



BASIC REPAIR AND MAINTENANCE INSTRUCTIONS

SLOW SPEED MODELS FOR PTO AND BELT-DRIVES: MCAT-Series, TC-Series.

HIGH SPEED MODELS FOR DIRECT ELECTRIC MOTOR AND ENGINE-DRIVES:

LOW CAPACITY: D-Series, E-Series, MC/GC-Series, SQ-Series.

MEDIUM CAPACITY: MC-1044/MC-1044H Series, MC-2 Series, ATC-2 Series.

HIGH CAPACITY: MC-3, 4, and 5 Series; ATC-3, 4, and 5 Series.

THE SMITH PUMP EXCHANGE PLAN

WHEN THE PUMP CAN NO LONGER BE REPAIRED, "EXCHANGE" IT:

When the pump finally has to be replaced, it can be traded-in under the Smith pump exchange plan, for an exact-replacement model. Be sure to give us the model number, serial number, and complete information about the liquid(s) handled. The exchange pump will be in equal-to-new condition. All Smith exchange pumps carry the same guarantee as new ones. Contact the factory, or your nearest Smith representative, for more information.

ORDER THE EXCHANGE PUMP FIRST:

Under our exchange plan, you do not need to send the used pump back to the factory first. We will provide the factory-reconditioned exchange pump initially. When you receive the exchange pump, simply return your used pump for credit, using the same shipping crate or box. You will be billed initially for a new pump, and then given a credit for the used one when it is returned to our factory, freight prepaid. The net amount you pay for an exchange pump equals the actual reconditioning cost, plus the freight charges. Contact your nearest factory representative for additional information.

IF A HIGHER CAPACITY PUMP IS REQUIRED:

If your operation requires a higher capacity pump, we will allow a "one-for-one" exchange for a higher capacity unit, *provided it is of the same model type*. The net exchange cost would equal the cost of a new pump of higher capacity, less the exchange credit for the smaller used one, plus the freight charges. Consult with our Engineering Department if there are any questions regarding existing pipe sizes and higher capacity pump models.

CREDIT PROCEDURES:

The exchange plan may not be economical in countries other than the U.S.A., depending on shipping costs, required paperwork, and customs procedures. There are no "hidden core charges" when a sale is made. Both "new" and "exchange" units sell for the same price. The designated credit for a used pump is strictly a factor of its projected salvageability value. This value can only be given on a one-for-one basis, against an existing order specifically for an "exchange" pump of the same model type. Used pumps, therefore, cannot be credited outright, nor can they be accepted against orders for "new" pumps. All returned cores must be received at the factory within 30 days after the exchange pump has been received. Contact the factory, or our representative, for additional information.

MAINTENANCE SUGGESTIONS

WARNING: Do not attempt to repair or disassemble the pump, unless there is a noticeable verified condition which positively indicates a pump problem. To accomplish any pump replacement, internal inspection, or repair, *the pump must first be safely depressurized in the approved manner.* This procedure must be performed according to all applicable Safety Codes and practices consistent with local, State, or Federal Law and company procedures. Consult as necessary with the fabricators and the other manufacturers. Read their applicable service guides, and the applicable safety standards (such as NFPA-58). *Avoid potentially dangerous situations.*

If you cannot determine exactly how to safely depressurize the pump in the approved manner, and isolate it from the piping system, *do not proceed.* Wait until you can contact your immediate supervisor, or discuss the matter with the equipment manufacturer's representatives, or call us directly at 805/498-6616. The procedures as described in this bulletin, and others, should be followed, only after the pump has been safely depressurized, properly isolated from the tank pressure, and possibly removed from the system as required.

MECHANICAL SEAL LEAKS: **WARNING:** Replace the mechanical shaft-seal assembly before it leaks, on a predetermined routine maintenance schedule. All Smith pumps are provided with a "seal bleed port" for the purpose of channeling seal leakage away from the ball bearings, and also for facilitating leak detection (Note the small fitting installed in the bottom of part "A" on pg. 4). The discharge point of this channel is located on the bottom of the casing where the drive shaft exits, and is protected by what appears to be an oil fill cover, or a small threaded fitting. This cover prevents the entrance of moisture and debris. It is not for lubricating the ball bearings.

The ball bearings are permanently sealed, and require no periodic lubrication. *Do not obstruct or lubricate this opening, which is for venting and observing leakage.* Observed mechanical shaft seal leakage from this leak detection port, or "seal bleed port", may be a symptom of excessive internal wear, or lack of timely preventive maintenance. Obviously, if any leakage has been detected from the seal bleed port, the mechanical shaft-seal assembly ("G"), in its entirety, must be immediately replaced. However, the cause of seal failure must still be investigated.

Simply replacing the shaft-seal assembly should be considered as an interim safety procedure, not intended as a finality. Unlike other designs, the Smith mechanical shaft-seal assembly includes the mechanical seals, as well as the drive shaft and the ball bearing(s), all together in one unit, tested both statically, and dynamically, before shipment. In this fashion, its integrity can be guaranteed when field-installed into a pump.

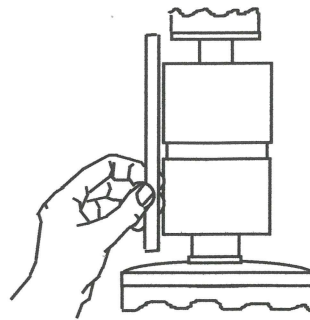
The Smith mechanical seal is of an extremely heavy-duty design, and is usually not the first item to wear out in a pump which is normally utilized in an average manner. Before the pump is put back into service, the seal failure cause must be determined and remedied. Inspect the internal parts and corresponding potential wear areas by following the steps as indicated in this bulletin and in the other literature pertinent to the particular model in question.

BE SURE TO CHECK THE FLEXIBLE DRIVE COUPLING CONDITION:

There are many different types of flexible drive couplings, which connect the pump shaft with the motor shaft. Some, such as the Smith flexible drive couplings, which have inserts of rubber or composite plastic material, will eventually develop wear.

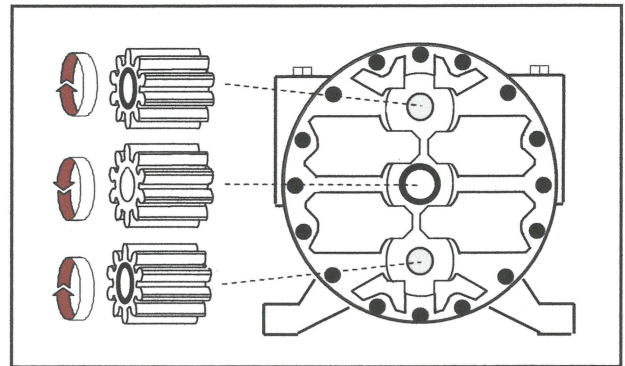
Follow the manufacturer's inspection instructions and replace all components as required. With the Smith coupling, inspect the pins, clearance bores, and insert, and replace the coupling, or the insert, as needed. To order a complete Smith coupling, or insert, from the factory or from our nearest representative, be sure to give complete information on the pump, as well as the motor, as follows:

1. Model number and serial number from the pump label plate.
2. Frame number of the motor.
3. Horsepower rating of the motor.
4. RPM rating of the motor.



Fast coupling wear indicates misalignment of pump and motor shafts. Misalignment or the continued use of a worn coupling insert, can be responsible for rapid pump wear, continual seal leaks, and extremes of bothersome noise. The proper way to align the Smith drive coupling is shown in the sketch. (See Bulletin "AL-3").

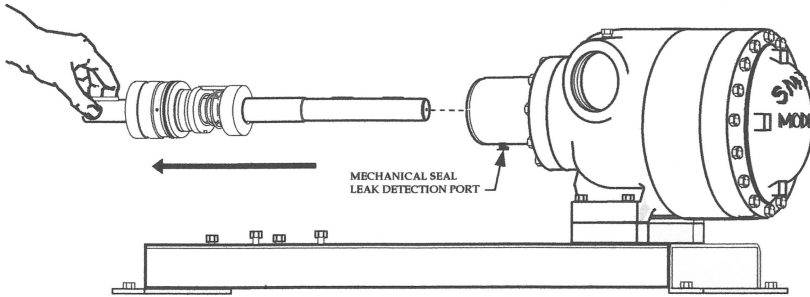
PERIODIC INSPECTION PLAN: The "Exchange Plan" as discussed previously in this bulletin, is not intended to be used in lieu of preventive maintenance, or in stead of proper repair procedures. We highly recommend that all Smith pumps be opened and inspected for wear at periodic intervals, determined by prior routine inspections at the site, before failure is observed. This is especially important for mechanical seals which should be replaced before any sort of leakage is observed. Depending upon the use conditions, this can be planned either by time in service, or volume of product handled. Contact the factory for exact details pertinent to the model(s) in question and the type(s) of service(s). The initial inspection intervals must be short enough to reveal only minimal wear. When these wear patterns are analyzed, required parts and their proper preventive replacement intervals, can be easily determined.



REPLACING THE GEARS: Unless there is some uncommon condition present, the parts that usually wear first are the gears. If they are replaced in time, the risk of incurring extensive casing wear can be substantially reduced. Therefore, be sure to have a set of gears (as shown by "C", and "E") on hand when approaching the limit of the determined replacement interval. Make sure they are the proper size. We can determine the proper gear size if we know the serial number of the pump.

CHECK ALL OTHER PARTS: Follow the repair procedures in proper sequence as shown in the appropriate service manual(s) and/or other Smith literature. While disassembling the pump, note if there is discernible face wear, or wear on the pocket diameters or ends, (casings "B", "D", and "F"). If there is visibly discernible wear, it may be excessive and the pump cannot be repaired in the field. Check the gear backlash, diameter, and length. Check all bushings ("H", "I", and "J"). Check the idler gear shaft(s). Do not reuse questionable parts. Contact the factory if there are any questions. There are no gaskets used between the sealing faces of Smith pump casings. When reassembling a repairable unit, make sure that the sealing surfaces are clean and flat. Carefully follow all of the correct procedures for applying the approved casing sealant to insure a positive casing seal. Be sure that the internal flow channels are properly aligned during reassembly. Be sure all cap screws are in good condition, that none are missing, and that they are assembled properly. *Before doing repairs, always read and understand the available literature for the specific models and services in question.* The recommended torque for all 3/8-16T and 7/16-14T screws is about 30 ft-lbs (see technical bulletin "AL-99" for specifics). *Only use recommended repair parts for the liquid stamped on the pump name plate, manufactured by Smith Precision Products Company.*

CHANGING THE MECHANICAL SHAFT-SEAL ASSEMBLY: In order to remove the mechanical shaft-seal assembly, it will have to be removed from the pump assembly as shown below. This will require removal of any attached flexible couplers, pulleys, or universal joints. Engines, motors, or other shafts will have to be moved out of the way. The pump must be either properly depressurized and Isolated, or



removed, from the piping system as described previously in this bulletin. (Be sure to follow all applicable safety codes and procedures). Remove the screws from the bearing retainer plate where the drive shaft exits the pump body. Turn the shaft so the coupling keyway is facing upward. With all models, other than the "MC/GC-Series", the shaft-seal assembly can then be pulled-out. *With the "MC/GC-Series" pumps, first, remove the gear end cover, the drive gear, and the drive gear key, before removing the shaft-seal assembly.*

In certain cases, the gear key locks in place in the half-round keyway, or the shaft sticks in the gear bore. Never pound on the shaft with a hammer for any reason. If the shaft cannot be removed from the front of the pump, remove the gear end cover and lightly tap on the end of the shaft toward the shaft exit, with a soft metal drift. Be careful not to chip or deform the shaft.

Once removed, examine the bore and the leak detection port for damage, corrosion, or obstructions. Clean the port and shaft seal bore, and remove obstructive debris, very carefully without damaging the surfaces. Replace the bleed port cover if necessary. Make sure the surfaces are clean and dry before reassembly. A slight amount of petroleum-based grease or oil can be used as a rust preventive in LPG, NH₃, and most petrochemical applications. However, this procedure cannot always be done, due to temperature and compatibility factors. Contact the factory for additional information regarding other services.

Slide the replacement shaft-seal assembly into position, making sure that the keyways are facing upward. As the shaft penetrates the gear bores, greater resistance will be felt. Turn the shaft back and forth a little, while lightly pushing, until the last key has entered the last remaining keyway.

High capacity Smith pumps can have as many as four drive gears, which would naturally require more time to properly align the gear drive keys. Once the shaft has cleared the last gear, push it inward the remaining distance to the bottom of the shaft end cover bore. No special tools are required to accomplish this operation. Never pound or tap on the shaft to assemble it into the pump. Do not use a hammer to assemble the drive coupling, universal joint, or pulley onto the shaft.

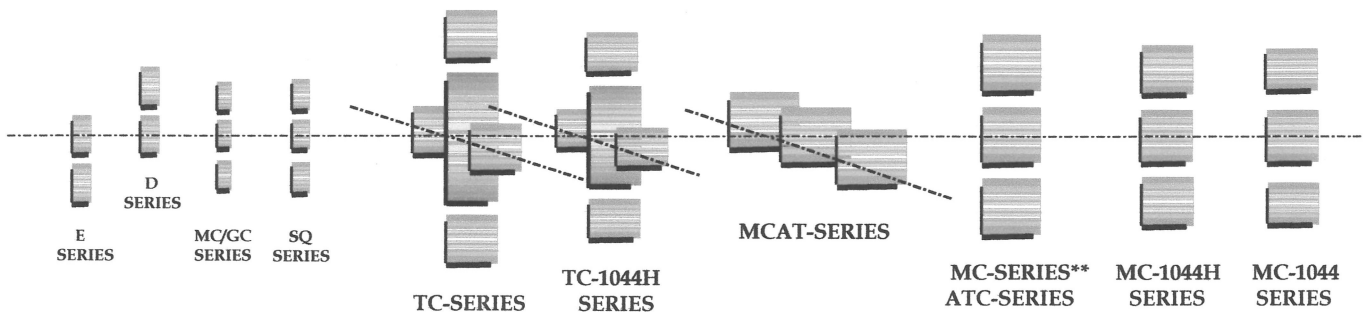
EXCHANGE PLAN FOR SHAFT-SEAL ASSEMBLIES: In most cases, the mechanical shaft-seal assembly components are not sold separately. If there is a mechanical seal failure, it will not be necessary to disassemble the mechanical seals or the ball bearing(s) from the drive shaft. Just as with the complete pumps, complete Smith mechanical shaft-seal assemblies can also be purchased economically, on an exchange basis. As with the pumps, there are no initial hidden core charges. Both "new" and "exchange" units sell for the same price. The designated credit for a used seal assembly is strictly a factor of its projected salvageability value. This value can only be given on a one-for-one basis against an existing order specifically for an "exchange" seal assembly of the same model type. Used assemblies, therefore, cannot be credited outright, or against orders for new assemblies. All cores must be returned to the factory within 30 days after the exchange seal assembly has been received. Contact the factory, or the closest factory representative, for additional information.

REPAIRS ON MOTORS, ENGINES, AND OTHER EQUIPMENT NOT MANUFACTURED BY SMITH PRECISION: Items not manufactured by Smith Precision, are covered by the guarantees provided by the other manufacturers. Required repairs on engines, motors, and other items produced by other manufacturing facilities, should be handled as per their required procedures. They usually request that the item(s) be returned directly to their factory, or to their authorized repair stations. Typical guarantees do not include the shipping charges or any other liability. The warranty is voided unless necessary repairs are made at authorized outlets. Items worn out from long service are also best repaired at the authorized repair outlets. Contact the manufacturers or their representatives, for more complete information.

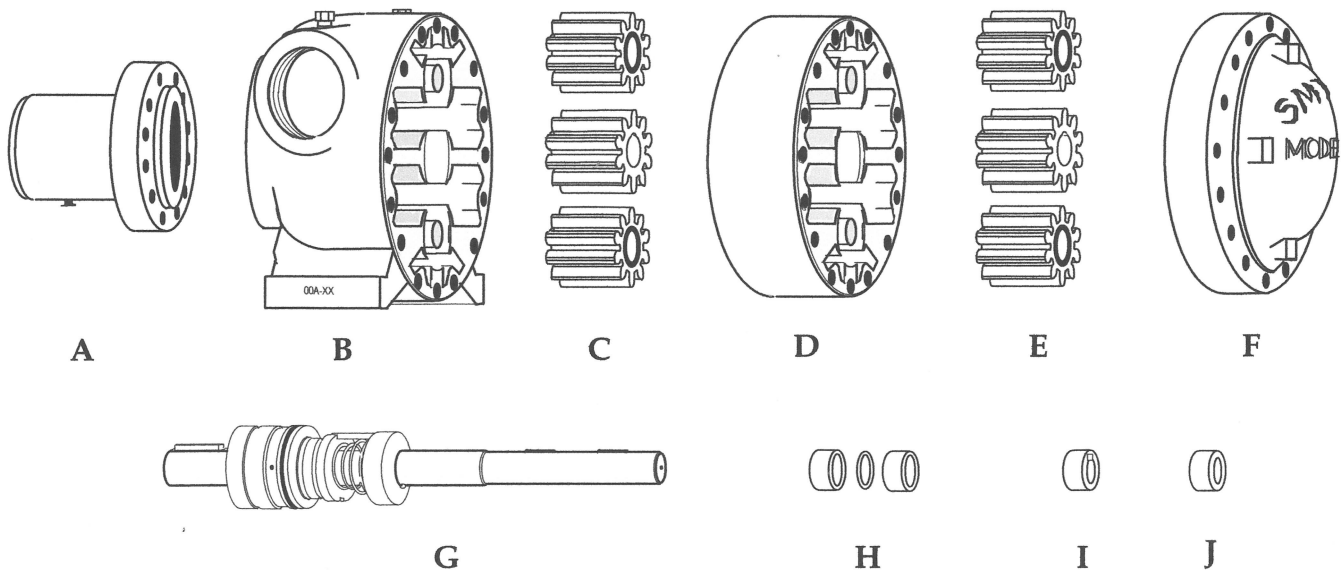
MAINTENANCE SUGGESTIONS FOR LINE STRAINERS: It is normally recommended that a Y-strainer with a reinforced screen element, be installed in the pump inlet line. Depending upon the service(s) involved, the element should have a particulate retention capability of at least .012 - .016" ("40 x 40 mesh" wire cloth). (Some systems have different requirements: contact the factory for recommendations). The strainer should be cleaned daily until foreign matter from the system has been washed-out. Thereafter, it should be inspected and cleaned often enough to assure free flow of liquid to the pump. Always keep an extra screen on hand. See bulletins "CP-6", "AL-3", "AL-17A", and "AL-40", for additional information.

AVAILABLE LITERATURE: There are other related items of additional literature, instruction booklets, manuals, parts lists, assembly views, sectional views, and discussions of technical problems available without charge upon request. Please direct all inquiries to our Engineering Department or to our nearest representative.

RELATIVE GEAR SET SIZES AND POSITIONS THEY OCCUPY WITHIN THE PUMPS



**The "MC-2Q Series" units are an exception, having one double-length drive gear and four standard-sized idler gears. "MC-2Q" pumps have the external appearance of the "MC-3" as shown above, and also on page 4.



This drawing is made to show the general positions of parts in Smith pumps. It is not drawn to scale, as sizes and configurations do vary from one model type to another. The MC-3 model type was used in the above drawing because it is typical of the majority of units actually in service. Contact the factory if there are any questions. See specific assembly views and parts lists for exact information.

MODEL TYPES

DISTINGUISHING CHARACTERISTICS

MCAT-2 Series
 MC/GC-Series, SQ-Series
 MC-1044/MC-1044H Series
 MC-2 Series, ATC-2 Series

Assembled as shown in figures "A", "B", "C", "F", "G", and "H". SQ-Series units do not have a separate housing corresponding to "A", above, and have two separate cases corresponding to "B". All of these model types have one gear set, consisting of one drive gear, and two idler gears.

TC-1044H Series
 TC-2 Series

Assembled as shown in figures "A", "B", "C", "F", "G", and "H". All have one gear set, consisting of one drive gear and four idler gears.

MCAT-3 Series
 MC-3 Series, ATC-3 Series
 MC-2Q Series

Assembled as shown in figures "A", "B", "C", "D", "E", "F", "G", "H", "I", and "J". All of these model types have two gear sets, consisting of two drive gears, and four idler gears. The "MC-2Q" model types are an exception, having only one double-length drive gear, and four standard-length idler gears, and the external appearance of the "MC-3" Series.

TC-3 Series

Assembled as shown in figures "A", "B", "C", "D", "E", "F", "G", "H", "I", and "J". All of these model types have two gear sets, consisting of two drive gears, and eight idler gears.

MCAT-4 Series, MC-4 Series
 ATC-4 Series

Assembled as shown in figures "A", "B", "C", "D", "E", "F", "G", "H", "I", and "J". All of these model types have three gear sets, consisting in three drive gears and six idler gears. Each unit has two "D" casings.

MC-5 Series
 ATC-5 Series

Assembled as shown in figures "A", "B", "C", "D", "E", "F", "G", "H", "I", and "J". All of these model types have four gear sets, consisting of four drive gears, and eight idler gears. Each unit has three "D" casings.

D-Series, E-Series

Assembled as shown in figures "A", "B", "C", "F", and "G". "A" and "B" casings are incorporated into the same casing. All of these model types have one gear set, consisting of one drive gear and one idler gear.



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