SC-45L TRIPLEX

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MYERS/APLEX INDUSTRIES, INC.
Ashland, Ohio U.S.A.
SC-45L TRIPLEX PLUNGER PUMP

POWER END ENGINEERING DATA

Model Triplex Pump	SC-45L
Max. Input HP @ Speed	60 @ 600 rpm
Rated Continuous Plunger Load	5,280 lbs
Stroke	2 1/4”
Max. Rated Continuous Speed	600 rpm
Normal Continuous Speed Range	150 to 500 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. qrts
Viscosity, S.S.U. @ 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One-Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Dia. x Length	3 1/4” x 3 5/8”
Crankshaft	Ductile Iron
Crankshaft Diameters:	
At Drive Extension	2.125/2.124”
At Tapered Roller Bearings	3.15”
At Crankpin Bearings, Dia. x Length	2 1/4”x 1 5/8”
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod:	
Integral w/ Plungers, 1 7/8" thru 1 1/2" sizes	316 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed:	
At 600 rpm	225 fpm
At 450 rpm	169 fpm
Minimum Life Expectancy, Main Bearings, L_{10}	15,000+hr

LIQUID END ENGINEERING DATA

Plunger Size Range diameter	2” Thru 2 1/4”
Max. Continuous Working Pressure	1,683 psi
Hydrostatic Test	2,500 psi
Discharge Connection Size	1 1/2” NPTF
Suction Connection Size	2 1/2” NPTF

SC-45L LIQUID END ENGINEERING DATA (*CONTINUED*)

Available Liquid End Materials, A.S.T.M.
- Ductile Iron A536 80-55-06
- Carbon Steel ..... A516 Gr. 70

Plunger Type "Rokide" Stainless Steel:
- Chromium Oxide-Coated ..... 416 S.S.

Stuffing Boxes, Field-Removable and Replaceable:
- Carbon Steel 1020

Packing Types Available:
- Gland-loaded, Non-Adjustable ..... Style 838
- Spring-loaded, Cup-Type ..... Style 120X
- Spring-loaded, Braided Teflon & Kevlar ..... Style 140/141
- Spring-loaded, Garlock ..... Style 892lK

Valve Cover and Cyl. Head Plugs ..... 416 S.S.
Retainer Plates, Steel, A.S.T.M. A36
Seals, Stuffing Boxes, Valve Covers, Cyl. Heads ..... Buna-N
Bolting, High Strength, Heat Treated ..... Alloy Steel
Available Valve Types:
- Standard, Acetal resin ..... "Delrin"
- Optional, Hardened and Lapped ..... l7-4PH S.S.
- Double Stem-Guided ..... l7-4PH S.S.

Valve Seat, Liquid Passage Areas:
- Plate (disc) Valves, (Delrin or S.S.) ..... 1.400 sq. in.
- Double Stem-Guided Valve ..... .958 sq. in.

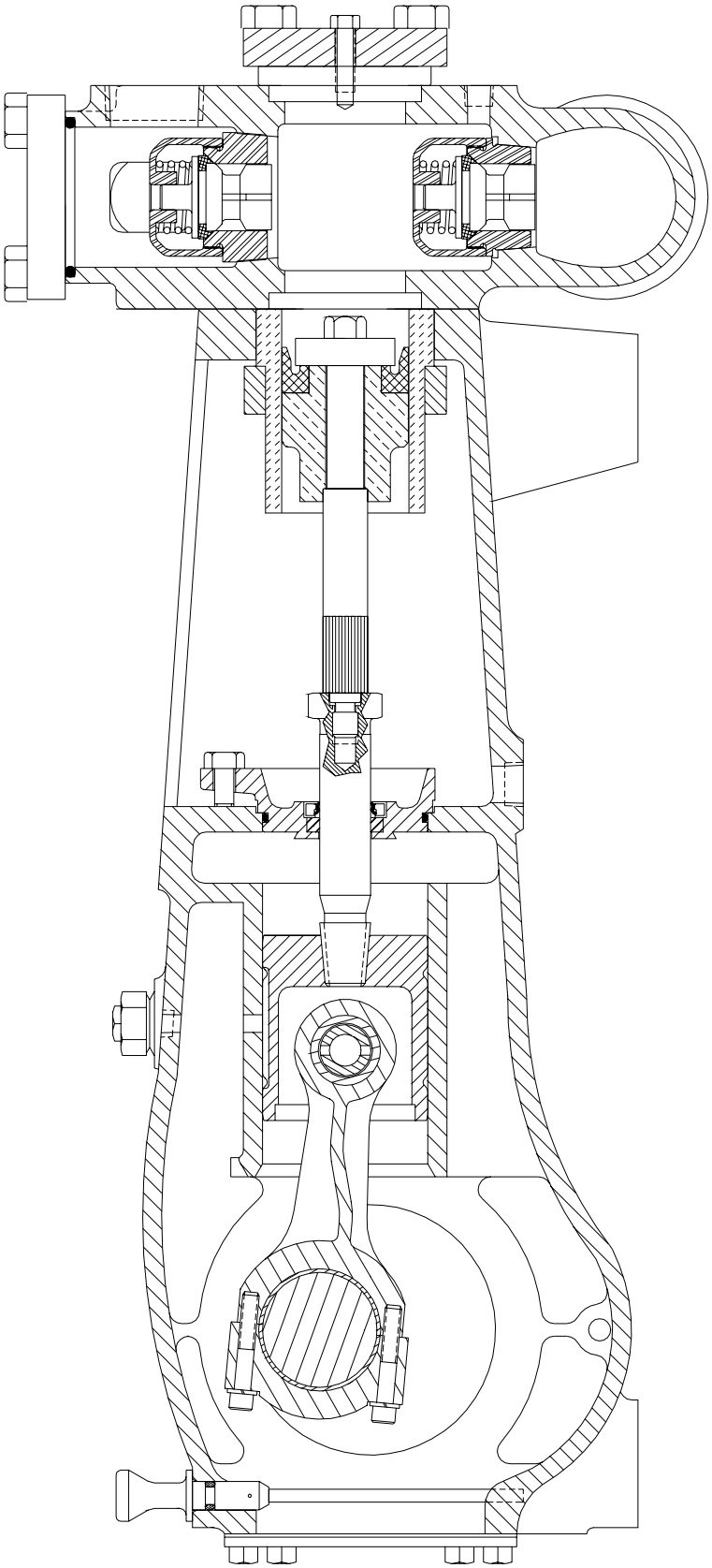
Avg. Liquid Velocity with 2 1/4" @ 600 rpm:
- Thru Plate Valves ..... 6.5 fps
- Thru Dual Stem Guided Valves ..... 9.8 fps
- Thru Suction Manifold ..... 4.5 fps
- Thru Discharge Manifold ..... 9.7 fps

SC-45L GENERAL ENGINEERING DATA

Overall Dimensions:
- Length ..... 30 1/2"
- Width ..... 18 5/8"
- Height ..... 12 3/8"

Approximate Weights:
- With Ductile Iron Liquid End ..... 440 lbs

SC-45L TRIPLEX



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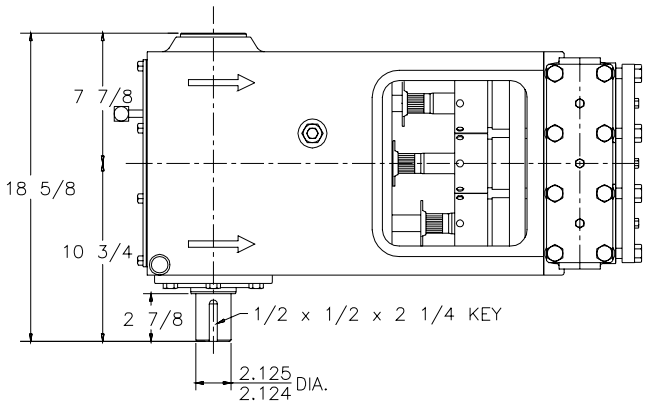

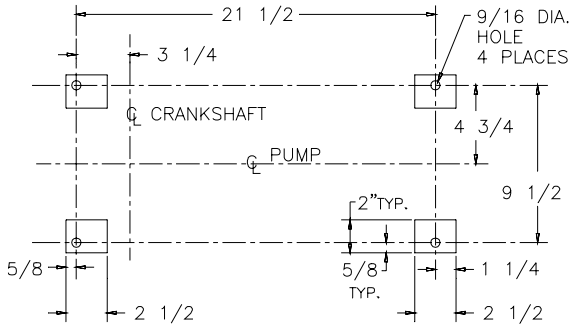

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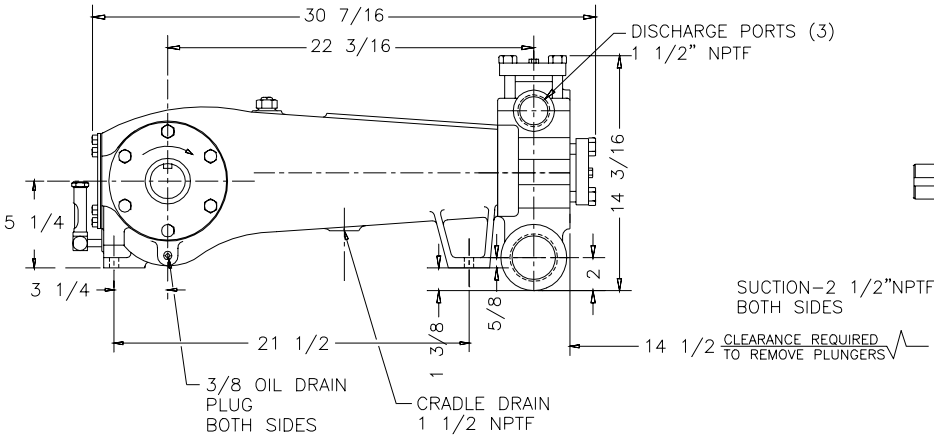

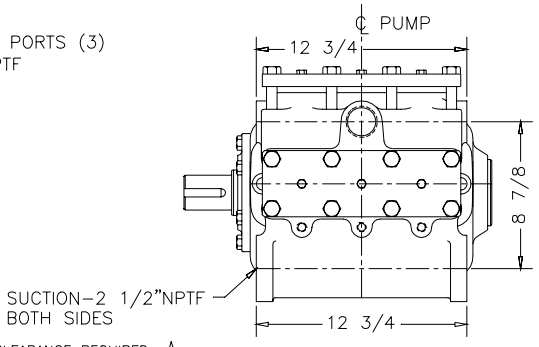

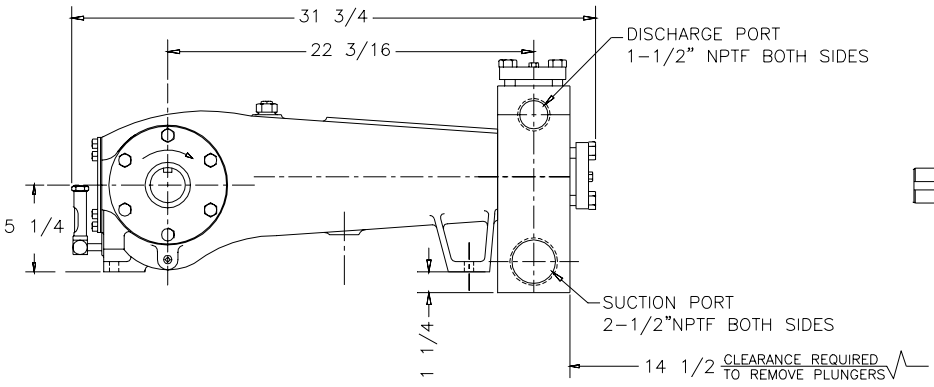

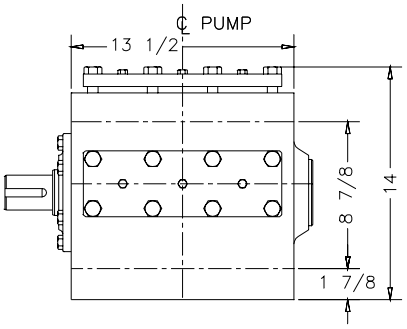

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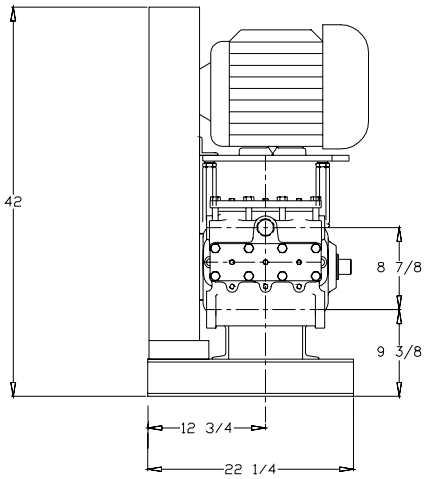
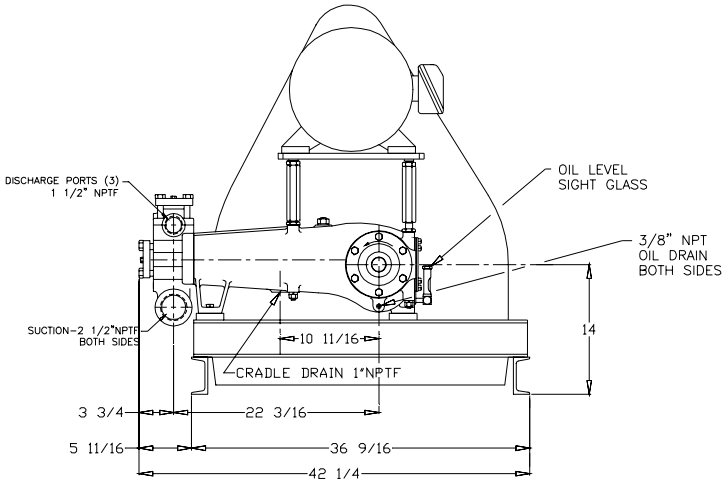




SC-45L TRIPLEX
INSTALLATION, OPERATION, LUBRICATION, MAINTENANCE AND STORAGE INSTRUCTIONS

SAFETY

Electrical power or engine must be shut off completely before attempting service on the pump or its drive. Air surrounding the unit to be free of toxic, flammable, or explosive gases.

Tools needed should be planned for in advance, (see valve seat pulling instructions), and should be clean and of adequate size. A torque-wrench will be required to tighten connecting rod cap screws.

A properly sized and set relief valve installed in the pump discharge system (ahead of any block valves) is necessary to protect personnel and to avoid dangerous overpressure. The relief valve set pressure should be not more than 25% above the design operating pressure and should discharge to tank or to the atmosphere (toward the ground), and must *not* be directed back to the pump suction system.

WARNING: *Improper use of this equipment could result in loss of life....*

STORAGE

Pumps are shipped dry from the factory. If a pump has been in storage in a humid environment for more than 6 months the crankcase cover should be removed and carefully examined for rust or water collected in the power end. Flush out any evidence of rust or damage which exists, using a light clean oil.

Pumps to be placed in extended storage should be cleaned, repaired as needed, and completely filled to the top with clean oil to prevent rusting. Rotate pump monthly 4 1/2 resolutions. Plug all openings to prevent air entry and oil leakage.

Fluid ends must be completely drained of water and suction and discharge ports blanked off. Store pump in a clean, dry location.

PUMP LOCATION & PIPING DESIGN

Locate pump and driver in a clean, well drained, ventilated, and brightly illuminated area, with adequate working spaces around the pump to provide ample access to fluid end, power end, and associated drive elements. Do *not* expect good maintenance to result if the pump is positioned on muddy terrain, or in a dirty, cramped, dimly-lighted area!

The supply tank(s) should be large to allow dissolved air and other gases to escape from the liquid and allow suspended solids to settle out before entering pump. A system employing dams and settling chambers is desirable.

Pumps are *not* designed to withstand piping weight, vibration, and the effects of thermal piping expansion/contraction. Piping loads may be considerable and the weight of all valving, dampeners, filters, and associated forces, moments, and couples must be completely isolated. Use flexible hoses and rigid piping supports to isolate the pump and its driver from these effects.

SUCTION PIPING

No part of the piping system deserves more careful planning than the suction piping system. Suction piping must be **SHORT, DIRECT,** and **OVERSIZE**. Use one pipe size larger than the pump suction connection. For example, since the suction connection for the SC-45L pump is 2 1/2", use a 3" short, direct suction line from tank to this pump. The shorter it is, the better! 1 to 3 feet per second sution velocity is acceptable.

Use no elbows, tees, or restricted port valves in this line. Do *not* install orifice plates or positive displacement type fluid meters in the suction line which act as flow restrictors. Avoid the use of suction filters, if possible. Consider filtering the liquid as it *enters* the supply tank rather than as it *leaves* it. The use of an eccentric reducer with the flat side up located at the pump suction connection is recommended. The suction line should slightly rise from tank to pump and loops in which air may collect must be avoided.

The absolute pressure in a suction line may be less than atmospheric pressure and air may be "sucked" into the line unless all flanges and connections are

airtight and watertight. If you can see water leaking out of a suction line when the pump is still, that may mean air is being sucked in when the pump is running.

Suction piping should be buried beneath the frost line, or insulated to avoid freezing in the winter. If the suction line has a block valve at the supply tank, a suitable relief valve is suggested to relieve the suction piping from any possible dangerous overpressure from the discharge piping system.

Suction piping is often large, heavy (especially when filled with liquid), and tends to vibrate. Proper solid supports are recommended. A suction hose located near the pump will isolate these effects, protecting the pump from the forces and moments that piping weight creates.

New suction piping systems should be flushed free of pipe scale, welding slag, and dirt before starting the pump. Hydrostatic testing to detect air leaks is advisable. Proper choice of suction hose construction is essential to avoid collapse of the hose liner.

Install a dry type compound gage in the suction line near the pumps which should fluctuate evenly. If violently pulsating, this gage indicates that the pump is not fully primed, or that one or more valves are inoperative.

ACCELERATION HEAD

A characteristic of all reciprocating pumps is the imperative need to consider the effects of acceleration head which is a **SYSTEM** related phenomenon. Acceleration head may be considered to be the loss of available hydraulic head (energy) in the piping system occurring because the demand by the pump cylinders for liquid is not smooth and even. Because the pump's demand for liquid is cyclical, the velocity of the liquid in the entire suction system is not truly constant but varies in response to the combined demand of the reciprocating plungers. Thus, liquid in the suction system is compelled to be accelerated and decelerated several times during each crankshaft revolution, depending on the number of plungers. Called "acceleration" head, this loss of available hydraulic head is proportional to:

(a) The speed (RPM) of the crankshaft
(b) The average liquid velocity in the piping
(c) The length of the suction piping
(d) The number of pumping chambers (triplex, etc.)
(e) The compressibility of the liquid

Thus, for a given pump, acceleration head effects may be reduced by the use of the shortest possible suction line, sized to reduce liquid velocity to a very low speed. This is often more economical than the use of charge pumps, or expensive suction stabilizers.

NOTE: Charge pumps should be sized to 150% of rated pump volume. Charge pumps need to be centrifugals not a positive displacement pump.

A charging pump is usually *not* a good substitute for a short, direct, oversize suction line, nor is it a substitute for the computation of available **NPSH**, acceleration head, friction head, vapor pressure and submergence effects duly considered. Required **NPSHR** of Myers/Aplex pumps depends on speed, choice of plunger size, and valve spring type. Consult Myers/Aplex Engineering for help with your particular application. A full discussion of suction system losses is given in the Standards of the Hydraulic Institute, 14th Edition.

A common design mistake is the connecting of two (or more) reciprocating pumps to a **COMMON** suction header. This is a profoundly complicated suction system, largely not amenable to mathematical analysis, and is frequently the cause of severe pump pounding, vibration and early valve failures. Each pump should be fed by its own separate, individual piping system, free from the effects of other pump cyclical demands for liquid.

DISCHARGE PIPING

A properly designed discharge piping system usually obviates the need of a pulsation dampener. The most common mistakes made in the design of the discharge piping system are:

Pumping *directly* into a tee or header. A "standing" wave (either audible or sub-audible) then often occurs. If flow must enter a header, use a 45° branch lateral (or equivalent) to avoid a reflecting surface from which sound can reflect.

Pumping into short radius 90° elbows. Instead,

use two 45° elbows spaced 10 or more pipe diameters apart.

Pumping into a right angle choke valve.

Pumping into too small piping line size. Piping should be sized to keep fluid velocity below 15 feet per second, max.

Pumping through an orifice plate, small venturi, or reduced port "regular opening" valve.

Pumping through a quick closing valve, which can cause hydraulic shock (water-hammer).

A good discharge piping system includes:

A properly sized, correctly set relief valve. Discharge from relief valve returned to tank (not to pump suction).

A full opening discharge gate or ball valve. Avoid restricting plug valves, globe valves, and angle valves.

A pressure gauge with gage dampener or snubber. Consider a liquid filled gauge. (Scale range to be double the normal pump operating pressure.)

Locate the relief valve and pressure gauge ahead of any block valve and so that the pressure in the pump is always reflected at the relief valve. The relieving capacity of the relief valve must exceed the capacity of the pump to avoid excessive pressure while relieving. Use a full size relief line.

To minimize vibration, (whether hydraulic or mechanical), discharge lines should be kept short, direct, well supported and solidly anchored. Avoid "dead" ends and abrupt direction changes.

BYPASS PIPING

Some designers ignore this important aspect of proper design of pump piping systems.

A reciprocating pump, especially after maintenance of the valves or plungers, **STARTS WITH ONE OR MORE FLUID CHAMBERS FULL OF AIR.** Pumps operating on propane, butane, or other volatile liquids **START WITH VAPOR IN THE FLUID CHAMBER(S).**

Positive displacement pumps do *not* automatically purge themselves of air and gas after shutdown. For example, a quintuplex plunger pump will, after servicing, expel the air in four of the five pump chambers. Thus, the pressure from four of the "active" cylinders will keep shut the discharge valve of the "inactive", or "air bound" cylinder. Then, the air or gas in this cylinder will be compressed and expanded by its reciprocating plunger, and never leave the chamber. Similar effects occur in duplex and triplex pumps.

To overcome these difficulties, adequate provision for expelling the gas in the "air bound" cylinders must be present. Common practice is to totally relieve the pump of all discharge pressure during the start-up, after servicing.

Consider the operational advantage of a full-sized bypass line (return to tank) which substantially removes discharge pressure from all cylinders during the start. This requires a block valve on the discharge side and a full opening bypass valve on the other side.

For economy, the bypass (to tank) can be combined with the relief valve discharge line. This line must be full-sized, well supported, and sloped downward to avoid freezing in cold weather. (A frozen relief valve line provides **NO** protection to either the pump or operating personnel!)

The ability of a reciprocating pump to be "self-priming" depends on the ratio of the swept (displaced) volume in the cylinder to the unswept (clearance) volume at the end of the stroke. This depends on the design of the fluid end and on the plunger size selected.

Choice of the largest size plunger for a particular fluid end improves this compression ratio and so leads to "self priming", or easy priming. Choice of the minimum size plunger sometimes leads to difficulties, especially with pumps that require frequent servicing, or which handle volatile liquids, or which contain substantial amounts of dissolved air or gas. An

SUGGESTED PIPING SYSTEM FOR PLUNGER PUMPS

NOTES

1) CENTERLINE OF PUMP SUCTION (INLET) TO BE SLIGHTLY HIGHER THAN CENTERLINE OF SUCTION (INLET) VALVE-SO ANY AIR IN SUCTION SYSTEM PROMPTLY REACHES THE PUMP AND IS EXPELLED.

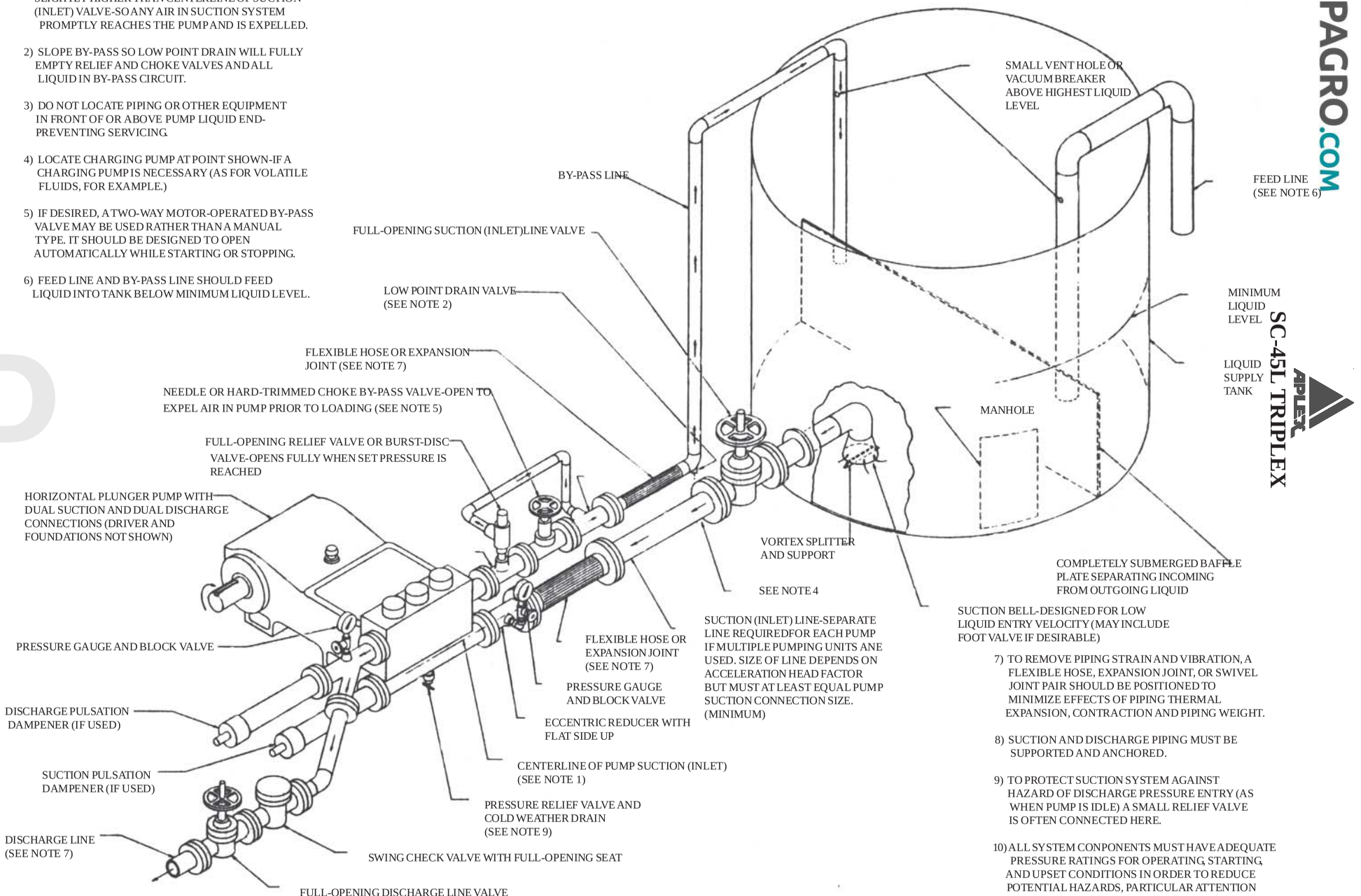
2) SLOPE BY-PASS SO LOW POINT DRAIN WILL FULLY EMPTY RELIEF AND CHOKE VALVES AND ALL LIQUID IN BY-PASS CIRCUIT.

3) DO NOT LOCATE PIPING OR OTHER EQUIPMENT IN FRONT OF OR ABOVE PUMP LIQUID END-PREVENTING SERVICING.

4) LOCATE CHARGING PUMP AT POINT SHOWN-IF A CHARGING PUMP IS NECESSARY (AS FOR VOLATILE FLUIDS, FOR EXAMPLE.)

5) IF DESIRED, A TWO-WAY MOTOR-OPERATED BY-PASS VALVE MAY BE USED RATHER THAN A MANUAL TYPE. IT SHOULD BE DESIGNED TO OPEN AUTOMATICALLY WHILE STARTING OR STOPPING.

6) FEED LINE AND BY-PASS LINE SHOULD FEED LIQUID INTO TANK BELOW MINIMUM LIQUID LEVEL.



7) TO REMOVE PIPING STRAIN AND VIBRATION, A FLEXIBLE HOSE, EXPANSION JOINT, OR SWIVEL JOINT PAIR SHOULD BE POSITIONED TO MINIMIZE EFFECTS OF PIPING THERMAL EXPANSION, CONTRACTION AND PIPING WEIGHT.

8) SUCTION AND DISCHARGE PIPING MUST BE SUPPORTED AND ANCHORED.

9) TO PROTECT SUCTION SYSTEM AGAINST HAZARD OF DISCHARGE PRESSURE ENTRY (AS WHEN PUMP IS IDLE) A SMALL RELIEF VALVE IS OFTEN CONNECTED HERE.

10) ALL SYSTEM CONPONENTS MUST HAVE ADEQUATE PRESSURE RATINGS FOR OPERATING, STARTING, AND UPSET CONDITIONS IN ORDER TO REDUCE POTENTIAL HAZARDS, PARTICULAR ATTENTION IS RECOMMENDED FOR THE SURGE CONDITION THAT WILL RESULT DOWNSTREAM OF THE RELIEF VALVE WHEN NORMAL DISCHARGE IS BLOCKED.

SC-45L TRIPLEX

LUBRICATION

SC-45L Myers/Aplex pumps utilize 5 U.S. quarts of S.A.E 40 wt. non-detergent oil in the crankcase. This oil requires only a non-foaming additive and should possess good water separation (anti-emulsion) characteristics. Such oils are often labeled "industrial" or "turbine" quality lubricants. If these oils are not available, a good quality gear oil or EP oil may be substituted. See lubrication guide lines.

In temperate climates oil viscosity selected should fall between 70 and 84 seconds Saybolt viscosimeter at 210° F. In arctic service, low pour point oils are needed.

After the first 500 hours of operation in a new pump, drain the oil. Refill with clean, fresh oil. Thereafter, change the oil every 1,500 hours or sooner if it becomes contaminated with water or dirt. Fill to the center of the sight gage. Pumps with dipsticks, fill above the line at the bottom of dipstick. Recheck after starting, adding oil to center of gage, or above the line on the bottom of dipstick, while running.

V-BELT DRIVE

A properly designed, well-aligned v-belt will provide years of reliable, economical service if properly tensioned and kept dry, free of oil, and ventilated.

Alignment is critical for long life. If the shaft axes are not truly parallel, or if the sheave grooves are not positioned in good alignment, some belts will carry most of the load resulting in their disproportionate load share and may actually twist or turn over in the groove. Use a straight edge across the rim of the sheaves to detect and correct for misalignment.

After about one week of operation, new v-belts will have stretched somewhat. The motor must be moved on its slide base to re-establish proper belt tensioning.

Insufficient tension results in slippage, burning, squealing (especially during starting), and shortened belt life. Overtightening imposes excessive loads on pump and motor bearings and can cause early shaft fatigue failure.

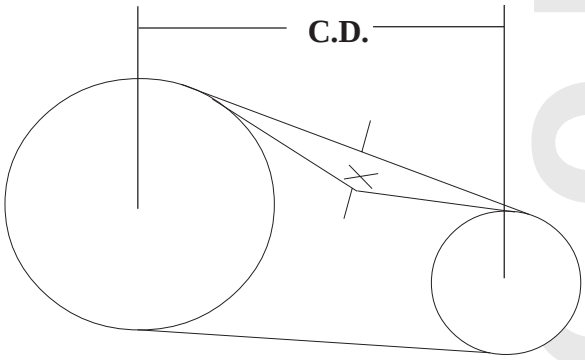
Use the following table in adjusting V-belt tension:

Belt Cross-Section	Tension at Mid - Span New Belts	Used Belts
"B"	5-6 lb.	3 1/4-5 lb.
"C"	9 3/4 -13 lb.	6 1/2- 9 3/4 lb.
"3V"	4-10 lb.	3-7 1/2 lb.
"5V"	17-30 lb.	13 - 23 lb.

Applying the above forces with a small spring scale, adjust motor position to provide the following deflection at mid-span:

Approx. Center Distance (Span)	Deflection, inches
16"	1/4"
22"	3/8"
28"	7/16"
32"	1/2"
40"	5/8"
48"	3/4"
60"	15/16"

Belts must be *matched* in pitch length. If one or two belts are slack, when the others are correctly tensioned, investigate for possible reasons. Correct any misalignment or lack of matching, so each belt will transmit its load share.



Sheaves must be balanced to prevent abnormal vibration. Balancing weights must **NOT** be removed. Type "QD" sheaves must be evenly tightened on their tapered hubs to avoid rim wobble and severe lateral vibration. V-belts which snap and jerk will produce abnormal vibration and loads on both pump and motor or engine.

Run the pump several minutes at full load with belt guard removed observing for uneven motion on the belt slack side, especially.

When an old V-belt drive becomes unserviceable, replace **ALL** belts, not just the broken or cracked belts. Do not operate belts on sheaves having worn, rusted, greasy, or broken grooves. Shut off power to driver before servicing driver or pump.

WARNING: *Do not operate without appropiate guards in place.*

DIRECTION OF ROTATION

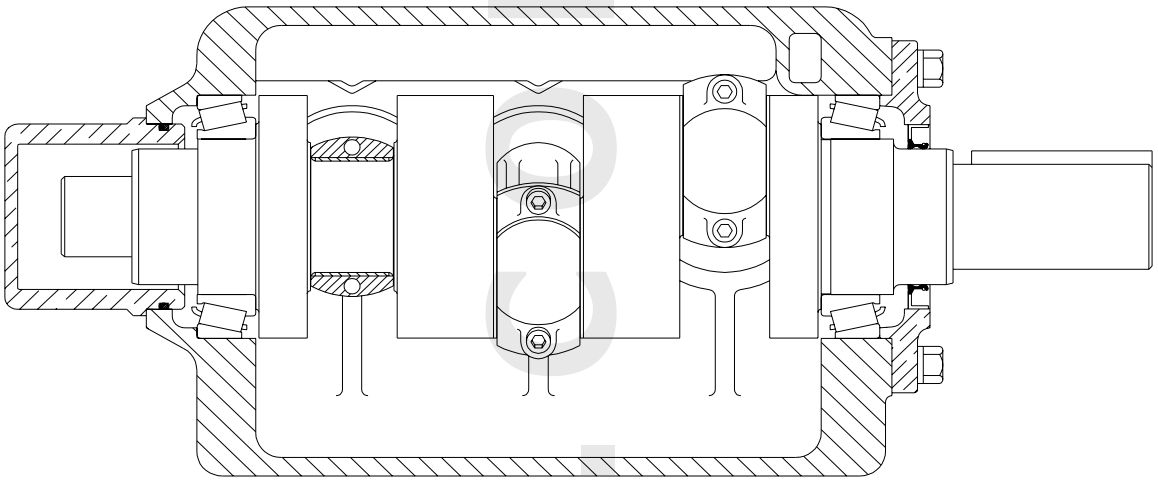
Before placing pump in operation, check that crankshaft rotation agrees with the arrows cast on top of the power frame by briefly jogging the electric motor. Crankshaft rotation must be clockwise as viewed from the right side of pump.

If pump is gear driven, remember that the pinion shaft turns opposite the crankshaft, if using a single-reduction geared drive or in the same direction as the crankshaft when using a planetary gear.

AUTOMATIC (SAFETY) SHUTDOWNS

Carefully check all electric shutdown devices present such as crankcase oil level, discharge pressure, vibration, lubricator oil level, motor thermostat, etc.

CRANKSHAFT ASSEMBLY



GENERAL

Myers/Aplex crankshaft suspension utilizes two single-row tapered bearings, which are shim adjusted to provide the correct running clearance.

Thorough cleaning of all components prior to assembly is essential.

Power frame, shaft, bearings and retainer **MUST** be scrupulously scrubbed with clean solvent (such as kerosene) before starting. Remove any oil, dirt, rust and foreign matter which might prevent the correct fit up.

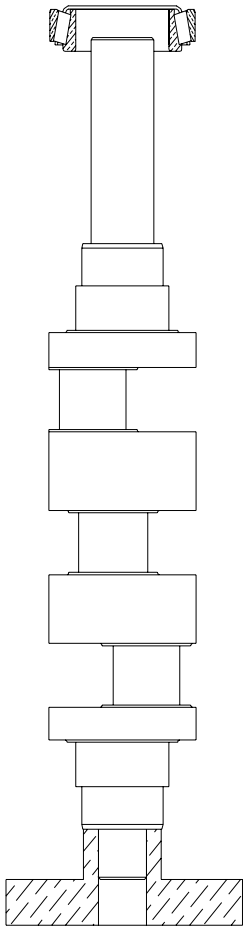
Crankshaft journals are critical. Remove all burrs, rust spots, and nicks, paying special attention to the ground areas on which bearings and oil seals operate.

TAPERED ROLLER BEARINGS

Shaft and frame tolerances provide a tight (press) fit on the shaft, and tap fit in the frame. The best way to install the cone assembly (consists of the inner race, cage and rollers) on the shaft is to heat the cone assembly in an electric oven for 30 minutes at 300 to 400°F. *No More!* (**Do NOT heat** bearings with an acetylene torch. This ruins the bearings!) Using clean, insulated gloves, remove the hot cone assembly from the oven, promptly dropping it on to the shaft.

The cone assembly **MUST** contact the seat thrust face (not be cocked), and the large end of the rollers **MUST** be down. Do not hammer on the bearing. The soft steel cage is easily distorted, ruining its function as a roller separator and guide against skewing. If the cone does not contact its thrust face properly, it must be pressed into place using a specially machined sleeve (which does not touch the soft steel cage). A hydraulic press is recommended if this difficulty arises.

INSTALLING CRANKSHAFT



GENERAL

Stand the power frame casting on the floor or on a bench with the fluid end face down and crankshaft end up. Insert one bearing cup in the left frame cup bore and shoulder it against the bearing retainer with rubber mallet. Pass the crankshaft through the right frame bore, and against the installed cup until the bearing cone seats into the left bearing cup. Insert a second bearing cup over the right hand crankshaft journal. Install o-ring on the crankshaft extension guard. Tap the guard over the crankshaft extension if an auxiliary drive is not being used.

SHIM ADJUSTMENT OF TAPERED ROLLER BEARINGS

To provide for crankshaft thermal expansion, sufficient shims (located beneath bearing retainer flange) must be installed to provide .005" to .015" lateral end play, when shaft is cold.

Separate the shims set (which consists of two .020"; three .007"; and three .005" thick shims). Select one .020" shim and the bearing retainer and position them over the bearing retainer.

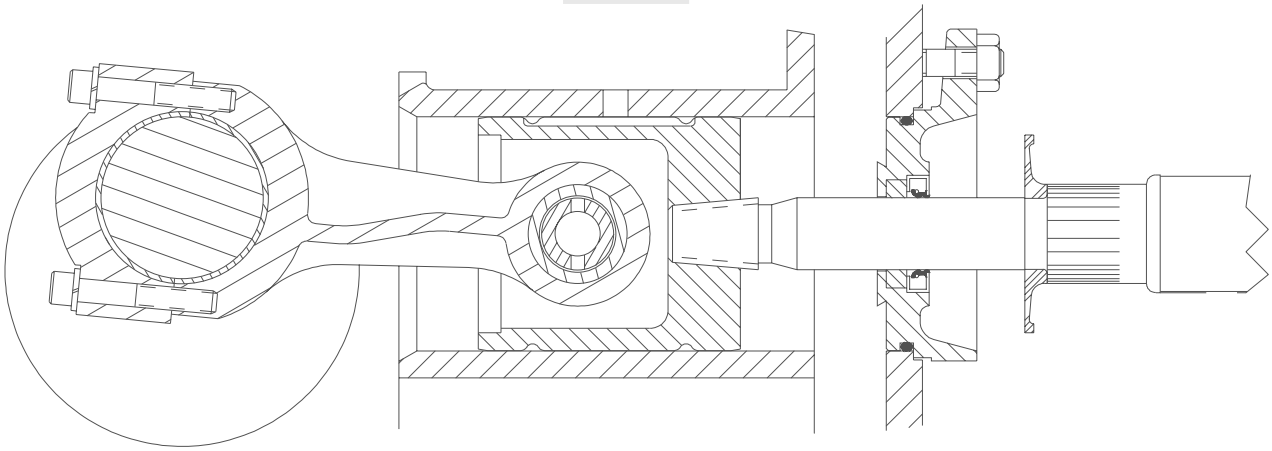
Insert two of six hex head cap screws 180° apart and tighten alternately until the bearing cup is seated. Place a magnetic base indicator on the exposed end of the crankshaft with indicator spindle against the side of power frame. Move crankshaft laterally with a pry bar first left and then right observing movement indicated in each direction. The lateral end play should be only .005" to .015". Remove the bearing retainer and add shims as needed. Repeat the procedure above until the proper end play tolerance is obtained. Install the remaining four cap screws.

The recommended tightening torque for bearing retainer 1/2"-13UNC cap screws is 59 to 72 Ft.Lb.

INSTALLATION OF CRANKSHAFT OIL SEAL

Insert oil seal over the end of crankshaft and position it into the oil seal bore in the power frame or bearing retainer. Using a rubber mallet, tap it into the bore until the face of the seal is flush with the power frame or bearing retainer.

CONNECTING ROD, CROSSHEAD, AND CROSSHEAD PIN ASSEMBLY:



GENERAL

Myers/Aplex connecting rod assemblies employ precision automotive type steel-backed, babbitt-lined crankpin bearing halves which require no shims for clearance adjustment. This pump employs full-circle (piston type) crossheads.

Plungers are provided with a knurled wrenching area to permit tightening of the tapered thread into the crosshead, establishing accurate alignment while affording easy field installation.

Before beginning the assembly all parts must be scrupulously cleaned, removing all oil, dirt, rust, and foreign matter which prevent proper fitting, or which might tend to score the rubbing surfaces. Clean and examine the power frame bores for scoring and abnormal wear, especially wear of the lower crosshead guide way. Hone smooth, if rough.

Measure the bores of the frame using inside micrometers to determine abnormal frame wear if any.

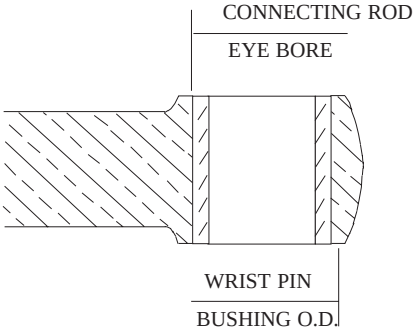
New crosshead O.D. ..... 3.243/3.246”
New frame bores ..... 3.253/3.250”

Frame bores which have become worn more than .015" must be sleeved with a cast iron liner to re-establish correct geometry and alignment. Contact Myers/Aplex concerning the repair of badly worn frame bores.

Smooth any rough corners and edges on the crosshead skirts, using fine emery cloth. Examine and clean the female tapered threads and wrist pin holes.

INSTALLING WRIST PIN BUSHINGS

The wrist pin bushing is precision machined bearing bronze which is press fitted into the eye of the connecting rod.



Bushing O.D. ..... 1.378/1.377”
Connecting rod eye bore .... 1.3750/1.3760”

Carefully align the bushing with its hole and after applying oil to bushing O.D. use a hydraulic press to force it home. When a bronze bushing is pressed into

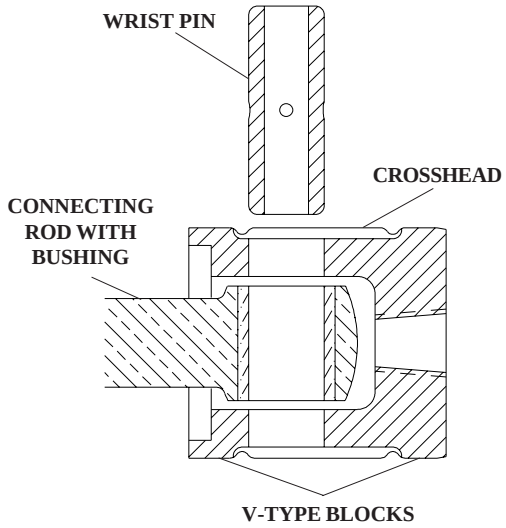
place, the I.D. (bore) of the bushing is reduced somewhat, owing to the extent of press fit. Therefore, a clean, new wrist pin should be inserted into the bushing bore to establish that running clearance has been obtained. The running clearance between the wrist pin and installed bushing is:

New pin O.D. ..... 1.0640/1.0635”
Installed bushing bore ..... 1.0645/1.0650”
Oil Clearance ..... .0005/.0015”

Replacement bushings are furnished pre-bored by Myers/Aplex which usually eliminates the need to ream the installed bushing bore. However, due to slight variations in finishes and tolerances it sometimes happens that more than predicted contraction of the I.D. occurs. This occurrence results in a slight interference which may be eliminated by lightly honing the bore of the bronze. (**NOT** by reducing the pin size!). An automotive engine repair shop usually is equipped with power honing machines capable of smoothly finishing the bushing bore. Bore of bushing must be round and free of taper.

PINNING THE CROSSHEAD

A pressfit is employed between the crosshead pin and crosshead to secure the pin against any motion. A hydraulic press is employed to force the pin thru the bosses of the crosshead.



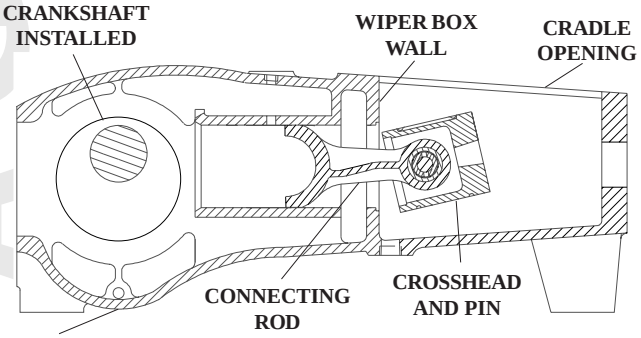
A mishap during insertion can occur causing the ruin of the pin or the crosshead, *if* during application of pressure:

a.) Pin is not aligned absolutely square with the crosshead.
b.) Crosshead is not supported on v-blocks so it can roll while under load.
c.) Connecting rod is not fully supported so pin cannot enter the bushing without damage to it. This will damage the bushing.
d.) Failure to oil pin O.D. and crosshead bores, to prevent galling. Use clean motor oil.

After installing the pin, carefully check the crosshead O.D. to see if it is out-of-round. If so, a smart blow with a rubber mallet will restore the crosshead O.D. into its original roundness.

ORDER OF ASSEMBLY

The connecting rod/crosshead assembly is installed **AFTER** the assembly of the crankshaft. The rod and crosshead will pass through the wiper box wall bore. With the frame in the horizontal position, load the rods through the cradle.

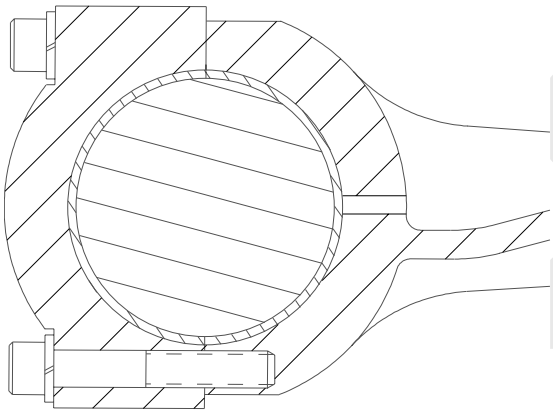


PRECISION CRANKPIN (CRANKTHROW) BEARINGS

Myers/Aplex pump crankpin bearings require no shimming to establish correct running clearance. Precise machining of the connecting rod, caps and crankpin journals is necessary to achieve this convenience.

New crankpin O.D. ..... 2.250/2.249”
New connecting rod bore .... 2.3944/2.3955”

Crankpins which are worn out-of-round, tapered, or badly scored should either be discarded or perhaps salvaged by grinding undersize, hard chrome-plated, and finish ground to above diameter. Connecting rod/cap bore must be perfectly round and within above sizes and free of taper. Discard, if elliptical or tapered as the result of abnormal heating. Each cap and rod is match-marked for correct identification. Take care that each cap is re-installed properly with its companion rod. Bearing halves are identical and are prevented from rotating by tongues which fit into slots in the cap.



Check that all oil holes are clean and fully open. **GRIT** is the greatest enemy of bearings, however precisely manufactured. Hence, all surfaces must be perfectly clean and lightly oiled prior to assembly. Remove any burrs or sharp corners which prevent the perfect fitting of these precision bearings. Using a torque wrench, tighten cap bolts as follows:

Thread Size	Tightening Torque
5/16”-18UNC	19 Ft.Lb.

Specified torque, applied to clean, well oiled threads and bearing faces, will create tensile stresses in the cap bolts from 90,000 to 110,000 psi, approx. and will provide correct initial tension. Myers/Aplex pumps utilize high strength cap bolts suitable for these initial loadings, maintained by hardened spring lockwashers.

After all rods and caps are secured, slowly turn the crankshaft to be sure no bearing is in a bind.

Using a flash light examine the location of each connecting rod (eye end) within its crosshead. Rods must not touch any crosshead boss or skirt.

SC-45L TRIPLEX
WIPER BOX ASSEMBLY

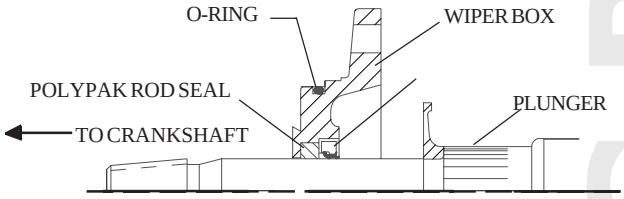
GENERAL

Extension rod wiper boxes (sometimes referred to as the diaphragm stuffing box, or stripper housing assembly) serve two important functions: retention of crankcase oil in the power end, and exclusion of dirt and water.

Myers/Aplex has developed a unique sealing set which operates on a hardened and ground stainless steel extension rod (often called "pony" rod), and a rubber baffle disc affording protection against leaking plunger packing. The seals require no adjustment, only correct and careful assembly.

"POLY PAK" SEAL

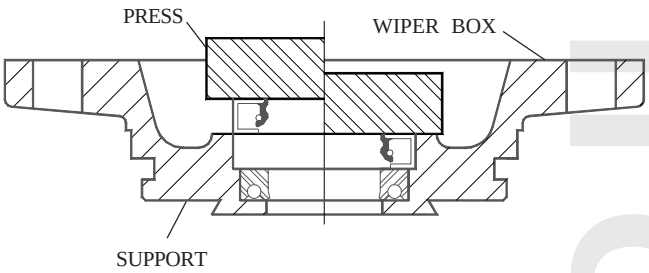
This seal keeps oil from leading out of the power frame. Developed by the Parker Seal Group, this patented rod seal, employs a soft nitrile rubber o-ring to energize a special hard polyurethane "Molythane" shell by forcing the inner lip against the rod and the outer lip against the housing bore, as shown.



The "Poly Pak" seal is inserted into its counter bore with its lips directed *toward* the oil in the crankcase. (Will **NOT** work if installed backwards!)

MECHANICAL OIL SEAL

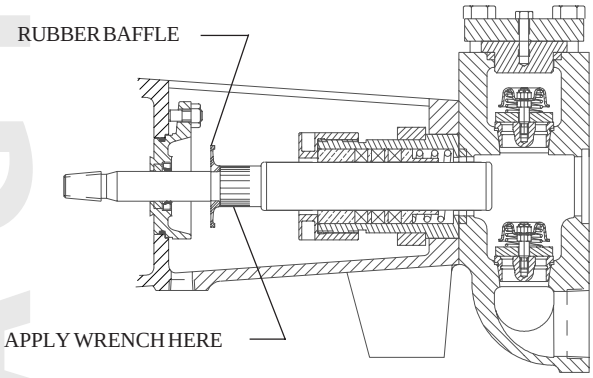
The oil seal is to keep contamination out of the power frame. With the box positioned in a hydraulic press, install the backup seal against the "Poly Pak" seal, with the lips of both seals facing downwards.



The mechanical seal contains a garter spring. Check to see that this spring is still properly located and in its position. The mechanical seal has a metal case which serves to force the "Poly Pak" seal into its cavity, energizing its lips. Apply oil lightly to the bore of the box before pressing each seal into its counterbore.

INSERTING THE PLUNGER

Insert the integral extension rod plunger through the fluid end and through the stuffing box. Insert the extension rod through the wiper seals with the tapered thread and entering **FIRST.** Next, install rubber baffle plate by oiling the extension rod portion of the plunger. This baffle plate seats into a reduced diameter next to the knurled shoulder. Care should be used in moving the male tapered thread through wiper seals to prevent dislocating the garter spring, or damaging seal lips.



Fasten the wiper box to the power frame by evenly tightening the two nuts on the wiper box studs. Oil leakage between frame face and wiper box is prevented by an o-ring on the O.D. of the wiper box.

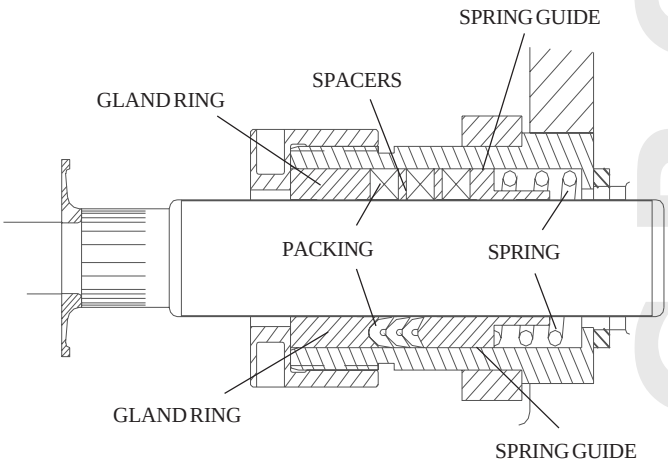
With extension rod inserted through the wiper box seals, thread the tapered threads (must be clean!) into the tapered crosshead female threads. Firmly tighten, apply wrench to the knurled area only. Never damage the extension rod ground surfaces!

SC-45L TRIPLEX
STUFFING BOX, PACKING & PLUNGER ASSEMBLIES

GENERAL

Myers/Aplex pumps all feature field removable and replaceable stuffing boxes. The SC-45L has integral extension rods. The plungers may be removed separately (with-out box removal) to facilitate re-packing. The integral extension rod type plunger may be removed by removing the cylinder head plug and retainer plate allowing the plunger to be removed through the fluid end, after unscrewing it from the crosshead. It is not necessary to disturb the fluid end or piping.

SPRING LOADED PACKING



Note that the gland is screwed tightly onto the box and contacts its face. The spring is providing all of the initial compression and adjustment. No adjustment is provided by the gland.

Since the force exerted by the spring is contingent on the space provided for it, the correct lengths of all rings is essential for good tensioning.

Spring:

A stiff Inconel spring, which closely fits the bore of the stuffing box, is used in this assembly. This spring is compressed in a vise to the operating length required plus 0.25" and tied with waxed nylon spot tie cord. The cord is looped over the ends of the spring through the coils and tied to maintain the length mention above. Each spring is assembled into the stuffing box. Note that the spring does not contact the plunger.

Spring-Guide Ring:

Plungers are heavy and the importance of a well-fitted guide ring which carries this weight is often overlooked. Discard any guide ring which becomes worn or scored, as it will then not serve its purpose. It should fit snugly in the box. Apply oil generously to this ring.

Spring Loaded Packing:

Three (3) rings of chevron or compression packing are installed next.For compression packing, install them with the skive intersections 180° apart to discourage leaking.

Gland Ring:

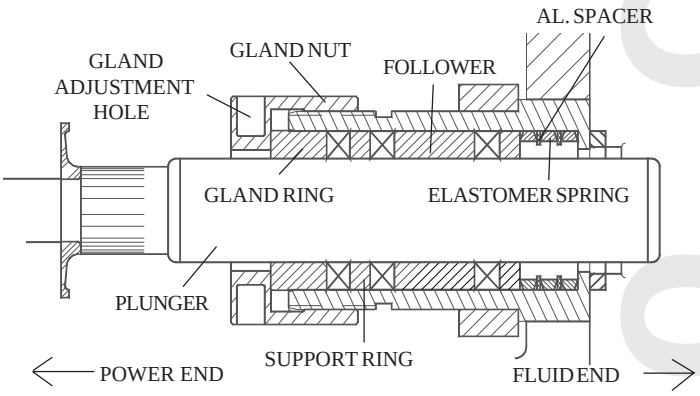
This ring also fits the plunger and helps support the plunger weight. Discard it if bore is worn, rough or out-of-round. Lightly oil the ring before insertion.

HI/LO GLAND ADJUSTABLE PACKING

The Myers/Aplex Hi/Lo adjustable packing was designed to provide sealing of the plunger in either high or low pressure operation. The packing is non-lubricated and user adjustable.

The packing begins to wear and leak (liquid running out of the cradle drain hole) the gland can be tighted. Tightening will increase packing preload and will control leakage. Adjustments (with the pump running) should be in 1/2 to 1/6 of a turn of the gland nut. There are 6 gland adjustment holes on the nut so 1/2 to 1 hole rotation will be desirable.

When a bentonite slurry is being pumped, it is normal for a "Putty" like material to collect at the packing plunger interface. This is nothing more than bentonite with most of the water evaporated. As this material begins to collect this is the first sign that the packing could be adjusted. Over tightening will unnecessarily shorten packing life.



The Hi/Lo packing is totally retrofitable to existing Myers/Aplex pump. Use the drawing for proper reassembly order.

Initial gland tightening should be 2 to 2 1/4 turns past hand tight. If there is a grease fitting in the stuffing box, remove it, use a 1/8" pipe plug and plug the hole. (*Caution*, make sure the plug does not protrude down into the ID of the stuffing box. If the plug is too long grind off the end and try again.)

INSERTING THE PLUNGER

Apply oil liberally to plunger O.D. and lightly tap it through the packing. When introducing the plunger through the SC-45L stuffing boxes, also apply oil liberally to the O.D. of each integral extension rod to allow easy passage through the wiper box seals.

A soft rubber mallet is recommended to avoid any damage to the plunger face or its threads. Remembering: The fragile nature of packing rings, and plunger surfaces deserve your respect and avoidance of careless damage to these key elements!

INSTALLING THE GLAND

Considerable downward pressure on the gland is required to compress the spring and to move the packing into location, and to start the threads of the box.

Once the gland threads are started, screw it down completely until it makes up tightly against the face of the box, for spring loaded packing. For Hi/Lo, J-Style or gland sdjusted packing, tighten the gland until it is seated firmly against the packing.

INSTALLING THE STUFFING BOX

Myers/Aplex stuffing boxes derive their alignment from the bores of the power frame and the faces of the fluid end. So these surfaces **MUST** be cleaned of rust, scale, and dirt before assembly is begun. Wash all contacting surfaces with clean solvent and dry with a **CLEAN** shop towel.

A nitrile rubber seal is used to seal between the face of the fluid end (must be flat, clean and smooth) and the face of the box. Replace if damaged.

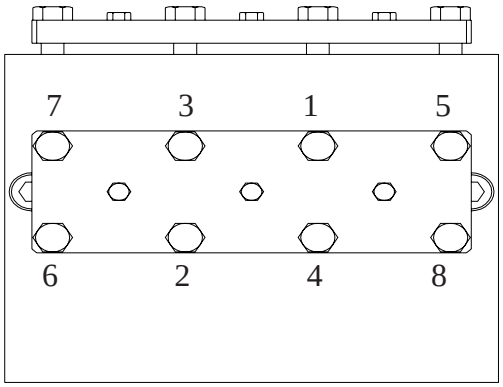
The fluid end is retained on the power end by two socket head cap screws. No dowel pins or other alignment techniques are needed since the power frame provides alignment to the stuffing boxes individually. These two screws should be tightened before the stuffing boxes. The torque value should be as follows:

3/4"-11UNC @ 160 Ft.Lb.

All stuffing boxes are retained by large bolts which extend through the liquid end, serving to clamp the box tightly against the fluid end face.

Using a socket extension, and torque wrench, tighten clean, well-oiled threads and nut faces as follows:

Long Screws 5/8"-11UNC @ 100 Ft.Lb.



Failure to fully and *evenly* tighten these studs (or cap screws) can lead to early failure, plunger mis-alignment and failure, and short packing life. Retighten after 500 hours of operation.

CONNECTING THE PLUNGER

Install the rubber baffle on to the integral extension rod, sliding it against the knurled shoulder of the plunger. Roll the pump crankshaft slowly until the plunger male threads touch the mating female threads in the crosshead.

Applying a pipe wrench to plunger knurled area, thoroughly tighten the connection. Do **NOT** use a "**cheater**" when connecting plunger to extension rod. (*Serves no useful purpose, and may damage the connection!*)

PACKING

Packing life for Aramid fiber packing may be improved, in some applications by regular, systematic lubrication. An optional force feed lubricator assembly is often recommended especially for pumps on continuous duty. This provides regular, controlled supply of lubricant lowering friction and heat.

Additionally, the regular application of the correct lubricant aids dissolving of salt and gyp tending to build up on the plungers in produced water applications. For this service, Rock Drill Lubricant is a popular and effective packing lubricant.

Plungers in CO_2, ethane, or other very cold liquid services may use brake fluid. This fluid does not congeal into a solid which cannot enter the packing. Consider the use of an air-sealed cradle into which dry (instrument) air may be directed, excluding the moisture which causes plunger icing especially in very humid conditions.

Packing lubricant for pumps on light hydrocarbons, hot water, lean oil, naphtha, or gasoline often require experimentation.

A good start is to use steam cylinder oil. Castor oil is sometimes successful as a packing lubrication for liquid propane and butane services, at ambient temperature.

In pumps placed in arctic service, a special low pour point oil is indicated.

Packing lubrication is not permitted on some services, such an amine, food stuffs, etc. and other packing styles and materials may be required.

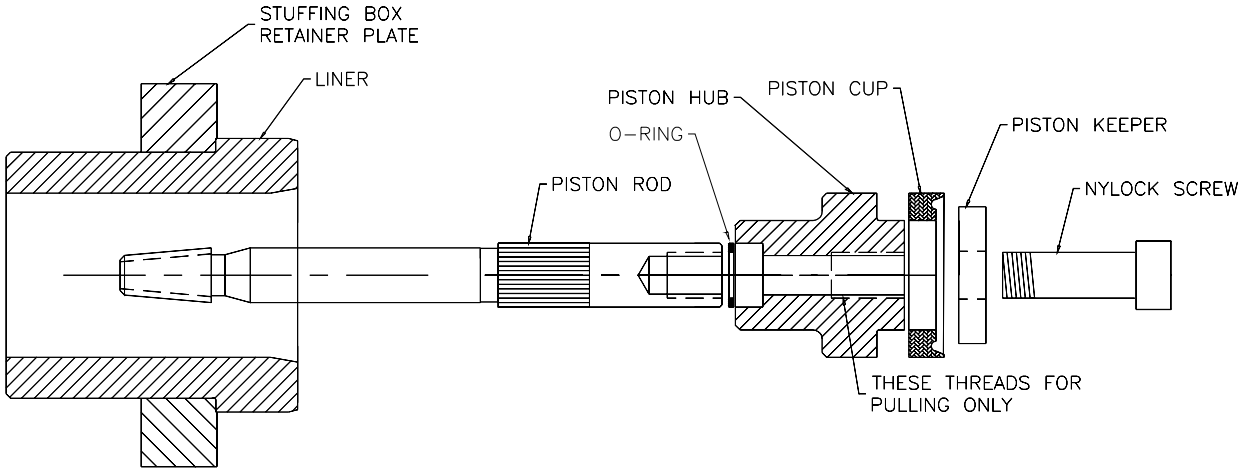
PLUNGERS

Myers/Aplex offers its own unique product: the Myers/Aplex "Rokide" plunger. This premier quality plunger consists of a chromium-oxide deposition on a solid stainless steel body.

Ordinary handling will not damage this fine product. Avoid striking the coated surface(black) during installation. Apply light forces only on the ends of the plunger. Do not hammer or pry.

All threads on Myers/Aplex plungers must be **CLEAN** and oiled before assembly. Stainless steel (although very corrosion resistant) has a tendency to gall and seize. To avoid this, an anti-seizing lubricant is well worth its use. Apply oil to the threads.

Myers/Aplex can supply solid ceramic plungers on order. This plunger is very fragile, vulnerable to thermal and mechanical shock, and must be handled with the greatest care. Use only a rubber mallet to insert it into the packing. Other plunger types are available upon request.



CONVERTING PLUNGER TO PISTON

DISSASSEMBLY

1) Remove the 8 cap screws and the cylinder head retaining plate from the front of the liquid end.
2) Unscrew the 3 glands from the stuffing boxes and remove. Unscrew the 3 plungers from the crossheads and work them gently through the wiper box seals and plunger packing. Pull them out the front of the pump.
3) Pull the stuffing box retainer plate to the back of the cradle, and remove the 3 stuffing boxes.

REASSEMBLY

1) Install the 3 liners in place of the stuffing boxes. The milled flat spots must be aligned to get the liners in the powerframe.
2) Pull the stuffing box retainer plate over the 3 liners.
3) Snap the piston cup over the piston hub. Assemble the piston rod, o-ring, piston assembly, piston keeper and nylock socket head cap screw (12mm hex) together.
4) Insert the entire piston assembly through the liquid end, liner and wiper box and screw into the crosshead. Once it is assembled you can tighten the nylock screw into the piston rod.
5) Reinstall the cylinder head retainer plate and 8 cap screws. Torque in an even manner as shown in the service manual.

CHANGING PISTON CUPS

1) Remove the 8 cap screws and the cylinder head retaining plate from the front of the liquid end.
2) Unscrew the nylock socket head cap screw (12mm hex) and remove with piston keeper.
3) Screw a 5/8”-11UNC all thread stud into the piston hub and remove from liner. Make sure the o-ring comes out also.
4) Change piston cup and reinstall with a new o-ringr and nylock screw. Inspect the piston hub for wear. It should be changed periodically.
5) Reinstall the cylinder head retainer plate and 8 cap screws. Torque in an even manner as shown on previous page.

SC-45L TRIPLEX

DISC VALVE SYSTEMS AND ABRASION RESISTANT

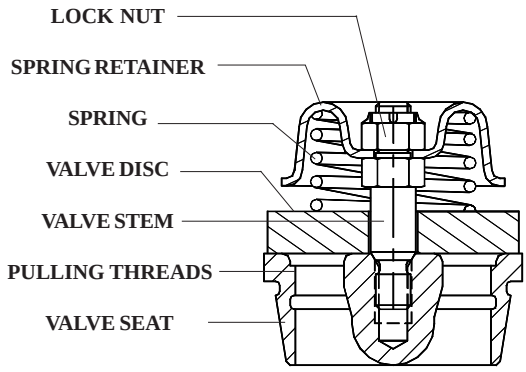
GENERAL

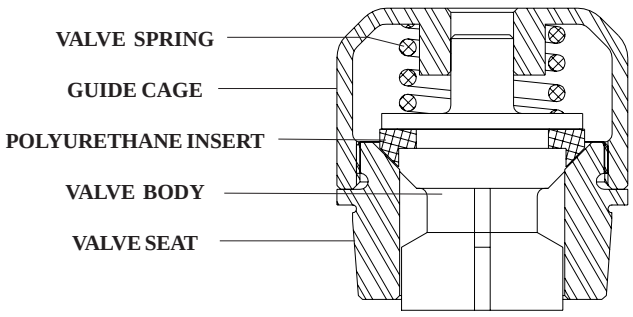
Myers/Aplex has developed a unique setting/puller system permitting quick, easy and safe methods of installing and removing tapered seat valves.

The system allows servicing without distortion of the seat, with minimum effort and **NO** damage to fluid end tapers or seat.

Tapered seats notoriously drive solidly down into mating deck tapers, so firmly that extraction heretofore has always posed severe problems. Old style valves may be pulled only with the greatest effort, using "J" puller heads (prone to failure), CO_2 - Dry Ice, and other improvisations.

DISC VALVE and ABRASION RESISTANT VALVE CONSTRUCTION





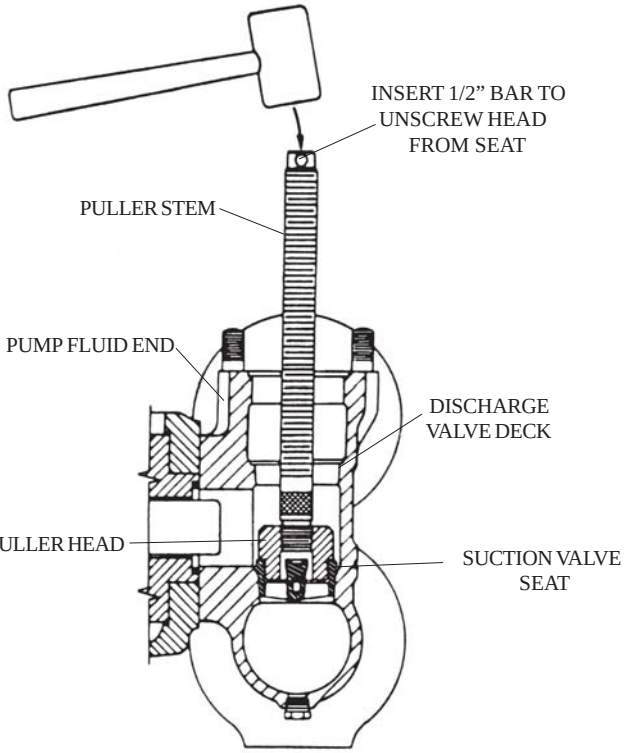
The Myers/Aplex valve is a precision made sub-assembly utilizing threads cut into the rim of seat for use with Myers/Aplex setting/pulling tool. These threads do **NOT** deteriorate as proven by field experience. By locating these on the rim setting/pulling forces are now applied only to the rim of the seat, never to the webs (or "spokes"), or to the center section. Distortion of the seat is eliminated.

Access to these seat threads is provided by the removal of the valve cage on Abrasion Resistant valve or the spring retainer on Disc valves which is screwed onto the seat. An anti-seizing lubricant applied to all threads is good insurance against future difficulty.

SETTING THE VALVE SEAT

Effective pressure-sealing between tapered (male) seat, and tapered (female) fluid end deck is possible **ONLY** if the tapers are absolutely clean and dry just prior to installation. Thoroughly clean surfaces using a clean solvent. Dry with a **CLEAN** shop towel.

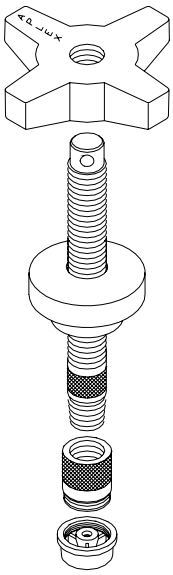
Examine the cleaned fluid end deck tapers, using a flashlight, and remove all deposits of gyp, salt, or other incrustation. Lightly emery cloth any minor imperfections found in the deck taper.



The puller stem and puller head are provided with tapered (locking) threads. Screw them together using two pipe wrenches applied to the knurled areas provided. Then screw the valve seat onto the puller head by hand-until it shoulders against the puller shoulder. Do not tighten.

Lower the seat and puller assembly into the fluid end, squarely setting the seat into the deck. Then pound the top of the stem with a 6 pound hammer until a sharp metallic sound is heard.

Unscrew the head and stem from the seat using a 1/2" bar (or screwdriver) into the hole provided at the top end of the stem.



INSTALLING O-RINGS, ABRASION RESISTANT SPRING AND CAGE

Install Nitrile o-ring over the threaded section of the seat and position it at the bottom of the threads. Install the polyurethane insert into the valve. The insert may be heated in hot water to make it flexible enough to stretch over the valve. Position the valve into the seat. Install the valve spring. Apply anti-seizing lubricant to the threads of the valve cage and screw the cage on to the threaded valve seat with cage setting tool.

INSTALLING DISC, SPRING, DISC VALVES AND STEM:

Myers/Aplex offers discs of "Delrin" acetal resin, of 17-4PH S.S. hardened and ground, and of titanium alloy.

Position the disc and Inconel spring on the seat, aligning the hole in the disc with the stem threads in the seat center.

The stem, spring retainer, and locknut are shipped from Myers/Aplex already assembled and tightened with a torque wrench with "Loc-Tite" sealant added to the top stem threads only.

Torque 16 Ft.Lb.

Use an anti-seizing lubricant in these threads. This is very necessary when seats and stems of Type 316 stainless steel are selected (optional) to prevent galling. CLEANLINESS of threads and other contacting surfaces is of paramount importance in the assembly of all valve elements.

VALVE SPRING OPTIONS

All Myers/Aplex valve springs are made of "Inconel" material, precisely designed and fabricated. Unless otherwise specified, the standard spring is furnished. It provides excellent results in the great majority of applications.

Pumps employed in marginally available NPSH conditions may require a "softer" spring, to reduce the required NPSH. For these special conditions, Myers/Aplex can supply "Light" valve springs which exert lower pressure on the valve disc. The use of "Light" valve springs may be limited by the choice of plunger size and/or limited by the chosen speed of the pump. "Light" valve springs may be impractical for pumps models fitted with their maximum plunger size, or which operate near top speed rating as disc bouncing and erratic seating may occur.

VALVE DISC OPTIONS

Myers/Aplex acetal resin discs made of DuPont "Delrin" are machined flat and smooth to produce perfect sealing on the lapped-flat face of the seat. Used successfully in thousands of applications these discs are light, slightly flexible under load, and seal well, even at high pump speeds, providing smooth pump action.

Acetal resins are very resistant to most corrodents, are not usually suitable where fluid temperatures above 120 degrees are met. Nor do they afford long life at extreme pressures. Pressure limitations depend n valve size. But continuous valve operation at pressures above 2,500 psi usually indicate the need of metal valve discs.

For higher temperatures or pressures, Myers/Aplex offers lapped flat, hardened Type 17-4PH stainless discs, or titanium alloy discs. These metal discs are less tolerant of any fine grit in the liquid and are noisier than the acetal resin disc.

PULLING THE VALVE SEAT

First drain the fluid end entirely. For Abrasion Resistant valves, use the cage wrench to unscrew the cage from the seat. For Disc Valves unscrew the stem from the seat. Remove the cage, spring and valve from the fluid end. Attach the Myers/Aplex puller head to the puller stem, tighten their tapered threads with a pipe wrench applied to the knurled areas of the puller stem and head. Lower the stem and head into the fluid end and engage the threads of the head onto the seat threads.

Using a 1/2" bar (or screwdriver) rotate the head clockwise, thread it fully onto the seat. But, do **NOT** tighten

Slide the bridge over the stem. Clean and oil the stem threads. Oil the face of the wing nut. Thread wing nut down onto the stem, seating it on the bridge top firmly. Extract the seat from the pump by striking the wing nut with a heavy hammer. A hydraulic ram may also be used. Stand clear of the pump when applying heavy tonnage, as the entire assembly will jump violently upwards when the pulling energy is suddenly released!

The Myers/Aplex puller/setting tool and gage tool are custom designed and built for each specific Myers/Aplex pump model. The same puller head is used on both suction and discharge seats. The bridge is made to fit each model and its proper use will not damage the valve cover gasket machined counterbore on the top of the fluid end.

SALVAGE OF WORN SEATS

Rough valve seat faces may often be renewed by lapping or grinding, if not deeply fluid-cut.

Perfect flatness is required. A surface grind, followed by lapping on a lapping plate provides excellent smoothness and the flatness needed for good sealing and smooth running. Metal valve discs may sometimes be salvaged by grinding or lapping, if not deeply cut or cracked.

Delrin discs are relatively inexpensive and salvage is seldom worthwhile. Replace the stem, if severely worn. Inconel valve springs rarely require replacement.

OTHER PUMP BRANDS

Myers/Aplex Industries can provide its unique (patented) valve to fit nearly all brands and models of multiplex pumps. And Myers/Aplex seat setting/puller tool is available, too!

SC-45L TRIPLEX
TROUBLE LOCATION & REMEDY

Trouble	Possible Cause	Remedy
Pump fails to deliver required capacity.	Speed incorrect. Belts slipping.	Change drive ratio or tighten belts (if loose). Correct motor speed.
	Air leaking into pump.	Seal with compounds.
	Liquid cylinder valves, seats or plungers worn.	Reface or lap valves and seats; replace packing or plungers.
	Insufficient NPSHA.	Increase suction pressure.
	Pump not filling.	Prime pump.
	Makeup in suction tank less than displacement of pump.	Increase makeup flow. Reduce pump speed.
	Vortex in supply tank.	Increased liquid level in supply tank. Install vortex breaker.
	One or more cylinders not pumping.	Prime all cylinders. Allow pump to operate at low pressure through bypass valve to eliminate vapor.
	Suction lift too great.	Decrease lift. Raise tank level.
	Broken valve springs.	Replace.
	Stuck foot valve.	Clean.
	Pump valve stuck open.	Remove debris beneath valve.
	Clogged suction strainer.	Clean or remove.
	Relief, bypass, pressure valves leaking.	Repair.

SC-45L TRIPLEX
TROUBLE LOCATION & REMEDY

Trouble	Possible Cause	Remedy
Suction and/or discharge piping vibrates or pounds.	Piping too small and/or too long.	Increase size and decrease length. Use booster pump. Use suction and/or discharge pulsation dampeners.
	Worn valves or seats.	Replace or reface.
	Piping inadequately supported.	Improve support at proper locations.
Pump vibrates or pounds.	Gas in liquid.	Submerge return, supply or makeup lines in suction supply tank.
		If operating under a suction lift, check joints for air leaks.
	Pump valve stuck open.	Remove debris beneath valve.
	Pump not filling.	Increase suction pressure.
	One or more cylinders not pumping.	Prime all cylinders. Allow pump to operate a low pressure through bypass valve to eliminate vapor.
	Excessive pump speed.	Reduce. Check drive ratio.
	Worn valves or seats.	Replace or reface.
	Broken valve spring.	Replace.
	Loose plunger.	Tighten.
	Loose or worn bearings.	Adjust or replace.
	Worn crossheads or guides.	Replace.
	Loose crosshead pin. Loose connecting rod cap bolts.	Adjust or replace.
	Pump running backwards.	Correct rotation.

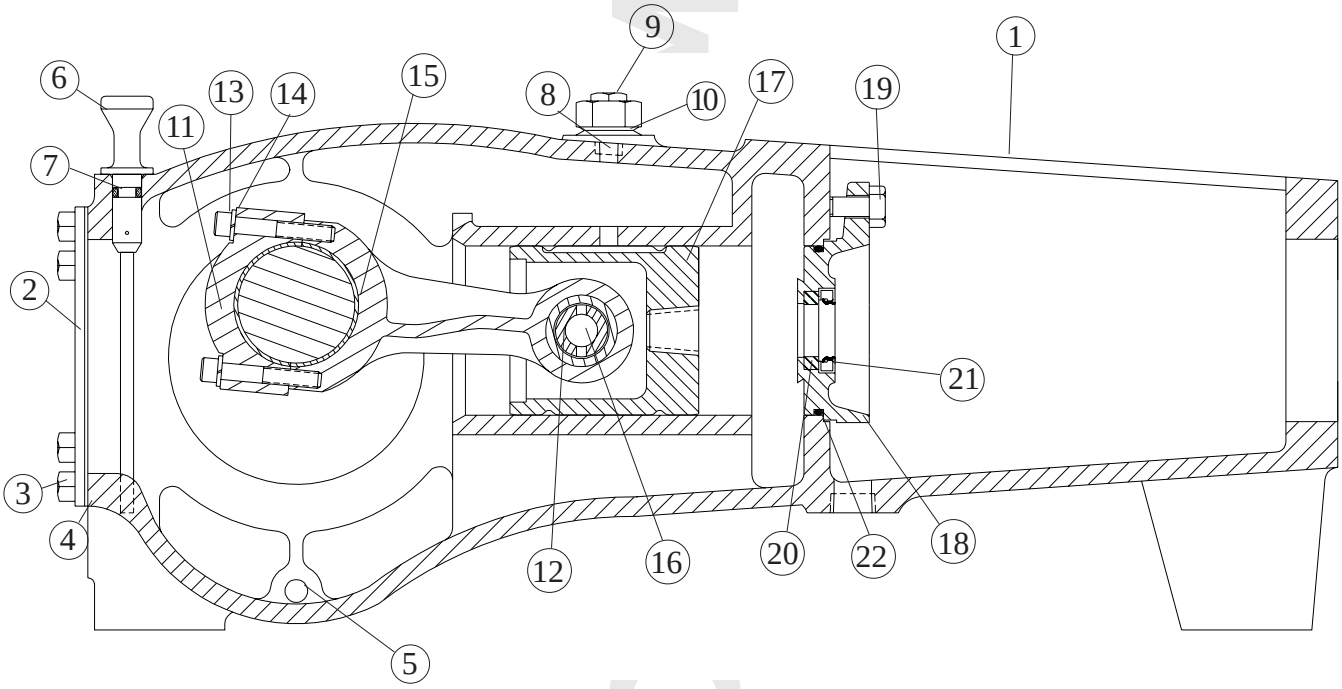
SC-45L TRIPLEX
TROUBLE LOCATION & REMEDY

Trouble	Possible Cause	Remedy
	Water in power end, crankcase.	Drain. Refill with clean oil.
	Worn or noisy gear.	Replace.
Consistent knock.	Worn or loose main bearing, crank pin bearing, wrist pin bushing, plunger, valve seat, low oil level. **NOTE**: High speed power pumps are not quiet. Checking is necessary only when the sound is erratic.	Adjust or replace. Add oil to proper level.
Packing failure. (*excessive*)	Improper installation.	Install per instructions.
	Improper or inadequate lubrication.	Lubricate per instructions.
	Improper packing selection.	Change to correct packing.
	Scored plungers.	Replace.
	Worn or oversized stuffing box bushings.	Repair or replace. Check bore and outside diameter of bushings frequently. (Many times plungers are replaced and bushings ignored.)
	Plunger misalignment.	Realign. Plungers must operate concentrically in stuffing box.
Wear of liquid end parts.	Abrasive or corrosive action of liquid.	Check valves and seats frequently at start-up to determine schedule for replacing, etc. Eliminate sand, abrasive, air entering pump.
	Incorrect material.	Install correct materials.
Liquidend cylinder failure.	Air entering suction system.	Eliminate air. **NOTE**: Pitting often leads to hairline cracks which ends in cylinder failure.

SC-45L TRIPLEX
TROUBLE LOCATION & REMEDY

Trouble	Possible Cause	Remedy
Wear of power end parts. (*excessive*)	Poor lubrication.	Replace oil as recommended in instructions. Keep oil clean and at correct temperature. Be sure oil is reaching all bearings.
	Overloading.	Modify pump or system to eliminate overload.
	Liquid in power end.	Drain power end. Eliminate cause or source of liquid entering power end. Relubricate.
Excessive heat in power end. (*Above 180°F*)	Pump operating backwards.	Correct rotation.
	Insufficient oil in power end.	Fill to proper level.
	Excessive oil in power end.	Drain to proper level.
	Incorrect oil viscosity.	Fill with correct oil.
	Overloading.	Reduce load.
	Tight main bearings.	Correct clearance.
	Drive misaligned.	Realign.
	Belts too tight.	Reduce tension.
	Discharge valve of a cylinder(s) stuck open.	Fix valve(s).
	Insufficient cooling.	Provide adequate cooling for oil or reduce ambient temperature.
	Pump speed too low.	Increase speed.

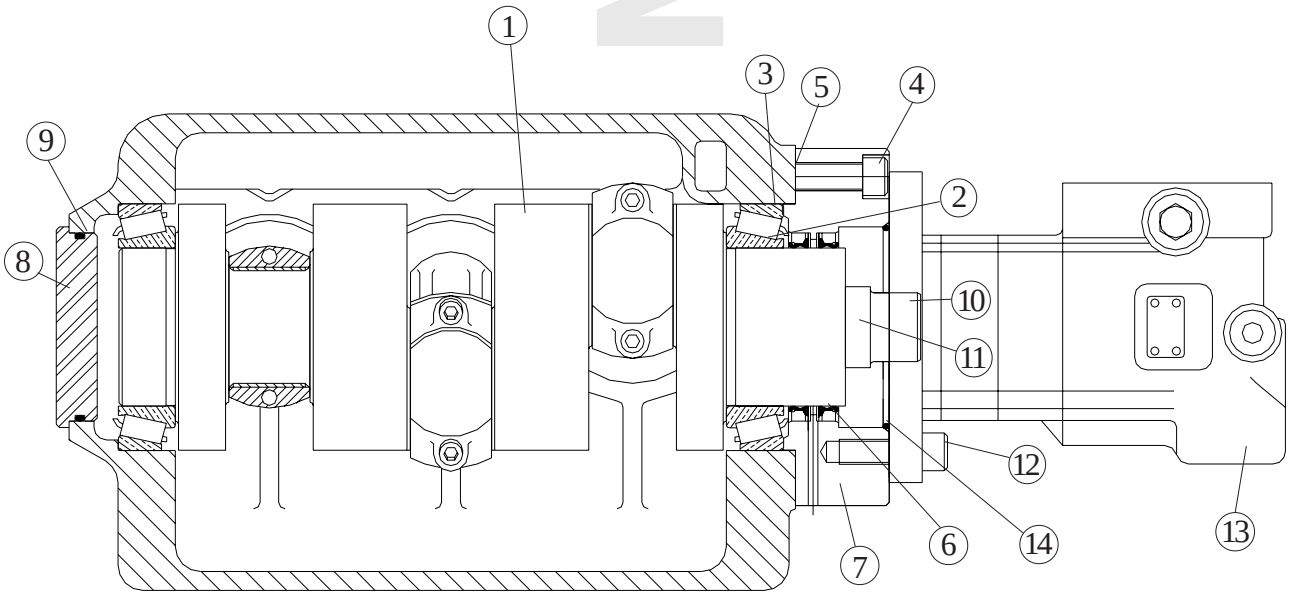
SC-45L TRIPLEX



DESCRIPTION: Power Frame Assembly; Conn. Rod, Crosshead & Wiper Box Assembly

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	Power Frame	7206-0276-00K
2	1	Crankcase Cover	7206-0021-00B
3	8	3/8” NC Hex Head Cap Screw X 5/8” Long	100-038058-273
4	1	Gasket, Crankcase Cover	7206-0022-00A
5	2	3/8” Pipe Plug, Square Head	170-038004-237
6	1	Oil Level Dipstick	7206-0094-00A
7	1	O-ring, size #2-110	110-000110-201
8	3	1/8” Pipe Plug, Socket Head	170-018003-237
9	1	Breather, Crankcase, 3/4” NPTM	7602-3002-10A
10	1	1/2” Pipe Plug, Square Head, Steel	170-012003-250
11	3	Connecting Rod sub-assembly, which includes:	7206-0003-00C
12	(1)	Wrist Pin Bushing	7206-0004-01A
13	(2)	Socket Head Cap Screw- 5/16” NC x 2” long	105-516200-454
14	(2)	5/16” Reg. Spring Lockwasher	154-516059-244
15	3	Crankpin Bearing Pair	7206-0006-00K
16	3	Wrist Pin	7206-0005-00A
17	3	Crosshead	7206-0010-00C
18	3	Wiper Box	7206-0009-00B
19	6	Hex Head Cap Screw- 3/8” x 1-1/4” long	100-038114-454
20	3	Polypak Ring	145-100112-999
21	3	Oil Seal	145-100158-999
22	3	O-ring	110-000234-201

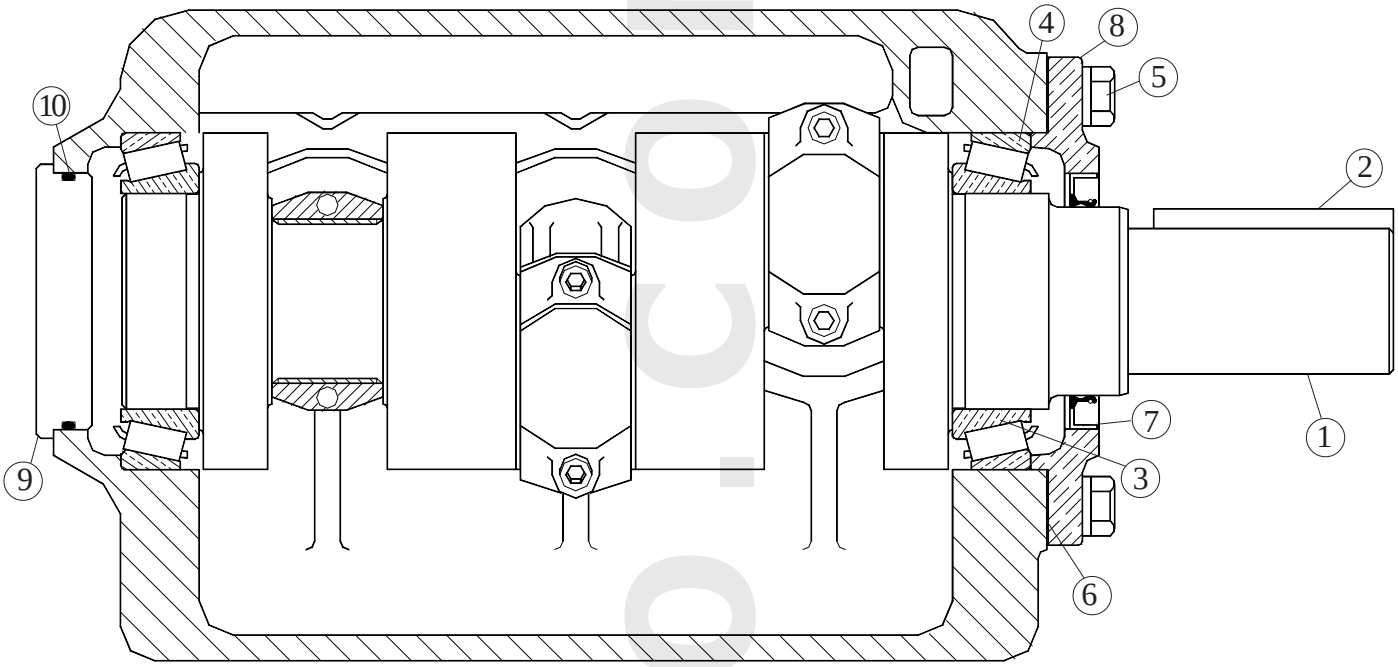
SC-45L TRIPLEX



DESCRIPTION: Crankshaft Assy. 2 1/4" Stroke
Bearingless Hyd. Motor

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
		Crankshaft Assembly *(includes items 1 & 10)*	PE236K
1	1	Crankshaft, for Bearingless Hyd. Motor	7206-0122-50B
10	1	Spline Adapter (coupling)	7206-0121-00A
		OR	
		Crankshaft Kit *(includes items 1, 2, 3, & 10)*	PE236KB
2	2	Bearing Cone, Tapered Roller	203-09624-999
3	2	Bearing Cup	202-02624-999
4	6	1/2” NC Hex Head Cap Screw 2” Long	100-012200-273
5	1	Shim Set	7509-0014-50A
6	2	Oil Seal	145-234334-999
7	1	Bearing Retainer and Motor Adapter	7206-0120-50A
8	1	Frame Plug	7206-0064-00A
9	1	O-Ring #2-238	110-000238-201
10	1	*(listed above with crankshaft assy)*	
11	1	Spacer, Hardened	7206-0363-00A
OPTIONAL:			
12	4	1/2”-13NC Socket Head Cap Screws X 1 1/4”	100-012114-273
13	1	Eaton 2000 Series Two-speed Bearingless Hyd. Motor	
14	1	O-Ring	110-000155-200

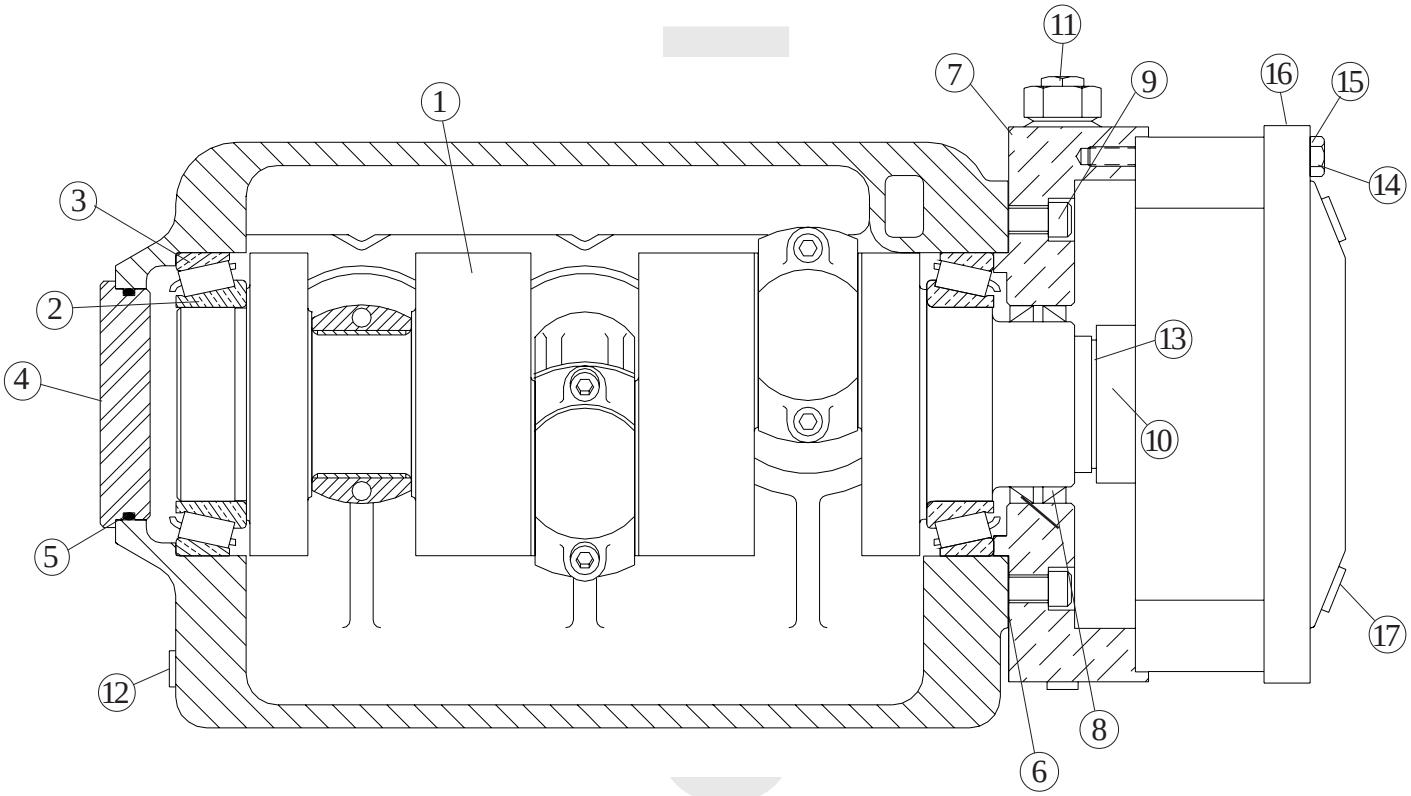
SC-45L TRIPLEX



DESCRIPTION: Crankshaft Assy. 2 1/4" Stroke
Right and Left Hand Drive
Right Hand Shown

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
		Crankshaft Assembly *(includes items 1 & 2)*	PE233K
1	1	Crankshaft, 2 1/4” Stroke	7206-0040-50D
2	1	Drive Key	146-012214-236
		OR	
		Crankshaft KIT *(includes items 1, 2, 3, & 4)*	PE233KB
3	2	Bearing Cone, Tapered Roller	203-09624-999
4	2	Bearing Cup	202-02624-999
5	6	1/2” NC Hex Head Cap Screw 1 1/4” Long	100-012114-273
6	1	Shim Set	7509-0014-50A
7	1	Oil Seal	145-234334-999
8	1	Bearing Retainer	7206-0007-50B
8a	1	(*also available with External Pilot Diameter*)	7206-0206-50A
9	1	Frame Plug	7206-0064-00A
10	1	O-Ring	110-000238-200

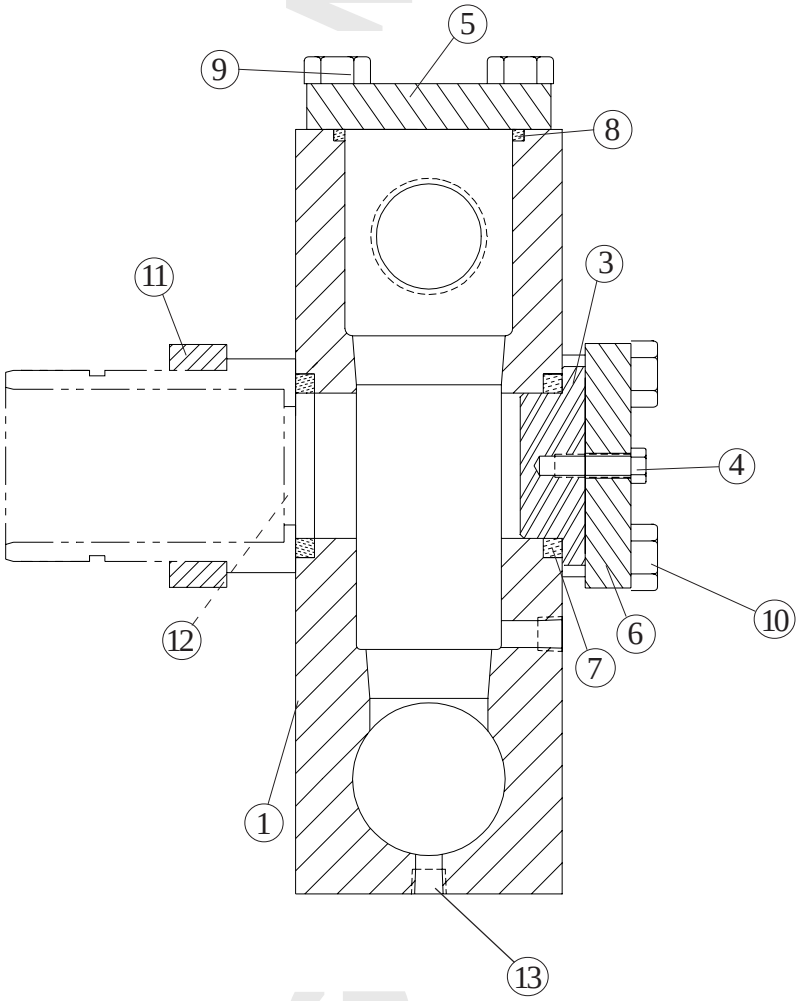
SC-45L TRIPLEX



DESCRIPTION: Crankshaft Assy. 2 1/4" Stroke
Auburn Gear #6 Kit

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
		Crankshaft Assembly *(includes items 1, 10 & 13)*	PE310K
1	1	Crankshaft, 2 1/4” Stroke	7206-0122-50B
10	1	Planetary Output Shaft	7206-0321-00A
13	1	Snap Ring	226-000225-999
		OR	
		Crankshaft KIT *(includes items 1, 2, 3, 10 & 13)*	PE310KB
2	2	Bearing Cone, Tapered Roller	203-09624-999
3	2	Bearing Cup	202-02624-999
4	1	Frame Plug	7206-0064-00A
5	1	O-Ring	110-000238-201
6	1	Shim Set	7509-0014-50A
7	1	Bearing Retainer	7206-0320-00A
8	2	Oil Seal	145-234334-999
9	6	1/2”NC Socket Head Cap Screw x 1 1/2” long	105-012112-273
10	1	(listed above with crankshaft assy)	
11	1	Breather Filter	7602-3002-10A
12	2	1/4”NPT Pipe Plug	170-014001-220
13	1	(listed above with crankshaft assy)	
14	8	5/16”NC Hex Hd. Cap Screw x 3 1/4” long	100-516314-454
15	8	Washer “Stat-O-Seal” 5/16”	156-516062-999
16	1	Auburn Gear #6 Kit 3.75:1 ratio	7203-0505-00A

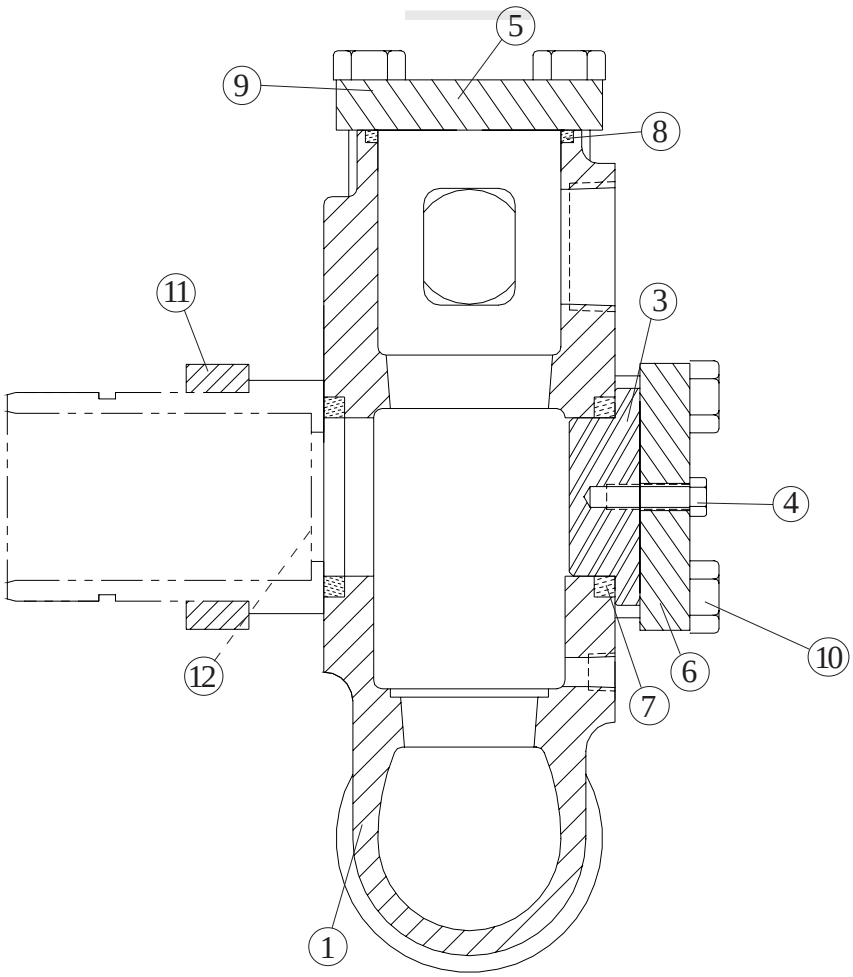
SC-45L TRIPLEX



DESCRIPTION: Fluid End Assembly, Carbon Steel

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	Fluid End, Steel	7206-0268-00B
2	2	3/4" NC Socket Head Cap Screw x 4 1/2" long	271-034412-271
3	3	Cyl. Head Plug	7203-0119-00A
4	3	3/8” NC Hex Head Cap Screw x 1 1/4” long	100-038114-273
5	1	Valve Cover	7206-0284-00 B
6	1	Retainer Plate, Cylinder Head	7206-0019-00B
7	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
8	3	O-Ring #335	110-000335-201
9	8	5/8" NC Hex Head Cap Screw x 1 3/4" long	100-058134-273
10	8	5/8" NC Hex Head Cap Screw x 7 1/2" long	100-058712-273
11	1	Retainer Plate, Stuffing Boxes	7206-0020-00B
12	2	3/8” NC Hex Head Cap Screw x 1 1/2” long	100-038112-273
13	4	1/4” Pipe Plug, S.S	170-014002-263

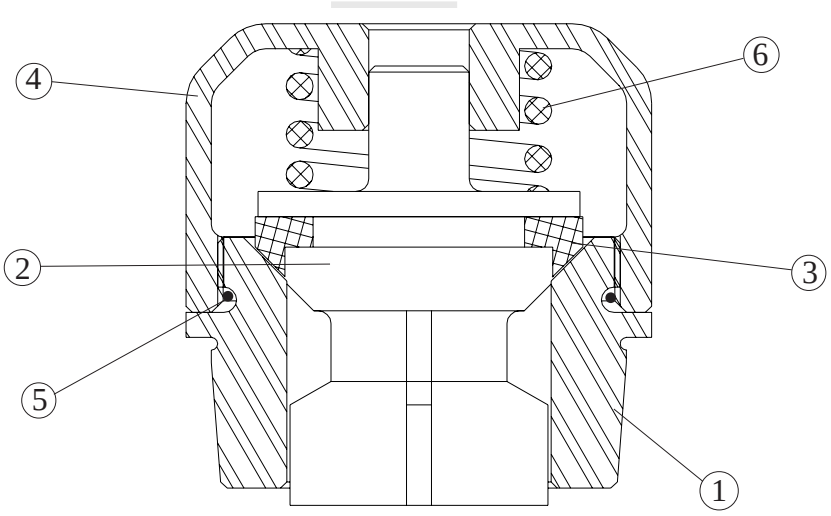
SC-45L TRIPLEX



DESCRIPTION: Fluid End Assembly, Ductile Iron

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	Fluid End, Steel	7206-0277-00B
2	2	3/4" NC Socket Head Cap Screw x 4 1/2" long	271-034412-271
3	3	Cyl. Head Plug	7203-0119-00A
4	3	3/8” NC Hex Head Cap Screw x 1 1/4” long	100-038114-273
5	1	Valve Cover	7206-0284-00B
6	2	Retainer Plate, Cylinder Head	7206-0019-00B
7	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
8	3	O-Ring #335	110-000335-201
9	8	5/8" NC Hex Head Cap Screw x 1 3/4" long	100-058134-273
10	8	5/8" NC Hex Head Cap Screw x 7 1/2" long	100-058712-273
11	1	Retainer Plate, Stuffing Boxes	7206-0275-00B
12	2	3/8” NC Hex Head Cap Screw x 1 1/2” long	100-038112-273

SC-45L TRIPLEX



DESCRIPTION: Abrasion Resistant Valve Assembly
Parts Assembly TS18-AR0-AC0714 Suction
Need 3 per pump

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	Valve Seat, Suction	7203-0543-00B
2	1	Valve Body	7203-0542-00A
3	1	Polyurethant Insert	7203-0546-00A
4	1	Guide Cage	7203-0544-00B
5	1	O-Ring	110-000032-201
6	1	Valve Spring	7206-0302-00A

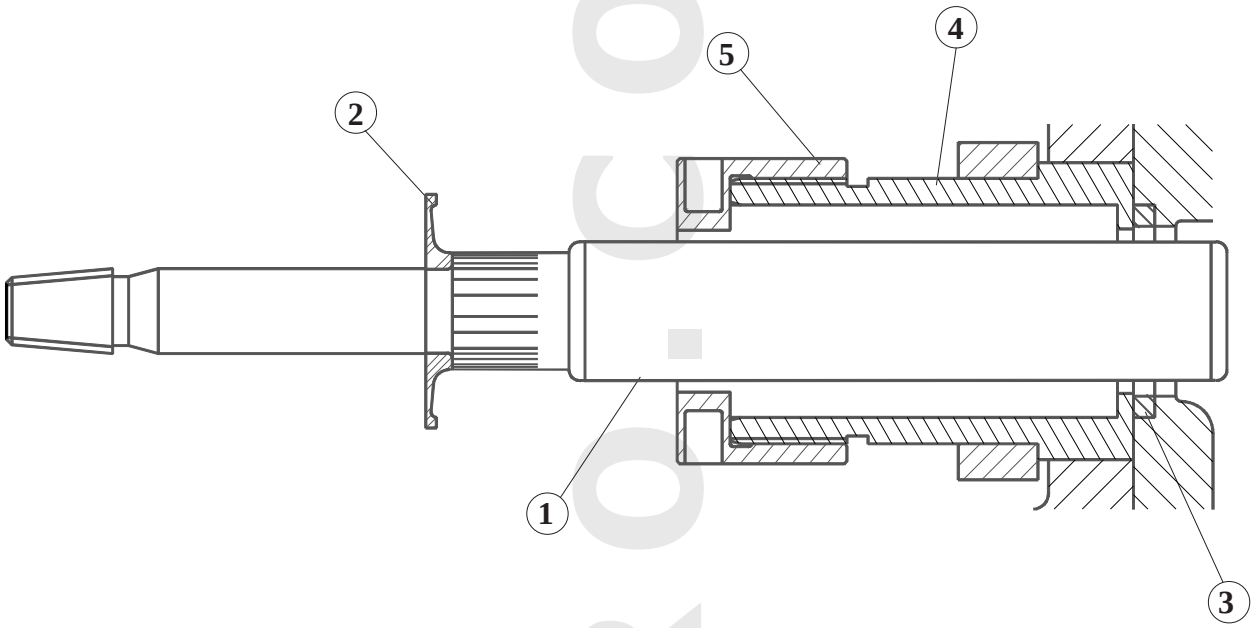
DESCRIPTION: Abrasion Resistant Valve Assembly
Parts Assembly TS18-AR0-AC0715 Discharge
Need 3 per pump

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	Valve Seat, Discharge	7203-0547-00B
2	1	Valve Body	7203-0542-00A
3	1	Polyurethane Insert	7203-0546-00A
4	1	Guide Cage	7203-0544-00B
5	1	O-Ring	110-000032-201
6	1	Valve Spring	7203-0302-00A

DESCRIPTION: Abrasion Resistant Valve Puller Assembly
Parts Assembly FE505

QUANTITY	DESCRIPTION	PART NUMBER
1	Stem	7203-0333-00A
1	Wing Nut	7201-0331-00B
1	Bridge	7203-0380-00A
1	Puller Head	7203-0212-00A
1	Cage Wrench	7203-0577-00B

STUFFING BOX ASSEMBLY



Qty. 3 per pump ea.

PLUNGER DIAMETER	1 *PLUNGER, *CHROME-OXIDE*	2 BAFFLE	3 STUFFING BOX SEAL, *NITRILE RUBBER*	4 STUFFING BOX * *STEEL*	5 GLAND NUT * *STEEL*
2 1/4"	7206-0023-18B	7207-0015-00A	7203-0118-00A	7206-0271-00A	7206-0272-00A
2 1/8"	7206-0023-17B	7207-0015-00A	7203-0118-00A	7206-0271-00A	7206-0272-00A
2"	7206-0023-16B	7207-0015-00A	7203-0118-00A	7206-0271-00A	7206-0272-00A

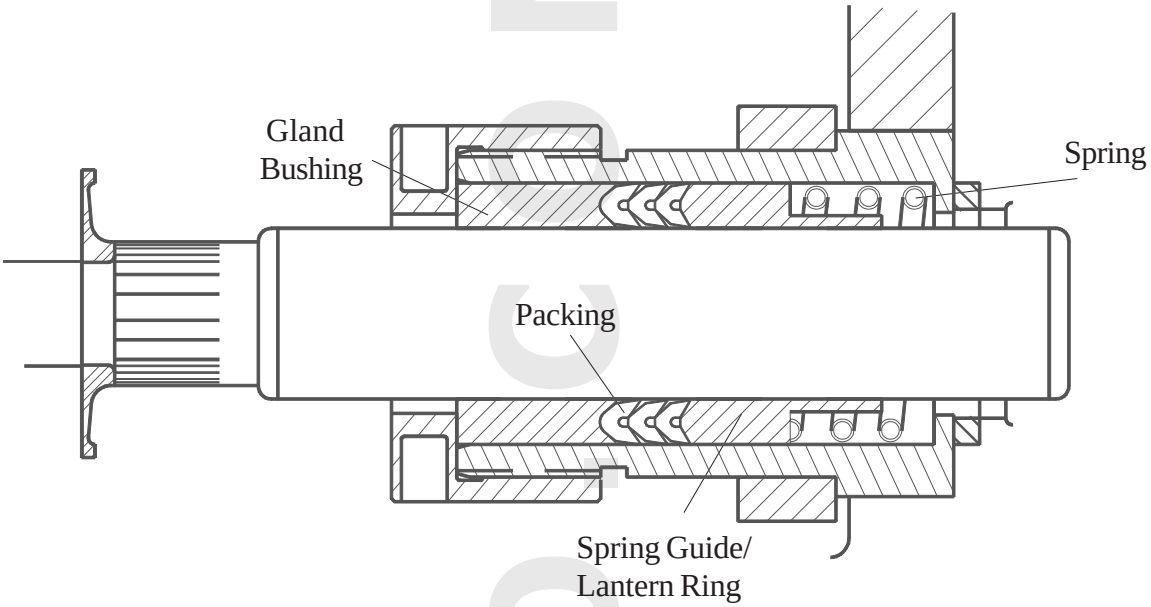
*For TX plunger use 7206-0278-xxB

(for abrasive service)

For both Stuffing Box and Gland use the following:
Nickel Aluminum Bronze: xxxx-xxxx-01A.
316 Stainless Steel: xxxx-xxxx-03A.
2205 Duplex Stainless Steel: xxxx-xxxx-04A.

GLAND NUT WRENCH 7206-0086-00B

SC-45L TRIPLEX

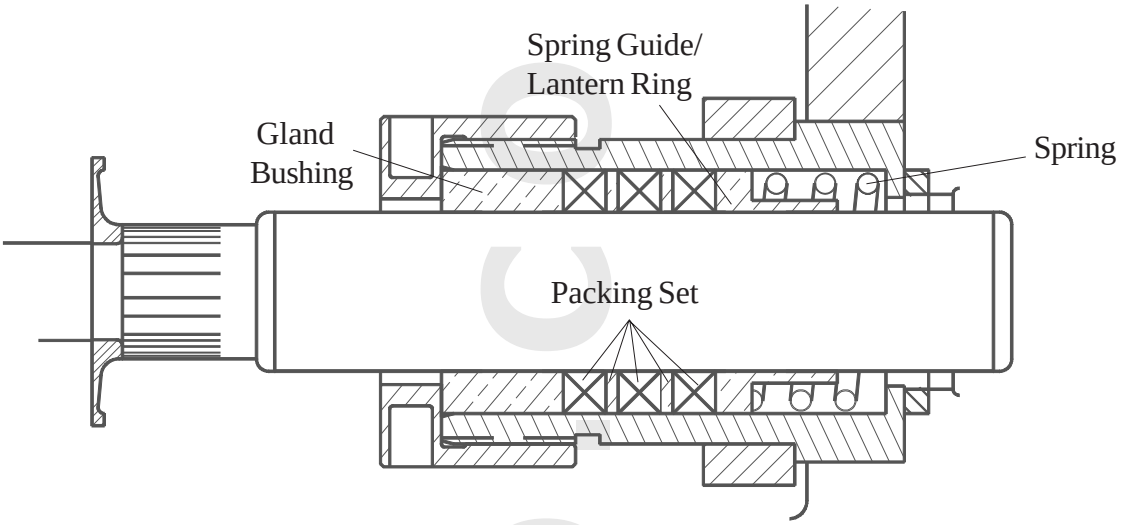


THREE sets per pump

120X & 805 PACKING ASSY

PLUNGER SIZE	STUFFING BOX BORE	MATERIAL	*COMPLETE ASSEMBLY	SPRING	SPRING GUIDE/ LANTERN RING	* PACKING ONLY qty 3	GLAND BUSHING
2 1/4"	2 7/8"	BRASS					
		CAST IRON					
		S. STEEL					
2 1/8"	2 7/8"	BRASS	7202-0514-0001	7202-0344-13A	7202-0514-02A	6618-52-0194-01	7202-0514-03A
		CAST IRON	7202-0514-1001	7202-0344-13A	7202-0514-12A	6618-52-0194-01	7202-0514-13A
		S. STEEL	7202-0514-2001	7202-0344-13A	7202-0514-21A	6618-52-0194-01	7202-0514-23A
2"	2 7/8"	BRASS	7203-0275-0001	7202-0344-13A	7203-0275-01A	6618-52-0542-01	7203-0275-02A
		CAST IRON	7203-0275-1001	7202-0344-13A	7203-0275-11A	6618-52-0542-01	7203-0275-12A
		S. STEEL	7202-0275-2001	7202-0344-13A	7203-0275-21A	6618-52-0542-01	7203-0275-22A

*For **805** use 720x-xxxx-xx02……..0805-xx-xxxx-01



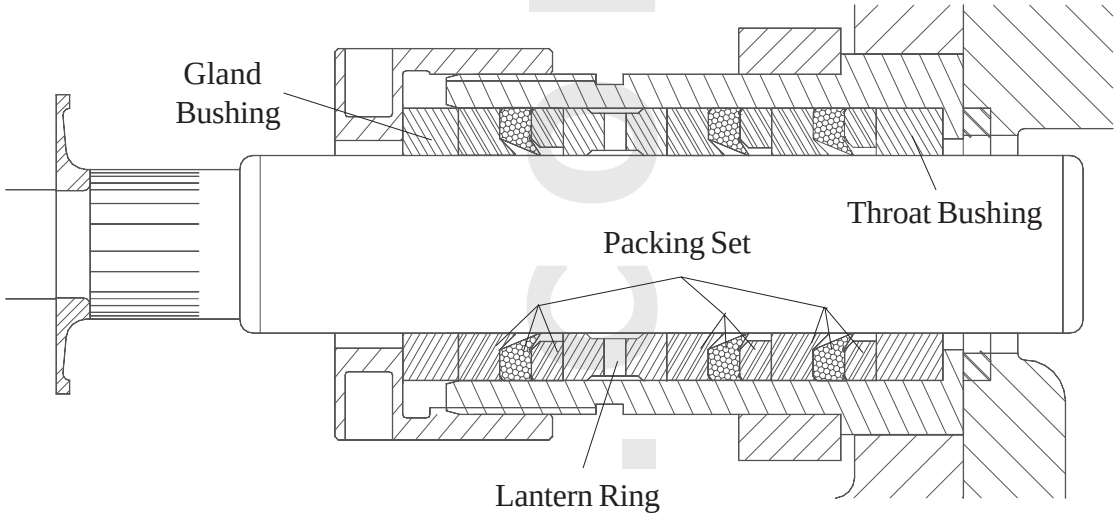
THREE sets per pump

COMPRESISON PACKING ASSY., 140, 141, & 8921K

PLUNGER SIZE	STUFFING BOX BORE	MATERIAL	*COMPLETE ASSEMBLY	SPRING	LANTERN RING	* PACKING SET ONLY	GLAND BUSHING
2 1/4"	2 7/8"	BRASS	7203-0204-0003	7202-0344-13A	7203-0204-01A	0140-52-0111-03	405-214278-302
		CAST IRON	7203-0204-1003	7202-0344-13A	7203-0204-11A	0140-62-0111-03	405-214278-351
		S. STEEL	7203-0204-2003	7202-0344-13A	7203-0204-21A	0140-62-0111-03	405-214278-402
2 1/8"	2 7/8"	BRASS	7202-0582-0003	7202-0344-13A	7202-0582-01A	0140-52-0194-03	407-218278-302
		CAST IRON	7202-0582-1003	7202-0344-13A	7202-0582-11A	0140-62-0194-03	407-218278-351
		S. STEEL	7202-0582-2003	7202-0344-13A	7202-0582-21A	0140-62-0194-03	407-218278-402
2"	2 7/8"	BRASS	7202-0494-0003	7202-0344-13A	7202-0494-01A	0140-52-0542-03	406-200278-302
		CAST IRON	7202-0494-1003	7202-0344-13A	7202-0494-11A	0140-62-0542-03	406-200278-351
		S. STEEL	7202-0494-2003	7202-0344-13A	7202-0494-21A	0140-62-0542-03	406-200278-402

*For **141** use 720x-xxxx-xx04……0141-xx-xxxx-01

*For **8921k** use 720x-xxxx-xx05……8921-xx-xxxx-01

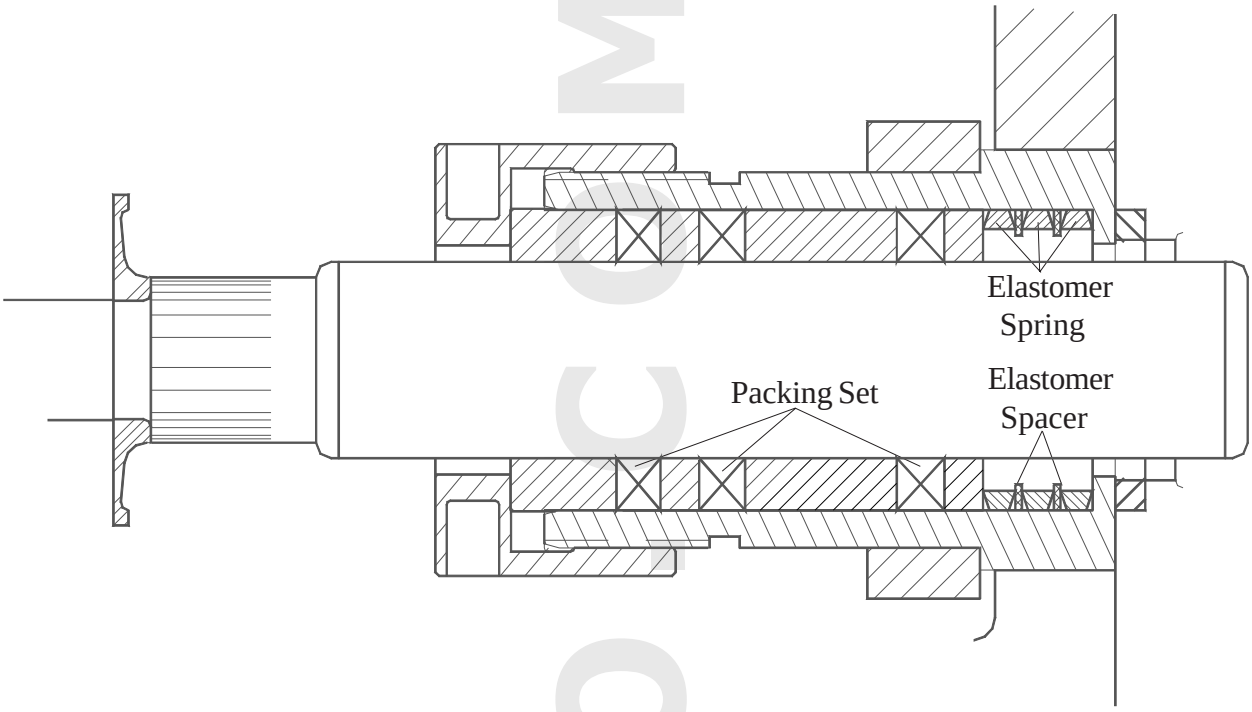


THREE sets per pump

838 PACKING ASSY.

PLUNGER SIZE	STUFFING BOX BORE	MATERIAL	COMPLEIE ASSEMBLY	THROAT BUSHING	LANTERN RING	PACKING SET ONLY	GLAND BUSHING
2 1/4"	2 7/8"	BRASS					
		CAST IRON					
		S. STEEL					
2 1/8"	2 7/8"	BRASS	7203-0573-0006	408-218278-302	7203-0573-02A	0838-01-0194-08	424-218278-302
		CAST IRON	7203-0573-1006	408-218278-351	7203-0573-12A	0838-01-0194-08	424-218278-351
		S. STEEL	7203-0573-2006	408-218278-402	7203-0573-22A	0838-01-0194-08	424-218278-402
2"	2 7/8"	BRASS					
		CAST IRON					
		S. STEEL					

SC-45L TRIPLEX

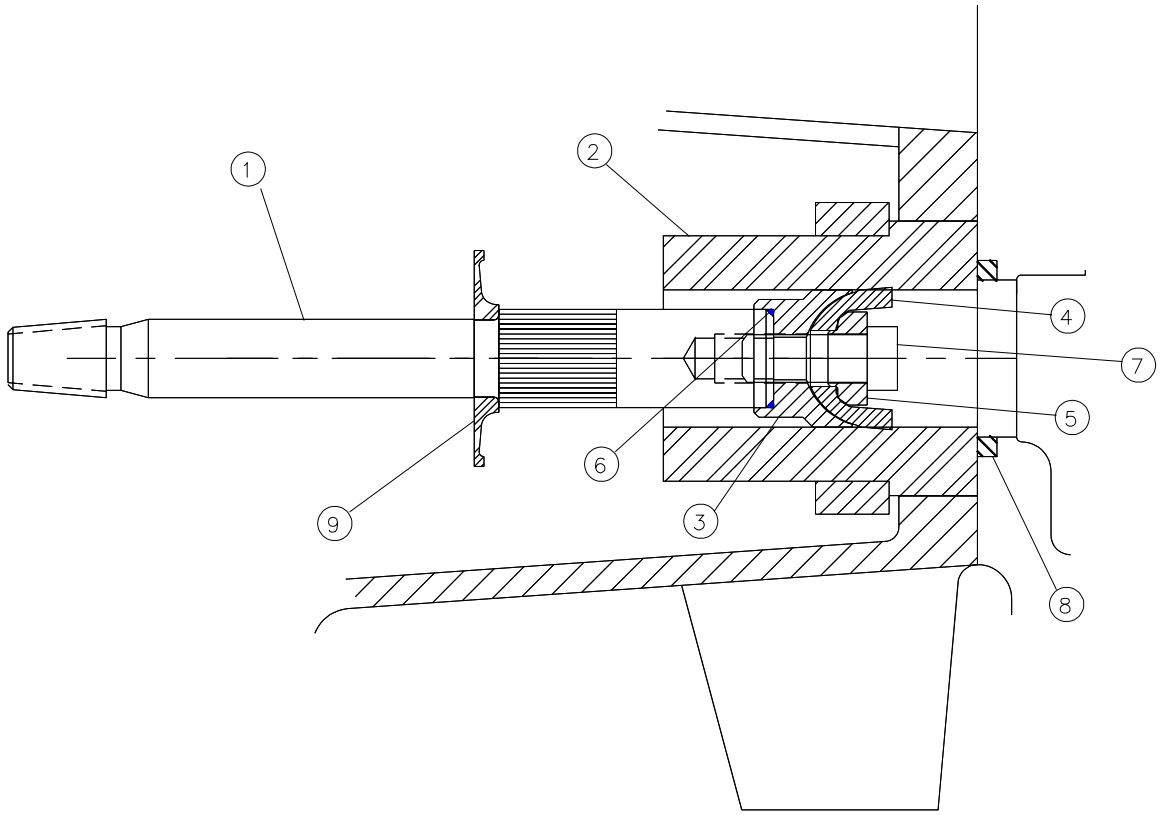


THREE sets per pump

HI/LO PACKING ASSY.

PLUNGER SIZE	STUFFING BOX BORE	MATERIAL	*COMPLETE ASSEMBLY	ELASTOMER SPRING	ELASTOMER SPACER	PACKING SET ONLY
2 1/4"	2 7/8"	BRASS	7203-0428-0007	7203-0399-00A	7203-0401-00A	0143-20-0111-01
		CAST IRON	7203-0428-1007	7203-0399-00A	7203-0401-00A	0143-20-0111-01
		S. STEEL	7203-0428-2007	7203-0399-00A	7203-0401-00A	0143-20-0111-01
2 1/8"	2 7/8"	BRASS	7203-0413-0007	7203-0399-00A	7203-0401-00A	0143-20-0194-01
		CAST IRON	47203-0413-1007	7203-0399-00A	7203-0401-00A	0143-20-0194-01
		S. STEEL	7203-0413-2007	7203-0399-00A	7203-0401-00A	0143-20-0194-01
2"	2 7/8"	BRASS	7203-0428-0007	7203-0399-00A	7203-0401-00A	0143-20-0542-01
		CAST IRON	7203-0428-1007	7203-0399-00A	7203-0401-00A	0143-20-0542-01
		S. STEEL	7203-0428-2007	7203-0399-00A	7203-0401-00A	0143-20-0542-01

SC-45L TRIPLEX



DESCRIPTION: Piston Assembly
2 1/4" Kevlar and Chrome Oxide

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	Piston Rod	7206-0365-00B
2	1	Piston Liner 2 1/4" White Ceramic	7206-0364-00A
		Piston Liner 2 1/4" Chrome Oxide	7206-0406-00A
3	1	Piston Hub	7206-0383-00A
4	1	Piston Cup HSN and Kevlar	7206-0380-00A
5	1	Piston Keeper	7206-0384-00A
6	1	O-Ring	110-000024-218
7	1	Socket Head Cap Screw	16654A006
8	1	Fluid Seal	7203-0118-00A
9	1	Baffle Plate	7206-0015-00A