



ATTO-1000S Controlled Removal Polisher

Instruction Manual



Equipment	Controlled Removal Polisher
Model	ATTO-1000S
Electrical Requirements	110 Volts
Motor Horsepower	1 hp (750W)
Manual Revision Date	June 23, 2025

WARRANTY

Terms and Conditions apply to all PACE Technologies Products.

1. LIMITED WARRANTY AND DISCLAIMER

PACE Technologies Products are warranted for two years from the purchase date to be free from defects in material and workmanship under correct use, normal operating conditions, and proper application. PACE Technologies' obligation under this warranty shall be limited to the repair or exchange, at PACE Technologies' option, of any PACE Technologies Product or part that proves to be defective as provided herein. PACE Technologies reserves the right to either inspect the product at the Buyer's location or require it to be returned to the factory for inspection. The buyer is responsible for freight to and from the factory on all warranty claims. The above warranty does not extend to goods damaged or subjected to accident, abuse, or misuse after release from PACE Technologies' warehouse, nor goods altered or repaired by anyone other than specifically authorized PACE Technologies representatives. PACE Technologies shall not in any way be responsible for the consequences of any alteration, modification, or misuse unless previously approved in writing by an officer of PACE Technologies. **Note: Corrosion is considered a maintenance issue and not a warranty issue.**

PACE TECHNOLOGIES MAKES NO EXPRESS WARRANTIES OTHER THAN THOSE WHICH ARE SPECIFICALLY DESCRIBED HEREIN. Any description of the goods sold hereunder, including any reference to Buyer's specifications and any description in catalogs, circulars, and other written material published by PACE Technologies, is for the sole purpose of identifying such goods and shall not create an express warranty that the goods shall conform to such a description.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS WARRANTY STATES PACE TECHNOLOGIES' ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM FOR DAMAGES IN CONNECTION WITH PACE TECHNOLOGIES' PRODUCTS. PACE TECHNOLOGIES WILL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER, NOR FOR ANY SUM IN EXCESS OF THE PURCHASE PRICE.

2. LIABILITY CAP

PACE Technologies maximum aggregate liability for loss and damage arising under, resulting from or in connection with the supply or use of the Equipment and Consumables provided under this purchase, or from the performance or breach of any obligation (s) imposed hereunder, whether such liability arises from any one or more claims or actions for breach of contract, tort, (including negligence), delayed completion, warranty, indemnity, strict liability or otherwise, unless otherwise limited by the terms hereof, shall be limited to one hundred percent (100%) of the purchase price.

3. DELIVERY

Customer assumes and shall bear the risk of all loss or damage to the Products from every cause whatsoever, whether or not insured, and title to such Products shall pass to Customer upon PACE Technologies delivery of the Products to the common carrier of Pace Technologies choice, or the carrier specified in writing by Customer, for shipment to Customer. Any claims for breakage, loss, delay, or damage shall be made to the carrier by the Customer, and Pace Technologies will render the Customer reasonable assistance in prosecuting such claims.

4. ACCEPTANCE

Customer shall inspect the Products promptly upon receipt of delivery. Unless the customer objects in writing within thirty (30) business days thereafter, the customer shall be deemed to have accepted the Products. All claims for damages, errors, or shortages in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

5. PAYMENT

Customer agrees to provide timely payment for the Products in accordance with the terms of payment set forth on the reverse side hereof or in any proposal submitted herewith. If any payment is not paid on or before its due date, Customer shall pay interest on such late payment from the due date until paid at the lesser of 12% per annum or the maximum rate allowed by law.

6. DEFAULT

If Buyer is in default (including, but not limited to, the failure by Buyer to pay all amounts due and payable to Seller) under the work or purchase order or any other agreement between Buyer and Seller, Buyer's rights under the warranty shall be suspended during any period of such default and the original warranty period will not be extended beyond its original expiration date despite such suspension of warranty rights.

7. MISCELLANEOUS PROVISIONS

This agreement has been made in and shall be governed by the laws of the State of Arizona. All disputes arising under or relating to the purchase of the equipment shall be brought and resolved solely and exclusively in the State of Arizona, Pima County. These terms and conditions and the description of the Products on the reverse side hereof or in any proposal submitted herewith constitute the entire agreement and understanding of the parties concerning this sale and supersede all prior and contemporaneous agreements or understandings, inducements or representations, expressed or implied, written or oral, between the parties with respect hereto. Any term or provision of this Agreement may be amended, and any observance of any term of this Agreement may be waived, only by a writing signed by the party to be bound. The waiver by a party of any breach shall not be deemed to constitute a waiver of any other breach. Should suit be brought on this Agreement, the prevailing party shall be entitled to recover its reasonable attorneys' fees and other costs of suit including costs and attorneys' fees incurred on appeal or in collection of any judgment., errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

8. RESTOCKING FEE

All returns are subject to a restocking charge equal to 15% (fifteen percent) of the Invoice, unless the Goods are proven to be non-conforming by PACE Technologies.

Table of Contents

1.0	Product Overview.....	1
1.1	<i>Technical Specifications.....</i>	1
1.2	<i>Machine Diagrams and General Features</i>	2
1.3	<i>Head Operation and Features</i>	4
2.0	Equipment Handling & Setup	6
2.1	<i>Installation Requirements</i>	6
2.2	<i>Unpacking.....</i>	6
2.3	<i>Head Installation</i>	7
2.4	<i>Head, Spindle, and Sample Holder Adjustments.....</i>	8
3.0	Safety Guidelines.....	12
3.1	<i>Safety Precautions.....</i>	12
3.2	<i>Emergency Statement.....</i>	13
4.0	Start-Up, Operation, and Calibration	14
4.1	<i>Main Menu</i>	14
4.2	<i>Manual-Mode</i>	14
4.3	<i>Auto-Mode</i>	15
4.4	<i>Calibrations.....</i>	16
4.5	<i>Verticality Verification of Grinding Head's Spindle</i>	19
4.6	<i>Parallelism Verification of the Fixture and the Working Plate.....</i>	24
5.0	Maintenance.....	27
5.1	<i>Cleaning the Equipment.....</i>	27
6.0	Accessories & Replacement Parts	27
7.0	Sample Preparation Guidelines	28
8.0	Drawings	30
9.0	YouTube Video Tutorial	30
10.0	Additional Resources	30

1.0 Product Overview

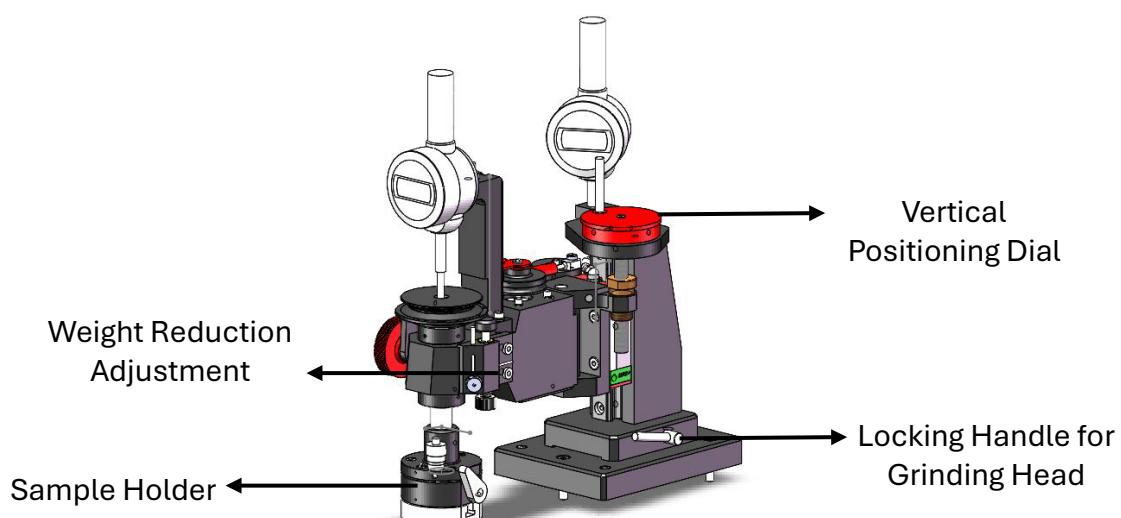
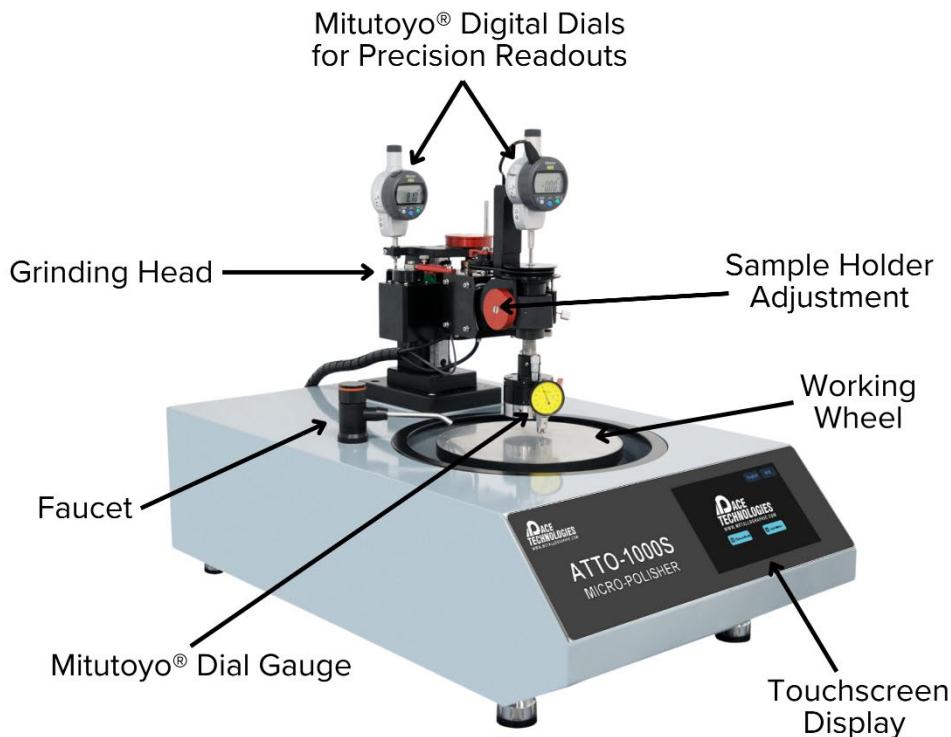
The ATTO-1000S delivers precise micron-level grinding and polishing. It is commonly used for optical lenses, semiconductor wafers, and both metal and non-metal crystals, ideal for SEM, FIB, and TEM analysis. Designed for parallel operations, it handles complex shapes with optional accessories.

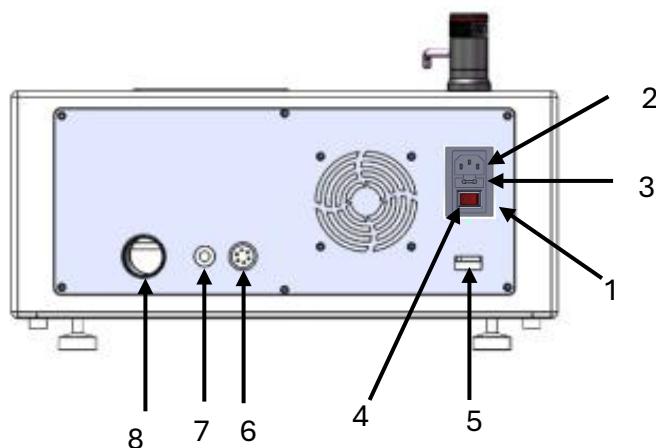
Monitor material removal in real-time or set a removal volume for unattended operation. Dual stepper motors independently control swing speed and range of the sample polishing head to enhance surface flatness, finish quality, and consumable efficiency.

1.1 Technical Specifications

Type		ATTO-1000S
Working Disk	Diameter	8"-10" (203/254mm)
	Speed	0-350rpm, continuously variable speed
	Direction	CW/CCW
	Power	750W
	Factory calibration	< 4µm
Sample Movement Head	Speed	0-150rpm, continuously variable speed
	Direction	CW/CCW
	Rotation	Yes, with adjustable range (semi-rotation)
	Oscillation	Yes, with adjustable range and speed
	Factory Calibration	Perpendicularity to the disk <4µm; parallelism <4µm
	Maximum Removal	10mm
Electricity	Power Supply	110V
	Panel	7-inch touch screen
Dimensions	WxDxH	700 x 430 x 580mm
	Weight	57kg

1.2 Machine Diagrams and General Features





- (1) Main power socket, 1.5 kW.
- (2) Main power cord socket.
- (3) Fuse socket, 10A, 5*20mm ceramic tube fuse.
- (4) Main power switch.
- (5) Data conversion interface for dial indicator.
- (6) Male connector with M19 thread.
- (7) Quick-plug water pipe with an outer diameter of 8mm, pressure <0.3MPa; pure water is recommended when polishing requirements are strict.
- 8) Drainage pipe, outer diameter 32mm.

1.3 Head Operation and Features

Vertical Positioning Dial

The vertical positioning dial knob (circled in green) is used to adjust the sample's height relative to the platen. Turning the dial clockwise raises the arm and sample; counterclockwise lowers them.

This dial also serves as the mechanical limit for how far down the sample can travel. The downward limit is reached when the spindle pulley makes contact with the arm. The rear digital gauge shows the vertical displacement in micron-level increments.

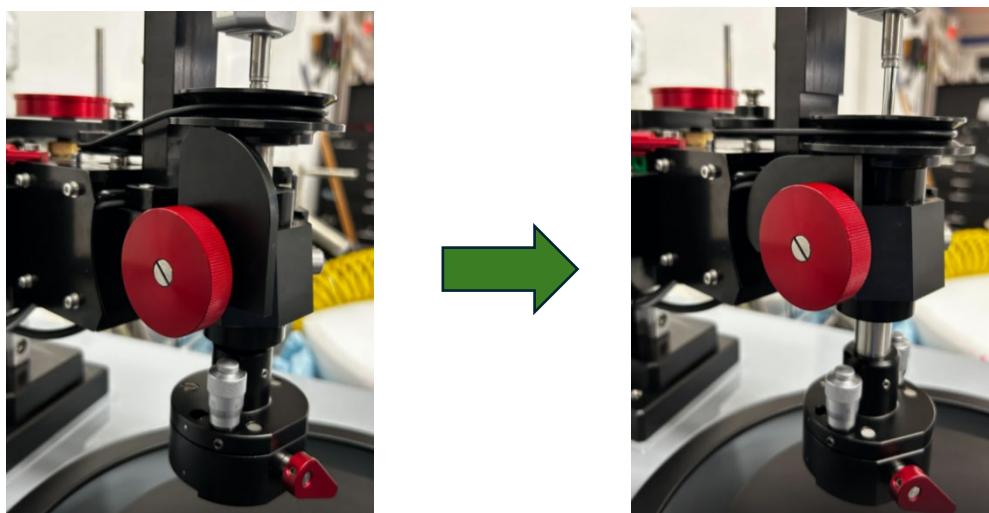


Spindle Lift Mechanism

Located on the left side of the arm (see figure below), the spindle lift mechanism allows you to elevate the spindle independently of the arm's vertical setting. This function is helpful for changing platens, swapping abrasives or cloths, or removing the sample/sample fixture for inspection. To engage, rotate the knob forward until the flat section of the fin contacts the base of the spindle pulley (Figure 7).

At this point, the sample can be removed, or the arm can be repositioned. When work resumes, lowering the spindle via the same mechanism restores the sample to its previous height, as the main vertical dial remains unchanged.

Note: If a different platen or abrasive thickness is used, the front digital gauge may display a variation.



Adjusting Sample Load and Pressure

The spindle applies up to 700 grams of downward force without a fixture. Once a fixture and sample are added, the total load will vary depending on their weight. Because of that, the scale should be used as a general reference rather than a precise measurement.

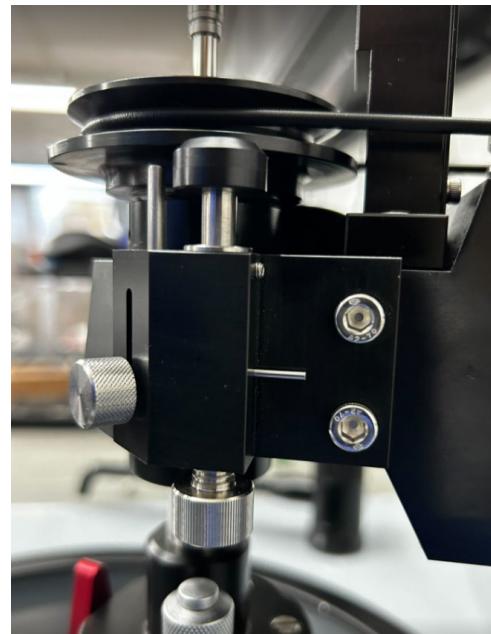
For sensitive applications, it is often helpful to reduce the applied load. You can do this by turning the knurled adjustment screw

It is also important to consider the surface area of a sample. Even with the same total load, smaller contact areas will result in higher pressure. To avoid damage, especially with delicate or small samples, a lighter load is usually recommended.

The images below illustrate the sample head's load adjustment:



Max. Load (screw lowered fully)



Min. Load (screw lowered, raised)

2.0 Equipment Handling & Setup

2.1 Installation Requirements

Install the unit carefully! Before installing the equipment, ensure the following requirements are met:

- (1) Power socket: 110V, power: 1.5Kw, well grounded.
- (2) Cooling water (or piped tap water), the outer diameter of the inlet pipe is 8mm. Equipped with a connector with a G1/2 thread, the outlet pipe can be installed by connecting a valve with a female G1/2 thread.

The ATTO-1000S must be installed on a dedicated, stable, and secure workbench. Ensure that the bench surface measures at least 800 mm (width) by 530 mm (depth), with a minimum clearance of 680 mm in height. All four base feet must rest evenly to guarantee proper stability and operation.

2.2 Unpacking

The unit is delivered in a two-part hard case, the polishing head is located on the top compartment, and the base is in the bottom compartment.

Unfasten both sides of the top case and set it on a stable surface; this will reveal the base of the polisher.



Polishing head and accessories

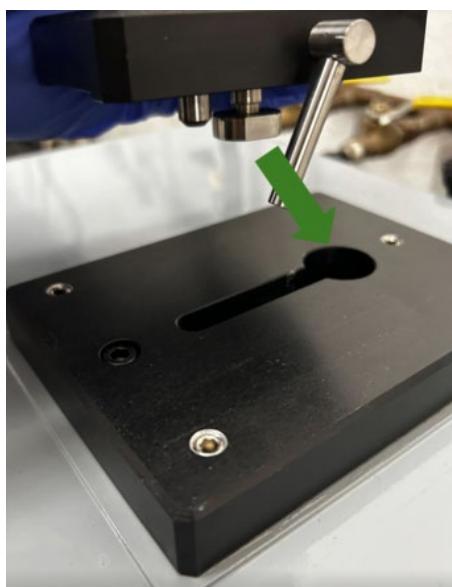
Polishing base

2.3 Head Installation

Place the polisher base in the desired work area, unpack the ATTO-1000S head and accessories.

Note: Ensure both the underside of the ATTO-1000S head and the top surface of the leveling plate are free of debris before installation.

While viewing the base of the head, rotate the attached lever and observe the movement of the locking plunger. Adjust the lever until the plunger is fully extended. Carefully position the ATTO-1000S head onto the leveling plate of the base unit, aligning the plunger with the designated slot (see below).



Slide the head forward until the front edge is forward, then firmly tighten the cam-lock lever to secure the head in place.



The screws on the leveling plate are fastened to the base with three stainless steel socket head cap screws. These are used to align the spindle of the ATTO-1000S head so that it is perpendicular to the polishing platen. See later pages for alignment calibration.

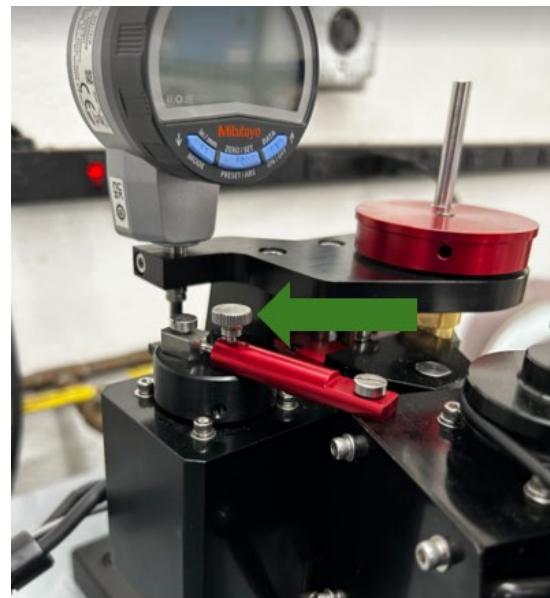
Once the head is securely mounted, connect the electrical cable. Before doing so, confirm that the power to the ATTO-1000S system is turned off. Plug the head's cable into the receptacle located on the rear of the base. The connector is keyed—align it properly before inserting.

2.4 Head, Spindle, and Sample Holder Adjustments

Oscillation

1. Adjusting the Sweep Range:

To set how far the sample will move during oscillation, first loosen the thumbscrew on the pulley oscillator, slide the dovetail bar so that the drive pin shifts closer to or farther from the center of the hub. Moving it inward reduces the distance covered during oscillation; while moving it outward increases the sweep area.

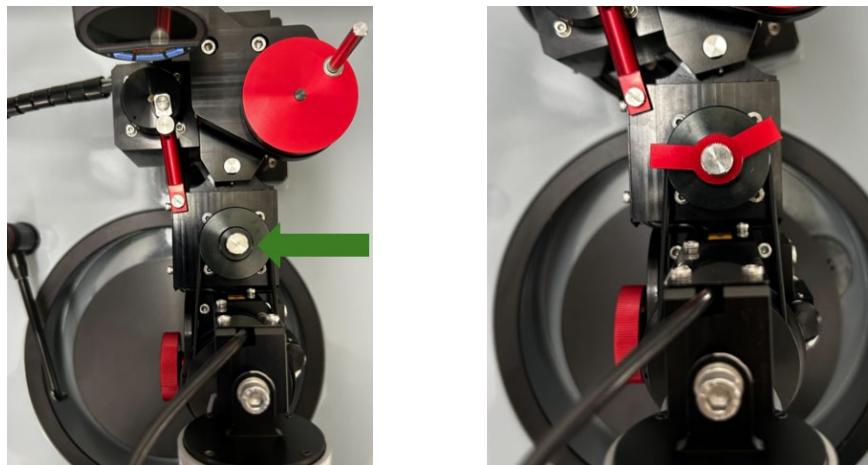


2. Setting the Sample Holder Rotation Range:

The sample holder's rotation can be limited when using the "Semi-Rotate" function:



This will then need to be followed by the installation and adjustment of the magnet stoppers.



The positioning of them relative to each other will determine the range of the polishing head:

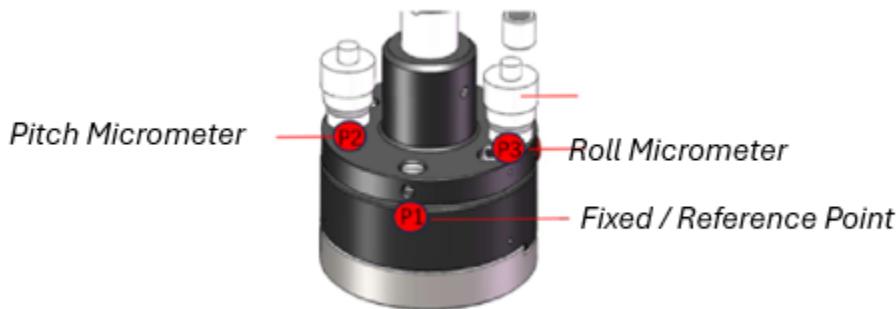


Tip: When swapping out platens or abrasives, you may need more clearance. Simply loosen the position thumbscrew and swing the arm to the right. It will lock into place with the built-in magnet, giving you easier access to the working area.



Pitch and Roll Adjustments of the Sample Holder

The sample holder can be pitched forward/back and rolled left/right, with the two micrometers located on it.



Roll: To correct side-to-side alignment, use the micrometer at the right rear of the hub (P3). Turning it clockwise lowers the right side of the fixture; counterclockwise raises it.

Pitch: For front-to-back adjustments, use the micrometer at the front left (P2). Rotate clockwise to lower the front edge, and counterclockwise to raise it.

These micrometers are positioned 90 degrees apart from a fixed pivot element (P1). The system is spring-tensioned, allowing continuous pressure between the spindle hub and the angular adjustment plate. The pivot component maintains a fixed distance between these two elements, serving as a reference for angular corrections.

Each division on the micrometer is 0.02 degrees:



A small gap between the spindle hub and the spring-tensioned angle plate enables these adjustments. This gap is preset to support pitch and roll movements within a range of approximately +10° to -2.5°. If additional angular range is needed, the gap can be widened, but doing so will shorten spring longevity.

Sample Holder Fixture Attachment

Fixtures are secured to the lower plate of the sample holder, which is located at the base of the spindle. Each fixture features a standardized U-shaped cutout for consistent placement. The flat side of the fixture should be aligned against the machined reference surface positioned just behind the cam-lock mechanism (see Figure 8).

To install the fixture:

1. Use the spindle lift mechanism and vertical adjustment dial to give yourself clearance for the fixture selected
2. Slide it into place on the base plate until it rests fully against the reference edge.
3. Ensure the fixture engages with the spring-loaded cam-lock pin.
4. Secure the assembly by turning the lock lever until it is firmly locked.

3.0 Safety Guidelines

3.1 Safety Precautions

Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the ATTO-1000S.

Proper operator training is recommended for the safe operation of the ATTO-1000S. Any unauthorized mechanical and electrical change, as well as improper operation, can void warranty claims. All service issues need to be reported to the manufacturer/supplier.

Please observe the following safety guidelines at all times:

1. Read the Manual Thoroughly

Before using the device, all users must read and understand the operation manual. Improper use or failure to follow the manual may result in equipment damage or personal injury and is not covered under warranty.

2. Electrical Safety

Ensure the power socket is grounded and rated for the specified power requirement of the equipment (110V or 220V).

3. Avoid using impure water. Ensure all plumbing is correctly connected to prevent leaks or electrical hazards.

The water faucet is designed to adjust the flow, to stop it completely. When pausing water need, use the equipment's digital controls to stop water flow.

4. Mechanical Hazards

Never touch the spindle, grinding head, or rotating parts while the machine is in operation. Always ensure the fixture is securely locked before beginning any process.

5. Routine Maintenance

Operators should follow the recommended maintenance routines to ensure safe and efficient operation (e.g., cleaning debris, inspecting noise, and belt tension).

6. Emergency Stop

Be familiar with the location and function of the Start/Stop controls. In the event of abnormal noise, vibration, or malfunction, immediately halt operation and disconnect power.

7. Personal Protective Equipment (PPE)

Always wear protective eyewear, gloves, and a lab coat when operating or performing maintenance on the equipment.

3.2 Emergency Statement

In the event of an emergency involving the ATTO-1000S, operators must act quickly and follow the procedure below to ensure personal safety and prevent equipment damage:

1. Immediate Shutdown

- Press the “Start/Stop” button on the touchscreen interface to immediately halt all grinding or polishing operations.
- Switch off the main power supply at the rear panel (Main Power Switch) to cut electrical power to the unit.
- If water is in use, turn off the cooling water supply at the inlet valve to prevent flooding or leaks.

2. Evacuate the Area if Necessary

- If there is visible smoke, burning odor, water leakage near electronics, or suspected electrical failure, evacuate the immediate area.
- Do not touch any part of the machine if it is wet or sparking.

3. Report the Incident

- Notify your lab supervisor or safety officer immediately.
- Clearly describe the situation (e.g., overheating, electrical failure, abnormal noise, or unexpected motion).

4. Medical Assistance

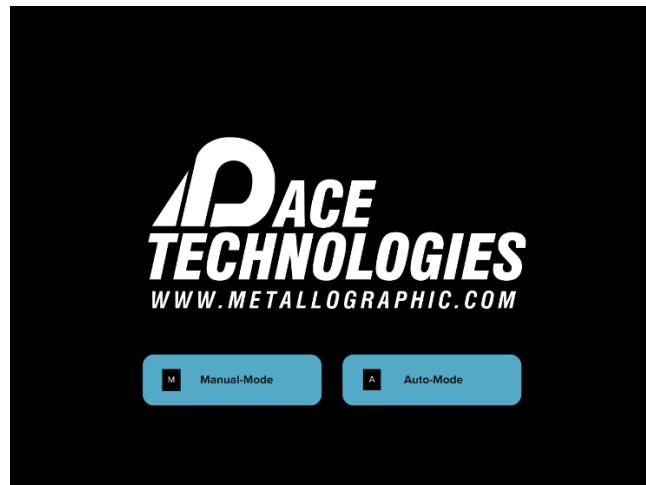
- If an injury occurs (e.g., burn, cut, or electric shock), seek first aid immediately and call emergency medical services if needed.
- Provide the operator’s manual or safety data if requested by medical personnel.

5. Post-Incident Action

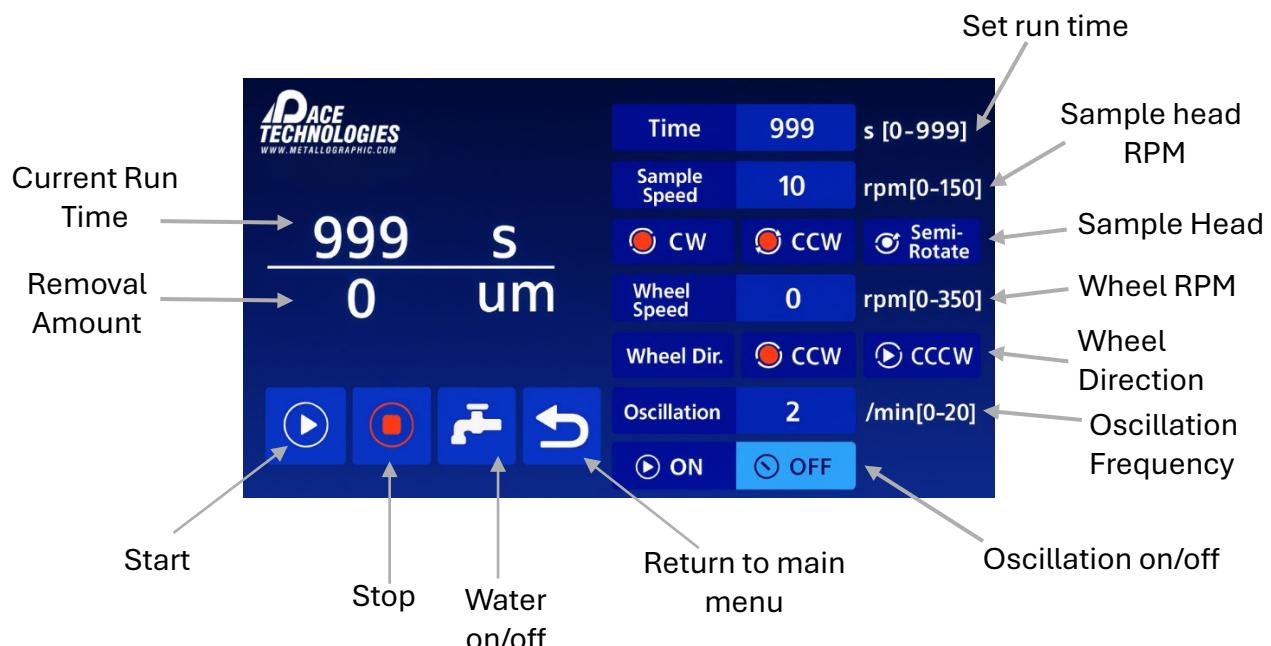
- Do not attempt to restart or repair the unit until it has been inspected and approved by qualified personnel or the manufacturer.
- Document the incident, including photos if applicable, and submit a safety report according to your organization’s protocol.

4.0 Start-Up, Operation, and Calibration

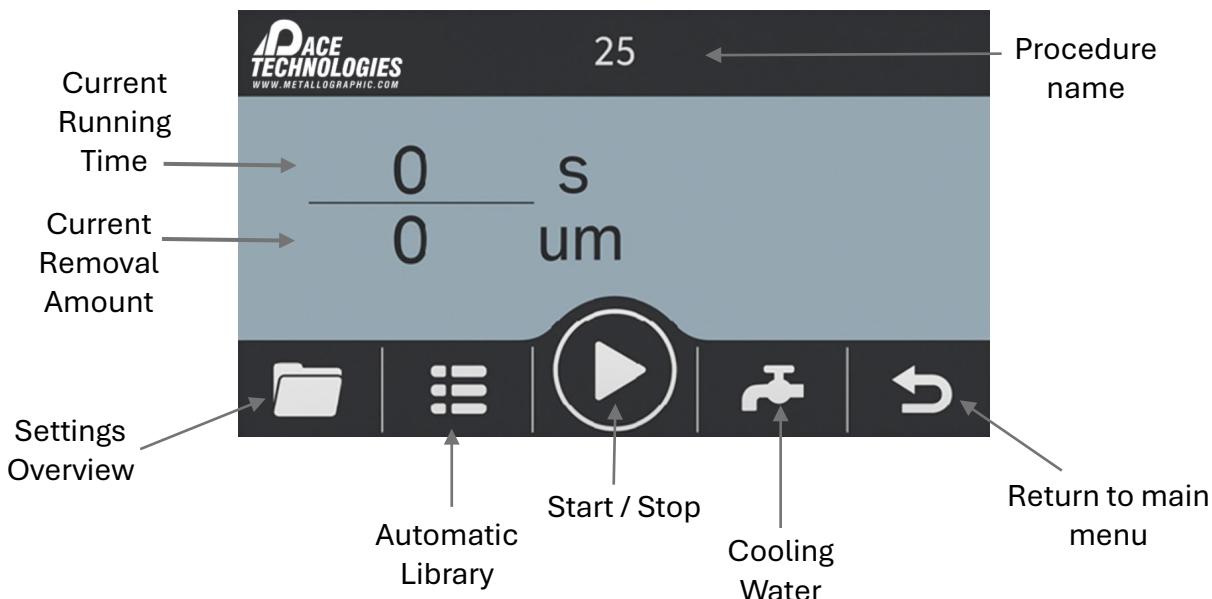
4.1 Main Menu



4.2 Manual-Mode

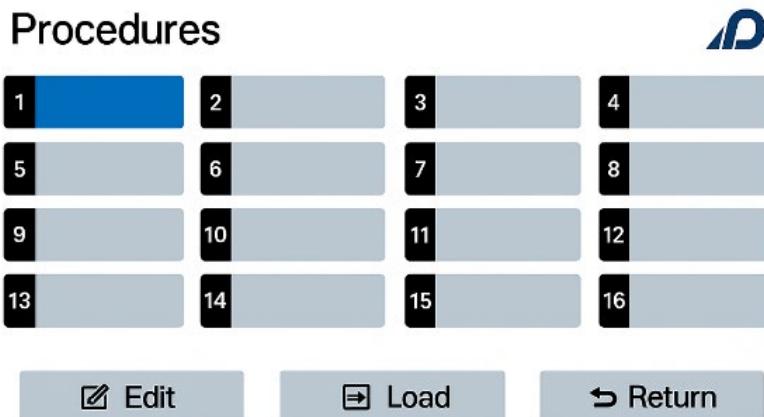


4.3 Auto-Mode



Auto-Mode Automatic Library

The Automatic Library can store 16 groups of different parameters. These parameters can be edited within the library and then loaded to load specific parameters for different applications or processes.



4.4 Calibrations

Calibrating the system ensures that both perpendicular and parallel reference surfaces are properly set before securing any samples. Because adjustments may be required during operation for different sample types or preparation goals, it's important to have a reliable method for recalibrating when needed.

The frequency of calibration depends on how frequently the system is used. While usage patterns vary, we strongly recommend performing a calibration check before beginning any new sample preparation. The process is efficient, typically taking only a few minutes, and plays a key role in maintaining consistent accuracy.

The head and base assemblies are manufactured to tight mechanical tolerances. Consistent calibration relies heavily on the cleanliness of the platen and its supporting surfaces. These components should be thoroughly cleaned and dried after each use to maintain optimal precision.

The calibration procedure involves three steps:

1. Verifying platen run-out
2. Calibrating the spindle to ensure perpendicular alignment with the platen
3. Calibrating the sample holder assembly so it maintains a parallel reference with the platen surface

Each unit is factory-calibrated prior to shipment, but it's best practice to verify calibration during installation using the procedure outlined in the setup guide in the following pages.

At the beginning of the alignment process, it's essential to verify that the platen's vertical runout (its up-and-down movement during rotation) stays within 5 µm.

Any debris or contamination on either the bottom of the platen or the platen base can affect this measurement and compromise proper alignment.

- (1) Secure the dial indicator (model 513-401-10) onto the designated fixed bracket for calibration.



Mitutoyo Dial Indicator



*Fixed bracket for the
Dial Indicator*



*Fixed bracket installed
on dial*



*Parallel Adhesive
Fixture's hole where
fixed bracket is
installed*



*Turn the spindle lift
mechanism, and attach
parallel adhesive fixture*



*Install the fixed bracket
in the hole of the
fixture*



Tighten the set screw



*Angle the carbide tip as
above*



Lower the spindle lift mechanism, there should be no contact between the needle of the dial and working wheel yet.



Turn the dial of the grinding head and lower the assembly until the dial tip makes contact, zero the dial and prepare to observe for run out

- (2) Select Manual Mode.
- (3) Set the sample rotation speed to 0 RPM, set the working plate speed to 50 RPM, and turn oscillation off.
- (4) Click Start to begin operation; initiating rotation of the working plate.
- (5) Ensure wheel run-out is less than 5µm.

If vertical runout exceeds 5µm, inspect the contact surfaces between the platen and the base for any debris, corrosion, or other contaminants. Clean the surfaces as necessary to ensure proper contact.

Note: Both the platen and platen base are precision-machined surfaces, but each may have a slight variation of 3–4 µm. The way the platen is positioned on the base can influence the total runout. For instance, if the thicker portion of the platen aligns with the higher side of the base, the resulting runout would add up their variations, compounding the overall runout.

4.5 Verticality Verification of Grinding Head's Spindle

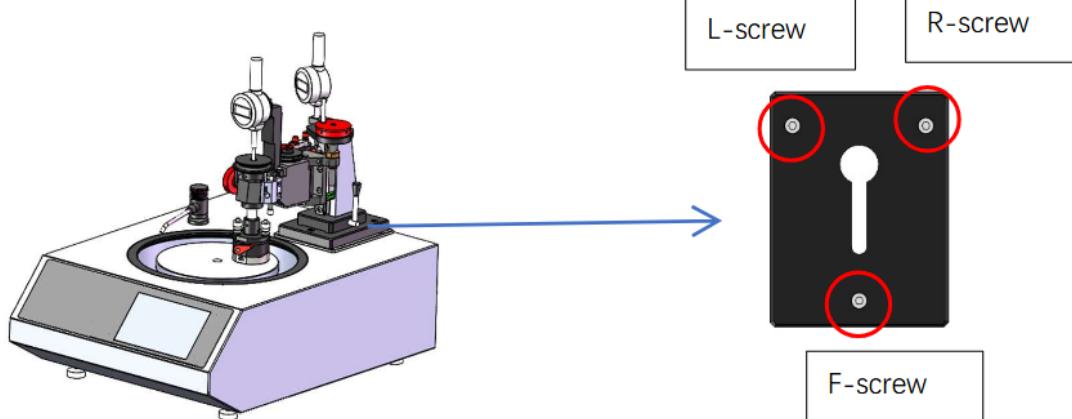
Aligning the vertical spindle is essential to ensure the rotation axis is perpendicular to the platen surface.

This alignment helps maintain full contact between the sample and platen throughout the rotation, preventing wedging and keeping the sample surface parallel to the platen.

Spindle vertical correction should be performed only if the wheel's run-out is within acceptable limits.

Adjustment is done with three screws, which secure the sample head to the base unit, and we call these screws:

L-screw, R-screw, and F-screw.



If the run-out of the working wheel does not exceed 4 μm , proceed with the steps on the following page.

Preparing the sample holder:

Turn the spindle lift to raise the spindle of the grinding head



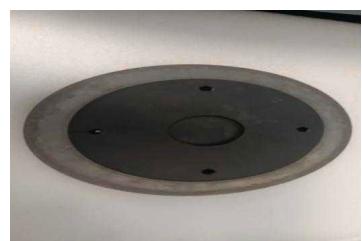
Loosen the connecting rod and hand-tighten the locking screw



Move the grinding head to one side



Remove the working wheel



Wipe the support platen and working wheel with alcohol and a lint-free cloth



Match the working wheel hole with the limit pin of the supporting disk and install working wheel

- (1) Press Manual Mode
- (2) Set the sample speed to 10 RPM and set the working wheel speed to 0 RPM.
- (3) Move the grinding head to the position below:



Move the grinding head into the measuring range for correction

Perspective Definition

Front View



Right View



Rear View



Left View

Rear View Calibration and Adjustment:

There should be no more than 5 μm of variation between the front view and rear view, and the same relationship between left and right view positioning.

To correct the gap error between the front and rear pointer views, turn off wheel RPMs, turn off oscillation, and set the sample speed to 10 RPM. Follow the steps in the table below (next page):

Step		Description
1		Rotate the sample holder and stop it when the rear-view position is reached.
2		Adjust the vertical positioning dial to lower the sample head, and let the gauge needle touch the wheel. Last, adjust the readout to 70.
3		Rotate the sample holder and stop at the front position. Remember the direction of the gauge needle during the rotation of the holder.
4		If the needle swings counterclockwise: Note the current number of the needle. Gradually tighten the F-screw until the needle moves to the opposite symmetrical position. For example, if the current number is 40, then the symmetrical number is 40.
		Vice versa, if the needle swings in this clockwise direction; slowly loosen the F-screw until the needle moves to the symmetrical number.

Repeat steps 1 to 4 until the offset value is less than $4\mu\text{m}$ between the Front and Back positions.

Follow the steps below to calibrate the Left and Right view positions:

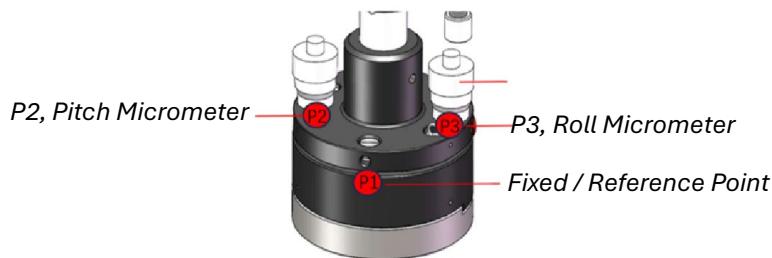
Step		Description
1		Rotate the sample holder and stop it when the Right view position is reached.
2		Rotate the grinding head handle to lower the sample head, and let the gauge needle touch the wheel. and adjust the readout to 70.
3		Rotate the sample holder and stop at the Left view position. Remember the direction of the gauge needle during the rotation of the holder.
4		If the needle swings counterclockwise: Slowly loosen the R-screw until the needle is back to 70.
		Vice versa, if the needle swings in this clockwise direction; slowly tighten the R-screw until the needle is back to 70.

4.6 Parallelism Verification of the Fixture and the Working Plate

The micrometer heads on the micro-hub assembly are used to tilt or adjust the sample by modifying its angle relative to the platen surface. This adjustment is helpful when surface irregularities are introduced by mounting wax, uneven potting, packaging, or tape.

Using the parallel polishing fixture, the micrometer heads allow for precise alignment to ensure the sample surface is parallel to the reference plane. Proper alignment also ensures the full angular range of movement is available during polishing.

The following pages demonstrate how to align the micrometer heads, to ensure the sample holder is parallel.



(If proceeding from previous calibrations) Remove the Parallel Adhesive Fixture by unlocking the red handle, and clean the base surface of the fixture.



Red handle unlocked

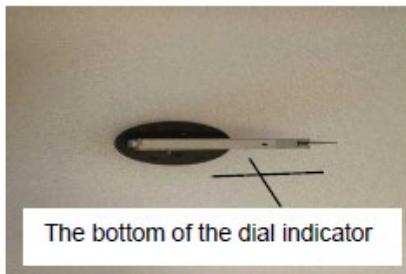


Remove the fixture and clean the surface with acetone and glue remover. After cleaning, install the fixture back and lock the red handle.

Paste Mitutoyo Dial Indicator:



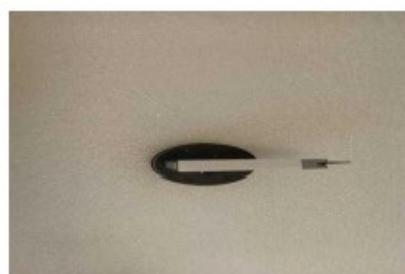
Double sided tape



Dial indicator



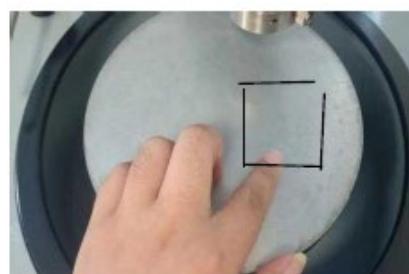
Cut a piece of double sided tape



Paste it on the bottom of the dial indicator



Peel off the protective layer of double sided tape



Paste position of dial indicator



Attach the bottom surface of the dial indicator downward



Tilt the micrometer pointer and body up 45°

Procedure for Vertical Calibration:

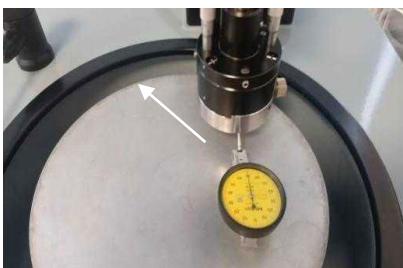
Set sample head speed to 10 RPM, working wheel to 0 RPM, and oscillation off.



Lower the spindle lift mechanism



Turn the lifting handwheel of the grinding head counterclockwise to make the fixture contact the tip of the dial indicator



Position the sample holder reference point (P1) over the dial needle



Lower the grinding head until the dial needle and parallel fixture make contact, and zero the dial to a reference point



Rotate the spindle of the grinding head, until under a micrometer (P2 or P3)



Adjust the micrometer precisely until the dial indicator needle aligns with the reference point

Rotate the grinding head spindle one full revolution. If the dial indicator needle deflects less than 2 µm, the setup is considered acceptable. If the deflection exceeds 2µm, repeat the procedure above until the deflection meets the specified tolerance.

Factory Micrometer Calibrations:

P2: _____

P3: _____

5.0 Maintenance

5.1 Cleaning the Equipment

Frequency	Content
Once a day	Wipe off any water stains from the equipment surface. Rinse or scrape away debris from the disc. Clear any surrounding debris, then shut off the water and power supply.
Once a week	Inspect and clean any clogged downspouts. Verify that all panel buttons function properly. Check for excessive vibration on the working surface and listen to any unusual noises during operation.
Once a year	Check the tension belt and inspect the spindle bearing for abnormal noise. Listen to unusual sounds from the motor and examine components for signs of wear.

6.0 Accessories & Replacement Parts

Type	Part Number	Image
Parallel Adhesive Fixture	ATTO-1000	
Teardrop Fixture	ATTO-1001	

Multipurpose Fixture	ATTO-1002	
Cross-Section & Clamping Fixture	ATTO-1004	
Cross-Section & Adhesive Fixture	ATTO-1005	
8-inch Working Wheel	PW-ATTO-8	
10-inch Working Wheel	PW-ATTO-10	
Rubber Drive Belt	ATTO-O-RING	

7.0 Sample Preparation Guidelines

Coarse Material Removal (Greater than 75 µm)

For larger-scale grinding operations, where more than 75 microns of material must be removed, use fixed abrasive discs with grit sizes of **6 microns or coarser** in combination with the **rear digital indicator**.

Procedure:

1. Place the selected abrasive disc on the platen surface.
2. Mount the fixture and sample securely. Adjust load settings as necessary.

3. Turn on the water flow and set the platen to the desired rotation speed.
4. Gradually lower the arm using the vertical positioning dial until the sample lightly contacts the abrasive.
Contact can be identified by sound or visible abrasive wear.
5. Zero the rear digital indicator. Engage rotation and oscillation if needed. Use the vertical dial to lower the arm to the intended removal depth, as read on the indicator.
6. Allow grinding to proceed until the sample rests on the mechanical stop, halting further advancement.
7. Raise the spindle using the sample riser mechanism. Clean and inspect the sample under a microscope to verify material removal.
8. Once confirmed, replace the abrasive with the next step and repeat as necessary.

Fine Material Removal (Less than 75 µm)

For high-precision polishing of smaller surface areas (under 20 mm²), diamond lapping films of **3 microns or finer** are preferred, and the **front digital indicator** should be used.

Procedure:

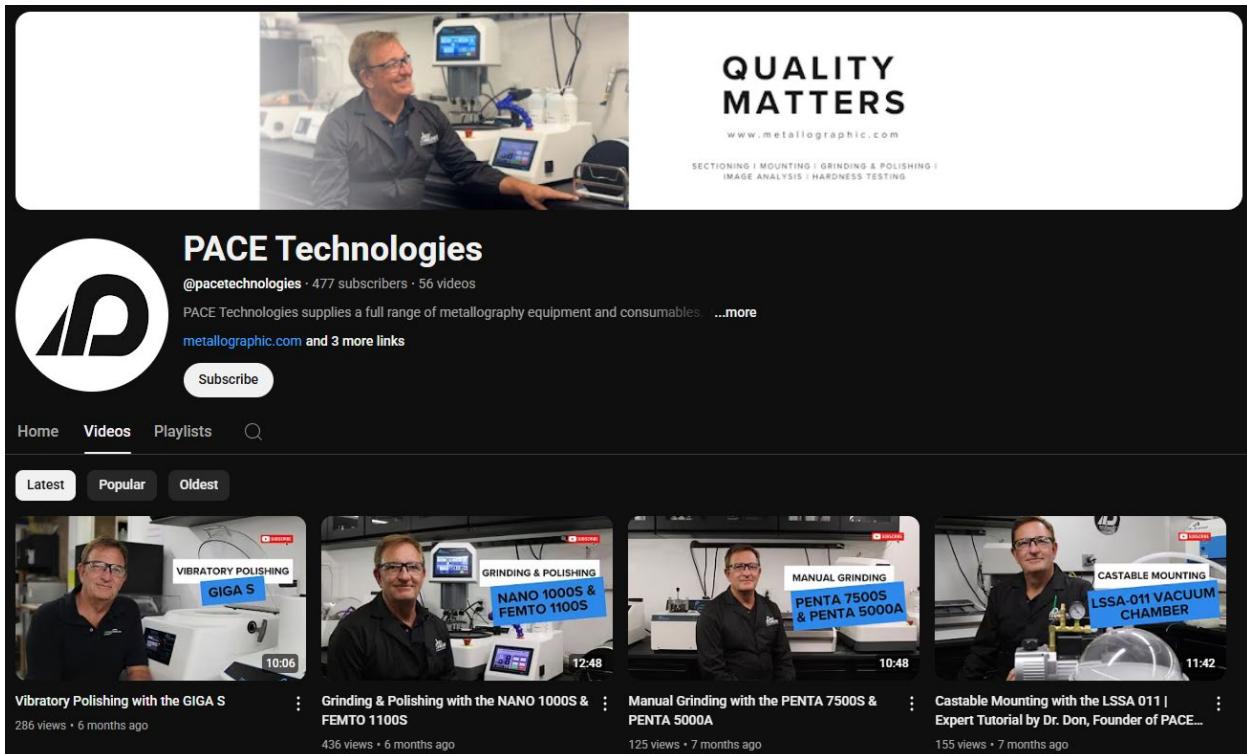
1. Apply the chosen fine abrasive film to the platen.
2. Secure the sample and fixture to the head, adjusting load as needed.
3. Raise the spindle riser to ensure no contact between sample and abrasive, then zero the front indicator.
4. Lower the arm slowly until the sample touches the abrasive, and stop when the display reads 100–150 microns more than the desired removal depth.
5. Raise the spindle again using the riser.
6. Start water flow and rotate the platen at a low initial speed (e.g., 10 RPM).
7. Lower the sample onto the abrasive via the riser, then zero the front indicator again.
8. Increase platen speed to your target setting. The indicator will reflect live material removal.
9. Once the desired amount of material has been removed, lift the sample using the riser.

8.0 Drawings

Electrical and mechanical drawings are available upon request. Please contact us at pace@metallographic.com.

9.0 YouTube Video Tutorial

YouTube Tutorials at [youtube.com/@pacetechnologies](https://www.youtube.com/@pacetechnologies) or click on the image below:



10.0 Additional Resources

Scan the QR code below for updates, tips, and industry insights:



Follow us for updates!

