

## ***Tri-Homo Style Operation and Maintenance Instructions***



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## *Installation and Start-up*

### **Do not perform following adjustments without disconnecting power**

1. Place unit in desired location. Bolting to floor is usually not required but if desired, make sure floor is level. Be careful not to distort mill frame by bolting to an uneven surface.
2. Connect motor leads properly according to the diagram provided with the motor. Only a certified electrician on site should perform this task.
3. **Steel and Stainless Steel Stators Only:** Connect cooling water to either nipple on the stator. Connect remaining nipple to drain. Stator must be cooled when unit is used in continuous production or when rotor and stator are operated at close gap settings. Cooling water serves to control thermal expansion and prevent surface distortion of the shaft and stator. Use of cooling water is optional for intermittent use, such as in a laboratory.



Connect stator cooling water; ¼" NPT

4. Before starting the mill, take serious heed of the notices below:
5. **Notice:** Do not operate the mill without product or water charged in the head assembly. Running the mill dry will severely damage the seal assembly!
6. **Notice:** Make sure rotor and stator are not in contact; galling of the stainless steel rotors and stators may occur. To ensure the rotor and stator are not in contact, insert the Adjusting Lever into the Adjusting Ring and rotate clockwise to completely open the Gap Setting, a marker on the head assembly will indicate this direction.
7. **Notice:** If the unit you have purchased possesses a flush mechanical seal as opposed to an O-ring seal assembly, ensure that flushing water is connected to the fittings supplied on the unit. Flushing water must be connected prior to operation or seal assembly will be damaged.
8. Motor rotation needs to be verified after wiring is completed; an arrow on the mill hanger indicates proper rotation.

9. Once water or process material is loaded in the mill, start the mill.
10. Direction of Shaft and Rotor rotation is always counter-clockwise as you stand facing the unit. Direction is also indicated by an arrow on top of the unit.
11. The unit has been tested and calibrated at the factory prior to shipping. The stator is properly centered and the indicator ring indicates the correct rotor/stator gap. However, jolting and bumping during shipping may cause maladjustment and it is wise to check **gap setting Zero and Center** prior to use. You will need to know these procedures for mill re-assembly as well. These procedures are detailed below in the next section.

**WARNING:** Do not perform these procedures for the Rental 12 inch Colloid Mill #100120; simply proceed to Step 17.

12. After adjusting the Zero and Center and rotation of the motor, flush out the water or material used to charge the mill head when the mill was started initially.
13. Place the Adjusting Lever into the Adjusting Ring and close the gap between the Rotor and Stator by rotating the Adjusting Ring counter-clockwise, opening direction will be indicated on the mill head, until the Indicating Ring zero mark (0) aligns with the zero setting indicated on the mill head.
14. **Notice:** For more detailed information on gap setting adjustments, read the next section.
15. Now open the gap by rotating the Adjusting Ring clockwise. Open gap to pre-determined setting.
16. If no setting has been pre-determined, open the gap to 0.020, or 20 on the Indicating Ring.
17. Charge the mill head with product either by gravity feed or pressure feed. **Notice:** If you use a pressure feeding system or a pump feeding system, ensure that a gauge is installed prior to the mill to monitor inlet pressure. The seal assembly will only handle about 50 psi.
18. Start the mill.
19. While product is running, slowly close the gap by rotating the Adjusting Ring with the lever clockwise, or in the direction indicated on the mill head

**For the Special 12 inch Rental Unit #100120:** Using a 9/16 wrench, turn each of the Rotor adjusting bolts (Item 12 per drawing TH12-070D) an 1/8 of a turn clockwise to close the gap

20. As you close the gap, flow will begin to decrease.
21. Set the mill at a specific gap setting and take a sample of the product.
22. Based on the analysis of your sample, either open or close the gap taking additional samples at various settings to determine the best setting.

## *Rotor - Stator Gap Setting Adjustments*

### **For Special 12 inch Rental Unit #100120**

Using a 9/16 wrench, turn each of the Rotor adjusting bolts (Item 12 per drawing TH12-070D) an 1/8 of a turn clockwise to close the gap; counter-clockwise to open the gap

## ***For Standard Colloid Mills***

Turning the Adjusting Ring by use of the Adjusting Lever provided in either direction rotates the Adjusting Cylinder; this cylinder is housed in a threaded bushing. The Shaft, bearings and Rotor are connected to this cylinder and move in synchronization with it. Rotating the Adjusting Ring clockwise while standing in front of the mill will increase the gap setting; an arrow on the head assembly indicates the rotational direction used to close the gap setting. The gap setting measurement is indicated by an Indicating Ring which is marked with numbers from 0 to 9. If properly adjusted the number 0 will align with a mark in the top of the hanger when the rotor and stator are just barely touching. Turning the adjusting lever to each successive number will open the gap one one-thousandth (.001) of an inch. The gap can be opened or closed whether the unit is running or not. However, always start the unit with a gap of at least several thousandth and slowly close to the desired setting in order to prevent momentary motor overload.

Thermal expansion during the operation will close the gap slightly, stainless steel rotors and stators should not be operated closer than .001 inch. Stainless steel will gall upon contact, usually requiring re-machining of the rotor and stator. Abrasive stones, ni-resist, and certain tool steel combinations may be operated close to contact. Do not start with the rotor and stator in contact, and keep close watch on the unit when operating at a near zero gap setting.

The rotor - stator gap setting will alter with time due to normal wear. It should be checked every 3 months to ensure proper **Zero** and **Centering**.

## ***Zero and Centering Procedures***

### **Zero**

1. Disconnect the electrical supply.
2. Flush the mill head assembly with hot water or cleaning solution to ensure the rotor and stator surfaces are clean.
3. Ensure the Head Cover Nuts are tightly secured.
4. By hand, without placing fingers, hands, etc., near the nip points, carefully turn the drive belts or one of the pulleys/couplings in the proper direction while closing the rotor - stator gap with the other hand. (Remember, rotor - stator gap setting is adjusted by rotating the Adjusting Ring by use of the lever provided).
5. When the rotor just begins to make contact with the stator you will feel a marked resistance to turning and hear a grinding sound.
6. Back off very slightly and turn the indicator ring so that the zero position is aligned with the mark on the hanger.
7. The unit is now properly **zeroed**.

### ***Centering; 2.5, 3 and 4 inch Colloid Mills***

1. Disconnect electrical supply.
2. Place Head Cover on stator and screw in the centering screws (Allen screws) but do not tighten them.
3. Place Stator assembly in head making sure the Head Cover fits snugly against the face of the head.

4. Install and tighten Head Cover Nuts.
5. Close rotor-stator gap using the Adjustment Lever.
6. Without placing fingers, hands, etc., near the nip points, turn the rotor by hand using either the belt or one of the pulleys/couplings.
7. While alternately closing the gap and turning the Rotor, rock the Stator back and forth and up and down. When the stator is too tight to move, tighten the centering screws. The stator should then be properly centered.
8. To check the centering, remove the stator and make 3 or 4 equidistant chalk marks on the largest diameter surface of the rotor. A thin line of grease or machinist's bluing paste may also be used if desired. Reinstall the stator and close the gap while turning the rotor by hand. Stop when the rotor makes contact with the stator. Remove the stator and check the chalk or grease. If the lines are smeared about equally, the stator is centered. If not, repeat the above steps.

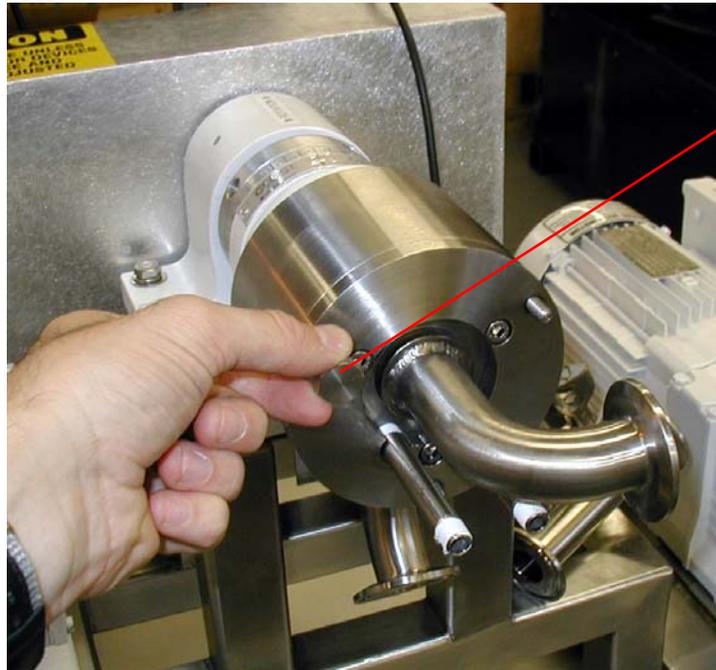
### ***Centering; 6, 8, 10 and 12 inch Colloid Mills***

1. Disconnect electrical supply.
2. Place Head Cover on Stator and screw in socket head cap screws but do not tighten. Insert centering rods and centering set screws in the edge of the Head Cover but do not tighten.
3. Place stator assembly in head making sure the head cover seats properly in the head. Install Head Cover Nuts and tighten alternately from side to side.
4. Close rotor-stator gap using the Adjusting Lever.
5. Without placing fingers, hands, etc., near the nip points, turn the rotor by hand using either the belt or one of the pulleys/couplings.
6. While alternately closing the gap and turning the rotor, rock the stator back and forth and up and down. When the stator is too tight to move, tighten the Allen centering screws in the face of the rotor. Also, tighten the centering set screws in the edge of the head cover.
7. To check the centering, remove the stator and make 3 or 4 equidistant chalk marks on the largest diameter surface of the rotor. A thin line of grease or machinist's bluing paste may also be used if desired. Reinstall the stator and close the gap while turning the rotor by hand. Stop when the rotor makes contact with the stator. Remove the stator and check the chalk or grease. If the lines are smeared about equally, the stator is centered. If not, repeat the above steps.

# *Component Removal and Replacement Procedures*

## **Removal**

1. Disconnect all seal and shaft cooling water as well as discharge and inlet piping to and from the mill.
2. Unbolt the Head Cover Nuts. For smaller mills there are 3; for larger mills there are 4 or more.



Remove Head  
Cover Nuts

3. Remove the Stator using the set screws in the Head Cover to jack the Head Cover/Stator assembly away from the head. *Never use a screwdriver or anything else to pry the head cover loose.* Damage to the mating surfaces could cause leakage and prevent the stator from being aligned with the rotor. Be careful not to drop the stator assembly. For smaller mills it is not necessary to use jacking screws,



- It is not necessary to disconnect the Head Cover and Stator assembly. If you do, you will have to **center** the Stator within the Rotor prior to operating the mill again.
- Once the Stator has been removed, the Rotor and Auger will be exposed.



Stator w/ serrated surface

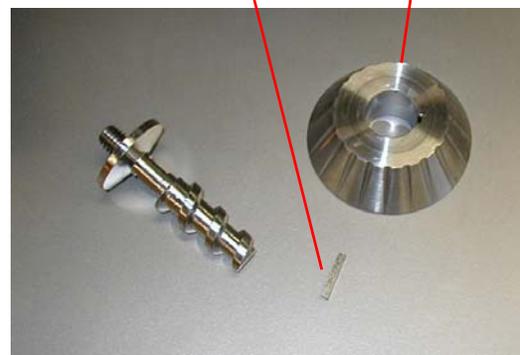
Auger

- Remove the Auger using a 5/16" wrench. Take precaution as the Rotor is spring-loaded and will shift outward as you remove the Auger. Watch for the small key that aligns the Rotor with the mill shaft.



Key

Rotor



- Behind the Rotor is the seal spring and seal-spring retainer that help hold the seal assembly in place during operation. These fit very loosely over the shaft. Behind these are the Seal Assembly consisting of the Seal and Ceramic Seat.



Seal Spring and Spring Retainer

Ceramic Seat

Seal



8. The best way to remove the Seal Assembly with smaller 2.5 – 4 inch Colloid Mills is to remove the Head Assembly by loosening the mounting screws at the back of the Hanger, remove the Head; the Seal will slide off the shaft in the process and the Ceramic Seat can be pushed out from the back either by hand or by tapping lightly with a rubber hammer and screw driver. Alternatively the Seal can be removed by hand or by a Jacking Wrench for larger Colloid Mills. The Ceramic Seat, if it is to be replaced can be broken and then removed.



Hanger

Head

9. Before reinstalling the Stator, wipe the end of the Head and the inside of the Head Cover with a clean rag to make sure there is no foreign material to prevent proper seating of the stator.

**Replacement; O-ring Seal Assembly**

1. Place O-ring lubrication around the ceramic Seal Seat O-ring.
2. Insert ceramic Seal Seat into the head assembly; when doing so make sure the shiny smooth surface faces out toward you - this will be the mating surfaces for the Seal Head Assembly to be installed next.
3. Place O-ring lubrication around the inside of the Seal Head Assembly.
4. Slip the Seal Head Assembly over the Shaft and push it against the seal seat.
5. Install the Seal Spring and Washer followed by the Rotor as described in earlier sections.

**Replacement; Rotor**

1. Check to see that the Shaft and the shoulder on the Shaft are free of any foreign material.
2. Check that Rotor bore and the back of the Rotor are clean.
3. Place the Seal Spring and Retainer over the shaft.

4. Install the Rotor on the Shaft. While pushing the rotor back against the spring, insert the Shaft Key.
5. While still holding the Rotor against the Spring, screw the Auger into the end of the shaft. Push the Rotor as far back as possible while tightening the Impeller. Use the wrench to snug up the Impeller.
6. Check that the Rotor is tight against the shaft shoulder by pushing on it and turning the Impeller with the wrench. If the Rotor is not tight, the rotor-stator gap cannot be properly set.

### ***Replacement; Stator***

1. Insert the Stator and tighten the Head Cover Nuts alternately from side to side. Make sure the jack screws have been retracted and there is nothing caught between cover and head which would prevent proper seating. Head Cover Nuts should be snug but not over tightened.
2. If the Stator was removed from the Head Cover, re-connect the two and insert the stator as described in the previous step.
3. Check Zero and Centering following the procedures detailed previously in this manual. Centering will especially be necessary if the Stator and Head Cover were disconnected.

## ***Bearing Removal and Replacement***

### ***Removal***

1. Make sure power to unit is off and disconnected.
2. Remove drive belts from top pulley.
3. Remove the pulley.
4. Remove the Stator assembly as described earlier.
5. Remove the Impeller and Rotor as described earlier.
6. Loosen all set screws and dog-point set screws located on the mill Hanger.
7. Remove the Adjusting Cylinder and Adjusting Bushing as one unit. It should slide out with some slight rotating back and forth. This assembly is seated by O-rings which will require lubrication during replacement.
8. Remove the threaded Adjusting Bushing from the Adjusting Cylinder by unscrewing counter-clockwise.
9. Remove the internal Snap Ring.
10. Remove the Front End Cap.
11. Remove the other internal Snap Ring.
12. Remove the Rear End Cap.
13. Place Adjusting Cylinder in an arbor press with drive end of Shaft facing upward.
14. Make Adjusting Cylinder is properly supported and clamped in place.

15. Press out the Shaft and front set of Bearings from the Adjusting Cylinder and place in a safe location.
16. Turn the Adjusting Cylinder over 180°.
17. Press out rear Double-row Bearings from Adjusting Cylinder.
18. Remove the external Snap Ring.
19. Place the Shaft with front set of Bearings in arbor press and press out the Shaft from the Bearings.

### ***Replacement***

1. Make sure all components are clean of debris.
2. Lubricate the Shaft and the inner wall of the Bearings.
3. Place the front set of Bearings in proper orientation on the arbor press. Make sure the inner face of the Bearings are properly supported, otherwise, during press the Bearing will get damaged.
4. Press the Shaft into the front set of Bearings with drive end of the Shaft facing into the Bearings. Press until Bearings seat properly onto the front shoulder of the Shaft.
5. Replace the external Snap Ring.
6. Place the Adjusting Cylinder onto the arbor press with threads facing upward.
7. Press Shaft and front Bearings into the Adjusting Cylinder such that the Bearings seat properly against the shoulder within the Adjusting Cylinder at the opposite end of the threads.
8. Replace the Front End Cap and internal Snap Ring.
9. Place the Adjusting Cylinder assembly onto the arbor press with the threads again facing upward.
10. Making sure to press upon the outer and inner races of the rear Double-row Bearings, press them onto the Shaft until they properly seat against the shoulder within the Adjusting Cylinder.
11. Make sure the Shaft turns freely and smoothly within the new Bearings.
12. Replace the Rear End Cap and internal Snap Ring.
13. Replace the threaded Adjusting Bushing by screwing clockwise into the Adjusting Cylinder until threads are flush.
14. Reinstall Cylinder and Bushing assembly into Hanger.

## *Cleaning*

The unit should be cleaned between batches or at least once a week if used in continuous service.

Remove the stator assembly and wash out the stator, rotor, and head, using hot water or an appropriate solvent. Unless the stator is removed, tramp metal, stones, and other large debris caught in the stator will not be removed. If cleaning is attempted by opening the rotor-stator gap without removing the stator, this debris may pass between the rotor and stator and damage or score the surfaces.

Never flush abrasive stones with cold water after use. They become hot in use and will crack if exposed to cold water immediately. Use only very hot water to flush.

## *Lubrication*

The adjustment cylinder has been appropriately greased at the factory. Additional grease is not necessary. Excessive lubrication may be damaging to the bearings and may cause premature failure. When new bearings are installed, they should be greased according to the bearing manufacturer's specifications. The grease used at the factory is Lubriko M-6.