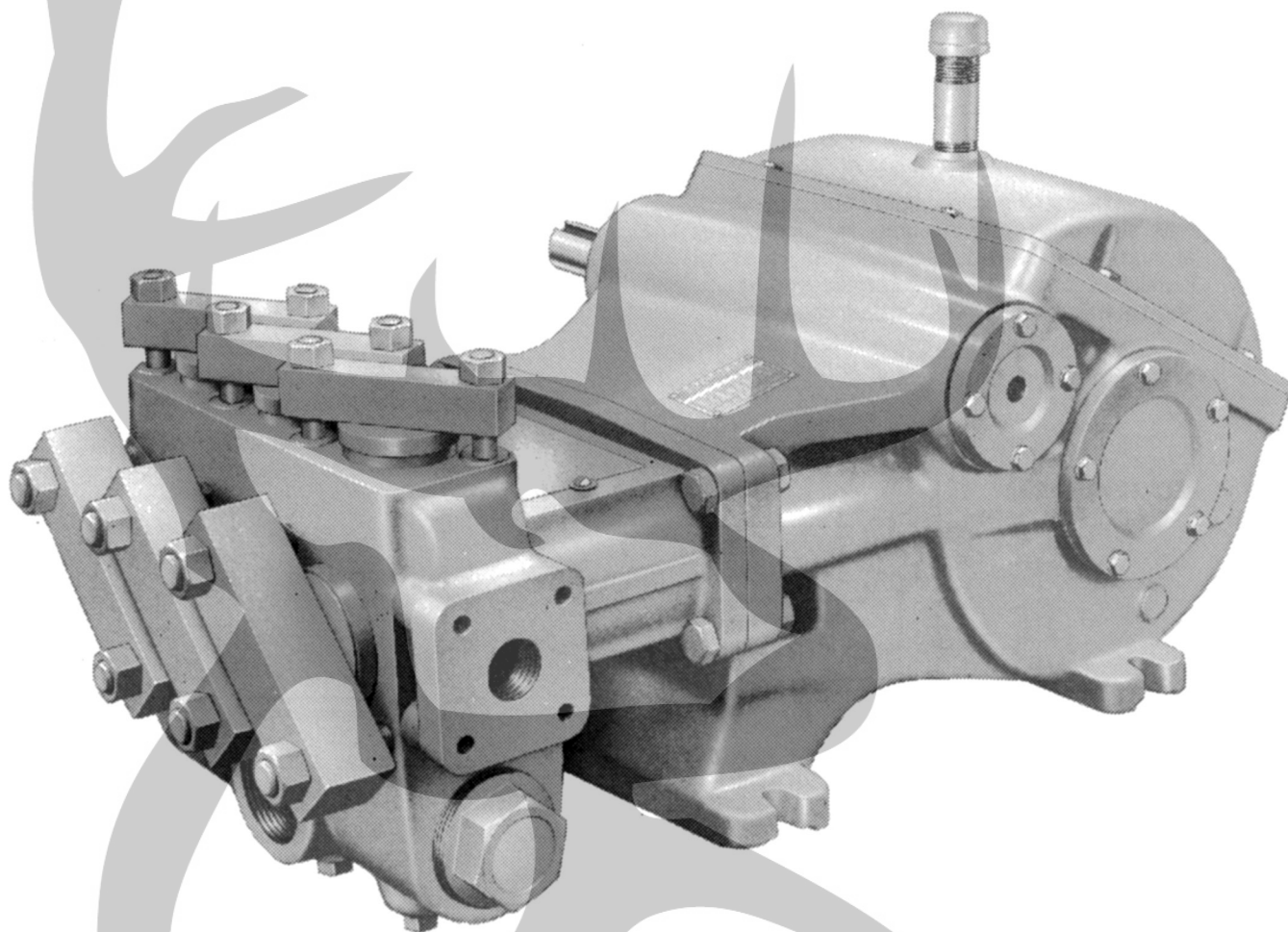




**MYERS®**



# BUCKHORN D35, D50 AND D60 SERIES INDUSTRIAL PUMPS, INC.

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

## GENERAL INSTRUCTIONS

Reciprocating pumps of both the plunger and cup type are positive displacement in principle. Due to positive displacement characteristics, problems may arise through improper installation or application. When new or unusual installations are planned, or the material to be pumped is a liquid other than cold water, the customer should consult the factory for additional information.

Positive displacement pumps must have a proper size and operable type of pressure regulating valve or pressure relief valve piped into the discharge line. This is mandatory to prevent damage to pump and piping or possible injury to personnel. Do not install any valves or shutoff devices in the by-pass line from pressure regulator to tank or supply.

All pumps should be installed level. For mobile applications the maximum angle of intermittent operation should be no more than 5 degrees in any one direction.

### CALIFORNIA PROPOSITION 65 WARNING:

**⚠ WARNING** This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

## INSTALLATION

Install suction piping one pipe size larger than suction tapping in pump. Reduce piping size at pump with a reducer coupling. A suction surge arrester will assure smoother operation. Keep suction piping as short and simple as possible with a minimum of lift when operating under suction lift conditions. Avoid any high points in suction line. Suction piping must not have any air leaks. Check suction piping assembly for leaks by using 20-80 psi air pressure and soap bubbles or submerging assembly under water.

Use suction strainer and screen of adequate size to avoid restriction of pump suction. Strainer mesh should be sufficiently small to prevent passage of trash which may lodge under pump valves. Keep screen clean with a regular maintenance schedule to avoid starving pump suction. Many pump problems and most plunger cup failures are directly traceable to a starved suction condition.

When pumping liquids that are heated, reduce pump speed to avoid suction problems. Be sure that discharge line is properly protected by means of a pressure regulating valve and a discharge surge arrester of proper size, capacity and pressure rating. The discharge line should be of comparable size to discharge tapping in pump. Discharge line velocity should not exceed 5 feet per second for most satisfactory operation.

Nozzle capacity or demand should not exceed 90% of pump capacity for satisfactory regulating valve operation. Nozzling in excess of this capacity may cause unstable pressure regulator operation. It is also preferred to nozzle in excess of 50% of pump capacity to reduce the rate of erosion or wear on the regulating valve and seat.

When lower system capacity demands are required, the pump speed should be reduced by changing drive ratios. This will reflect savings in power consumption, while reducing valve wear and extend pump life.

If line shock or water hammer is encountered, a second surge arrester should be installed in the discharge line adjacent to the spray gun or nozzles. Under some conditions it may also be desirable to isolate pump from piping with a suitable high pressure hose. This will eliminate transmission of line vibration to the pump and minimize possible failure of piping, pipe threads and pump casting.

Never pipe the bypass from a pressure regulating valve back into the pump suction. When the discharge line is shut off, the complete bypass is circulated back into the pump suction with a resulting rapid temperature rise which will destroy plunger cups and gaskets.

Avoid freezing by draining all water from pump and system in cold weather. Make sure that the drive is adequate for the horsepower required and is properly aligned and tensioned. With belt drives, the pulley on both the motor and pump should be located as closely as possible to the bearing to reduce bearing and shaft bending loads. Make sure that all bolts, nuts, set screws and keys are properly tightened and pump belts and pulleys are properly protected by guards according to code.

## DIRECT DRIVE ENGINE DRIVEN PUMPS

It is desirable to align the Dodge® Para-Flex® couplings as accurately as possible to minimize flexing. After any repositioning, recheck both parallel and angular alignments by mounting indicators, near the O.D. of the flange, and rotate the shaft 360 degrees. A good installation indicator reading should exceed .030". Flange should be positioned on shaft to obtain 3-1/16" measured from adapter to rear of clamp ring. Adaptor bolts should be torqued to 300lbs and clamp ring bolts to 400lbs.

## STARTING PUMP

Fill pump crankcase with recommended oil to the level mark on the oil saber. Oil recommendations are covered in lubrication section of pump instructions. Replace all drain plugs in pump and piping. Inspect tank to be sure that no foreign material is in tank or suction line. Fill tank at least half full or connect

suction to water supply. Open valve if present in suction line. If pumping from a pit, make sure that suction line is completely submerged. Make sure all valves, including spray gun or nozzles, are open in discharge line. Spray gun may be anchored to discharge back into the tank. Completely back off pressure adjusting screw on pressure regulating valve.

**CAUTION:** When pumping from a pit or under a suction lift condition, remove the cylinder end caps and pour water into each cylinder. This will assure that water is present in the cylinder to lubricate cups.

After starting, close discharge valve or spray gun slowly while watching pressure gauge to make sure relief valve or unloader is operating properly. Adjust relief valve or unloader to desired pressure. See regulator instructions. Cycle nozzles, or gun, on and off to be sure that pressure adjustment and regulator operation is satisfactory. Nozzle capacity should not exceed 90% of pump capacity for satisfactory regulating valve operation.

## LUBRICATION

Fill gear case with Mobilgear 630 or equal additive to 3-1/2 qts for D35 Series and 5-1/2 qts for D50-60 Series. Maintain oil level at the mark on oil dipstick.

**NOTE:** After first 30 hours of operation, drain oil from gear case (preferably drain at operating temperature), replace plug and fill gear case with kerosene to normal oil level. Operate at full speed at zero pressure for two minutes then drain, replace plug and refill crankcase with new oil. Change oil every 300 hours thereafter. Check oil level daily and add oil as needed.

## ADDITIVES FOR CRANKCASE OIL

Use of molybdenum disulfide ( $\text{MoS}_2$ ) is highly recommended as an additive to the gear case oil in back geared pumps and speed reducers. The additive is compatible with all known oils. It appears to be so effective in reducing wear and friction that power train life may be doubled between overhauls.

- D35 volume  $\text{MoS}_2$  concentrate or dispersion "M" for 5% – 6 fl. oz.
- D35 volume  $\text{MoS}_2$  concentrate or dispersion "M" for 10% – 12 fl. oz.
- D50-60 volume  $\text{MoS}_2$  concentrate or dispersion "M" for 5% – 9 fl. oz.
- D50-60 volume  $\text{MoS}_2$  concentrate or dispersion "M" for 10% – 18 fl. oz.

## SERVICE

Disconnect electrical leads to motor, or remove spark plug leads on engine.

## REMOVING PLUNGERS: BELL SHAPED CUPS

Place plunger at front end of cylinder and remove valve assembly, if required, to provide clearance for pulling plunger. Remove socket head cap screw, thread plunger removal tool onto plunger stud and pull plunger out of cylinder liner.

## REPLACING PLUNGER CUPS (MODELS D35-12D, D50-12, D60-10)

Remove nut from plunger stud and remove worn cup. Apply non-hardening sealing compound and replace with new cup. Thread nut back onto plunger stud and tighten nut to a snug compression loading.

**CAUTION:** Do not overtighten nut on plunger cup, as this will cause excessive squeeze at the cup heel resulting in rapid cup wear.

Before installing the plunger in the cylinder, the ring gasket seal between the plunger and rod should be inspected and replaced if worn. Inspect cylinders for linear grooving and replace cylinders if necessary. New cups will rapidly cut or wear out in groove cylinders.

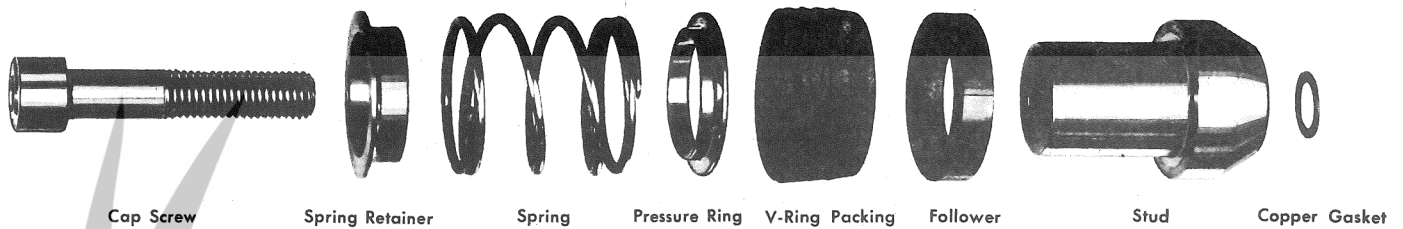
Thread the plunger removal tool onto the plunger stud making it flush with the plunger nut. Lubricate plunger cup with Molykote® or Lubriplate® and check to be sure that the ring gasket is installed in plunger stud. Retract plunger rod by rotating pump crankshaft. Install plunger by driving plunger assembly back into cylinder. Replace plunger rod socket head cap screw.

## REPLACING PLUNGERS V-RING PACKING (MODEL D35-12AVD)

Move plunger to the front end of the cylinder and remove valve assembly if required to provide clearance for pulling plunger. Remove cap screw and with plunger at extended position, back off piston rod and insert tool until large diameter catches behind stud. Force plunger assembly from liner by rotating crankshaft slowly. Inspect cylinders for linear grooving and replace cylinders if necessary. New packing will rapidly cut or wear out in grooved cylinders.



## V-RING PLUNGER ASSEMBLY



V-rings should be lubricated with Molykote for ease in assembly. Do not use a graphite type grease.

When installing each V-ring plunger assembly, rotate crankshaft until piston rod is at the most extended position. Place copper gasket in position in the stud and use a small amount of Permatex® to hold in place. Insert plunger assembly into liner and drive slowly into place. Cap screw should then be inserted and torqued to 25 ft/lb.

### REPLACING PLUNGERS SINGLE LIP CUP (MODEL D35-8PP)

Move plunger to front end of cylinder and remove suction valve if required for clearance for pulling plunger. Remove socket head cap screw and rotate crankshaft to retract plunger rod from cylinder. Insert V-ring packing tool into rear of cylinder and force plunger assembly from cylinder by slowly rotating crankshaft. Inspect cylinders for linear grooving and replace cylinders if necessary. New cups will rapidly cut or wear out in grooved cylinders.

Grease the O-ring and install in the groove on cup follower. With a flat plate behind cup, hold the cup and follower firmly in a vise with follower boss in hole in cup. Use a thin blunt tool and carefully push entire circumference of O-ring to the back of the groove and under the lip of the cup. Assemble all parts onto socket head cap screw and apply Lubriplate® to the outside of cup. With plunger rod in forward position, insert plunger assembly into cylinder and tighten cap screw.

### REPLACING CYLINDER LINERS

Remove plungers and rotate crankshaft until piston rod is in rear position. Insert puller through the inside of cylinder and pilot over piston rod. Insert disc into slots on puller and slip plate over threads on puller. Screw nut onto thread on puller and snug up. Tighten nut until liner breaks loose. Loosen nut, slip disc out of slot and remove puller. Repeat to remove remainder of cylinder liners.

Reasonable care and judgment should be used when installing the new tapered cylinder shell. Clean out any accumulation of loose rust or corrosion in tapered cylinder slots. Insert shells into position by hand and drive into position firmly. Never use a hand or hydraulic arbor press to install cylinder shells. If extreme pressures are used during installation, parts will be very difficult to remove for later replacement and liners may be distorted.

### REPLACING SEATS: CENTER POST VALVES

Remove the valve and cylinder caps which provide access to both the suction and discharge valves. Remove the stainless steel shoulder screw, which serves as a valve guide and spring retainer, spring and valve from the pump fluid end. Assemble stud, retainer and three screws. Insert screw heads through holes in valve seat. Rotate retainer to the right until heads catch and secure in place by screwing down stud firmly by hand. Place plate over stud and screw on nut. Torque slowly until seat breaks loose. Suction valve seats in similar manner, except two stud lengths are joined using coupling.

**NOTE:** Valve seats are usually distorted and cannot be reused unless face is reground to flat condition.

Inspect tapered valve seat bore in fluid end for rust and wipe out excess. Place a new lower seat in tapered hole and drive lower seat firmly into place. Repeat for upper seat being sure to also inspect the tapered bore in housing for rust. Reassemble the valve, spring and spring retainer, and verify that springs are in correct location. When upper and lower valve seats are the same size, the heavier spring is always installed on the upper or discharge valve.

**NOTE:** Be sure that shoulder screw is bottomed in valve seat and the valve disc is installed on valve with flat face down.

Inspect O-ring on valve and cylinder caps. Replace if they show signs of wear. Lubricate O-rings and replace cap, bar and nuts.

## REPLACING SEATS: CAGED VALVES

Remove spring retaining bar, spring and flat valve. When removing upper valve seat, pass head of puller through hole in valve seat before the slide wedge is inserted alongside puller bolt. Draw down on the nut at the top of the bolt. When removing lower seats, drop puller bolt through opening for upper seat and remove in same manner using the slide wedge on pumps where lower seats are same size as upper seats.

Place new lower seat in tapered hole in cylinder body. Hold a soft brass or hardwood round bar against slot and drive into place. The knocker stem is in two pieces so that it can be shortened for installing discharge valves after suction valves have been installed.

## REPLACING PLUNGER ROD SEALS

The rod seal assembly contains two seals and two oil seals with lips facing the power end. The oil seal can be replaced without taking the fluid end off by removing the cylinder and piston to allow access to oil seal housing. Unscrew the two Allen screws and place them into the other two tapped holes. Gradually screw them in to push oil seal housing off the retainer. After assembling new seals in oil seal housing, an assembly thimble should be used on the end of the crosshead rod for sliding the oil seal housing back into the retainer. Check gasket and replace if damaged.

## REMOVING CRANKSHAFT AND PINION SHAFT

Remove plunger assemblies and remove connecting link caps. Move the link-crosshead assembly as far forward as possible. On some models, it may be necessary to remove the fluid cylinder body to obtain clearance for crankshaft removal.

Secure separation of the crankshaft gear and gear case so that crankshaft will be held in place against pinion shaft. Remove both crankshaft bearing caps. Hold crankshaft at ring gear and left-hand link journal to prevent dropping into bearing bores and remove from gear case by moving crankshaft to the right until left end can be swung free.

To remove pinion shaft, observe inside of gear case to see if small sheet metal plates are in front of each bearing. These plates must be removed prior to the bearing caps.

Tap the end of the pinion shaft extension to remove the bearing cup at the opposite end. After removing pinion shaft, the remaining bearing cup can be removed by gently tapping against the peripheral edge of the cup with a brass rod.

## REPLACING PINION SHAFT AND SHIMMING BEARINGS

After installing the link-crosshead assemblies and moving them toward the fluid end as far as possible, tap the right-hand pinion shaft bearing cup into position using the bearing cap. Place pinion shaft in position and tap left-hand bearing cup into place. Replace sheet metal plates, if used on this model pump.

Cover the shaft keyway to protect lip of oil seal. Slide on the open bearing cap with a .030" shim. Tighten the four cap screws to recommended torque.

Install other cap using total shim thickness. Tighten cap screws holding pinion or crankshaft caps to gear case. Rotate pinion shaft back and forth, applying about 15 lbs. axial force to properly seat tapered rollers. Measure end-play by using an indicating gauge.

Subtract recommended end-play (.005" – .009") from actual end-play. This is the amount of shim that must be removed. After excess shim thickness has been removed, replace caps and retighten cap screws. Measure end-play, and if end-play is not within limits recommended, add or subtract shims as required.

Pinion bearing shims are made of .002" layers bonded together. Start separation of layers by heating edge, then peel back.

## REPLACING CRANKSHAFT AND SHIMMING BEARINGS

Press the bearing cups into the caps. Place one cap into position on the right side with cap screws engaged about one turn. Install crankshaft, left end first, and push both bearing caps into place. Extreme care should be exercised to avoid damage to gear teeth, bearings and link journals.

For quiet operation and long life, the crankshaft and bearings must be installed with .003" to .005" preload. To adjust, loosen the four cap screws on the pinion shaft bearing cap. Place about a .045" shim on the right crankshaft bearing cap and tighten the five cap screws. Install the left cap without shims and secure with two cap screws. Torque at 13 ft/lbs and rotate the crankshaft. Retorque the cap screws. Repeat three times to properly seat the tapered roller bearings. Measure the shim gap remaining between the bearing cap and the gear case. Required shim thickness for this cap is equal to the average gap measurement plus .031" for D35 and .022" for D50-60 Series. Insert correct shim thickness under left bearing cap and tighten cap screws. Next, install connecting links and caps, and torque cap screws.

Check for adequate side clearance of links on crankshaft. Some shims must be moved from one end to the other until sideways movement of all links can be seen. Check the torque of cap screws on all bearing caps.

## RECONDITIONED CRANKSHAFTS

When the crank throws are slightly damaged, they can sometimes be reconditioned for further use. This can be done by sandpapering and polishing until all ridges are completely removed. The final polishing operation should be with very fine emery cloth. If the surface is badly damaged, the crankshaft can often be salvaged by “metalizing” the crank throw, regrinding and polishing to the original diameter.

## SERVICING CONNECTING LINKS

The connecting rod link is furnished with replaceable split sleeve bearing inserts at the crank throw. Do not attempt to re-fit connecting links to the crankshaft bearings by filing or grinding the mating faces of the link cap where it contacts the link. Always be sure that the proper side of the link is placed upward when attaching it to the crankshaft. The upper side contains an oil hole at the crosshead end of the link. This oil hole must be up to allow proper oil feeding to the crosshead pin bushing. The wrist pin is then press-fitted into the crosshead and slip-fitted through the bronze bushing. Use an arbor press to force in the wrist pin, checking to see if the link is free to rotate after the wrist pin is pressed in. Verify that both sides of the wrist pin do not protrude beyond the crosshead.

The crosshead end of the connecting link is fitted with a bronze bushing. New replacement link bushings are reamed to the proper size for immediate installation. If the bushing is removed from an old link, it may be necessary to ream the replaced bushing to the proper inside diameter after it is pressed into the link. When placing the bushing on the link, be sure that the oil holes in the bushing and link are in line after the bushing is pressed into position.

## CROSSHEAD AND PISTON RODS

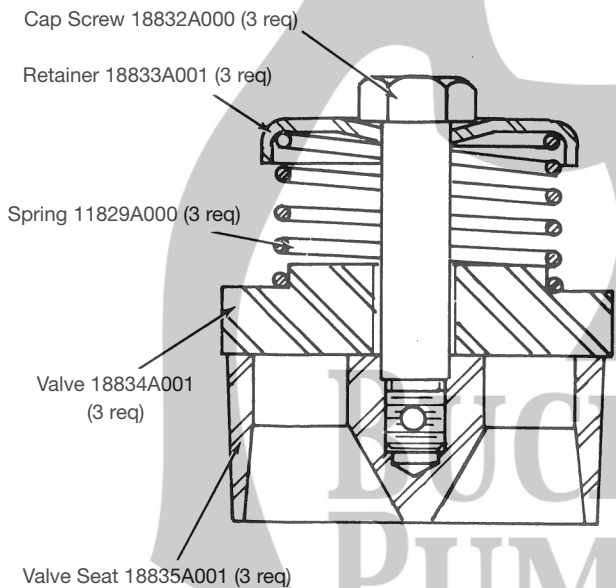
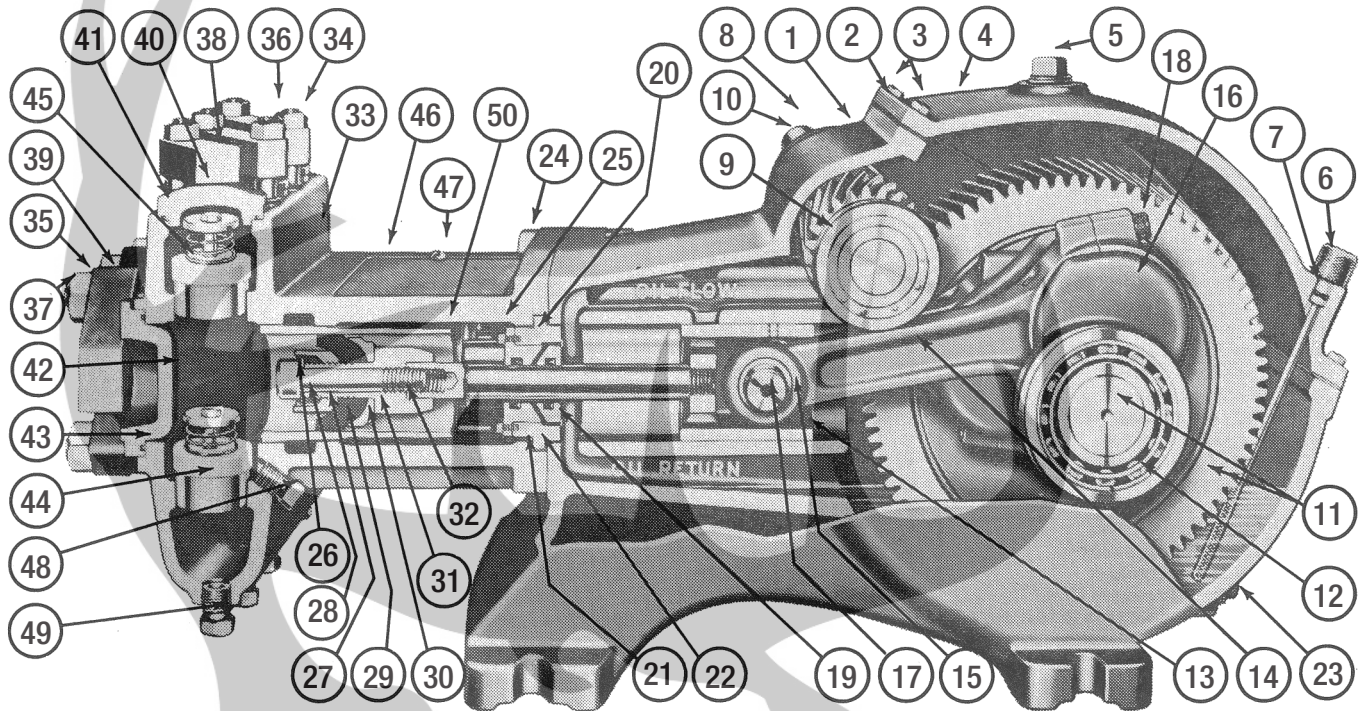
Repair parts for the crosshead and piston rod are supplied as a complete unit. If either of these parts becomes worn, it is necessary to replace both the crosshead and piston rod. It is not practical to attempt to tighten a loose piston rod in a crosshead. Under normal conditions a crosshead will not wear, nor will the bore of the crankcase wear to the extent that oversize crossheads will be required. A clearance of .002" to .004" is standard for the crosshead.

## RECOMMENDED TORQUE VALUES (foot-pounds)

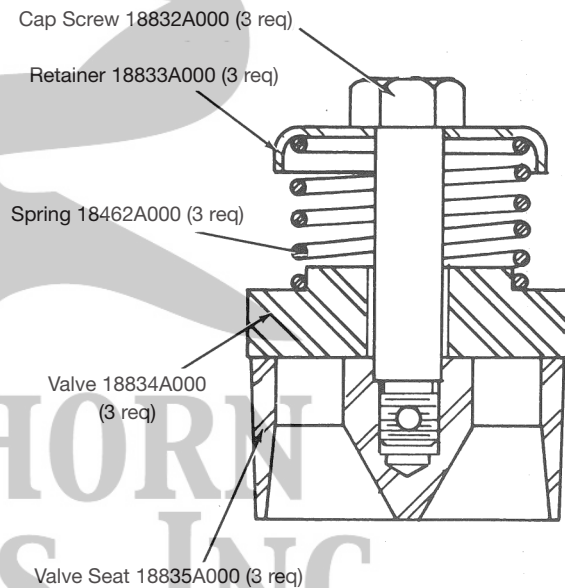
FASTENER LOCATION
Link Bearing Caps - 40
Crankshaft End Caps - 20
Pinion Bearing End Caps - 20
Fastener Plunger Assembly to Piston Rod Nut and Cap Screw- 25
Valve Cover Clamps - 50
Cylinder Cover Clamps - 50



# D35-8PP-2H & D45-12PP INDUSTRIAL PUMPS PARTS LIST



DISCHARGE VALVE AND SEAT COMPLETE NO. 18925A001K



SUCTION VALVE AND SEAT COMPLETE NO. 18925A000K

# D35-8PP-2H & D45-12PP INDUSTRIAL PUMPS PARTS LIST

Catalog Number of Industrial Pump (Helical Gears)			D35-8PP-2H	D45-12PP
Item	Description	Qty.	Eng. No.	Eng. No.
1	GEAR CASE	1	04663E000	04663E000
2	GASKET, FOR GEAR CASE LID	1	06222C000	06222C000
3	CAP SCREW, 5/16"-18 UNC x 7/8"	8	19100A005	19100A005
4	LID, FOR GEAR CASE	1	04664B000	04664B000
5	VENT AND OIL FILTER PLUG	1	17388A000	17388A000
6	OIL GAUGE WITH O-RING	1	17360A010K	17360A010K
7	CYLINDER LINER	3	18806A001	18806A001
	PLUG, 1-1/4" PIPE	1	05022A041	05022A041
	PLUG, 2" PIPE	2	05022A048	05022A048
	O-RING, FOR CYLINDER LINER	3	05876A085	05876A085
8	PINION SHAFT WITH HELICAL PINION	1	19816B000	19816B000
	SHIM PLASTIC FOR PINION SHAFT .003" THICK	4	05231A074	05231A074
	SHIM PLASTIC FOR PINION SHAFT .015" THICK	4	05231A075	05231A075
9	CONE, BEARING, PINION SHAFT	2	05674A013	05674A013
	CUP, BEARING, PINION SHAFT	2	05675A009	05675A009
10	CAP, OPEN, PINION SHAFT	1	04563A001	04563A001
	CAP, CLOSED, PINION SHAFT	1	04741B000	04741B000
	OIL SEAL, OPEN END OF PINION SHAFT	1	05710A017	05710A017
	CAP SCREW, 3/8"-UNC x 1", BEARING CAPS	18	19101A009	19101A009
	WASHER SEAL, FOR 3/8" CAP SCREWS	18	14946A003	14946A003
11	CRANKSHAFT WITH HELICAL GEAR	1	19817C000	19817C000
12	CONE, BEARING, FOR CRANKSHAFT	2	05674A015	05674A015
	CUP, BEARING, FOR CRANKSHAFT	2	05675A011	05675A011
	CAP, BEARING, FOR CRANKSHAFT	2	18466B001	18466B001
	SHIM PLASTIC, 4-17/32" I.D., 6-1/32" O.D., .003" THICK	6	05068A017	05068A017
	SHIM PLASTIC, 4-17/32" I.D., 6-1/32" O.D., .015" THICK	5	05068A015	05068A015
13	CROSSHEAD AND PISTON ROD	3	06361B002	06361B002
14	LINK AND BUSHING AND CAP SCREWS	3	11651C002	11651C002
15	BUSHING, FOR LINK	3	B1619A000K	B1619A000K
16	BEARING, HALVES REG., FOR LINK	3	11647A012K	11647A012K
17	WRIST PIN, CROSSHEAD TO LINK	3	M1525A001	M1525A001
18	CAP SCREW, FOR LINK	6	06106A040	06106A040
	WASHER, LOCK	6	05454A025	05454A025
19	HOUSING, OIL SEAL	3	24959A001	24959A001
	OIL SEAL	6	22835A004	22835A004
20	RETAINER, OIL SEAL HOUSING	3	24958A000	24958A000
	SCREW, ALLEN	6	06106A034	06106A034
	GASKET, SEAL HOUSING	3	05059A434	05059A434
	KIT FOR REF. NO. 19 & 20	1	24648A000	24648A000

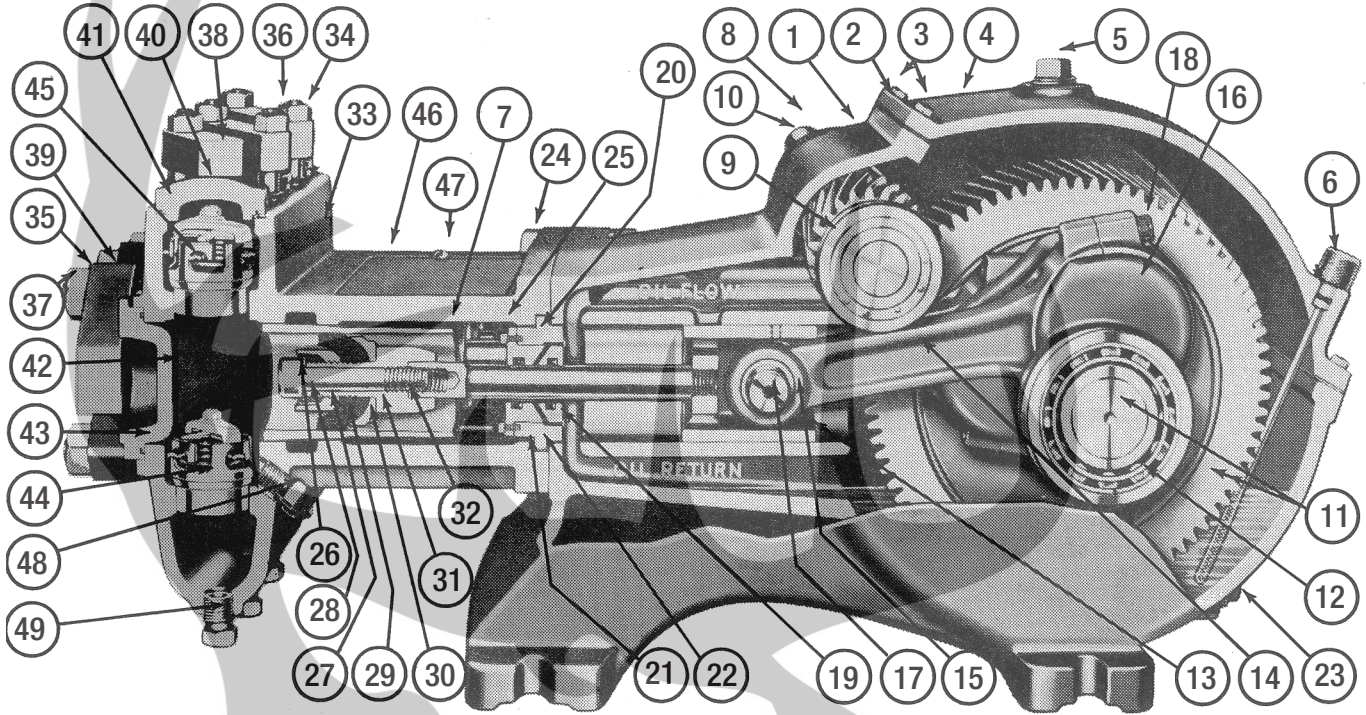
Catalog Number of Industrial Pump (Helical Gears)			D35-8PP-2H	D45-12PP
Item	Description	Qty.	Eng. No.	Eng. No.
21	SPRING, FOR RETAINER FOR OIL SEAL WIPER	3	M01643A000	M01643A000
22	GASKET, VELLUMOID, FOR OIL SEAL ASSEMBLY	3	05059A058	05059A058
23	DRAIN PLUG, MAGNETIC 3/4"	1	17481A002	17481A002
24	CAP SCREW, 3/4"-10 UNC x 3" CYLINDER BODY TO GEAR CASE LOCK WASHER, 3/4", FOR REF. 24	4	06106A038	06106A038
25	CAP SCREW, 5/8"-11 UNC x 2" CYLINDER BODY TO GEAR CASE	4	05454A003	05454A003
26	CAP SCREW, PLUNGER TO PISTON ROD	3	16654A006	16654A006
27	FOLLOWER, FOR PLUNGER	3	† 20161A001	17537A000
28	O-RING, FOR PLUNGER FOLLOWER		NOT REQ	NOT REQ
29	PLUNGER CAP (FLAT)	3	† 13046A026	06086A011
30	O-RING, FOLLOWER TO BACKUP RING	3	05876A022	05876A022
31	RING, BACKUP, FOR PLUNGER	3	20162A001	17535A000
32	STUD, PLUNGER	3	20163A000	17533A000
33	CYLINDER BODY	1	18791F000	18791F000
34	NUT, 1/2"-13 UNC, FOR STUD REF. 36	6	19109A097	19109A097
35	NUT, 1/2"-13 UNC, FOR STUD REF. 37	6	19109A097	19109A097
36	STUD, FOR VALVE CAP CLAMPS	6	05659A548	05659A548
37	STUD, FOR CYLINDER CAP CLAMPS	6	05659A548	05659A548
38	CLAMP, VALVE CAP	3	M01517A000	M01517A000
39	CLAMP, CYLINDER CAPS	3	M01517A000	M01517A000
40	VALVE CAP, DISCHARGE	3	17390A000	17390A000
41	O-RING, FOR VALVE CAPS	3	05876A064	05876A064
42	CYLINDER CAP, SUCTION	3	17391A000	17391A000
43	O-RING, FOR CYLINDER CAPS	3	05876A065	05876A065
44	SUCTION VALVE AND SEAT COMPLETE	3	18925A000K	18925A000K
45	DISCHARGE VALVE AND SEAT COMPLETE	3	18925A001K	18925A001K
46	LID, OVER PLUNGERS	1	M01820A000	M01820A000
47	MACHINE SCREW, FOR LID OVER PLUNGERS WASHER, STEEL, FOR REF. 47 MACHINE SCREW	2	148850001	148850001
		2	05030A020	05030A020
48	DRAIN PLUG, 3/8" PIPE	3	06136A000	06136A000
49	DRAIN PLUG, 1" PIPE	3	06206A000	06206A000

† The parts above are used on newer D35-8PP-2H pumps. It can be differentiated by the follower and cup. Use 06737A031 if your cup is all rubber and no fabric. The 13046A026 contains fabric and rubber. Use 20161A000 & 05876A040 O-ring if your follower has an O-ring groove on the outside diameter. The 20161A001 follower has no groove and does not need an O-ring groove on the outside diameter. This does not apply to D45-12PP.

# BUCKHORN PUMPS, INC.



# D35-12D-2H INDUSTRIAL PUMP PARTS LIST



Locknut 11904A001 (3 req)

Valve Clamp 11818A000 (3 req)

Locknut 11904A001 (3 req)

Valve Clamp 11828A000 (3 req)

Retainer  
11817A000 (3 req)

Retainer  
11827A000 (3 req)

Valve Spring  
18462A000 (3 req)

Valve Spring  
11029A000 (3 req)

Valve 17552A001(3 req)

Valve Seat 06272A000 (3 req)

Valve 17553A001(3 req)

Valve Seat 06271A000 (3 req)

SUCTION VALVE AND SEAT COMPLETE NO. 11902A001K

DISCHARGE VALVE AND SEAT COMPLETE NO. 11903A001K

BUCKHORN  
PUMPS, INC.

# D35-12D-2H

## INDUSTRIAL PUMP PARTS LIST

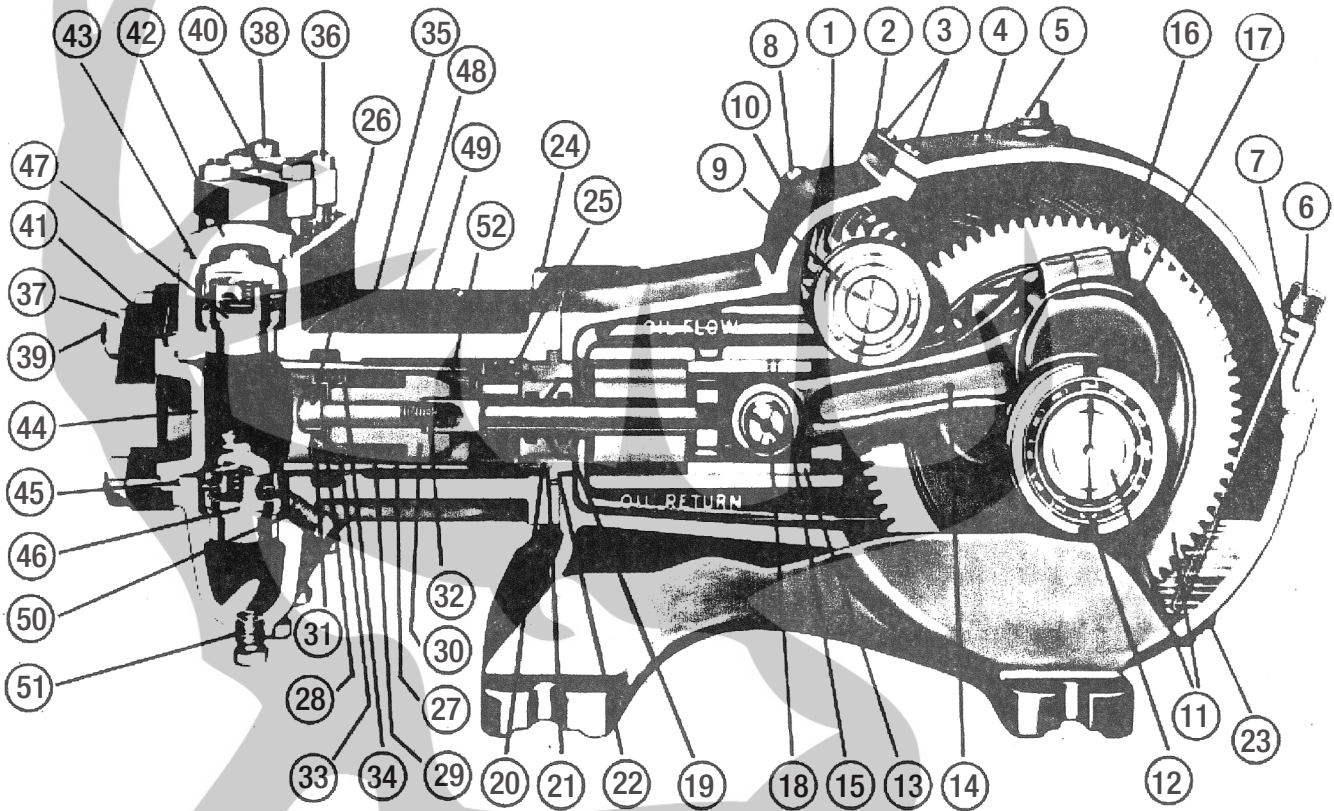
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1	GEAR CASE	1	04663E000
2	GASKET, FOR GEAR CASE LID	1	06222C000
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4	LID, FOR GEAR CASE	1	04664B000
5	VENT AND OIL FILTER PLUG	1	17388A000
6	OIL GAUGE WITH O-RING	1	17360A001
7	O-RING, FOR OIL GAUGE	1	000790031
8	PINION SHAFT WITH HELICAL PINION	1	19816B000
	SHIM PLASTIC FOR PINION SHAFT .003" THICK	4	05231A074
	SHIM PLASTIC FOR PINION SHAFT .015" THICK	4	05231A075
9	CONE, BEARING, PINION SHAFT	2	05674A013
	CUP, BEARING, PINION SHAFT	2	05675A009
10	CAP, OPEN, PINION SHAFT	1	04563A001
	CAP, CLOSED, PINION SHAFT	1	04741B000
	OIL SEAL, OPEN END OF PINION SHAFT	1	05710A017
	CAP SCREW, 3/8"-UNC x 1", BEARING CAPS	18	19101A009
	SEAL WASHER, FOR 3/8" CAP SCREWS	18	14946A003
11	CRANKSHAFT WITH HELICAL GEAR	1	19817C000
12	CONE, BEARING, FOR CRANKSHAFT	2	05674A015
	CUP, BEARING, FOR CRANKSHAFT	2	05675A011
	CAP, BEARING, FOR CRANKSHAFT	2	18466B001
	SHIM PLASTIC, 4-17/32" I.D., 6-1/32" O.D., .003" THICK	6	05068A017
	SHIM PLASTIC, 4-17/32" I.D., 6-1/32" O.D., .015" THICK	5	05068A015
13	CROSSHEAD AND PISTON ROD	3	06361B002
14	LINK AND BUSHING AND CAP SCREWS	3	11651C002
15	BUSHING, FOR LINK	3	B01619A001
16	BEARING, HALVES REG., FOR LINK	3	11647A012K
17	WRIST PIN, CROSSHEAD TO LINK	3	M01525A001
18	CAP SCREW, FOR LINK	6	06106A040
	WASHER, LOCK	6	05454A025
19	HOUSING, OIL SEAL	3	24959A001
	OIL SEAL	6	22835A004
20	RETAINER, OIL SEAL HOUSING	3	24958A000
	SCREW, ALLEN	6	06106A034
	GASKET, SEAL HOUSING	3	05059A434
	KIT FOR REF. NO. 19 & 20	1	24648A000
21	SPRING, FOR RETAINER FOR OIL SEAL WIPER	3	M01643A000

Catalog Number of Industrial Pump (Helical Gears)			D35-12D-2H
Item	Description	Qty.	Eng. No.
22	GASKET, VELLUMOID, FOR OIL SEAL ASSEMBLY	3	05059A058
23	DRAIN PLUG, MAGNETIC 3/4"	1	17481A002
24	CAP SCREW, 3/4"-10 UNC x 3" CYLINDER BODY TO GEAR CASE	4	06106A038
	LOCK WASHER, 3/4", FOR REF. 24	4	05454A003
25	CAP SCREW, 5/8"-11 UNC x 2" CYLINDER BODY TO GEAR CASE	4	19105A008
26	CAP SCREW, PLUNGER TO PISTON ROD	3	16654A006
27	NUT	3	17512A000
28	WASHER LOCK	3	06107A013
29	CUP	3	06086A010
30	FOLLOWER	3	17511A000
31	WASHER	3	05030A128
32	STUD, PLUNGER	3	17545A000
33	CYLINDER BODY	1	18782F000
34	NUT, 1/2"-13 UNC, FOR STUD REF. 36	6	19109A097
35	NUT, 1/2"-13 UNC, FOR STUD REF. 37	6	19109A097
36	STUD, FOR VALVE CAP CLAMPS	6	05659A059
37	STUD, FOR CYLINDER CAP CLAMPS	6	05659A059
38	CLAMP, VALVE CAP	3	17438A000
39	CLAMP, CYLINDER CAPS	3	17438A000
40	VALVE CAP, DISCHARGE	3	17390A000
41	O-RING, FOR VALVE CAPS	3	05876A064
42	CYLINDER CAP, SUCTION	3	17391A000
43	O-RING, FOR CYLINDER CAPS	3	05876A065
44	SUCTION VALVE AND SEAT COMPLETE	3	11902A001K
45	DISCHARGE VALVE AND SEAT COMPLETE	3	11903A001K
46	LID, OVER PLUNGERS	1	M01820A000
47	MACHINE SCREW, FOR LID OVER PLUNGERS	2	148850001
	WASHER, STEEL, FOR REF. 47 MACHINE SCREW	2	05030A020
48	DRAIN PLUG, 3/8" PIPE	3	06136A000
49	DRAIN PLUG, 1" PIPE	3	06206A000
50	CYLINDER LINER	3	18806A003
	PLUG, 1-1/4" PIPE	1	05022A047
	PLUG, 2" PIPE	2	05022A048
	O-RING, FOR CYLINDER LINER	3	05876A085

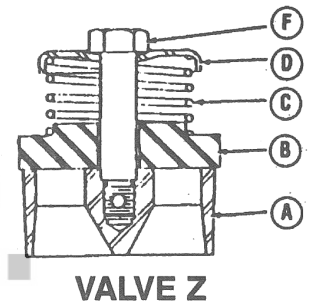
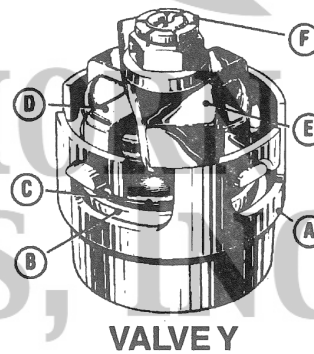
BUCKHORN  
PUMPS, INC.



**D35-12AVD-2H, D35-AVD-2HL,  
D35-12AVD-CP, D35-12AVAB,  
D35-12AVAB-CP & D35-12AVABL-CP  
INDUSTRIAL PUMPS PARTS LIST**



STYLE VALVE ASSEMBLY			Y	Z	Z
SUCTION VALVE ASSEMBLY			11902A001K	18925A000K	18925A010K
DISCHARGE VALVE ASSEMBLY			11903A001K	18925A001K	18925A014K
SEAT MATERIAL			420F	420F	316
Item	Description	Qty.	Eng. No.	Eng. No.	Eng. No.
A	SEAT, VALVE SUCTION	3	06272A000	18835A000	18835A003
	SEAT, VALVE DISCHARGE	3	06271A000	18835A001	18835A004
B	VALVE, SUCTION	3	17552A001	18834A000	18834A000
	VALVE, DISCHARGE	3	17553A001	18834A001	18834A001
C	SPRING, SUCTION	3	18462A000	18462A000	18462A000
	SPRING, DISCHARGE	3	11829A000	11829A000	11829A000
D	RETAINER, SUCTION	3	11817A000	18833A000	18833A000
	RETAINER, DISCHARGE	3	11827A000	18833A001	18833A001
E	CLAMP FOR RETAINER, SUCTION	3	11818A000	—	—
	CLAMP FOR RETAINER, DISCHARGE	3	11828A000	—	—
F	LOCK NUT OR CAP SCREW	6	11904A001	18832A000	18832A001



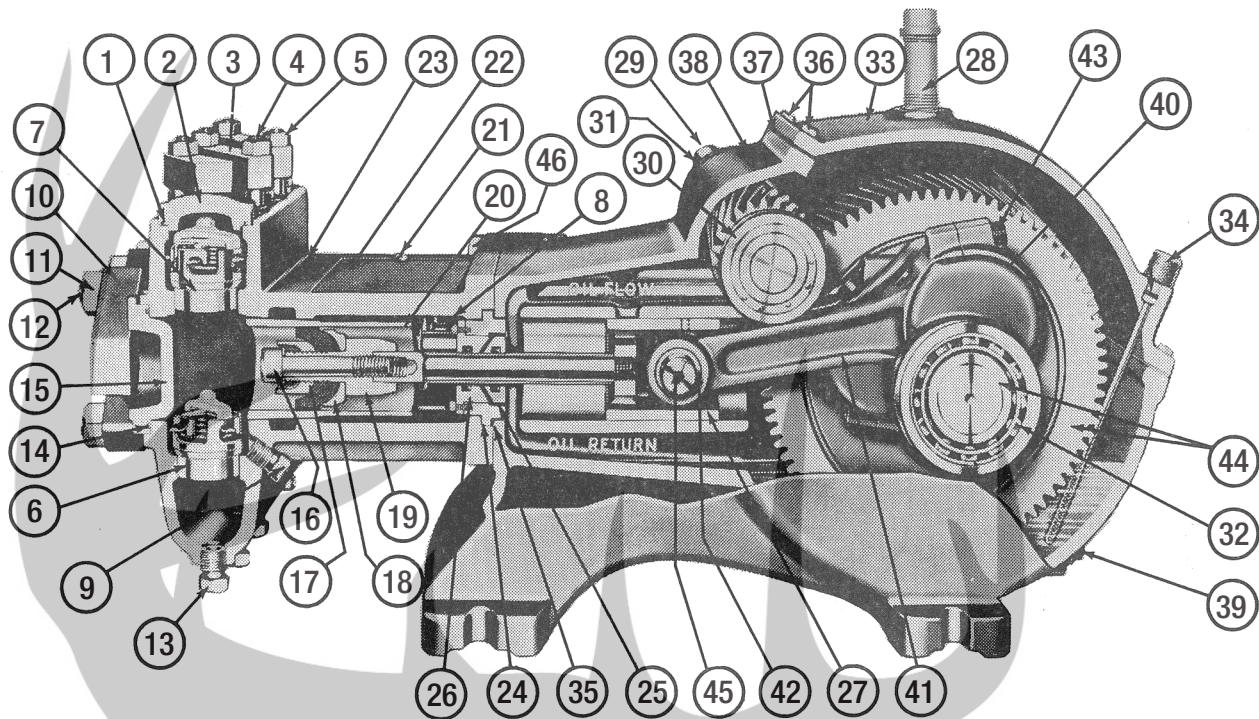


# D35-12AVD-2H, D35-AVD-2HL, D35-12AVD-CP, D35-12AVAB, D35-12AVAB-CP & D35-12AVABL-CP INDUSTRIAL PUMPS PARTS LIST

Item	Description	Qty.	Eng. No.
1	GEAR CASE	1	04663E000
2	GASKET, FOR GEAR CASE LID	1	06222C000
3	CAP SCREW, 5/16"-18 UNC x 7/8" FOR GEAR CASE LID	8	19100A005
4	LID, FOR GEAR CASE	1	04664B000
5	VENT AND OIL FILTER PLUG	1	17388A000
6	OIL GAUGE WITH O-RING	1	17360A010K
8	PINION SHAFT WITH HELICAL PINION	1	19816B000
	SHIM, PLASTIC FOR PINION SHAFT .003" THICK	4	05231A074
	SHIM, PLASTIC FOR PINION SHAFT .015" THICK	4	05231A075
9	CONE, BEARING, PINION SHAFT	2	05674A013
	CUP, BEARING, PINION SHAFT	2	05675A009
10	CAP, OPEN, PINION SHAFT	1	04563A001
	CAP, CLOSED, PINION SHAFT	1	04741B000
	OIL SEAL, OPEN END OF PINION SHAFT	1	05710A017
	CAP SCREW, 3/8"-16 UNC x 1", BEARING CAPS	18	19101A009
	SEAL WASHER, FOR 3/8" CAP SCREWS FOR BEARING CAPS	18	14946A003
11	CRANKSHAFT WITH HELICAL GEAR	1	19817C000
12	CONE, BEARING, FOR CRANKSHAFT	2	05674A015
	CUP, BEARING, FOR CRANKSHAFT	2	05675A011
	CAP, BEARING, FOR CRANKSHAFT	2	18466B001
	SHIM PLASTIC, 4-17/32" I.D., 6-1/32" O.D., .003" THICK	6	05068A017
	SHIM PLASTIC, 4-17/32" I.D., 6-1/32" O.D., .015" THICK	5	05068A015
13	CROSSHEAD AND PISTON ROD (SLIP FIT WRIST PIN)	3	N/A
	CROSSHEAD AND PISTON ROD (PRESSED FIT WRIST PIN)	3	06361B002
14	LINK AND BUSHING AND CAP SCREWS	3	11651C002
15	BUSHING FOR LINK	3	B01619A000K
16	CAP SCREW FOR LINK	6	06106A040
	WASHER, LOCK FOR CAP SCREWS FOR LINK	6	05454A025
	WIRE FOR CAP SCREWS FOR LINK NO LONGER USED USE LOCK WASHER 05454A025		N/A
17	BEARING, FOR LINK TO CRANKSHAFT	3	11647A012K
18	WRIST PIN, CROSSHEAD TO LINK FOR SLIP FIT CROSSHEAD	3	M01525A000
	WRIST PIN, CROSSHEAD TO LINK FOR PRESSED FIT CROSSHEAD	3	M01525A001
19	OIL ASSEMBLY (NEW STYLE) PICTURE DEPICTS NEW STYLE	1	24648A000
20	HOUSING, OIL SEAL	3	24959A001
	WIPER, OIL SEAL FOR PISTON ROD (NEW STYLE)	6	22835A004
	RETAINER, OIL SEAL HOUSING	3	24958A000
	SCREW, ALLEN, OIL SEAL HOUSING TO RETAINER	6	06106A034
	GASKET, BETWEEN OIL SEAL HOUSING AND RETAINER	3	05059A434
21	SPRING, BETWEEN RETAINER & CYLINDER BODY	3	M01643A000
22	GASKET, BETWEEN RETAINER & GEAR CASE	3	05059A058
23	DRAIN PLUG, OIL, MAGNETIC 3/4" PIPE	1	17481A002
24	CAP SCREW, ALLEN HEAD 3/4"-10 UNC x 2-1/2" TO GEAR CASE	4	06106A038
	LOCKWASHER, 3/4" FOR CAP SCREW, REF. 24	4	05454A003
25	CAP SCREW, 5/8"-11 UNC x 2" LG. CYLINDER BODY TO GEAR CASE	4	19105A008
26	CAP SCREW, PLUNGER TO PISTON ROD	3	16654A006
27	FOLLOWER FOR PLUNGER	3	18923A000
28	LOCKWASHER FOR PLUNGER CAP SCREW	3	06107A013
29	"V" PACKING FOR PLUNGER	3	18922A000

Item	Description	Qty.	Eng. No.
30	STUD FOR PLUNGERS	3	18924A000
	STUD FOR PLUNGERS, 316 SST FOR AVAB-CP PUMP	3	18924A010
31	RETAINER, SPRING FOR PLUNGERS	3	18879A000
	RETAINER, SPRING FOR PLUNGERS, 316 SST FOR AVAB-CP PUMPS	3	18879A003
32	WASHER, COPPER, STUD TO PISTON ROD	3	05030A128
33	SPRING FOR PLUNGERS	3	18920A000
34	RING, PRESSURE FOR PLUNGERS	3	18921A000
	RING, PRESSURE FOR PLUNGERS, 316 SST FOR AVAB-CP PUMP	3	18921A002
35	CYLINDER BODY	1	18782F000
	CYLINDER BODY, ALUM. BRONZE FOR AVAB & AVAB-CP PUMPS	1	18782F002
36	NUT, 1/2"-13 UNC FOR STUD	6	19109A097
37	NUT, 1/2"-13 UNC FOR STUD	6	19109A097
38	STUD, 1/2"-13 UNC x 3-5/16" FOR VALVE CAP CLAMPS	6	05659A059
39	STUD, 1/2"-13 UNC x 3-5/16" FOR CYLINDER CAP CLAMPS	3	05659A059
40	CLAMP FOR VALVE CAPS	3	17438A000
41	CLAMP FOR CYLINDER CAPS	3	17438A000
42	VALVE CAP, DISCHARGE	3	17390A000
	VALVE CAP, DISCHARGE, ALUM. BRONZE FOR AVAB & AVAB-CP PUMPS	3	17390A002
43	O-RING, 2-3/8" I.D., 2-9/16" O.D., 3/32" DIA.	3	05876A064
44	CYLINDER CAP, SUCTION	3	17391A000
	CYLINDER CAP, SUCTION, ALUM. BRONZE FOR AVAB & AVAB-CP PUMPS	3	17391A002
45	O-RING, 2-7/8" I.D., 3-1/16" O.D., 3/32" DIA.	3	05876A065
46	SUCTION VALVE AND SEAT COMPLETE, VALVE Y	3	11902A001K
	SUCTION VALVE AND SEAT COMPLETE, VALVE Z	3	18925A000K
	SUCTION VALVE AND SEAT COMPLETE FOR AVAB-CP PUMP, VALVE Z	3	18925A010K
47	DISCHARGE VALVE AND SEAT COMPLETE, VALVE Y	3	11903A001K
	DISCHARGE VALVE AND SEAT COMPLETE, VALVE Z	3	18925A001K
	DISCHARGE VALVE AND SEAT COMPLETE FOR AVAB-CP PUMP, VALVE Z	3	18925A014K
48	LID, OVER PLUNGERS	1	M01820A000
49	MACHINE SCREW, 1/4"-20 UNC x 1/2" FOR LID OVER PLUNGERS	2	148850001
	WASHER, STEEL, 5/16" I.D., 3/4" O.D., 1/16" THICK FOR MACHINE SCREW, REF. 47	2	05030A020
50	DRAIN PLUG, 3/8"	3	06136A000
	DRAIN PLUG, 3/8" 316 SST FOR AVAB & AVAB-CP PUMPS	3	05022A062
51	DRAIN PLUG, 1"	3	06206A000
	DRAIN PLUG, 1" ALUM. BRONZE FOR AVAB & AVAB-CP PUMPS	3	05022A064
52	CYLINDER LINER, 2" I.D. FOR ALL PUMPS	3	18806A003
	O-RING FOR CYLINDER LINER	3	05876A085
	PLUG, 1-1/4" FOR DISCHARGE	1	05022A041
	PLUG, 1-1/4" FOR DISCHARGE ALUM. BRONZE FOR AVAB & AVAB-CP PUMPS	1	05022A065
	PLUG, 2" FOR SUCTION	2	05022A048
	PLUG, 2" FOR SUCTION ALUM. BRONZE FOR AVAB & AVAB-CP PUMPS	2	05022A066

## D50-12D-3H & D50-12AB INDUSTRIAL PUMPS PARTS LIST

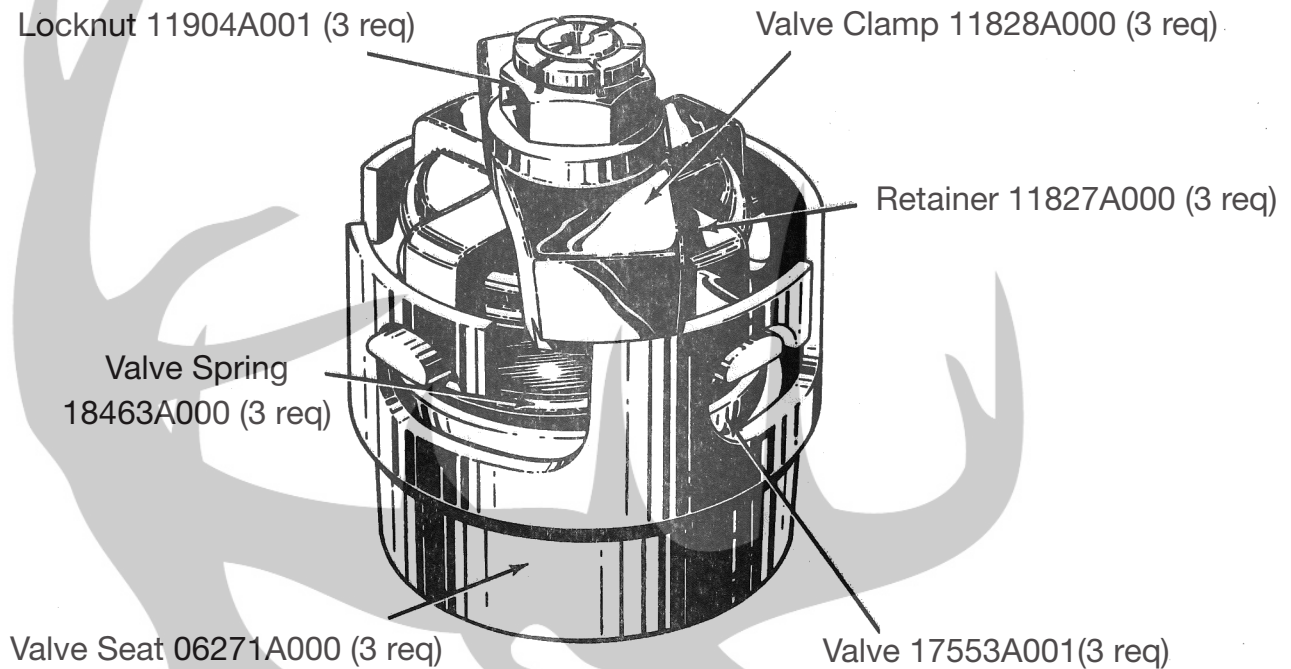


Item	Description	Qty.	Eng. No.
1	O-RING	3	05876A064
2	VALVE CAP	3	17390A000
	VALVE CAP FOR AB PUMP	3	17390A002
3	CLAMP	3	17438A000
4	STUD	6	05659A059
5	HEX NUT	6	19109A097
6	SUCTION VALVE AND SEAT COMPLETE	3	11903A002K
7	DISCHARGE VALVE AND SEAT COMPLETE	3	11903A001K
8	CAP SCREW	4	19105A008
9	PLUG 1/2" PIPE	3	B01053A000
10	CLAMP	3	17389B000
11	HEX NUT	6	19109A046
12	STUD	6	05659A0560
	PLUG 1-1/4" PIPE	1	05022A041
	PLUG 3"	2	03210A000
13	PLUG 1" PIPE	3	06206A000
14	O-RING	3	05876A066
15	CYLINDER CAP	3	17392A000
16	CAP SCREW	3	16654A006
	NUT	3	17535A000
	LOCK WASHER	3	06107A013
17	CUP, NEOPRENE & FABRIC	3	06086A011
18	FOLLOWER	3	17537A000
19	STUD	3	17533A000
	WASHER	3	05030A128
20	CYLINDER LINER	3	M01512A004
	O-RING FOR CYLINDER LINER	3	05876A095
21	MACHINE SCREW	2	148850001
	WASHER	2	05030A020
22	CYLINDER LID	1	M01520A000
23	CYLINDER BODY	1	18639F000
	CYLINDER BODY ( FOR AB PUMP)	1	18639F003
24	SPRING	3	M01643A000
25	HOUSING, OIL SEAL	3	24959A001
	OIL SEAL	6	22835A004
26	RETAINER, OIL SEAL HOUSING	3	24958A000
	SCREW, ALLEN	6	06106A034

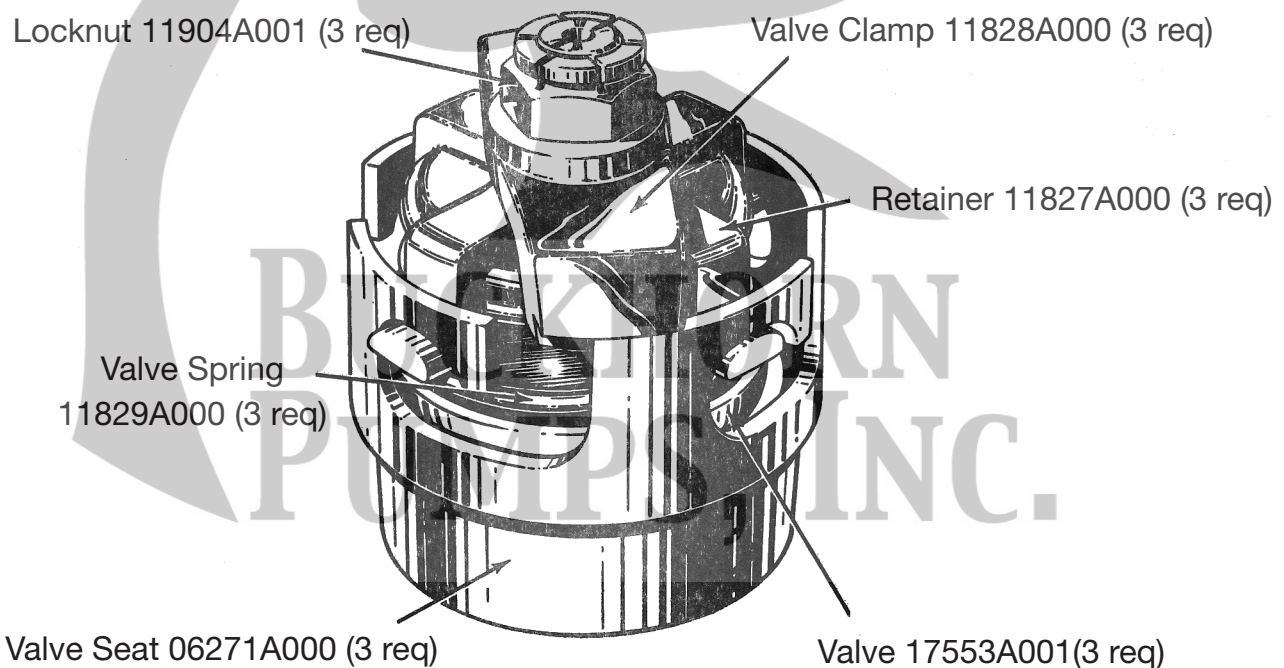
Item	Description	Qty.	Eng. No.
26	GASKET, SEAL HOUSING	3	05059A434
	KIT FOR REF. NO. 25 & 26	1	24648A000
27	CROSSHEAD	3	06211B041
28	VENT PLUG	1	17388A000
29	SHAFT PINION	1	20164B020K
	SPACER	1	20164B022A
	CUP BEARING	2	05675A009
30	CONE BEARING	2	05674A013
	SHIM FOR PINION SHAFT .003" THICK	4	05231A074
	SHIM FOR PINION SHAFT .015" THICK	4	05231A075
	CAP CLOSED	1	04741B001
	OIL SEAL	1	05710A017
31	CAP OPEN	1	04563A001
	WASHER, SEAL	18	14946A003
	CAP SCREW	18	19101A009
	CUP BEARING	2	05675A012
32	CONE, BEARING	2	05674A017
	BEARING CAP	2	04624B002
	O-RING FOR BEARING CAP	2	05876A098
	SHIM, GREEN .015"	6	05068A018
	SHIM, PINK .003"	6	05068A016
33	LID	1	04561B000
34	OIL GAUGE WITH O-RING	1	17360A011K
35	GASKET	3	05059A058
36	CAP SCREW	8	19100A005
37	LID GASKET	1	06201C000
38	GEAR CASE	1	04625E001K
39	PLUG, PIPE MAGNETIC	1	17481A002
40	BEARING TWO HALVES	3	15245A101K
41	LINK	3	17042C002
42	BUSHING	3	B01619A000K
43	CAP SCREW	6	19103A016
	LOCK WASHER	6	05454A004
44	CRANK SHAFT WITH HELICAL GEAR	1	20355C022K
45	WRIST PIN	3	M01525A001
46	CAP SCREW	4	06106A038
	LOCK WASHER	4	05454A003

## D50-12D-3H & D50-12AB INDUSTRIAL PUMPS PARTS LIST

### SUCTION VALVE AND SEAT COMPLETE NO. 11903A002K

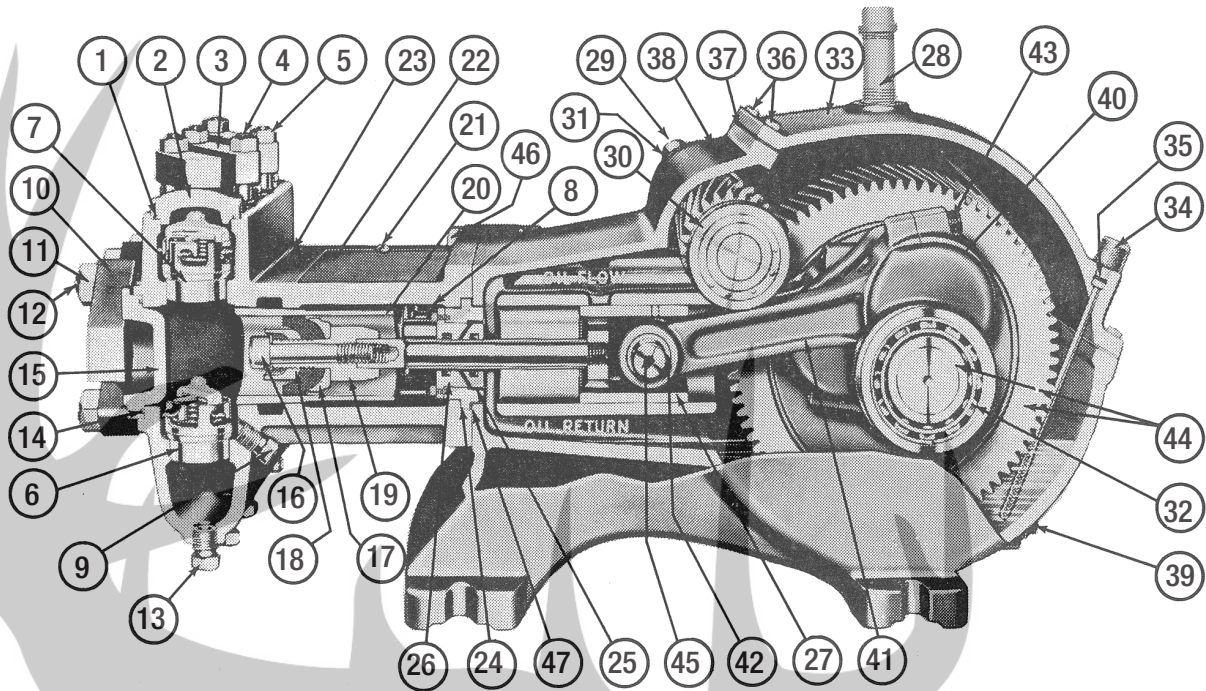


### DISCHARGE VALVE AND SEAT COMPLETE NO. 11903A001K





# D60-10D-3H, D60-10D-3HL & D60-10AB INDUSTRIAL PUMPS PARTS LIST

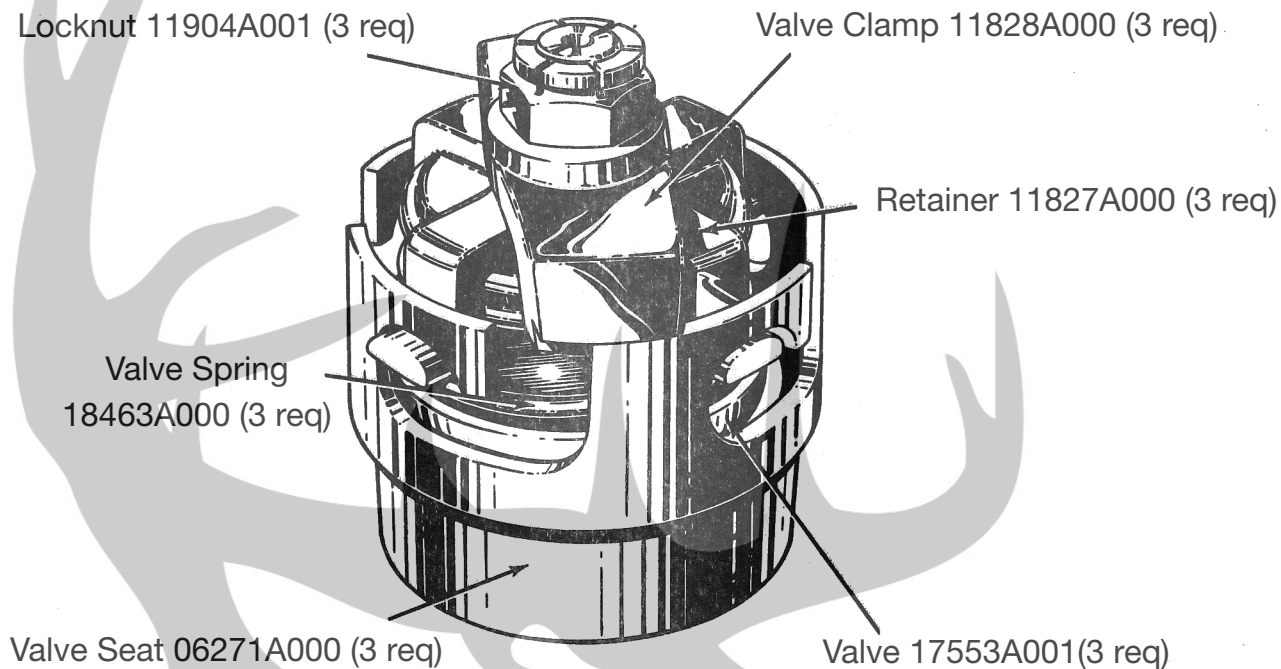


Item	Description	Qty.	Eng. No.
1	O-RING	3	05876A064
2	VALVE CAP	3	17390A000
	VALVE CAP FOR AB PUMP	3	17390A002
3	CLAMP	3	M01517A000
4	STUD	6	05659A548
5	HEX NUT	6	19109A097
6	SUCTION VALVE AND SEAT COMPLETE	3	11903A002K
7	DISCHARGE VALVE AND SEAT COMPLETE	3	11903A001K
8	CAP SCREW	4	19105A008
9	PLUG 1/2" PIPE	3	B01053A000
10	CLAMP	3	M01516A000
11	HEX NUT	6	19109A046
12	STUD	6	05659A560
	PLUG 1-1/4" PIPE	1	05022A041
	PLUG 3"	2	03210A000
13	PLUG 1" PIPE	3	06206A000
	VALVE LIFTERS	3	13015A002
14	O-RING	3	05876A066
15	CYLINDER CAP	3	17392A000
16	CAP SCREW	3	16654A006
	NUT	3	18458A000
	LOCK WASHER	3	06107A013
17	CUP, NEOPRENE & FABRIC	3	06086A012
18	FOLLOWER	3	17534A000
19	STUD	3	17533A000
	WASHER	3	05030A128
20	CYLINDER LINER	3	M01512A003
	O-RING FOR CYLINDER LINER	3	05876A095
21	MACHINE SCREW	2	148850001
	WASHER	2	05030A020
22	CYLINDER LID	1	M01520A000
23	CYLINDER BODY (FOR ALL MODELS EXCEPT D60-10AB)	1	18639F000
	CYLINDER BODY (FOR D60-10AB)	1	18639F003
24	SPRING	3	M01643A000
25	HOUSING, OIL SEAL	3	24959A001
	OIL SEAL	6	22835A004
26	RETAINER, OIL SEAL HOUSING	3	24958A000
	SCREW, ALLEN	6	06106A034

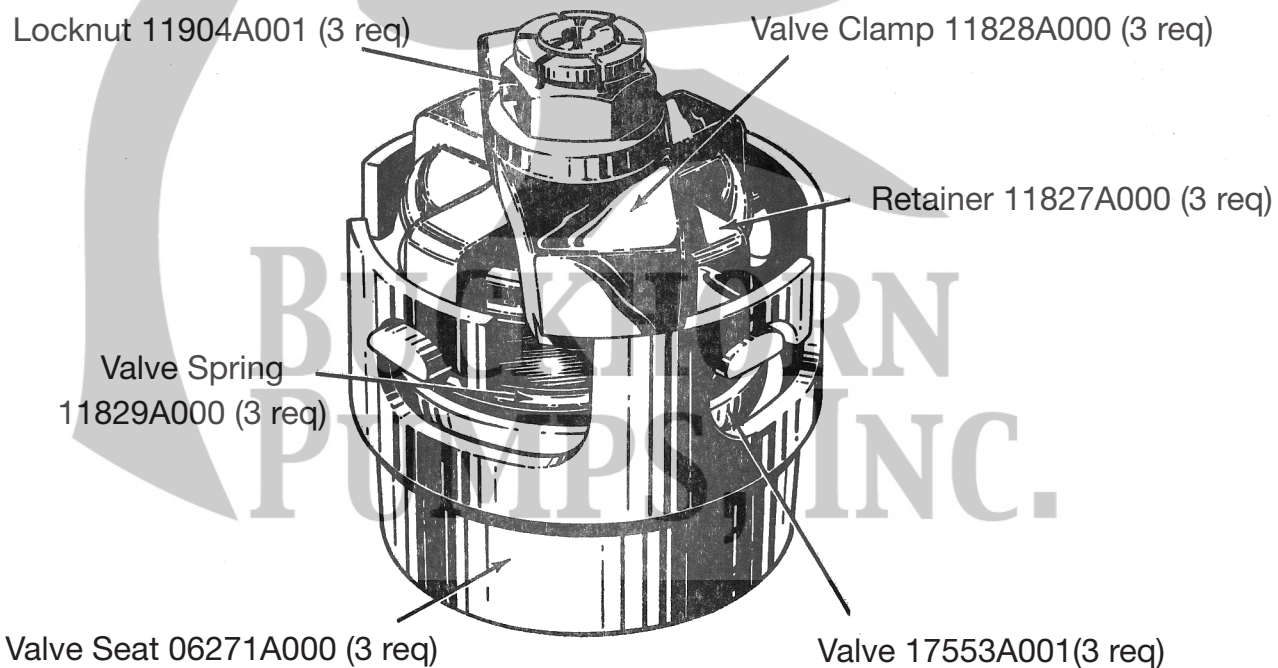
Item	Description	Qty.	Eng. No.
26	GASKET, SEAL HOUSING	3	05059A434
	KIT FOR REF. NO. 25 & 26	1	24648A000
27	CROSSHEAD	3	06211B041
	PIPE CAP	1	05737A002
28	VENT PLUG	1	17995A000
29	SHAFT PINION	1	20164B020K
	SPACER	1	20164B022A
	CUP BEARING	2	05675A009
30	CONE BEARING	2	05674A013
	SHIM FOR PINION SHAFT .003" THICK	4	05231A074
	SHIM FOR PINION SHAFT .015" THICK	4	05231A075
	CAP CLOSED	1	04741B001
	OIL SEAL	1	05710A017
31	CAP OPEN	1	04563A001
	WASHER, SEAL	18	14946A003
	CAP SCREW	18	19101A009
	CUP BEARING	2	05675A012
32	CONE, BEARING	2	05674A017
	BEARING CAP	2	04624B002
	O-RING FOR BEARING CAP	2	05876A098
	SHIM, GREEN .015"	6	05068A018
	SHIM, PINK .003"	6	05068A016
33	LID	1	04561B000
34	OIL GAUGE WITH O-RING	1	17360A011K
35	O-RING, 3/8" I.D. x 9/16" O.D. x 1/16" THICK	3	110-000110-201
36	CAP SCREW	8	19100A005
37	LID GASKET	1	06201C000
38	GEAR CASE	1	04625E001K
39	PLUG, PIPE MAGNETIC	1	17481A002
40	BEARING TWO HALVES	3	15245A101K
41	LINK	3	17042C002
42	BUSHING	3	B01619A000K
43	CAP SCREW	6	19103A016
	LOCK WASHER	6	05454A004
44	CRANK SHAFT WITH HELICAL GEAR	1	20355C022
45	WRIST PIN	3	M01525A001
46	CAP SCREW	4	06106A038
	LOCK WASHER	4	05454A003

## D60-10D-3H, D60-10LD-3H & D60-10AB INDUSTRIAL PUMPS PARTS LIST

### SUCTION VALVE AND SEAT COMPLETE NO. 11903A002K



### DISCHARGE VALVE AND SEAT COMPLETE NO. 11903A001K



**THE PUMP MUST BE INSTALLED WITH A PRESSURE RELIEF VALVE IN DISCHARGE LINE**

## TROUBLESHOOTING

Pump fails to build pressure with discharge closed						
Failure to hold pressure with discharge open						
Pump is noisy						
Pump gets hot						
Pressure gauge shows abnormal fluctuation						
Regulator chatter						
<b>POSSIBLE CAUSE OF PROBLEM</b>						
1. Pump not primed						X
2. Valve closed in suction line				X		X
3. Suction line or sediment chamber clogged				X	X	X
4. Air leak in suction line				X	X	X
5. Pressure regulator valve badly worn or not properly adjusted					X	X
6. Pump plunger cups or valves badly worn		X		X	X	
7. Pump cylinder body cracked				X	X	X
8. Holes in discs are too large					X	
9. Need suction surge arrester				X		
10. Water in crankcase			X			
11. Worn connecting link bearings			X	X		
12. Lack of oil in crankcase			X	X		
13. Foaming mixture		X		X	X	
14. Regulator plunger sticking		X				
15. Unloader stuffing box nut too tight		X				
16. Foreign matter under pump valve		X		X	X	
17. Discharge surge arrester inoperative	X	X				
18. Loose plunger rod				X		
19. Improper preload of crankshaft bearings			X	X		

## Explanation of the Service Chart

1. Pump priming is usually not necessary when the pump is installed correctly. However, there are certain conditions which may make it necessary to prime the pump to get the pumping action started. Priming will be required when it is impossible for the plunger to displace the air in the pump and replace it with water. This can be caused by a high suction lift, the valves being stuck on the seat or by valves sticking due to extreme corrosion. A pump will not prime readily if someone has tampered with the valve springs causing them to exert undue pressure of the valve plates against the valve seats.
2. A gate valve is sometimes installed in the suction line between a tank or pressure line and the pump sediment chamber. It will shut off the supply source in order to clean the sediment chamber or to perform pump repairs. If this valve is partially or fully closed, it will interfere with the flow of water to the pump suction. This may cause severe knocking and vibration of the pump because the water cannot flow into the cylinder cavities fast enough.
3. A sediment chamber should be installed in the suction line between the gate valve and the pump suction. The strainers in the sediment chambers are sufficient to allow a free flow of liquid to the pump. If the strainers become severely clogged, they will completely stop the flow of liquid to the pump.
4. Any plunger pump operating at a high pressure will not perform properly nor quietly if a mixture of air and water is allowed to enter the pump suction. A small air leak in the suction line will cause the pump to knock and vibrate excessively by allowing the pump to draw a certain amount of water mixed with air on each stroke of the plunger. A large air leak will cause the pump to lose prime after which it cannot be reprimed until the air leak is stopped. Air leaks may occur at the joints of the suction line piping, at the gate valve in the suction line, at the gasket sealing the cap on the sediment chamber, by a crack in the suction wall of the cylinder body or by air drawing past the plunger cups on the suction stroke if the plunger cups are badly worn.



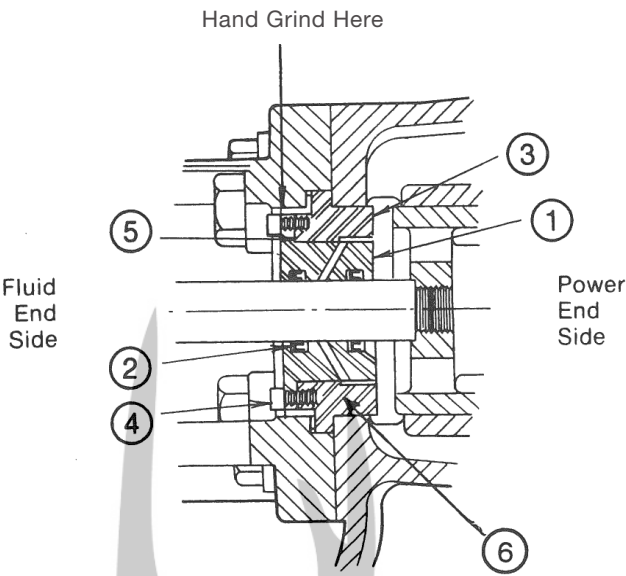
5. If the pressure regulator unloading valve is worn, it will allow too much of the pump capacity to be bypassed and recirculated back to the tank. By examining the flow from this valve with the discharge turned on, it can be determined whether or not the valve is worn. If a heavy flow continues when the discharge is turned on, it is usually a good indication of a worn valve and should be replaced.
6. Worn plunger cups, valves or valve seats will cause a severe drop in pump capacity pressure. Worn plunger cups are detected by water leakage past the cups and immediately should be replaced. Water getting into the pump crankcase will cause severe corrosion of the bearings. Worn valves can only be detected by visual examination of each valve assembly. Abrasive liquid will cause wire cuts which begin as a very small groove, but increase rapidly once the valve starts to leak through this groove. If the valve plates are replaced as soon as they start to show this cutting action, it will prevent the valve seat from becoming cut in a similar manner.
7. Pump cylinder bodies withstand an extreme amount of shock and pulsation while in operation, but if the pump is allowed to freeze, by not being drained, the freezing may crack the cylinder body walls in almost any location. If the crack occurs on the suction valve or cylinder portion of the body, it may allow a small amount of air to enter on the suction stroke and cause noisy operation or a decrease in pumping capacity. If the crack develops in the walls between the cylinder cavities or discharge valve cavity, it may allow the water to flow from one cavity to the adjacent cavity and cause uneven displacement.
8. The holes in the gun or nozzle discs are continually subject to wear because of the high velocity of the liquid through the holes. If the holes become worn, they may allow a higher rate of discharge than the pump is able to provide, then a drop in pressure will be noticed. This can quickly be checked by reducing the number of nozzles or guns while watching the amount of overflow from the pressure regulator. If there is considerable overflow, it is an indication that the regulator valve is worn rather than the gun or nozzle disc.
9. Suction surge arresters should be installed on the suction line of reciprocating pumps, 1-1/2" or 2" can be used. A standing height of 12"-15" will be sufficient with the top end closed by an ordinary pipe cap.
10. Water may accumulate in the pump crankcase from two sources; leakage of the plunger cups or an accumulation of condensation/moisture inside the crankcase due to changes in weather or the repeated heating and cooling of the pump. Pumps used consistently, running for a considerable period of time to heat the oil and other working parts, will not normally accumulate water by condensation. Replace the plunger cups as soon as they start to leak.
11. Worn connecting link bearings are caused by unusual or adverse operating conditions and are seriously affected by corrosion if water is present in the crankcase. They will wear out from overheating if adequate oil is not provided in the crankcase. It is recommended to drain, clean and refill with new oil prior to any storage period. Replace bearings as soon as any damage is discovered to avoid possible damage to crankshaft.
12. Low oil in the crankcase can quickly cause failure of the pump's power end and result in extensive repairs. Oil level should be checked periodically during normal operation and during all maintenance work.
13. A foaming mixture will sometimes have the same effect as a small air leak in the suction line. This is because various quantities of the foam are drawn through the suction line into the pump disrupting the normal flow of water.
14. Pressure regulators and unloading valves may become sluggish in action due to the plunger sticking or fitting too tightly in its cylinder. This may happen by an accumulation of chemicals collecting in and around the plunger or due to excessive corrosion of the plunger parts. To check this condition, remove and clean the plunger and cover the parts with a waterproof grease before assembling.
15. The stuffing box nut on the unloading valve lifting post should not be tightened to severely grip or bind the packing on the post. Tighten this nut just enough to prevent leakage and chatter. The pressure regulator and unloading valves may chatter or vibrate excessively due to an unstable operation from nozzling in the high or low capacity range of the regulator or unloader. The range should be at least 50% to 90% of pump capacity. With unloader valves, nozzle capacity should be at least 20% and not exceed 90% of pump capacity.
16. If foreign matter becomes lodged between the pump valve and valve seat, a drastic drop in capacity and considerable surge or pulsation will occur in the discharge line. Examine each valve if this occurs.
17. When a pump is used for a long period of time, a waterlogged discharge surge could cause pulsation at the discharge. The suction should be opened into the atmosphere to allow air to be drawn through the pump to recharge the surge arrester. Do this with the pressure release valve open so the pump operates at no pressure.
18. Noisy pump operation can be caused by a loose plunger rod in the crosshead. This noise usually has a regular cadence timed with each stroke of the plunger. When this occurs, always replace both the rod and the crosshead.
19. Increased preload to the crankshaft bearings will reduce bearing life, require more power and generate more heat, while insufficient preload may cause a knock, timed with the crankshaft rotation. Check for loose bolts on the crankshaft end caps or adjust shims to obtain proper bearing preload.

# D SERIES CROSSHEAD SEALS

## 24648A000 KIT

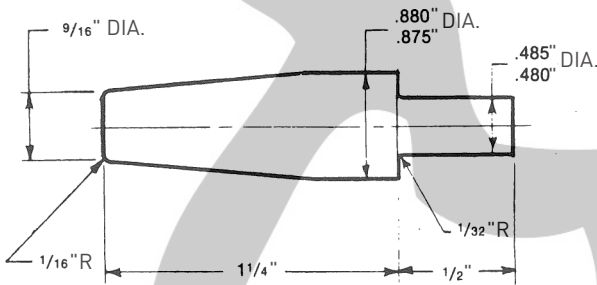
Field installation of these kits will require removal of the fluid end to replace the existing retainer and seals. On some fluid ends it may be necessary to hand grind I.D. of fluid end to fit new kit. The same spring and gasket is used to hold and seal the retainer.

The rod seal assembly contains two seals, and two oil seals with lips facing the power end. The oil seal can be replaced without taking the fluid end off by removing the piston and the cylinder liner to allow access to oil seal housing. Unscrew two Allen screws and place into the other two tapped holes. Gradually screw them in to push the oil seal housing off the retainer. After assembling new seals in the oil seal housing, an assembly thimble should be used on the end of the crosshead rod for sliding oil seal housing back into the retainer. Check gasket and replace if damaged. The thimble should be machined from high carbon steel and polished on the exterior to reduce the possibility of seal lip damage. Place two Allen screws into clearance holes and tighten snug.



OIL SEAL HOUSING ASSEMBLY

## RECOMMENDED THIMBLE



ITEM	DESCRIPTION	QTY.	ENG. NO
1	HOUSING, OIL SEAL	3	24959A001
2	OIL SEAL	6	22835A004
3	RETAINER, OIL SEAL HOUSING	3	24958A000
4	SCREW, ALLEN	6	06106A034
5	GASKET, SEAL HOUSING	3	05059A434
6	GASKET	3	05059A058

BUCKHORN  
PUMPS, INC.

## **STANDARD LIMITED WARRANTY CENTRIFUGAL & RECIPROCATING PUMPS**

Pentair Myers® warrants its products against defects in material and workmanship for a period of 12 months from the date of shipment from Pentair Myers or 18 months from the manufacturing date, whichever occurs first – provided that such products are used in compliance with the requirements of the Pentair Myers catalog and technical manuals.

During the warranty period and subject to the conditions set forth, Pentair Myers, at its discretion, will repair or replace to the original user, the parts that prove defective in materials and workmanship. Pentair Myers reserves the right to change or improve its products or any portions thereof without being obligated to provide such a change or improvement for prior sold and/or shipped units.

Seals, piston cups, packing, plungers, liners and valves used for handling clear, fresh, nonaerated water at a temperature not exceeding 120°F are warranted for ninety days from date of shipment. All other applications are subject to a thirty day warranty. Accessories such as motors, engines and auxiliary equipment are warranted by the respective manufacturer and are excluded in this standard warranty. Under no circumstance will Pentair Myers be responsible for the cost of field labor, travel expenses, rented equipment, removal/reinstallation costs or freight expenses to and from the factory or an authorized Pentair Myers service facility.

This limited warranty will not apply: (a) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with the printed instructions provided; (b) to failures resulting from abuse, accident or negligence; (c) to normal maintenance services and parts used in connection with such service; (d) to units that are not installed in accordance with applicable local codes, ordinances and good trade practices; (e) if the unit is moved from its original installation location; (f) if unit is used for purposes other than for what it is designed and manufactured; (g) to any unit that has been repaired or altered by anyone other than Pentair Myers or an authorized Pentair Myers service provider; (h) to any unit that has been repaired using non factory specified/OEM parts.

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Warranty Rev. 12/13

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