

# VascuLathe<sup>®</sup>-ASR Series

## Stage User's Manual

P/N: EDS115 (Revision 1.05.00)



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# Table of Contents

<b>Chapter 1: Overview</b> .....	<b>1</b>
1.1. Standard Features.....	3
1.1.1. Linear Axis.....	3
1.1.2. Rotary Axis.....	4
1.2. Optional Features.....	5
1.2.1. CMS (Cable Management System) Options.....	5
1.2.2. Wet Cut.....	5
1.2.3. Tooling Options.....	5
1.2.4. Gripper Jaws.....	5
1.2.5. Pneumatics.....	6
1.2.6. Electronics / Controller.....	6
1.3. Model Numbers.....	7
1.4. Dimensions.....	8
1.5. Safety Procedures and Warnings.....	9
1.6. EC Declaration of Incorporation.....	11
<b>Chapter 2: Installation</b> .....	<b>13</b>
2.1. Unpacking and Handling the Stage.....	13
2.2. Preparing the Mounting Surface.....	14
2.3. Securing the Stage to the Mounting Surface.....	15
2.4. Attaching the Payload to the Stage.....	16
2.5. Changing ASR Workholding Devices.....	17
2.5.1. Collet Installation and Removal Procedure.....	17
2.6. (-AG) Alignment / Gripper Operation.....	20
2.7. (-G) Gripper Operation.....	22
2.8. Electrical Installation.....	23
2.9. Air Requirements.....	23
2.10. Wet Cut Fluid Requirements.....	23
<b>Chapter 3: Operating Specifications</b> .....	<b>25</b>
3.1. Environmental Specifications.....	25
3.2. Basic Specifications.....	26
3.3. Load Capability.....	29
<b>Chapter 4: Maintenance</b> .....	<b>31</b>
4.1. Service and Inspection Schedule.....	31
4.2. Lubrication and Cleaning.....	32
4.2.1. Collet & Collet Chuck Lubrication and Cleaning.....	33
4.3. Seal Replacement.....	34
4.3.1. Piston Seal Change Procedure.....	34
4.3.2. Ringseal O-Ring Replacement.....	34
4.3.3. Wet Cut Rotary Union Seal Replacement.....	36
4.4. Wet Cut Rotary Union Removal.....	40
4.5. Linear Lubrication and Cleaning Process.....	42
4.6. Linear Spar Cover Removal.....	43
<b>Appendix A: Warranty and Field Service</b> .....	<b>49</b>
<b>Appendix B: Technical Changes</b> .....	<b>51</b>
<b>Index</b> .....	<b>53</b>
<b>Reader's Comments</b> .....	<b>57</b>



## List of Figures

Figure 1-1: VascuLathe®-ASR Series Positioning Stage.....	1
Figure 1-2: VascuLathe®-ASR Rotary Stage with ER Collet.....	4
Figure 1-3: VascuLathe®-ASR Dimensions.....	8
Figure 2-1: VascuLathe®-ASR Stage Showing Mounting Holes (Top View).....	15
Figure 2-2: Installation of Collet Nut.....	18
Figure 2-3: Installation Procedure for Collet/Collet Nut.....	19
Figure 2-4: Alignment Gripper Detail.....	20
Figure 2-5: Gripper Detail.....	22
Figure 3-1: VascuLathe®-ASR Wet Cut Rotary Union Location.....	29
Figure 4-1: Ringseal Removal and Replacement.....	34
Figure 4-2: Typical Ringseal.....	35
Figure 4-3: Cross-Section View of Ringseal Showing O-Ring.....	35
Figure 4-4: Cross-Section View of Wet Cut Rotary Union Assembly.....	36
Figure 4-5: Carriage Cover Removal.....	37
Figure 4-6: Seal Assembly Removal.....	37
Figure 4-7: Seal Installation.....	38
Figure 4-8: Seal Retainer Assembly.....	38
Figure 4-9: Wet Cut Rotary Union Shaft Inspection.....	39
Figure 4-10: Wet Cut Rotary Union.....	40
Figure 4-11: Wet Cut Rotary Union Installation.....	41
Figure 4-12: Linear Bearing Grease Nipple.....	42
Figure 4-13: Removing the Inside Spar Cover.....	43
Figure 4-14: Removing the Outer Spar Cover.....	44
Figure 4-15: Removing the Carriage Side Cover.....	45
Figure 4-16: Removing M4 MHCS Screws.....	46
Figure 4-17: Releasing Tension on the Belt.....	47
Figure 4-18: VascuLathe®-ASR with Belts Folded Back.....	47



## List of Tables

Table 1-1: Model Numbering System.....	7
Table 3-1: Environmental Specifications.....	25
Table 3-2: VascuLathe®-ASR Series Specifications.....	26
Table 3-3: VascuLathe®-ASR Rotary Motor Specifications.....	27
Table 3-4: VascuLathe®-ASR Linear Motor Specifications.....	28
Table B-1: Current Changes (1.05.00).....	51
Table B-2: Archived Changes.....	52





## Chapter 1: Overview

VascuLathe<sup>®</sup>-ASR represents a revolutionary approach to satisfying the demanding requirements of tubular manufacturing applications. This fully integrated motion system couples automated material handling with high performance direct drive linear and rotary motion.

The VascuLathe<sup>®</sup>-ASR has been designed with a collet chuck that supports ER16 collets (manufactured to DIN6499 specs) to allow for a wide range of materials and applications. This product is intended for light industrial manufacturing or laboratory use.

This manual describes Aerotech's VascuLathe<sup>®</sup>-ASR series dual axis positioning stage. Figure 1-1 shows a typical VascuLathe<sup>®</sup>-ASR stage.

This chapter introduces standard and optional features of the VascuLathe<sup>®</sup>-ASR, explains the model numbering system, and gives general safety precautions.



Figure 1-1: VascuLathe<sup>®</sup>-ASR Series Positioning Stage

**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](http://www.aerotech.com).

**NOTE:** This manual should be read in its entirety before operating the VascuLathe<sup>®</sup>-ASR system.

**Failure to follow the maintenance procedures outlined in Section 4.3.3. will result in voiding of warranty.**



**WARNING**

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

## 1.1. Standard Features

### 1.1.1. Linear Axis

The linear axis features proprietary linear drive technology, which coupled with an extremely rigid mechanical design, allows for unparalleled high-bandwidth positioning performance.

All VascuLathe<sup>®</sup>-ASR stages include a fully-sealed design. Metal waycovers are designed to protect the internal components (linear bearings and encoder, for example) from damage by preventing dust or debris from entering the stage. The external stage surfaces have a black hardcoat finish to withstand rugged environments.

To aid in stage setup and mounting, the stage base plate mounting holes are accessible without removing any components.

A pair of sealed linear bearings are common to all VascuLathe<sup>®</sup> series stages. The bearings are mounted between the stage spars and rotary carriage to provide smooth motion and excellent stiffness characteristics.

Other features include optical limit switches mounted at each end of travel. These switches are configured as normally-closed. If the stage is driven beyond these electrical limits, a mechanical hard stop is in place slightly past each limit switch.

The VascuLathe<sup>®</sup>-ASR is offered with a non contacting linear encoder with an achievable resolution of .001  $\mu\text{m}$ , and accuracies of  $\pm 1.0 \mu\text{m}$ .

Travels available are 200 mm to 300 mm.

### 1.1.2. Rotary Axis

All VascuLathe<sup>®</sup>-ASR stages come standard with a direct drive brushless motor with a non-contacting integral rotary union. These features combine to create a low friction, low maintenance rotary stage capable of high accelerations and low positioning error. With a non-contact rotary union, there are no seals to replace or lubricate, allowing for a lifetime of maintenance free performance. The brushless, slotless motor design allows for extremely high torque coupled with smooth motion. There are no brushes to wear, no belts to tension, and no gears to wear resulting in a completely maintenance-free motor.

The VascuLathe<sup>®</sup>-ASR is available with an ER16 style collet chuck. The maximum tube diameter supported by the ER16 collet chuck is 5.8 mm when configured for wet cut and 10 mm for dry cut. The collet is retained with a threaded collet nut enabling quick changeover. It is configured in a “fail-safe” normally-closed mode where full clamping force is applied when no air pressure is present.

**NOTE:** Aerotech recommends using electro-polished collets manufactured to DIN6499 specs.

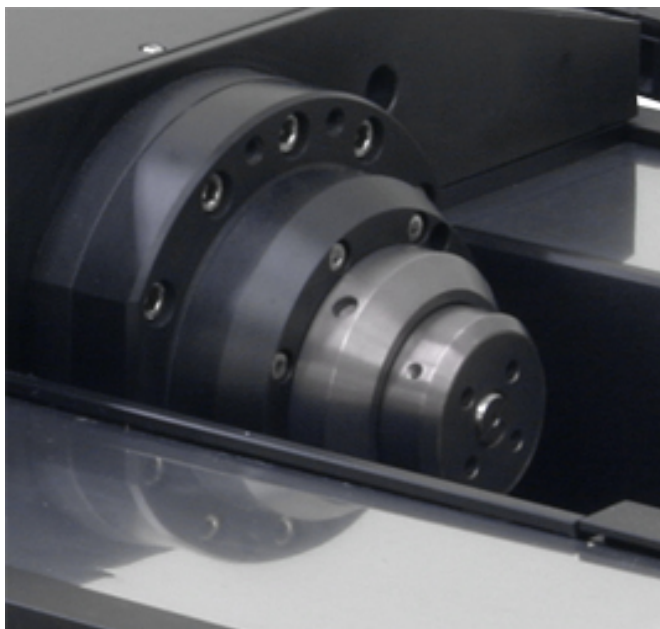


Figure 1-2: VascuLathe<sup>®</sup>-ASR Rotary Stage with ER Collet

## 1.2. Optional Features

### 1.2.1. CMS (Cable Management System) Options

The VascuLathe®-ASR can be ordered so that an optional cover is included to enclose the moving CMS components from the system operator.

**NOTE:** The cover is a stationary guard designed to isolate the operator from moving components in the CMS and is not intended to prevent contaminants from entering.

### 1.2.2. Wet Cut

The VascuLathe®-ASR rotary has an optional wet cut rotary union configuration that can be used for fluid delivery (@ 100 psi max pressure) in wet laser cutting applications. A 3/8 NPT tapped hole is supplied on the rear of the rotary to allow for connections of different length pressure vessels depending on the tube length being cut. See Section 3.3. , Section 4.3.3. , and Section 4.4. for details regarding use and maintenance of the wet cut rotary union.

**NOTE:** If wet cutting, the purchase of a ringseal will also be required based on the tube diameter used in the cutting application. Consult Aerotech for more information.

### 1.2.3. Tooling Options

VascuLathe®-ASR can be equipped with two types of tube advance systems that give the customer a more advanced, highly integrated tubular manufacturing system.

- **-AG:** This option equips the system with a parallel gripper for automated tube advancement along with a Y/Z adjustment stage. The adjustment stage has a travel range of  $\pm 0.75$  mm to aid in the alignment of material support bushings (see Section 2.6. ).
- **-G:** This option equips the system with a parallel gripper for automated tube advancement and material handling (see Section 2.7. ).

### 1.2.4. Gripper Jaws

This option is selected when a tooling option is ordered and is sized based on application requirements. Refer to Table 1-1 for a full breakdown of jaw options.

### 1.2.5. Pneumatics

This option is offered in three configurations and is supplied with every VascuLathe<sup>®</sup>-ASR system. Two configurations (-PNG and -PN) include the required filters, driers, solenoids, relays, fittings, valves, and hose required to connect the VascuLathe<sup>®</sup>. The third configuration (-FD) includes only the filter and dryer assembly to condition the incoming air.

- **-PNG:** This option will supply the pneumatics to control the air supply to both the collet and the optional gripper.
- **-PN:** This option is ordered when the pneumatics to control the air supply are required for the collet only.
- **-FD:** This option is ordered when the customer will implement their own pneumatics controls. The filter/dryer assembly is supplied to guarantee the conditioning of incoming air.

Refer to the documentation package shipped with your system for proper interconnection of the pneumatics.

### 1.2.6. Electronics / Controller

The VascuLathe<sup>®</sup>-ASR stage is part of a complete Aerotech motion control system, which is adjusted at the factory for optimum performance. Setup involves connecting a stage to the appropriate drives with the cables provided. Refer to your electrical documentation package for further information.

### 1.3. 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.

**Example:** VascuLathe-ASR-300S-NC-ER16-WCRU-AG-J0-10-PNG

**Table 1-1: Model Numbering System**

<b>VascuLathe, Direct Drive Linear and Rotary Motion</b>	
-ASR	Direct drive rotary stage with integral ER-style collet chuck
<b>Linear Travel / Cable Management System (CMS) Style</b>	
-200S	200 mm linear travel, with standard cms configuration
-200C	200 mm linear travel, with covered cms configuration
-300S	300 mm linear travel, with standard cms configuration
-300C	300 mm linear travel, with covered cms configuration
<b>Collet Type</b>	
-NC-ER16	Air-actuated ER16 collet chuck, normally closed Supports tube diameters from 0 mm to 10 mm
<b>Wet Cut</b>	
-WCRU	Wet cut, maximum tube diameter 5.8 mm
<b>Gripper</b>	
-AG	Gripper with X/Y bushing alignment
-G	Gripper Only
<b>Gripper Jaws</b>	
-J0-10	Gripper jaws for tube diameters ranging from 0 mm –10 mm
<b>Pneumatics</b>	
-PNG	Pneumatics kit for ER collet and optional gripper
-PN	Pneumatics kit for ER collet
-FD	Pneumatics kit, filter/dryer assembly only

### 1.4. Dimensions

The following figure illustrates the basic dimensions for the VascuLathe<sup>®</sup>-ASR. The latest version of this figure is available on Aerotech's website.

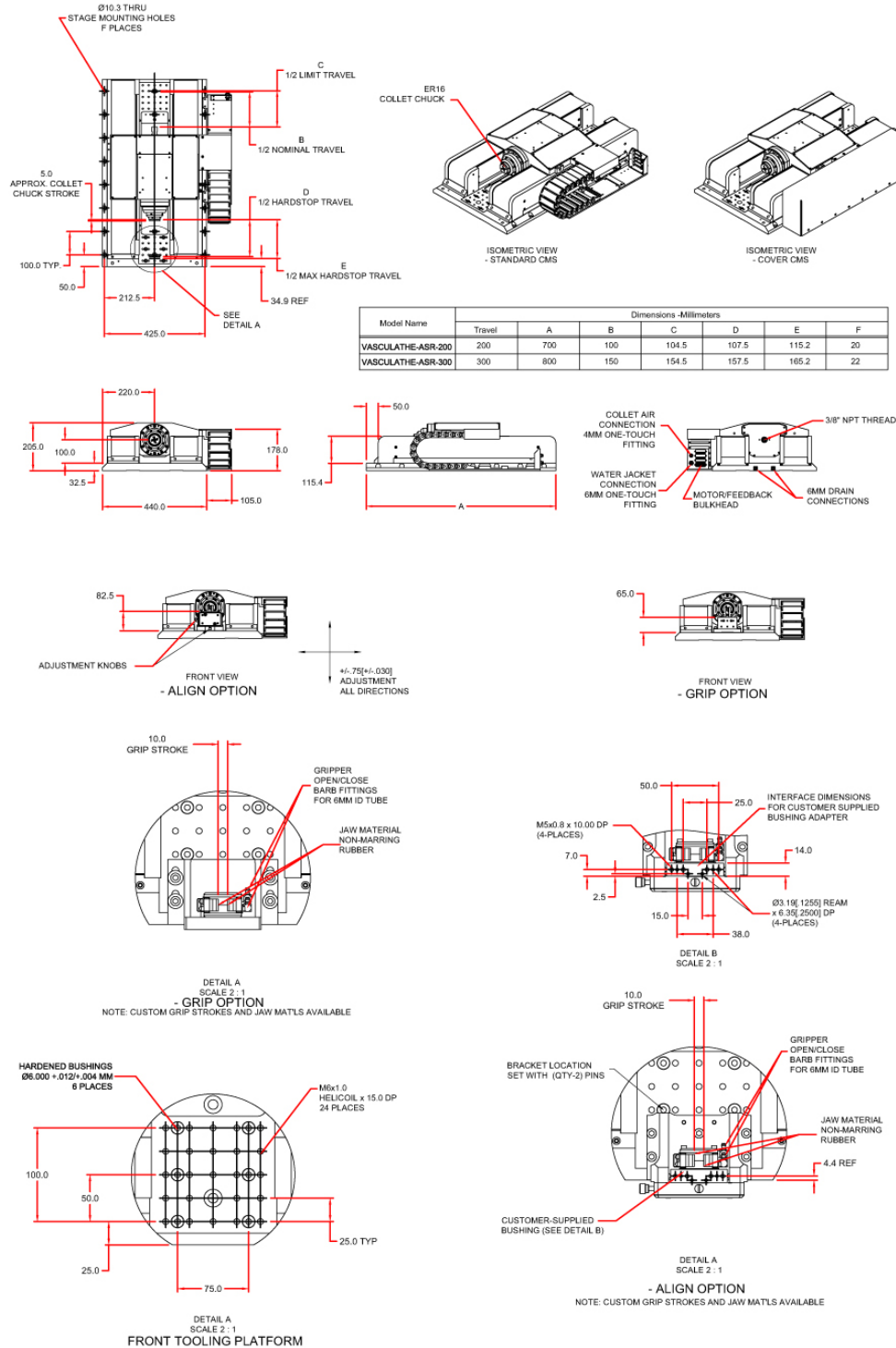


Figure 1-3: VascuLathe<sup>®</sup>-ASR Dimensions



## 1.5. 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.



DANGER

To minimize the possibility of electrical shock and bodily injury or death, disconnect all electrical power prior to making any electrical connections.



DANGER

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.



DANGER

To minimize the possibility of bodily injury or death, disconnect all electrical power prior to making any mechanical adjustments.



DANGER

Moving parts of the stage can cause crushing or shearing injuries. All personnel must remain clear of any moving parts.



WARNING

Improper use of the stage can cause damage, shock, injury, or death. Read and understand this manual before operating the stage.



WARNING

If the stage is used in a manner not specified by the manufacturer, the protection provided by the stage can be impaired.



WARNING

Stage cables can pose a tripping hazard. Securely mount and position all stage cables to avoid potential hazards.



WARNING

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.



WARNING

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



WARNING

Use care when moving the stage. Manually lifting or transporting stages can result in injury.



WARNING

Only trained personnel should operate, inspect, and maintain the stage.



WARNING

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.



WARNING

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

## 1.6. EC Declaration of Incorporation

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



**herewith declares that the product:**

Aerotech, Inc. VascuLathe®-ASR 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.***

**This is to certify that the aforementioned product is in accordance with the applicable requirements of the following Directive(s):**

2011/65/EU      RoHS 2 Directive

**Authorized Representative:** Manfred Besold  
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Süd-West-Park 90  
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**Name:**

Alex Weibel /   
Engineer Verifying Compliance

**Position:**

**Location:** Pittsburgh, PA

**Date:** February 21, 2011



## Chapter 2: Installation

This chapter describes the installation procedure for the VascuLathe<sup>®</sup>-ASR stage. It includes notes on proper stage handling, 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 instructions 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. Use compressed nitrogen or clean, dry air to remove any dust or debris that has collected during shipping. *If any damage has occurred during shipping, report it immediately.*

Before operating the stage, it is important to let the stage stabilize at room temperature for at least 12 hours. Allowing the stage to stabilize to room temperature will ensure that all of the alignments, preloads, and tolerances are the same as they were when tested at Aerotech. Set the stage on a smooth, flat, and clean surface.

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.



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



Do not allow the stage to drop onto the mounting surface.



Lift the stage only by the base at (Qty-3) 1/2-13 tapped holes (see Figure 2-1). Do not use the stage table or motor as lifting points.

## 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 VascuLathe<sup>®</sup>-ASR stage. When a stage is mounted to a non-flat surface, the stage can be distorted as the mounting screws are tightened. This distortion will decrease the overall accuracy of the stage. Adjustments to the mounting surface must be done before the stage is secured.

**NOTE:** To maintain accuracy, the mounting surface should be flat within 1 $\mu$ m per 50 mm.

**NOTE:** The stage base plate 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. Shimming should be avoided!

## 2.3. Securing the Stage to the Mounting Surface

If necessary, move the stage carriage to access the base plate mounting holes along the edges of the stage (refer to Figure 2-1). Install the appropriately sized mounting screws (M8 or 5/16 SHCS) through the holes and secure the stage to the mounting surface.



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

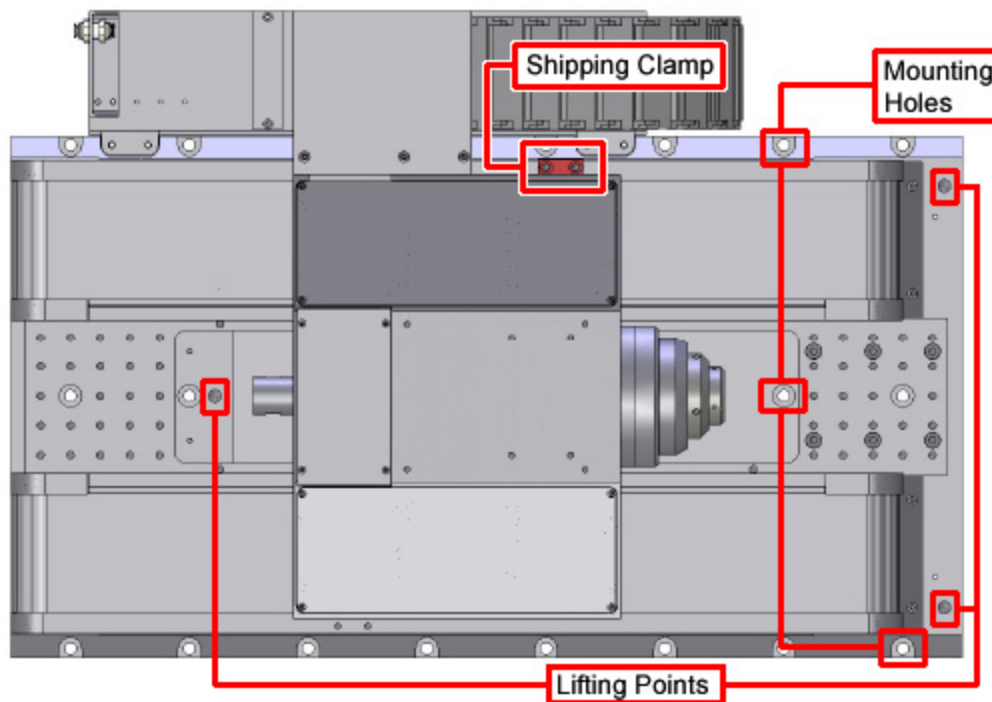


Figure 2-1: VascuLathe<sup>®</sup>-ASR Stage Showing Mounting Holes (Top View)



Remove the shipping clamp before attempting to move the stage carriage.

## 2.4. Attaching the Payload to the Stage

To prevent damage to the stage or parts, test the operation of the stage before any material is held in the collet or gripper. Proceed with the electrical installation and test the motion control system.

### Linear

The VascuLathe<sup>®</sup>-ASR comes standard with two tooling platforms located on the front and the back of the stage. It is important that when mounting fixtures and tooling to these platforms that they are flat to within 10 microns or less to prevent base plate deformations.

### Rotary

To operate the collet, clean compressed air or nitrogen must be supplied to the stage (see Section 2.9. ). The one-touch air inlet fitting accepts 4 mm OD plastic air line. Simply push the air line into the fitting and supply air to the stage. Depending on the pneumatics kit option chosen, Aerotech provides valves, fittings, and air-lines in the kit to connect the collet system.

Once air is supplied, material of the appropriate size can be placed in the collet. All collets supplied by Aerotech are clearly labeled with their clamping size range and collet style. Be sure to use only the correct size material in the collet. If an incorrect material size is clamped, the accuracy of the collet could be compromised. Never clamp material or tools that are larger than the specified range. It is also important to have the material or tool inserted at least 2/3 the length of the collet bore. Any less than this could cause permanent deformation of the collet and reduce accuracy (see Section 2.5.1. for collet installation).



## 2.5. Changing ASR Workholding Devices

VascuLathe®-ASR stages are equipped with an ER16 style collet. This manual will cover the removal and installation methods required to change these collets. It is important that only the collets designed for a particular collet holder are used. Aerotech collet chucks are designed for use with ER collets manufactured to DIN6499 specifications. Aerotech recommends the use of ultra precision electroplated collets only. Contact the factory for more details.

**NOTE:** Various grip diameters are commonly available and can be interchanged following the collet removal and installation procedure detailed in Section 2.5.1.

### 2.5.1. Collet Installation and Removal Procedure



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

- Step 1: Before any collet change operation, remove power to the stage.
- Step 2: Apply air pressure to loosen the collet chuck.
- Step 3: Unscrew the collet nut. If necessary, use a spanner wrench (available from Aerotech).
- Step 4: For installation of a collet, first clean the collet housing, collet nut threads, collet nut, and new collet. Acetone or isopropyl alcohol may be used to clean the metal components. A small amount of any general-purpose, high viscosity grease can be applied to the collet taper to help reduce friction and decrease wear.
- Step 5: Noting the orientation of the spot drill on the back side of the collet nut, refer to the instructions in Figure 2-2 to install the collet.
- Step 6: Guide the collet using the nut into the stage (Figure 2-3) making sure that the collet seats properly in its taper. Be sure that air pressure is still being supplied to the stage so the collet chuck is in the open position.
- Step 7: Tighten the collet nut. Tightening by hand is sufficient as the clamping force is not determined by the torque of the nut, but by the force of internal springs. Spanner wrenches may be used if desired.
- Step 8: Restore power to the stage.
- Step 9: For removal of a collet from the collet nut, apply pressure to the front of the collet while tilting it towards the spot drill.

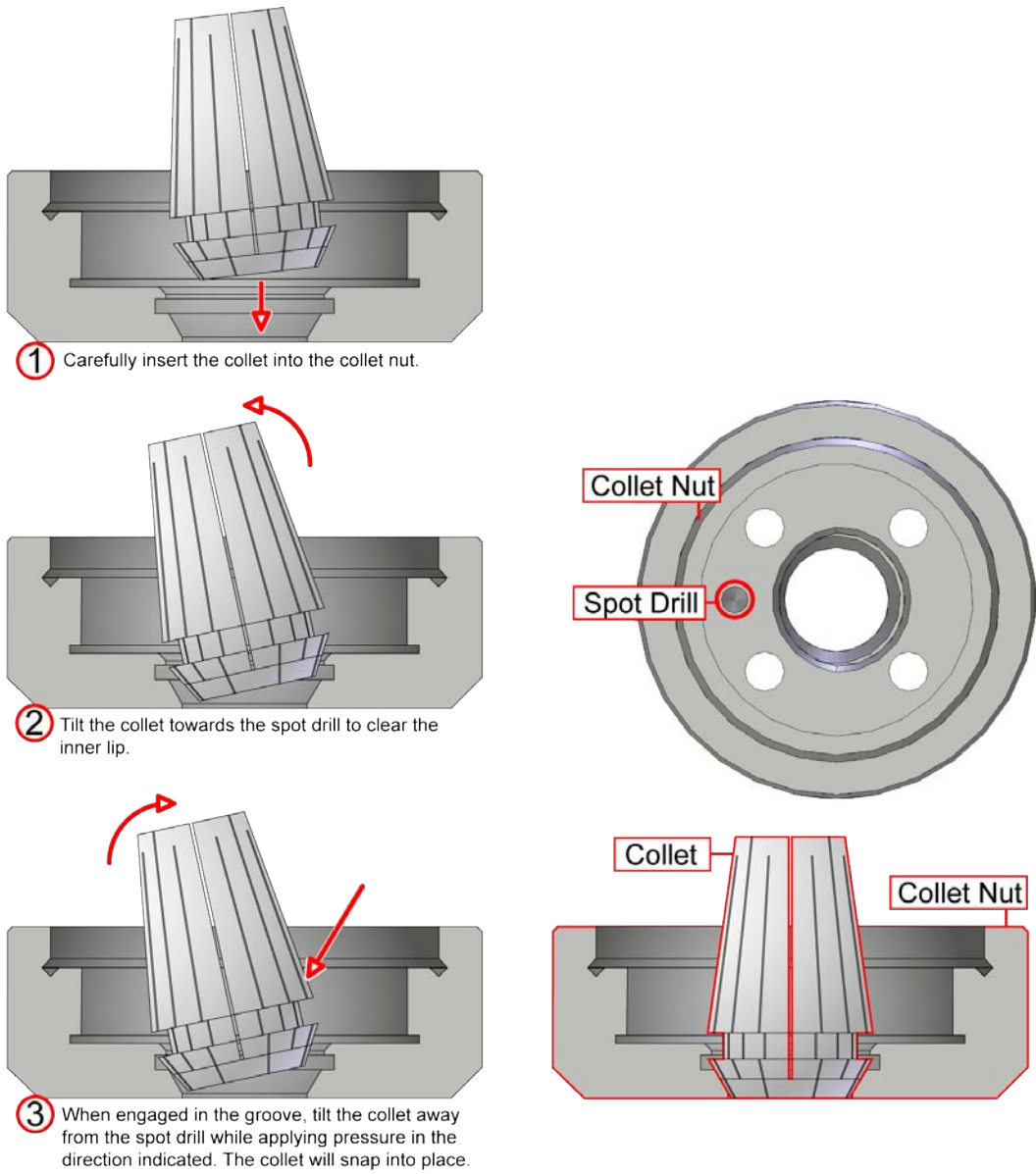


Figure 2-2: Installation of Collet Nut

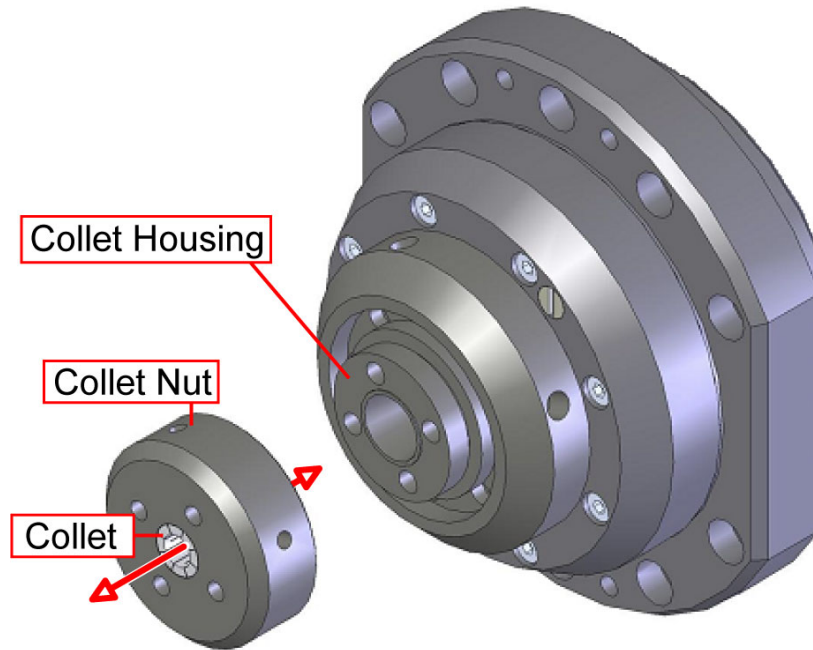


Figure 2-3: Installation Procedure for Collet/Collet Nut



Do not install the collet into the taper and then thread the collet nut on. Damage to the collet or the collet nut could result.

## 2.6. (-AG) Alignment / Gripper Operation

This option equips the system with a parallel gripper for automated tube advancement along with a Y/Z adjustment stage. The adjustment stage has a travel range of  $\pm 0.75$  mm to aid in the alignment of material support bushings.

The alignment / gripper option is added to VascuLathe<sup>®</sup>-ASR systems as follows:

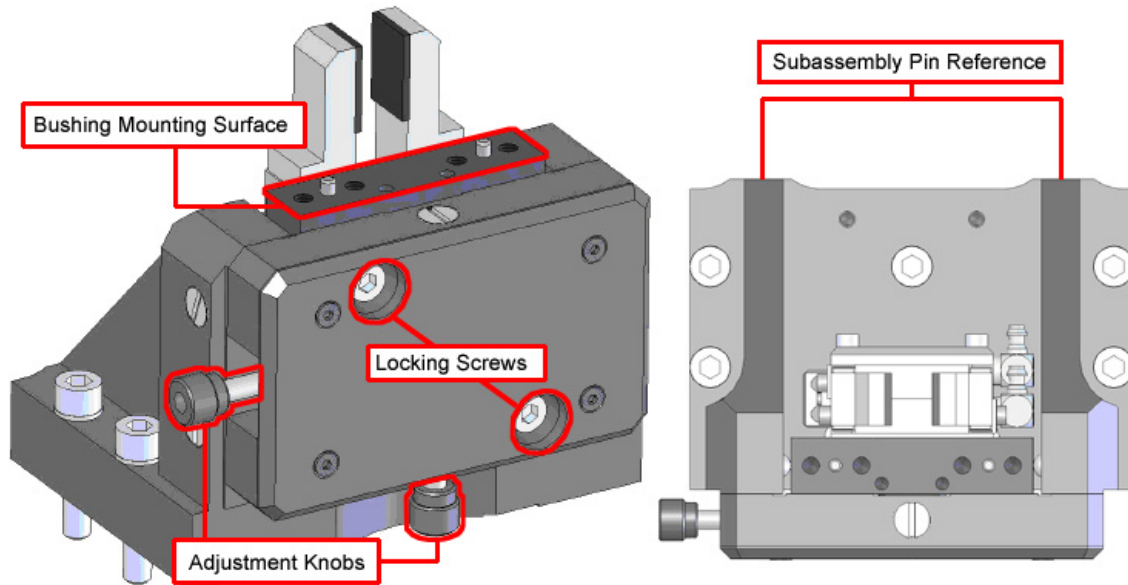


Figure 2-4: Alignment Gripper Detail

Step 1: Place the provided (Qty-2) 6 mm pins in bushing inserts of the base plate. Refer to Figure 2-4 and Figure 2-1. Use the two bushings that are in the middle of the front mounting platform so that tube waste is minimized.

Step 2: Set up the alignment / gripper on the front tooling platform and reference it against the pins.

Step 3: Add (Qty-5) M6 socket head screws w/ washers.

**NOTE:** Make sure that the assembly is still referenced against 6 mm pins as described in Step 2.

Step 4: Manually index the VascuLathe<sup>®</sup> carriage towards the sub assembly and verify that there is no interference.

Step 5: Attach tube support to the alignment mechanism.

**NOTE:** The tube support or bushing is customer supplied.

Step 6: Loosen (Qty-2) M5 socket head (locking screws) shown in Figure 2-4 so that the alignment mechanism can be adjusted.

Step 7: Feed the part into the collet and through the tube support bushing.

Step 8: Align bushing's vertical and horizontal position using the provided adjustment knobs.

Step 9: Secure the (Qty-2) M5 socket head cap screws that were loosened in step 6.

Step 10: Connect the provided pneumatics kit to the gripper and adjust the operating pressure for desired grip force.

**NOTE:** Do not exceed 87 psi to gripper on either the open or closing cycle.

**NOTE:** Refer to pneumatics layout drawing which is included with the documentation for assembly instructions.

## 2.7. (-G) Gripper Operation

This option equips the system with a parallel gripper for automated tube advancement and material handling.

The gripper option is added to VascuLathe<sup>®</sup>-ASR systems as follows:

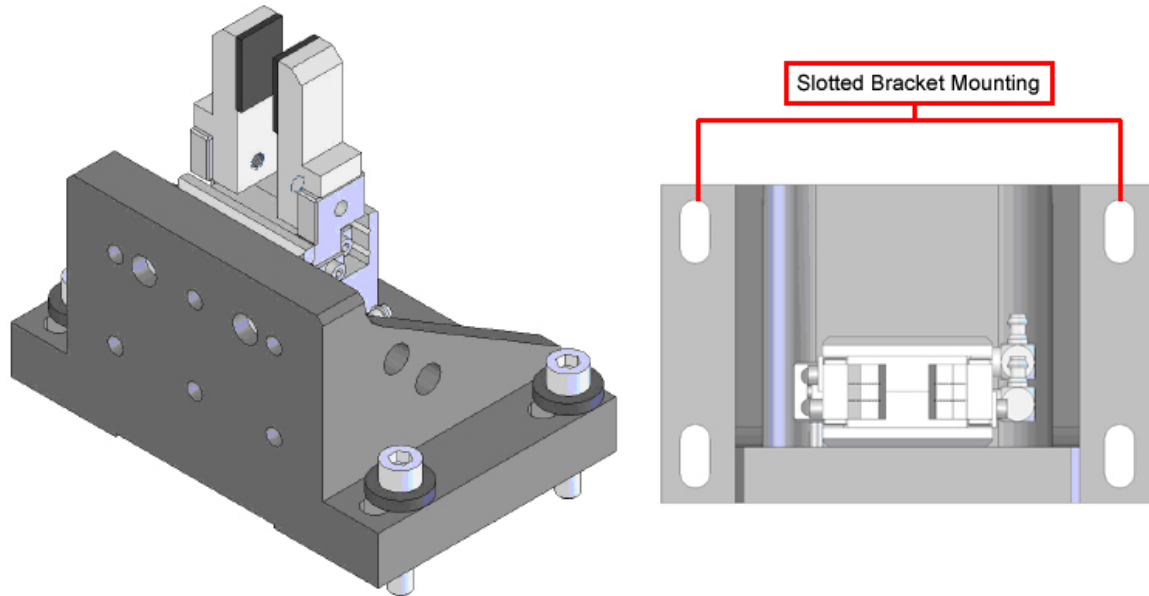


Figure 2-5: Gripper Detail

- Step 1: Set up the alignment / gripper on the front tooling platform.
- Step 2: Add (Qty-4) M6 socket head screws w/ washers.
- Step 3: Manually index the VascuLathe<sup>®</sup> carriage towards the sub assembly and verify that there is no interference.
- Step 4: Slide the gripper as required using the provided slots in the bracket.
- Step 5: Connect the provided pneumatics kit to the gripper and adjust the operating pressure for desired grip force.

**NOTE:** Do not exceed 87 psi to gripper on either the open or closing cycle.

**NOTE:** Refer to pneumatics layout drawing which is included with documentation package for assembly instructions.

## 2.8. Electrical Installation

Aerotech motion control systems are adjusted at the factory for optimum performance. The VascuLathe<sup>®</sup>-ASR stage is part of a complete Aerotech motion control system; setup involves connecting a stage to the appropriate drives with the cables provided.

Labels on the drive indicate the appropriate connections. Refer to your drive manuals and documentation for additional installation and operation information. In some cases, if the system is uniquely configured, a drawing showing system interconnects is supplied.



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



Use only the cables provided by Aerotech as part of the complete motion control system.

## 2.9. Air Requirements

The air pressure supplied to the collet holder or gripper is important in ensuring that the material or tool is released properly, or for the optional gripper, that the material is held securely.

- If compressed air is used, it must be filtered to 0.25 microns, dry to 0° F dew point, and oil free.
- If nitrogen is used, it must be 99.99% pure and filtered to 0.25 microns.

The chuck becomes fully open at approximately 4-5.5 bar (60-80 psig) depending on the collet size. Higher pressures will not cause damage to the rotary union, but high flow rates will result. Because of the noncontact rotary union design on collet-equipped stages, a small amount of leakage will occur. Approximate leakage rates of between 10 Lpm (0.5 CFM) and 40 Lpm (1.4 CFM), depending on pressure, will be observed when the collet is open.

**NOTE:** When operating the VascuLathe<sup>®</sup>-ASR it is recommended that 5 psi be supplied to the collet at all times. This will act as an air purge and help prevent contaminants from entering the rotary union.

## 2.10. Wet Cut Fluid Requirements

Water or cutting fluid used during wet cut operations must be conditioned to meet certain requirements ensuring seal functionality and service life of the wet cut rotary union.

- Water or cutting fluid must be filtered to 5 microns or better.
- Fluid filter must be installed upstream of the rotary union between pump outlet and rotary union inlet.





## Chapter 3: Operating Specifications

The surrounding environment and operating conditions can affect the performance and service life of the stage. This chapter contains general technical information about the VascuLathe®-ASR on ideal environmental, operating, and basic product specifications.

### 3.1. Environmental Specifications

The environmental specifications for the VascuLathe®-ASR are listed in the following table.

**Table 3-1: Environmental Specifications**

<b>Ambient Temperature</b>	Operating: 16° to 25° C (61° to 77° 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
<b>Humidity</b>	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
<b>Altitude</b>	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.
<b>Vibration</b>	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.
<b>Dust Exposure</b>	The VascuLathe®-ASR stages have limited protection against dust, but not water. This equates to an ingress protection rating of IP50.
<b>Use</b>	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. Basic Specifications

Basic VascuLathe®-ASR stage specifications are shown in Table 3-2. Rotary motor specifications are shown in Table 3-3 and linear motor specifications are shown in Table 3-4.

**Table 3-2: VascuLathe®-ASR Series Specifications**

		Units	VascuLathe-ASR-200	VascuLathe-ASR-300
Travel	Linear	mm	200	300
	Rotary	degrees	360° continuous	
Maximum speed	Rotary	rpm	600	
	Linear	m/s	2.0	
Collet Type <sup>(1)</sup>		n/a	ER16	
Maximum Aperture (ER16)		mm	5.8 (Wet Cut)	
			10 (Dry Cut)	
Linear Accuracy		microns	±1.0	
Linear Repeatability		microns	±0.5	
Linear Straightness		microns	±2.0	±3.0
Linear Flatness		microns	±2.0	±3.0
Linear Pitch		arc-sec	8.0	10.0
Linear Yaw		arc-sec	8.0	10.0
Rotary Accuracy (standard)		arc-sec	±15.0	
Rotary Repeatability (standard)		arc-sec	±3.0	
Rotary Pin / Collet Runout <sup>(2)</sup>		microns	<25	
Maximum Load <sup>(3)</sup>	Axial	kg	3	
	Radial	kg	2	
	Moment	N-m	3	
Stage mass		kg	95	100
Minimum System Air Pressure <sup>(4)</sup>		psig	100	
Finish	Stage / Body	n/a	Black hardcoat/black anodize	
	Collet Chuck	n/a	Hardened 440C stainless steel/NiCoTef	
	Waycovers	n/a	Hardened stainless steel	
<p>(1) VascuLathe® collet chuck accepts Rego-Fix ER collets manufactured to DIN6499 specifications only.</p> <p>(2) Measured TIR of precision gage pin chucked with an ultra precision ER collet (DIN6499) 10 mm away from collet face.</p> <p>(3) Maximum loads are mutually exclusive. Loading limits are due to the collet chuck mechanism. Contact Aerotech directly if part load requirement exceeds specifications.</p> <p>(4) Collet chuck mechanism is normally-closed. Collet mechanism requires air to open collet chuck. Air supply must be dry (0°F dew-point) oil-less air OR 99.99% pure Nitrogen. Air or nitrogen must be filtered to 0.25 micron particle size or better</p>				

**Table 3-3: VascuLathe®-ASR Rotary Motor Specifications**

Model	BM250	
<b>Performance Specifications (1,5)</b>		
Stall Torque, Continuous (2,8)	N-m	2.0
	oz-in	285
Peak Torque (3)	N-m	5.0
	oz-in	712
Rated Speed	rpm	4,000
Rated Power Output, Continuous	watts	671
<b>Electrical Specifications (5)</b>		
BEMF Constant (line to line, max)	Volts pk/krpm	28.0
Continuous Current, Stall (2,8)	Amp pk	10.5
	Amp rms	7.4
Peak Current, Stall (3)	Amp pk	26.3
	Amp rms	18.6
Torque Constant (4,9)	N-m / Amp pk	0.19
	oz-in / Amp pk	27.1
	N-m / Amp rms	0.27
	oz-in / Amp rms	38.4
Motor Constant (2,4)	N-m / $\sqrt{W}$	0.171
	oz-in / $\sqrt{W}$	24.24
Resistance, 25 °C (line to line)	ohms	1.1
Inductance (line to line)	mH	1.30
Maximum Bus Voltage	VDC	340
Thermal Resistance	°C / W	0.94
Number of Poles	P	8
<p>1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature</p> <p>2. Values shown @ 130 °C rise above a 25 °C ambient temperature, with motor mounted to a 250 mm x 250 mm x 6 mm aluminum heat sink</p> <p>3. Peak torque assumes correct rms current, consult Aerotech</p> <p>4. Torque Constant and Motor Constant specified at stall 5. All performance and electrical specifications +/- 10%</p> <p>6. Maximum winding temperature is 155C</p> <p>7. Ambient operating temperature range: 0 °C - 25 °C, consult Aerotech for performance in elevated ambient temperatures</p> <p>8. De-rate continuous torque &amp; continuous current by 10% when using an encoder</p> <p>9. All Aerotech amplifiers are rated Apk; use torque constant in N-m/ Apk when sizing</p>		

**Table 3-4: VascuLathe®-ASR Linear Motor Specifications**

Model	BLM-203	
Winding Designation	-A	
<b>Performance Specifications (1,5)</b>		
Continuous Force, 20 psi, 1.4 bar (2)	N	195.0
	lb	43.8
Continuous Force, No Cooling, (2)	N	118.8
	lb	26.7
Peak Force (3)	N	780.1
	lb	175.4
<b>Electrical Specifications (5)</b>		
BEMF Constant (line to line, max)	V / m / sec	25.77
	V / in/ sec	0.65
Continuous Current, 20 psi, 1.4 bar (2)	A, pk	8.70
	A, rms	6.15
Continuous Current, No Cooling (2)	A, pk	5.30
	A, rms	3.75
Peak Current, Stall (3)	A, pk	34.80
	A, rms	24.61
Force Constant, Sinusoidal Drive (4,8)	N / A, pk	22.42
	lb / A, pk	5.04
	N / A, rms	31.70
	lb / A, rms	7.13
Motor Constant (2,4)	N / √W	10.94
	lb / √W	2.46
Resistance, 25 °C (line to line)	Ohms	4.0
Inductance (line to line)	mH	3.20
Thermal Resistance, 20 psi, 1.4 bar	°C / W	0.31
Thermal Resistance, No Cooling	°C / W	0.85
Maximum Bus Voltage	VDC	340
1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature 2. Values shown @ 100 °C rise above a 25 °C ambient temperature, with motor mounted to the specified aluminum heat sink 3. Peak force assumes correct rms current, consult Aerotech 4. Force Constant and Motor Constant specified at stall 5. All performance and electrical specifications +/- 10% 6. Maximum winding temperature is 125 °C 7. Ambient operating temperature range: 0 °C - 25 °C, consult Aerotech for performance in elevated ambient temperatures 8. All Aerotech amplifiers are rated Apk; use torque constant in N-m / Apk when sizing		

### 3.3. Load Capability

The VascuLathe®-ASR is designed for tubular manufacturing applications. With this in mind, the tubes loaded into the collet chuck of the rotary axis must fall within the maximum load parameters outlined in Table 3-2.

**NOTE:** Maximum loads are mutually exclusive; loading limits are due to the collet chuck mechanism. Contact Aerotech directly if part requirements exceed specifications.

If the stage is configured for wet cut, it will contain a rotary union attached to the end of the rotary shaft (Figure 3-1). A 3/8 NPT tapped hole is provided on the end of the rotary union shaft to allow for connecting a pressure vessel or extension tube. To prevent damage or performance degradation of the stage, the unsupported length and weight of the attached pressure vessel is limited.

**NOTE:** Aerotech recommends the following limitations on the size and weight of an unsupported pressure vessel:

Length past end of rotary union (L): <250 mm  
Moment about end of rotary union (M): <1.0 N-m

If these limits are exceeded, it is recommended that an external steady-rest or support be implemented.

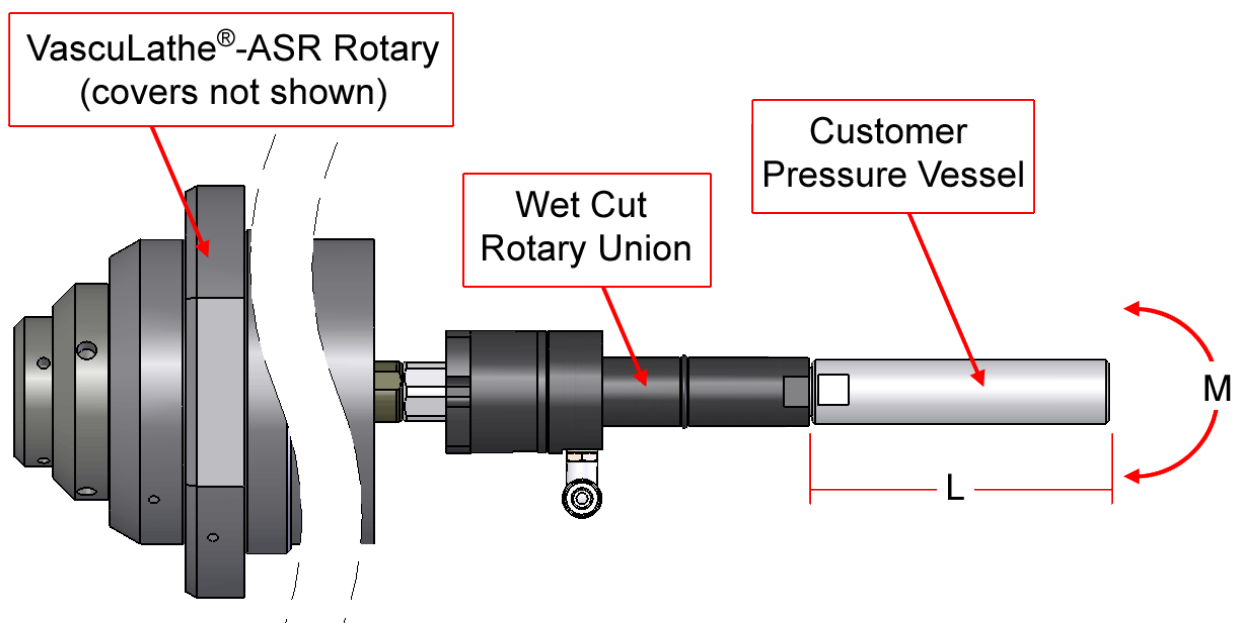


Figure 3-1: VascuLathe®-ASR Wet Cut Rotary Union Location



## Chapter 4: Maintenance

This chapter will cover information about component replacement, intervals between lubrications, detail the lubrication and inspection process, and cover which lubricants are recommended for use.



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

### Linear

The VascuLathe<sup>®</sup> linear bearing area must be kept free of foreign matter and moisture; otherwise the performance and life expectancy of the stage will be reduced. Always operate the stage with all covers and seals in place to help keep dirt out.

### Rotary

Although the VascuLathe<sup>®</sup> rotary axis is designed to be low in maintenance, there are a few items that may require preventative maintenance during the lifetime of the stage. This chapter will detail the lubrication, inspection, and replacement process of various components.



For the wet cut option, it is recommended that rotary seals be replaced at a minimum of every 1000 hours of service until a definite trend develops. Refer to Section 4.3.3. for more details.

## 4.1. Service and Inspection Schedule

### Linear

Lubricant inspection and replenishment in VascuLathe<sup>®</sup>-ASR series stages depends on conditions such as duty cycle, speed, and the environment. An inspection interval of once every few months 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. For stages operating under conditions involving excessive debris, lubrication every six months is recommended.

### Rotary

Seal inspection and replacement in VascuLathe<sup>®</sup>-ASR rotary stages depends on conditions such as duty cycle, speed, and the environment. A frequent inspection interval is recommended until a trend develops for the application. As part of this inspection interval, the seals should be examined for excessive air or water leakage. The application will determine the required replacement interval for the seals. The bearings, motor, and encoder for the ASR series require no preventative maintenance.

## 4.2. Lubrication and Cleaning

### Linear

The linear bearings of the VascuLathe<sup>®</sup> are greased with Dow Corning BR-2. Do not mix lubricants due to potential incompatibilities.

If a solvent is necessary for cleaning the stage, it is recommended that isopropyl rubbing alcohol be used. Harsher solvents, such as acetone, may damage the plastic and rubber seals on the linear bearing trucks.

Refer to Section 4.5. for the correct cleaning and lubrication procedure.

### Rotary

O-rings and collet piston seals should be lubricated with Parker O-Lube lubricant or an equivalent o-ring lubricant. See Section 4.3.3. for details regarding lubrication of the wet cut rotary union seals.

Any metal parts may be cleaned with either acetone or isopropyl alcohol. Seals and o-rings may be wiped with a small amount of isopropyl alcohol if necessary.



Acetone should never be used to clean the o-rings or seals.



### 4.2.1. Collet & Collet Chuck Lubrication and Cleaning

For the collet chuck and collet to operate properly, preventative maintenance and regular cleaning is required.



Failure to lubricate and clean the collet interface surfaces will cause premature failure and wear that may void the warranty.

Before inserting any collet into the chuck, clean the chuck taper and the collet with acetone or isopropyl alcohol with a lint-free cloth or rag. If required, compressed air can be used to clean out the collet grooves. Inspect the collet and the chuck interface surfaces to be sure no wear marks are present. If wear or fret marks [copper-colored oxide marks] are present, the taper can be lightly polished with a fine-grit crocus cloth. The goal is to clean the surface of the taper and not to remove an excessive amount of material. If the wear marks are large, or excessive polishing is required to remove these marks, the taper and the collet may need to be replaced. Contact Aerotech Customer Service for more information. Finally grease the chuck taper and collet taper with a small amount of lubricant and insert the collet.

Aerotech recommends the following lubricants (or equivalent):

Vender	Product	Item #	Description
Henkel Technologies	Loctite	80209	Silver Grade Anti-Seize
Henkel Technologies	Loctite	51168	Food Grade Anti-Seize
Jet Lube	White Knight	16404	Food Grade Anti-Seize

Lubricant inspection and replenishment depends on conditions such as collet chuck duty cycle and the machining environment. An inspection interval of once every 8-hours is recommended until a trend develops for the application. Longer or shorter intervals may be required to maintain a film of lubricant on the collet taper. It is also recommended that every time a collet is removed, the collet and the chuck interface surfaces are cleaned, inspected, and greased.

## 4.3. Seal Replacement

### 4.3.1. Piston Seal Change Procedure

The collet chuck on the VascuLathe®-ASR is equipped with o-ring piston seals that are designed to last many collet chuck (open/close) cycles. However, due to regular wear, the seals may require replacement during the lifetime of the product. If trouble with the piston seals is suspected, it is recommended that you contact Aerotech customer service. The seals should only be replaced by a qualified Aerotech technician.

### 4.3.2. Ringseal O-Ring Replacement

On stages equipped with the wet cut option, it may be necessary to change the ringseal o-rings. A typical ringseal insert is shown in Figure 4-2. Depending on the size, the ringseal may be one or two pieces. The ringseal screws into the center of the shaft, from the front of the stage and is replaced by the following steps:



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

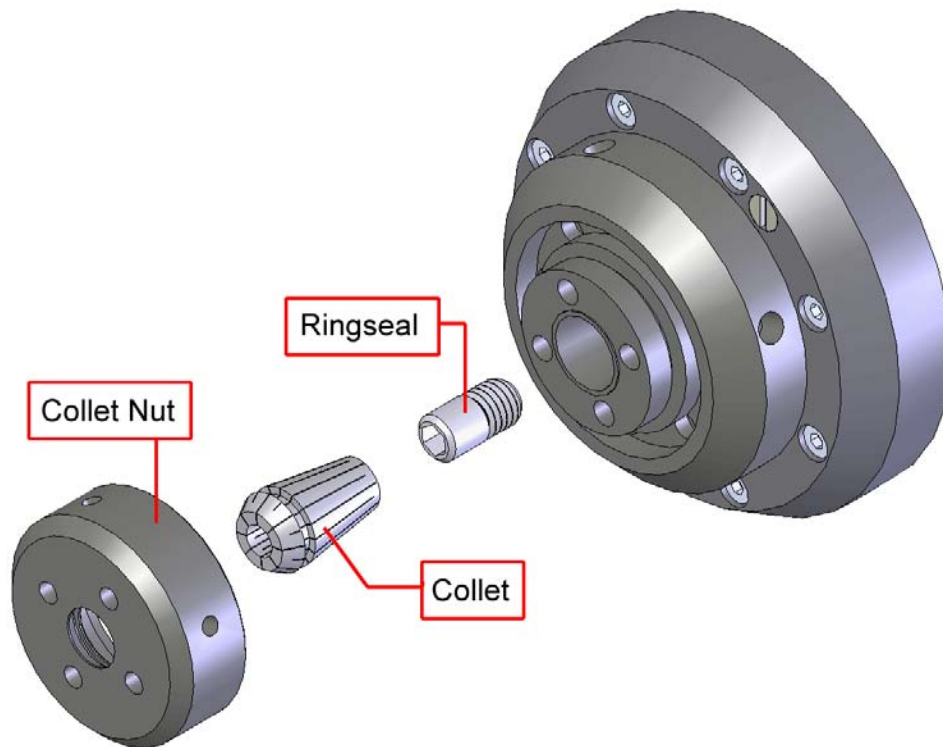


Figure 4-1: Ringseal Removal and Replacement

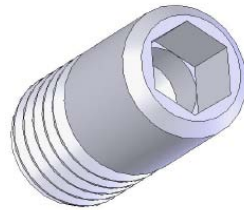


Figure 4-2: Typical Ringseal

- Step 1: Remove power to the stage.
- Step 2: Open the collet chuck. Since the collet holder is in the normally closed position, this will require air pressure supplied to the air inlet.
- Step 3: Once the collet has been released, unscrew the collet nut as shown in Figure 4-1. If necessary, use a spanner wrench available from Aerotech.
- Step 4: With the collet and collet nut removed, the ringseal will now be exposed. Unscrew the ringseal from the shaft.
- Step 5: Remove the damaged or worn o-ring and replace it with a properly sized and lubricated new o-ring (as shown in Figure 4-3). A long pick or thin screwdriver will be necessary to remove the o-ring and replace it. Contact Aerotech for the appropriate o-ring size and type.
- Step 6: Re-insert the ringseal into the inner collet housing and tighten it into position.
- Step 7: Replace collet and collet nut.

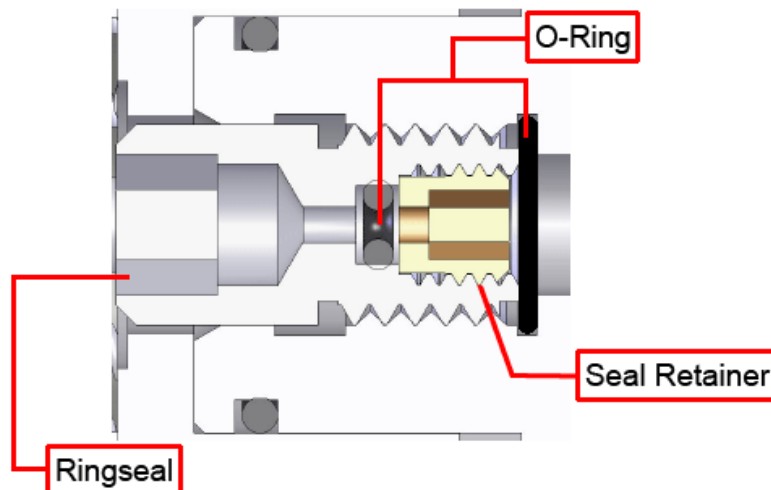


Figure 4-3: Cross-Section View of Ringseal Showing O-Ring

### 4.3.3. Wet Cut Rotary Union Seal Replacement

On stages with a rotary union, there is a rotary seal in the rear of the stage that requires periodic replacement. Aerotech recommends replacing this seal before 1000 hours of stage run time. Contact Aerotech for obtaining appropriate replacement seals. Figure 4-4 shows a cross section of the rotary union assembly. The procedure for seal replacement is as follows:



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



The wet cut rotary union seal should be replaced and relubricated at a minimum of every 1000 hours of stage operation. For heavy use or three shift operation this corresponds to replacement every month. For lighter use or single shift operation, this corresponds to replacement every three months. Failure to do so will void the stage warranty.

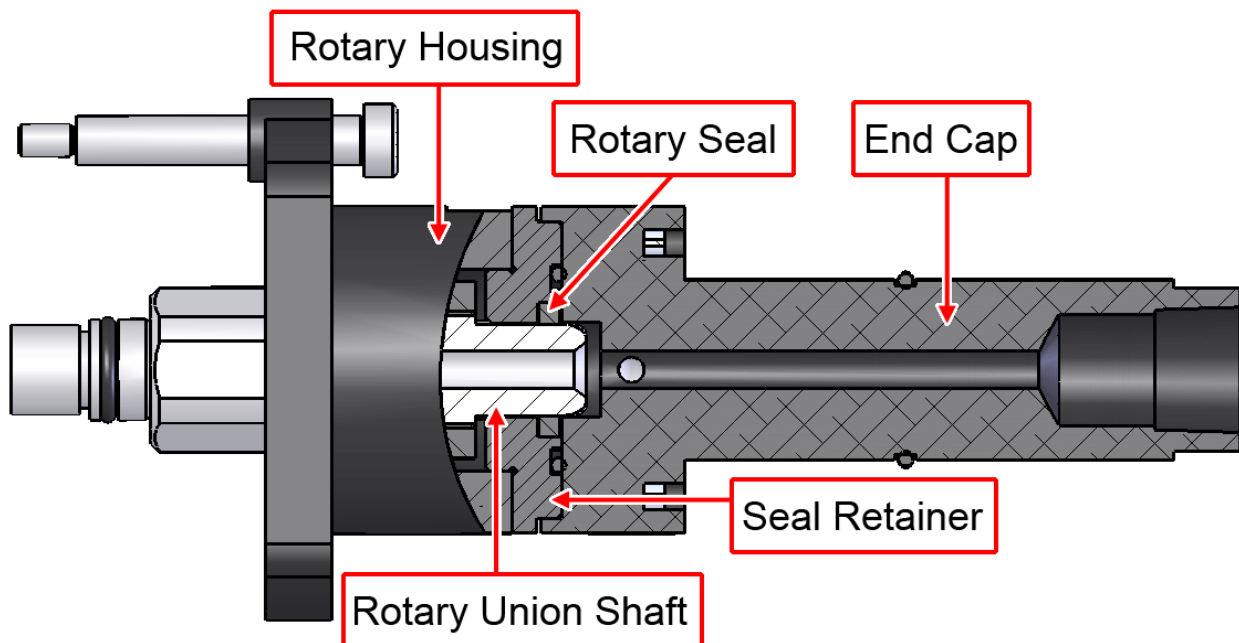


Figure 4-4: Cross-Section View of Wet Cut Rotary Union Assembly

Step 1: Remove power to the stage.

Step 2: To access the rotary union assembly, remove rear carriage cover and top carriage cover located on the backside of the carriage (see Figure 4-5). It may be necessary to insert (Qty-2) M4x0.7 screws into rear cover to help with removal.

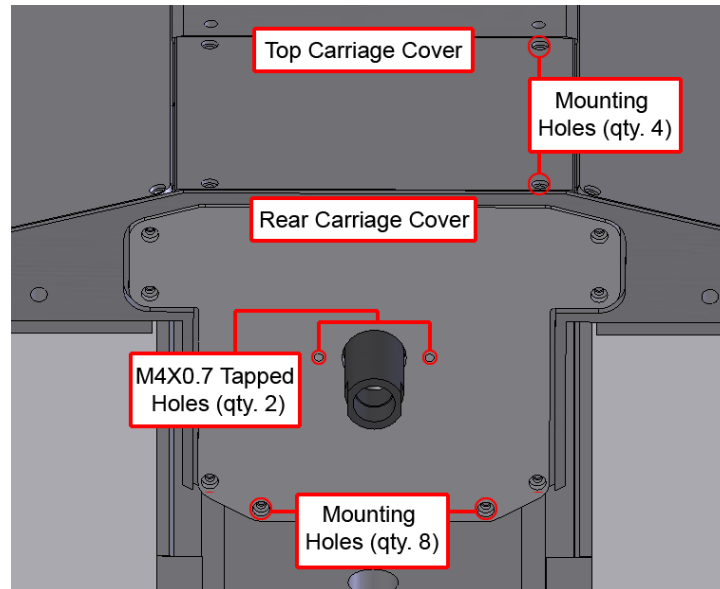


Figure 4-5: Carriage Cover Removal

Step 3: Remove the six seal assembly screws from the rear end of the rotary union (see Figure 4-6).

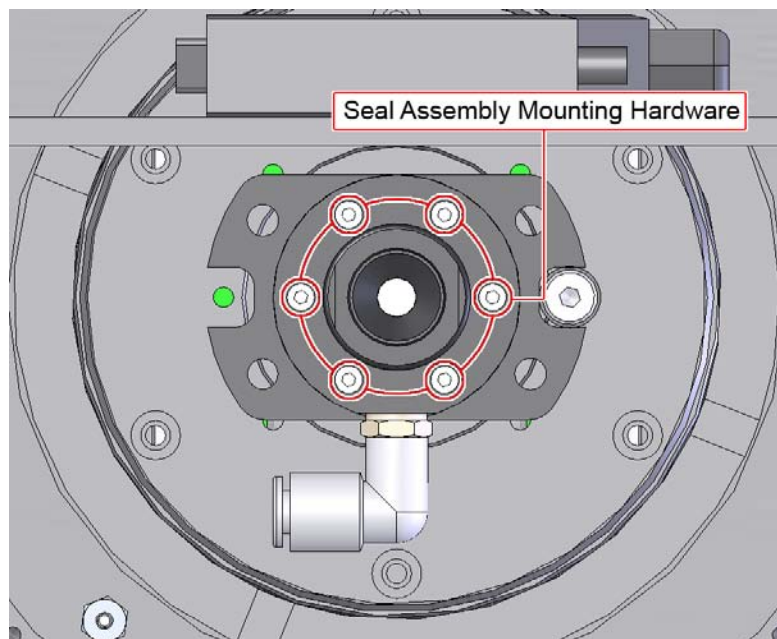


Figure 4-6: Seal Assembly Removal

Step 4: Carefully pull the seal assembly off of the stage. Figure 4-7 shows an exploded view of the seal assembly.

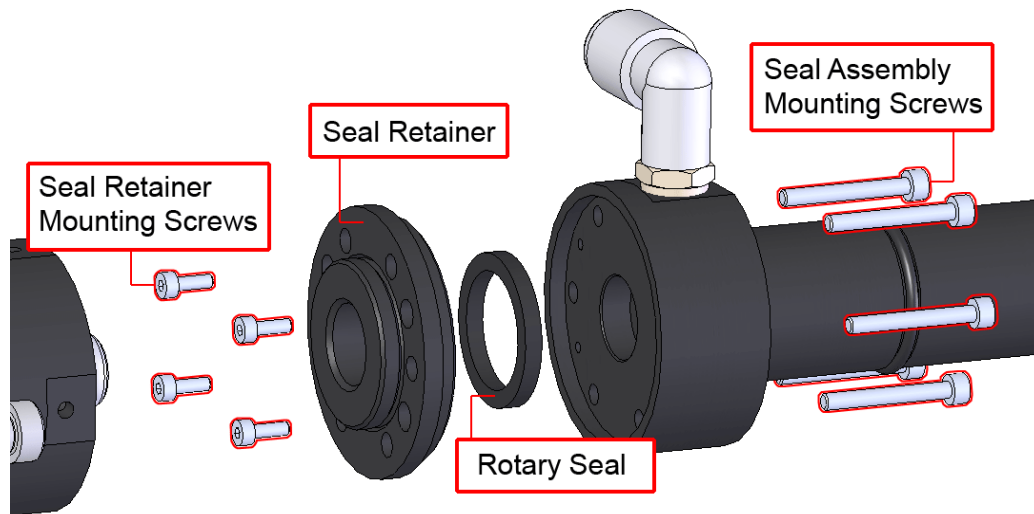


Figure 4-7: Seal Installation

Step 5: Remove the four seal retainer screws and remove the seal retainer. The rotary seal will now be exposed.

Step 6: Pry the rotary seal from its housing using care not to damage the sealing surfaces (see Figure 4-8). Inspect the shaft and seal surface for scratches or nicks (see Figure 4-9). Small wear marks are normal. If the shaft and seal retainer sealing surface are undamaged, clean both the shaft and seal assembly surfaces with a lint-free rag and isopropyl alcohol.

If the shaft or sealing surface is scratched (you can feel it with your fingernail), contact Aerotech customer service.

If advised to remove the rotary union, see Section 4.4. for instructions.

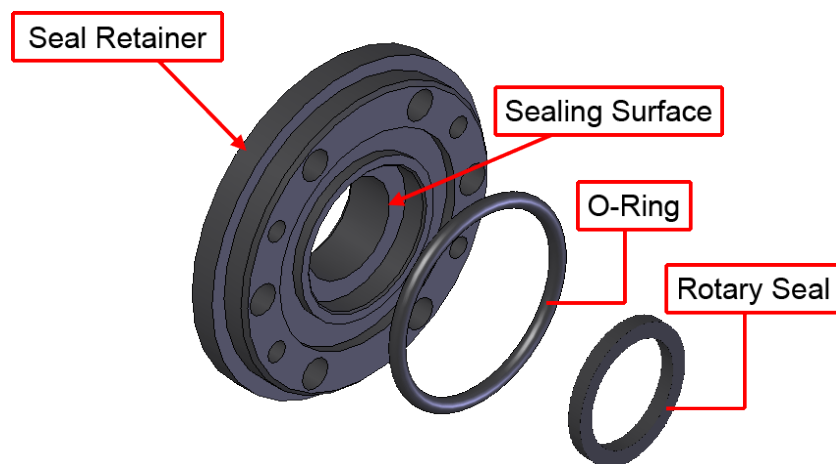


Figure 4-8: Seal Retainer Assembly

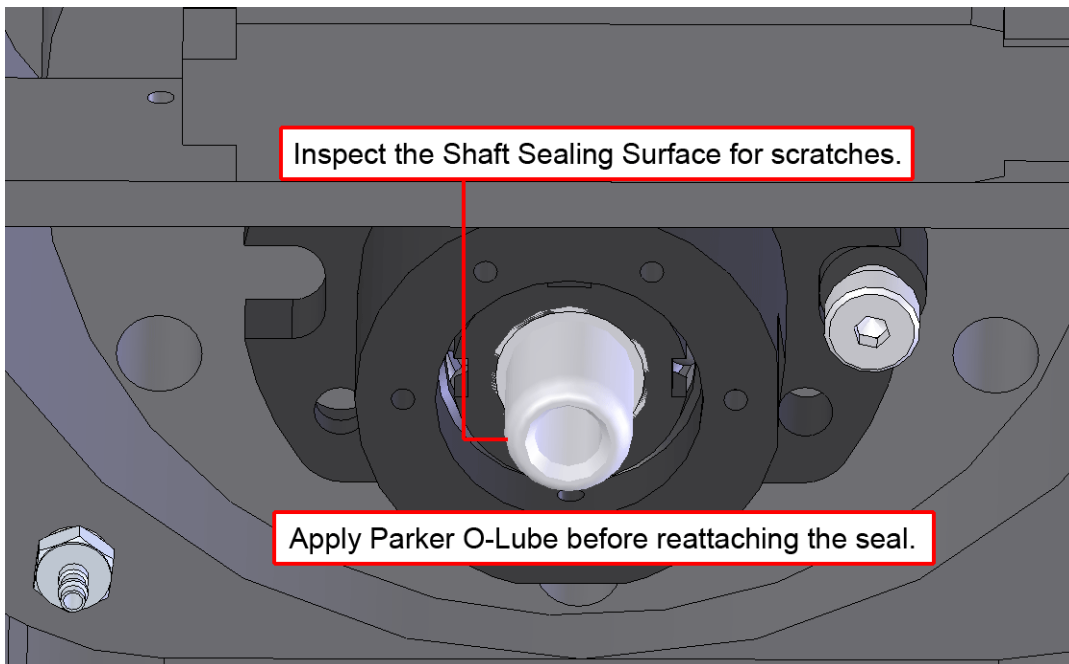


Figure 4-9: Wet Cut Rotary Union Shaft Inspection

- Step 7: Lubricate the new seal with a generous amount of Parker O-Lube and press it uniformly into its housing.
- Step 8: Reattach the seal retainer to the end cap and tighten all screws in a cross pattern.
- Step 9: Apply Parker O-Lube to the exposed end of the rotary union shaft as shown in Figure 4-9.
- Step 10: Press the seal assembly back over the rotary union shaft. Use care so that damage does not occur to the newly installed seal.
- Step 11: Tighten the seal assembly screws and reattach covers.
- Step 12: Restore power to the stage.

#### 4.4. Wet Cut Rotary Union Removal

If the rotary union shaft becomes scratched or damaged, it will be necessary for the rotary union to be replaced in order to properly seal the system. Figure 4-10 shows a view of the rotary union assembly. The procedure for replacement is as follows.



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

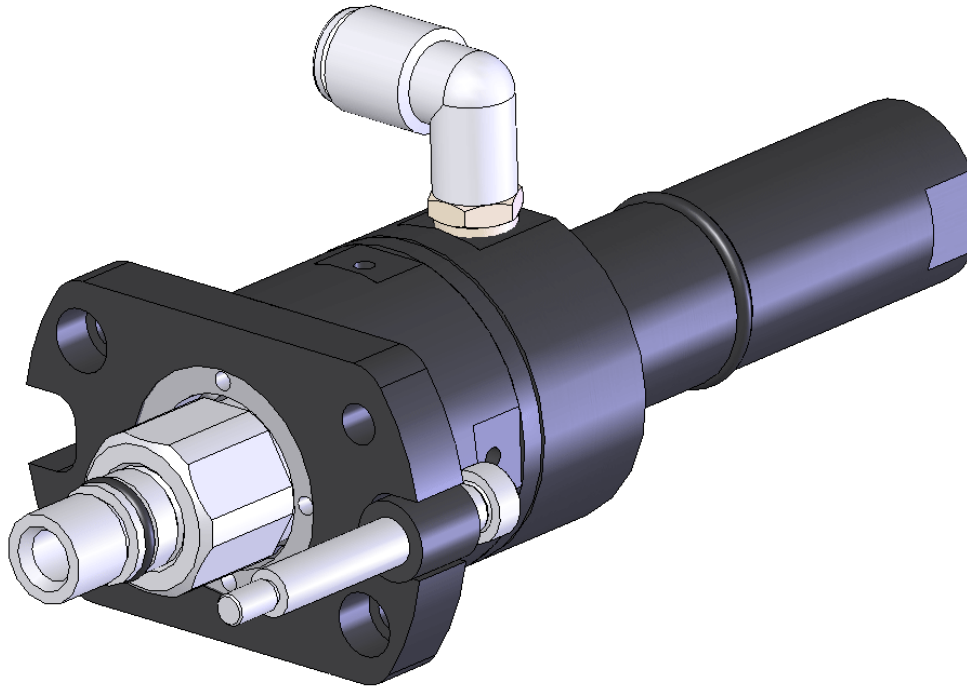


Figure 4-10: Wet Cut Rotary Union

Step 1: Remove power to the stage.

Step 2: Remove the rear carriage cover and top carriage cover located on the backside of the carriage (see Section 4.3.3. for the removal procedure).



Step 3: Remove the shoulder bolt and bushing (see Figure 4-11).

Step 4: Using two 19 mm wrenches (one on the rotary union shaft nut, the other on the VascuLathe<sup>®</sup>-ASR shaft flats) coming in from the top of the carriage, unscrew the rotary union from the VascuLathe<sup>®</sup>-ASR shaft (see Figure 4-11).

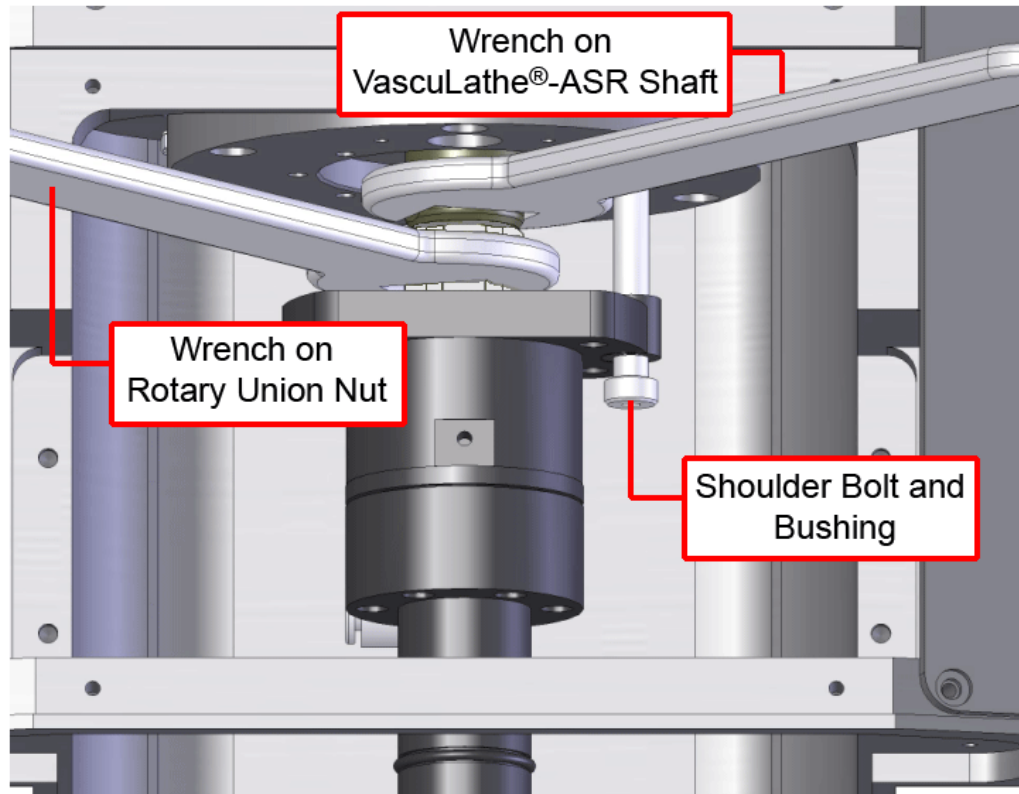


Figure 4-11: Wet Cut Rotary Union Installation

Step 5: Install a new rotary union assembly by attaching it to the rear of the VascuLathe<sup>®</sup>-ASR shaft. Tighten to 10 ft-lbs.

Step 6: Tighten the shoulder bolt and bushing.

Step 7: Reattach all covers.

Step 8: Restore power to the stage.

## 4.5. Linear Lubrication and Cleaning Process

The lubrication and cleaning process is outlined in the steps that follow. Before beginning lubrication, see Section 4.2. for recommended lubricants.



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

Step 1: Remove power to the stage.

Step 2: Remove spar belt covers (see Section 4.6. ).

Step 3: Remove any accumulated dust or debris from both the belts and the belt guide tracks located on the inside and outside spar covers removed in step 2.

Step 4: Remove any accumulated dust or debris from the inside of the assembly.

Step 5: Remove any dirty or dried lubricant from the linear bearing guides. Use a clean, lint-free cloth. A swab soaked in isopropyl alcohol may be used to remove stubborn debris.

Step 6: Apply a thin, continuous film of lubricant to the linear bearing guides. A good quality, natural bristle artist's brush makes an excellent applicator.

Step 7: Using the grease nipple on each linear bearing truck, add grease as required.

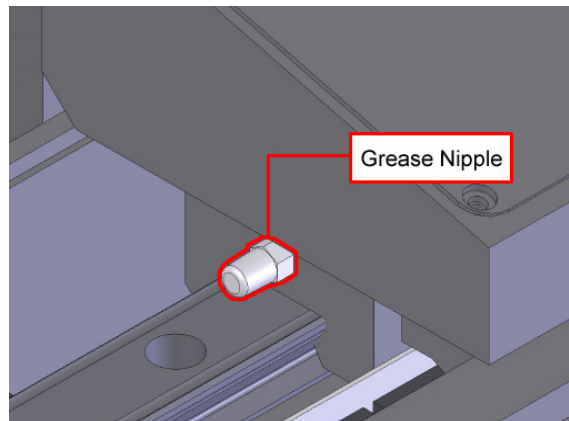


Figure 4-12: Linear Bearing Grease Nipple

Step 8: Manually move the stage to the opposite end of travel to work the grease into the linear bearing guides.

Step 9: Repeat steps 3 through 7 for any areas covered by the original table position.

Step 10: Refasten the covers.

Step 11: Restore power to the stage and drive the stage table back to its original position to redistribute lubricants.

### 4.6. Linear Spar Cover Removal

The procedure outlined below details how to remove the linear spar covers.

Step 1: Remove the inside spar cover as shown below and lean against inside of carriage.

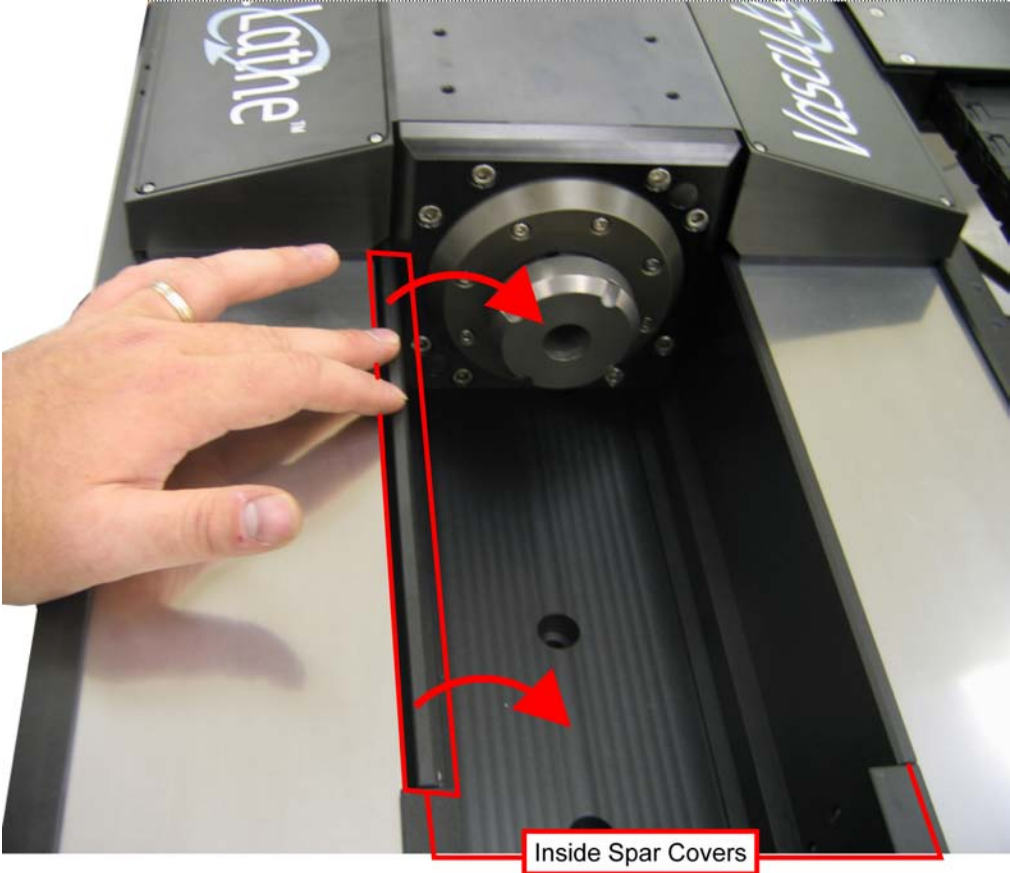


Figure 4-13: Removing the Inside Spar Cover

Step 2: Remove the outer spar cover mounting screws and remove the cover.

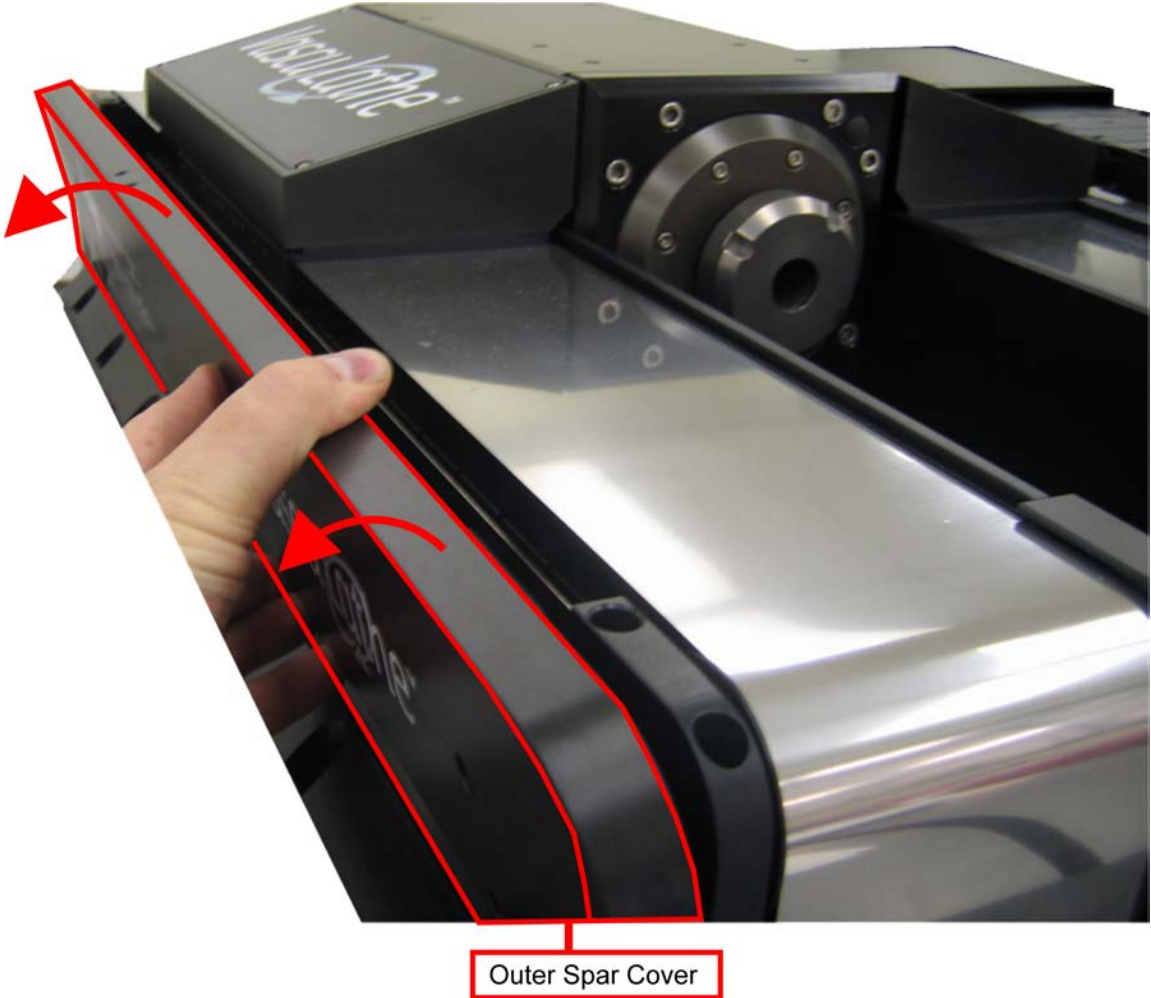


Figure 4-14: Removing the Outer Spar Cover

Step 3: Remove the carriage side cover on the side of the spar cover being serviced.

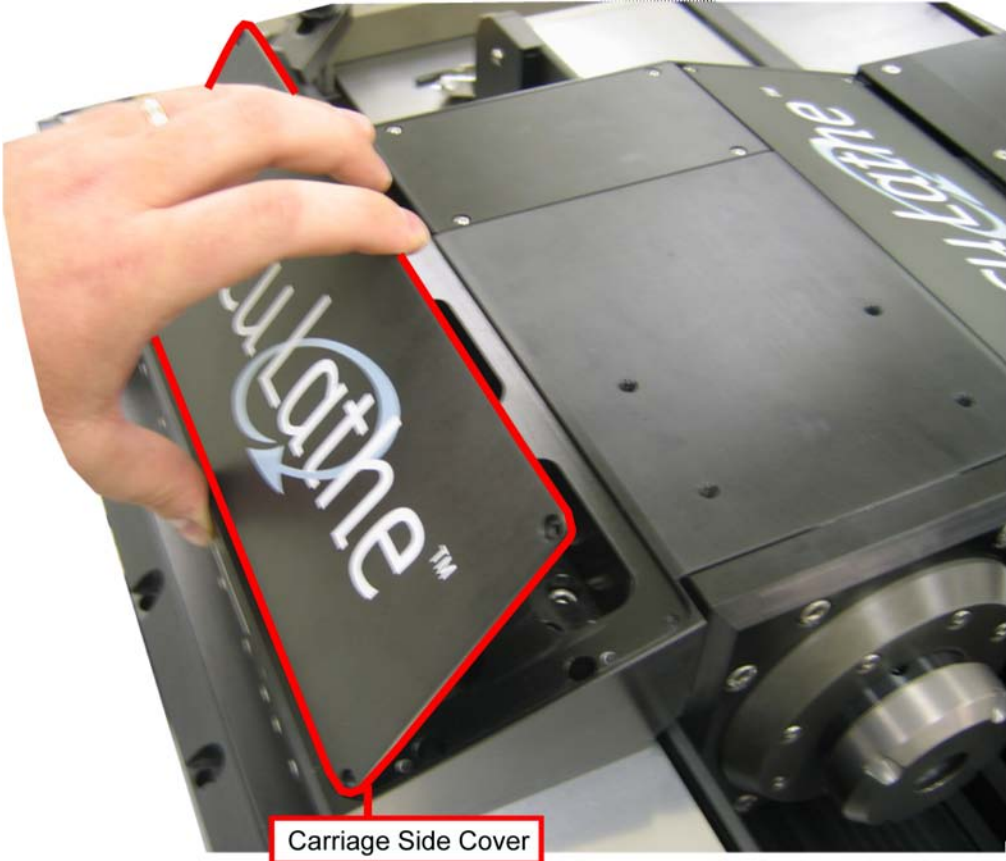


Figure 4-15: Removing the Carriage Side Cover

Step 4: Loosen and remove the (Qty-2) M4 SHCS through the top of the carriage on the front side.

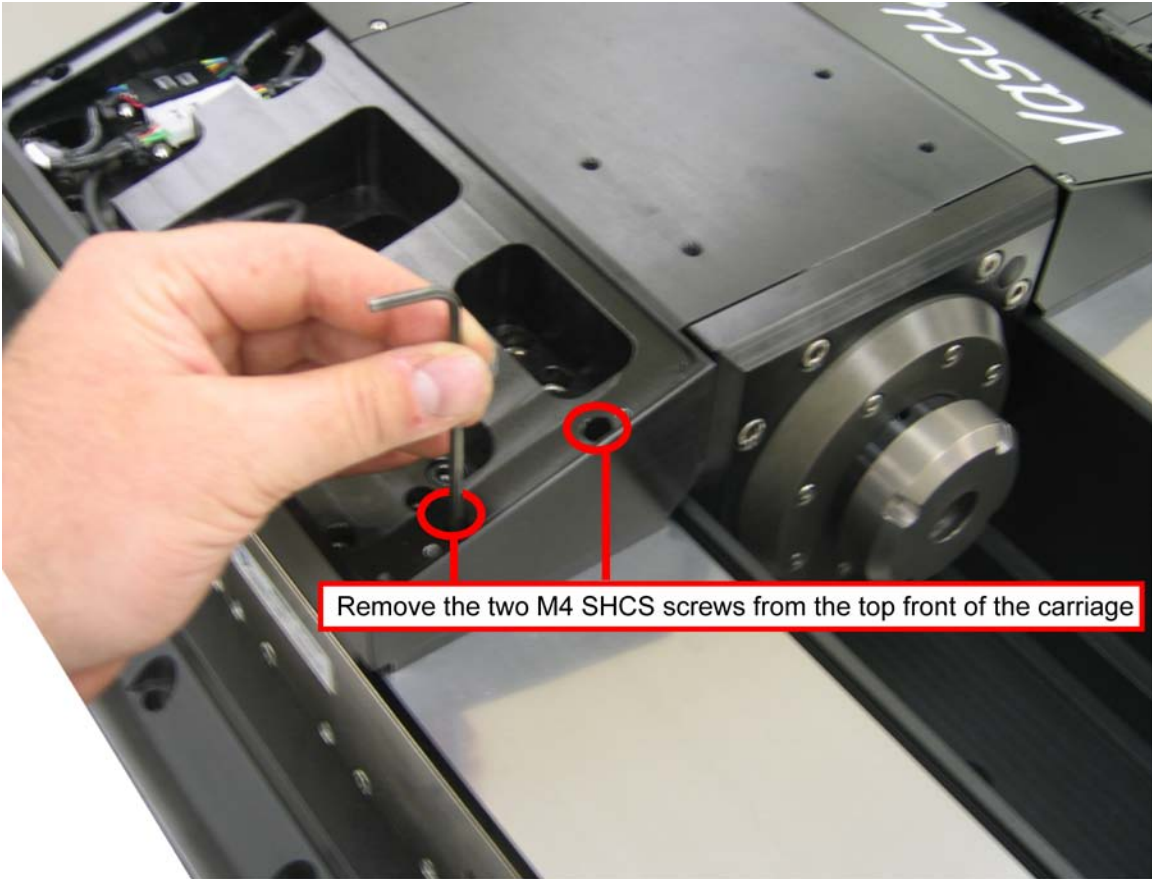


Figure 4-16: Removing M4 MHCS Screws



Step 5: Carefully pull the cover clamps down off of the dowel pins and remove tension from the belt.

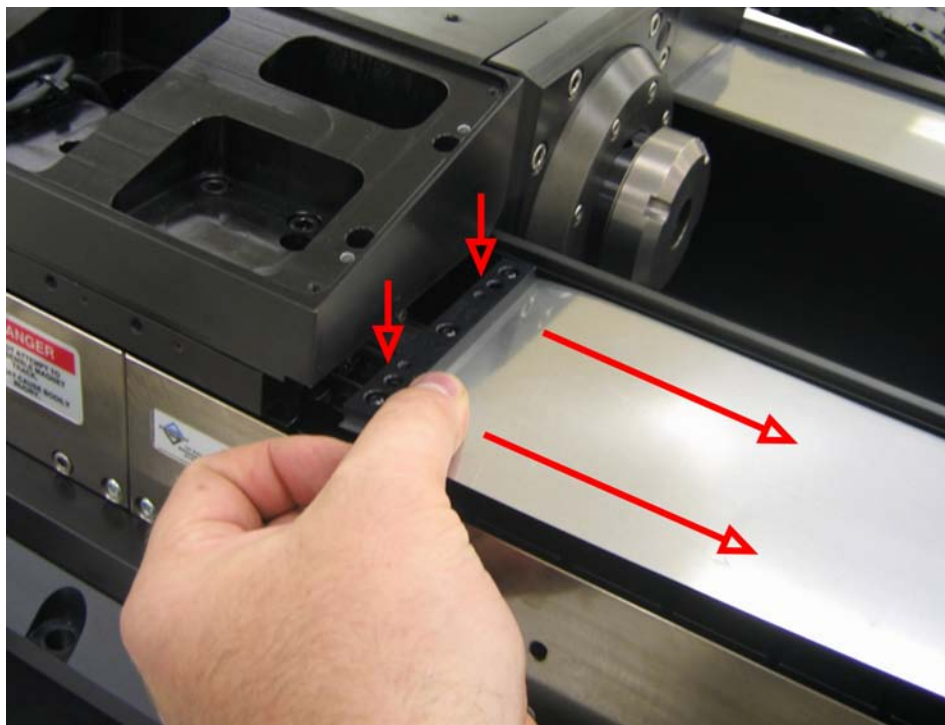


Figure 4-17: Releasing Tension on the Belt

Step 6: Carefully fold each side of the belt back using care not to damage the belt.

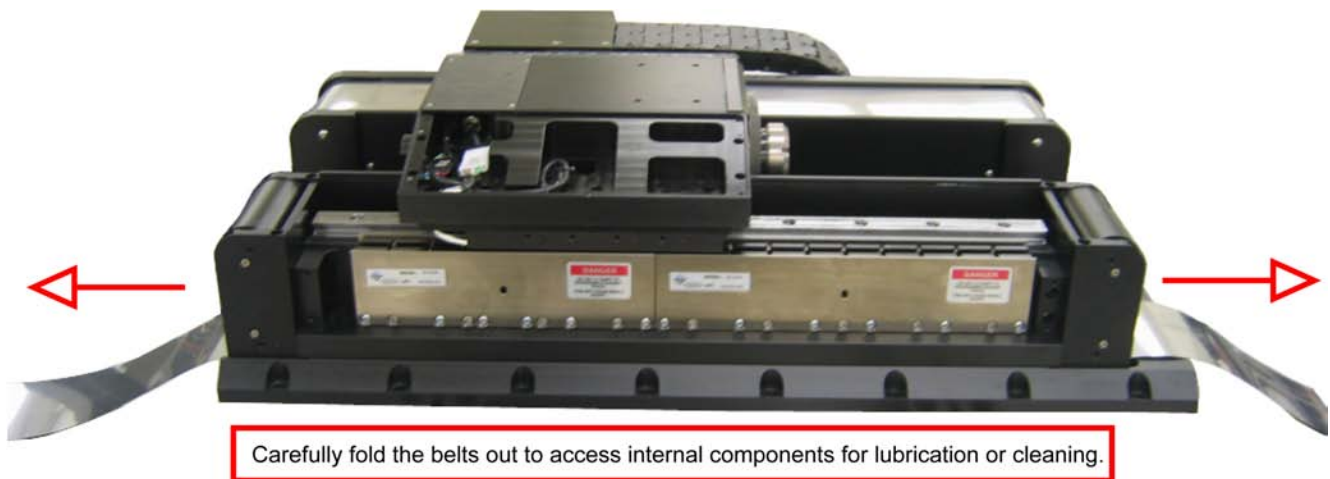


Figure 4-18: VascuLathe®-ASR with Belts Folded Back





## 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 (1.05.00)**

<b>Section(s) Affected</b>	<b>General Information</b>
Section 1.6.	Added section
Section 3.1.	Added section
Chapter 2: Installation, Section 2.1. , Section 2.3. , Section 2.8. , and Section 1.5.	Added safety information and warnings
Section 3.2.	Added motor specifications

**Table B-2: Archived Changes**

Revision	Section(s) Affected	General Information
1.00.00	--	New manual
1.01.00	Section 2.5. Section 3.3. Section 4.2.	Added details on collet retention nose cap Added details on customer pressure vessel limitations Added details on wet cut rotary union
1.02.00	Chapter 4 Section 4.3.3.	Removed portion of note about lubrication or rotary seals Added note regarding inspection of seal housing surfaces
1.02.00	Section 2.10. Section 1.4. All	Added wet cut fluid requirements section Added dimensions section Changed page numbering from section based to absolute
1.03.00	Section 4.2.1.	Changed collet and collet chuck lubrication and cleaning instructions

## Index

-AG tooling option.....	5, 7	collet removal.....	17
alignment.....	20	collet type.....	7
-FD option (pneumatics).....	6-7	collet/collet chuck	
-G tooling option.....	5, 7	cleaning.....	33
operation.....	22	lubrication.....	33
-PN option (pneumatics).....	6-7	compressed air.....	23
-PNG option (pneumatics).....	6-7		
		<b>D</b>	
<b>A</b>		Declaration of Incorporation.....	11
accuracy.....	14	Dimensions.....	8
air			
compressed.....	23	<b>E</b>	
leakage.....	23	electrical installation.....	23
nitrogen.....	23	Environmental Specifications.....	25
requirements.....	23	ER16 style collet chuck.....	4
air line.....	16		
attaching the payload.....	16	<b>G</b>	
		gripper.....	5, 7
<b>C</b>		operation.....	20, 22
cable.....	6	gripper jaws.....	5, 7
changing ASR workholding devices.....	17		
cleaning.....	32	<b>H</b>	
collet/collet chuck.....	33	handling the stage.....	13
linear.....	42		
metal.....	32	<b>I</b>	
stage.....	32	inspection schedule.....	31
CMS.....	5, 7	installation.....	13
collet chuck.....	4	collet.....	17
ER16.....	4		
max tube diameter.....	4	<b>L</b>	
collet installation.....	17	leakage (air).....	23
		linear	
		cleaning.....	32, 42
		inspection.....	31
		lubrication.....	32, 42

maintenance..... 31  
 spar cover removal..... 43  
 linear axis..... 3  
 linear motion guide  
     lubrication..... 42  
 linear tooling platforms..... 16  
 linear travel..... 7  
 load capability..... 29  
     rotary union..... 29  
 lubrication..... 32  
     collet/collet chuck..... 33  
     linear..... 42  
     linear bearings..... 32  
     o-rings..... 32  
     piston seals..... 32

**M**

maintenance..... 31  
 model numbers..... 7, 13  
 mounting  
     linear platforms..... 16

**N**

nitrogen..... 23

**O**

operating specifications..... 25  
 options..... 5  
     cable management system (CMS)..... 5  
     controller..... 6  
     electronics..... 6  
     gripper jaws..... 5  
     pneumatics..... 6  
     tooling..... 5

wet cut..... 5  
 overview..... 1

**P**

piston seal replacement..... 34  
 pneumatics..... 6-7  
 preparing the mounting surface..... 14  
 pressure vessel length/weight limits..... 29

**R**

requirements  
     air..... 23  
 ringseal o-ring replacement..... 34  
 rotary..... 16  
     cleaning..... 32  
     inspection..... 31  
     lubrication..... 32  
     maintenance..... 31  
 rotary axis..... 4  
 rotary union  
     load capability..... 29  
     pressure vessel length/weight limits..... 29

**S**

safety procedures..... 9  
 seal replacement..... 34  
 securing the stage to the mounting surface..... 15  
 service schedule..... 31  
 spar cover removal..... 43  
 specifications  
     overview..... 25  
 Specifications..... 26  
 standard features..... 3

**U**

unpacking and handling the stage..... 13

**W**

Warnings..... 9

wet cut.....5, 7

wet cut rotary union removal.....40

wet cut rotary union seal replacement .....36

workholding devices..... 17







