Polisher Training Notebook

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University of California, Riverside

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Before you begin…

- ❑ Complete the required safety training modules on UC Learning
  - ❑ Laboratory Safety Fundamentals
  - ❑ Hazardous Waste Management
  - ❑ Compressed Gas Safety
- ❑ Submit a copy of your Training Transcript to Lab Manager
- ❑ Review the MSE Policies and Regulations
- ❑ Fill out the MSE 150, 250, 309 FAU Authorization Form with PI signature
- ❑ Provide your ENGR username to Lab Manger to set up Faces account
- ❑ Arrange a time for training with Lab Manager
- ❑ Schedule your reservation on Faces for your training

Allied MetPrep 3 Polisher Operation

I. Polisher Layout

II. Control Panel

III. Grinding

IV. Polishing

V. Cleaning Samples

VI. Powerhead Positioning

VII. Manual Polishing

VIII. Semiautomatic Polishing

IX. Adjustable Parameters

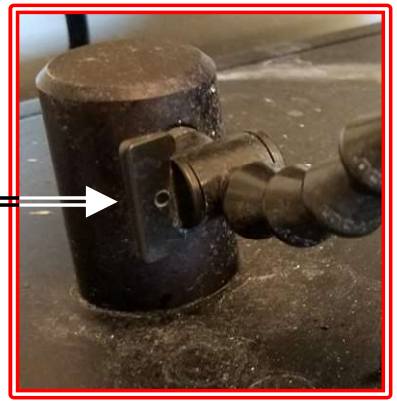
X. Individual Force Setup

XI. Central Force Setup

XII. Cleanup

I. Polisher Layout – 1/3

Perpendicular = Off
Parallel = On



Emergency Stop

Power Head

Handle

Water Nozzle

Platen

Release Latch

Positioning Lever

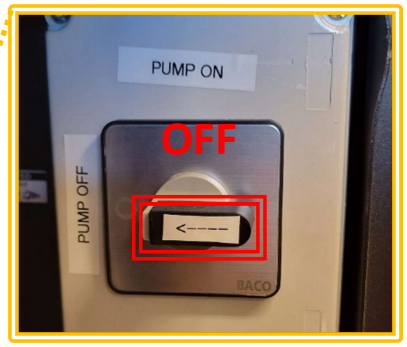
Sample Holder

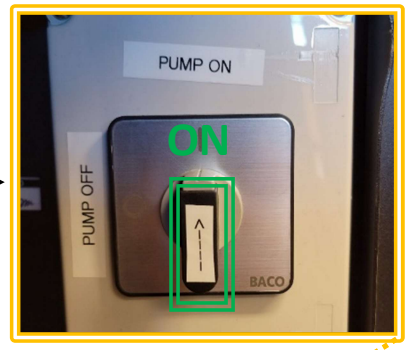
Control Panel

I. Polisher Layout – 2/3

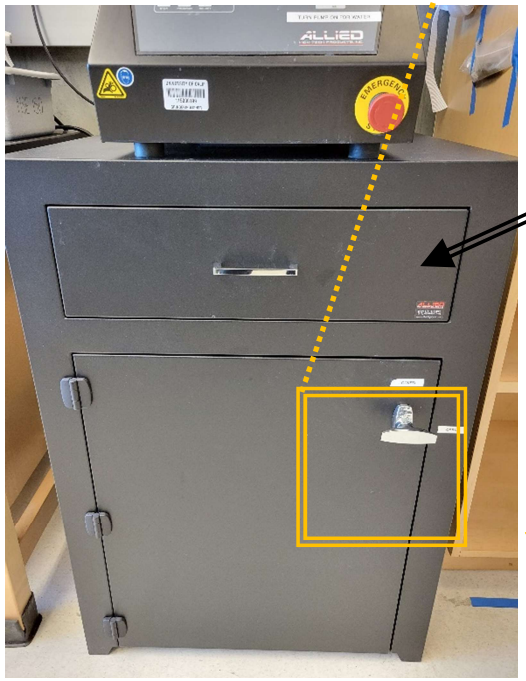
Water Dispensing requires pump to be turned on first!

Turn Knob to **"Pump On"** if water is needed





Remember to **Turn Knob** to **"Pump Off"** when finished!

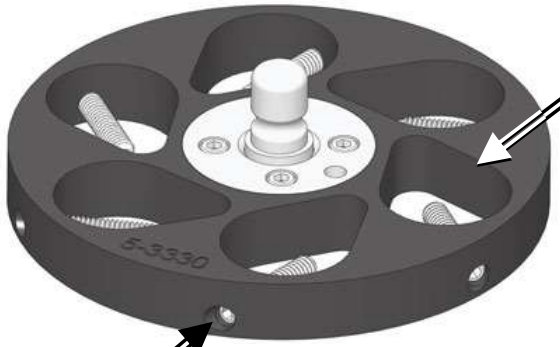


Coffee Filter

Strainer

I. Polisher Layout – 3/3

Sample Holder for
Central Force (CF) - ***Grinding***

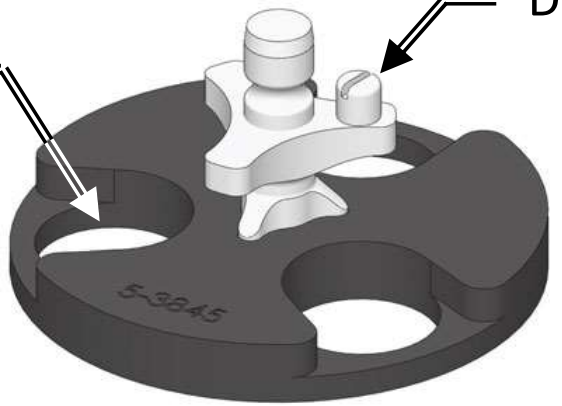


1.25” (25 mm)
Sample Size

Set-screws
for Sample

Sample Holder for
Individual Force (IF) - ***Polishing***

Drive Pin



Sample Loading/Unloading Fixture

II. Control Panel – 1/2

Jog: Activates and deactivates ***Platen*** rotation
- used to clean platen or to apply diamond suspension
- also used to rotate ***Platen*** for manual grinding/polishing

Water: Activates and deactivates water
- will override any setting for water in automatic operation

Stop: Deactivates every function during operation

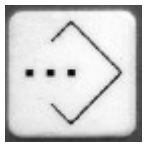
Start: Activates the step toward which the arrow is pointing on display

Emergency Stop: Shuts off all power and stops operation of machine
- use only during EMERGENCY to prevent injury to operator or damage to instrument
- turn clockwise on red knob to restore power

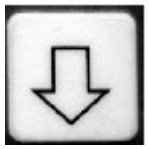
II. Control Panel – 2/2

Step: Accesses the ***Step Menu***
- steps will be displayed
- selection arrow designates desired ***Step***

Program: Used to program individual parameters within each ***Step***



Select: Used to toggle selection arrow in display windows
- navigate to different screens
- select ***Step*** for programming



Arrows: (***Jog Mode***) will increase and decrease ***Platen Speed***

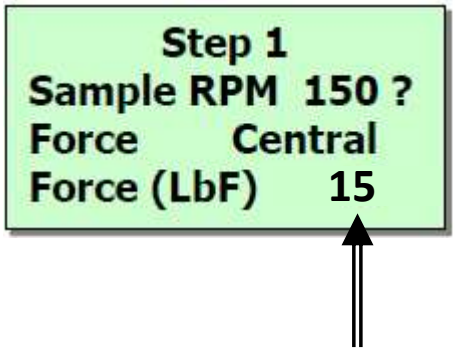
(***Step Parameters***) will scroll up and down and change parameters to desired value

III. Central Force Holder Settings – 1/1

1. Perform ***Grinding*** FIRST to:
   - Remove any deformation left over from the sectioning
   - Expose specific regions in the sample from the bottom of the ***Sample Mount***

2. Use the ***Central Force*** functionality for ***Grinding*** with ***Central Force Holder***

3. Speed (most commonly used settings):
   - ***Platen Speed*** = 200 – 300 RPM
   - ***Sample Speed*** = 150 RPM



Total Force if ***Force*** = ***Central***

4. Force (most commonly used settings):
   - For 1.25” (32 mm) Sample Mount: 4 – 6 LbF (per sample)
   - E.g. 3 Samples -> 12 – 18 LbF ***Total Force***
   - E.g. 6 samples -> 24 – 36 LbF ***Total Force***

5. Abrasive:
   - 8” Silicon Carbide Paper are provided in 180, 320, 600, and 1200 Grit

IV. Individual Force Holder Settings – 1/1

1. Perform ***Polishing*** AFTER ***Grinding*** to:
   - Remove scratches from grinding and any metallurgical deformation

Step 1	
Sample RPM	150 ?
Force	Single
Force (LbF)	5

2. Use ***Individual Force*** functionality for ***Polishing*** with ***Individual Force Holder***

3. Speed (most commonly used settings):
   - ***Platen Speed*** = ***Sample Speed*** = 150 RPM

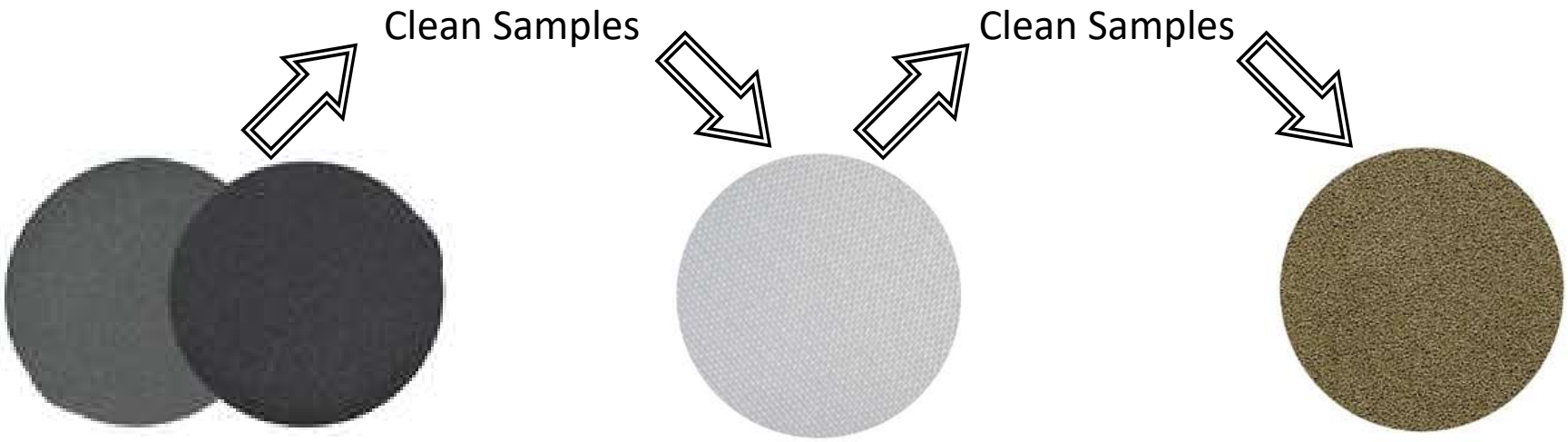
4. Force (most commonly used settings):
   - For 1.25” (32 mm) Sample Mount: 4 – 6 LbF (per sample)

5. Polishing Cloth + Abrasives:
   - ***Polishing Cloths*** for specific ***Abrasives*** are provided
   - ***Polycrystalline Diamond Suspensions***:
     3 μm, 1 μm, 0.5 μm, and 0.05 μm are provided

Note: Only use the designated Suspensions with the designated Polishing Cloth!

V. Cleaning Samples – 1/1

1. Samples MUST be cleaned after every ***Grinding*** and ***Polishing*** step



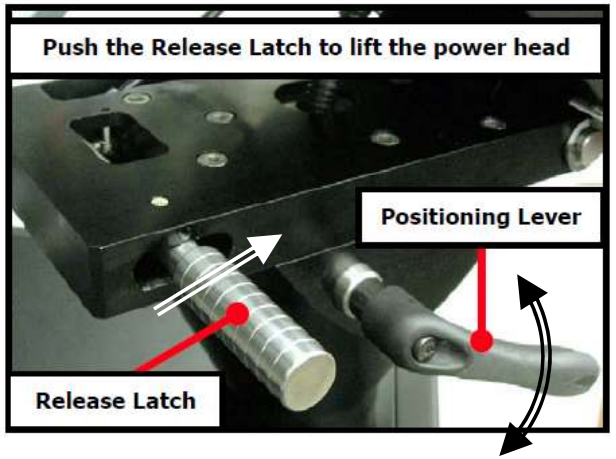
2. Failure to properly clean each ***Sample*** before next step will transfer ***Abrasive Particles*** onto subsequent ***Grinding Paper*** and ***Polishing Cloth***

   Note: If Polishing Cloths are CONTAMINATED, they must be replaced $$$

3. Remove the ***Sample Holder*** to clean BEFORE switching ***Grinding Paper*** or ***Polishing Cloths*** to avoid contamination

VI. Powerhead Positioning – 1/1

1. Loosen the ***Positioning Lever*** to adjust and swivel the position of the ***Powerhead***



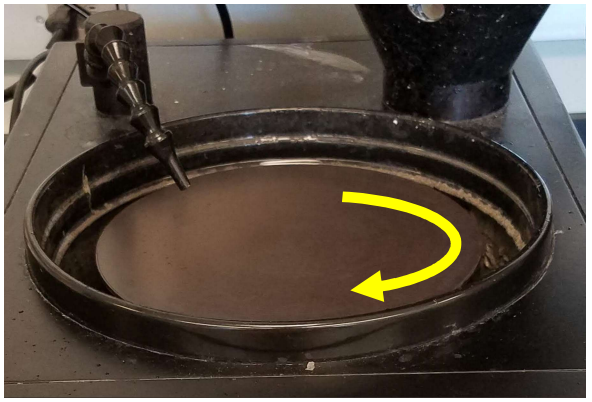
2. Push the ***Release Latch*** to lift up the ***Powerhead***

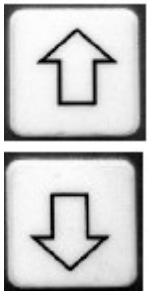
3. Use the ***Powerhead Handle*** to raise and lower the ***Powerhead*** and adjust position

VII. Manual Polishing – 1/1

1. Press the ***Jog*** button  to initiate ***Manual Grinding*** using the ***Platen*** only

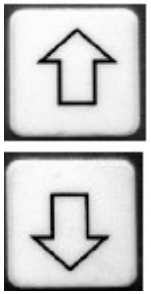
2. During this operation, the ***Platen*** always rotates ***clockwise***

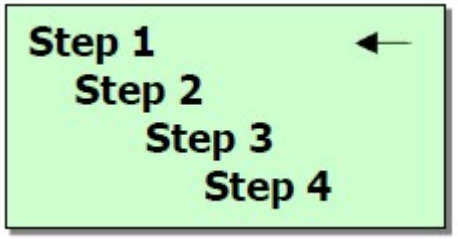


3. Press the ***Up*** and ***Down*** arrows  to change the ***Platen RPM***

4. Press the ***Water*** button  to stream water onto the ***Platen***

VIII. Semiautomatic Polishing – 1/1

1. Press the ***Steps*** button  to program ***Semiautomatic Polishing*** parameters
2. Press the ***Up*** and ***Down*** arrows  to scroll to desired ***Program Step***



3. Press ***Select*** button  to enter settings menu
4. To change the value of any setting,
   scroll to that parameter and press the ***Program*** button 
5. A "**?**" will appear next to parameter and can be changed
   using ***Up Down*** arrow buttons

6. Press ***Program*** button  to set into memory

IX. Adjustable Parameters – 1/2

- **Sample RPM**: displays rotation speed of ***Sample Holder***
  - variable between 0 and 150 RPM {with 10 RPM increments}

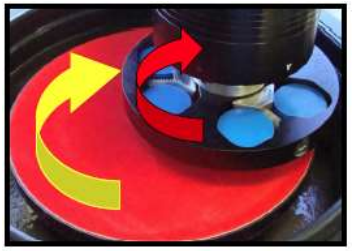
- **Force**: allows toggling between ***Central Force*** and ***Individual Force*** modes

- **Force (LbF)**: (***Central Force***) will display ***Total Force*** acting on sample holder

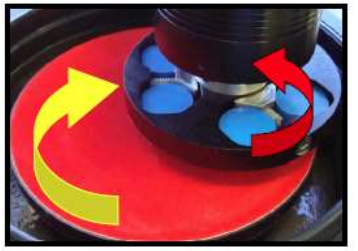
  (***Individual Force***) will display the ***Individual Force*** acting on each sample

- **Platen RPM**: displays rotation speed of ***Platen***
  - variable between 40 and 600 RPM

- **Mode**: ***Comp*** = indicates ***Platen*** and ***Sample Holder*** rotates in same ***complimentary*** clockwise direction
  - used for most applications



Contra = indicates ***Platen*** and ***Sample Holder*** rotates in ***opposite*** direction
- used for aggressive material removal during ***Grinding***



IX. Adjustable Parameters – 2/2

- **Time:** displays the total time that step will run before automatically stopping
  - adjustable between 0 and 120 minutes {in 15 second increments}

- **Fluid** (***Off***) no water is activated when step is started

  (***Water***) – water will be dispensed from nozzle
  - generally used for grinding applications and to flush/rinse the ***Platen***

- **Rinse** allows a rinse cycle to be activated in the last **XX** seconds of step
  - commonly used to rinse cloth and samples with water

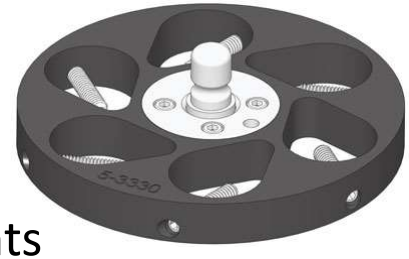
- **Frc Reduce** (***On***) will reduce the force applied at the end of step
  - gradual application of force produces more shallow scratch and protect delicate samples from cracking

- **Reduce Time** defines duration of force reduction in **XX** seconds
  - only applicable if **Frc Reduce** is set to "***On***"

- **Reduce %** defines percentage that force that will be decreased during **Frc Reduce**

- **Frc Start** (***On***) will reduce force by ***70%*** in first ***10*** seconds as "soft start"
  - helps protect samples from damage to sudden application of full force

X. Central Force Setup – 1/5

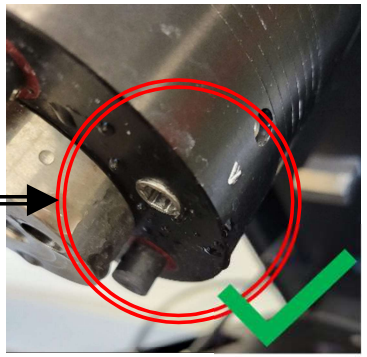


- Central Force (CF) holder requires a MINIMUM of 3 sample mounts
- Not recommended for precision/site specific applications
- Samples need to be equally positioned around center of sample holder to polish evenly and remain balanced

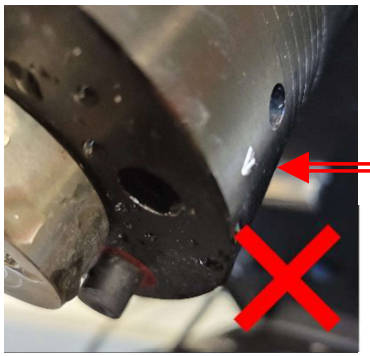
Note: Failure to balance will damage instrument, sample holder, or even operator!

1. Position the ***Powerhead*** in the ***Lifted Up*** position

2. Check if ***Diverter Valve*** is already dis-engaged (flush with surface)
   - If already dis-engaged, continue to ***Step 6***

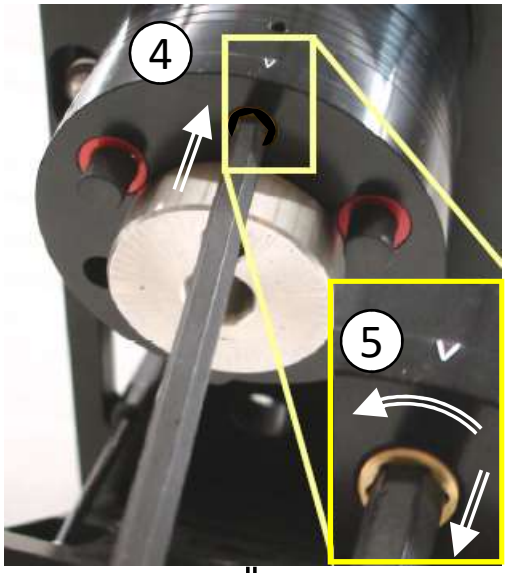


3. If not, locate the "***V***" stamped into the cylinder



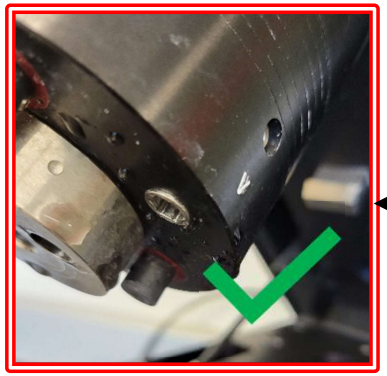
X. Central Force Setup – 2/5

4. Take the ***¼" Allen Wrench*** and insert into hole

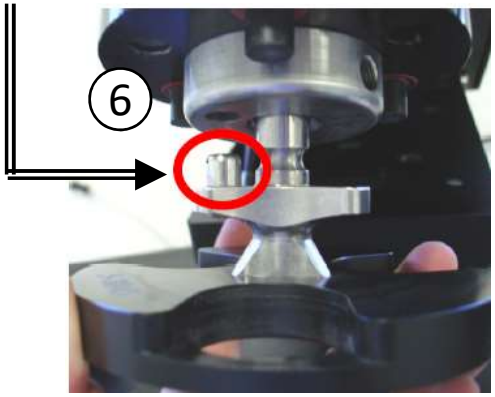


5. ***Rotate counter-clockwise*** until ***Diverter Valve*** is disengaged and slides down cylinder

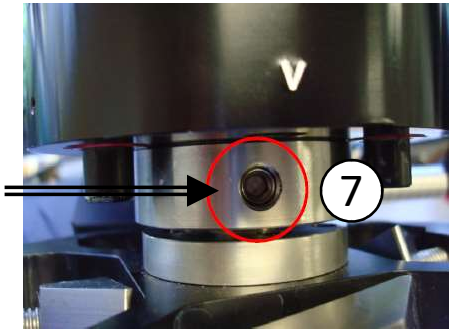
Note: Failure to unlock it will damage cylinder!



6. Position the CF fixture so the ***Drive Pin*** is aligned

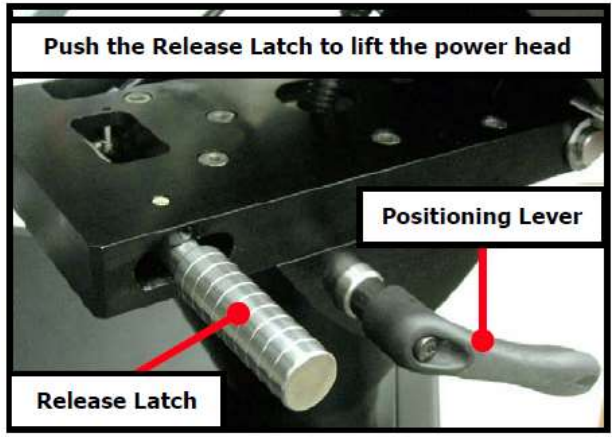


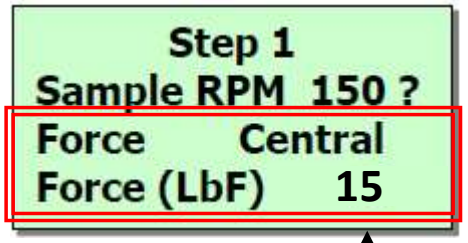
7. Take a ***5/32 Allen Wrench*** and securely tighten the set-screw



X. Central Force Setup – 3/5

8. Loosen the ***Positioning Lever*** and swivel the ***Powerhead*** and lower the ***Mount Holder*** so it is located between the ***Edge*** and ***Center*** of the ***Platen***



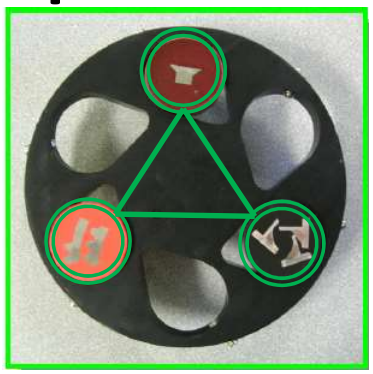


9. Confirm that "***Force***" setting is set to "***Central***"

10. Use the provided ***Sample Loading Fixture*** to set the proper depth of mounts when secured into the ***CF Sample Holder***

X. Central Force Setup – 4/5

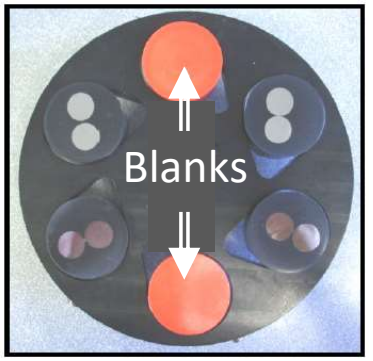
11. The ***Sample Mounts*** MUST be correctly balanced on the ***Sample Holder***
    - 3 Sample Mounts (shown) or
    - 6 Sample Mounts



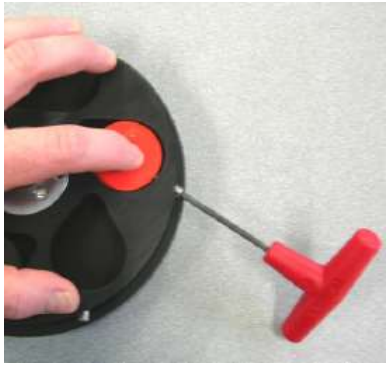
Correct

Incorrect

12. If necessary, provide "***Blanks***" to occupy empty spaces so ***Sample Holder*** is properly balanced
    - 4 Sample Mounts + 2 Blanks (shown)

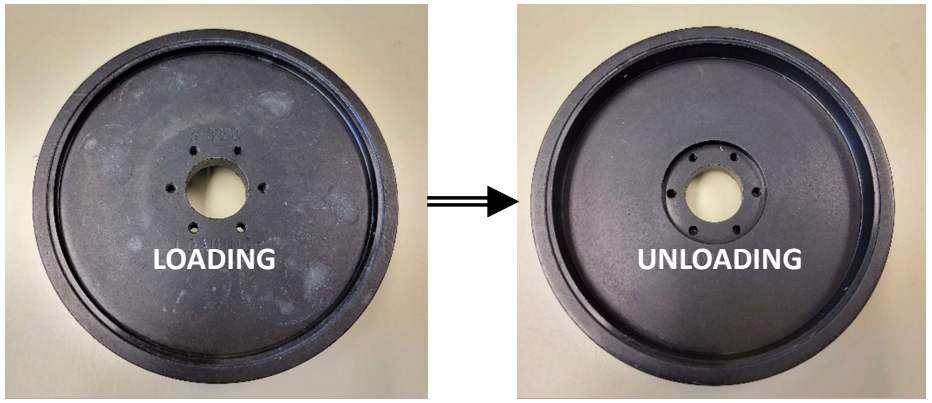


13. Secure the ***Sample Mounts*** by applying pressure to the backside of the ***Sample Mount*** and tightening the set-screw using provided ***1/8" Allen Wrench***

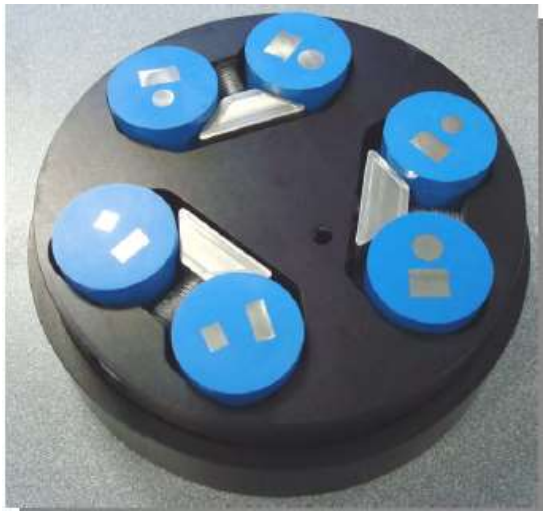


X. Central Force Setup – 5/5

14. To unload ***Sample Mounts***, flip the ***Sample Loading Fixture*** to ***Unloading*** position



15. Insert the ***Sample Holder*** onto the ***Sample Unloading Fixture*** with the ***Sample Mounts*** facing upward



16. Inspect the ***Samples*** first before unloading ***Samples***

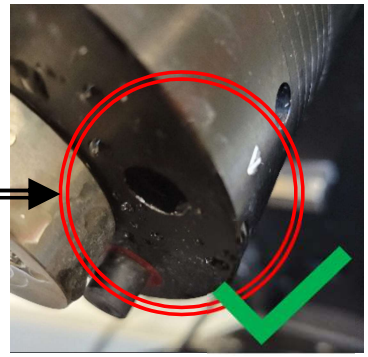
17. Remove the ***Samples*** from the ***Sample Holder*** by loosening the set-screw with provided ***1/8" Allen Wrench***

XI. Individual Force Setup – 1/3

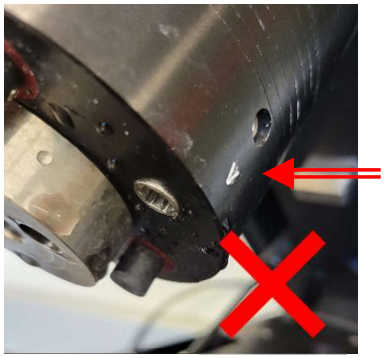
- Individual Force (IF) holder allows up to 3 mounts to be prepared simultaneously
- Each mount floats independently and force is applied individually to each location
- IF functionality is more suitable for precision/site-specific applications

1. Position the ***Powerhead*** in the ***Lifted Up*** position

2. Check if ***Diverter Valve*** is already engaged (sunken in)
   - <u>If already engaged, continue to ***Step 6***</u>

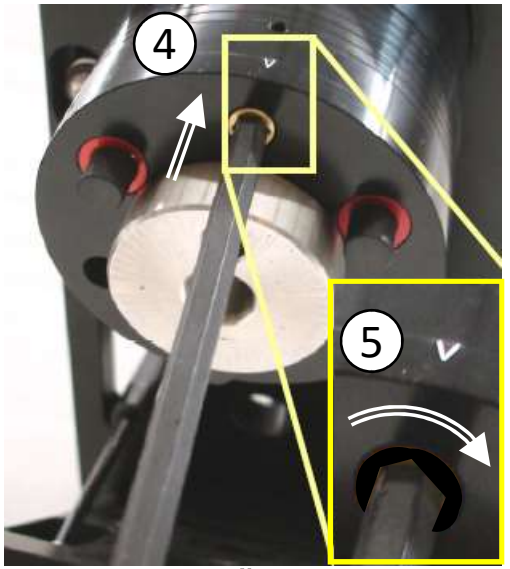


3. If not, locate the "***V***" stamped into the cylinder



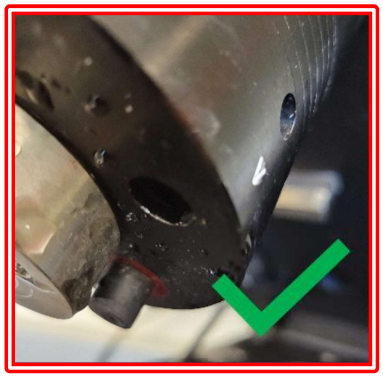
XI. Individual Force Setup – 2/3

4. Take the ***¼" Allen Wrench*** and insert into hole and press ***upward***

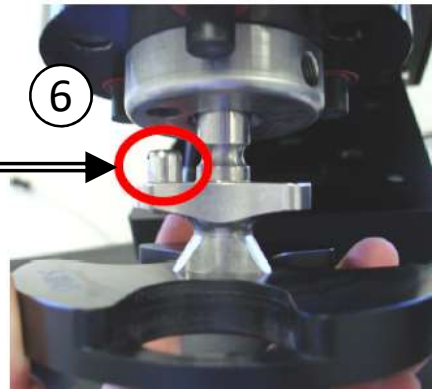


5. ***Rotate clockwise*** until ***Diverter Valve*** locks into place for IF

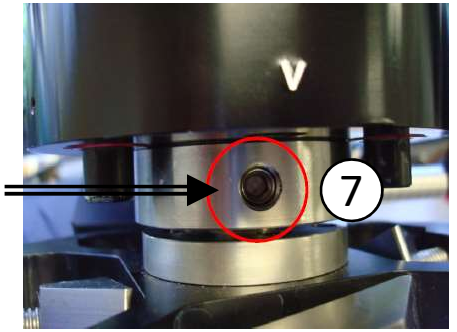
Note: Failure to lock it into place will damage IF holder!



6. Position the IF fixture so the ***Drive Pin*** is aligned

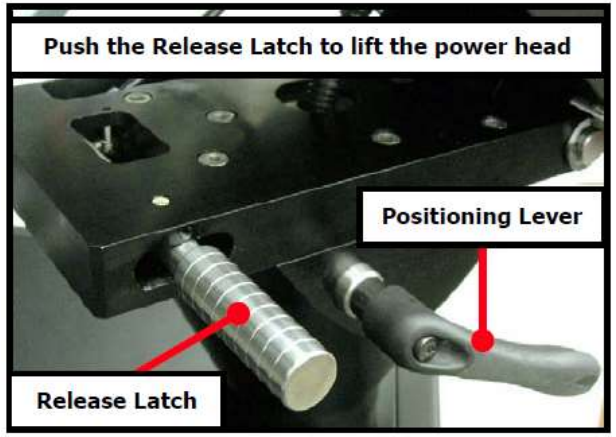


7. Take a ***5/32 Allen Wrench*** and securely tighten the set-screw



XI. Individual Force Setup – 3/3

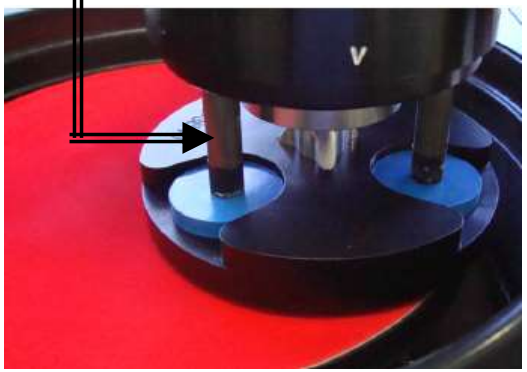
8. Loosen the ***Positioning Lever*** and swivel the ***Powerhead*** and lower the ***Mount Holder*** so it is located between the ***Edge*** and ***Center*** of the ***Platen***



9. Confirm that "***Force***" setting is set to "***Single***"

10. During operation individual ***Pistons*** will extend from cylinder body to apply pressure to back of mounts

11. The ***Pistons*** above empty locations will stop above ***Platen*** surface automatically



XII. Cleanup – 1/1

1. Remove and clean ***Sample Holders***
2. Return back to appropriate drawer
3. Rinse the ***Polishing Cloths*** and return to appropriate drawer
4. Rinse the ***Platen*** and ***Chamber*** thoroughly
5. Keep the ***Powerhead*** in the ***Lifted Up*** position
6. Swivel the ***Powerhead*** away from the ***Platen***
7. Record your usage on the ***Sign-in Sheet*** indicating all consumables used