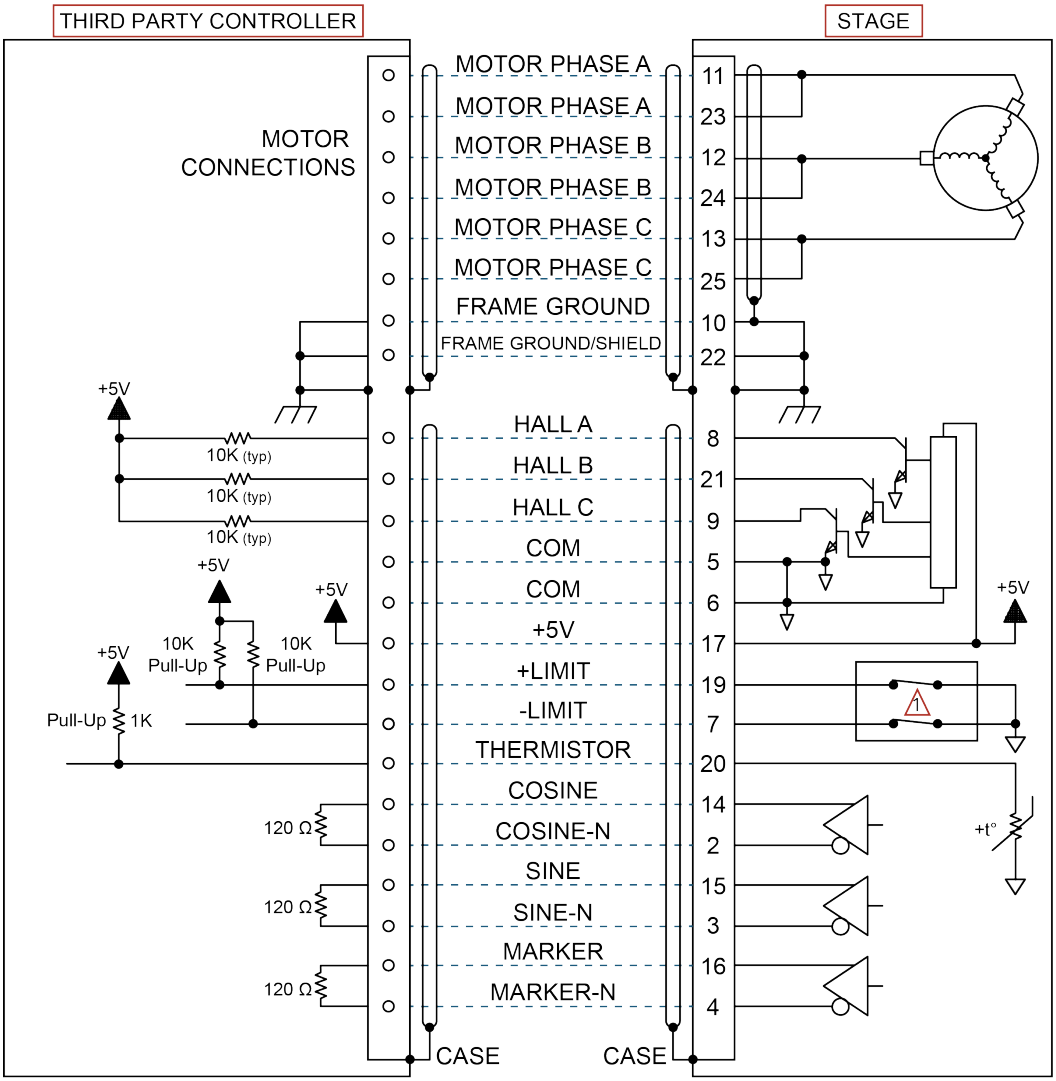
Table 3-2: 25-Pin Mating Connector Part Numbers

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

3.2. Motor and Feedback Wiring

Shielded cables are required for the motor and feedback connections.

Figure 3-1: MPS130LM Motor and Feedback Wiring



⚠1 Over-travel limit switches are normally-closed.

3.3. Motor and Feedback Specifications

IMPORTANT: All 5 V supplies share one common connection within the stage.

Table 3-3: Hall-Effect Sensor Specifications

	Specification
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)

Table 3-4: Thermistor Specifications

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

Table 3-5: Encoder Specifications

	Specification
Supply Voltage	5 V ±5%
Supply Current	250 mA (typical)
Output Signals (Differential)	**Sinusoidal Type (Incremental Encoder)**: • Analog: SIN+, SIN-, COS+, COS-, 1V $_{pk-pk}$ • Digital (RS422): MRK+, MRK- signals.
	Digital Output (Incremental Encoder): TTL Encoder line-driver signals; RS422/485 compatible
	Serial Output (Absolute Encoder): BiSS C with 32 bit word

Table 3-6: Encoder Resolution

Encoder Option	Fundamental Signal Period	Resolution
[-E1] w/ x4000 Interpolation	20 micron	5 nm
[-E1] w/ x16000 Interpolation	20 micron	1.25 nm
[-E2]	20 micron	5 nm

Table 3-7: Limit Switch Specifications

	Specification
Supply Voltage	5 V ±5%
Supply Current	25 mA
Output Type	Open Collector
Output Voltage	5 V
Output Current	10 mA (sinking)
Output Polarity (Factory Configured)	**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)
Note: If the MPS130LM is driven beyond the electrical limit, it will encounter a mechanical stop. Impacting the mechanical stop could cause damage to the stage.	

Table 3-8: MPS130LM Motor Specifications

		Linear Motor [MPS130LM]
Performance Specifications		
Continuous Force (No cooling)	N	23.0
Electrical Specifications		
BEMF Constant (Line-Line, Max)	V/m/s	9.00
Continuous Current (No cooling)	A	2.94
Peak Current, Stall	A	20.68
Force Constant, Sine Drive	N/A	7.83
Motor Constant	N/√W	3.35
Resistance, 25 °C (Line-Line)	ohms	5.2
Inductance (Line-Line)	mH	0.70
Thermal Resistance (No cooling)	°C/W	2.12
Maximum Bus Voltage	VDC	80 V
Magnetic Pole Pitch	mm	16.00

(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 have a tolerance of ±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 A_{pk}; use force constant in N/A_{pk} when sizing.
(9) All Aerotech motors and amplifiers are rated using vector amplitude values. For sinusoidal signals, use sine wave peak value.

3.4. Limits, Marker, and Machine Direction

Aerotech stages have both a positive and negative ***Machine Direction*** and a positive and negative ***Programming Direction***.

Machine Direction: The machine direction is defined by how the encoder and motor are mounted and the electrical wiring connections in the stage.

Programming Direction: Your system controller defines the programming direction of the stage and is application specific. A positive programmed move may or may not agree with the machine positive direction. Refer to your programming help documentation for more information.

Figure 3-2: Machine Direction

3.5. Motor and Feedback Phasing

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

Figure 3-3: Hall Phasing Diagram

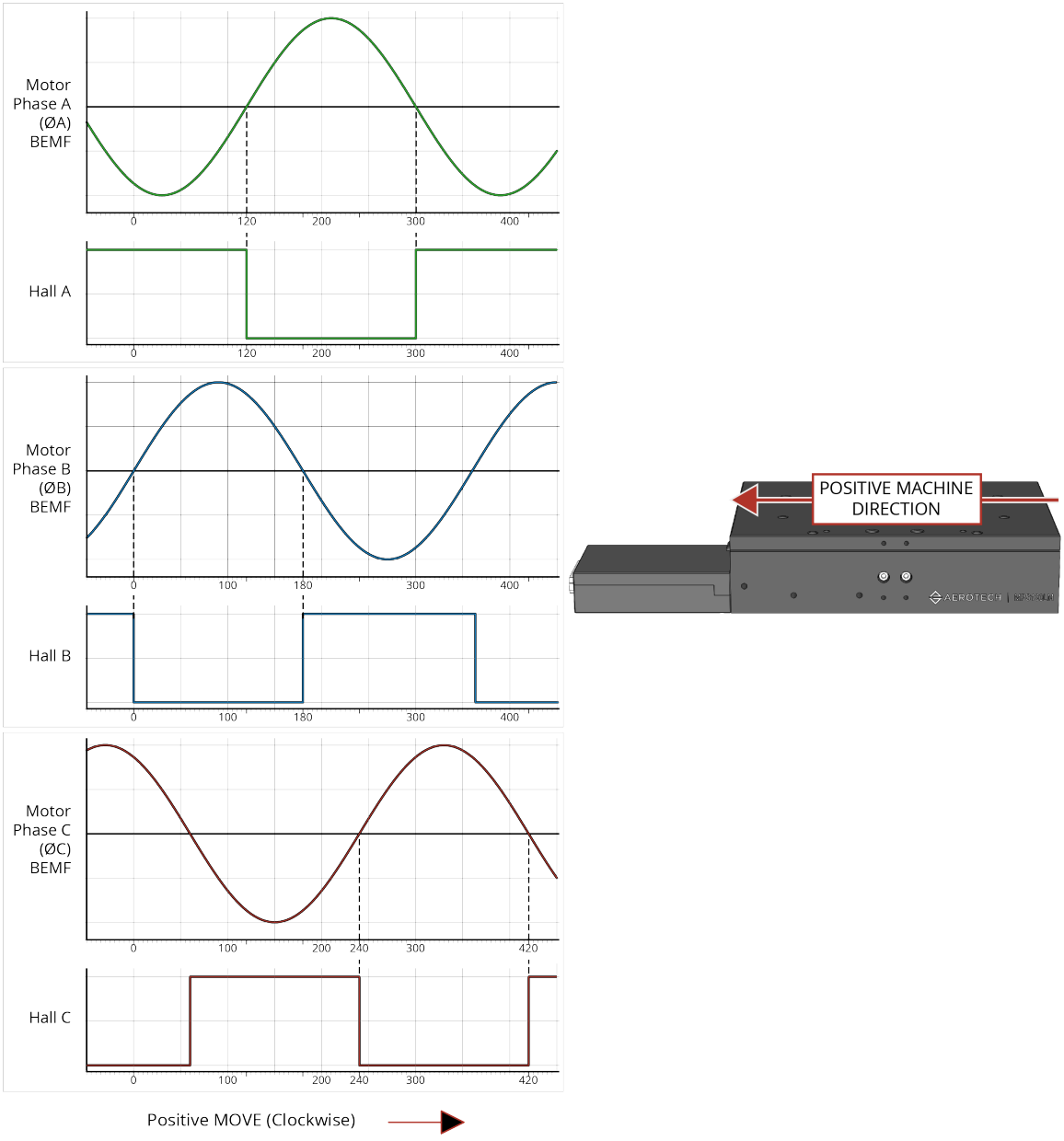
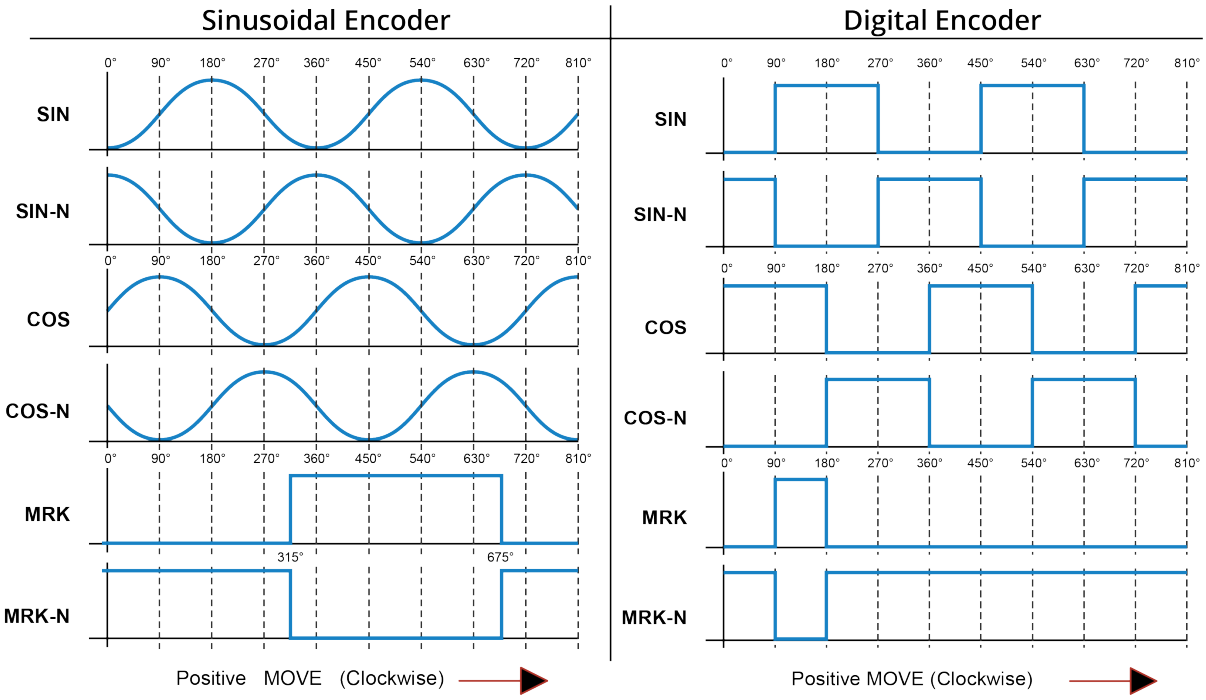


Figure 3-4: Encoder Phasing Reference Diagram



This page intentionally left blank.

Chapter 4: Maintenance

IMPORTANT: Read the Safety Procedures and Warnings (on Page 9) before you do maintenance to the stage.

IMPORTANT: Keep the bearing area free of foreign matter and moisture or the performance and life expectancy of the stage will be reduced.

DANGER: Electrical Shock Hazard!

- Do not connect or disconnect stage/motor interconnections while connected to a live electrical power source.
- Before you set up or do maintenance, disconnect electrical power.

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

4.1. Service and Inspection Schedule

Inspect the MPS130LM at least once per month. The need for a longer or shorter inspection interval will depend on the application and conditions, such as the duty cycle, speed, and environment.

Monthly inspections should include but not be limited to:

- Visually inspect the stage and cables.
- Re-tighten loose connectors.
- Replace or repair damaged cables.
- Clean the MPS130LM and any components and cables as needed.
- Repair any damage before operating the MPS130LM.
- Inspect and perform an operational check on all safeguards and protective devices.

4.2. Cleaning and Lubrication

DANGER: **Electrical Shock Hazard!** Before you do maintenance to the equipment, disconnect the electrical power.

DANGER: **Mechanical Hazard!** When you move the tabletop manually to do maintenance, this could expose the operator to pinch points. Refer to Pinch Points on Page 13.

DANGER: **Magnetic Field Hazard!** When you move the tabletop manually to do maintenance, this could expose the operator to the magnet track. Refer to Magnetic Hazards on Page 14.

IMPORTANT: Wear appropriate personal protective equipment (PPE) when you use cleaning solvents or lubricants.

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

When you clean and/or lubricate components of the MPS130LM series stage:

1. Use a clean, dry, soft, lint-free cloth for cleaning.
2. Before you use a cleaning solvent on any part of the stage, blow away small particles and dust with clean, dry, compressed air.
3. Take the opportunity during the lubrication procedure to inspect the motion guides or bearings for any damage or signs of wear.
4. In applications that have multiple stages bolted together to form multi-axis systems, the orthogonality can be lost if the stage tables of the support stages are loosened. Precision aligned stages should not be loosened or disassembled.
5. We recommend that you do not disassemble the stage beyond the instructions given in this manual. Proper assembly and calibration can only be done at the factory. Contact Aerotech for more information.

Cleaning

Use isopropyl alcohol on a lint-free cloth to clean any external metal surface of the MPS130LM.

WARNING: **General Hazard Warning!** Make sure that all solvent has completely evaporated before you move the stage.

Lubrication

You should only use Kluberplex BEM 34-132 as the standard lubricant for MPS130LM stages.

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.

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

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.
- 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.

- Aerotech recommends that you use a good quality, natural bristle artist's brush for the 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 and drive the stage table back to its original position to redistribute lubricants.

4.3. Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	Shipping brackets still installed. Remove the red anodized shipping brackets. Brake not released (if equipped with brake). In Limit condition. Check limits (refer to Chapter 3: Electrical Installation) 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: Electrical Installation and Controller documentation). Motor Connections (refer to Chapter 3: Electrical Installation 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 Global Technical Support Portal 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

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

USA, CANADA, MEXICO
Aerotech, Inc.
Global Headquarters

CHINA
Aerotech China
Full-Service Subsidiary

GERMANY
Aerotech Germany
Full-Service Subsidiary

TAIWAN
Aerotech Taiwan
Full-Service Subsidiary

UNITED KINGDOM
Aerotech United Kingdom
Full-Service Subsidiary

Appendix B: Revision History

Revision	Description
1.00	New manual

This page intentionally left blank.

Index

A

Accuracy and Temperature Effects 18
Accuracy of the Ballscrew 18
Altitude 18
Ambient Temperature 18
Attaching the Payload 25

B

Braycote® 602EF 20

C

cleaning
  mounting surface 23
Cleaning 38
cleaning solvent 38

D

Dimensions 21

E

Electrical Installation 27
Electrical Warnings 11
Encoder Specifications 31

G

grease 20

H

Hall-Effect Sensors Specifications 31
Handling 15
Humidity 18

I

Inspection Schedule 37
isopropyl alcohol 38

L

label 15
Limit Switch Specifications 31
lubricant
  vacuum 20
Lubrication 39

M

Motor-Related Warnings 12
mounting surface
  cleaning 23
  securing stage 23
multiaxis combinations 38

P

packing list 15
part number 15
Possible Cause 40
Protection Rating 18
protective ground connection 28

S

serial number 15
shims 23
Solution 40
solvents 38
Specifications 19
  Encoder 31
  Hall-Effect Sensors 31
  Limit Switch 31
  Thermistor Specifications 31
stabilizing stage 16
stage
  distortion 23
  stabilizing 16
Storage 15
Symptom 40

T

Table of Contents 3
Temperature Effects 18
Thermistor Specifications 31
Troubleshooting 40

V

vacuum guidelines 20

vacuum lubricant (Braycote 602EF) 20
Vacuum Operation 20
Vibration 18

W

Warnings 9
Warranty and Field Service 41