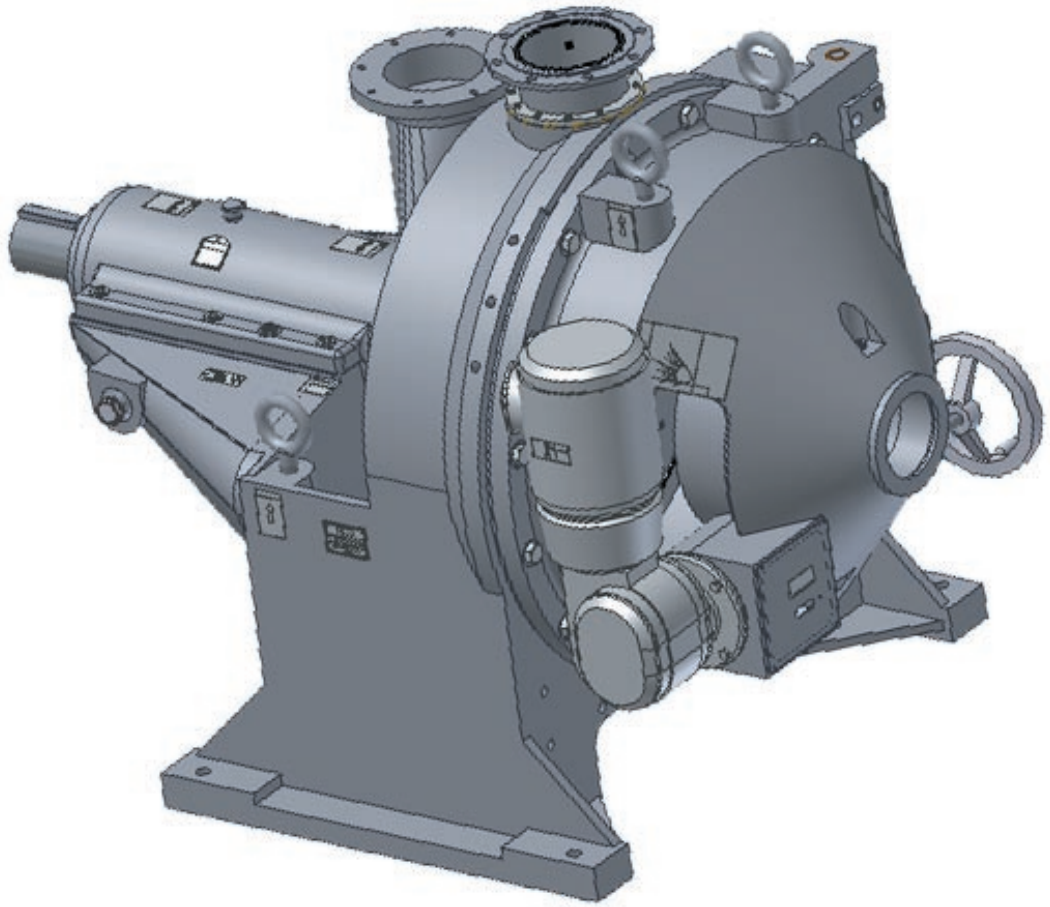
Installation, Operation and Maintenance Manual

DD® 4600 Refiner



GL&V USA INC. • 141 Burke Street • Nashua, New Hampshire 03061 • Telephone: 603-882-2711 • Fax: 603-595-0035

141 Burke St.
Nashua, N.H. 03060
Tel. No.: (603) 882-2711
Fax No.: (603) 598-7979

Drawing Transmittal #1

Date: 11/16/06

S.O. # : NA00052804
Cust. P.O. # : 579987
Acct. No.: 630

Project Manager: Shawn Bergeron
Area Manager: Roger Emerson

1
Customer Name: Wausau Paper
Address: 1 Mill Street
City, State, Zip: Jay, ME 04239
Attention: Ron Holmes
Telephone #: 207-897-7228

2
Consulting Firm:
Address:
City, State, Zip:
Attention:
Telephone #:

3
Contractor:
Address:
City, State, Zip:
Attention:
Telephone #:

4
Other:
Address:
City, State, Zip:
Attention:
Telephone #:

Format: **V** - Vellum, **P** - Print, **M** - Microfilm, **D** - Disk, **C** - CDROM, **T** - Transmittal Only, **E** - Electronic Copy
Drawing Type: **Ref** - Reference, **App** - Approval, **Rapp** - Re-Approval, **Cert** - Certified, **Rcert** - Re-Certified

Serial No	Drawing No.	Rev	Drawing Title	Dwg. Type	Distribution 1	2	3	4
06T3801 06T3802 06T3803 06T3804	B342		DD4600 Refiner manual		3			
			Drawings					
	000374N63-20	-	Rotating Head Assembly					
			CD ROM		1			

Approval & or Certified drawings requesting information NOT returned within two weeks of receipt will not be released for manufacture and will cause delay in shipping. Delay will be based on shop load at the time the information is received.

A signed copy of the transmittal must be returned to acknowledge receipt. **Rec'v'd by:** _____

DISK REFINER UPGRADE
CERTIFICATION SHEET
24”DD 4600

Customer Information		**CS06T3801-3804**
Customer : Wausau Paper		Date: 7-Sep-06
Address: Otis Mill, 1 Mill Street Jay, ME 04239		Size: 24”
GL&V S.O. # NA00052804	Cust. P.O. # 579987	Model: 4624
Certified by: Bob Eldridge	Title: Product Specialist	S/N: 06T3801-3804

General Specifications:		
Original SO #: Unknown	Original SN: Unknown	Equipment # Unknown
Rotating Head Assembly: 000374N63-20		
Removal Arm Assembly: None		
Disk #1 & #2 N/A	#3 & #4 N/A	Bar Code:
Manual # B343	SPL#: SPL06T3801-3804	

Gear Motor:					
	Torque Limited:	HP:	Volts:	HZ:	Phase:

Controls:		
Type:	Serial No.:	Manual No.:
Local/Remote:	Serial No.:	Manual No.:

Remarks:	
SpiralTrac: 59-915001-G2	
Flow Switch: A11046-14	
Cert. Sheet Rev. -	Form: EF513 3/5/02

This instruction manual provides installation, operation and maintenance information for the equipment supplied by GL&V Inc. Illustrations used are typical and are intended to show the principal design features. The specific drawings supplied for the unit should be consulted for more accurate detail. There is no intent to state or imply any warranties or guarantees of process or performance. Any contractual obligations of GL&V are stated in the terms of the Sales Agreement.

The contents of this manual should be studied carefully by all Engineering, Supervisory, Operation and Maintenance personnel before any attempt is made to install, operate or maintain the equipment. Although every effort has been made to provide comprehensive instructions, this manual may not provide for every contingency which may arise during installation, operation and maintenance. Should further information be desired, or should you have questions, contact GL&V USA Inc., Nashua, NH, U.S.A., Customer Support Group, telephone 603-882-2711, fax 603-595-0035. Please be sure to include the specific serial number of the machine involved when making informational inquiries or requests for spare parts.

GL&V can provide field service if mills require support for installation, mechanical checking or maintenance/repair service. For further details contact the Customer Support Group at the numbers listed previously.

Do not attempt to install, operate or perform any work on this equipment until you have read and fully understood the instructions in this manual. Serious injury can result.

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Table of Contents

Safety Information

The safety labels shown in this manual and on the equipment are for personnel protection. Replacement safety labels can be obtained at no cost by contacting the Customer Support Group at:

GL&V USA Inc.
141 Burke Street
Nashua, NH 03061
Telephone: 603-882-2711
Fax: 603-595-0035

SAFETY FIRST

Safety is the primary concern for the protection of both personnel and the equipment. All personnel must thoroughly understand all safety precautions before operating or doing any maintenance work on this equipment.

RECOGNIZE SAFETY INFORMATION

This is the safety–alert symbol.

When you see this symbol on your equipment or in the manual, be alert to the potential for personal injury. Be sure to follow all recommended precautions and safe operating practices.

UNDERSTAND SIGNAL WORDS

A signal word – **DANGER**, **WARNING**, or **CAUTION** – is used with the safety alert symbol. All personnel must understand the DANGER, WARNING, CAUTION and NOTICE used throughout the text of this manual, and on the safety labels located on the equipment.

Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

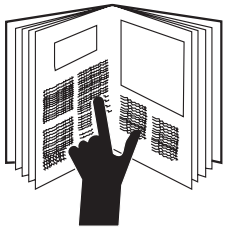
Caution indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Caution used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Notice is used to notify people of installation, operation, or maintenance information which is important but not hazard related.

SAFETY WARNINGS AND PRECAUTIONS
The following safety precautions and all mill safety procedures must be observed during the installation, operation and maintenance of this equipment to prevent injury to personnel or damage to equipment.

WARNING



Failure to follow these instructions can cause severe injury or death.

Read Operation and Maintenance manuals supplied with this equipment before operating and servicing.

Follow all mill safety procedures during operation and servicing of this equipment.

PS00091 Rev. A

1. The operator or millwright should use common sense and good working practice while operating and maintaining this equipment.

2. Servicing and maintenance should be done by qualified personnel, adequately trained and equipped with the proper tools.

WARNING

3. **Do not remove guards prior to or during operation of machine. Contact with rotating equipment can cause severe injury or death.**

Listed below are areas that have been guarded, accompanied by the associated warning.

- Main Drive Coupling

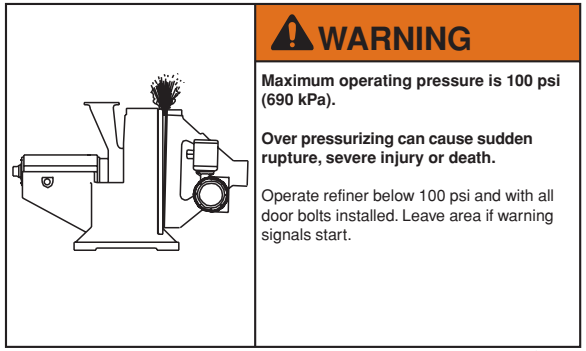
WARNING

Rotating coupling.
Can cause severe injury.

Do not operate with guard removed.

PS00121 Rev. A

SAFETY WARNINGS AND PRECAUTIONS (CONT.)



WARNING

4. **Do not operate this machine at pressures exceeding 690 kPa (100 psig). Overpressurizing the refiner can cause sudden rupture of the refiner casing. This can result in serious injury or death. A refiner can become overpressurized due to several factors.**

   - Incorrect refiner application,
   - Incorrect process control,
   - Closed or plugged stock lines,
   - Unusual process conditions.

WARNING

5. **Do not operate this machine without all of the safety interlocks in place. These interlocks are designed to alert the operator about the low flow and high pressure conditions that lead to overpressurization. Overpressurization can cause sudden rupture of the refiner casing. This can result in serious injury or death.**

WARNING

6. **Do not work on, climb on or enter this machine until the following procedures have been performed. Severe injury or death can result if these minimum precautions are not followed.**

   a. Follow mill "Lockout/Tagout" procedures prior to servicing this machine.

   b. Mechanically disconnect the motor from the driven components before working on this machine.

   c. Isolate the machine from the process. Close, lock and tag all valves on all inlet and discharge lines.

   d. Completely drain the machine. Allow it to cool down to room temperature before performing any work on it. Hot pulp and liquor can cause severe burns.

   e. Use caution when removing any access covers. Gaskets may stick, retaining hot pulp or liquor.

   f. Completely wash all stock and liquor off the machine before starting any work on the machine.

SAFETY WARNINGS AND PRECAUTIONS (CONT.)

⚠ WARNING

7. **Improper door fastening can result in door opening while machine is operating under pressure. Serious injury or death can result.**

   The machine covered in this manual is available in both U.S. inch and SI metric models. Use care to not interchange inch and metric fasteners. Many inch and metric fasteners will appear to mate but are not interchangeable. Consult your certified General Arrangement Drawing to determine the type of fasteners used on your machine.

   Always use proper grade fasteners (SAE grade 5 for inch, ISO grade 8.8 for metric)

   Always torque fasteners properly. See torque chart in the Appendix of this manual.

   Always inspect condition of fasteners and mating tapped holes. Replace damaged fasteners. The mating surface should have a minimum engagement of 1.5 times the fastener diameter with solid, undamaged threads.

8. Do not operate this machine without the proper seal water flow and pressure at the shaft seals.

⚠ WARNING

9. **Always operate the machine within all design specifications. Modification on the machine without proper design review may result in personal injury and/or property damage.**

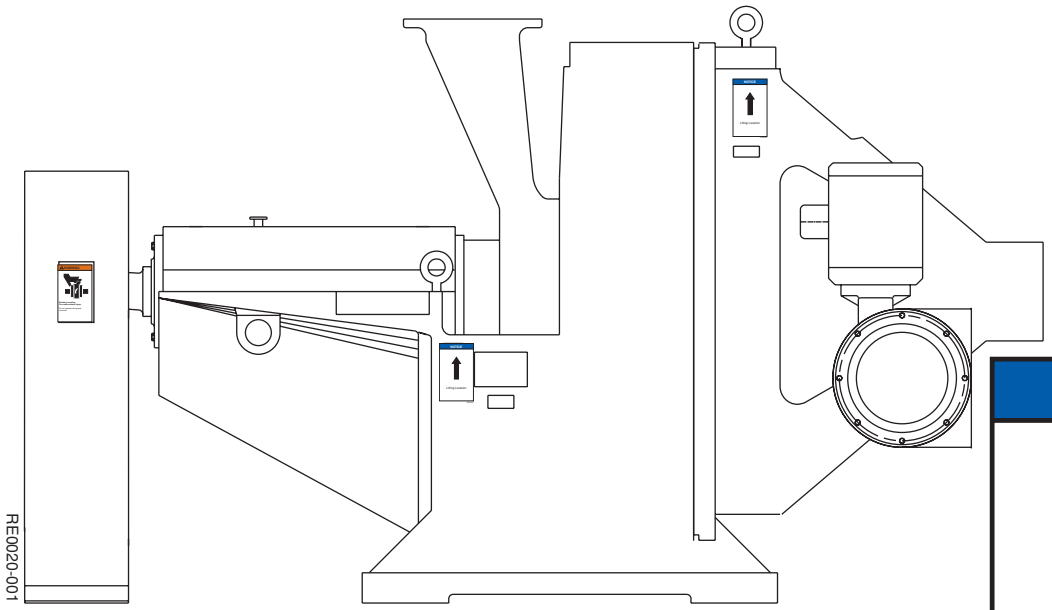
DECAL LOCATIONS

WARNING

Rotating coupling.
Can cause severe injury.

Do not operate with guard removed.

PS00122 Rev. A



RE0020-001

Decals are on both sides of the machine.

NOTICE

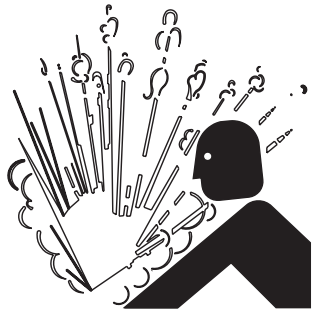
Lifting Location

PS09552

Side View

DECAL LOCATIONS (CONTINUED)

WARNING

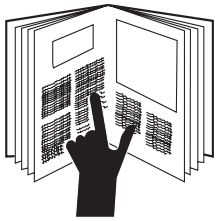


Hot pressurized pulp and/or liquor. Can cause severe injury or death.

Relieve pressure, drain and cool vessel before removing cover.

PS10281

WARNING

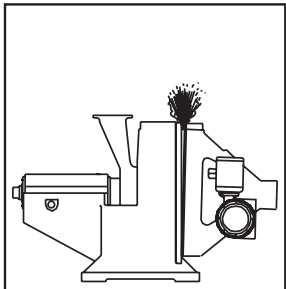


Failure to follow these instructions can cause severe injury or death.

Read Operation and Maintenance manuals supplied with this equipment before operating and servicing.

Follow all mill safety procedures during operation and servicing of this equipment.

PS00091 Rev. A



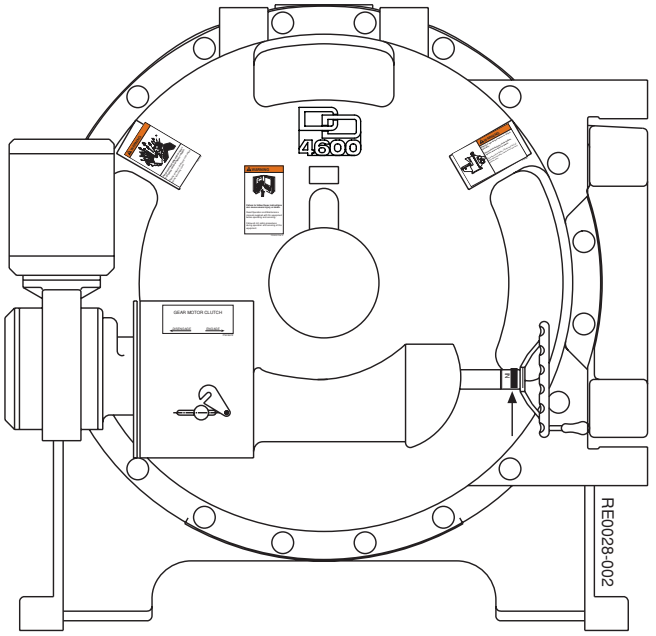
WARNING

Maximum operating pressure is 100 psi (690 kPa).

Over pressurizing can cause sudden rupture, severe injury or death.

Operate refiner below 100 psi and with all door bolts installed. Leave area if warning signals start.

PS09591



GEAR MOTOR CLUTCH

DISENGAGE ENGAGE

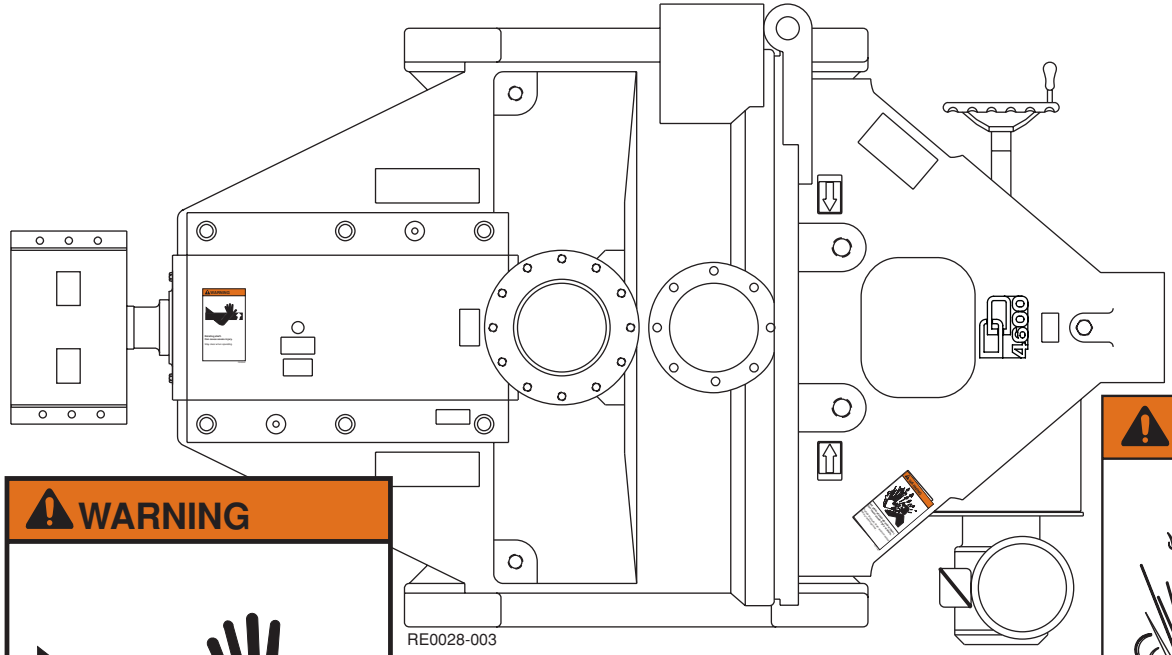
PS0967Z

IN

PS0966Z

End View - Door

DECAL LOCATIONS (CONTINUED)



RE0028-003

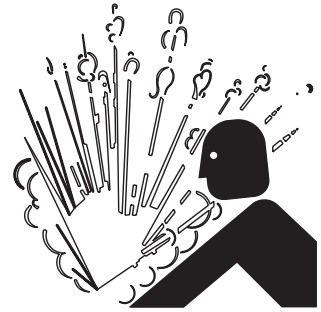
WARNING

Rotating shaft.
Can cause severe injury.

Stay clear when operating.

PS05542

WARNING



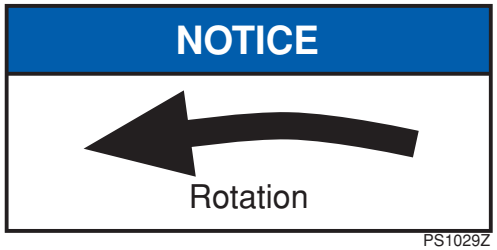
Hot pressurized pulp and/or liquor.
Can cause severe injury or death.

Relieve pressure, drain and cool vessel before removing cover.

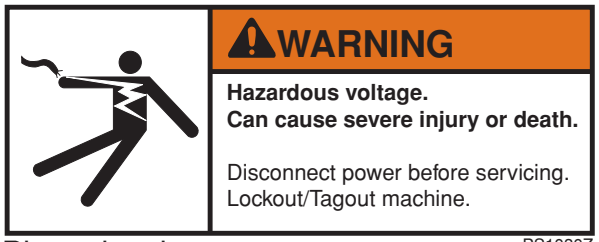
PS10281

Top View

DECAL LOCATIONS (CONTINUED)

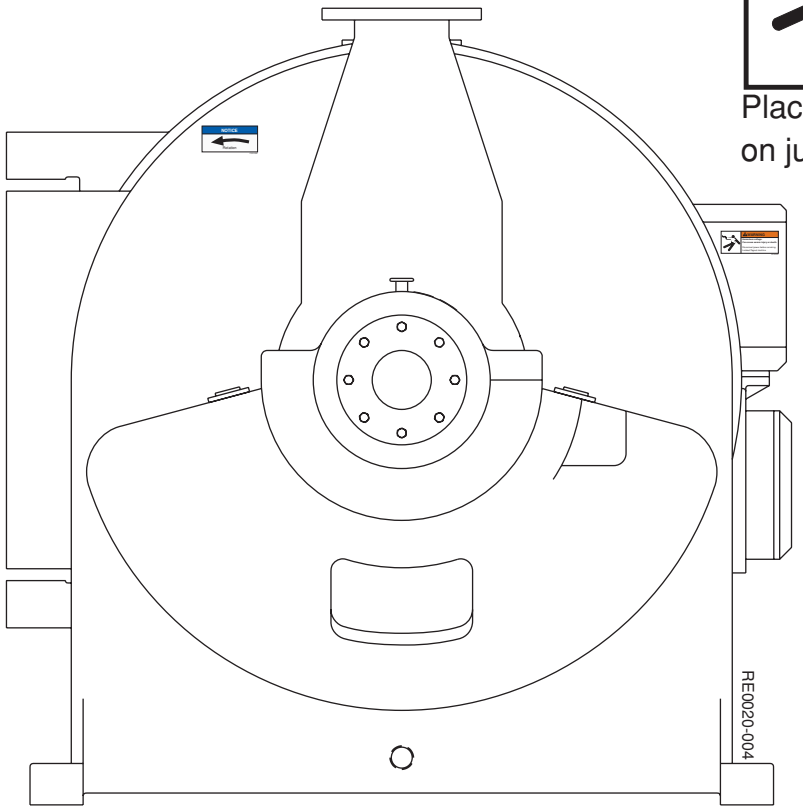


PS1029Z



PS1030Z

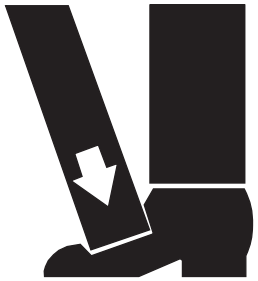
Place decal
on junction box cover.



Drive End View

DECAL LOCATIONS (CONTINUED)

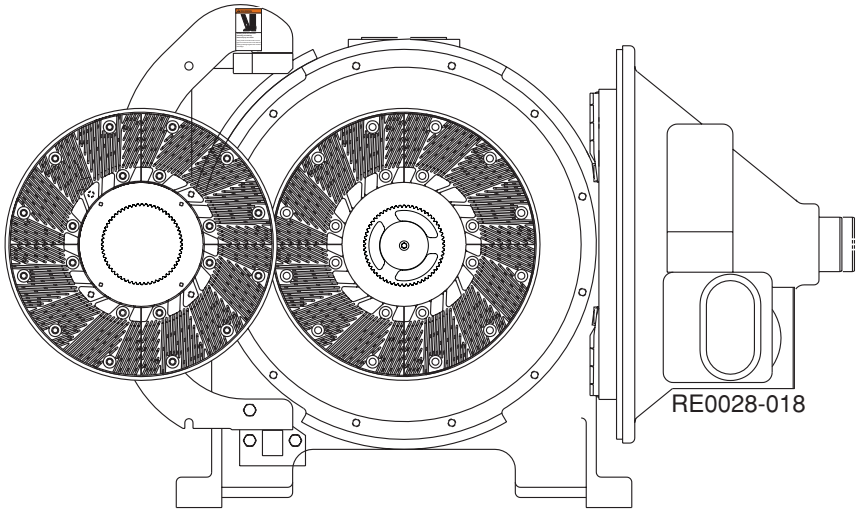
WARNING



Rotating head can fall when removing or installing.
Serious injury can result.

Verify center stud and center nut are tight. Pull rods and nuts must hold the rotating head tight against the removal hub flange.

PS11152



Optional Rotor Removal Arm

Description

COMPONENTS

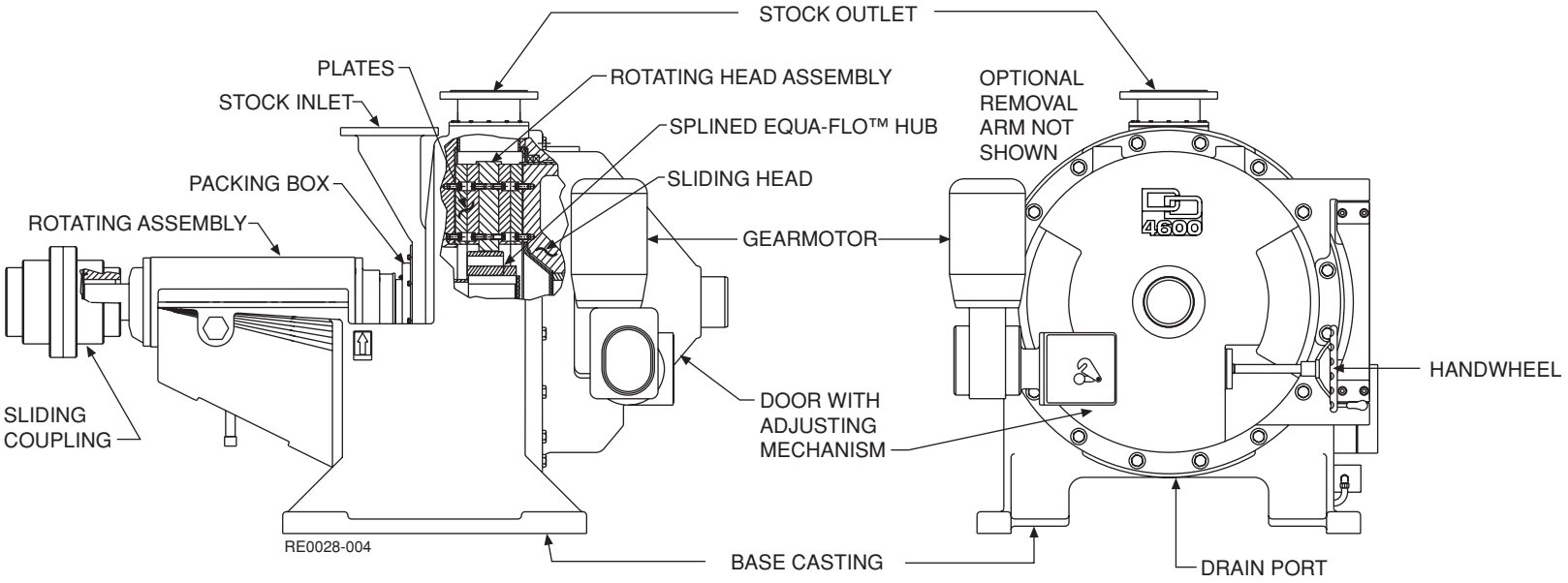
The DD® 4600 is a pressurized, four-disk refiner. The major components of a refiner are the Base Casting, the Adjusting Mechanism, the Rotating Assembly, the Packing Box, the Sliding Coupling, the Rotating Head Assembly, the Removal Arm Assembly (optional) and the Electrical Components.

Base Casting

The base casting contains the refining cavity, the bearing pedestal, the stock outlet and the support hinge for the adjusting mechanism. A stainless steel liner protects the refining cavity. The liner is machined and fastened in place. The base provides support for the other components of the refiner. The base is mounted firmly to the foundation.

Adjusting Mechanism

The door casting is the housing for the adjusting mechanism. The mechanism consists of the worm and worm gear set, the sliding head, and the gearmotor with clutch. The gearmotor rotates the worm. This turns the worm gear. The worm gear moves the sliding head (with one plate attached) horizontally. This movement changes the size of the gap between the plates. A hand wheel is provided for manual adjustment.



DD® 4600 Refiner

COMPONENTS (CONTINUED)

Rotating Assembly

The rotating assembly consists of the bearing housing, the main shaft and the bearings. The coupling is mounted on one end of the shaft, and the splined hub is mounted on the other. The shaft and bearings are held in position within the bearing housing.

Packing Box

The packing box prevents stock from leaking out of the refining cavity. The packing box is lubricated with pressurized water. The packing sleeve on the shaft is replaceable.

Drive Coupling

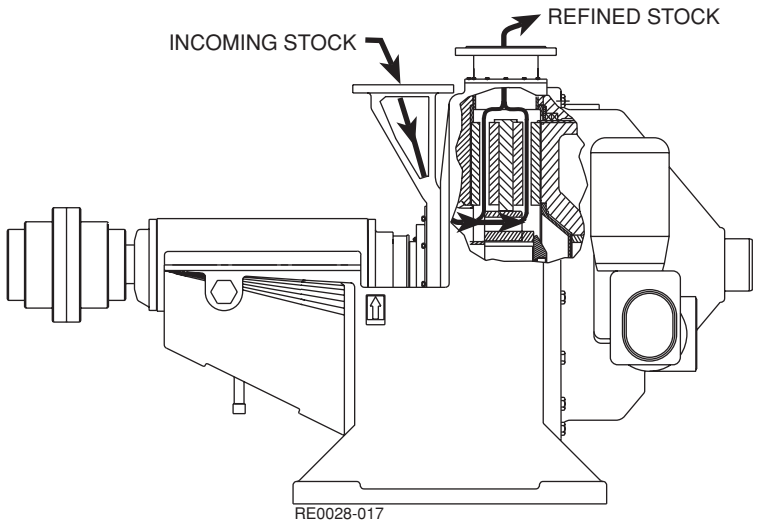
The coupling connects the refiner to the main motor.

Rotating Head Assembly

The rotating head assembly consists of the rotating head and two circles of plates. The rotating head has a splined center that mounts to the splined hub of the rotating assembly. The rotating head assembly is free to move axially and centers itself between the stationary plates even when the adjustable head is moved.

Electrical Components

The electrical components of the refiner consist of three pressure switches. One pressure switch is used on the inlet stock line, and one is used on the outlet stock line. The third pressure switch is used on the packing box water line.



Stock Flow Through the DD® 4600 Series Refiner

OPERATION

Refining is a basic step in stock preparation. Refining is a mechanical process that changes the characteristics of the individual fibers within the stock. The goals are to produce a better quality paper and more consistent paper machine operation.

The DD 4600 Refiner combines the features of a free moving rotating head assembly and the micro-adjustment capability of the Integrated Motor Drive (IMD). The rotating head assembly is spline mounted to the main shaft thus negating the hydraulic imbalance of the drive shaft of a conventional rotor. This results in a more uniform clearance between the two rotor and the 2 stator rings producing more uniform refining. Adjusting the gap between the rotating and stationary disks controls the severity of the refining process. The closer together the plates are, the more aggressive the refining will be.

During operation, stock is fed in through the inlet. The stock passes between the rotating disks and the stationary disks. The distance between the plates is adjusted by the IMD gearmotor. These adjustments by the IMD gearmotor are made based on a signal from an electronic controller. The IMD is a variable frequency drive gear motor. The variable speed drive of the IMD allows for improved plate adjustment during refiner operation. This improves the refiner's responsiveness to process conditions such as flow and consistency and thus minimizes fiber quality variation. The IMD maintains the process setpoint up to 85% tighter than with a two-speed gear motor. The tighter process setpoint allows the refiner to be more responsive to process changes, hence minimizing fiber quality variation. The refined stock is then discharged from the refiner through the outlet.

Weights and Lifting

MAJOR ASSEMBLY AND COMPONENT WEIGHTS

Servicing the DD 4600 Refiner may require the removal of heavy sub-assemblies or components. The weights listed are to be used to select the proper lifting equipment.

DD™ 4600 Refiner Major Assembly and Component Weights					
	16	**20/24**	**26/30**	**34/38**	**42/46**
Complete Refiner	945 kg (2100 lbs)	1980 kg (4400 lbs)	3330 kg (7400 lbs)	5175 kg (11,500 lbs)	9000 kg (20,000 lbs)
Rotating Assembly	113 kg (250 lbs)	275 kg 600 lbs)	525 kg (1150 lbs)	820 kg (1800 lbs)	1340 kg (2950 lbs)
Door Casting	295 kg (650 lbs)	340 kg (750 lbs)	500 kg (1100 lbs)	810 kg (1780 lbs)	1325 kg (2920 lbs)
Door, with Complete Adjusting Mechanism	454 kg (1000 lbs)	750 kg (1650 lbs)	1040 kg (2300 lbs)	1730 kg (3800 lbs)	2725 kg (6000 lbs)
Plate, one-piece circle	15 kg (34 lbs)	50 kg (110 lbs)	110 kg (245 lbs)	210 kg (460 lbs)	270 kg (600 lbs)
Rotor Only	47 kg (104 lbs)	- kg (- lbs)	- kg (- lbs)	240/343 kg (530/757 lbs)	585/900 kg (1290/1984 lbs)
Hub	9 kg (20 lbs)	- kg (- lbs)	- kg (- lbs)	48 kg (105 lbs)	91kg (200 lbs)
Packing Box	N/A	N/A	35 kg (77 lbs)	47 kg (128 lbs)	90 kg (200 lbs)
Coupling - Slide	39 kg (85 lbs)	40/64 kg (88/142 lbs)	95 kg (209 lbs)	126/180 kg (279/399 lbs)	180/297 kg (399/657 lbs)
Coupling Guard	30 kg (67 lbs)	44/104 kg (98/231 lbs)	44/220 kg (98/486 lbs)	72/160 kg) (160/355 lbs	87/197 kg (193/436 lbs)
Gear Motor	37 kg (81 lbs)	37 kg (81 lbs)	93 kg (205 lbs)	118 kg (261 lbs)	179 kg (395 lbs)

DD™ 4600 Plate Segment Weights		
	Each Segment	**Segments per Circle**
16	N/A	N/A
20/24	10 kg (23 lbs)	4
26/30	17 kg (30 lbs)	4
34/38	12 kg (27 lbs)	8
42/46	24 kg (53 lbs)	6

LIFTING

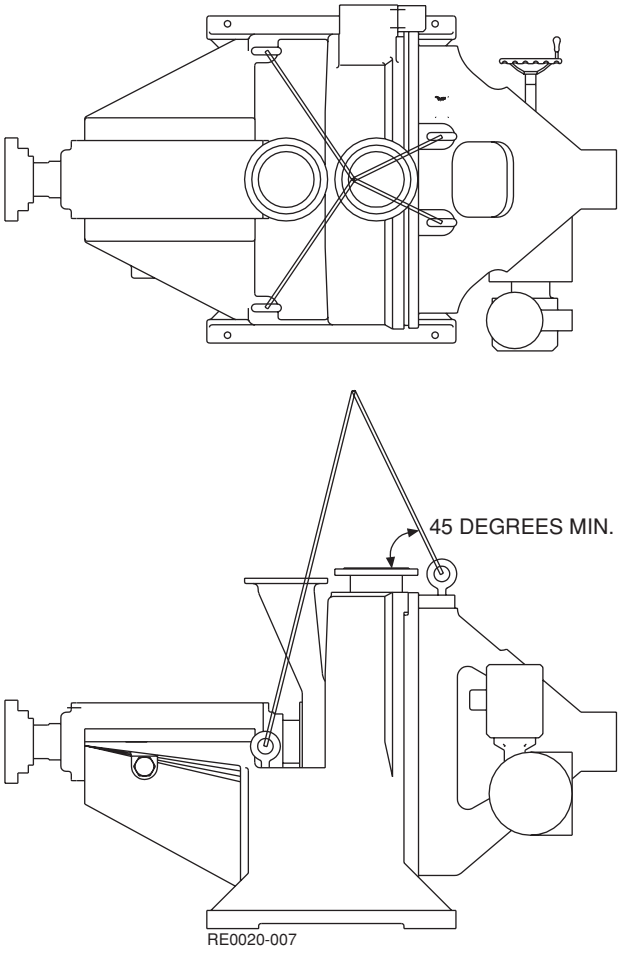
Lifting the Entire Machine

1. The hoisting system required will vary based on the size of the refiner involved. See the Major Assembly and Component Weights Chart for weight information about the specific size refiner being lifted. Weights range from 945 kg (2100 lbs) to 9000 kg (20,000 lbs).

2. The accompanying illustration shows the recommended method for lifting the entire dry machine. The lift requires four forged eyebolts of the proper size (these are supplied with the refiner). The eyebolts must be properly seated in the refiner base before any lifting.

NOTICE

Lift the refiner by the eyebolts as shown in the illustration. Do not attach any lifting equipment to the refiner shaft. Lifting the refiner by the shaft can damage the refiner.



Lifting the DD 4600 Refiner

LIFTING (CONTINUED)

Lifting the Disks and Rotating Head

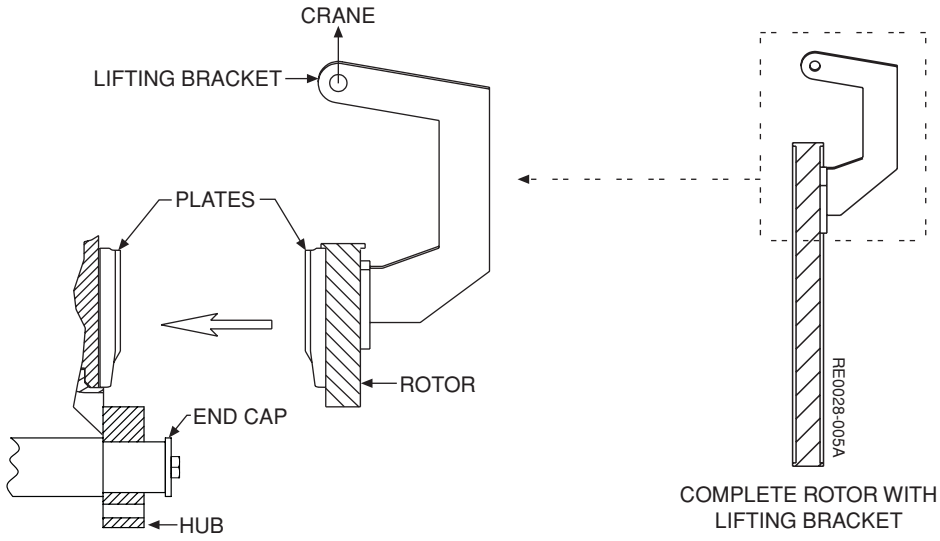
A special lifting bracket may be used to remove the rotor. Remove a plate segment and then attach the lifting bracket to the rotor. Remove the end cap and spacer from the end of the shaft. To prevent the hub from sliding off of the shaft, re-attach the end cap. Using a crane, lift the rotor from the hub.

Refer to the "Maintenance" section for additional disc replacement instructions.

Lifting the Rotating Head Assembly

NOTICE

Do not allow lifting cables or chains to come in contact with the finished diameter of the shaft. Do not allow any lifting equipment to come in contact with the splined center of the rotating head.



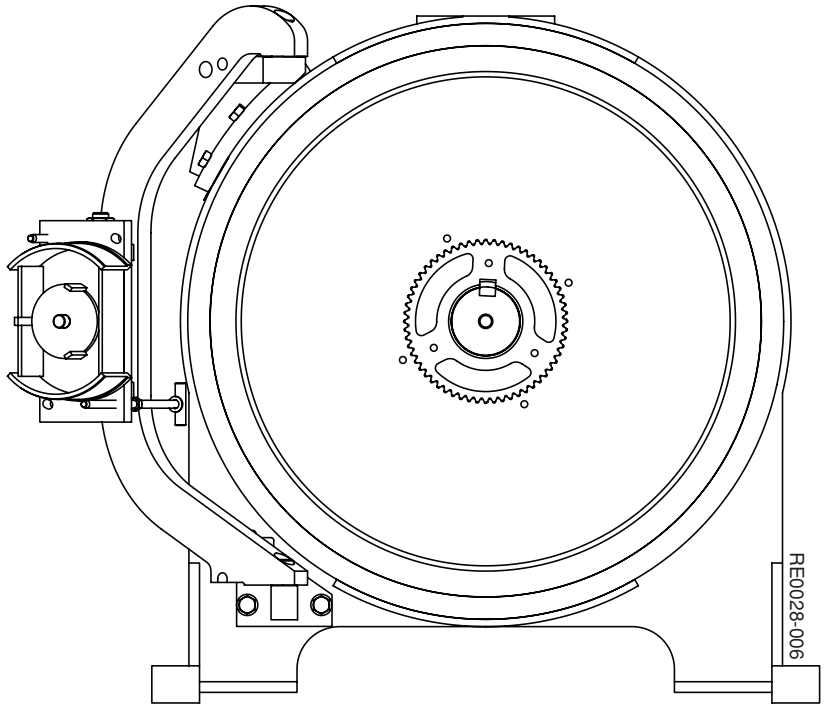
Lifting the Rotor

Removal Arm Assembly (Optional)

A removal arm assembly is built into the DD 4600 to aid in changing the refiner plates. Retain the rotating head on hub with push-pull screws supplied. The Maintenance section gives a detailed procedure for changing plates.

NOTICE

Do not allow lifting cables or chains to come in contact with the finished diameter of the shaft. Do not allow any lifting equipment to come in contact with the splined center of the rotating head.



Removal Arm in Stowed Position

Receiving and Storage

Each machine is carefully packed to prevent damage in transit. When the shipment arrives, carefully inspect each item listed on the shipping papers to assure that no damage or loss has occurred in transit. If loss or damage is detected, notify the carrier immediately and file claim with the carrier.

All DD Series Refiners are shipped as a complete assembly except for several components that are boxed separately. They are to be assembled at the customer's facility. These components are:

1. The motor half of the coupling.
2. The lifting bracket for the disks and the rotating head.
3. The controls.

SHIPPING PREPARATIONS

Under ordinary conditions, the normal shipping preparations below will protect the machine in storage for three months. For severe conditions or longer periods, see Long Term Storage Preparations and Conditions.

Prior to shipment the equipment is thoroughly cleaned and prepared as follows:

1. All exposed machined surfaces are coated with rust inhibitor.
2. Lubricant compatible rust inhibitors are used with greases and oils during assembly and testing. These protect the bearings, seals and internal surfaces of lubricant chambers.
3. All ports and openings are covered with plywood or other suitable material to prevent entry of any foreign material.
4. Depending on the method of shipment the equipment may be covered or not covered during shipment. Protective shipping covers may consist of various materials such as polyethylene shrink wrap, polyethylene sheets, tarpaulins, etc. Note that these coverings may not be appropriate for long term storage purposes.

LONG TERM STORAGE PREPARATIONS AND CONDITIONS

1. To permit shaft rotation during storage, remove any blocking which might interfere.
2. Special care must be taken to maintain the rust inhibitor coating on exposed machined surfaces. Renew as necessary using a rust inhibitor (Spec. S8310 or equivalent).
3. Store the machine in a weather-tight warehouse. Controlled atmospheric conditions are preferred. If this is not possible, the machine must be sheltered completely from the weather. It must be kept out of direct sunlight. Ultraviolet rays have an adverse affect on seal materials and any polyethylene covering used.
4. The machine must not be exposed to extremes in temperature or rapid changes in temperatures.

LONG TERM STORAGE PREPARATIONS AND CONDITIONS (CONTINUED)

5. The machine should be protected from foreign material. Polyethylene sheet material should be applied over a framework that is large enough to allow free circulation of air around the machine. It should also allow access for any necessary maintenance. Any wood used on the machine or in the framework, must be kiln dried.

6. If the machine is stored in a closed container, a desiccant must be provided to control the humidity inside the container. The desiccant must be accessible for periodic renewal.

STORAGE MAINTENANCE

To assure maximum protection during long term storage, the following maintenance must be performed.

Every Three Months

1. Rotate the shaft several revolutions by hand. This will ensure that the rust inhibitor thoroughly coats the bearings and internal surfaces.

2. Inspect all exposed external machined surfaces for integrity of the rust inhibitor coating. Renew as necessary.

3. Inspect integrity of cover material.

Every Two Years

1. Purge all greases and rust inhibitors from the machine. Renew all lubricants using lubricants specified in the Lubrication Section of this manual.

2. Renew rust inhibitor coating on all exposed machined surfaces as specified previously.

3. Carefully inspect the cover material and its framework. Replace as necessary.

VENDOR SUPPLIED DRIVES AND OTHER EQUIPMENT

For special long term storage instructions for items not made by GL&V, see the vendor instructions.

Installation

⚠ WARNING

Follow all mill lockout/tagout procedures before working on this machine. Unexpected machine operation can cause property damage, serious injury or death. All energy sources including process piping must be properly locked out and tagged before any repair work or maintenance is done. Read and follow all safety precautions in the Safety Section of this manual.

INITIAL LUBRICATION

Prior to starting this machine for the first time, all lubrication points should be checked. See the Lubrication Section of this manual for the specific lubrication procedures and lubricant requirements. The areas to be checked include:

- The rotating assembly – The preservative oil in the rotating assembly will need to be completely drained. Refill with proper oil as listed in the Lubrication Section of this manual.
- The oil circulation system – If this option has been installed, see the Maintenance Section of this manual for more information about this system.
- The grease fittings for the sliding head – On new models, these are brought to a central block on the gearmotor side of the door of the refiner. Check for the presence of grease.
- The slide coupling – This is an oil lubricated coupling. Rotate the coupling so that one drain plug on the refiner half is at 45 degrees with the other at 225 degrees. Remove both drain plugs and check for the presence of oil. Repeat for the motor half of the coupling.
- The gearmotor – Check the grease fitting on the top of the motor. Remove the red plug on the side of the gearcase and check the oil level.
- The adjusting mechanism – Check for proper oil level.

Clean the rust inhibitor coating off the exterior machined surfaces.

DISKS

New refiners are typically shipped with disks installed. If not already installed, follow instructions found in the Maintenance section of this manual.

CAUTION

The 34/38" and 42/46" DD™ 4600 Refiners are designed for using segmented disks only. Do not install one-piece disks, this could result in machine damage.

FOUNDATION AND LEVELING

The size of the foundation is shown on the Certified General Arrangement Drawing. The drawing also shows the size, number and location of the foundation bolt holes. Note that the distance from the center of the outlet port on the casing to the end of the main motor shaft is critical. Particular care must be used to ensure that this dimension is correct when installing the foundations.

The refiner must be leveled to within .26 mm per meter (.003" per foot).

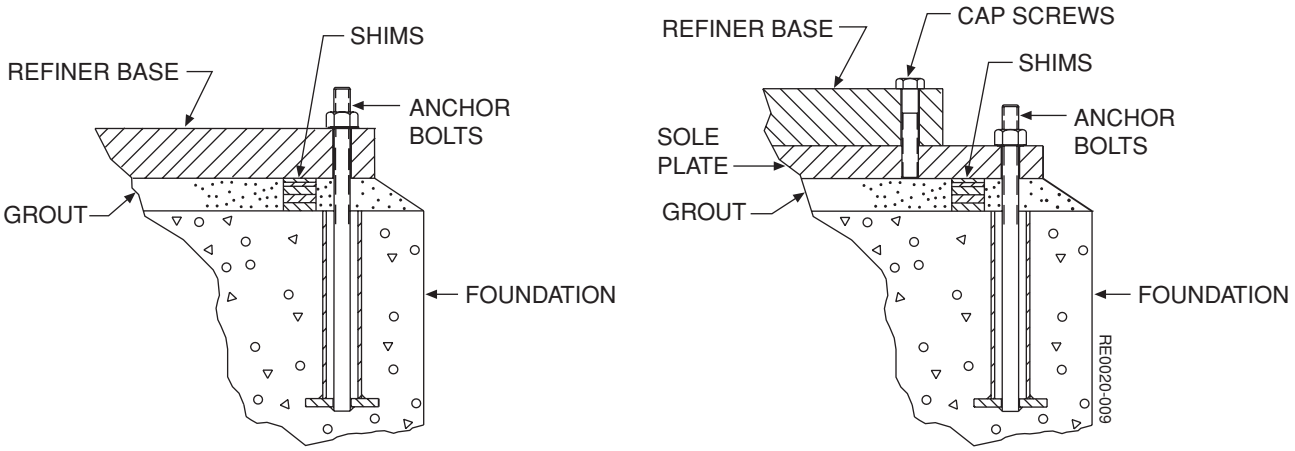
Installing the Refiner to the Foundation without a Sole Plate

1. Use the machined surface of the casing outlet as the leveling surface.
2. Build shims under the base at all anchor bolt locations. Use the minimum number of shims possible.
3. Tighten the nuts on the anchor bolts. Recheck the refiner for level.
4. Grout under base with non-shrink grout. Do not overlap onto the refiner base.

Installing the Refiner to the Foundation with a Sole Plate (Optional)

Sole plates may be one-piece or multi-piece. This is determined by the size of the refiner.

1. Use the machined surface of the sole plate(s) as the leveling surface. If the sole plate is a multi-piece, the pieces must also be level to each other.
2. Build shims under the sole plate(s) at all anchor bolt locations. Use the minimum number of shims possible.
3. Tighten the nuts on the anchor bolts. Recheck the sole plate(s) for level.
4. Grout under the sole plate(s) with concrete.
5. Mount the refiner to the sole plate(s) after the grout has set.



Foundation Requirements

COUPLING INSTALLATION - GEAR TYPE

For information about coupling installation or maintenance see the Maintenance section of this manual and the vendor data supplied with this manual. Please note that there are two documents provided by the coupling vendor. One covers general coupling Installation and Alignment. The other covers oil lubrication of couplings.

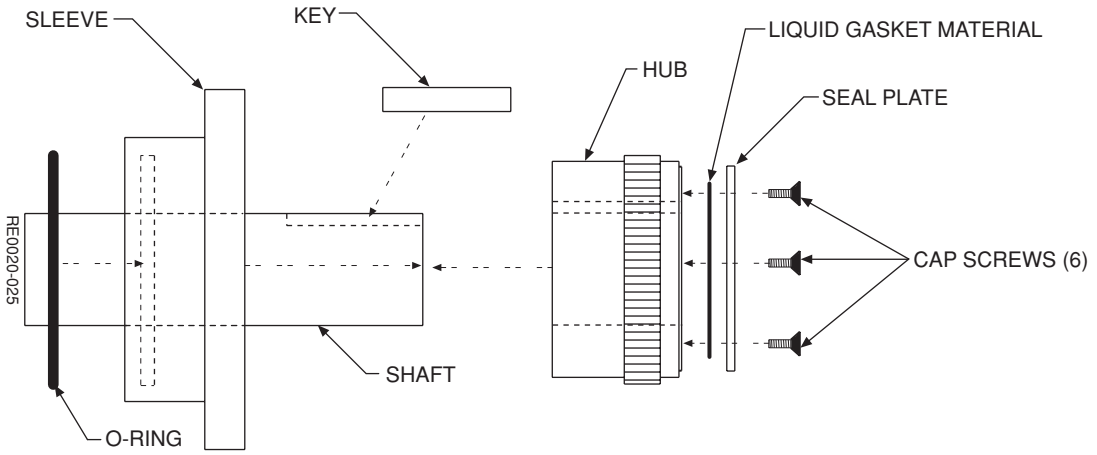
NOTICE

There are several installation issues not covered in the vendor data. These issues are specific to use of the coupling on the DD 4600 Refiner. These steps are as follows:

1. The hubs are mounted with the teeth toward the end of the shaft. The face of the hub must be flush with the end of the shaft.

2. Seal plates are installed over the ends of the shafts.

   - Apply sealant to the face of the hub where the seal plate mounts.
   - Use care not to seal the ends of the keyways. The keyways allow for venting of the coupling during operation.
   - Install the seal plate to the hub of coupling.



Installing the Seal Plate

COUPLING INSTALLATION (CONTINUED)

3. When the coupling halves are assembled together, a stop plate with two gaskets is installed between them. Take care that there are no folds or creases in the gaskets.

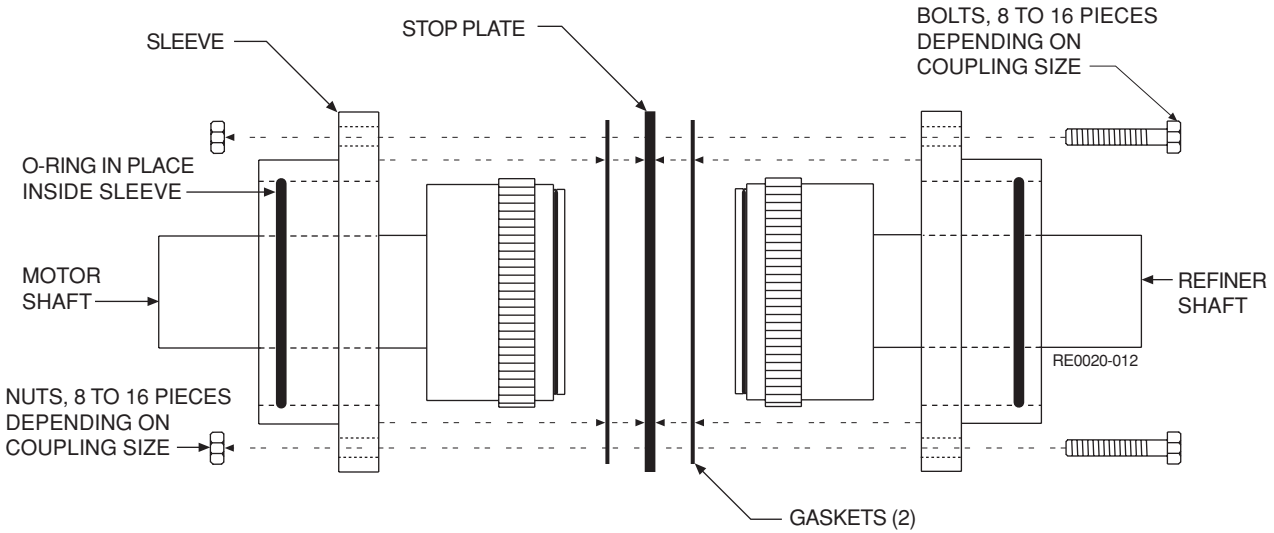
COUPLING INSTALLATION - DISC TYPE

1. Install the bearing housing spacers prior to installing coupling.

2. For straight shaft only: Install refiner side hub per “Installation and Alignment Instructions” flush to end of shaft.

3. For taper shaft only: Install refiner side hub per “Installation and Alignment Instructions”. See the ”Disc Coupling Arrangement” drawing for required hub advance. Attach the hub retainer plate to the shaft and lockwire the hex bolts.

4. Loosen the packing gland and pull the refiner shaft back toward the motor to take-up all bearing clearance.



Assembling the Coupling

5. See the Disc Coupling drawing in the vendor data section for required hub to hub gap and installed gap tolerance.

6. Measure the existing gap between refiner half hub and the motor shaft end.

7. Install the motor half coupling and maintain the hub to hub gap. The hub can overhang the motor shaft up by to 6.3 mm (.25") if needed.

8. Install the disc packs, align the hubs and complete the coupling assembly per the “Installation and Alignment Instructions”.

9. The disk coupling does not require any lubrication.

FINAL INSTALLATION CHECK

1. Check that all connections and services to the machine have been properly made.

2. Check the entire installation for leaks.

3. Check machine rotation. It should be counterclockwise when viewed from the motor end.

4. Check that all guards and covers are properly in place.

5. Check that all bearings have been properly lubricated.

6. Check that the seal water is fully operational.

7. Check oil level in the coupling.

8. Check gearmotor for direction of rotation and speed.

9. Check limit switch.

Piping and Wiring

GENERAL PIPING CONSIDERATIONS

1. Consult the Certified General Arrangement Drawing for the size and location of all connections and the recommended fittings.

2. All connecting piping must be separately supported and properly aligned. This will prevent strain or misalignment from being transmitted to the machine.

3. Piping should not be completely fabricated prior to the machine being fully installed on the foundation. The exact location of connections on the machine may vary slightly due to manufacturing tolerances.

4. Check all valves for freedom of operation after assembly.

5. All instrumentation should be calibrated prior to installation.

INLET AND OUTLET PIPING

1. A stock shutoff valve should be installed on the inlet pipe. This will make it easier to bypass the refiner and wash the machine down.

2. A 50 mm (2") diameter flush-out line should be installed on the inlet line. It should have proper pressure gauge and check valve.

3. The inlet pressure transmitter must be installed between the refiner and the shutoff valve.

4. The outlet pressure transmitter must be installed between the refiner and any shutoff valve on the outlet stock line.

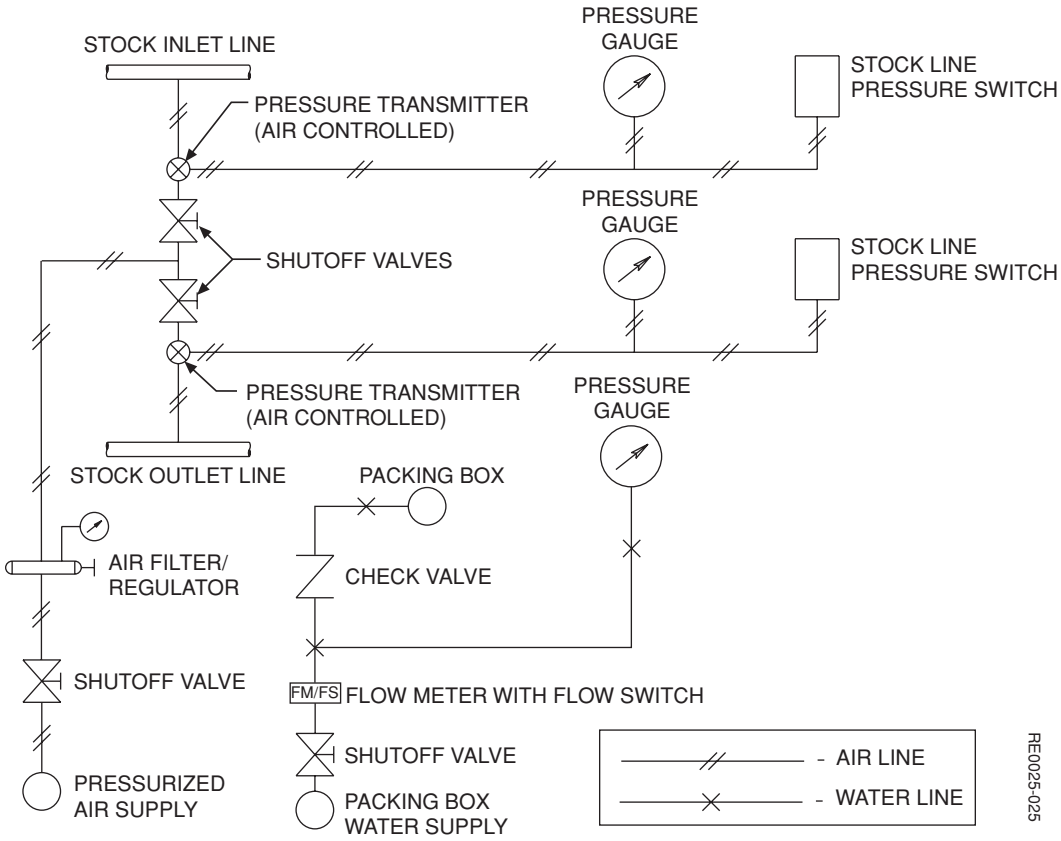
5. A threaded drain connection is located at the bottom center of the refiner. A full size valve is recommended to permit adequate flush-out. See Certified General Arrangement Drawing for specific information about the size of the piping.

NOTICE

Drain valve installation is left to the customer's discretion. However, it should be mounted as close to the refiner as possible to prevent it from becoming clogged with stock.

SEAL WATER PIPING - SPIRAL TRAC

1. Clean water filtered to 100 microns should be supplied for the packing box.
2. The customer should supply a valve, check valve, flow meter with flow switch and pressure gauge for the packing box inlet line.
3. The inlet flow should be at 2.84 lpm (0.75 gpm) minimum. The valve on the inlet line controls this flow.
4. The pressure is to be 105 kPa (15 psi) minimum above the inlet stock pressure.
5. The packing gland water flow switch is to be set for 2.84 lpm (0.75 gpm) minimum.



Piping Schematic

PRESSURIZED AIR SUPPLY

Most of the inlet and outlet pressure transmitters supplied by GL&V are air operated. If the transmitters supplied with the refiner are air operated, the following conditions must be met.

1. The customer should provide a pressurized air supply of at least 760 kPa (110 psi). This is 70 kPa (10 psi) above the highest operating pressure of the refiner.

2. If the air supply provided by the customer is less than 760 kPa (110 psi), the safety interlocks will have to be set to lower pressures.

    - The high-high pressure interlock will have to be set to 70 kPa (10 psi) below the supplied pressure.

    - The high pressure interlock will have to be set to 140 kPa (20 psi) below the supplied pressure.

WIRING

The customer provides all wiring. Requirements will be based on:

- The size and type of the main motor.

- The size of the gear motor.

- The process control system used.

See Vendor Data for specific component wiring requirements.

The wiring for the gear motor must be a flexible conduit. It should be run from the hinge side of the refiner door. It should have enough slack to allow the door to be completely opened without disconnecting the wiring.

System Design and Operation

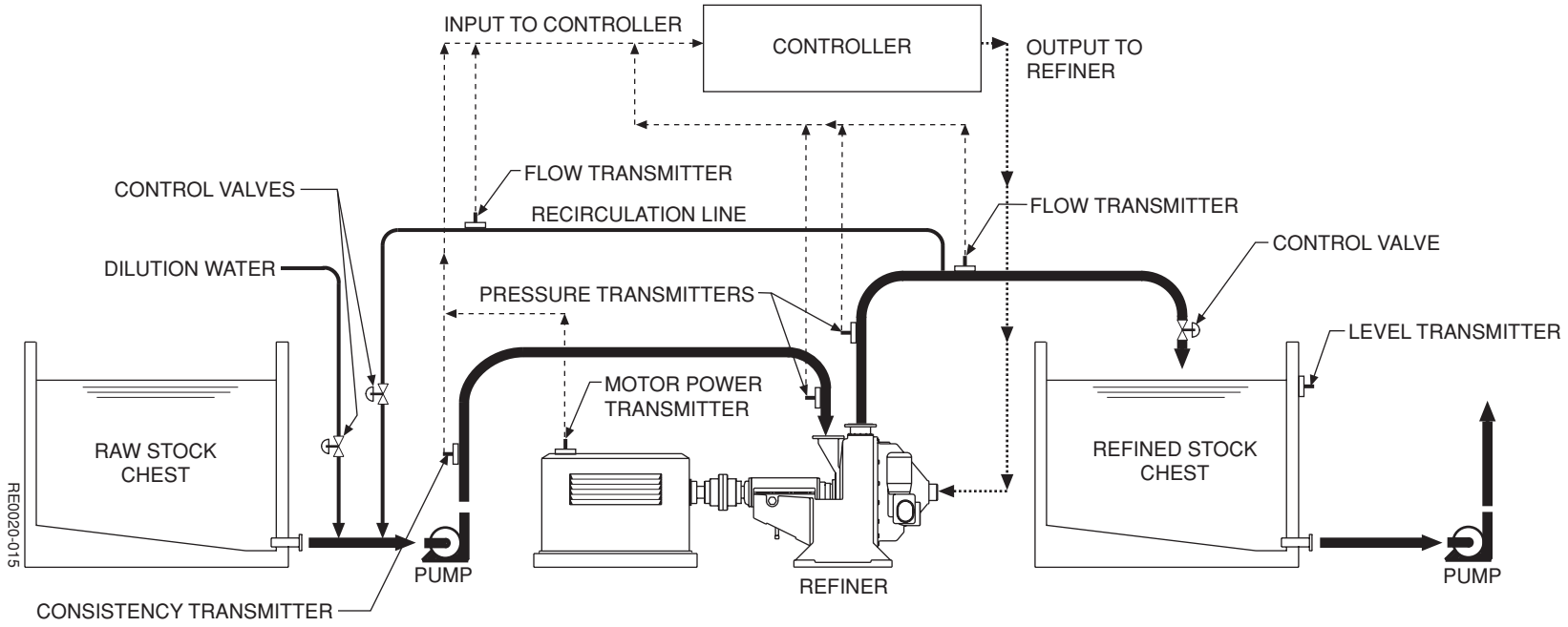
INTRODUCTION

Refining is a basic operation in stock preparation. It is a mechanical treatment of the pulp. It changes the individual fibers. This produces different properties in the finished paper. These properties can include strength, surface finish, etc. Refining also affects the papermaking process. Properly refined stock allows the paper machine to operate more consistently.

The mechanical treatment covers two extremes: cutting and brushing.

- Cutting – A high severity treatment. It produces short, stiff fibers. These fibers produce paper that is bulky, stiff, and has low strength.
- Brushing – A low severity treatment. It produces long, flexible fibers. These fibers produce flexible, high strength paper.

Most refining falls in between these two extremes.



The Refining System

INTRODUCTION (CONTINUED)

Many factors can affect the final outcome of the refining process. These include raw stock type, paper grade, refiner design and refining severity.

The change in freeness is the most readily observed indication of refining effectiveness. Freeness is the measure of how quickly water drains from the fiber.

- High Freeness – Water drains very quickly. Produced by low severity refining.
- Low Freeness – Water does not drain easily. Produced by high severity refining.

In operation, stock for the refiner is generally fed from a raw stock chest to the refiner. It is then pumped to a refined stock chest. From there, it will either go to the paper machine or for additional treatment.

CONTROLS

The goal of refining is to produce consistent quality stock. This is done by controlling certain variables during the refining process. These variables include refiner power, stock flow and stock consistency.

- Refiner power (motor load) is the most immediate indication of refining severity. The greater the motor load, the more severe the refining. Moving the plates changes the motor load. Moving them closer together will increase the motor load. Moving them apart will decrease the motor load.
- Stock flow can be controlled by recirculating stock back through the refiner.
- The stock consistency can be changed by adding dilution water into the system.

There are several different schemes of controlling these variables. The two most common control schemes are Auto kW Control and Net Specific Energy.

- Auto kW Control – This method uses a target set point for the main motor load (power). The set point is maintained by moving the plates in or out. If the motor load drops below the set point, the plates are moved closer together. If the motor load goes above the set point, the plates are moved farther apart.
- Net Specific Energy – This method is more accurate and more common. It uses a combination of stock flow and stock consistency to keep the same amount of refining power per ton of fiber treated. Also called HPDT (Horsepower Day per Ton).

There are other, more specialized control schemes. All of these control schemes depend on electronic control systems. These controllers are produced by GL&V and other electronics manufacturers. Detailed study of controllers and control schemes is beyond the scope of this manual. Anyone who needs more information about refiner control should contact the GL&V Field Service Department for assistance.

INTERLOCKS

The DD 4600 Refiner is equipped with three pressure switches for the safety interlocks. The customer must include the following interlocks in their control scheme. They are:

- Low Stock Inlet Pressure Interlock;
- High Pressure Interlock; and
- High-high Pressure Interlock.

⚠ WARNING

Do not operate this machine without all of the safety interlocks in place. These interlocks are designed to prevent the low flow and high pressure conditions that lead to overpressurization. Overpressurization can cause sudden rupture of the refiner casing. This can result in serious injury or death.

1. Low Inlet Stock Pressure Interlock – This interlock engages when stock inlet pressure falls below 105 kPa (15 psi).
   - It starts the gearmotor in *FAST OPEN* mode. This completely opens the refiner plates. This will completely unload the refiner motor.
   - It gives an audio/visual signal to indicate this condition exists.
   - It prevents the refiner plates from being closed during start-up.
2. High Pressure Interlock – This interlock engages when either the inlet or outlet pressure reaches 620 kPa (90 psi) or some other predetermined lower set point.
   - It starts the gearmotor in *FAST OPEN* mode. This completely opens the refiner plates. This will completely unload the refiner motor.
   - It gives an audio/visual signal to indicate that this condition exists.
3. High-High Pressure Interlock – This interlock engages when either the inlet or outlet pressure reaches 690 kPa (100 psi) or some other predetermined lower set point. This interlock is an additional safety precaution above the high pressure interlock. It engages if the pressure continues to rise after the high pressure interlock has engaged.
   - It shuts down the main motor.
   - It gives an audio/visual signal near the refiner, and at the control room, to indicate that this condition exists.

INTERLOCKS (CONTINUED)

In addition to the required interlocks, there are several other optional controls that can be added to the system. All of these controls are available from GL&V as options. For additional information about these controls, contact GL&V Field Service.

1. Electronic Low Flow Interlock – This interlock engages if the flow of stock to the refiner drops below a predetermined volume. Its effects on the operation of the refiner are the same as the low stock inlet pressure interlock.

   - It starts the gearmotor in *FAST OPEN* mode. This completely opens the refiner plates. This will completely unload the refiner motor.
   - It gives an audio/visual signal to indicate this condition exists.
   - It prevents the refiner plates from being closed during start-up.

   The following chart includes the recommended minimum flow rates for the DD 4600 Refiner.

Minimum Process Flow Values Chart	
Refinfer Size	**Minimum Flow**
16	170 lpm (45 gpm)
20	245 lpm (65 gpm)
24	360 lpm (95 gpm)
26	455 lpm (120 gpm)
30	570 lpm (150 gpm)
34	830 lpm (220 gpm)
38	985 lpm (260 gpm)
42	1135 lpm (300 gpm)
46	1515 lpm (400 gpm)

2. Stock Inlet Pressure Control – This control maintains the same stock inlet pressure, no matter what the flow volume. This prevents the stock outlet pressure from getting too high. It is especially useful where refiners are used in a series.

INITIAL START-UP

NOTICE

Prior to the initial start-up, the refiner needs to be thoroughly checked to be sure that it is ready to be operated.

1. Verify all piping and wiring connections.

   - All piping should be secured to proper hangers. The refiner should not be supporting the weight of the piping.

   - Flanges on inlet and outlet stock lines are bolted properly. All bolts are in place.

   - Pressure transmitters on inlet and outlet stock lines are between the refiner and any shutoff valves.

   - Seal water piping should be connected to the packing gland. The inlet line goes to the bottom connection, and the outlet goes to the top. No outlet is required when using an optional Spiral-Trac insert.

   - The air line for the pressure transmitters needs to be connected. Check to be sure that the available pressure is enough to operate the transmitters.

   - All electrical wiring must be done according to approved electrical wiring codes.

   - Wiring for gearmotor should be a flexible conduit. It should be fed from the hinge side of the door. It should also be long enough for the door to open completely.

   - All wiring should be properly secured. Relocate any wiring that might trip or snag someone working near the refiner.

   - Check all electrical enclosures. Covers need to be closed and secured. Watertight electrical enclosures should be checked for gaskets/sealers.

INITIAL START-UP (CONTINUED)

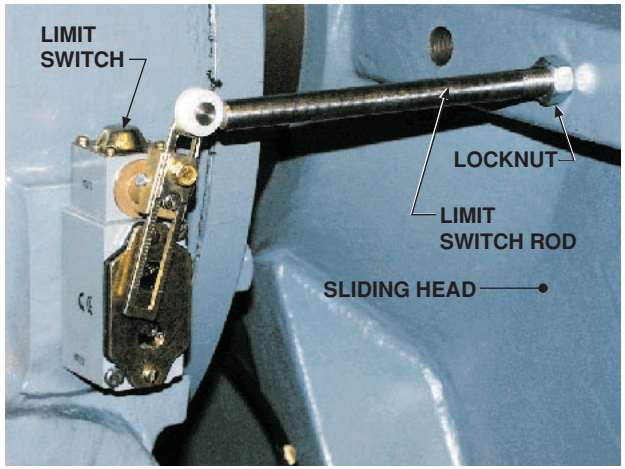
2. Verify lubrication. See the Lubrication Section of this manual for details.

NOTICE

Lack of lubrication, or use of incorrect lubrication, can cause serious damage to the refiner. Damage caused by failure to follow the lubrication requirements in this manual is not covered by the warranty on this refiner.

- Preservative oil in rotating assembly has been replaced.
- Adjustment mechanism is full.
- Gearmotor is full.
- Grease fittings are properly greased.
- Both halves of the coupling have the correct amount of **oil**.

3. Set limit switch.
   - Use clutch handle to disengage gearmotor.
   - Use handwheel to move plates firmly into contact with each other.
   - Note the position of the pointer on the limit switch scale.
   - Rotate the handwheel in the opposite direction until the pointer has moved 5 mm (3/16").
   - Loosen the nut that locks the limit switch rod in place.
   - Set the rod to where it opens (trips) the limit switch.
   - Lock the nut in place.



Limit Switch

INITIAL START-UP (CONTINUED)

4. Set pressure alarms.

   - Set low inlet pressure alarm to 105 kPa (15 psi).

   - Set high inlet and outlet pressure alarms to 620 kPa (90 psi) or 140 kPa (20 psi) below the maximum available air supply. Never exceed 620 kPa (90 psi).

   - Set high-high inlet and outlet pressure alarms to 690 kPa (100 psi) or 70 kPa (10 psi) below the maximum available air supply. Never exceed 690 kPa (100 psi).

5. Start seal water.

   - Set gland water pressure alarm to 70 kPa (10 psi) above the stock inlet pressure.

   - Turn on the packing box water. Verify pressure.

   - Verify that water is visible all the way around the shaft. If it is not, loosen the elastic stop nuts that retain the packing gland.

START-UP AND OPERATION (TYPE 2) REFINER LOADING STATION - DCS OR OTHER REMOTE CONTROL

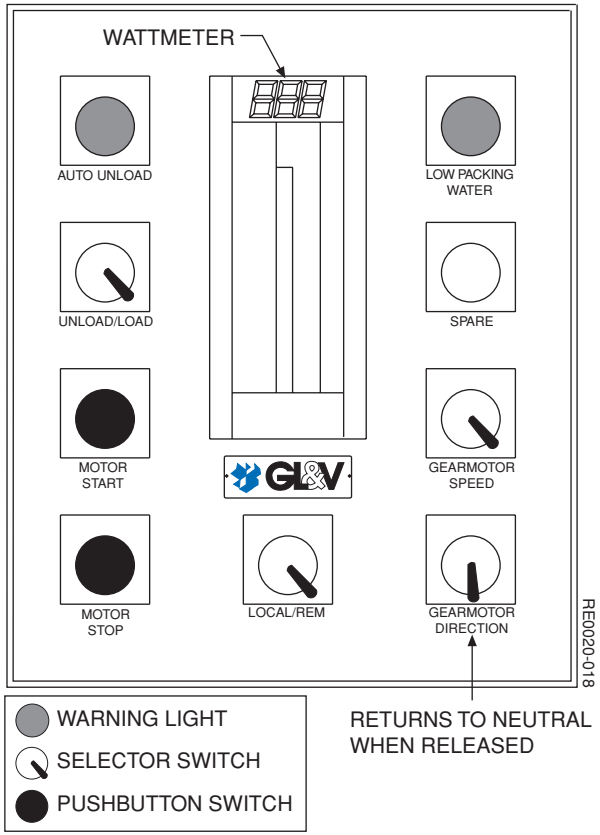
NOTICE

The following instructions apply in general to the start-up with a Manual refiner loading station, PRC, DCS, etc. See the Vendor Data for your specific controller.

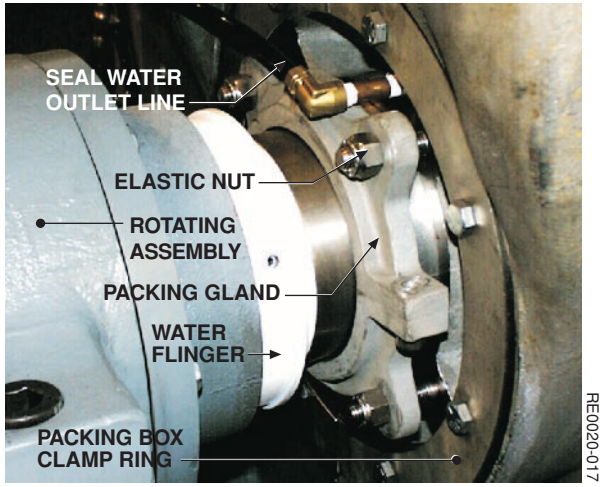
CAUTION

These steps must be followed in the order listed. Failure to follow the steps can result in damage to the refiner.

1. Start seal water. Verify seal water pressure. It should be 105 kPa (15 psi) above the stock inlet pressure.
2. Verify that the plates are backed all the way out.
3. Turn on the power to the control panel if equipped.
4. Start the refiner main motor.
5. Adjust the packing gland by using the stop nuts. Water should drip from the packing gland, but should not be thrown from the refiner shaft.
6. Open the stock outlet valve at least 25%.
7. Turn the refiner control selector to *LOAD*.
8. Open the stock inlet valve and start the stock pump. Verify that stock is flowing through the refiner.
9. Turn the gearmotor selector switch to *FAST* and turn the gearmotor control to *IN*. The sliding head will start forward at high speed.



GL&V Manual Loading Station Control Panel



Packing Gland

START-UP AND OPERATION (TYPE 2) REFINER LOADING STATION (CONTINUED)

10. When the power level on the wattmeter begins to rise, release the gearmotor control (it is spring loaded and will return to the middle position).

11. Turn the gearmotor selector switch to *SLOW*.

12. Use the gearmotor control to adjust the setting for the desired power level.

    - To increase the power level, turn the selector to *IN*.
    - To decrease the power level, turn the selector to *OUT*.

CAUTION

The gearmotor will overheat if allowed to operate for more than thirty minutes. Overheating may damage gearmotor.

SHUTDOWN

1. Select the *UNLOAD position on switch*. The alarm light on the control panel will light up and the gearmotor will start in reverse. The gearmotor will continue to reverse at high speed until the limit switch is reached. The limit switch will shut off the gearmotor.

2. Shut off the stock flow by closing the inlet valve or turning off the stock pump.

⚠ WARNING

Do not close the stock outlet valve before stopping the stock feed pump. This will lead to overpressurization. Overpressurization can cause sudden rupture of the refiner casing. This can result in serious injury or death.

3. After the stock flow stops, flush out the refiner. This is done with the two-inch flush-out line and the bottom drain.

4. The refiner main motor can now be turned off.

PROLONGED SHUTDOWN

Any shutdown that is expected to last more than 24 hours is to be treated as a prolonged shutdown. During a prolonged shutdown, additional steps need to be taken to ensure the long term reliability of the refiner.

1. Open the door of the refiner and wash or scrape all built-up stock out of the machine. This cleanout includes the inlet, outlet, rotor, door, packing box, etc.

2. Allow the machine to dry. Then coat any exposed mild steel with oil. A preservative oil is preferred for this treatment.

3. Check and fill all lubrication points according to the instructions in the Lubrication Section of this manual.

4. For a shutdown that is expected to last more than 30 days, see the Receiving and Storage Section of this manual or contact our GL&V Field Service Dept. for advice on long term storage.

Lubrication

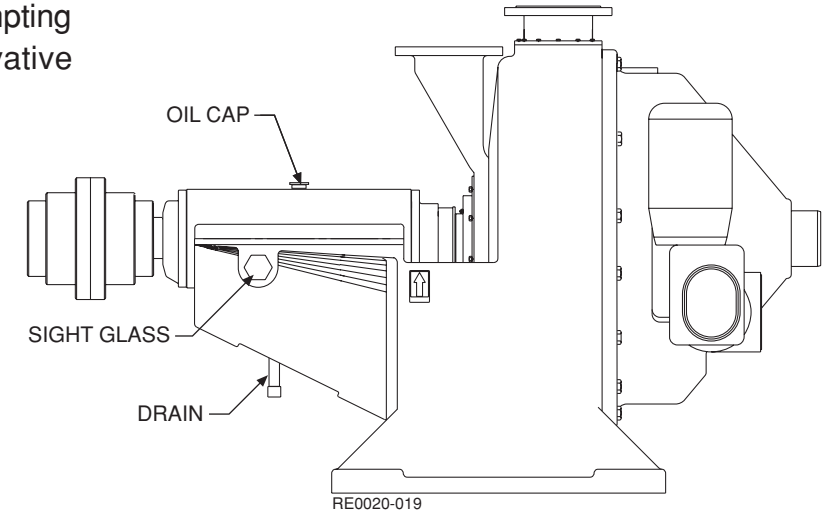
ROTATING ASSEMBLY - STANDARD LUBRICATION SYSTEM

The bearings are designed for splash oil lubrication. The oil cap at the top of the bearing housing provides easy access for adding oil. It also serves as an air vent. A sight glass is attached to the side of the bearing housing.

NOTICE

Before initial start-up, drain preservative oil from the rotating assembly. The refiner can not be operated with this oil in place. Attempting to operate the refiner with the preservative oil in place will damage the bearings.

- Use AGMA #5 premium grade rust and oxidation inhibiting gear oil – Shell Morlina #220 or equivalent.
- Fill to the level marked on the sight glass.
- Drain, flush and replace oil the first time after ten to fourteen days of operation.
- Drain, flush and replace oil every three months after initial oil change. If any sludge forms in the oil, change it more often.



Rotating Assembly Lubrication - Standard Lubrication System

ROTATING ASSEMBLY - OPTIONAL OIL CIRCULATION LUBRICATION SYSTEM

The bearings are designed for splash oil lubrication. The oil cap at the top of the bearing housing serves as an air vent. A sight glass is attached to the side of the bearing housing.

NOTICE

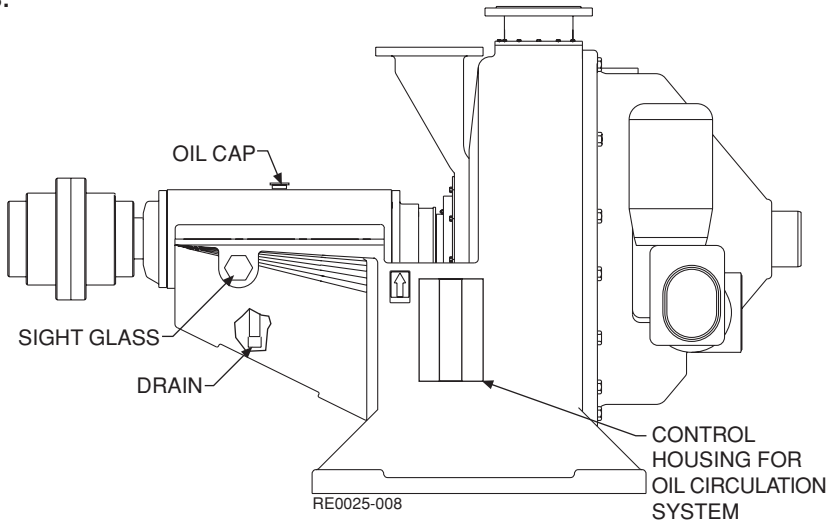
Before initial start-up, drain preservative oil from the rotating assembly. The refiner can not be operated with this oil in place. Attempting to operate the refiner with the preservative oil in place will damage the bearings.

- Use AGMA #3 premium grade rust and oxidation inhibiting gear oil. Use Shell Morlina #100 or equivalent.
- Check that all piping lines are properly attached.
- See Vendor Data supplied with the oil supply system for detailed information.

CAUTION

Never locate the oil supply system more than 3 meters (10 feet) from the machine. Oil deprivation at bearings, or overflowing oil reservoir may result. Failure to follow may result in damage to the refiner.

- Fill to the level marked on the sight glass.
- Drain, flush and replace oil the first time after ten to fourteen days of operation.
- Drain, flush and replace oil every three months after initial oil change. If any sludge forms in the oil, change it more often.

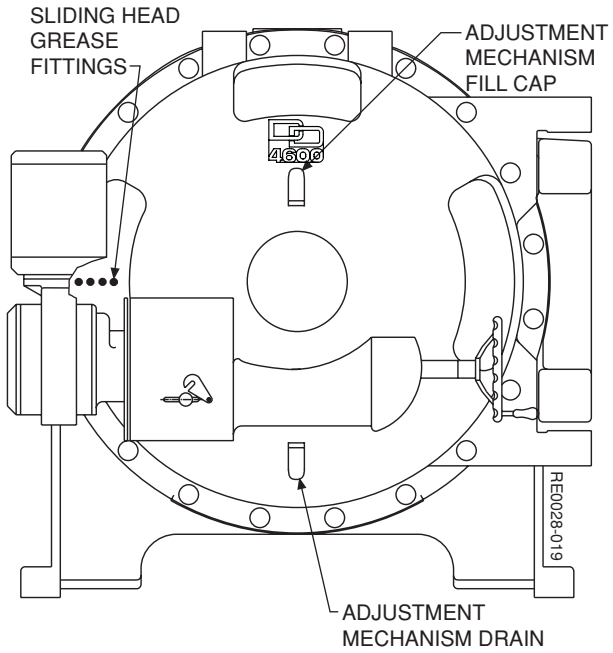


Rotating Assembly Lubrication with Oil Circulation System

ADJUSTING MECHANISM

The adjusting mechanism (adjusting screw, worm gear and cross shaft) are immersed in an oil bath.

- Use AGMA #8 premium grade gear oil with extreme pressure additive package containing no lead. Use Shell OMALA #680 or equivalent.
- Drain, flush and replace oil the first time after ten to fourteen days of operation.
- Drain, flush and replace oil every three months after initial oil change.



Adjusting Mechanism Lubrication

SLIDING HEAD

The sliding head contains four grease lubricated pads that are piped to a single distribution block located on the gearmotor side of the door of the refiner.

- Use a premium quality, multi-purpose, non-soap grease. It should have a NLGI No. 0 consistency with good load carrying ability. Use Shell DARINA A-EP 0 or equivalent.
- Lubricate every three months.

COUPLING - GEAR TYPE

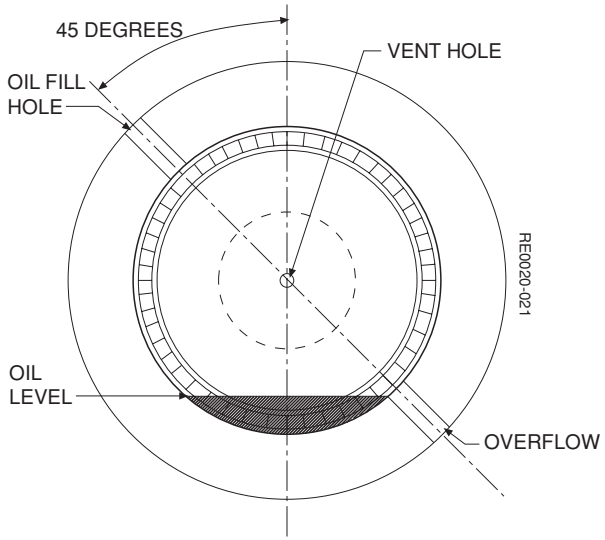
CAUTION

The coupling is a gear-type coupling that uses oil. Substituting grease can cause severe damage to the refiner. This damage can include:

- Excessive plate wear.
- Damage to the coupling teeth.
- Damage to the main motor. This can include having the shaft bearings pushed out of the casing due to excessive thrust loads.
- Premature wear to the gearmotor and gearcase.

The two halves are separated by a steel plate and must be oiled separately.

- Use AGMA #8 premium grade gear oil with extreme pressure additive package containing no lead. Use Shell OMALA #680 or equivalent.
- Drain, flush and replace oil the first time after ten to fourteen days of operation.
- Drain, flush and replace oil every three months after initial oil change.
- Rotate the coupling until the oil holes on the refiner half are at 45° and 225°.
- Remove both plugs.
- Add oil through the upper (45°) hole until oil starts to flow out the lower (225°) hole.



Coupling Lubrication

CAUTION

The chart lists the most common sizes of couplings used on DD 4600 Refiners and their oil capacity. The capacities listed on the chart are approximate. Be sure to follow the procedure for filling the coupling. Overfilling the coupling with oil can interfere with the proper operation of the refiner and cause damage to the machine. See the Certification Sheet that came with the refiner to determine exactly what size coupling is on the machine.

- Replace both plugs.
- Repeat procedure for the motor half of the coupling.

Coupling Oil Capacity Chart						
Refiner Size	16	20/24	26/30	34/38	42/46	42/46
Coupling Size	#3.0	#3.5	#4.0	#5.0	#5.5	#6.0
Capacity	**.24 liter** 0.5 pint	**.35 liter** .75 pint	**.47 liter** 1 pint	**.83 liter** 1.75 pint	**1.3 liters** 2.75 pint	**1.6 liters** 3.38 pint

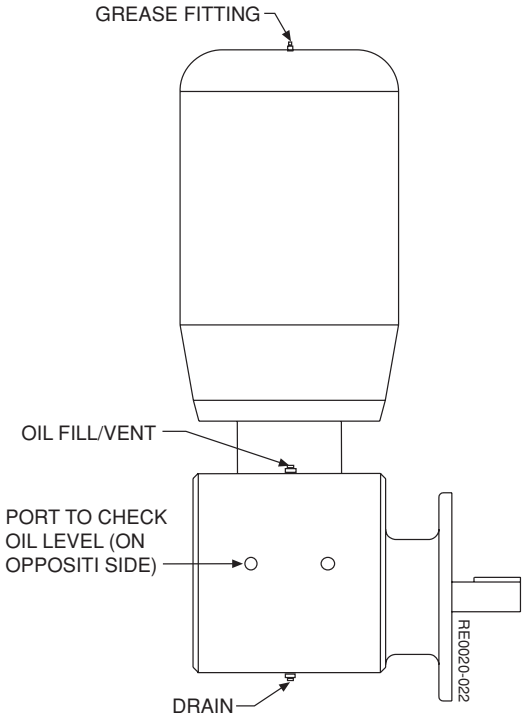
COUPLING - DISC TYPE

No lubrication is required.

GEARMOTOR

Lubrication is extremely important for satisfactory operation. The proper oil level must be maintained in the gearcase at all times. The unit should be inspected often. It should be turned off, but warm, when inspected.

- See Vendor Data specification for the oil in the gearcase and the grease in the fitting on top of the motor.



Gearmotor Lubrication

- Drain, flush and replace oil the first time after ten to fourteen days of operation.
- Drain, flush and replace oil every six months after initial oil change.
- Grease the top bearing every time the oil is changed. Do not over lubricate.
- No lubrication required for Integrated Motor Drive (IMD).
- To check oil level, remove the plug from side of gearcase.
- Add oil through the oil fill hole on top of the gearcase until oil comes out of the oil level hole.
- Replace the oil plug securely.

Lubrication Chart

Refiner Component	Lubricant Type	Lubricant Changes	Recommended or Equivalent
Rotating Assembly	Premium grade rust and oxidation inhibiting gear oil.	First oil change after 10 to 14 days. Change every 3 months after that.	
Below 66°C (150°F)	AGMA #3 (417-510 SUS @ 38°C/100°F)		Shell Morlina #100
Above 66C (150F)	AGMA #5 (918-1120 SUS @ 38°C/100°F)		Shell Morlina #220
Adjusting Mechanism	AGMA #8 premium grade gear oil with extreme pressure additive containing no lead. (2837-3467 SUS @ 38°C/100°F)	First oil change after 10 to 14 days. Change every 3 months after that.	Shell OMALA #680
Sliding Head	A premium quality, non-soap grease NGLI No. 0 with good load carrying ability.	Every 3 months	Shell DARINA EP-0
Coupling Fill each half separately. Do not use grease.	AGMA #8 premium grade gear oil with extreme pressure additive containing no lead. (2837-3467 SUS @ 38°C/100°F)	First oil change after 10 to 14 days. Change every 3 months after that.	Shell OMALA #680
Gearmotor Gearcase	See Vendor Data	First oil change after 10 to 14 days. Change every 6 months after that.	MOBILUBE 600W
Top Motor Bearings		When changing oil in gearcase.	Shell ALVANIA RL #2

Maintenance

⚠ WARNING

Follow all mill lockout/tagout procedures before working on this machine. Unexpected machine operation can cause property damage, serious injury or death. All energy sources including process piping must be properly locked out and tagged before any repair work or maintenance is done. Read and follow all safety precautions in the Safety Section of this manual.

PREVENTIVE MAINTENANCE

Proper maintenance is important for trouble-free operation of a refiner. Proper preventive maintenance involves more than lubrication. Refiners are often missed during routine maintenance for a number of reasons.

- A refiner usually runs 24 hours a day, 7 days a week. They are perceived as predictable or automatic.

- Usually located in a remote part of the mill.

- Usually monitored from a distant control room. It is not seen, so it is not thought of.

REFINER INSPECTION AND MAINTENANCE

A refiner does need routine maintenance. The best way to ensure that this maintenance gets done is to do regular inspections. An inspection should be performed every six months. If it can be done more often, it is even better. This inspection can usually be performed during a scheduled shutdown.

This inspection is fairly simple. It will generally take less than half a day. The easiest way to perform this routine inspection is with the following 12-step plan. These steps are a guide. Detailed instructions are contained in this section for the particular component involved.

See Typical DD Refiner Cutaway illustration for inspection points.

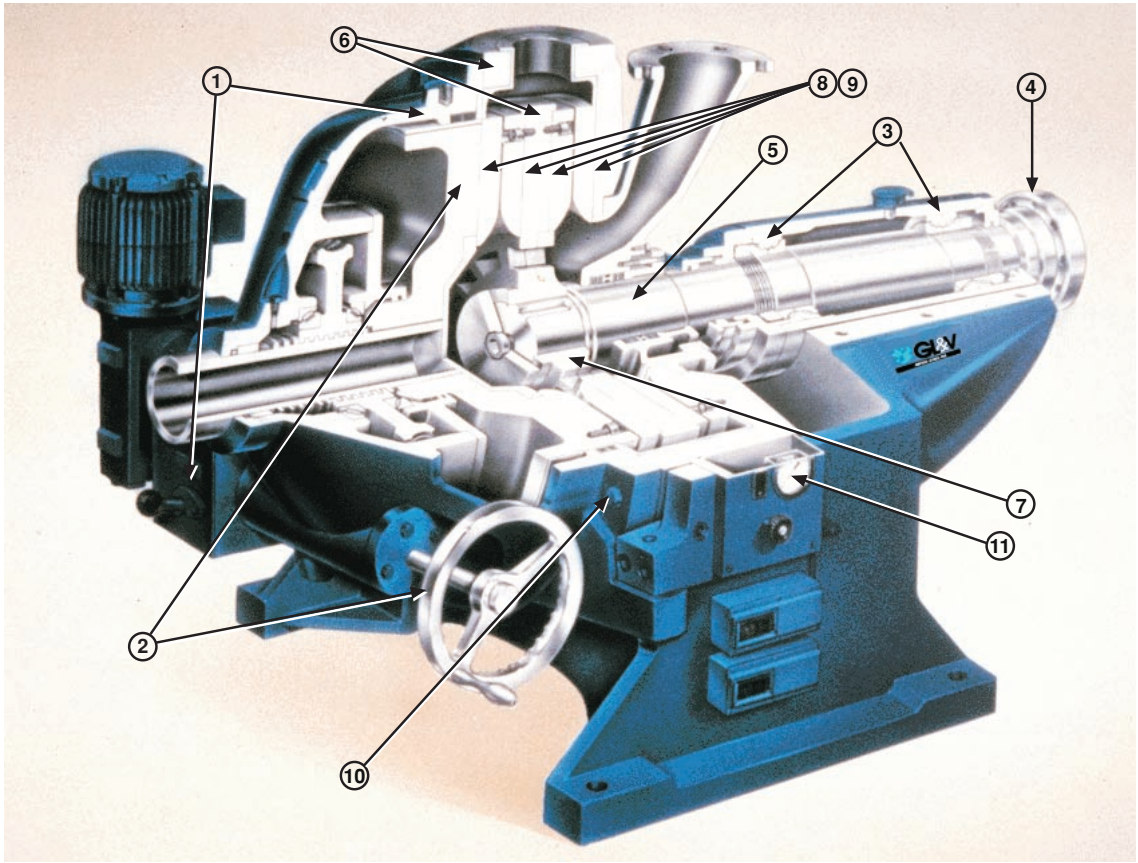
1. Inspect the grease fittings for the sliding head. If the fittings are dry, the sliding surfaces may have experienced undue wear. This can lead to tilting of the head. This can cause the shear pin to break. Also check the shear pin and shear pin hole. An incorrect pin (see Shear Pins later in this section) can cause damage to the refiner. An oversize or misshaped hole can cause the high torque gearmotor to break the pin.

2. Inspect the sliding head for vibration or pulsing. This is a sign of excessive wear in the adjustment mechanism. The refiner may not load up properly because of this problem. The following is the procedure for checking the backlash (play) in the adjusting mechanism.

   - Use a magnetic base to mount a dial indicator to the door casting. Set the indicator plunger against the sliding head.

   - Turn the handwheel and count how many turns it takes to move the head 1.5 mm (.060"). This is count “A.”

REFINER INSPECTION AND MAINTENANCE (CONT)



Typical DD Refiner Cutaway

- Turn the handwheel the opposite direction and count how many turns it takes to return the dial indicator to zero. This is count "B."

- Subtract count "A" from count "B." This is how much backlash (play) is in the adjusting mechanism. The normal backlash in a new adjusting mechanism is approximately 1/4 turn. Worn parts can allow 2 turns or more of backlash.

NOTICE

In many cases, what first appears to be a problem with the refiner's controller may be related to excessive backlash in the adjusting mechanism. If the backlash is greater than 2 turns, the refiner may not run consistently. The controller may cause the gearmotor to "hunt." It will keep moving the sliding head trying to find the correct adjustment. The excessive backlash prevents the controller from setting the sliding head at the best position.

REFINER INSPECTION AND MAINTENANCE (CONT)

3. Inspect the bearing housing for excessive heat. If the housing temperature is above 85°C (185°F) there may be a bearing problem. Model 4600 Refiners have higher bearing temperatures than Model 4000 Refiners because of increased loading. The causes of excessive bearing heat can include:
   - The bearing was not set up properly.
   - The bearing housing is out of alignment.
   - The shaft-to-bearing fits are not to specification.
   - Excessive vibration due to a bent shaft.
   - Inadequate or insufficient lubrication.
4. Check the coupling for free movement. There should be no grease in the coupling. The slide coupling provided with GL&V refiners uses oil. Disc type couplings provided by GL&V require no lubrication.
5. Inspect the packing sleeve for grooving. Grooving can prevent a proper packing seal.

⚠ WARNING

Completely drain the machine before opening. Allow it to cool down to room temperature before performing any work on it. Contains hot pulp and liquor and can cause severe burns if procedure is not followed.

6. Check the alignment (tram) of the rotating head. Misalignment can cause excessive wear of the bearing surfaces of the bearing housing, and a decrease in the refiner's performance. Severe misalignment (.5 mm [.020"]) can cause a broken shaft and spline damage. Refer to the procedure for checking the alignment (tramming) of the rotating assembly as described in "Alignment of the Rotating Assembly" found later in this section of the manual
7. If the rotating assembly alignment must be corrected, first check that the hub mounting diameter of the shaft is straight using the following procedure:
   - Use a magnetic base to mount a dial indicator on the machined face that the door closes against. Set the plunger against hub mounting diameter of the shaft.
   - Rotate the shaft and note the readings on the dial indicator. A difference (TIR or total indicator runout) of more than .025 mm (.001") indicates a bent shaft.

REFINER INSPECTION AND MAINTENANCE (CONT)

8. Inspect the disk mounting surfaces of the stationary, rotating and sliding heads. Built-up stock can leave a corroded outline of the disk on the mounting surface. If this corrosion has occurred, the surface will have to be remachined so that it is flat and parallel.

9. Check the coil-type thread inserts on the plate mounting surfaces. If these are not seated properly, they can cause high spots. These high spots interfere with proper disk installation. This can lead to plate clashing and damage.

10. Inspect the condition of the tapped holes for the door. Inspect both the coil-type thread inserts and the threads they are screwed into. These threads can corrode. Once this underlying material is damaged, the inserts are not properly supported. At high operating pressures these corroded threads can fail. This could allow the door to open. If the door opens during operation, it can cause serious injury or death. All door bolts must have solid engagement. The length of this engagement should be two times the diameter of the bolt. For example, 25 mm (1") bolts need 50 mm (2") of solid engagement.

⚠ WARNING

Improper door fastening can result in door opening while machine is operating under pressure. Serious injury or death can result.

The machine covered in this manual is available in both U.S. inch and SI metric models. Use care to not interchange inch and metric fasteners. Many inch and metric fasteners will appear to mate but are not interchangeable. Consult your certified General Arrangement Drawing to determine the type of fasteners used on your machine.

Always use proper grade fasteners (SAE grade 5 for inch, ISO grade 8.8 for metric)

Always torque fasteners properly. See torque chart in the Appendix of this manual.

Always inspect condition of fasteners and mating tapped holes. Replace damaged fasteners. The mating surface should have a minimum engagement of 1.5 times the fastener diameter with solid, undamaged threads.

11. Check the inlet pressure. Excessive inlet pressure (above 445 kPa [65 psi]) can cause excessive wear on the #1 and #2 disks. It can also cause packing leakage or premature wear. Inlet pressure should be around 275 kPa (40 psi).

12. Check the stock recirculation line, if one is used (not shown). Confirm that it is working properly. An improperly working recirculation system can cause a build-up of pressure in the refiner. For more information on overpressurization, see the Safety section and Interlocks in the System Design and Operation section in this manual.

TROUBLESHOOTING CHART

Troubleshooting Chart for DD 4600 Refiner		
PROBLEM	**CAUSE**	**SOLUTION**
Low throughput	Worn plates	Replace plates.
	Wrong plate pattern	Replace with correct plate pattern.
	Incorrect plate installation	Check mounting surfaces and coil-type thread repair inserts. Are plates in the correct order? Are segments properly matched?
	Plugged lines	Check inlet and outlet flow. Clear lines.
	Incorrect motor rotation	Check rotation. Rewire for correct rotation.
Premature plate wear	Tramp metal	Install HD cleaner
	Plate-to-plate contact	Correct underlying problem. See “Plate-to-plate contact” section below.
	Contaminated stock	Select proper alloy
	Corrosion	Select proper alloy
Uneven plate wear	Worn spline	Replace rotor or hub or both.
	Refiner out of tram	Realign (tram) rotor.
	High or low stock velocity	Adjust flow rate
	Bent shaft	Straighten or replace shaft.
	Bearings off-center	Realign
Sliding head will not move. Gearmotor runs.	Sliding head pads not lubricated	Grease sliding head.
	Broken shear pin	Determine cause of shear pin breakage. Replace broken shear pin.
	Poor sliding head seal	Repair or replace seal.
	Low stock flow interlock	Provide sufficient stock to refiner.
	High pressure interlock	Determine cause of high pressure. Correct cause.
Can’t load refiner	Broken shear pin	Determine cause of shear pin breakage. Replace broken shear pin.
	Refiner out of tram	Realign (tram) rotor.
	Low stock flow interlock	Provide sufficient stock to refiner.
	Low stock consistency	Increase stock consistency.
Short bearing life	Coupling misaligned	Check and correct coupling alignment.
	Bearing over/under lubricated	Clean and lubricate bearing to the proper level.
	Too much oil in coupling	Check and clean coupling. Fill to proper level.
	Bent shaft	Straighten or replace shaft.
	Poor foundation	Repair or replace foundation.
	Improper motor mounting	Correct motor mounting.
Premature packing failure	Follower too tight	Loosen and readjust packing gland.
	Wrong packing	Install correct packing.
	Improper run-in	Replace packing and redo run-in.
	Low seal water flow	Set seal water flow to 4–6 lpm (1–1.5 gpm).

TROUBLESHOOTING CHART (CONTINUED)

Troubleshooting Chart for DD 4600 Refiner - Continued		
PROBLEM	**CAUSE**	**SOLUTION**
Short sleeve life	Tight or misaligned follower	Loosen and readjust packing gland.
	Low seal water pressure	Set seal water pressure to 105 kPa (15 psi (above stock inlet pressure.)
	Contaminated seal water	Use clean, filtered water for packing seal water.
	Incorrect packing box clearance	Realign shaft through packing box.
Erratic motor load	Refiner out of tram	Realign (tram) rotor.
	Broken meter	Test and replace meter.
	Incorrect plate installation	Check mounting surfaces and coil-type thread repair inserts. Are plates in the correct order? Are segments properly matched?
	Variations in consistency or flow	Stabilize feed to the refiner.
	Worn adjusting mechanism	Rebuild adjusting mechanism.
	Misaligned coupling	Check and correct coupling alignment.
Plate-to-plate contact	Refiner out of tram	Realign (tram) rotor.
	Low consistency	Increase stock consistency.
	Low flow	Increase flow to the refiner.
	Incorrect plate installation	Check mounting surfaces and coil-type thread repair inserts. Are plates in the correct order? Are segments properly matched?
Bearing overheating	Bearing over/under lubricated	Clean bearing and lubricate to the proper level.
	Improper oil	Check Lubrication Section of manual and fill with the correct oil.
Excessive vibration	Coupling misaligned	Check and correct coupling alignment.
	Bent shaft	Straighten or replace shaft.
	Cracked shaft	Replace shaft.
	Disks not balanced	Check disks and rebalance.

COMPONENTS

Read the entire disassembly and reassembly instructions before starting the job.

Use care when disassembling any part of the refiner. Use the correct tool for the job being done. Place removed parts in a clean, dry protected area. To prevent corrosion high quality light oil should be applied to all parts.

If the machine is to be left disassembled for more than 24 hours, openings should be protected to prevent the entry of foreign material.

Carefully inspect all parts before reassembly. This includes both new and reused parts. Use the correct tools for the job.

Do not reuse O-Rings, gaskets, seals or bearings. These parts are subject to wear and contamination and should only be reused in an emergency, as when new parts are not available. If these parts are reused, they should be replaced as soon as possible.

Molybdenum disulfide (MoS_2) compound or equivalent should be used on all hardware during reassembly, unless stated otherwise.

COUPLING - DISC TYPE

For maintenance of disc type coupling see Vendor Data supplied with this manual.

COUPLING - GEAR TYPE

Removing the Coupling

The first part of this instruction covers both straight shaft and tapered shaft refiners.

1. Remove all four oil plugs.

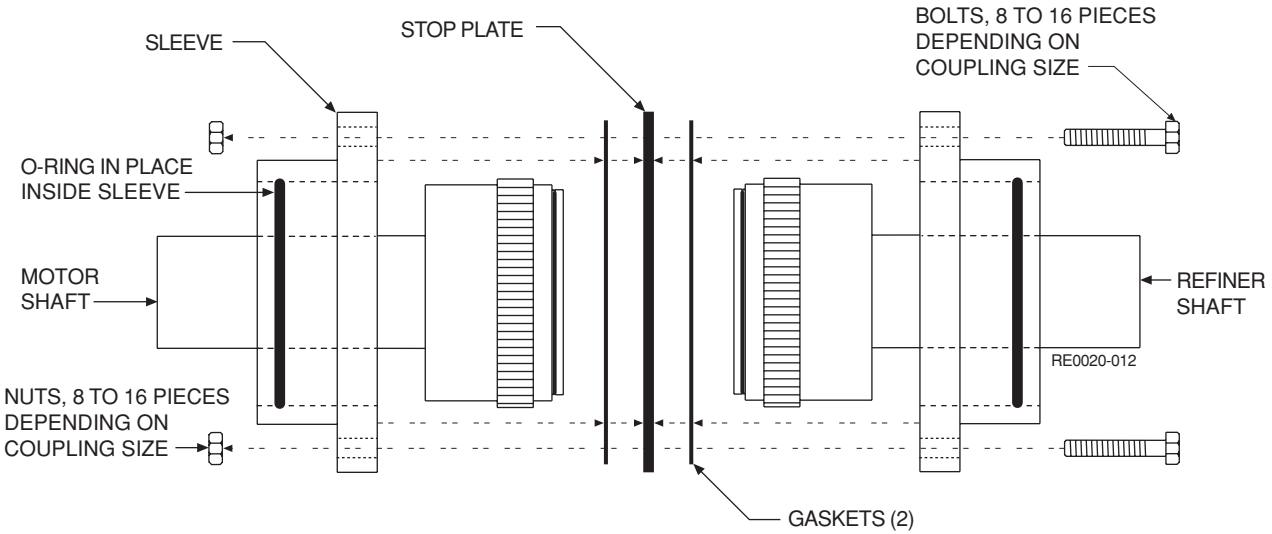
2. Rotate the coupling so that the oil holes are in the 6 and 12 o'clock positions, and allow the oil to drain.

3. Remove the bolts that hold the two halves of the sleeve together.

4. Separate the two halves of the sleeve, and remove the stop plate and gaskets.

5. Slide the sleeve halves back out of the way.

6. Unbolt the main motor from its sole plate. Move the motor back to provide room to remove the coupling halves.



Disassembling the Coupling

COUPLING (CONTINUED)

The following two sections provide specific instructions for straight or tapered shaft refiners.

Most refiners have a straight bore. A machine with a tapered bore can be recognized by the hex head cap screws locked in place by a safety wire.

For Couplings on Tapered Shaft Refiners

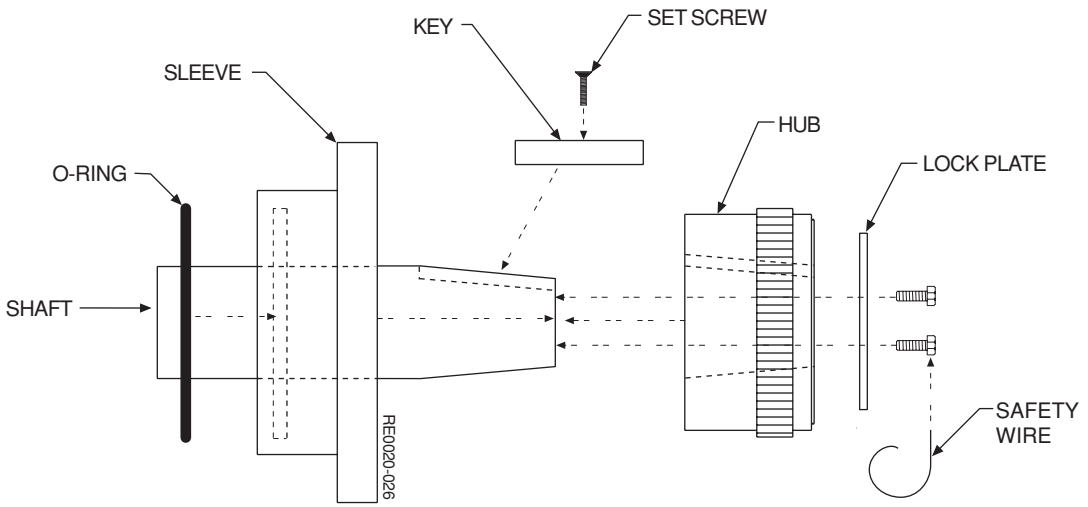
1. Remove the safety wire from the bolt heads. Discard the old safety wire. Loosen the lock disk bolts.

2. Strike the other end of the hub (closest to the refiner) with a plastic, lead or brass hammer. This will loosen the hub from the shaft.

NOTICE

Do not use a steel hammer on the hub to remove it from the shaft. Do not strike the teeth with any hammer.

3. Finish removing the lock disk bolts. Remove the lock disk and hub.



Coupling on a Tapered Shaft Refiner

COUPLING (CONTINUED)

For Couplings on Straight Shaft Refiners

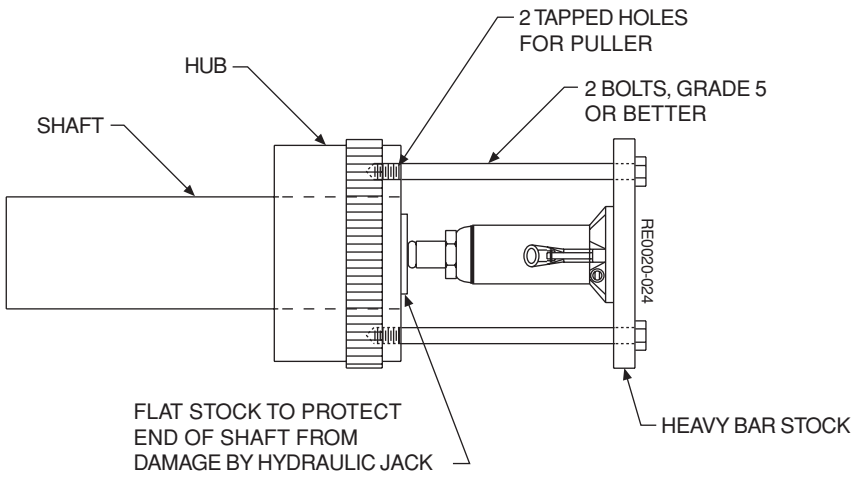
1. Remove the six screws that hold the seal plate in place and remove the seal plate.

2. Pull the hub off of the shaft with a suitable puller.

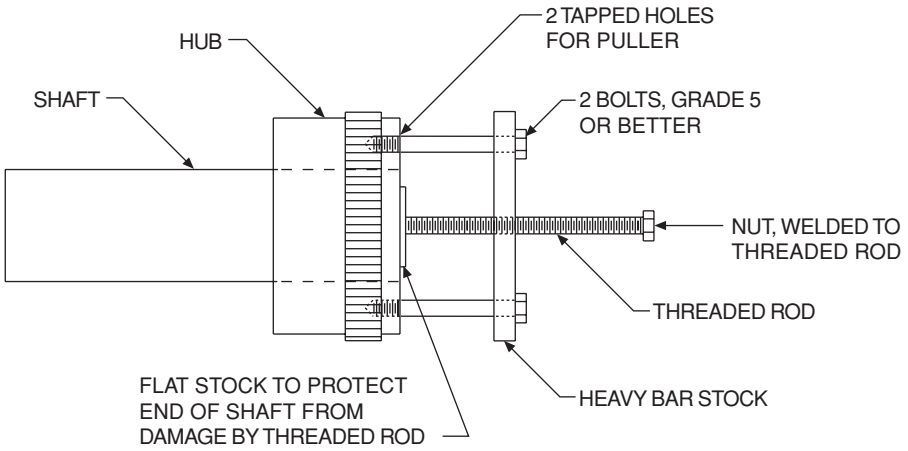
NOTICE

Do not hammer on the hub to remove it from the shaft. Do not pull the hub by the teeth.

HUB PULLER USING A HYDRAULIC JACK



SCREW TYPE HUB PULLER



Hub Pullers

COUPLING (CONTINUED)

Installing the Coupling

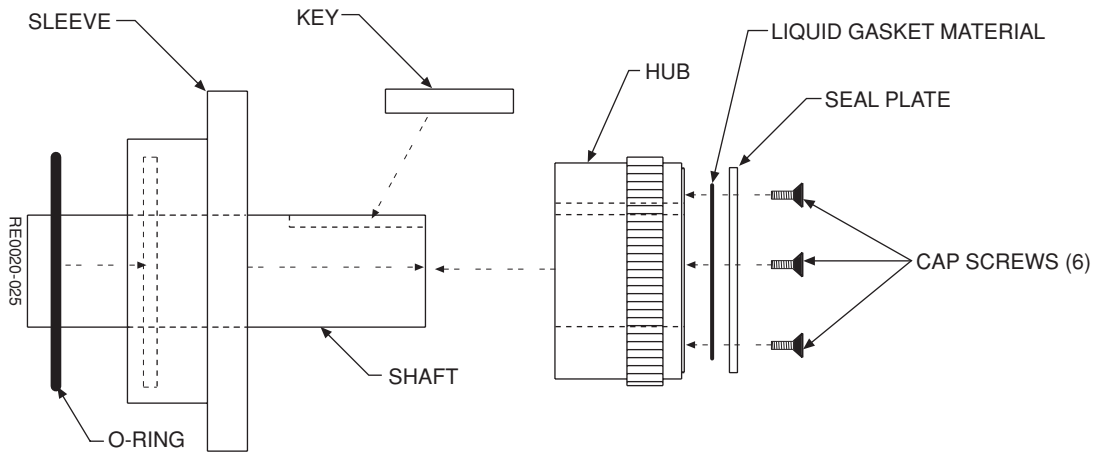
For information about coupling installation or maintenance see the vendor data. Please note that there are two documents provided by the coupling vendor. The first one covers general coupling installation and maintenance. The second covers oil lubrication of couplings.

NOTICE

There are several installation issues not covered in the vendor data. These issues are specific to use of the coupling on the DD 4600 Refiner. These steps are as follows:

1. The hubs are mounted with the teeth toward the end of the shaft. The face of the hub must flush with the end of the shaft.
2. On straight shaft refiners, seal plates are installed over the ends of the shafts.

   - Apply sealant to the face of the hub where the seal plate mounts.
   - Use care not to seal the ends of the keyways. The keyways allow for venting of the coupling during operation.
   - Install the seal plate to the hub of the coupling.



Installation of the Seal Plate

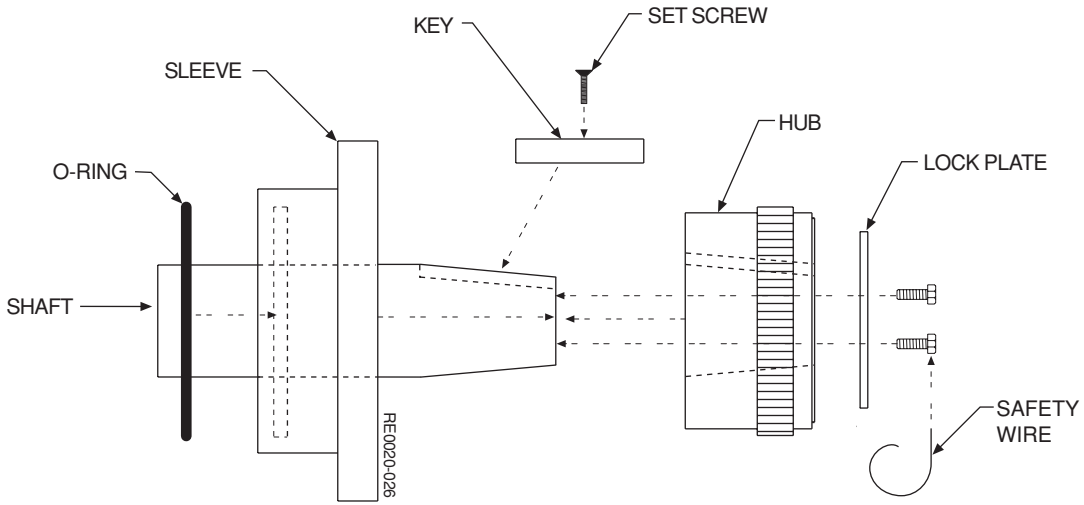
COUPLING (CONTINUED)

3. On tapered shaft refiners there is no seal plate over the end of the refiner-half hub.

   - There is a lock plate. There is no sealant behind the lock plate.

   - The lock plate is held in place by hex head bolts. These bolts have holes drilled through the heads. These holes are for a safety wire. See the Torque Chart in the Appendix in this manual for recommended torque values for the bolts.

   - After the bolts are torqued in place, a safety wire is fed through the holes. Twist the ends of the wire together and fold the ends flat against the lock disk. **Always use a new safety wire.**



Installation of the Lock Disk

COUPLING (CONTINUED)

4. When the coupling halves are assembled together, a stop plate with two gaskets is installed between them. Take care that there are no folds or creases in the gaskets.

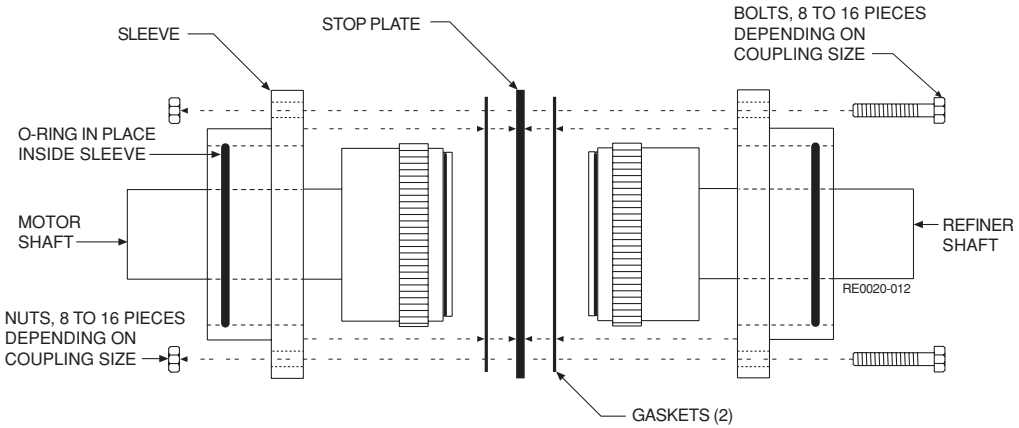
DISK SET

Disks are usually referred to by the position they occupy in the machine.

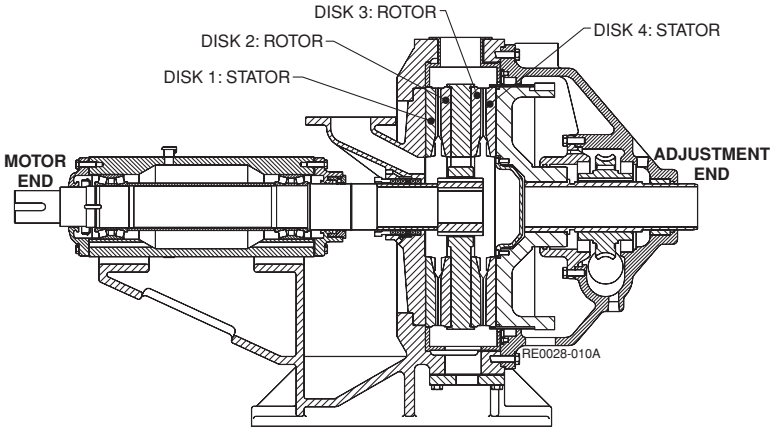
- Disk 1 is the stationary disk closest to the main motor.
- Disk 2 is on the side of the rotor facing Disk 1.
- Disk 3 is on the side of the rotor facing the door.
- Disk 4 is mounted to the adjusting mechanism. This is the disk that is moved to make adjustments to the refiner.

NOTICE

Do not use an air or electric impact wrench when installing disk segments. This can damage the threads on the collar bolts. It may also cause the disks to be torqued incorrectly. Use a hand torque wrench to tighten the bolts to the proper torque. See the Torque Chart in the Appendix in this manual.



Assembling the Coupling



Disk Positions

CAUTION

DD™ 4600 Refiners are designed for using segmented disks only. Do not install one-piece disks, this could result in machine damage.

SEGMENTED DISKS

Identification

A segmented disk is shipped as a set. One box contains the segments for one disk. A segmented disk is ground to its final thickness as a set. The segments from a disk should always be used together as a set.

Segmented disks may be marked several ways.

- All segments are marked on the back with the pattern number.
- The segments of some disks will be match marked. The segments of the disk are installed in a specific order.
- Some disks are identified with their position number (Disk 1, 2, 3 or 4). These disks are meant to be installed at a specific location in the refiner.

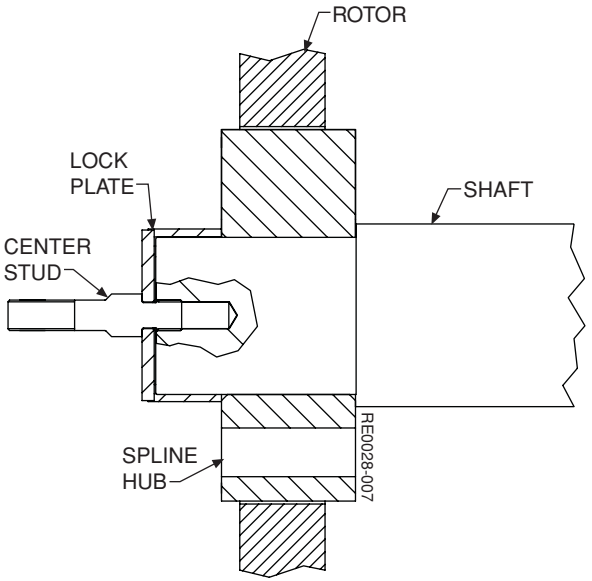
For specific installation instructions see the vendor instructions for the specific disk set.

Removing Segmented Disks

1. Open the door of the refiner.
2. Unbolt and remove the segments of Disk 4. Store the segments in a protected area. Keep segments for each disk together as a set.
3. Unbolt and remove the segments of Disk 3. Store the segments in a protected area. Keep segments for each disk together as a set. Do not mix segments with other disks.

The rotor must be removed to access disks 1 and 2.

4. Remove the spline hub retainer plate, spacer and bolt at center of rotating head assembly.
5. Install the lock plate and center stud into the shaft end.



Lock Plate and Center Stud Assembly

SEGMENTED DISKS (CONTINUED)

6. Swing in the removal arm assembly. Align removal hub on center stud and push removal hub tight against spline hub. Install the center nut until it touches the removal hub.

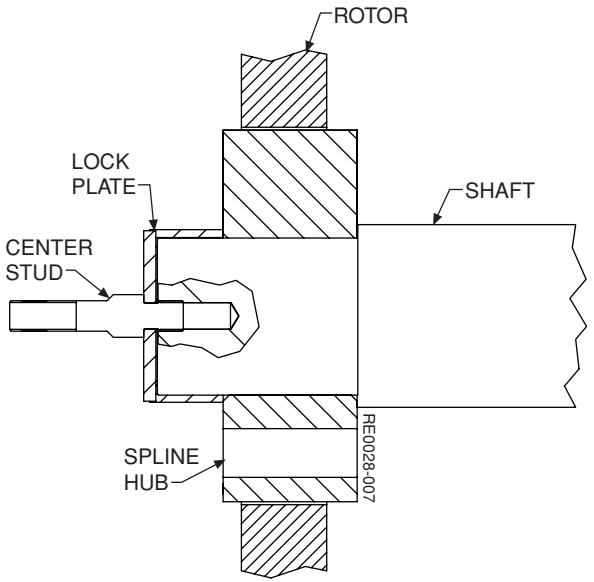
7. Check removal hub vertical alignment. It should be flush to the spline inside diameter of the rotor. Rotate the jacknut to raise or lower the removal hub as required. Tighten center nut when the removal hub is in position.

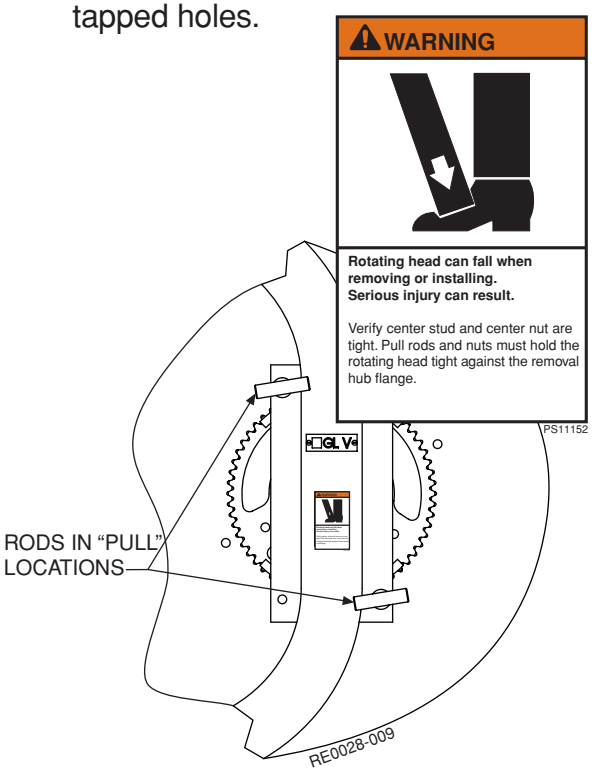
8. Install push/pull rods into outer clearance holes of removal hub and screw into rotor removal holes located between cross flow ports.

   Please note, on smaller size refiners, it may be necessary to remove two opposite inner disc mounting bolts and install push/pull rods in these tapped holes.

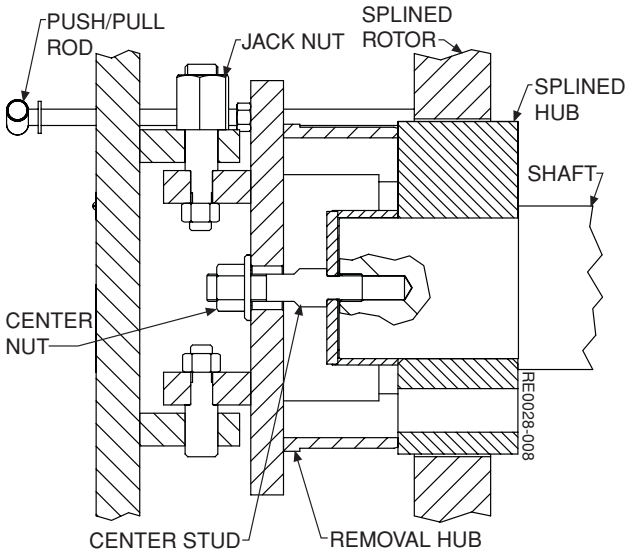
9. Pull rotor off spline hub with push/pull rods.

10. When rotor is fully onto the removal hub, remove the center nut. Swing rotor and arm out of the main housing.





Hub in Locked Position Ready for Removal



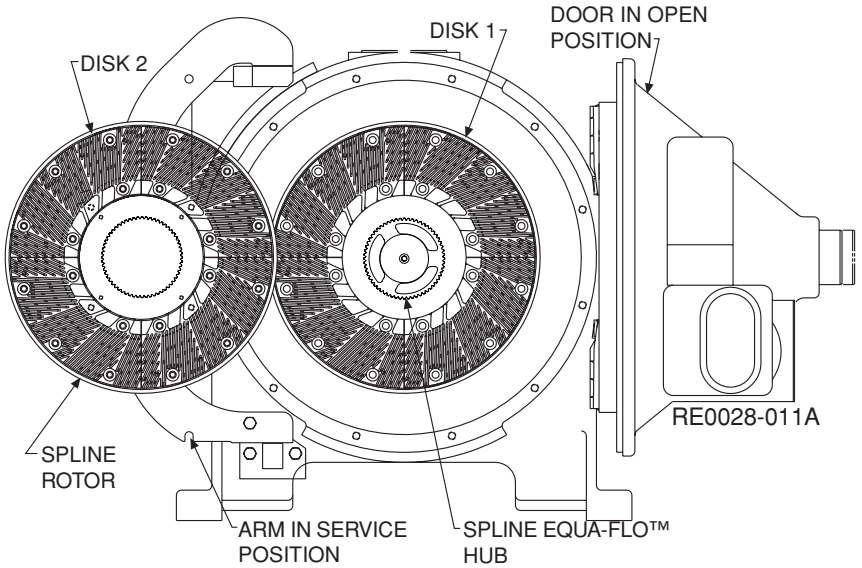
Final Hub Adjustment

SEGMENTED DISKS (CONTINUED)

⚠ WARNING

Do not remove push/pull rods from rotor until after the rotor is ready for installation with the center nut tightened to hold the removal hub against the splined hub. Failure to follow could result in serious injury from falling rotor.

11. Disks 1 and 2 are now ready to be removed following above steps 2 through 6.



Rotor Fully Removed

12. The segments for Disk 2 may be removed individually at this time. Keep segments for each disk together as a set. Do not mix segments with other disks.

13. Unbolt and remove the segments of Disk 1. Store the segments in a protected area. Keep segments for each disk together as a set. Do not mix segments with other disks.

14. Disks should be cleaned and inspected to determine if they are going to be kept for future use. Before the disks are stored, their position (Disk 1, 2, 3 or 4) should be marked on them. This will make future installation easier.

NOTICE

When the spline working surfaces on the hub and rotating head become worn, the hub and rotor can be "flipped" by installing both parts with previously outward facing surfaces facing inward. "Flipping" provides a set of unworn spline working surfaces. The hub and rotor must be "flipped" together.

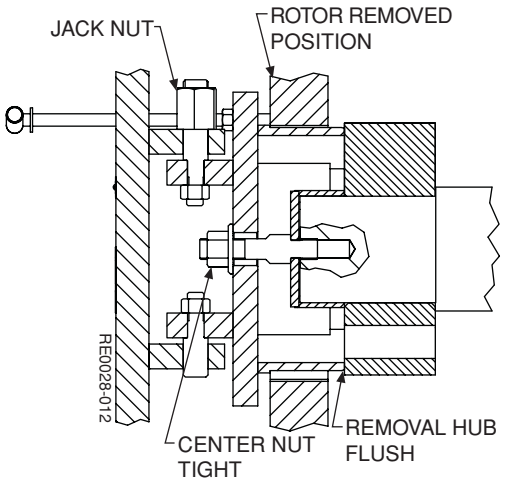
SEGMENTED DISKS (CONTINUED)

Installing Segmented Disks

1. Inspect the mounting surfaces in the refiner and on the rotor. These must be free of burrs or high metal. Inspect the back side of the disk segments. These must be free of burrs and high metal.
   - If there are coil-type thread inserts in any of the disk locations, they must be seated below the surface.
2. Determine where each segment will go in the refiner.
   - For new disk sets refer to the vendor's instruction sheet.
   - For used disk sets check the identification that was marked on them at the time they were removed from the refiner.
3. Install the segments for Disk 1. Be sure to push each segment outward toward the retaining ring before tightening. The two bosses on the outer edge of the segment should be pressed firmly against the retaining ring. Tighten to the proper torque value. See the Torque Chart in the Appendix for the proper torque values.
4. Install the segments for Disk 2 to the #2 side of the rotor. Be sure to push each segment outward toward the retaining ring before tightening. The two bosses on the outer edge of the segment should be pressed firmly against the retaining ring. Tighten to the proper torque value.
5. Swing in the rotor mounted to the removal arm. Be careful to align rotor and removal hub to center stud and to clear housing. Push removal hub flat to spline hub.
6. Install the center nut onto the center stud until it touches the removal hub. Rotate the jacknut to position the removal hub. Because of the rotor weight, the removal hub will need to be raised to center the rotor and hub splines. Tighten the center nut when the removal hub is in position. Mechanically test that the removal arm can not rotate out of the housing.

⚠ WARNING

Center nut must be tight to removal hub. Check carefully. Failure to follow could result in severe injury.



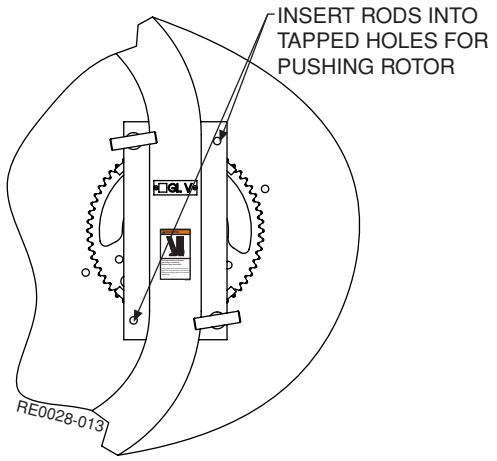
Rotating Head in Locked Position Ready for Installation

SEGMENTED DISKS (CONTINUED)

7. Remove push rods from outer "pull off" position and reinstall into threaded holes to "push" position.

NOTICE

Rotor and hub are reversible and have match marks to assure worn surfaces run together. Verify outward facing single or double match mark on hub matches single or double match mark on rotor.



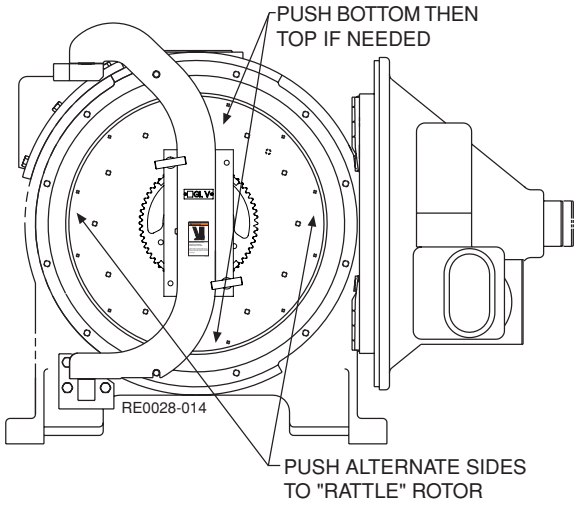
Push/Pull Rod Location

8. Push rotor toward splined hub until splines begin to engage. The rotor should slide freely. If not:

   a. Make sure spline teeth are in alignment.

   b. Make sure vertical alignment is reasonably close.

9. "Rattle" align rotor to splined hub by pushing at alternate locations, left, right, bottom, top. Take up tension on push rods slowly as splines align. Be careful not to bind splines.



Rotor Alignment Procedure

10. After aligning spline teeth, continue pushing rotor assembly onto hub alternating between push rods.

CAUTION

Do not bind splines. Failure to follow may result in damage to the splines.

11. After rotor is fully onto spline hub and tight against disk 1, back off push rods 4 turns. Remove center nut and rotate removal arm out of housing and back to stored position.

12. Remove lockplate and center stud from shaft and install back into removal hub of arm assembly. Install center nut onto center stud for storage.

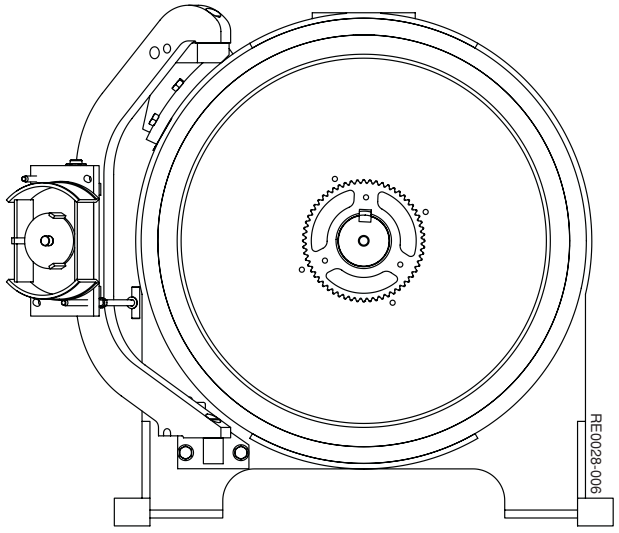
13. Reinstall spacer and rotor retainer plate and torque bolt per Torque Chart in the Appendix of this manual. Verify the ports in the spacer do not block the splined hub ports.

SEGMENTED DISKS (CONTINUED)

14. Install all of the segments for Disk 3. Follow the procedure used for Disks 1 and 2 in Steps 3 and 4 above.

15. Install the segments for Disk 4 to the sliding head. Follow the procedure used for Disks 1 and 2 in Steps 3 and 4 above.

16. The limit switch will have to be reset before the refiner can be run. See the procedure under the Adjusting Mechanism in this section of the manual.



Removal Arm in Stowed Position

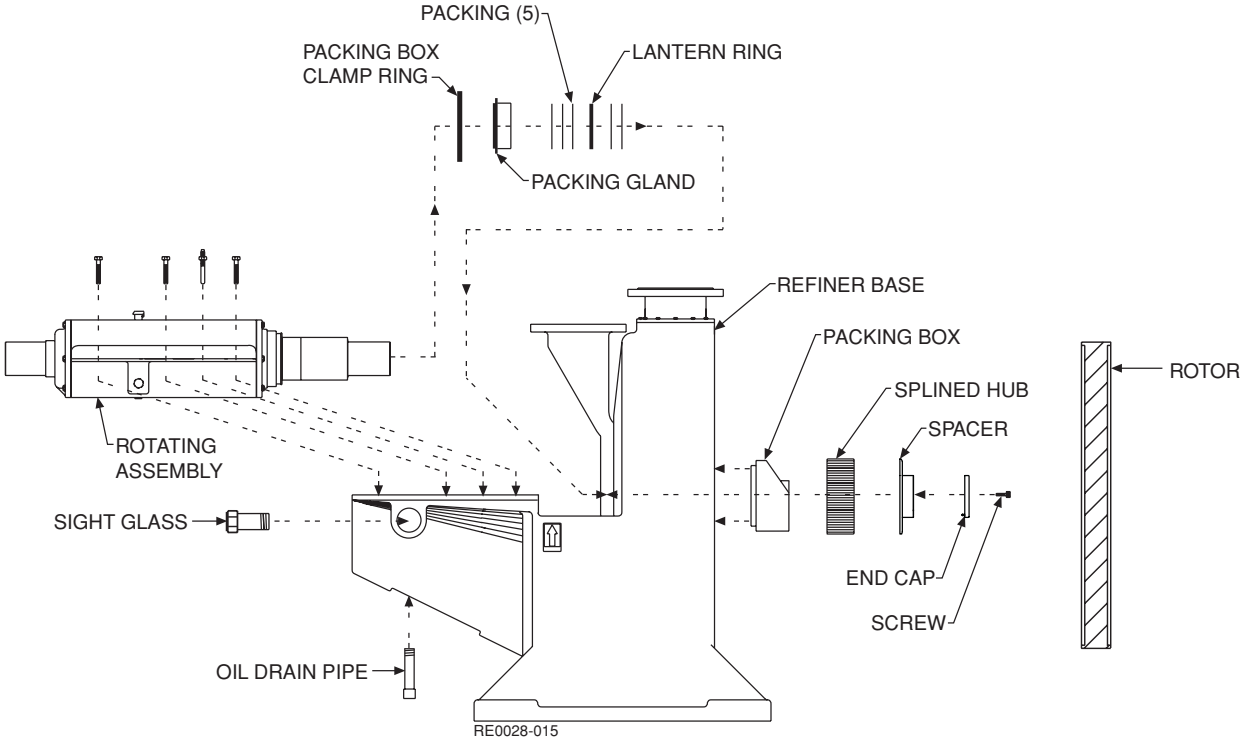
HUB

Removing the Splined Hub

1. Open the door of the refiner.

2. Remove the rotor. Follow the instructions in the section on removing the disk set. Do not remove disk 3.

3. Remove the rotor and swing removal arm around to stored position on the side of the machine.

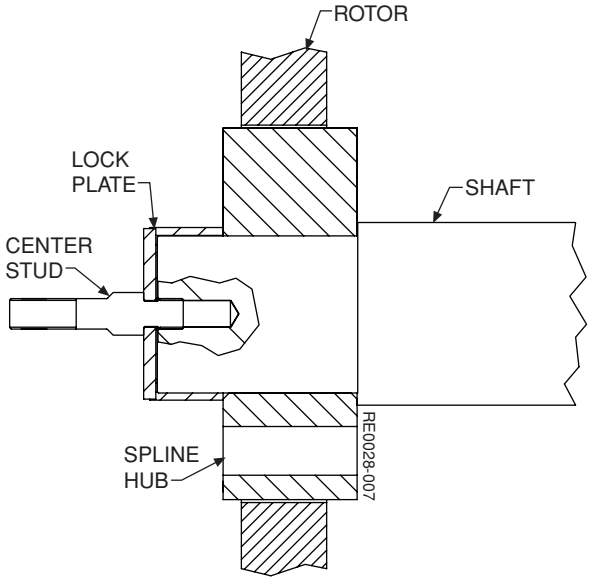


Refiner Rotating Components

HUB (CONTINUED)

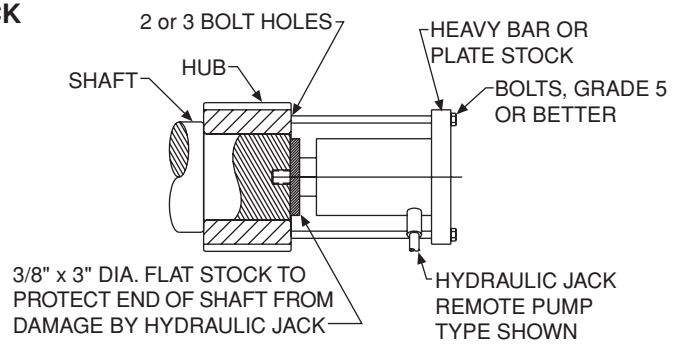
4. Remove lockplate and center stud assembly.

5. Use a suitable puller to remove the hub from the shaft. See Weight section for hub weight and lift accordingly.

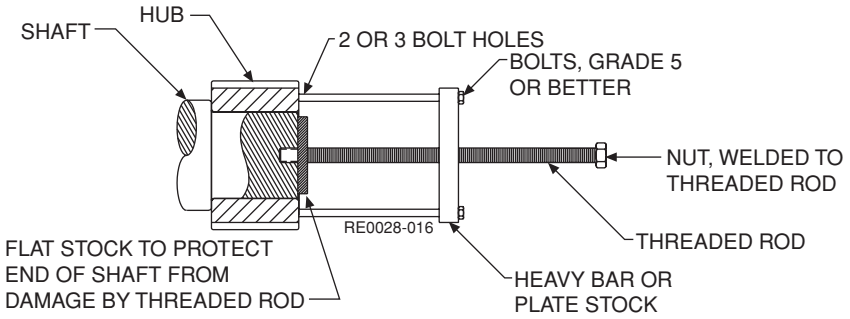


Lock Plate and Center Stud Assembly

HUB PULLER USING A HYDRAULIC JACK



SCREW TYPE HUB PULLER



Hub Pullers

HUB (CONTINUED)

Installing the Hub

1. Clean the bore of the hub and the hub-fit on the shaft.

2. Inspect the hub and the shaft for burrs or damage. Pay special attention to the shoulder where the hub fits to the shaft. The hub must seat tightly and squarely to this shoulder.

3. Check the end of the shaft for runout.

   - Mount a dial indicator base to the Disk 1 location.

   - Set the plunger of the dial indicator on the outside diameter (OD) of the hub fit area of the shaft.

   - Rotate the shaft and note the readings on the dial indicator. A difference (TIR or total indicator runout) of more than .025 mm (.001") indicates a bent or out-of-round shaft.

CAUTION

Do not operate machine with a bent or out of round shaft. Further damage can occur.

4. Apply molybdenum disulfide (MoS_2) compound or equivalent to the hub fit area of the shaft.

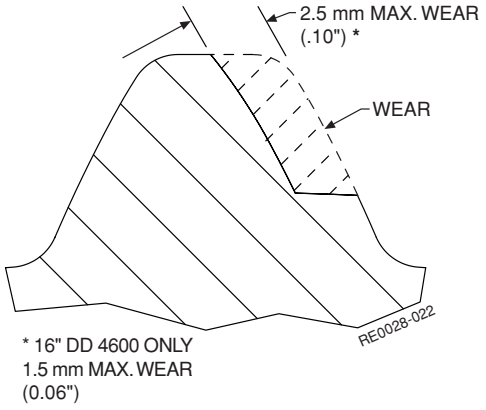
5. The splined hub has a close fitting, clearance fit on the shaft.

6. Install retainer cap with screw. Tighten the retainer screw to the full torque value. See the Torque Chart in the Appendix of this manual for the correct torque values.

SPLINE WEAR

The following will help you to know when to reverse (“flip”) the rotor and hub.

The splined rotor and hub will provide many years of reliable service but over time the splines will wear during operation. The rotor and hub should be reversed (“flipped”) before the tooth wear on either part exceeds 2.5 mm (.10”) for refiner sizes 20" - 46". For size 16" refiners, wear should not exceed 1.5 mm (0.06"). The rotor and hub should also be reversed if the plate wear is uneven.



Spline Tooth Profile - 20" - 46" Shown

SPLINE WEAR (CONTINUED)
Always reverse ("flip") the rotor and hub together to provide maximum part life. The rotor and hub have match marks to identify the side.

A number of factors contributing to accelerated wear:

- process conditions – some stock is more abrasive
- applied power – higher power increases tooth pressure
- frequency of loading adjustments – frequent adjustments means more relative tooth movement
- rotating assembly alignment (tram) – misalignment creates uneven tooth loading and gouging. See the Rotating Assembly Alignment section for checking alignment.

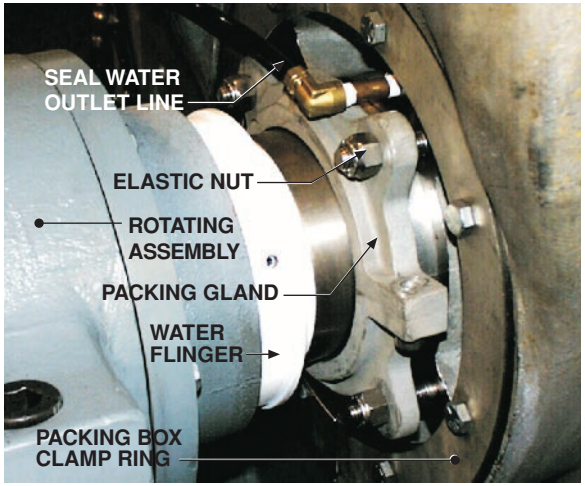
PACKING BOX - SPIRALTRAC

For maintenance of SpiralTrac see Vendor Data supplied with this manual.

PACKING BOX - MECHANICAL SEAL REPLACEMENT

For units supplied with mechanical seals only.

1. Before starting the installation of the mechanical seal, verify that the shaft is slid back towards the motor against back bearing. There is clearance in the rotating assembly to allow for thermal expansion and the clearance must be at the front bearing.



Packing Gland

2. See the “Seal Installation” drawing in the vendor data section. Some seals require the rotating assembly water flinger to be re-located for seal clearance. Re-locate the rotating assembly water flinger as shown on vendor drawing.

3. Follow the seal installation instructions supplied in the vendor data section.

PACKING BOX - LANTERN RING PACKING

Removing the Packing

1. Turn off the seal water and allow the pressure to drain out of the packing box.

2. Disconnect the seal water piping from the packing gland.

3. Remove the elastic stop nuts and slide the packing gland out of the packing box.

4. Remove the screws that hold the two halves of the packing gland together. Separate the two halves, and remove them from the shaft.

PACKING BOX (CONTINUED)

5. Remove all the old packing and the lantern ring. If the packing failed prematurely inspect the packing and the lantern ring as they are removed. See the following list for possible packing problems.

   - The thickness of the packing is reduced on one side – bearings are loose or worn. This allows the shaft to whip or climb to one side. This crushes the packing and wears the lantern ring in that area.

   - Bulge in the side of one or more rings – the ring next to it was either cut too short or shrank leaving a gap between the ends of the packing. This allowed the packing material to be pushed into the gap.

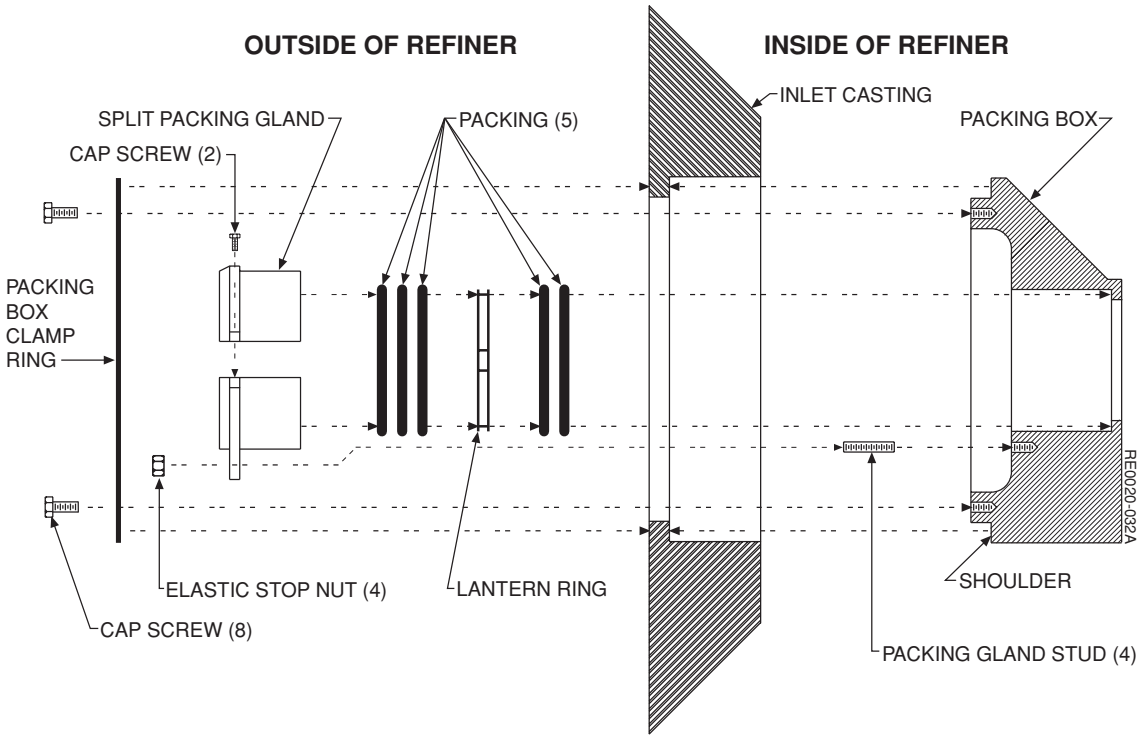
   - Wear on the outside diameter – the packing and lantern ring are rotating with the shaft. They are too loose or are seized to the shaft.

   - The packing rings closest to the gland are deformed, but the rest are okay – improper installation. The gland was tightened too quickly during run-in.

   - The wear surface of the packing (the inside diameter or ID) is glazed or charred – too much heat. Lack of packing seal water.

   - Lantern ring is melted or deformed – too much heat. Lack of seal water.

   - Packing material has hardened – packing has been in the machine too long.



Packing Box Components

PACKING BOX (CONTINUED)

6. Visually examine the packing sleeve for scoring or grooving.

7. Check the sleeve for runout.

   - Mount a dial indicator base to the base casting.

   - Set the plunger of the dial indicator on the outside diameter (OD) of the sleeve.

   - Rotate the shaft and note the readings on the dial indicator. A difference (TIR or total indicator runout) of more than .075 mm (.003") indicates a bent shaft, worn bearings or worn sleeve.

8. Clean the inside of the packing box, and check the seal water piping to be sure it is clear.

Replacing the Packing

1. Apply clean oil to the inside of the packing box and to the packing sleeve.

2. Wrap the packing material on an arbor that is the same size as the shaft. Cut the ends of each ring square to long axis of the arbor. Cut packings to fit snugly with little or no gap between the ends.

NOTICE

Do not unroll or flatten out the packing material. This forces the lubricant out of the packing material and reduces its effectiveness. Leave the packing material coiled up when working with it.

Always use new packing material whenever the packing has been removed. Once packing material has been compressed, its ability to seal properly is decreased. It can also cause damage to the packing sleeve. Used packing should only be reused in an emergency.

3. Install the packing material into the packing box one ring at a time.

   - Tamp each ring firmly into place.

   - Install two rings of packing, then the lantern ring, then the last three rings of packing. The last ring should be at least 3 mm (1/8") inside the packing box.

   - Stagger the joints in the packing rings so the joints do not line up with each other. For two rings together, space the joints 180 degrees apart. For three rings together, space the joints 120 degrees apart.

4. Assemble the two halves of the packing gland on the shaft.

5. Slide the gland into the packing box, and put the elastic stop nuts on the studs. Tighten the nuts just enough to hold the gland firmly against the packing.

PACKING BOX (CONTINUED)

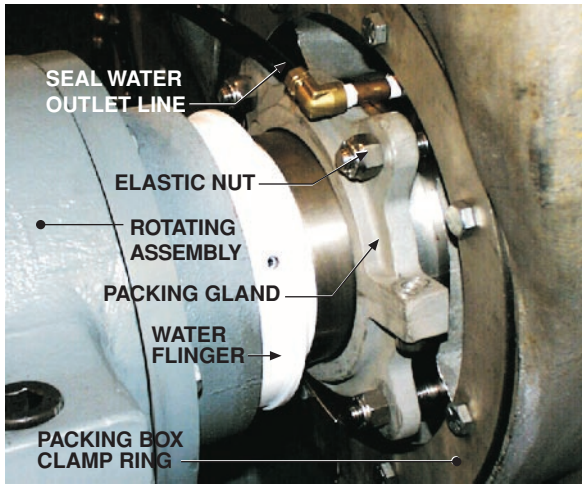
Adjusting the Packing Gland

1. Turn on the seal water. The pressure should be set at 70 kPa (10 psi) above the stock inlet pressure. The flow should be 4 to 6 lpm (1 to 1.5 gpm).

2. Start the refiner. The water should drip from the packing gland at the rate of one to two drops per second for every 25 mm (1-inch) of shaft diameter. For example, a 100 mm (4-inch) shaft should have a drip rate of 4 to 8 drops per second.

3. Run the refiner for one to two hours to break in the new packing.

   - If the drip rate slows down, loosen the elastic nuts.
   - If the drip rate is too fast, slowly tighten the elastic nuts. Do not tighten them too fast. Tighten them approximately 1/6 of a turn (1 flat) every ten minutes.
   - Do not allow the packing gland to become overheated. If the gland is too hot to hold a hand on, it is too hot. Loosen the elastic nuts and allow the gland to cool.
   - Continue the adjustments until the packing is completely broken in. This point is reached when the drip is minimized, but packing gland stays cool enough to hold a hand on.



Packing Gland

Removing the Packing Box

1. Open the door of the refiner.
2. Turn off the seal water and allow the pressure to drain out of the packing box.
3. Remove the rotor according to the instructions in the section about changing the disk set.
4. Remove the hub according to the instructions in the section about removing the hub.
5. Disconnect the seal water piping from the packing gland.
6. Remove the packing gland, packing and lantern ring according to the instructions in the section about removing the packing.
7. Remove the bolts that hold the packing box clamp ring in place. Remove the two halves of the clamp ring.

PACKING BOX (CONTINUED)

8. Slide the packing box out through the refiner cavity.

NOTICE

When removing the packing box, do not bump it against the packing sleeve on the shaft.

Installing the Packing Box

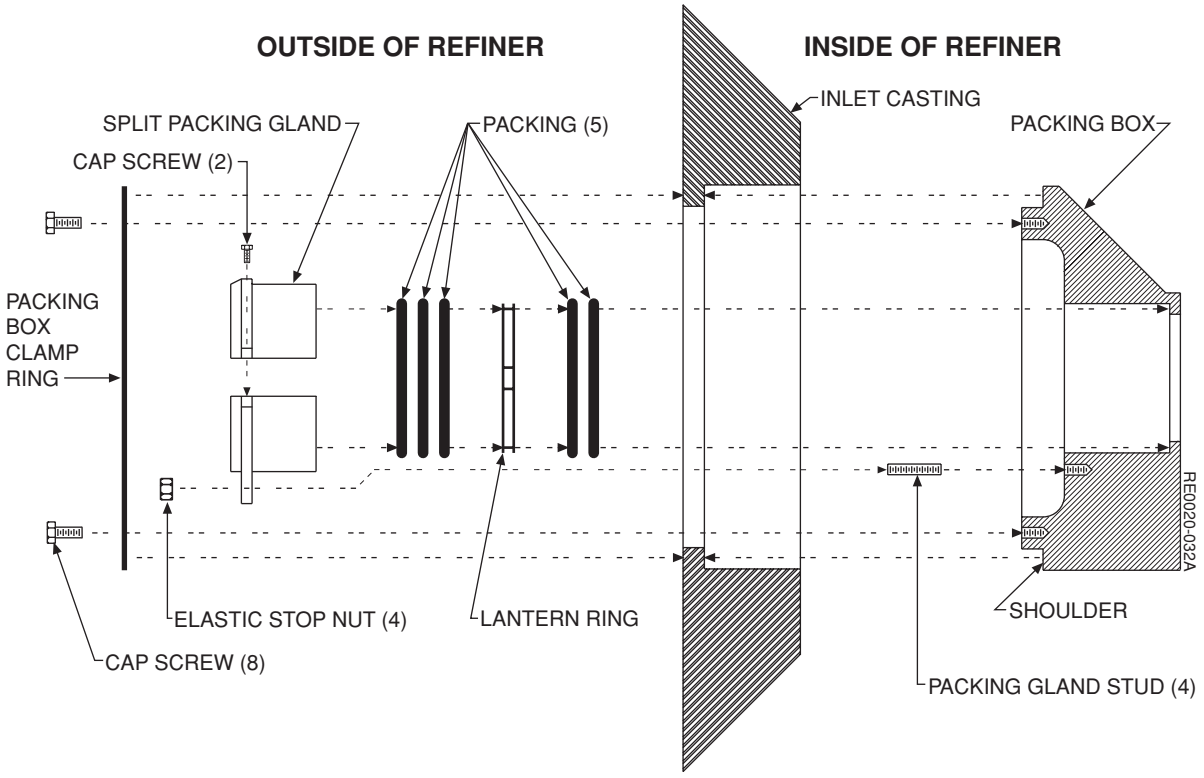
1. Thoroughly clean the packing box. Check the threaded holes for grease, dirt or metal chips. Check all machined surfaces for burrs. Use a hard stone to remove any burrs that are found.

2. Thoroughly clean the packing box area of the refiner base casting. Check all machined surfaces for burrs. Use a hard stone to remove any burrs that are found.

3. Slide the packing box over the shaft and into location. There are two points that need special attention:

- Be sure that the 45 degree area on the outside of the packing box is facing up towards the inlet.
- Be sure that the packing box is fully seated on the rabbeted shoulder of the inlet casting.

4. Install the packing box clamp ring with the bolts. Only tighten the bolts hand tight at this time.

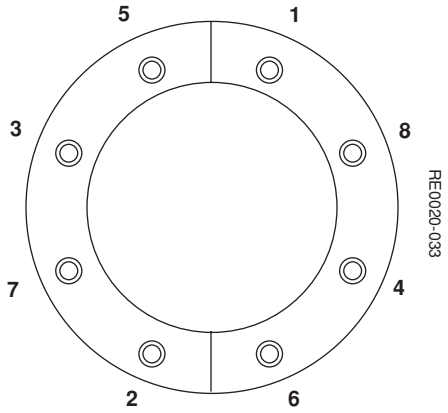


Packing Box Components

PACKING BOX (CONTINUED)

5. Pre-torque the bolts to 60% of full torque value. See the Torque Chart in the Appendix for the proper torque values. Tighten the bolts in a crossed pattern as shown.

6. After all the bolts are pre-torqued, tighten the bolts to full torque. See the Torque Chart in the Appendix for the proper torque values. Tighten the bolts in a crossed pattern as shown.



BOLT TIGHTENING PATTERN
PACKING BOX CLAMP RING

Clamp Ring Bolt Torquing Sequence

7. Connect the seal water piping. The outlet line goes to the top, and the inlet line goes to the bottom.

8. Install new packing according to the instructions in the section about packing.

ROTATING ASSEMBLY

Removing the Rotating Assembly

1. Open the oil drain, and drain the oil from the rotating assembly.

2. Open the refiner door.

3. Remove the rotor according to the instructions in the section about removing the disk set.

4. Remove the hub according to the instructions in the section about removing the hub.

5. Remove the packing box according to the instructions in the section about removing the packing box.

6. Removal of the coupling is optional at this point. If the rotating assembly is going to be disassembled, the coupling will have to be removed at some point. The working conditions will dictate whether to remove the coupling now or after the rotating assembly is removed from the refiner. Remove the coupling according to the instructions in the section about removing the coupling.

7. Remove the oil drain tube or drain from the bottom of the rotating assembly.

8. Remove the sight glass from the side of the rotating assembly.

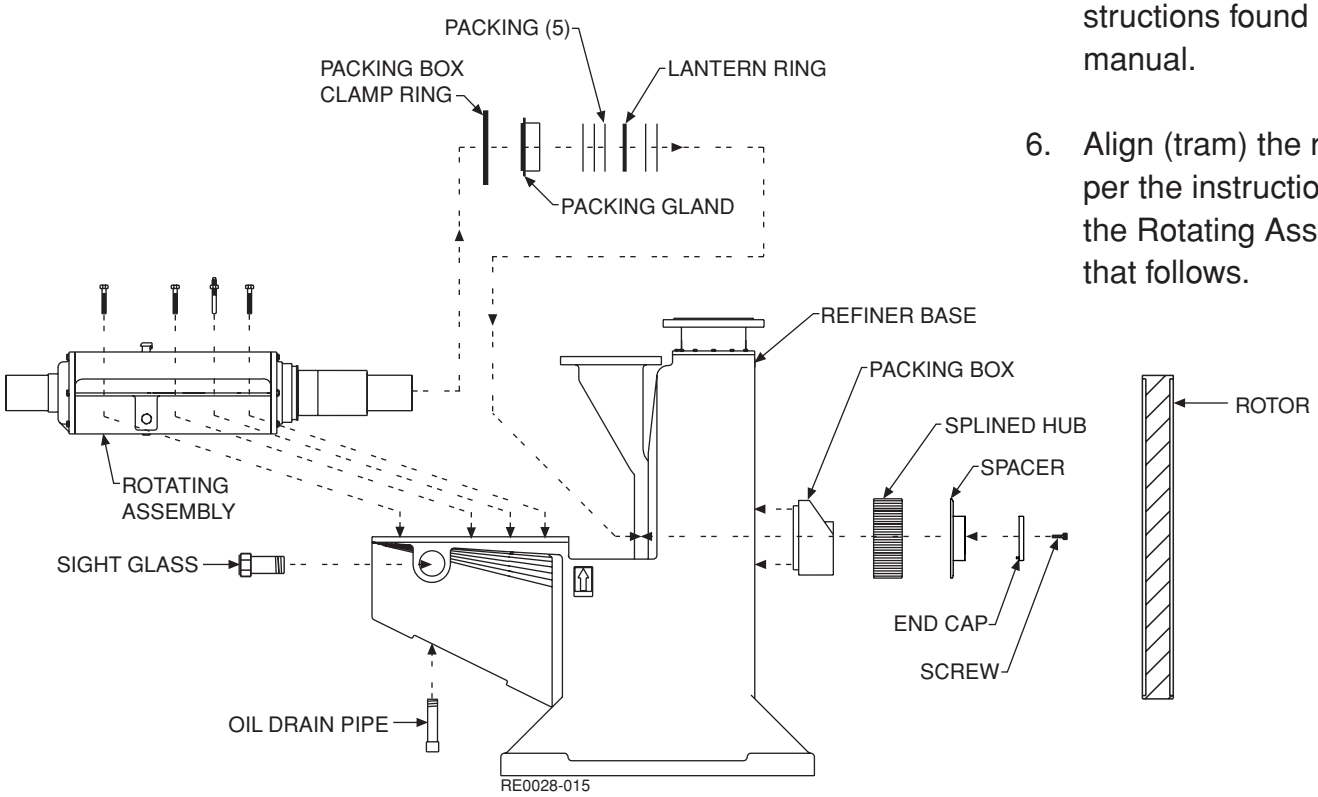
9. Remove the bolts and dowels that hold the rotating assembly to the refiner base.

10. The rotating assembly can now be lifted off of the refiner base. For rotating assembly weights, see the Lifting section in this manual.

ROTATING ASSEMBLY (CONTINUED)

Installing the Rotating Assembly

1. Clean and inspect the mating surfaces on the refiner base and the rotating assembly. Stone the surfaces with a hard stone to ensure that there are no burrs or high spots on these surfaces.
2. Carefully set the rotating assembly down on the refiner base.
3. Install the bolts and dowels that hold down the rotating assembly. Tighten the bolts for the rotating assembly to 60% of the final torque value.
4. Install the packing box according to the instructions in the section about installing the packing box. Do not install the packing or packing gland at this time.
5. Install the hub, rotating head and refiner plates according to the instructions found in this section of the manual.
6. Align (tram) the rotating assembly per the instructions in "Alignment of the Rotating Assembly" (Tramming) that follows.



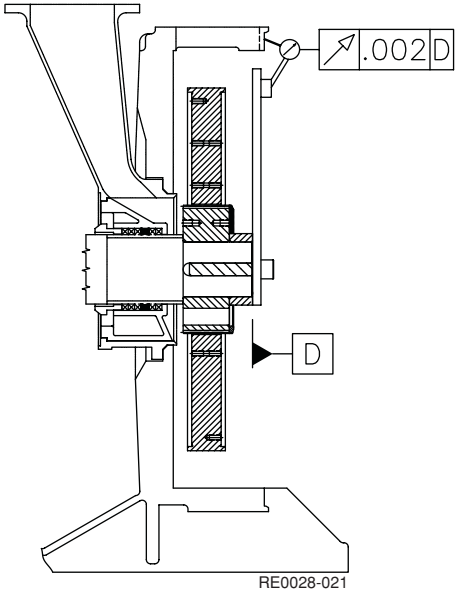
Refiner Rotating Components

ROTATING ASSEMBLY (CONTINUED)

Alignment of the Rotating Assembly (Tramming)

1. Open the refiner door. The rotating assembly should be aligned with the rotating head and hub installed. The refiner plates can also be installed before tramming.

2. Remove the shaft end cap. Mount a bar to the face of the spacer using the bolt on the shaft end. Attach the magnetic base of a dial indicator to the end of the bar. Set the dial indicator plunger against the machined face that the door closes against.



Alignment of the Rotating Assembly (Tramming)

3. Rotate the shaft and note the indicator readings at the 3, 6, 9 and 12 o'clock positions. The difference between the four positions (TIR or total indicator runout) should be less than 0.5 mm (.002").

4. If the rotating assembly must be adjusted, remove the dowel pins and loosen the housing bolts. Shift the rotating assembly until the readings are the same at the 3 and 9 o'clock positions and at the 12 and 6 o'clock positions.

   - Adjust the 3 and 6 o'clock readings by removing the dowels and shifting the rotating assembly from side-to-side.

   - Adjust the 6 and 12 o'clock readings by adding shims between the rotating assembly and the base.

5. Tighten the bolts for the rotating assembly to 60% of the final torque value and recheck the dial indicator readings. See the Torque Chart in the Appendix in this manual for the proper torque values.

6. Check for clearance between the shaft and the packing box.

7. Install dowels.

   - If the side-to-side position of the rotating assembly did not change, the original dowels and dowel holes can be used.

   - If the side-to-side position of the rotating assembly did change, the dowel holes will have to be redrilled.

8. Tighten bolts to final torque value.

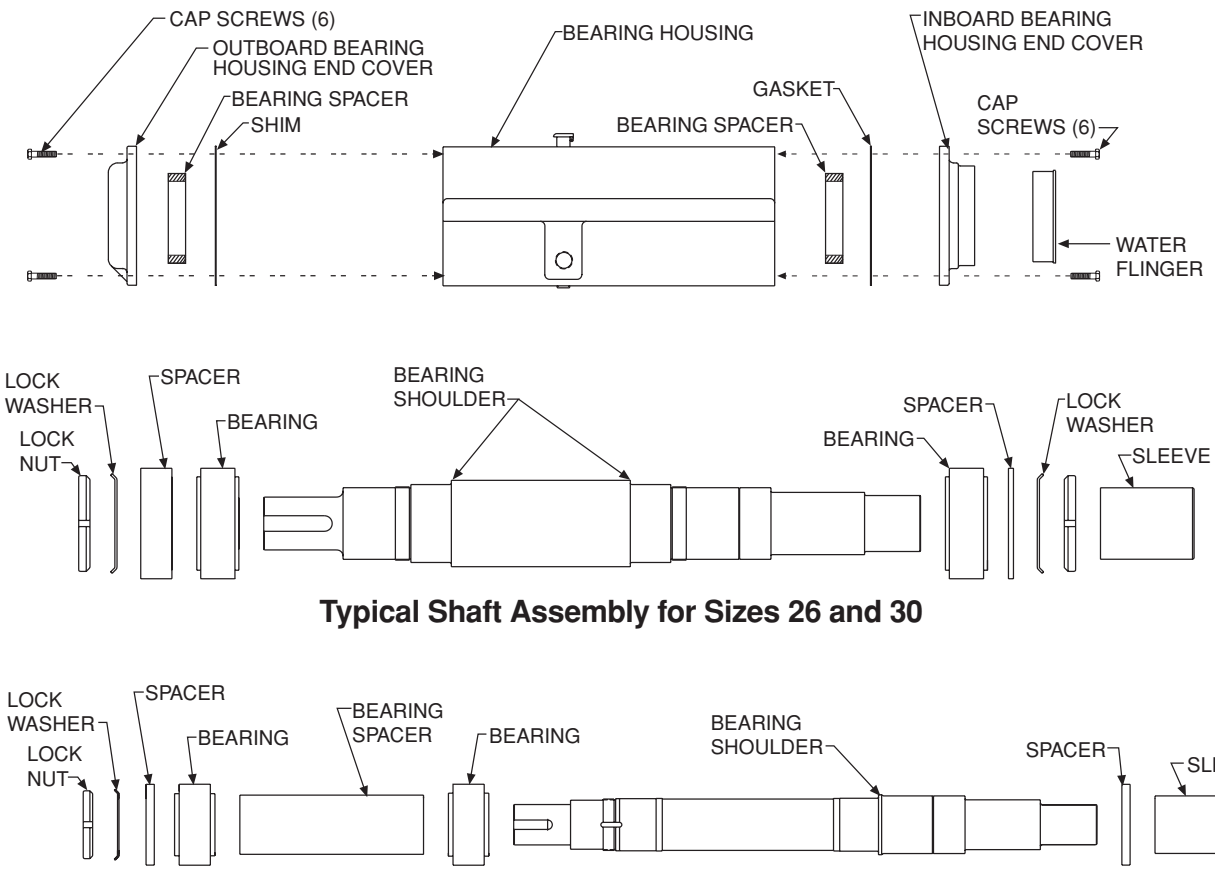
Disassembling the Rotating Assembly

NOTICE

Disassembly, repair or rebuild of the rotating assembly should be done only by qualified personnel. To avoid damage in rebuilding the rotating assembly we suggest you contact GL&V Customer Service at the phone number provided in the Preface of this manual.

1. Remove the rotating assembly from the refiner. Follow the instructions in the section about removing the rotating assembly.

2. Remove the coupling from the rotating assembly. Follow the instructions in the section about removing the coupling.



Typical Shaft Assembly for Sizes 26 and 30

Typical Shaft Assembly for All Sizes Except 26 and 30

Rotating Assembly Components

ROTATING ASSEMBLY (CONTINUED)

3. Loosen set screws in the water flinger and slide the water flinger off of the shaft.

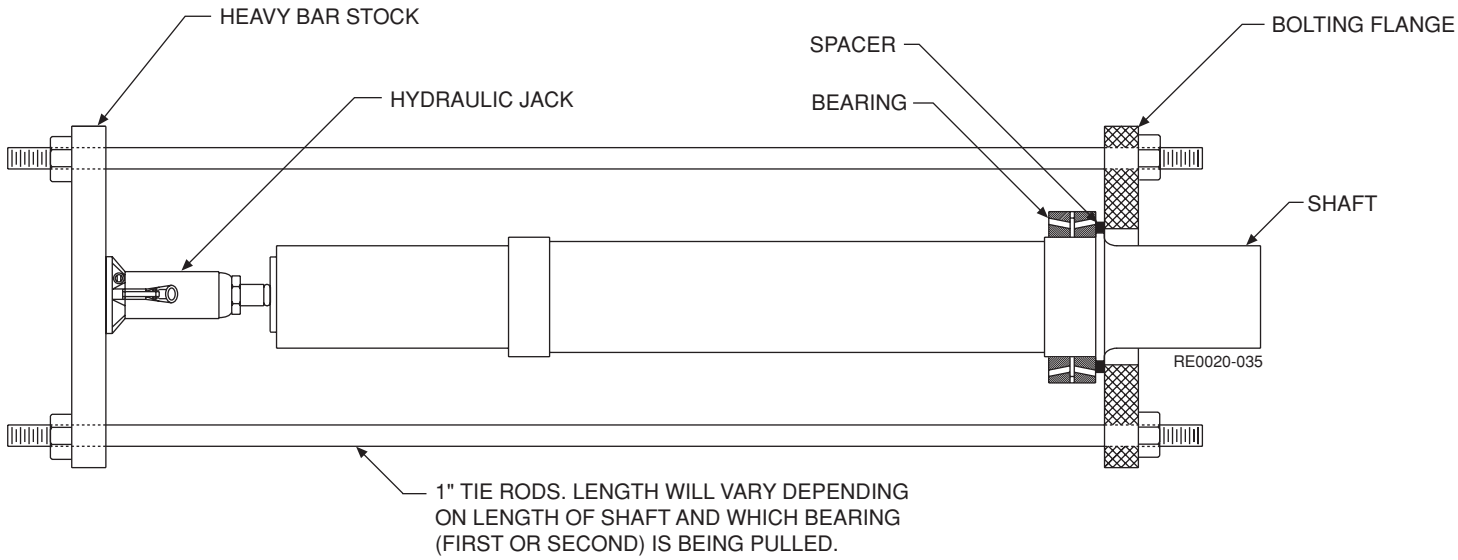
4. Remove both end covers and gaskets.

5. Slide the shaft and bearings out of the bearing housing.

6. Bend the lockwasher tabs back out of the locknut. Remove the locknut.

7. Remove the outboard bearing from the shaft, then the bearing spacer and then the inboard bearing. Use a suitable puller.

8. Clean, inspect and oil all parts.



Bearing Puller

ROTATING ASSEMBLY (CONTINUED)

Reassembling the Rotating Assembly

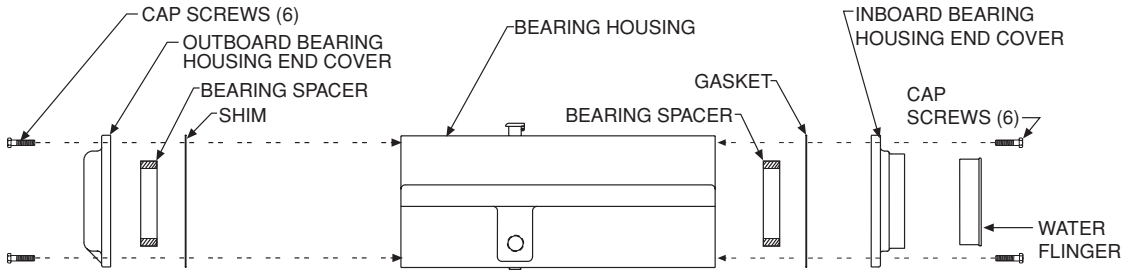
See "Rotating Assembly" drawing and "Rotating Head Assembly" drawing for specific details.

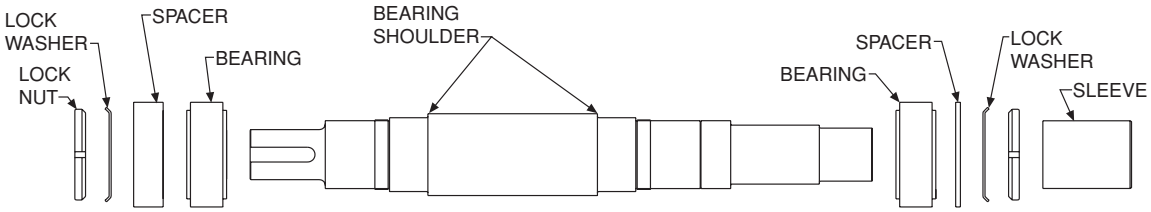
1. Clean the entire bearing housing. Remove any loose paint from inside the housing.
2. Inspect the bearing housing for burrs or damage. Use a hard stone to remove any burrs, and repaint the inside of the housing if needed. Do not paint the machined bores that the bearings fit into.
3. Inspect the new bearings.
4. Heat the bearings to 120°C (250°F). Use an oven or oil bath to heat the bearing.

NOTICE

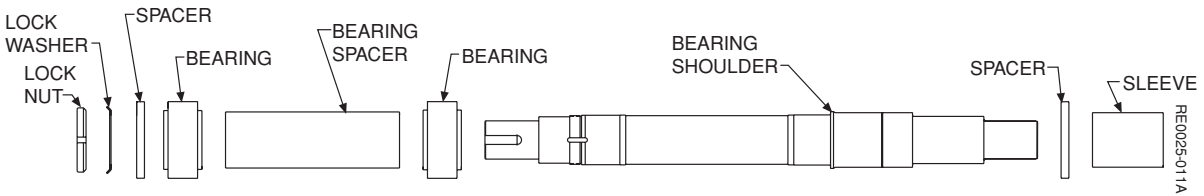
All bearings must be used as complete sets. Do not intermix components. Do not exceed 150°C (300°F) when heating the bearings. Do not allow the bearing to come in contact with the heating element during heating.

5. When the bearings are properly heated, install the inboard bearing onto the shaft. Then install the bearing spacer and the outboard bearing.
6. Install and tighten the locknut against the outboard bearing. Allow the bearings to cool to room temperature.





Typical Shaft Assembly for Sizes 26 and 30



Typical Shaft Assembly for All Sizes Except 26 and 30

Rotating Assembly Components

ROTATING ASSEMBLY (CONTINUED)

7. After the bearings have cooled, remove the locknut and install the lockwasher.

NOTICE

Do not reuse the old lockwasher. A new lockwasher should be used each time the rotating assembly is disassembled. Repeated bending of the tab will weaken it. This decreases its ability to properly lock the nut in place.

8. Install and tighten the locknut. See the Rotating Assembly drawing for specific information about setting the internal clearance of the bearings. Bend the washer tab into the nut.

9. Install the inboard spacer ring. See "Rotating Head Assembly" drawing.

10. Install the inboard bearing housing cover and the gasket to the bearing housing. Tighten the screws to the correct torque. See the Torque Chart in the Appendix for the correct torque values.

11. Apply a coat of oil to the outside diameter (OD) of the bearings. Apply a coat of oil to the inside of the bearing housing and the inside diameter (ID) of the inboard bearing housing cover.

    If grease lubricated, be sure bearings are hand packed with grease.

12. Slide the shaft/bearing assembly into the bearing housing. Be sure that it is the hub end of the shaft that goes into the housing.

13. Install correct outboard spacer ring. See "Rotating Head Assembly" drawing.

14. Apply a coat of oil to the inside diameter (ID) of the outboard bearing housing cover. Install the cover and the gasket to the bearing housing. Do not install shims at this point. Hand tighten screws only.

15. Set up a dial indictor on a stationary surface to measure axial movement of the shaft. Slide the shaft inside the housing from inboard cover to outboard cover. Rotate the shaft several times at each end to verify that the bearing is fully contacting. Record the measured movement.

16. See the "Rotating Head Assembly" drawing for the allowable movement in the bearing assembly and calculate the shim thickness required to obtain this movement. For example if .020" was measured in step 15, a .025" shim is required to obtain an allowable movement of .045" (+/- .010").

17. Remove outboard bearing housing cover (installed in step 14). Apply sealant to both sides of the shim pack and install the shims of the proper thickness as calculated in step 16. Tighten the screws to the correct torque. See the Torque Chart in the Appendix for the correct torque values.

ROTATING ASSEMBLY (CONTINUED)

18. Repeat step 15 and verify the rotating assembly has the required allowable movement.

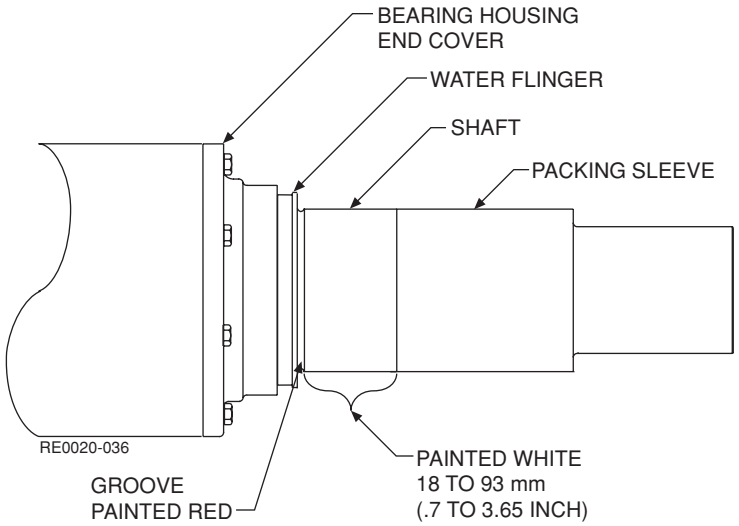
19. Clean the area of the shaft between the end of the packing sleeve and the inboard bearing housing cover.

20. Repaint the area between the end of the packing sleeve and the groove in the shaft with white paint, if required. Repaint the groove with red paint, if required.

21. Install a new O-Ring into the water flinger. Apply a light coat of oil to the O-Ring and the outside diameter (OD) of the hub end of the shaft.

22. Slide the water flinger onto the shaft. Align the flat face of the water flinger with the inner edge of the groove on the shaft and tighten the set screws. The red groove should be visible after the set screws are tightened.

23. The rotating assembly is ready to be installed to the refiner base according to the instructions in the section about installing the rotating assembly.



Water Flinger Alignment

PACKING SLEEVE

Removing the Packing Sleeve

1. Remove the packing box from the refiner. Follow the instructions in the section about removing the packing box.

2. Remove the water flinger from the shaft.

3. Apply a suitable clamp (lathe dog, clamp ring, etc.) onto the sleeve. Do not over tighten the clamp. Over tightening could crush the sleeve onto the shaft. This would make removal more difficult. If the existing packing sleeve is so damaged or worn that it is going to be disposed of, pulling rods may be welded directly to the sleeve. Be sure to protect the rest of the shaft and the refiner from weld damage or spatter.

CAUTION

Attach ground for welding to shaft only. Bearing damage can result if grounded otherwise.

4. Apply heat to the sleeve. This can be done with a heat lamp, heat gun or torch.

⚠ WARNING

Use extreme care when heating any machine component. Heat sources and hot parts can cause severe burns and damage to equipment. Use proper handling and personal protection equipment. Have adequate fire suppression equipment available.

5. Pull the sleeve with a steady pressure as the heat is applied. The sleeve should start to pull off of the shaft at approximately 205°C (400°F).

6. Clean the old adhesive from the shaft with a suitable cleaning solvent.

Installing the Packing Sleeve

1. Inspect and clean the inside diameter (ID) of the new sleeve.

2. Apply an anaerobic-type liquid cylinder bonding adhesive to the sleeve and the shaft according to the adhesive manufacturer's directions. Be sure to follow the directions exactly. This includes cleaning, priming and application instructions. The adhesive used needs the following characteristics:

   - Shear strength – 210 kg/cm^2 (3000 psi).
   - Operating temperature range – -50°C to 150°C (-65°F to 300°F).
   - Use Loctite® brand 609 or equivalent.

3. Slide the sleeve onto the shaft, and seat the sleeve firmly against the shoulder of the shaft.

PACKING SLEEVE (CONTINUED)

4. Clamp the sleeve against the shoulder of the shaft. Use a spacer held in place by the hub retainer cap and screw.

5. Allow the assembly to sit until the adhesive sets up before starting re-assembly of the refiner. See the adhesive manufacturer's directions for details about curing times. This should generally be two to six hours before the part can be handled.

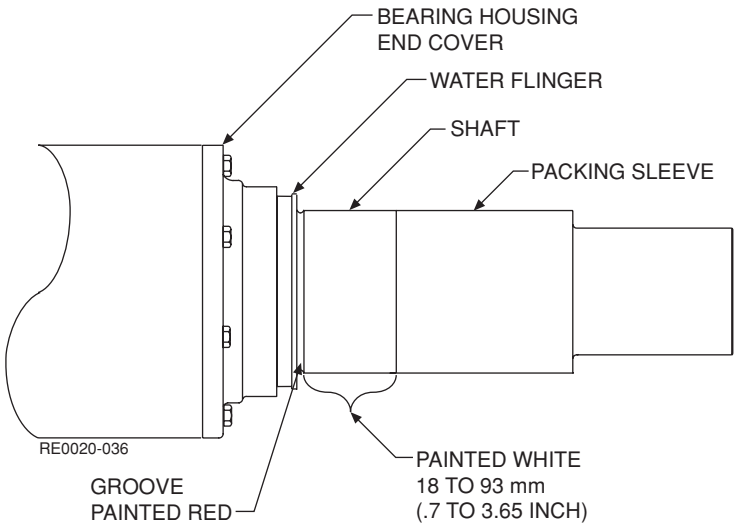
6. Repaint the area between the end of the packing sleeve and the groove in the shaft with white paint, if required. Repaint the groove with red paint, if required.

7. Install a new O-Ring into the water flinger. Apply a light coat of oil to the O-Ring and the outside diameter (OD) of the hub end of the shaft.

8. Slide the water flinger onto the shaft. Align the flat face of the water flinger with the inner edge of the groove on the shaft and tighten the set screws. The red groove should be visible after the set screws are tightened.

9. The packing box is ready to be installed to the refiner base according to the instructions in the section about installing the packing box.

10. Allow the adhesive to fully cure before applying power to the machine. See the adhesive manufacturer's directions for details about curing times. This should generally be about 24 hours.



Water Flinger Alignment

ADJUSTING MECHANISM

Setting the Limit Switch

1. Use clutch handle to disengage gearmotor.

2. Use handwheel to move plates firmly into contact with each other.

3. Note the position of the pointer on the limit switch scale.

4. Rotate the handwheel in the opposite direction until the pointer has moved 5 mm (3/16"). The following chart gives the number of turns needed to move the sliding head 5 mm (3/16").

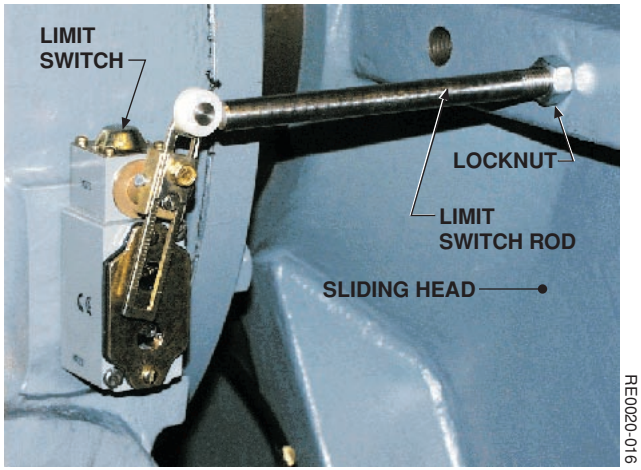
   The number of turns in the chart apply to new assemblies only. As the gears wear more turns may be required.

5. Loosen the nut that locks the limit switch rod in place.

6. Set the rod to where it opens (trips) the limit switch.

7. Lock the nut in place.

Refiner Model	16	20/24	26/30	34/38	42/26
Movement of sliding head per turn of the handwheel.	.20 mm (.0083")	.20 mm (.0083")	.52 mm (.0204")	.70 mm (.0272")	.35 mm (.0136")
Number of turns to move 5 mm (3/16")	24	24	9	7	14



Limit Switch

ADJUSTING MECHANISM (CONTINUED)

Removing the Refiner Door

1. Install the eyebolts in the holes in the top of the door.

2. A decision will have to be made at this point about whether the gearmotor should be taken off. If the door is going to be rebuilt, it may be easier to remove the gearmotor at this time.

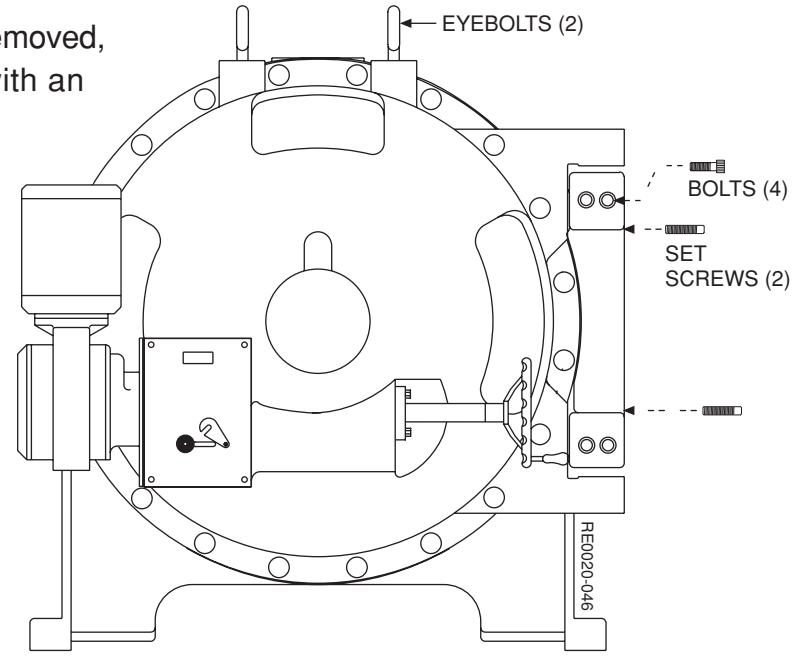
3. If the gearmotor is to be removed, it must first be secured with an appropriate lifting strap. See the Lifting Section in this manual for information about the weight of the gearmotor.

4. Place tension on the lifting strap with a crane. Unbolt the flange bolts, and pull the gearmotor out of the door.

5. Unbolt and open the door.

6. Apply tension to the eyebolts with a crane. See the Lifting Section in this manual for more information about the weight of the complete door.

7. Unbolt the hinge and remove the door.



Refiner Door Removal

Installing the Refiner Door

1. Attach the door to the base with four to six bolts. Be sure the door is properly aligned. Do not bolt the hinge in place at this time.

2. Turn the hinge to its proper position.

3. Measure the gap between the hinge and the base of the refiner. They must be the same at both the inside and outside of the hinge.

4. Install the correct number of shims between the hinge and the base.

5. Install and tighten the four bolts that hold the hinge to the base. See the Torque Chart in the Appendix in this manual for the proper torque values.

6. Tighten the hinge set screws against the base.

7. Install the roll pin in the hinge.

ADJUSTING MECHANISM (CONTINUED)

Disassembly of the Adjusting Mechanism

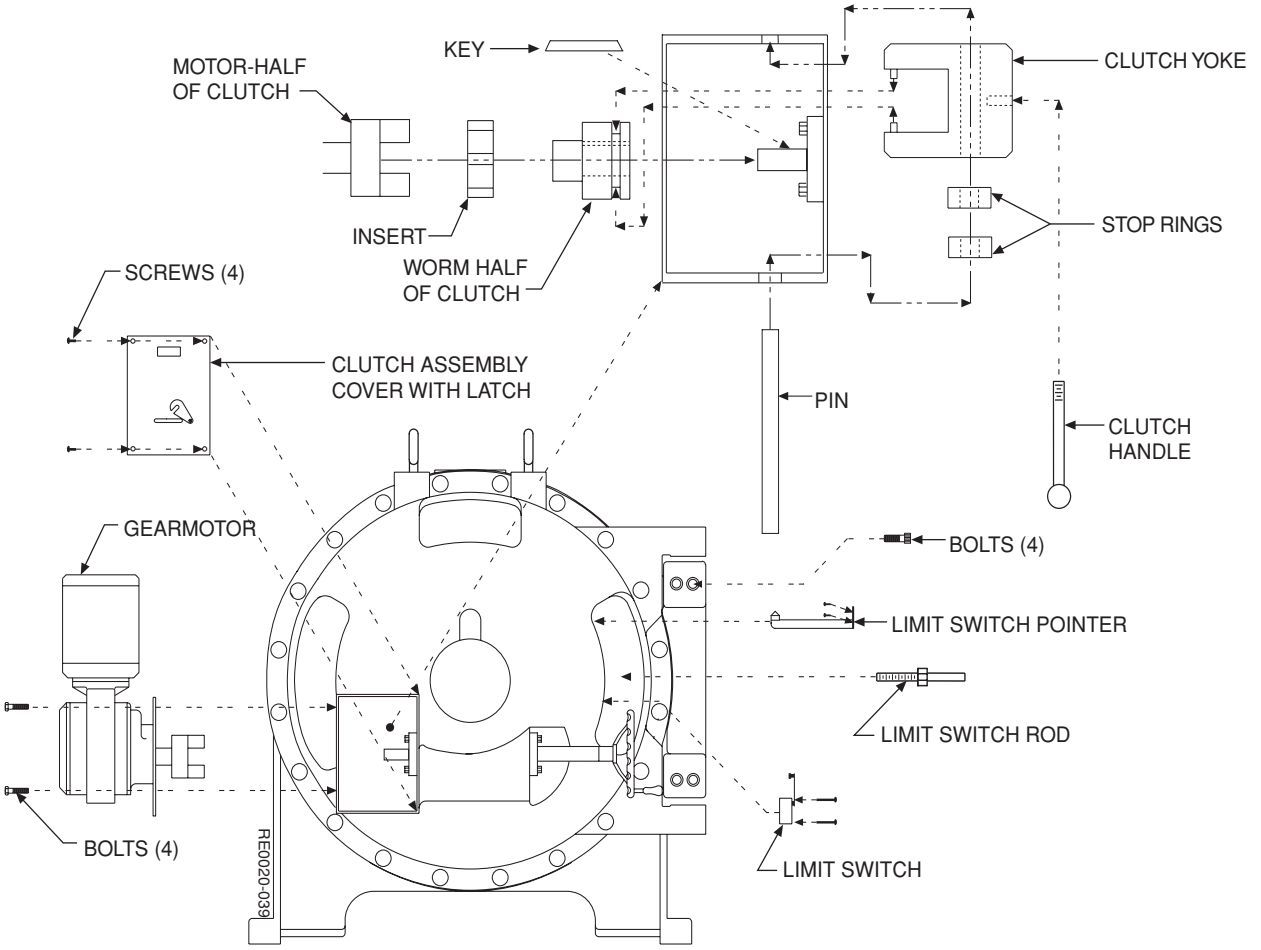
CAUTION

The following instructions and assembly diagrams are provided for reference purposes only. The adjusting mechanism has a number of clearances and fits that must meet strict factory specifications. Disassembly, repair or rebuild of the adjusting mechanism should be done only under the supervision of a qualified GL&V Service technician. Disassembly, repair or rebuild of the adjusting mechanism by untrained personnel can result in serious damage to the refiner. For assistance contact GL&V Customer Service at the phone number provided in the Preface of this manual.

1. Drain the oil from the adjusting mechanism.

2. Remove the limit switch, limit switch rod and limit switch pointer. These are located in the cavity just above the handwheel. Inspect for damage.

3. Unscrew the clutch handle, and remove the clutch assembly cover.



Gearmotor and Clutch Removal

ADJUSTING MECHANISM (CONTINUED)

4. Remove the gearmotor. Inspect the motor half of the clutch and the gearmotor mounting flange for damage. The motor half of the clutch is pinned to the gearmotor's output shaft. It should not be removed unless it is going to be replaced. If it must be removed, remove the shear pin and slide the clutch off of the shaft.

5. Remove the brass clutch insert from the worm half of the clutch.

6. Loosen the set screws for the two stop rings inside the clutch assembly housing. Please note that the stop rings, the clutch yoke and the pin are all loose fit parts. Hold the pin in place from underneath while loosening the stop ring set screws.

7. Slide the pin out of the housing, and remove the clutch yoke and the stop rings.

8. Slide the worm half of the clutch off of the shaft. Remove the key from the shaft.

9. Clean and inspect all parts. Apply a light coat of oil to all parts

10. Install the eyebolt(s) in the top of the door.

11. Open the refiner door, and remove the retainer ring and the two lip seals.

12. Support the door with a crane and remove the bolts that hold the hinge to the base casting. See the Major Assembly and Component Weights and Lifting Section in this manual for guidance on selecting the correct lifting equipment.

13. Lift the door away from the refiner and place it on the floor. The sliding head must be facing down if the door is going to be disassembled further.

14. Loop fabric lifting straps through the openings in the back of the door. Space the straps to achieve an even lift.

15. Take up all slack with a crane and start to turn the handwheel clockwise. This will move the sliding head out of the door. Slowly lift the door as the handwheel is turned. Continue until the sliding head separates from the door.

16. Turn the sliding head over, and remove the sliding head liner.

ADJUSTING MECHANISM (CONTINUED)

17. Press out the adjusting screw.

18. Clean and inspect the sliding head, liner and adjusting screw. Apply a light coat of oil to the parts.

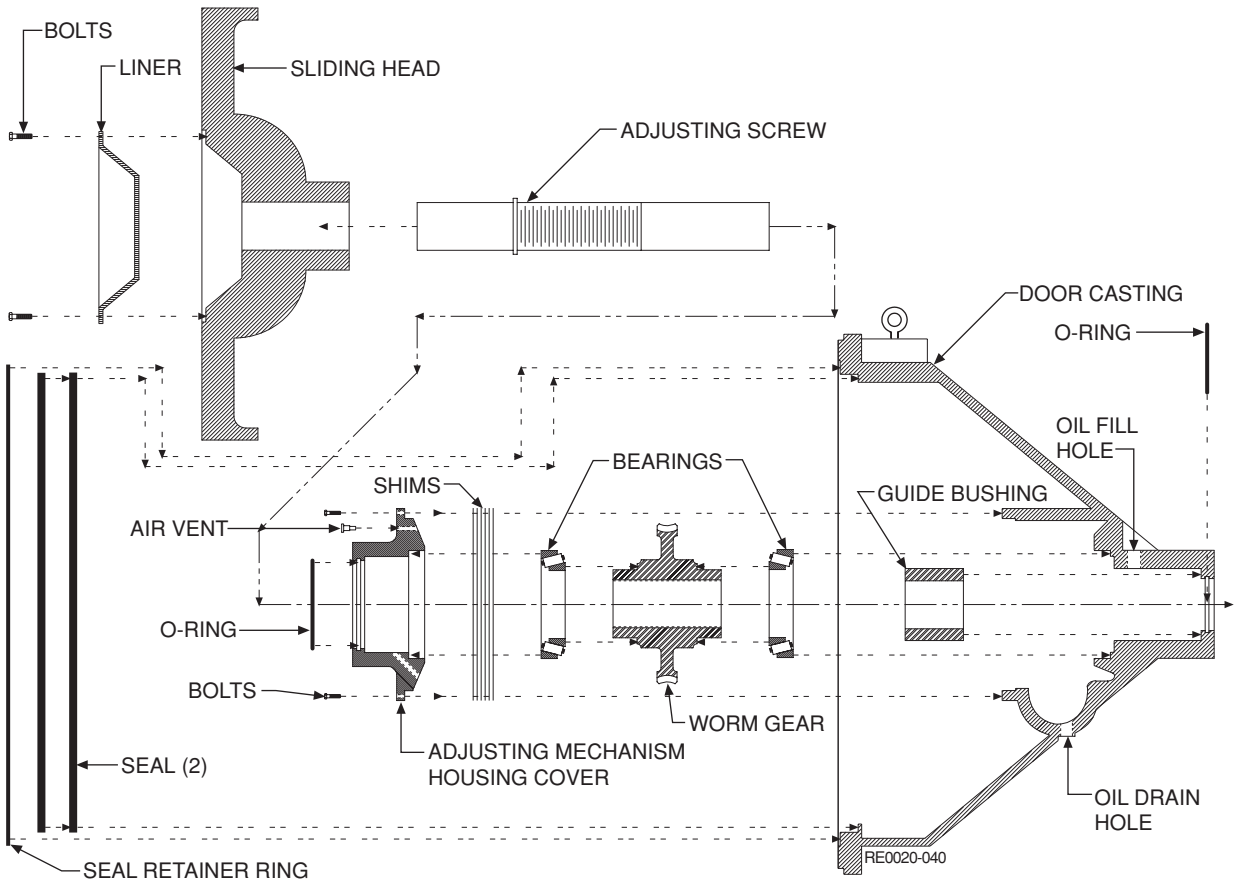
19. Unbolt and remove the adjusting mechanism housing cover from the door. Remove the roll pin from cover or door. Press the bearing cup out of the cover. Remove the O-Ring from the cover.

20. Remove the worm gear and bearings from the door.

21. Remove the bearings from the worm gear if the worm gear is going to be reused.

22. Remove the bearing cup from inside the door. Use a suitable puller.

23. Remove the bronze guide bushing and the O-Ring from inside the door.



Sliding Head and Worm Gear Components

ADJUSTING MECHANISM (CONTINUED)

24. Loosen the locknut on the handwheel, and remove the handwheel from the worm shaft.

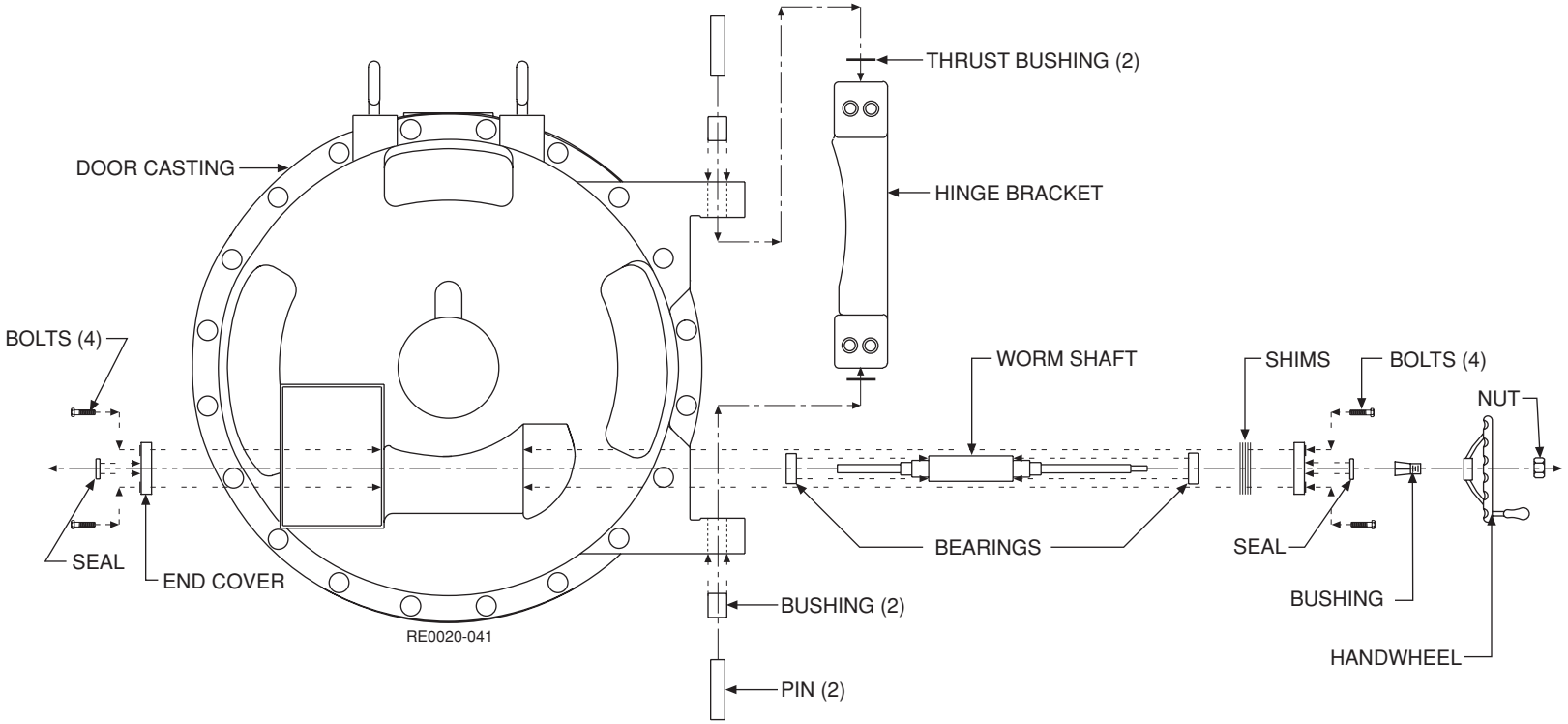
25. Unbolt the end cover, and remove the worm shaft and bearings. Unbolt and remove the end cover inside the clutch housing.

26. Remove the seals from the end covers.

27. Remove the bearings from the shaft. Use a suitable puller.

28. Press door hinge pins out of hinge and door. Remove the oilite bushings from the door.

29. Clean and inspect all parts. Apply a light coat of oil to all parts.



Worm Shaft Components

ADJUSTING MECHANISM (CONTINUED)

Assembling the Adjusting Mechanism

1. Install the guide bushing into the door casting. Be sure to keep the bushing straight while it is being pressed into place. To ease installation, the bushing may be frozen first in order to shrink it.

2. Install O-Ring into the door casting.

3. Heat the worm gear bearings to 120°C (250°F). Install the bearings onto the worm gear.

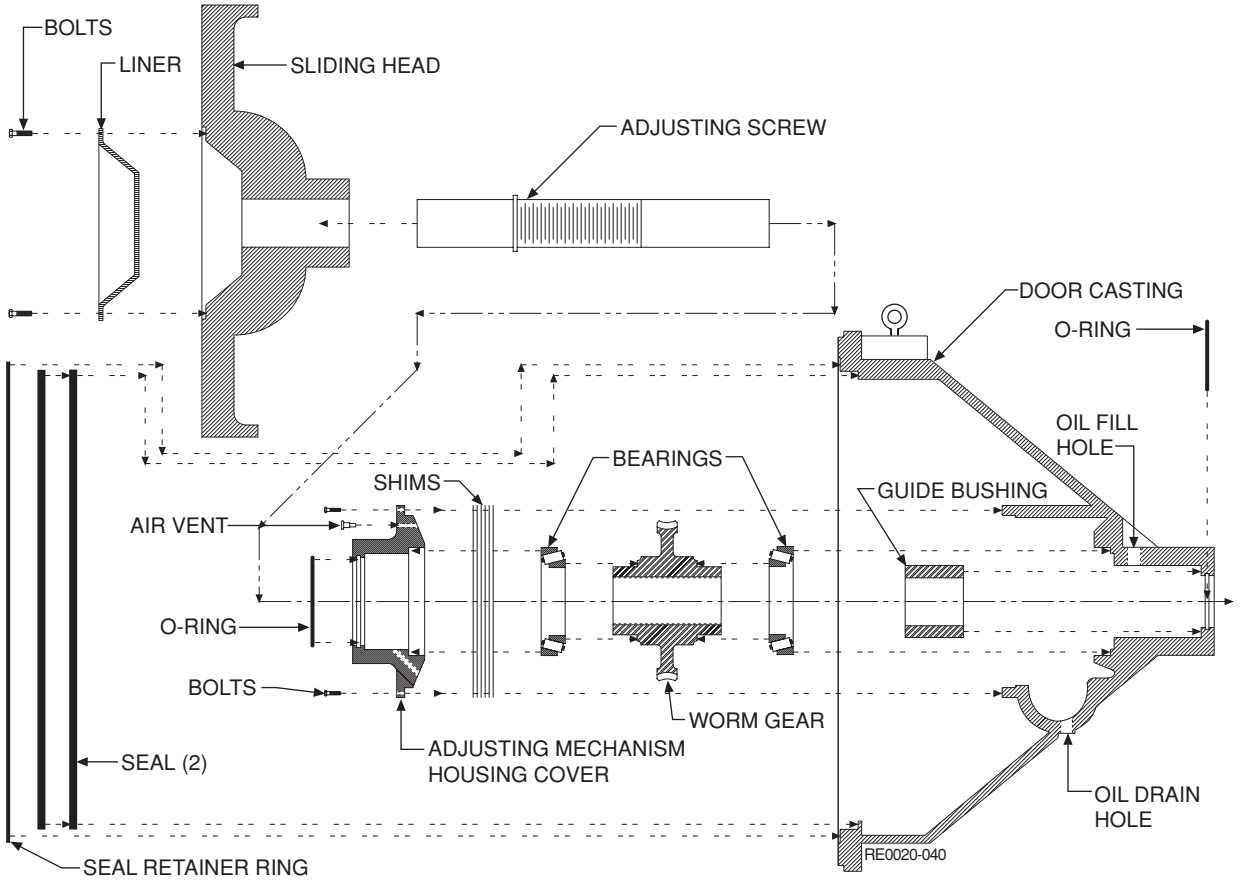
4. Install the bearing cups into the door casting and into the adjusting mechanism housing cover. Be sure the bearing cups are fully seated.

5. Install the new O-Ring into the adjusting mechanism housing cover.

6. Seat the worm gear into the door casting.

7. Install the complete shim set and the adjusting mechanism housing cover. Install four bolts in the cover, and tighten them slightly.

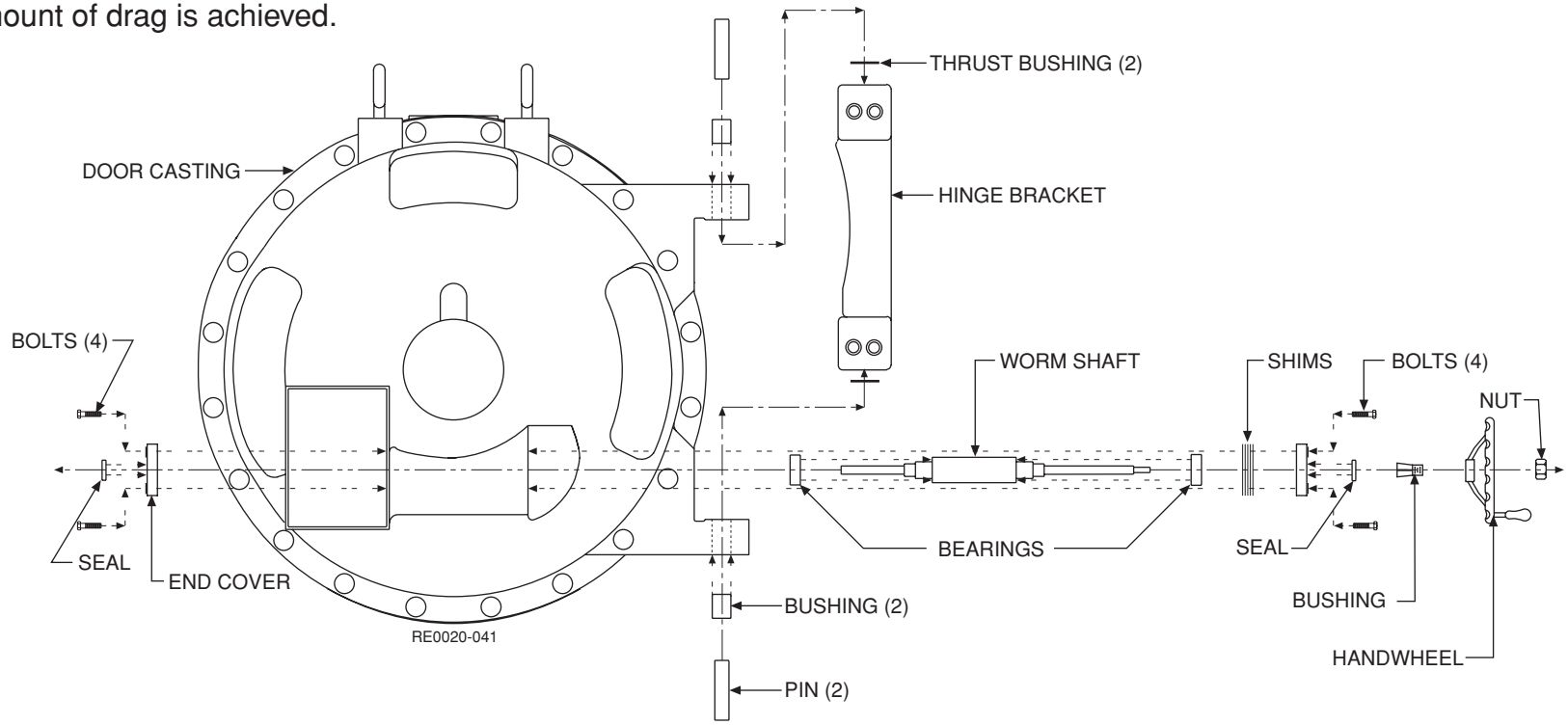
8. Reach through the opening for the worm shaft and pull on the worm gear. There should be a slight drag when the worm gear is rotated.



Sliding Head and Worm Gear Components

ADJUSTING MECHANISM (CONTINUED)

9. If there is no drag, remove the housing cover, remove one shim, then reassemble and test worm gear again. If the drag is excessive or the worm gear can not be rotated, remove the housing cover, add additional shim material and reassemble. Continue to repeat these steps until the proper amount of drag is achieved.
10. Remove the cover, shim pack and gear, and place them in a protected area. Tape the shim pack together. This will prevent the shims from becoming separated before final assembly.
11. Heat the worm shaft bearings to 120°C (250°F). Install the bearings onto the shaft.
12. Install the worm shaft, end covers and shims. All shims are to be installed under the cover plate on the hand-wheel side of the worm shaft.



Hinge Components

ADJUSTING MECHANISM (CONTINUED)

13. Check the end play of the worm shaft. Remove shims until there is no end play but the shaft still turns freely.

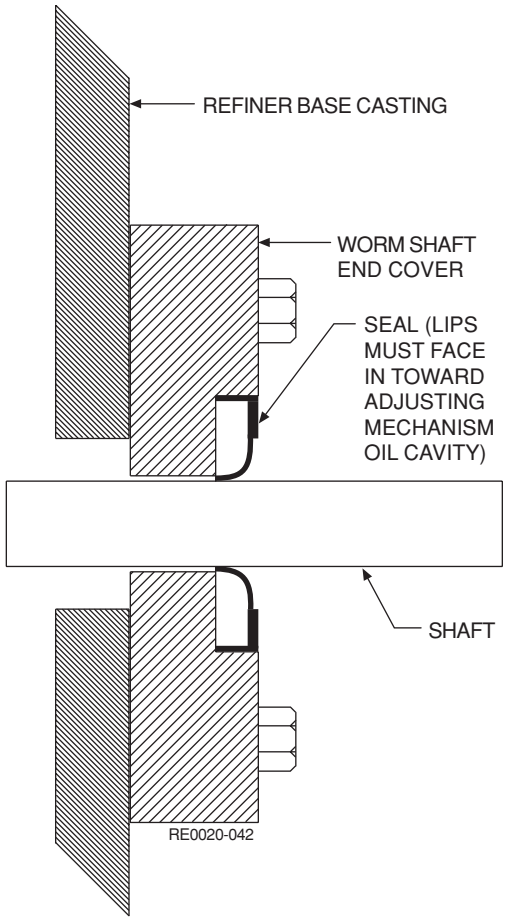
14. Remove the end cover from the gearmotor end of the worm shaft. Apply gasket sealer to the cover and reinstall. Only tighten bolts hand tight at this time.

15. Pre-torque the bolts to 60% of full torque value. See the Torque Chart in the Appendix for the proper torque values.

16. After all the bolts are pre-torqued, tighten the bolts to full torque. See the Torque Chart in the Appendix for the proper torque values.

17. Remove the handwheel end cover and shims from the worm shaft. Apply gasket sealer to the end cover, the door casting and between each layer of the shims. Reinstall the cover (with the shims) in the same manner as the gearmotor end cover.

18. Install seals in the end covers. Be sure that the lips are facing in toward the adjusting mechanism cavity as shown in the illustration.



Worm Shaft Seal Installation

ADJUSTING MECHANISM (CONTINUED)

19. Reinstall the worm gear into the door casting. Be sure that the gear teeth are seated into the worm shaft.

20. Install the roll pin into the hole in the door casting.

21. Apply a layer of gasket sealer to the face of the housing cover, the door casting and between each layer of the shims.

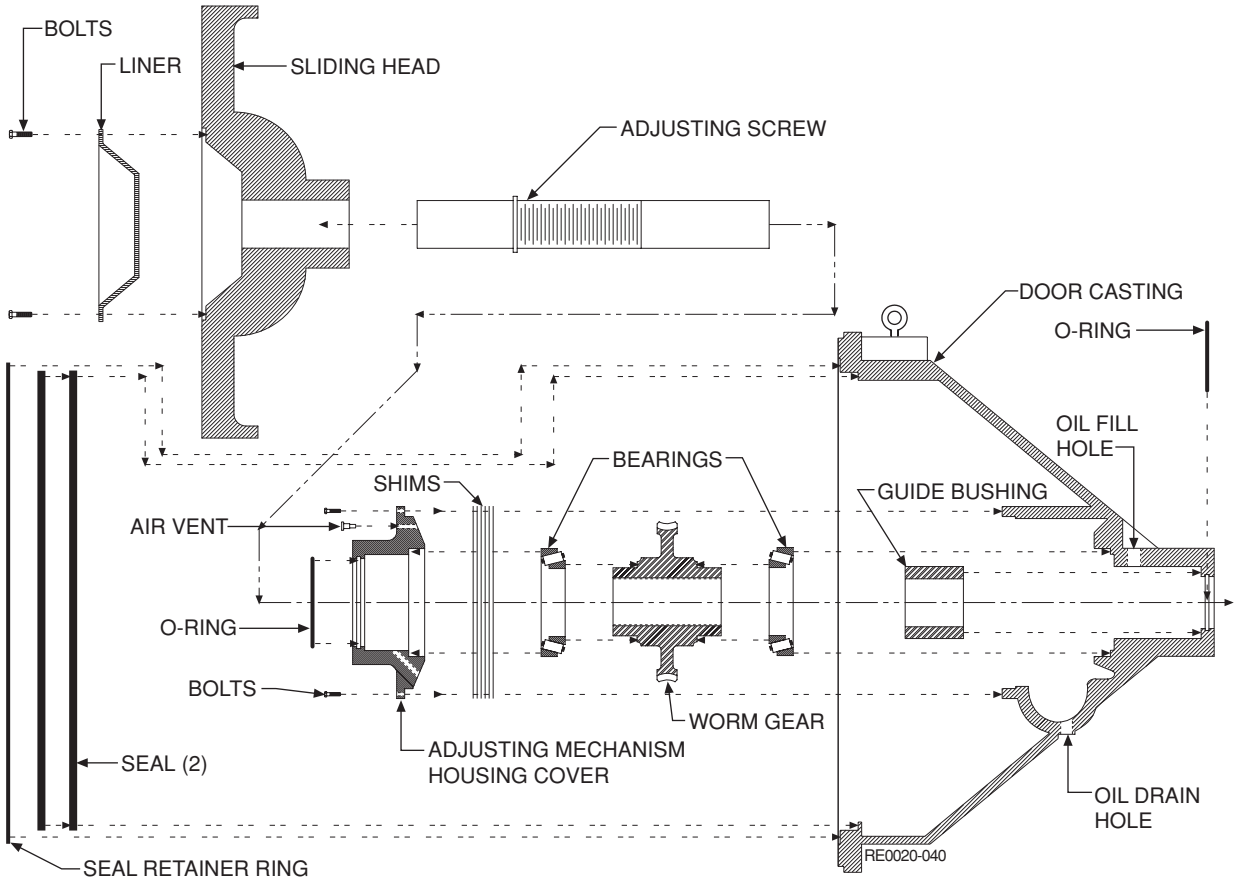
22. Install the housing cover to the door casting. Only tighten bolts hand tight at this time. Install the breather to the housing cover.

23. Pre-torque the bolts to 60% of full torque value. See the Torque Chart in the Appendix for the proper torque values.

24. After all the bolts are pre-torqued, tighten the bolts to full torque. See the Torque Chart in the Appendix for the proper torque values.

25. Press the adjusting screw into the sliding head. Place the sliding head face down on a solid surface.

26. Turn the refiner door over so that the bolting flange is facing down. Install the handwheel, grease the keyways and pads, and loop fabric lifting straps through the holes in the back of the door.



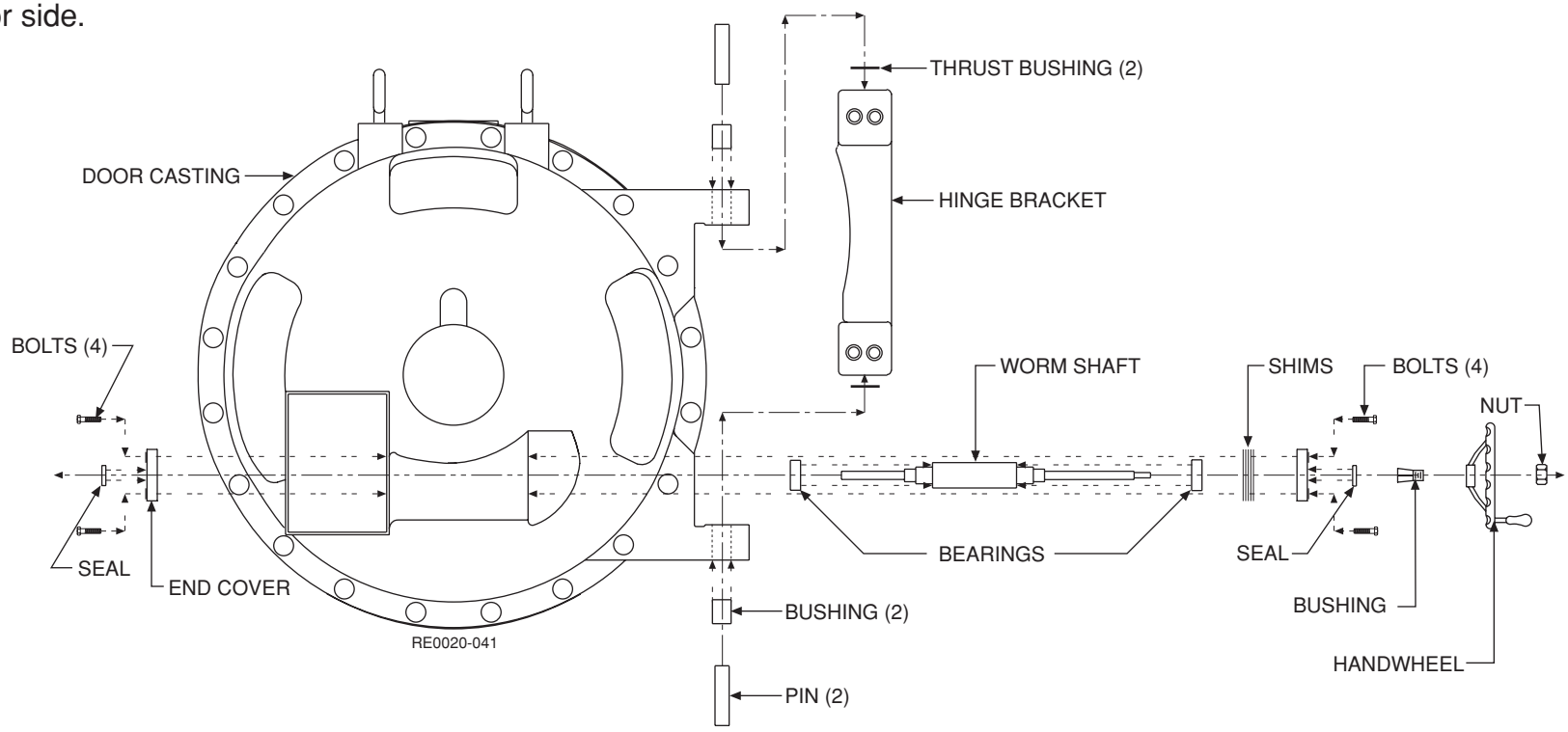
Sliding Head and Worm Gear Components

ADJUSTING MECHANISM (CONTINUED)

27. Lift the door and lower it over the sliding head. Allow the adjusting screw to slide through the worm gear and into the guide bushing. Be sure to check the alignment of the sliding head. The hole for the limit switch rod should be on the handwheel side of the door and the grease block on the motor side.

28. When the internal threads of the worm gear and the external threads of the adjusting screw come into contact, slowly turn the handwheel counterclockwise until the threads become engaged. Continue to turn the handle as the door is lowered onto the sliding head. Be sure to check the alignment of the keys as the door is lowered.

29. Install the hinge bushings into the holes on the door.



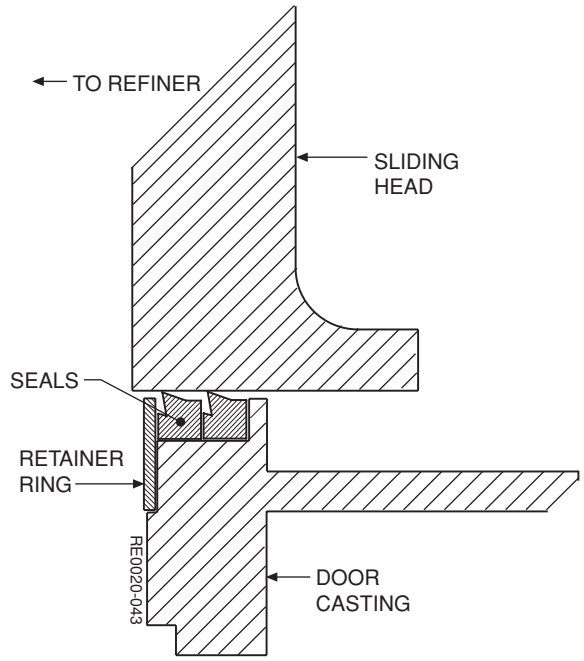
Worm Shaft Components

ADJUSTING MECHANISM (CONTINUED)

30. Align the hinge bracket and the thrust bushings with the door. Slide the hinge pins into the hinge bracket through the thrust bushings and into the door. Apply anaerobic-type liquid thread locking adhesive to the area of the pins that will be in the hinge bracket. Allow adhesive to set up according to the manufacturer's directions. The adhesive used should have the following characteristics:

    - Breaking strength – 12 Nm (115 in/lbs).
    - Operating temperature range – -50°C to 150°C (-65°F to 300°F).
    - Use Loctite® 242 or equivalent.

31. Turn the door over, sliding head facing up, and install the seals. Place the seal joints on opposite sides of the door from each other. Be sure that the seals are installed with the lip facing out as shown in the illustration.



Sliding Head Seal Installation

32. Install the seal retainer ring. Use anaerobic-type liquid thread locking adhesive on the screws for the retaining ring. The adhesive used should have the following characteristics:

    - Breaking strength – 12 Nm (115 in/lbs).
    - Operating temperature range – –50°C to 150°C (-65°F to 300°F).
    - Use Loctite® 242 or equivalent.

33. Apply gasket sealer to the mounting face of the sliding head liner and install. See the Torque Chart in the Appendix for the correct torque value.

34. Lift the door by the two lifting eyebolts and install it to the refiner.

35. Install the key to the motor end of the worm shaft and slide the clutch half onto the shaft.

ADJUSTING MECHANISM (CONTINUED)

36. Take the pin for the clutch assembly and start to slide it through the hole in the bottom of the clutch assembly housing. Slide the two stop rings onto the part of the pin on the inside of the clutch housing. Do not tighten the set screws at this time.

37. Hold the clutch yoke so that the two pins inside of it are in the groove in the worm shaft half of the clutch. Slide the pin up through the clutch yoke and into the hole in the top of the clutch assembly housing.

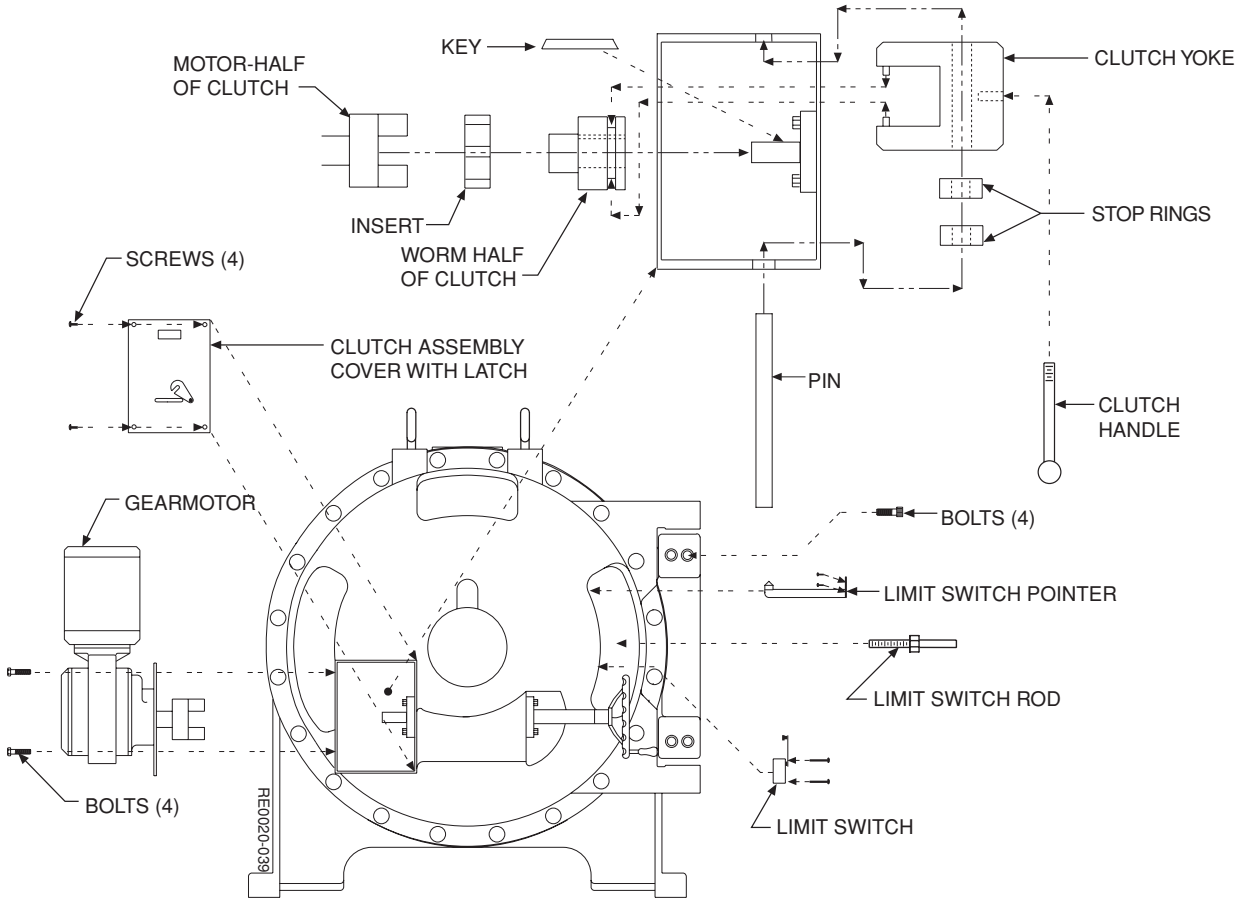
38. Slide the lower stop ring down against the inside wall of the clutch assembly housing. Tighten the set screw.

39. Slide the clutch yoke on the pin until the shaft half of the clutch is centered between the pins in the yoke. Slide the upper stop ring up against the bottom of the yoke, and tighten the set screw.

40. Place the clutch insert into the shaft half of the clutch and install the gearmotor.

41. Install the clutch assembly cover and the clutch handle.

42. Install the limit switch, limit switch rod and pointer.



Gearmotor and Clutch Assembly

SHEAR PINS

Why Are Shear Pins Used

The gearmotor clutch of the DD 4000 Refiner is equipped with a shear pin. The shear pin holds the motor half on the clutch onto the motor shaft.

⚠ CAUTION

A shear pin is an important safety device. It is designed to break before other parts of the refiner are damaged. Do not substitute a cap screw or bolt for a shear pin. Also, never use heat treated hardware, such as grade 5 or grade 8 bolts, or hardened dowel pins, as a substitute for the correct shear pin. An improper substitution can cause severe damage to the refiner and serious personal injury. If the refiner is repeatedly breaking shear pins (the most common reason for substitutions), the machine must be shut down and inspected to determine the cause of the repeated breakage.

Removing a Shear Pin

1. If the shear pin is not broken,
   - remove the snap clip from either end of the shear pin.
   - push the shear pin out. If it is tight, tap it out with a brass or plastic drift pin.
2. If the shear pin is broken,
   - most of the time the motor half of the clutch will be wedged onto the motor shaft. In this situation remove the gearmotor from the refiner.
   - use a suitable puller to remove the motor half of the clutch from the motor shaft.
   - remove the broken ends of the shear pin from the hub of the clutch, if they are still present.
   - use a hammer and a brass drift punch to drive the broken pin out of the shaft.

SHEAR PINS (CONTINUED)

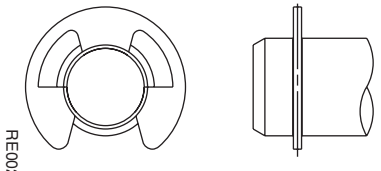
Replacing a Shear Pin

1. Inspect the condition of the shear pin hole in both the shaft and the clutch. If these holes are elongated, additional repairs will be required. Contact GL&V Field Service for more information.
2. File or stone the edges of the shear pin holes to remove any burrs or high metal. Inspect the entire area of the shaft where the motor half of the clutch mounts. File or stone any burrs or high metal.
3. Slide the motor half of the clutch onto the shaft and align the holes.
4. Install one of the snap rings onto the shear pin. Insert the shear pin through the hole. Use a brass or plastic hammer to tap the pin into place if required. Install the second snap ring.

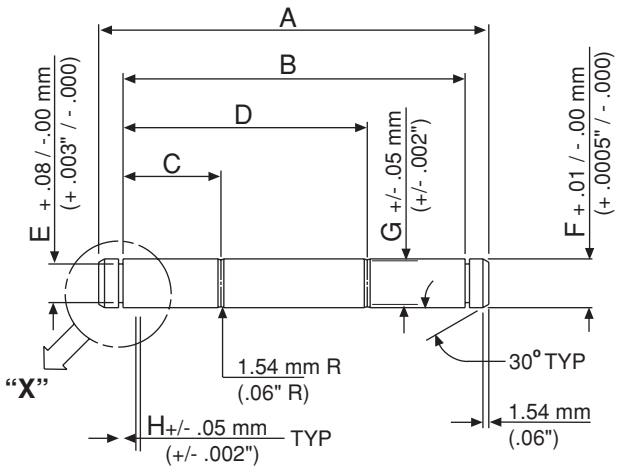
Making Replacement Shear Pins

See the illustration for detailed information about making replacement shear pins.

REFINER	SNAP RING		A	B	C	D	E	F	G	H
16"	5133-18	mm	57.15	44.628	8.026	36.601	3.734	4.7625	4.115	.737
		(Inch)	(2.25)	(1.757)	(.316)	(1.441)	(.147)	(.1875)	(.162)	(.029")
24"	5133-25	mm	69.85	57.328	14.376	42.951	5.334	6.350	5.715	.737
		(Inch)	(2.75)	(2.257)	(.566)	(1.691)	(.210)	(.250)	(.225)	(.029)
30"	5133-31	mm	82.55	70.028	N/A	N/A	6.350	7.9375	N/A	.737
		(Inch)	(3.25)	(2.757)	(N/A)	(N/A)	(.250)	(.3125)	(N/A)	(.029)
38"	5133-50	mm	101.6	89.078	25.502	63.602	10.058	12.700	11.684	1.168
		(Inch)	(4.00)	(3.507)	(1.004)	(2.504)	(.396)	(.500)	(.460)	(.046)
46"	5133-37	mm	114.30	101.778	23.901	77.876	7.696	9.525	8.458	.991
		(Inch)	(4.50)	(4.007)	(.941)	(3.066)	(.303)	(.375)	(.333)	(.039)



DETAIL "X"
TYPICAL BOTH ENDS



NOTE: SHEAR PINS ARE PURCHASED FINISHED WITH SNAP RING MATERIAL: HRS 1020

Shear Pin Details

PRESSURE SWITCHES

The standard pressure switches supplied by GL&V are either electronic or air controlled. The procedures for setting, adjusting and maintaining these switches are found in the vendor information about the switches.

OIL CIRCULATION SYSTEM–OPTIONAL

An oil circulation system is available as an option for the DD 4600 Refiner. It is designed to provide continuous lubrication for the bearings in the rotating assembly.

This unit is not manufactured by GL&V. It is built to requirements by another manufacturer. At a minimum, the system requires the following:

1. An oil reservoir, which includes:
    - Level gauge
    - Thermometer
    - Filler-breather
    - Dump strainer
    - Return port.
2. One or two oil pumps with motors. The pumps must be able to deliver .5 liters (1 pint) per minute per bearing at 172 kPa (25 psi).
3. An oil filter.
4. A water cooled heat exchanger.
5. A water temperature control for the heat exchanger.
6. A thermometer at the heat exchanger outlet.
7. A pressure gauge.
8. An immersion-type oil heater.
9. A flow control unit that mounts on the refiner. It includes:
    - Two flow control needle valves
    - Two flow switches
    - One load switch.

The exact specifications for each component will depend on the manufacturer. See the manufacturer's information for details about maintenance and service.

OIL CIRCULATION SYSTEM–OPTIONAL (CONT.)

CAUTION

Never locate the oil supply system more than 3 meters (10 feet) from the machine. Oil deprivation at bearings, or overflowing oil reservoir may result. Failure to follow may result in property damage.

Installation

The circulating system should be located as close to the refiner as possible. This allows for the most direct routes for feed and return lines.

The oil feed line should run from the outlet connection on the system to the flow control unit on the refiner.

The return line should run from the oil outlet on the refiner to the return port on the system. This return line should be 20 mm (3/4") inside diameter (ID) minimum. It may be hose, tubing or pipe. It should have a minimum slope of 40 mm per meter of run (1/2" per foot) going downhill to the system reservoir. An oil sight indicator is recommended for this line but it is not required.

Make all electrical connections according to the instructions provided by the manufacturer. The pump rotation should be checked. It must run as shown by the arrow on the pump or motor housing.

The system is to be filled with oil for the rotating assembly. See the Lubrication Section of this manual for details.

Startup and Test

1. With the reservoir filled to the proper level, turn on the immersion heater. Allow the oil to reach 38°C (100°F).

2. Disconnect the oil feed line from the refiner.

3. Turn on the system pump and collect the oil in a suitable container.

4. Run the pump for one minute, then measure the amount of oil it pumped. The requirement is .5 lpm per bearing (1 pint) at 172 kPa (25 psi).

5. Adjust the flow using the flow control needle valve and the pressure by using pressure relief valve.

NOTICE

During operation the oil circulation system must always be started before the refiner is started up. An interlock should be installed to prevent the main motor from starting if the oil pump is not running. There should also be an audible or visual warning that is activated if the pump fails while the refiner is running.

Appendix

SUGGESTIONS FOR THE CARE AND USE OF STAINLESS STEEL EQUIPMENT

Introduction

Stainless steels develop their corrosion resistance by forming a thin layer of chrome oxide on the surface. Chromium is an element used in the manufacture of stainless steel which prevents the surface from rusting under normal atmospheric exposures. The chromium in the steel reacts with the oxygen in the atmosphere to form chromium oxide which is a chemical resistant barrier that forms on the surface. Stainless steel will corrode if the thin protective chrome oxide layer happens to be damaged either mechanically or chemically.

Precautions

Dos and don'ts to follow in handling stainless steel equipment.

Do keep equipment clean and free from pulp build-up or other deposits.

Do protect equipment from soot, dirt, corrosive solutions and corrosive vapors during storage and idle periods.

Do wash equipment with water to remove soot, pulp, solids or foreign particles which could lead to surface attack. If needed, use detergent with water to remove surface contaminants.

Do protect equipment from stray electrical currents or potentials from welding or other electrical sources.

Do inspect equipment frequently for evidence of attack especially when process and service conditions are changing or new equipment and processes are being started. Process and service conditions can sometimes be modified to eliminate corrosion before it seriously damages the equipment.

Don't lift stainless steel parts with unprotected steel cables or chains. When using steel cables or chains first insert the cable or chain through a rubber hose making sure the rubber hose contacts the stainless steel instead of the steel cable or chain. Unprotected cables or chains may damage the stainless steel surface which may result in areas for chemical attack.

Don't expose equipment to stagnant solutions or corrosive vapors. Stagnant acid-chloride solutions and vapors are particularly harmful to the surface of stainless steel.

Don't allow welding spatter and grinding particles from nearby work areas to contaminate surfaces of stainless steel equipment. Shield stainless equipment from such exposures.

Don't weld temporary mild steel brackets to stainless steel wetted surfaces. In doing so the corrosion resistance of stainless steel is lowered.

Don't remove barnacles from corroded stainless steel equipment. Removal of barnacles may result in leakage which may require immediate repair.

SUGGESTIONS FOR THE CARE AND USE OF STAINLESS STEEL EQUIPMENT (CONT.)

Cleaning Procedure

If the stainless steel equipment requires spot cleaning to remove iron from the surface, phosphoric acid may be used. There are also pickling pastes available which contain nitric/hydrofluoric acid for the more difficult areas to clean.

Should the equipment require welding on the surface exposed to the process these areas should be cleaned with pickling paste as the final step after welding.

Sources for phosphoric acid and pickling pastes are as follows:

Phosphoric Acid	USA	Oakite Products Inc. 50 Valley Road Berkeley Heights, NJ 07922 Telephone: 800-526-4473, 908-464-6900
	Canada	Telephone: 416-791-1628
Hydrofluoric/Nitric Acid Pickling Paste	USA	Avesta Welding 1971 Abbott Road Lackawanna, NY 14218 Telephone: 800-441-7343, 716-827-4400
	Canada	Avesta Sheffield, Inc. 2140 Meadowpine Boulevard Mississauga, Ontario L5N 6H6 Telephone: 800-387-9900, 905-567-9900
	USA	Major Metals, Inc. P.O. Box 844 Pottstown, PA 19464 Telephone: 215-323-2120

The companies listed above, upon request, supply the proper instructions for the application and use of their products. Also they can supply Material Safety Data Sheets which are essential to read and understand prior to using a product. **Should questions arise contact our Customer Support Group at 603-882-2711.**

RECOMMENDED TIGHTENING TORQUE FOR CAP SCREWS (INCH)

SIZE UNC	HEAD MARKING AND MATERIAL GRADE											
	CARBON STEEL				See Note 4: ASTM A193 Grades B8, B8C, B8M and B8T STAINLESS				SAE Grade 5 MEDIUM CARBON STEEL			
	Tightening Torque ft-lbs (Nm)											
	Non-Lubricated		Lubricated		Non-Lubricated		Lubricated		Non-Lubricated		Lubricated	
1/4 – 20	3	(4)	2.3	(4)	3	(4)	2.3	(3)	9	(12)	7	(10)
5/16 – 18	7	(10)	5.3	(7)	6	(8)	4.5	(6)	18	(24)	14	(19)
3/8 – 16	12	(16)	9	(12)	11	(15)	8	(11)	32	(43)	24	(33)
7/16 – 14	20	(27)	15	(20)	17	(23)	13	(18)	51	(69)	38	(52)
1/2 – 13	29	(39)	22	(30)	25	(34)	19	(26)	76	(103)	57	(77)
9/16 – 12	43	(58)	32	(43)	35	(48)	26	(35)	110	(150)	82	(112)
5/8 – 11	59	(80)	44	(60)	50	(68)	38	(52)	152	(206)	114	(155)
3/4 – 10	105	(142)	79	(107)	88	(119)	66	(90)	269	(365)	202	(274)
7/8 – 9	170	(231)	128	(174)	140	(190)	105	(142)	435	(590)	326	(442)
1 – 8	255	(346)	191	(259)	210	(285)	158	(214)	652	(884)	489	(663)
1-1/8 – 7	361	(492)	270	(369)	300	(410)	225	(308)	811	(1108)	608	(831)
1-1/4 – 7	509	(695)	382	(521)	420	(570)	315	(430)	1146	(1563)	858	(1172)
1-3/8 – 6	667	(911)	500	(683)	556	(759)	417	(569)	1501	(2049)	1126	(1537)
1-1/2 – 6	887	(1209)	665	(907)	735	(1004)	551	(754)	1992	(2720)	1494	(2040)
1-3/4 – 5	1396	(1907)	1047	(1430)	1164	(1589)	873	(1192)	3142	(4291)	2357	(3218)
2 – 4-1/2	2099	(2868)	1574	(2151)	1750	(2390)	1313	(1792)	4725	(6452)	3544	(4839)
2-1/4 – 4-1/2	3069	(4191)	2302	(3144)	2564	(3500)	1923	(2608)	6910	(9436)	5183	(7077)
2-1/2 – 4	4199	(5735)	3149	(4300)	3500	(4779)	2625	(3560)	9450	(12904)	7088	(9678)

NOTES

1. The data tabulated here is for metal to metal joints. **Do not** use for gasketed joints.
2. The use of Loctite or its equivalent is considered a lubricant. Use the lubricated table torque values.
3. Recommended torque value for gasketed joints should be specified on the Assembly Drawing. If they are not, contact us.
4. Recommended torque values for stainless steel socket head cap screws are the same as for stainless steel hex head cap screws.

NOTICE

Do not use this data if different than values shown on assembly drawing.

RECOMMENDED TIGHTENING TORQUE FOR CAP SCREWS (METRIC)

SIZE ISO	HEAD MARKING AND MATERIAL GRADE											
	4.6 CARBON STEEL				See Note 4 STAINLESS				8.8 or 9.8* MEDIUM CARBON STEEL * M20 and above			
	Tightening Torque Nm (ft-lbs)											
	Non-Lubricated		Lubricated		Non-Lubricated		Lubricated		Non-Lubricated		Lubricated	
M6 x 1	3	(2)	2	(1.5)	3	(2)	2	(1.5)	11	(8)	8	(6)
M8 x 1.25	10	(7)	7	(5.3)	10	(7)	7	(5.3)	29	(21)	22	(16)
M10 x 1.5	20	(15)	15	(11.3)	18	(13)	14	(10)	59	(44)	44	(32)
M12 x 1.75	34	(25)	26	(19)	33	(24)	25	(18)	102	(75)	77	(57)
M14 x 2	54	(40)	41	(30)	52	(38)	39	(29)	164	(121)	123	(90)
M16 x 2	87	(64)	65	(48)	80	(59)	60	(44)	253	(185)	190	(139)
M20 x 2.5	168	(124)	126	(93)	157	(116)	118	(87)	455	(332)	340	(249)
M24 x 3	297	(217)	222	(163)	267	(195)	200	(147)	783	(573)	587	(430)
M30 x 3.5	589	(431)	442	(324)	530	(388)	398	(291)	1555	(1139)	1166	(854)
M36 x 4	1029	(754)	772	(565)	926	(678)	695	(509)	2718	(1990)	2038	(1493)
M42 x 4.5	1648	(1207)	1236	(905)	1483	(1086)	1112	(815)	4350	(3186)	3263	(2389)
M48 x 5	2471	(1810)	1853	(1357)	2224	(1629)	1668	(1222)	6524	(4778)	4893	(3583)

NOTES

1. The data tabulated here is for metal to metal joints. **Do not** use for gasketed joints.

2. The use of Loctite or its equivalent is considered a lubricant. Use the lubricated table torque values.

3. Recommended torque value for gasketed joints should be specified on the Assembly Drawing. If they are not, contact us.

4. Recommended torque values for stainless steel socket head cap screws are the same as for stainless steel hex head cap screws.

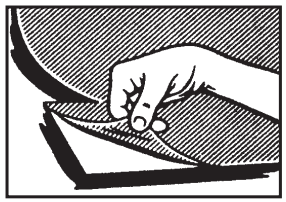
NOTICE

Do not use this data if different than values shown on assembly drawing.

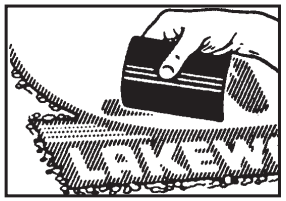
PROCEDURE FOR APPLYING POLYESTER SIGNS

Wash areas (where signs are to be mounted) with a degreasing solvent (such as SIMPLE GREEN*) to ensure a clean mounting surface. Mix a mild solution of detergent (such as IVORY LIQUID or LURON** lotion soap) and water as follows: One tablespoon detergent to one gallon of water.
Do not use lanolin based detergent.

Use a sponge to apply solution to surface where sign is to be applied and leave wet.



Peel backing sheet from sign. Place sign on wet surface and slide to position.



Smooth out all wrinkles and air bubbles working from center of sign. Use squeegee for this purpose.
Wipe off excess solution and let dry.

*SIMPLE GREEN is a nontoxic, nonflammable, biodegradable cleaner and degreaser. Manufactured by Sunshine Makers, Inc., Huntington Harbor, CA 92649. Available from industrial suppliers, department stores and supermarkets.

**LURON lotion soap is a pH balanced mild cleaner. Manufactured by the Dial Corporation, Phoenix, AZ 85077. Available from industrial suppliers.

E3084

Spare Parts

The recommended spare parts listed on the following pages provide for **minimum** coverage only. For multiple machines quantities should be increased proportionately.

GL&V USA Inc.
141 Burke Street
Nashua, NH 03060-4788
Tel: (800) 261-9351
Fax: (603) 595-0035

Date: 9/07/2006

Recommended Spare Parts List

Equipment: 06T3801-06T3804 - 24" DD 4600 Refiner - Standard

Part Number	Description	Start Up	1st Year	Long Term
ROTATING ASSEMBLY				
000248N63	Rotating Assy - Straight Bore Cplg. w/Nickel/Chrome/Boron Coated Sleeve Includes Outboard & Inboard Bearing Locknuts, Lockwashers, & Bearing Spacers	0	0	1
59-211004-01	Bearing Spacer	0	0	2
011178	Outboard Bearing	0	0	1
011131	Inboard Bearing	0	0	1
A10230-121	Lockwasher	0	0	1
A10230-21	Locknut #AN-21	0	0	1
59-809001-1	Gasket, Bearing Cover	0	0	2
97-915001-71	O-Ring, Water Flinger	0	0	1
59-312003-1	Packing Sleeve Nickel-Chrome-Boron Coated	0	0	1
617007	Loctite Sealant for Sleeve	0	0	1
617020	Cleaner - Locquic Primer for Sleeve	0	0	1
97-924005-3	Oil Sight Gauge, 1" NPT	0	0	1

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Nashua, NH 03060-4788
Tel: (800) 261-9351
Fax: (603) 595-0035

Recommended Spare Parts List

Equipment: 06T3801-06T3804 - 24" DD 4600 Refiner - Standard

Part Number	Description	Start Up	1st Year	Long Term
HUB AND ROTOR				
000369N63-01	Rotating Head - 24" 17-4 PH	0	0	1
000370N63-01	Splined Hub	0	0	1
NXS1252-1368	Screw, S/S Socket Head Cap - 3/4" x 2"	0	1	0
000372N63-01	End Cap	1	0	0
	Disks - Set of 4 Circles Contact GL&V For Specific Part# and Description	1	0	0
97-811039-1	Collar Bolts S/S - 1/2" x 1"	0	64	0
NXS1185-1348	Screw-Socket Head Cap - (was 101132) S/S 1/2" x 1" - For Milled Bar Plates	0	48	0
PACKING BOX				
59-915001-G2	SpiralTrac Bushing/Packing Set	0	1	0
59-915001-02	Packing - Chesterton Mill Pack 1730	1	0	0

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Fax: (603) 595-0035

Recommended Spare Parts List

Equipment: 06T3801-06T3804 - 24" DD 4600 Refiner - Standard

Part Number	Description	Start Up	1st Year	Long Term
BASE ASSEMBLY				
418012	Gasket - Base Drain	0	0	1
741570	Helicoil Insert Kit - 5/8" - 6 Inserts, 1 Tap & 1 Install Tool	0	0	1
	Please Note - Helicoil Insert Kit Above for Door Mounting			
741564	Helicoil Insert Kit - 1/2" 12 Inserts, 1 Tap & 1 Install Tool - (Plate Mounting)	0	0	1
GAUGE PANEL				
677007	Pressure Switch - Gland Water 0 Allen Bradley	0	0	1
459457	Pressure Switch - Stock Line Pressure - Barksdale	0	0	1
GEARMOTOR				
A11233-161	1 HP – Motor 460/60/3	0	0	1
000590N63-10	VFD – 2 HP - 460/60/3	0	0	1
19-424002-G2	Shear Pin - 3 Spares furnished with Refiner	0	0	3
59-421001-2	Gearmotor Clutch Half	0	0	1
COUPLING - REFINER HALF				
	Coupling - Refiner Half Contact GL&V For Specific Part# and Description	0	0	1
COUPLING – MOTOR HALF				
	Coupling - Motor Half Contact GL&V For Specific Part# and Description	0	0	1

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141 Burke Street
Nashua, NH 03060-4788
Tel: (800) 261-9351
Fax: (603) 595-0035

Recommended Spare Parts List

Equipment: 06T3801-06T3804 - 24" DD 4600 Refiner - Standard

Part Number	Description	Start Up	1st Year	Long Term
ADJUSTING MECH				
97-941003-12	Limit Switch - Allen Bradley	0	0	1
602509	Packing - Sliding Head Quantity is in inches - Price is per inch Quantity is enough for 2 req'd pcs.	0	0	162
59-404001-1	Worm Gear	0	0	1
011130	Bearing	0	0	2
011163	Bearing, Tapered Roller - Worm Shaft	0	0	2
59-425001-1	Guide Bushing	0	0	1
59-410001-1	Pipe & Adjusting Screw	0	0	1
97-915001-8	O-Ring, Adjusting Screw	0	0	1
97-915001-51	O-Ring, Adjusting Screw	0	0	1
97-915002-13	Clipper Seal, Worm Shaft	0	0	2
610048	Cylindrical Bushing, Oilite	0	0	2
610400	Thrust Washer, Oilite	0	0	2

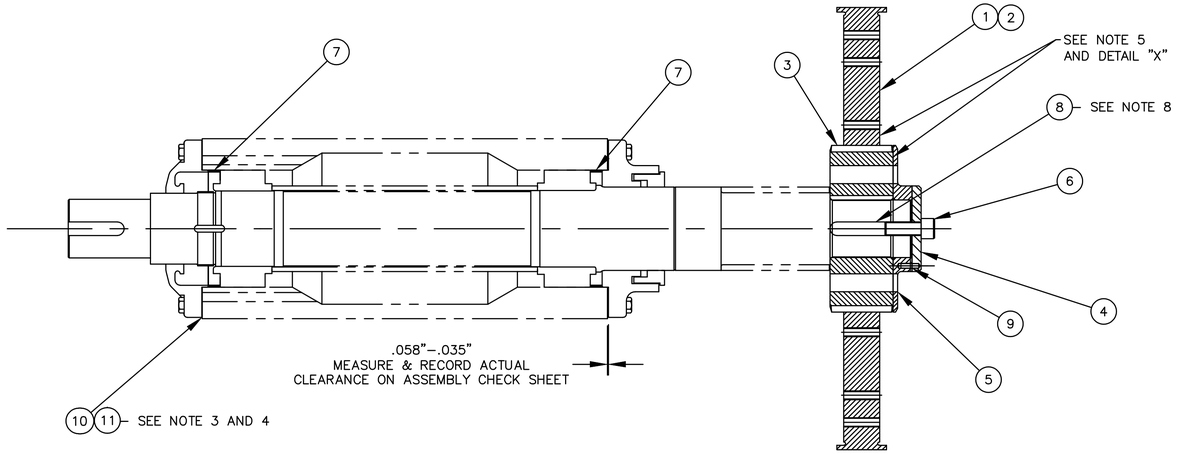
Drawings

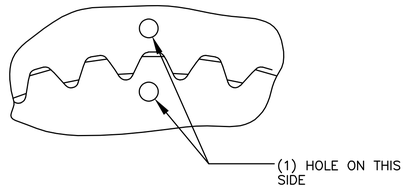
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

NOTES:

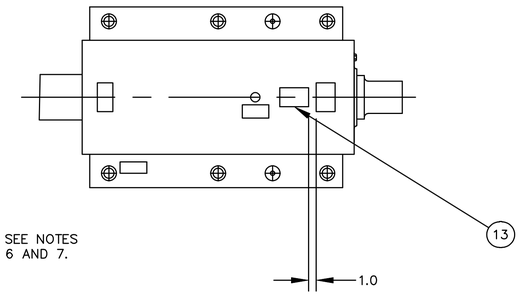
1. −10 = 20" ROTATING HEAD ASSEMBLY
   −20 = 24" ROTATING HEAD ASSEMBLY
2. ESTIMATED WEIGHT:

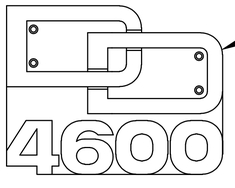
   20" ROTATING HEAD = 155 LBS.
   24" ROTATING HEAD = 235 LBS.
   SPLINED HUB = 38 LBS.
3. ADJUST THICKNESS OF SHIMS TO MAINTAIN GAP AS SHOWN (.058"−.035")
4. APPLY SEALANT PERMATEX #2B (ITEM 11) TO BOTH FACES OF SHIM (ITEM 10) AFTER FINAL SETTING.
5. MAKE SURE THE MATCH MARKS ON THE HEAD AND HUB ARE LINED UP BEFORE INSTALLING ITEM 5.
6. ITEM 12 IS MOUNTED PER C19−801003 FOR NEW INSTALLATION.
7. ITEM 12 REPLACES EXISTING DD NAMEPLATE FOR ALL UPGRADES. FORM N/P TO CONTOUR AND USE EXISTING 4−#10−32 MACHINE SCREWS.
8. ITEM 8 REPLACES EXISTING KEY FOR ALL UPGRADES AND NEW UNITS.





DETAIL "X"





QTY	PART NO.	DESCRIPTION	MATERIAL	ITEM
1	PS11162	SAFETY TAG		13
1	000204N63−01	DD 4600 REFINER NAMEPLATE		12
1	621005	SEALANT − PERMATEX #2B		11
1	59−823003−1	SHIM−BEARING HOUSING .188 THK	LAMINATED	10
1	A11237−05	ø1/4" X 1" LG DOWEL PIN	S1368	9
1	C97−873009−C22R	SQUARE KEY (.75" X 4.12"LG)	CF4140	8
2	59−211004−01	BEARING SPACER (.661 WIDE)		7
1	NXS1252−1368	3/4"−10UNC X 2" LG SHC/SCR	S1368	6
1	000371N63−01	SPLINED SPACER		5
1	000372N63−01	SPLINED END CAP		4
1	000370N63−01	SPLINED HUB		3
1	000369N63−01	24" ROTATING HEAD		2
0	000373N63−01	20" ROTATING HEAD		1

Parts List 000374N63−20

QTY	PART NO.	DESCRIPTION	MATERIAL	ITEM
1	PS11162	SAFETY TAG		13
1	000204N63−01	DD 4600 REFINER NAMEPLATE		12
1	621005	SEALANT − PERMATEX #2B		11
1	59−823003−1	SHIM−BEARING HOUSING .188 THK	LAMINATED	10
1	A11237−05	ø1/4" X 1" LG DOWEL PIN	S1368	9
1	C97−873009−C22R	SQUARE KEY (.75" X 4.12"LG)	CF4140	8
2	59−211004−01	BEARING SPACER (.661 WIDE)		7
1	NXS1252−1368	3/4"−10UNC X 2" LG SHC/SCR	S1368	6
1	000371N63−01	SPLINED SPACER		5
1	000372N63−01	SPLINED END CAP		4
1	000370N63−01	SPLINED HUB		3
0	000369N63−01	24" ROTATING HEAD		2
1	000373N63−01	20" ROTATING HEAD		1

Parts List 000374N63−10

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES

WARNING:
THE EXPORT OR REEXPORT OF THIS DRAWING OR A PRODUCT PRODUCED BY THIS DRAWING IS SUBJECT TO U.S. EXPORT ADMINISTRATION REGULATIONS AND OTHER APPLICABLE GOVERNMENTAL RESTRICTIONS OR REGULATIONS.

ANSI Y14.5 SYMBOLS

SYM	GEOMETRY
⌖	TRUE POSITION
⏥	FLATNESS
⊥	PERPENDICULARITY
∥	PARALLELISM
∠	ANGULARITY
↗	RUNOUT
⌓	PROFILE OF A SURFACE
○	ROUNDNESS
—	STRAIGHTNESS
◎	CONCENTRICITY
Ⓜ	MAX MATL CONDITION
⌭	CYLINDRICITY

UNLESS OTHERWISE SPECIFIED, THE FOLLOWING STDS. APPLY: DIM & TOL− ANSI Y14.5, SURFACE FINISHES−ISO 1302 ALL DIM. APPLY TO FINISHED PART

REMOVE ALL BURRS AND SHARP CORNERS AND COUNTERSINK ALL TAPPED HOLES TO MAJOR DIAMETER

X.XX BASIC DIM NO TOL | ( ) − REF | Ø − DIAMETER | R − RADIUS

SPECS

TYPE	NO.	TYPE	NO.
TOL	E−2167		
WELD	E−3090		
THRD	E−825		

NEXT ASSY. SEE ENG SHEET
REF.DWG. 33−311011

	DRAWN	DATE
	RPE	21−MAR−05
CHECKED	BEH	23−MAR−05
APPROVED	BEH	23−MAR−05

GL&V NASHUA N.H.

TITLE
ROTATING HEAD ASSEMBLY
20/24" DD 4600
REFINER

SIZE D | THIRD ANGLE PROJECTION | DRAWING NO. 000374N63 | REV −

SCALE NONE | | SHEET 1 OF 1

AutoCAD

Vendor Data

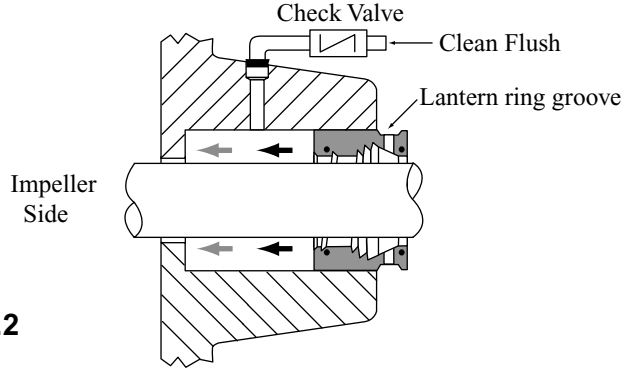


Fig.2

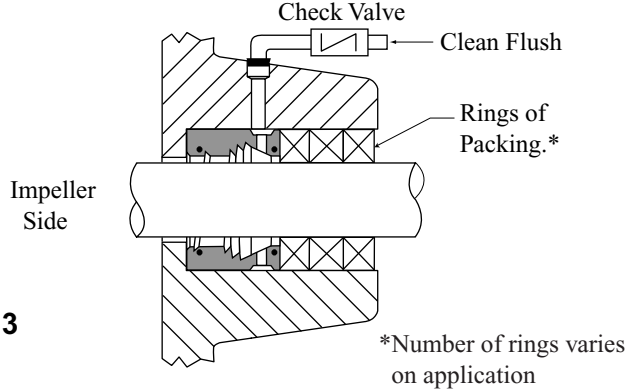


Fig.3

*Number of rings varies on application

U.S. Patents # 5,553,868
5,167,418
Euro. Pat. App. 0 912 848

ST01253-240703

SpiralTrac™

Throat Bushing

Version P

Installation Instructions

EnviroSeal
Engineering Products Ltd.
1310 Rocky Lake Drive, Waverley,
Nova Scotia, B2R 1R6, Canada

Tel: 1-800-884-7325
Fax: (902) 861-3522
Website: http://www.enviroseal.ca

Important: In some Process equipment a flush in / flush out piping arrangment is utilized. In all cases, when using SpiralTrac, **use flush in only** and plug the flush out port. It is also important to **use a check valve** on the flush line to prevent backflow.

Step 1: Disassemble Version P Type "S" split bushing. Components (Fig 1) will be two halves of bushing with alignment pins in place.

Step 2: Separate halves of SpiralTrac Version P and position on the shaft as shown in fig 2. When installed lantern ring groove will correspond with the injection port as shown in fig 3.
Note: On double ended pumps make sure the rotation is correct for each end.

Step 3: Push the device evenly into the stuffing box.

Step 4: Install packing rings and gland follower loosely.

Caution: Do not over tighten packing.

Step 5: Tighten packing to attain a drip rate leakage as per instructions of Manufacturer. Note: Self locking nut on gland studs may be required.

These instructions are meant as a guide to simplify the installation of SpiralTrac™ Environmental Controllers. Should additional assistance be required when performing an installation, please contact your local distributor or EnviroSeal.

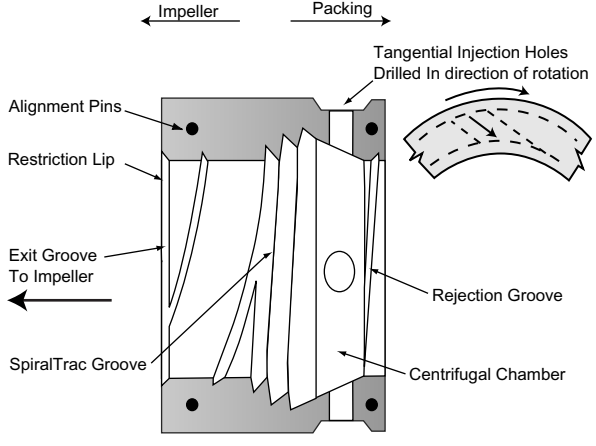


Fig.1

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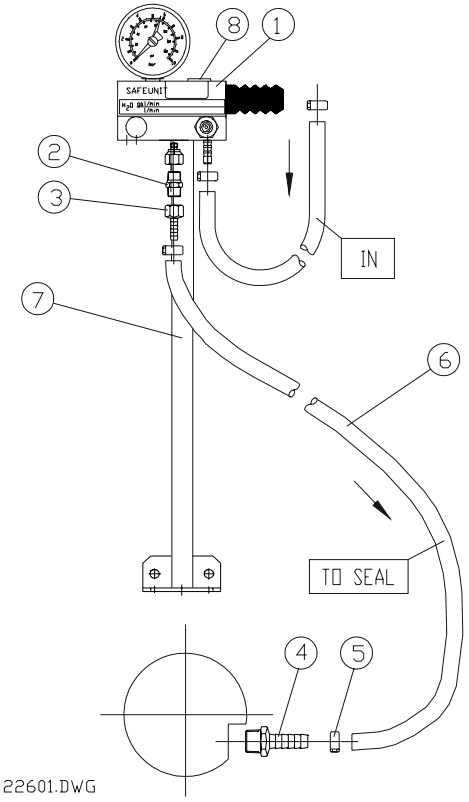
INSTALLATION AND OPERATION INSTRUCTIONS

No. 20000226EN
Date 1.6.1998
Revision No. 1
Date 24.6.1999

SAFEUNIT MONITORING AND CONTROL SYSTEM FOR SEAL WATER

TYPE SFP COMPLETE FOR PACKINGS AND FLUSH SEALS

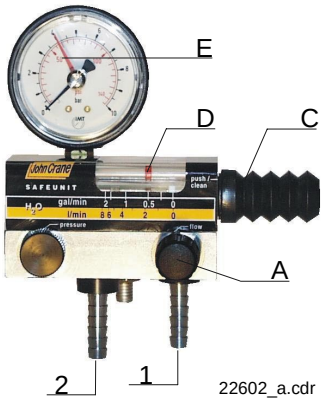


BILL OF MATERIAL

1. Flowmeter	1 pc
2. Back valve	1 pc
3. Hose coupling	1 pc
4. Hose coupling	1 pc
5. Hose clamp	4 pcs
6. Hose (inside diameter 3/8", 10 mm)	2 pcs
7. Stand	1 pc (option)
8. Alarm device (Flush-seals)	1 pc (option)*

* Alarm device type: AC-1, DC-1 or EX-1 (*see separate instructions: 20000224, 20000225 or 20000246*).

OPERATION INSTRUCTIONS OF SAFEUNIT FLOWMETER



Type SFP

- Lead water to the flowmeter.
- Disconnect the waterline of the packings from the water connection of the stuffing box.
- Use the regulating valve (A) to adjust a flow rate allowed to worn packings.
- Reconnect the water connection to the packings.
- Adjust the tightness of the packings. The pressure gauge shows the pressure in the packing.
- Adjust the red indicator (D) of the flowmeter and the red arrow (E) of the pressure gauge to show the desired values. This allows you to control changes in flow and pressure. These changes indicate the condition of the seal.

Water connections

1. Water in 2. To seal

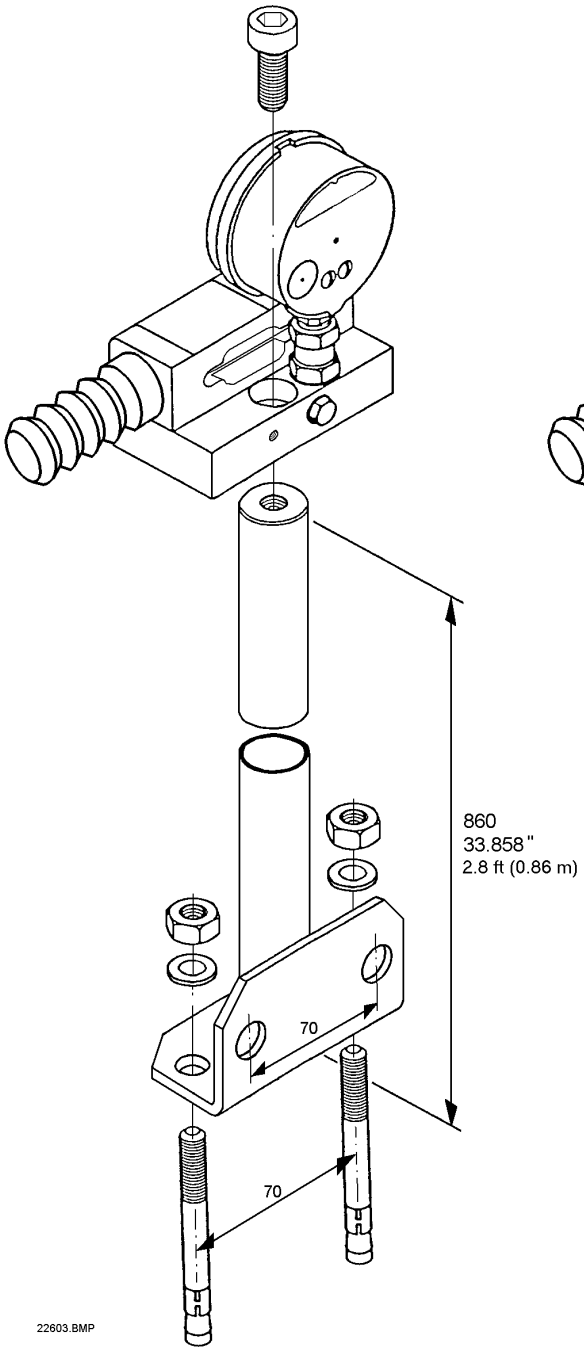
Cleaning

1. Press the button (C) on the right side of the unit. This does not affect the pressure or the flow of the sealing water.
2. The display surface is now cleaned by the float.
3. Repeat until full readability is reached.
4. When the alarm is connected, pushing the cleaning button won't cause an extra alarm.

Flow			**Pressure**
3 = 0 - 3	l/min	(0 - 0,75 GPM)	10 = max 10 bar, 145 psi
8 = 0 - 8	l/min	(0 - 2 GPM)	25 = max 25 bar, 360 psi
15 = 0 - 15	l/min	(0 - 4 GPM)	

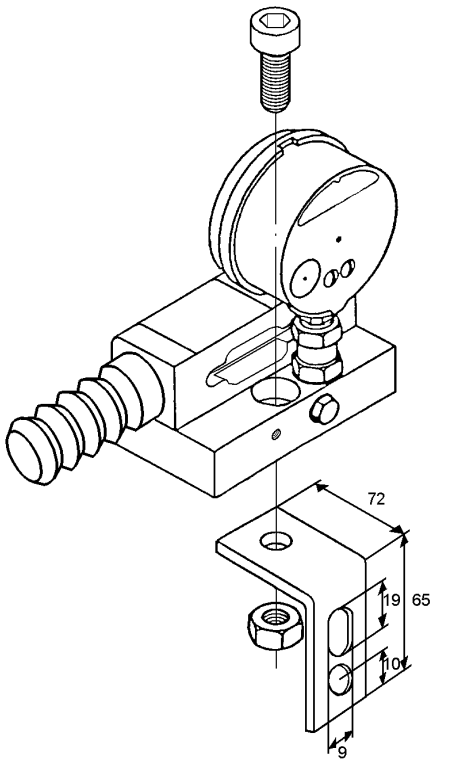
INSTALLATION OF SAFEUNIT

Install the Safeunit to a place where it is accessable for reading and testing according to drawings 1 or 2.



Drawing 1

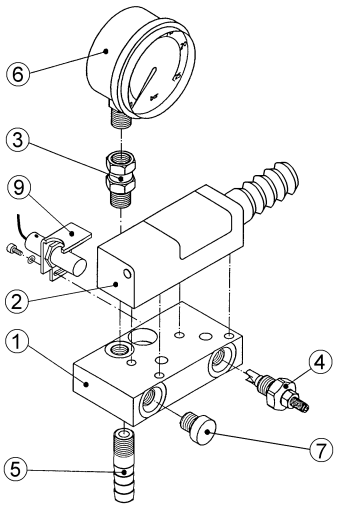
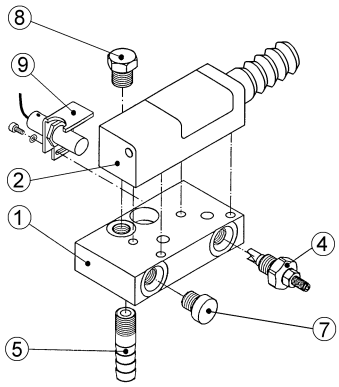
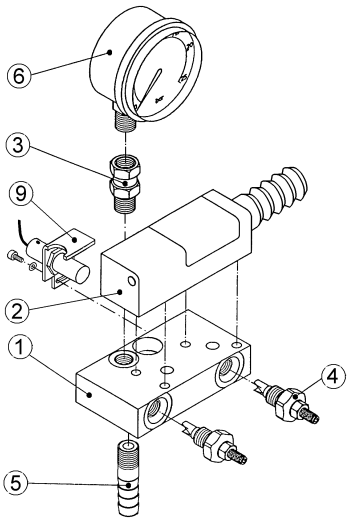
Safeunit installation to stand 404317.



Drawing 2

Safeunit installation to any other stand.

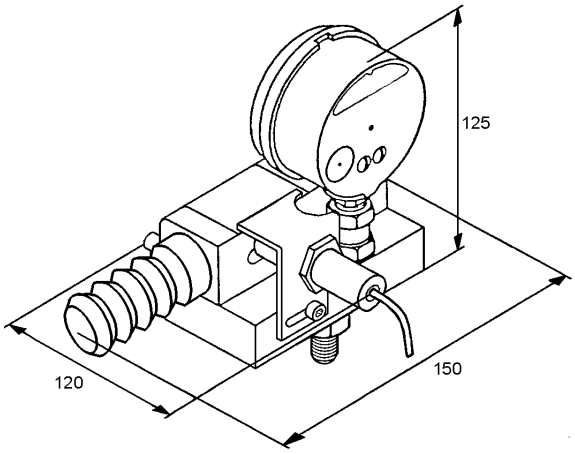
SAFEUNIT SEALWATER MONITORING AND CONTROL SYSTEM SPARE PARTS

Type SFP	Type SFQ	Type SFD
 22604.BMP	 22605.BMP	 22606.BMP

ITEM	Type SFP	Type SFQ	Type SFD
1. BASE PLATE			
R-thread	22771370	22771370	22771370
NPT-thread	22771350	22771350	22771350
2. ACRYL PART			
3 l/min	22400050	22400050	22400050
8 l/min	22400100	22400100	22400100
15 l/min	22400150	22400150	22400150
3. PRESSURE GAUGE COUPLING	22640850		22640850
4. REGULATING VALVE	22400200 (1 pc)	22400200 (1 pc)	22400200 (2 pc)
5. HOSE COUPLING	22640400 (2 pc)	22640400 (2 pc)	22640400 (4 pc)
6. PRESSURE GAUGE			
0-10 bar	22600050		22600050
0-10 bar (AISI 316)	22600100		22600100
0-25 bar	22600150		22600150
0-25 bar (AISI 316)	22600200		22600200
7. PLUG FOR REGULATING VALVE	22770030 (1 pc)	22770030 (1 pc)	
8. PLUG FOR PRESSURE GAUGE		22661350	
9. ALARM			
AC-1	22770511	22770511	22770511
DC-1	22770515	22770515	22770515

DIMENSIONS

Flowmeter, model 3, 8 and 15 l/min



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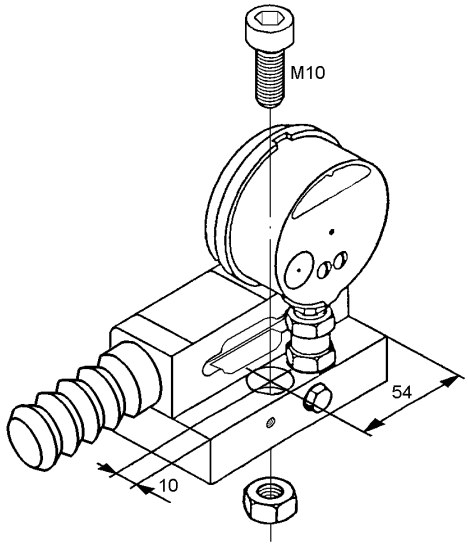

22608.BMP

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INSTALLATION AND OPERATION INSTRUCTIONS

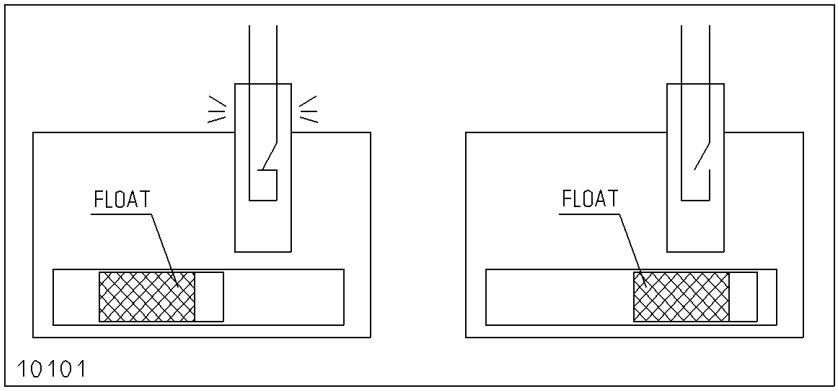
No. 20000224EN
Date 1.6.1998
Revision no.
Date

SEAL WATER MONITORING UNIT FOR TYPES SFP, SFQ AND SFD

Inductive alarm unit for low flow, AC-1 Suitable for AC- and DC-service

ALARM FUNCTION

The alarm signal is issued by an opening contact. The normally closed contact opens when the flow rate falls below a preset lower limit.



Flow rate within permissible range Alarm for low flow

INDICATOR FUNCTION

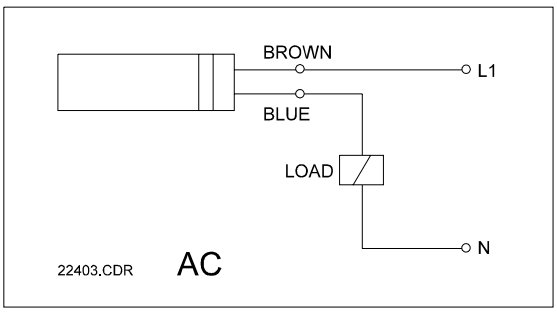
LED light on. Flow rate within permissible range.
LED light off. Low flow alarm activated.

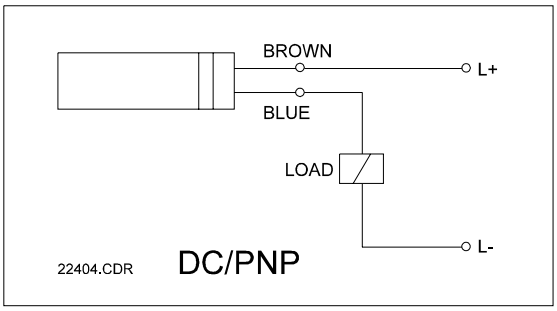
ADJUSTMENT RANGE OF THE ALARM UNIT

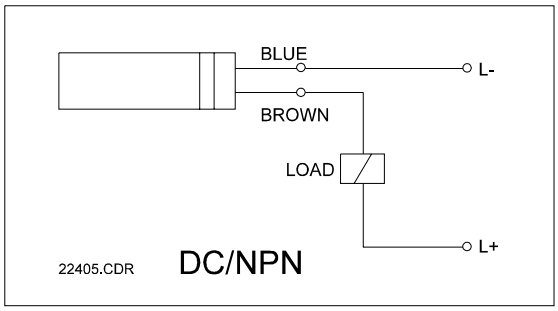
- Model 3: 0,5 - 2,0 l/min (0,1 - 0,5 GPM)
- Model 8: 1,0 - 3,0 l/min (0,25 - 0,75 GPM)
- Model 15: 6,0 - 12,0 l/min (1,5 - 3,0 GPM)

ELECTRICAL CONNECTION OF INDUCTIVE ALARM

Supply voltage:	20 ... 250 VAC/DC, 45 ... 65 Hz for AC
Load current:	I min. = 5 mA, I max. = 350 mA AC/100 mA DC
Leakage current:	Less than 2,5 mA/250 VAC; 0,8 mA/24 VDC
Switch contact:	Normally-closed (N/C) when the alarm is not activated
Protection class:	NEMA 4, IP 67







ADJUSTMENT OF THE ALARM UNIT

1. Set the flow to the desired lower limit by the flowmeter.
2. Loosen the locking screw and attach the alarm in to the body and move the alarm horizontally to the position in which the alarm is activated. The alarm is at the minimum value of the adjustment range when the alarm is in the leftmost position as viewed from the rear of the alarm unit which is, e.g., 1 l/min (0,25 GPM) for Model 8. To increase the setting toward its max. value which is, e.g., 3 l/min (0,75 GPM) for Model 8, move the alarm to the right.
3. Tighten the lock screw of the alarm.
4. Check the correct function of the alarm unit by the LED indicator. The LED should turn off at the alarm point and stay off when the flow rate is reduced to zero. The LED should stay on only when the flow is within the permissible range of flow rate.
5. Finally adjust the seal water flow rate to desired value with the help of the flowmeter.

NOTE! Unnecessary alarms may also be caused by the occational pressure fluctuations in the sealing water line. Such erroneous alarms can be inhibited by, e.g, programming a delay in the logic control system or using a delay unit with an independent power supply.

The delay can be programmed as follows:

Fluctuation in the flow -> delay 20 seconds -> alarm -> delay 5 minutes -> shut down of the equipment.