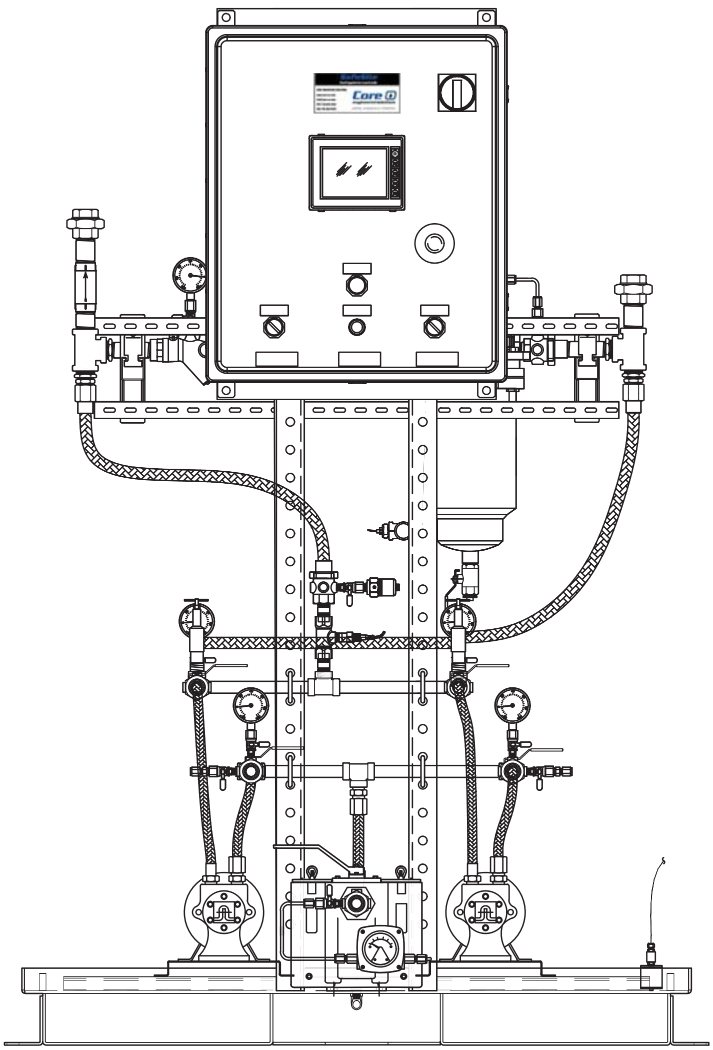
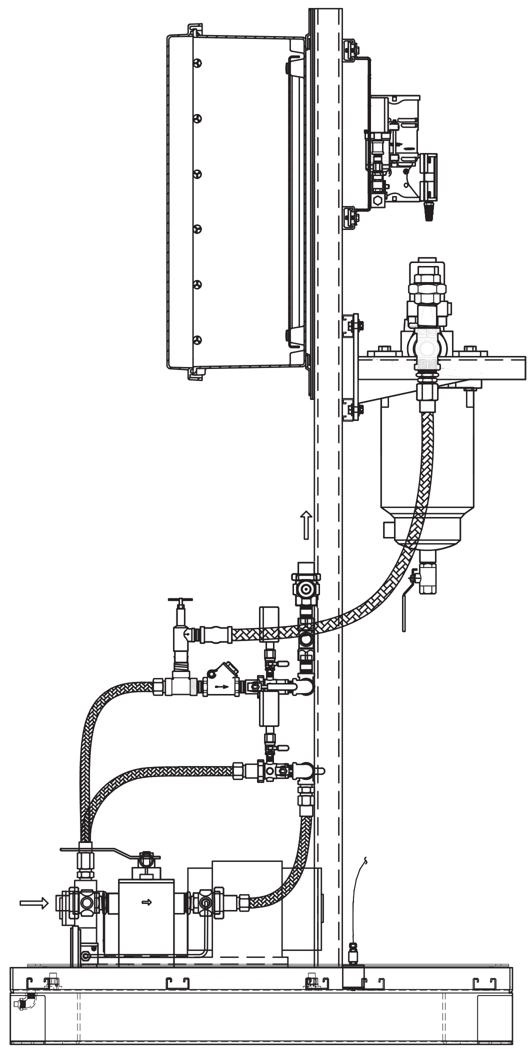
Core Engineered Solutions
1141 River Road
Selkirk, NY 12158
P: 518-635-4343
F: 518-635-4346
info@core-es.com

# SafeSite Fuel Oil Duplex Pump Set
# Installation, Operating and Maintenance





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# Safety Notices

*DO NOT exceed the pumps rated pressure, flow and temperature.*

*DO NOT change the system or duty parameters from those originally supplied without confirming its suitability for the new service.*

*BEFORE* operating the pump be sure that:

1. It is clean and free from debris
2. All valves in the suction and discharge pipelines are fully opened
3. Make sure that all solenoid bypass valve handles are fully closed (extended down)
4. All piping connected to the pump is fully supported and correctly aligned with the pump
5. Pump rotation is correct for the desired flow direction.

*INSTALL* pressure gauges/sensors next to the pump set suction and discharge connections to monitor pressures.

*USE* extreme caution when lifting the pump. Suitable lifting devices should be used when appropriate.

*DO NOT* attempt to dismantle a pressure relief valve that has not had the spring pressure relieved or is mounted on a pump that is operating.

*AVOID* contact with hot areas of the pump and/or drive. Certain operating conditions, temperature control devices, improper installation, improper operation, and improper maintenance can all cause high temperatures on the pump and/or drive.

*THE PUMP MUST* be provided with pressure protection. This may be provided through a relief valve mounted directly on the pump. Relief valve adjusting screw caps must always point towards suction side of the pump.

*THE PUMP MUST* be installed in a matter that allows safe access for routine maintenance and for inspection during operation to check for leakage and monitor the pump operation.

# General Description

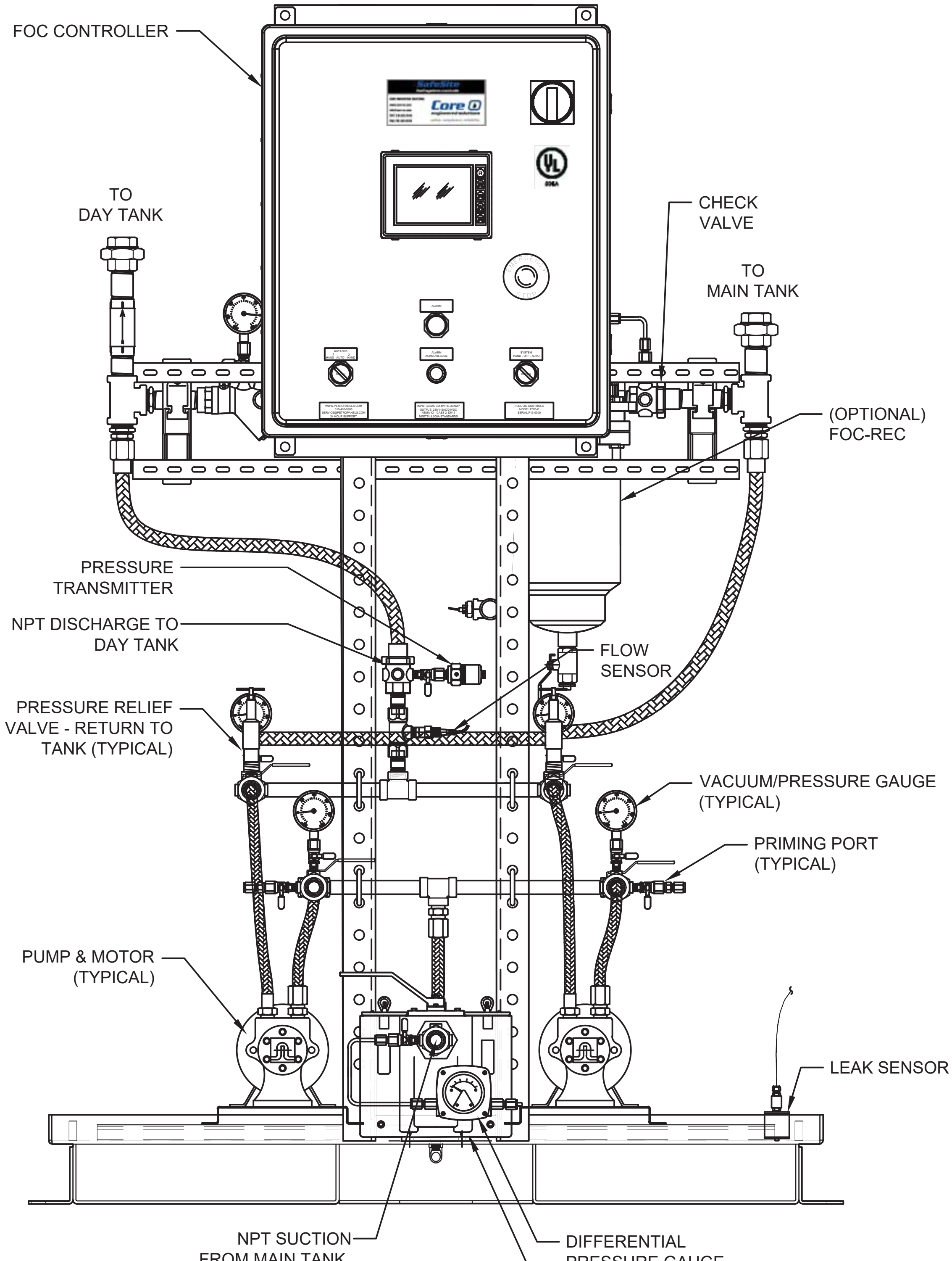
The duplex pump set is designed for reliable fuel transfer in emergency power systems at critical facilities. Its innovative compact design has a minimal footprint while delivery between 1/3 and 30 GPM of fuel to serve emergency generators and boilers.

The mechanical design is based on Viking positive displacement pumps and is complete with strainers, check valves, ball, valves, pressure/vacuum gauges and relief valves. The unit is mounted on an integral containment drip pan-basin with leak detection monitoring.

The duplex pump set includes a motor starter panel (with optional Variable Frequency Drive) and disconnect switch. The motor starter/drive includes current sensors for performance feedback to the fuel oil control panel.

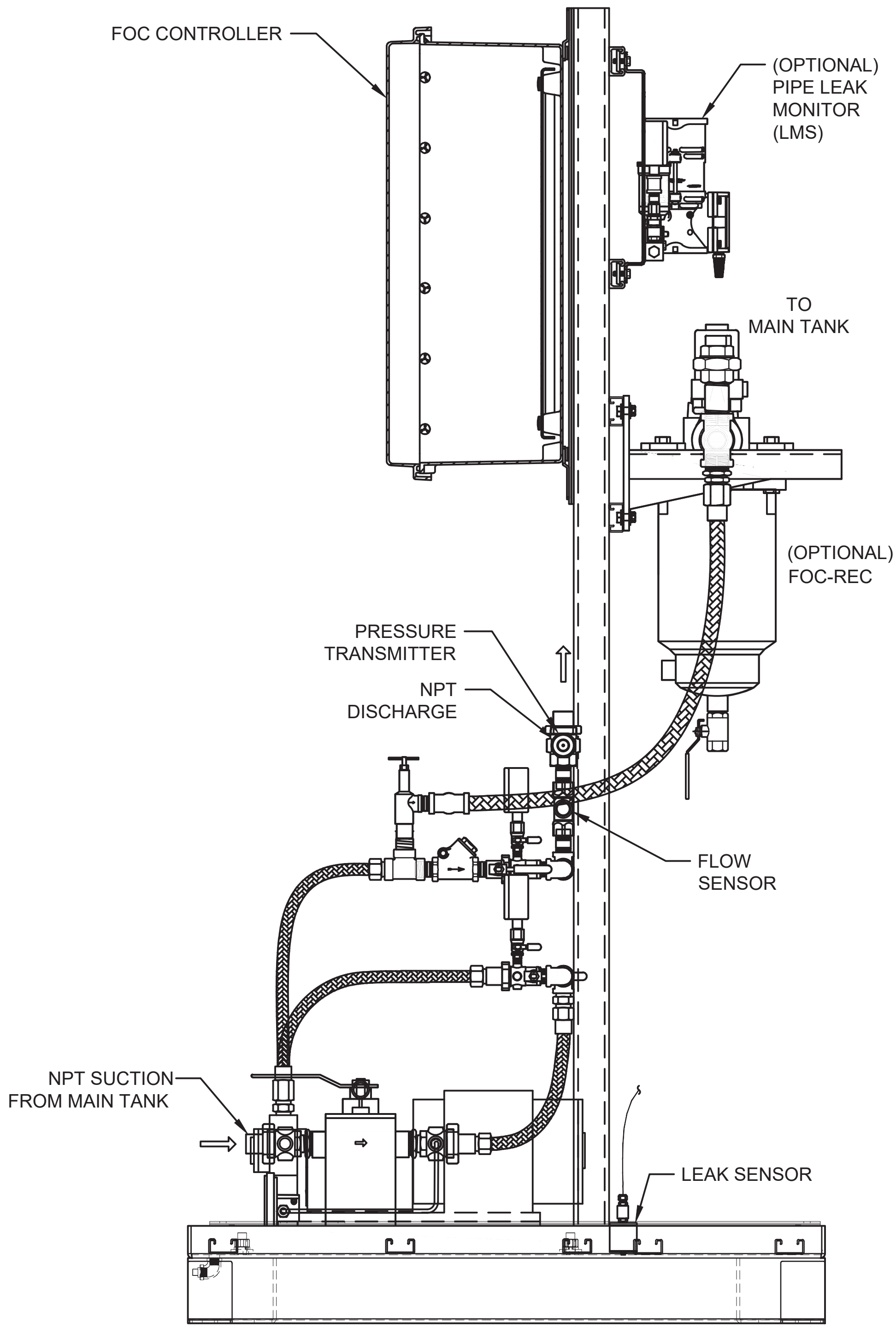
The fuel oil control panel provides duplex pump operation and monitoring with HAND-OFF-AUTO (H-O-A) switches and an emergency stop button. The control panel screen provides a summary of operating parameters and allows selection of special operating modes. The control panel networks with other system controllers using Ethernet, and directly to Building Management Systems (BMS) with an option of BACnet or Modbus.

# System Components




FRONT VIEW

# System Components



# Planning the Installation

1. Location: Always locate the pump as close as possible to the supply of liquid to be pumped. Always locate the pump below the liquid supply if possible. Viking pumps are self-priming but the better the suctions conditions, the better the performance will be.

2. Accessibility: The pump should be located where it is accessible for inspection, maintenance and repair.

3. Pressure Relief/Pressure Protection: Viking pumps are positive displacement style pumps, meaning that when the pump is rotated, liquid will be delivered to the discharge side of the pump. If there is no place for this liquid to go (e.g., discharge line is blocked or closed) pressure can build up until the motor stalls, the drive equipment fails, a pump park breaks or ruptures, or the piping bursts. **The pumps have an integral pressure relief valve mounted directly on the pump head to avoid the issues lists.**

4. Piping: Many fuel oil pumps are caused by improperly engineered or installed suction piping. The suction piping should always be as large and short as practical. Before starting the layout and installation of your piping system, consider the following: (1) the suction piping should NEVER be smaller than the pump inlet connection; and (2) ensure that the inside of the pipe is clean before making the final connections.

5. Foot Valve: When pumping a light liquid with a suction lift, a foot valve at the end of the suction piping or a check valve in the first horizontal run will hold the liquid in the line and make it easier for the pump to prime. The foot valve or check valve must be sized appropriately for the fuel oil system so as to not cause excessive line loss.

6. Strainer: The pump inlet strainer will keep foreign objects from entering the pump. The strainer is particularly important at the initial start-up to help clean the system of weld beads, pipe scale and other foreign objects. The strainers should be checked after initial use and cleaned if required.

7. If there are obstacles in the routing of the suction or discharge fuel lines, go around the obstacle instead of over to minimize air pockets, which will make it hard for the pump to prime.

8. If the suction line includes a long horizontal run, keep the horizontal portion below the tank liquid level if possible. This will keep the pipe full of fuel and prevent the pump from having to remove as much air from the line when starting.

9. Install a priming tee and cap on the inlet side of the pump in an easily accessible location.

10. Include for expansion or contraction of the piping. Loops, expansion joints or unsecured (not to be mistaken as unsupported) runs should be used so the pump casing is not stressed by the piping.

11. The pumps should not be used to support the piping, instead it should be carried by hangers, supports, stands, etc.

12. While fastening the piping to the pump it should not be necessary to impose any strain on the pump casing. Springing or drawing the piping up to the pump will cause distortion, misalignment or rapid wear of the pump.

13. All joints of the piping system should be tight; pipe sealer will help assure leak-free threaded joints. Leaks in the suction line will result in reduced flow capacity.

14. Provide a pressure relief device in any part of a pump and piping system that can be isolated. The rise in temperature causes the liquid to expand; if there is no provision for pressure relief in the closed off section - the pump or piping may rupture.

# Installation

1. Remove packaging and inspect for any shipping damage. Note any shipping damage on the shipping ticket and provide pictures. NOTIFY CORE ENGINEERED SOLUTIONS OF ANY SHIPPING DAMAGES WITHIN 24-HOURS OF RECEIPT.

2. Set the unit at the installation location. Use proper handling procedures to avoid damage to the unit.

3. Install anchor bolts at the four corners of the unit. Use 1/2-inch diameter expansion anchors with 3-inch embedment or as required by local code compliance.

4. Connect power to motor starters and control panel. Reference the specific installation instructions and wiring diagrams for the control panel and motor starters. These instructions will be included inside the control panel.

5. Check tightness of all bolts, which may have loosed during shipment. Tighten four bolt flanges by gradually tightening across the bolt patter.

6. Pressure test the pump set to 50 PSIG or in accordance with the project design requirements. Correct any loose bolts or threaded joints if required.

7. Connect suction and discharge lines to the inlet and outlet sides of the pump set, respectively. Confirm that field piping is independently supported to avoid stress on the pump set piping.

8. Check the pump rotation by energizing the pump momentarily to observe direction of the motor fan rotation. The pump inlet and outlet are offset from the centerline of the pump head. The pump rotation should be so that it progresses along the long arc from the inlet to the outlet.

# Start-Up

1. Review this entire document before continuing. ONLY TRAINED, QUALIFIED AND FACTORY CERTIFIED TECHNICIANS SHALL START-UP THE EQUIPMENT FOR THE FIRST TIME.

2. Prime the suction line by removing the threaded plug on the pump inlet piping and pour the designated fuel into the piping until full, reinstall the threaded plug. Operate the pump for a maximum of 60-seconds. Observe the inlet and outlet pressure/vacuum gauges to confirm the pump rotation and progress of eliminated any remaining air from the suction piping. A fully primed suction line will be demonstrated by a steady vacuum gauge reading on the pump inlet.

3. Open all inlet and outlet valves and confirm that there is a clear flow path from the fuel source to the destination (boiler feed, day tank, header, etc.)

4. Manually start the pump to confirm prime. Operate the pump for a maximum of 60-seconds. Observe the inlet and outlet pressure/vacuum gauges to confirm the pump rotation and progress of eliminated any remaining air from the suction piping. A fully primed suction line will be demonstrated by a steady vacuum gauge reading on the pump inlet.

5. If the pump still does not function as required, it may be cause by the following: (a) air leaks in the suction line; (b) suction line obstructions; (c) suction tube or foot valve in take is not installed; (d) suction lift is too great or the suction piping is too small; or (e) anti-syphon or check valve setting in the suction line is too high.

6. Adjust pressure relief valve to required setting. Adjust the pump pressure relief valve to the maximum design pressure of the system, which can be done by removing the cap from the valve and adjusting the spring bolt accordingly. The valve adjustment should result in the pump being capable of operating against the closed discharge valves without overloading/tripping the motor.

7. Check pressure and vacuum operating ranges. Confirm that the vacuum and pressure gauge readings are in conformance with the design requirements.

8. Check for leaks and correct any loose flanges or threaded fittings.

9. Check motor starter overload settings. Confirm that the motor starter overload settings match the full load amps indicated on the pump motor.

10. Check the strainers and clean if required. Close the inlet valve to isolate the strainer, remove the threaded plug and clean any debris from the strainer.

# Operation

Refer to the Fuel Oil Controls Operations Manual or Sequence of Operation for details on the operation of the SafeSite Fuel Oil Duplex Pump Set

# System Maintenance

**Fuel Oil Duplex Pump Set System Maintenance**
1. Check weekly for leaks in the duplex pump set drip-pan/containment basin.
2. Operate the pumps manually on a monthly basis to confirm prime.
3. Check strainers after initial use, clean if required.
Check strainers if an increase in the vacuum/pressure gauges is observed, clean if required.

**Fuel Oil Pump Maintenance**
The Viking Pumps used in the design and construction of the SafeSite Fuel Oil Duplex Pump Set is designed for a long trouble free life under a wide variety of application conditions with minimum maintenance, however, the following should be considered.

1. Lubrication: External lubrication not required for the pumps. The liquid being pumped lubricates the internal bearings in the pump.
2. Packing Adjustment: The pumps are designed with a packing spring to maintain a constant load on the packing; no external adjustment is possible. When leakage becomes excessive the packing must be replaced. Refer to Core Engineered Solutions for instructions on the proper installation of packing.
3. End Clearance Adjustment: After long term operation it is sometimes possible to improve the performance of the pump, without major repair, by adjusting the end clearance. Refer to Core Engineered Solutions for instructions on the proper installation and procedures for adjusting the end clearance.
4. Safety Relief Valve: If your pump is equipped with a safety relief valve, adjustment can be made as follows. Remove the adjusting screw cap, turn in the adjusting screw to increase the pressure and turn-out to decrease the pressure. If the pump is not producing the rated capacity adjustment of the safety relief valve may be necessary. Be sure adjusting screw cap is reinstalled before pump is started.
5. Cleaning the Pump: It is good practice to keep the pump as clean as possible. This will facilitate inspection, adjustment and repair work.
6. Storage: If the pump is to be stored or not used for any appreciable length of time it should be drained and a light coat of lubricating and preservative oil should be applied to the internal parts.

**Suggested Repair Tools**
The following tools must be available to properly repair the Viking Pumps installed on your Fuel Oil Duplex Pump Set. These tools are in addition to standard mechanics' tools such as open end wrenches, pliers, screw drivers, etc. Most of the items can be obtained from an industrial supply house.

1. Soft headed hammer
2. Allen wrenches (some mechanical seals and set collars)
3. Packing hooks, flexible (packed pumps)
4. Mechanical seal installation sleeve
5. Bearing locknut spanner wrench (#472 J.H. Williams & Co. or equal)
6. Spanner wrench, adjustable pin type for use on double end caps (#482 J.H. Williams & Co. or equal)
7. Brass bar
8. Arbor press