

ES 15783-1 Vacuum Chuck

Hardware Manual

P/N: EDS110 (Revision 1.01.00)



Dedicated to the Science of Motion
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Chapter 1: Overview

This chapter introduces vacuum chuck and kinematic assemblies.

1.1. Standard Features

The vacuum chuck assembly consists of a base mounting plate, a vacuum chuck, and three leveling screw assemblies (see Figure 1-1).

The vacuum chuck is secured to the base plate via the three kinematic style leveling screws. These kinematic mounts allow fine adjustment of the tip and tilt of the vacuum chuck while minimizing distortion of the chuck surface due to flatness errors of the structural mounting surface.

Vacuum to the chuck is supplied by tubing (1/4 inch od x 1/8 inch id) to a barbed brass fitting. The vacuum is then ported into recesses in the chuck surface to provide holding force on the substrate. The vacuum recesses are designed to provide both even distribution of normal force from the vacuum and also consistent structural support of the substrate to prevent distortion due to the vacuum load.

Plastic handles are included in the assembly for handling the vacuum chuck during unpacking and mounting.

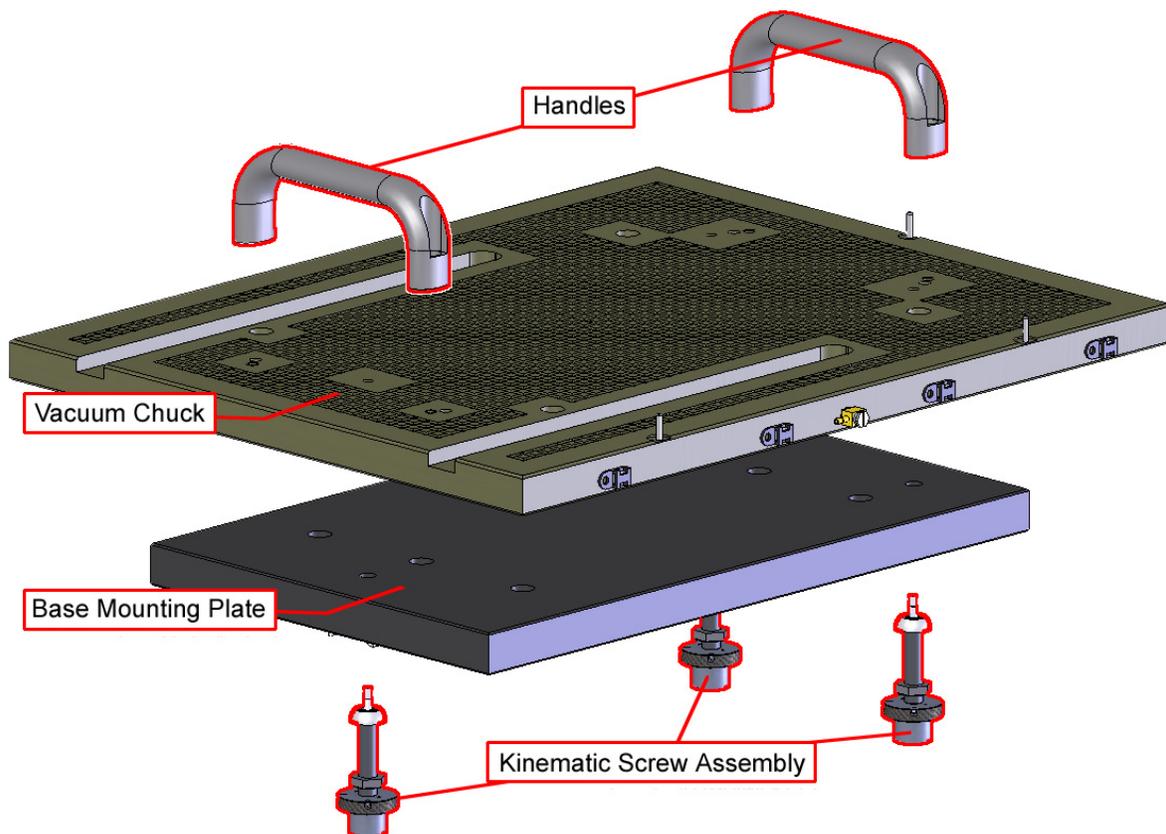


Figure 1-1: Chuck Assembly (Exploded View)

1.2. 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 vacuum chuck should be retained for the life-time of the product.



WARNING

Read and understand this manual before operating the vacuum chuck.



WARNING

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



WARNING

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



WARNING

Use care when moving the vacuum chuck. Manually lifting or transporting equipment can result in injury.



WARNING

Only trained personnel should operate, inspect, and maintain the vacuum chuck.



WARNING

This equipment is intended for light industrial manufacturing or laboratory use. Do not use this unit in a manner other than that specified by Aerotech, Inc.



WARNING

Before using this equipment, perform an operator risk assessment to determine the needed safety requirements.

Chapter 2: Installation

This chapter describes the installation procedure for the vacuum chuck, including handling the chuck properly, preparing the mounting surfaces, securing the base to the mounting surface, attaching the chuck, and making the final leveling adjustments.



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

2.1. Unpacking and Handling the Chuck

Carefully remove the chuck assembly from the protective shipping container. To prevent damage to the kinematic assemblies, the vacuum chuck and base plate are packaged as separate subassemblies. The kinematic leveling screws in the base plate have been adjusted such that the base plate and the vacuum chuck are parallel when the subassemblies are mounted together. Do not adjust the position of the leveling screws until later in the installation procedure.

Blow the chuck parts off with compressed nitrogen or clean, dry air. Any dust or debris that is not blown off can be removed with acetone or isopropyl alcohol and a clean, lint free cloth. Before mounting the chuck, it is important to let the assembly stabilize at room temperature for at least 12 hours.

The chuck has a label listing the system part number and serial number. These numbers contain information necessary for maintaining or updating system hardware. Locate this label and record the information for later reference. If any damage has occurred during shipping, report it immediately.



Improper handling could adversely affect the chuck's performance. Use care when moving the chuck assembly. Manually lifting or transporting the chuck can result in injury.

2.2. Preparing the Mounting Surface

The mounting surface must be smooth and free of burrs, metal chips, or other debris. Local high spots on the mounting should be removed with precision flat stones. The flatness of the mounting surface must be less than .005" to prevent distortion of the precision chuck surface. Adjustments to the mounting surface must be done before the chuck is secured.

2.3. Securing the Base to the Mounting Surface

The vacuum chuck base plate has six counter-bored holes for connection to the mounting surface as seen in Figure 2-1. The base plate is to be secured with the six M6-1.0 x 25 mm socket head cap screws with flat washers included in the assembly kit. Alternatively, 1/4-20 socket head cap screws (not provided) may be used with flat washers to secure the base plate. The mounting screws should be tightened to 6 ft-lb with a torque wrench.



WARNING

The vacuum chuck must be properly secured to the mounting surface. Improper mounting can result in injury or damage to the equipment.

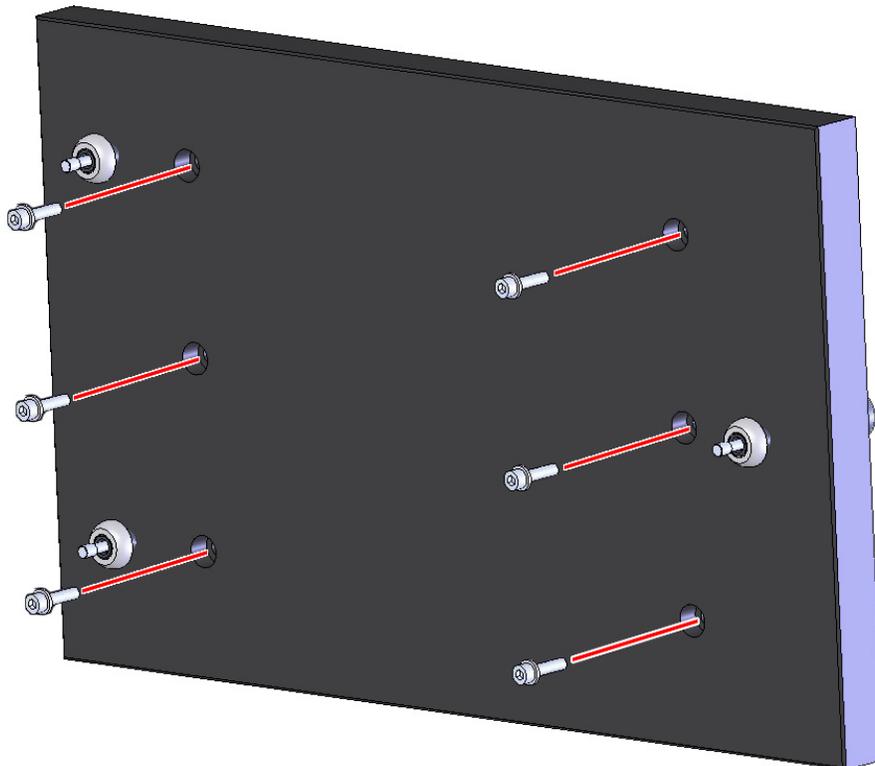


Figure 2-1: Mounting the Vacuum Chuck Base Plate

2.4. Attaching the Chuck to the Base

The vacuum chuck mounts to the base through three identical kinematic assemblies. The kinematic assembly is shown in 2.4. An M10-1.0 threaded leveling screw threads through the base plate and is secured to the base plate with a jam nut. A knurled knob is attached to the M10 adjustment screw for manual adjustment of the chuck leveling. A semisphere caps the opposite end of the adjustment screw. The semisphere seats between two quarter rounds to create the kinematic mount.

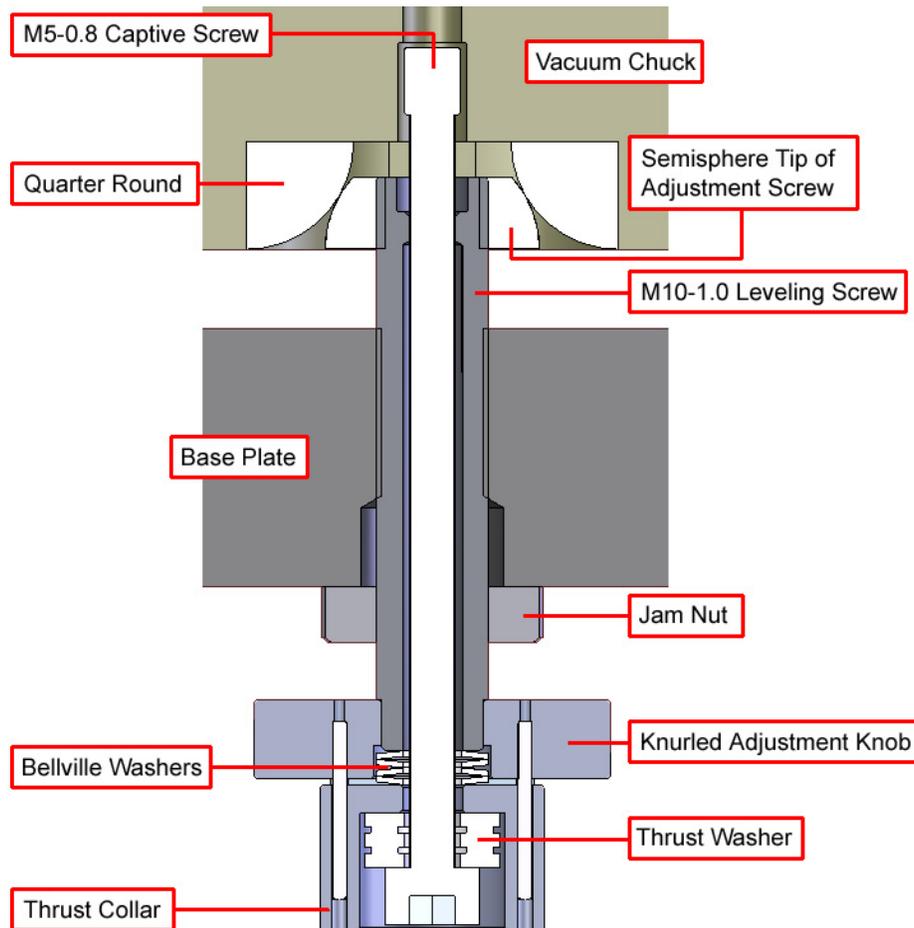


Figure 2-2: Kinematic Mounting and Leveling Assembly

A captive M5-0.8 socket head cap screw connects the vacuum chuck to the adjustment screw assembly. Bellville washers ensure that the proper preload is applied through the M5 mounting screws without excessive tightening.

**WARNING**

Excessive tightening of the chuck mountings screws will result in distortion of the precision vacuum chuck surface. Observe the following mounting instructions carefully to achieve optimal performance.

**WARNING**

If mounting the chuck to a vertical wall, two people are required for safe assembly of the chuck. Bodily injury or damage to the chuck could result if vertical assembly is attempted alone.

Align the quarter rounds in the chuck subassembly with the leveling screws and bring the chuck into contact with the base. Finger-tighten the M5 captive screw until the Bellville washers are roughly halfway compressed.

With all three mounting screws partially engaged, tighten one of the M5 captive screws until the thrust collar just bottoms out against the knurled adjustment knob. Then, loosen the M5 captive screw a quarter-turn. Repeat with the other two M5 captive screws.

Remove the plastic handles from the vacuum chuck and store for future use. Each handle is mounted to the vacuum chuck with two M5-0.8 x 20 mm socket head cap screws.

2.5. Leveling Adjustment

Loosen the M10-1.0 jam nuts (see 2.4 above) with a 17 mm wrench. Turn the knurled adjustment knob by hand to achieve the desired position change. For large adjustments, it may be desirable to reduce the preload on the M5 screws by more than one quarter turn. When adjustment is complete, torque the M10-1.0 jam nuts to roughly 2 ft-lb.

Some motion is expected at the chuck surface when the M10 jam nuts are loosened due to clearance between the male and female screw threads. The motion is predictable as long as the torque applied on the M10 jam nut is repeatable.

2.6. Vacuum Connection

Vacuum is supplied through a barbed fitting equipped with an o-ring seal designed for ¼" O.D x 1/8" I.D. plastic air tubing. However, this fitting can easily be replaced with any commercially available fitting with a #10-32 thread. In addition, a cable clamp is supplied for hose routing.

NOTE: To ensure even holding pressure on the substrate, the chuck should be allowed to normalize for 5 seconds after vacuum is applied before any process is performed.

Chapter 3: Operating Specifications

This chapter contains general technical information about the vacuum chuck. Included are basic product specifications, materials, and test results.

3.1. Environmental Specifications

The environmental specifications for the ES15783-1 Vacuum Chuck 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 \pm 2° C (68° F \pm 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 60 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 system performance. Contact Aerotech for information regarding your specific application.
Dust Exposure	The ES15783-1 Vacuum Chuck is not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
Use	Indoor use only



Do not expose the equipment 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. Flatness and Temperature Effects

Temperature gradients across the vacuum chuck or between the base plate and the vacuum chuck can cause distortions in the flatness of the precision chuck surface. If the chuck is to operate at a temperature other than room temperature, it must be allowed to soak in at that temperature prior to mounting.

3.3. Basic Specifications

Table 3-2: ES15783-1 Vacuum Chuck Specifications

Item	Value
Overall Size	480 mm x 380 mm
Working Area	Central 470 mm x 370 mm
Flatness Specification	10 μ m
Height / Tip – Tilt Adjustment	5 mm per Leveling Screw
Chuck Material	Hardcoated Aluminum
Base Material	Black Hardcoated Aluminum
Total Mass	16.8 kg (37.0 lb)
Base Subassembly Mass	6.5 kg (14.3 lb)
Chuck Subassembly Mass	10.3 kg (22.7 lb)

3.4. Inspection Method

Flatness is measured with the chuck mounted horizontally. The base plate is supported on three points, and the chuck subassembly is mounted to the base plate using the procedure outlined in the Installation section of this manual. Measurements are performed at room temperature with an electronic indicator and a granite surface plate. See shipment documentation for individual test results.

Chapter 4: Maintenance

The vacuum chuck assembly is made of corrosion resistant materials and therefore does not require excessive maintenance. The M10 leveling screws are manufactured from hardened 420 series stainless steel, so in harsh environments they may develop some minor corrosion. In this case, a small amount of lubricant on the M10 adjustment screws such as WD-40 or light machine oil may be used to keep the threads corrosion free.

4.1. Recommended Cleaning Solvents

Before using a cleaning solvent on any part of the chuck, it is recommended that compressed nitrogen or clean, dry air be used to blow away small particles and dust. The chuck may be cleaned with acetone or isopropyl alcohol on a lint-free, clean cloth. Avoid using abrasive cleaning agents or tools, as the surface quality and flatness of the precision chuck surface will be degraded.

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.

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.

Laser Products

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.

Return Procedure

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 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.

Returned Product Non-warranty Determination

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.

Rush Service

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.

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Appendix B: Technical Changes

Table B-1: Current Changes (1.01.00)

Section(s) Affected	General Information
Section 1.2.	Added section
Section 3.1.	Added section
Chapter 2: Installation, Section 2.1. , and Section 2.3.	Added safety information and warnings

Table B-2: Archived Changes

Revision	Section(s) Affected	General Information
1.00.00	--	New manual

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