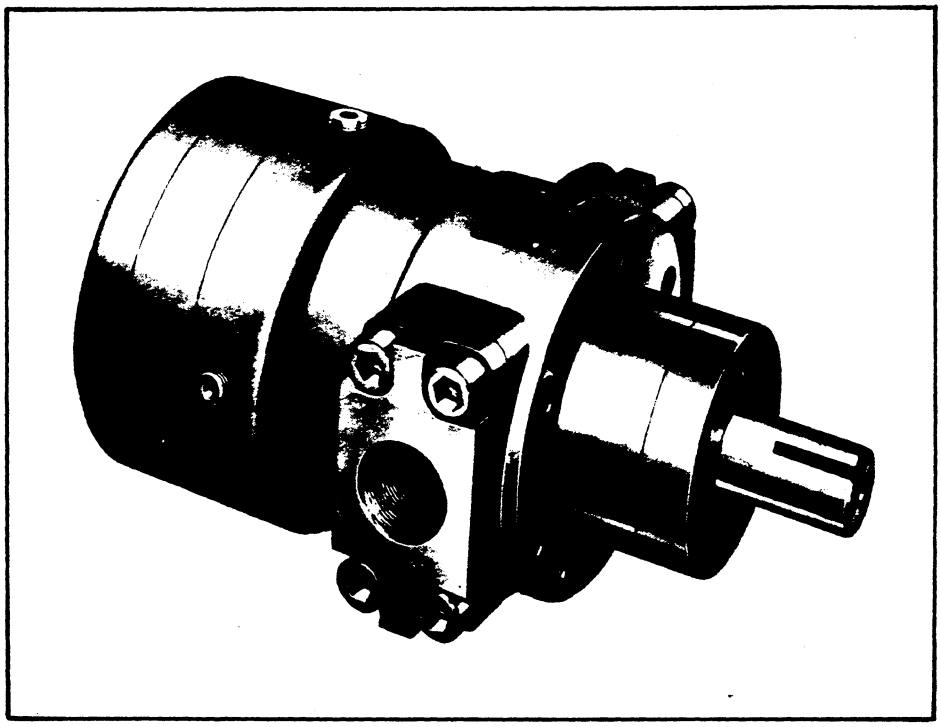
BULLETIN SP4-1-J

DENISON | Hydraulics | SERVICE LITERATURE



600-700-800 SERIES

AXIAL PISTON CONSTANT VOLUME PUMPS

MAINTENANCE INSTRUCTIONS
FOR ASSEMBLY AND DISASSEMBLY OF
DENISON AXIAL PISTON CONSTANT VOLUME TYPE PUMPS

This pump may be repaired or inspected in the machine without removing the entire pump, but when installed in one of our presses, the entire motor-pump assembly must be removed from the press frame. However, if packing or bearings are to be removed from the other end of the pump, it is necessary to remove the entire unit. Surfaces within this pump are lapped to a critical finish and should be carefully handled during removal and replacement. It is advisable, if possible, to return the pump to the factory at Columbus, Ohio, for repair so that it can be thoroughly tested before replacing in your machine.

DISASSEMBLY

To dismantle the pump, disconnect the pipe flange held in position by bolts on each port, and disconnect the drain line. Remove pipe plug and drain case of oil. Remove bolts to take off end cap.

The outer bearing race can now be removed exposing bearing rolls and cylinder and piston assembly. To dismantle, remove piston shoe retainer and lift the pistons out as a unit. Care should be taken that the pistons are reassembled in the same position in the barrel as originally assembled. The pistons may now be removed from the retainer. The hold down assembly consisting of ball, bronze spring socket and steel spring retainer will slide out with a few light taps on the retainer. The bearing is released from the cylinder barrel by removing seven bolts.

When removing the cylinder barrel, the port plate may cling to the porting surface of the cylinder barrel due to the film of oil on the surface. The port plate is not attached to the cylinder barrel and a few light bumps will cause it to break loose and can later be removed after the barrel is out of the way. In the event it does not catch on the spline, be careful that the port plate does not drop from the barrel. In handling all parts removed, be extremely careful to keep them clean and free from harmful bumps or scratches on critical surfaces.

To remove port plate without removing bearings and seal retainer from the other side, insert two brass rods of the same diameter as the sausage porting and by placing on opposite sides and squeezing together, a grip on the plate can be obtained so that the plate can be removed. Removing plate after the shaft bearing assembly on the other end has been removed is much simpler. This is not a tight fitting plate and should be removed easily.

Denison pumps can be serviced in the machine up to this point in the dismantling. To work on the other end of the pump necessitates the removal of the pump from the machine.

Working from the motor shaft connection end, remove six bolts from oil seal retainer, and remove retainer. Extreme care should be taken in removing oil seal if it is to be used again. A thin sleeve should be made, (.003) shim stock, (soft) will answer the purpose, so that the key slot in the shaft is covered during removal of the seal. Minute scratches on the surface of the seal will cause leakage around the shaft, especially where light fluid is used. Place a brass rod inside the splined end of the shaft and by tapping lightly, the shaft and bearing assembly may be removed from the port block.

To remove bearings from the shaft, bend the ear up on the lock washer and remove nut and washer from the shaft. Bearings can then be pressed off the shaft.

REASSEMBLY

To reassemble shaft and bearing assembly, bearings must be replaced in proper position in relation to the preload conditions of the bearings. These are matched preloaded bearings and care must be taken to assemble them correctly. The assembly consists of the two bearings, and an inner and outer spacer which are held firmly in place by the nut and lock washer. Direction of preload is indicated by the slotted opening on each side of the bearing retainer. The narrowest slot should be placed inward, toward the spacer in each case. After bearings are in place, the lock washer and nut are tightened against the inner spacer. The inner spacer prevents tightening the nut too tightly and should be turned for a snug fit. Bend the ear down on the washer into the slot in the nut to lock in position.

Before replacing port block, be sure that the porting surface of the port block is clean and free from scratches or burrs incurred during dismantling of the pump.

To replace shaft and bearing assembly in the port block, place the block on the bench and insert the shaft, splined end first, through the block. Lift the assembly vertically so that shaft rests on a wooden bench and holding the block in both hands, bump the shaft lightly. Do not allow bearing race to bump the shoulder too hard as it reaches the extreme in position, as damage may occur to the bearing race. "O" ring is next inserted in the grooved shoulder of the seal retainer. Seal retainer is next mounted to the port block and again care must be taken in sliding the seal over the shaft to avoid even slight scratching. Always use some method of protecting the seal from the shaft while this is being done. (Place body on bench with small opening up and insert "O" ring in groove.) Insert port block and shaft assembly with splined end of shaft down and carefully fit block into body. Insert six bolts and tighten securely. These bolt holes are not equally spaced so block should be rotated until all holes are in correct alignment. Lay pump on end and insert port plate over shaft and into pilot bore of the body, making sure dowel pin is inserted in hole in the direction of desired rotation. The port plate must be indexed in the direction of pump rotation. Be sure port plate is not on bind. After locating, check with hand to see if it will move slightly and freely.

Before replacing cylinder barrel in position, examine surface of porting to be sure no scratches or burrs have been incurred during the removal. Replace, making sure that face of the barrel is not bumped. With pump in upright position, the barrel will fall in place easily. in replacing spring retainer of the hold down assembly, locate on small dowel pin and be sure it rests correctly on end of splines in barrel which must project above shaft spline. Insert spring and bronze spring socket and place ball in position on the socket.

Replace pistons in the piston shoe retainer. Piston shoes should lie flat in the piston shoe retainer. The lapped surfaces should be free of scratches. Replace the piston assembly in the cylinder barrel, making sure that the pistons are replaced as nearly as possible in the same position as removed. Replace bearing race replacing "O" ring or gasket on body of pump before assembly, lining up holes with holes in pump body. Holes are unevenly spaced and can be mounted in two positions – 180° apart.

Assemble end cap with gasket under cap. Be sure the cam plate is in proper relation to the pressure port, the thick side of the cam plate should be on the opposite side from the bleed slot.

REVERSING DIRECTION

OF PUMP ROTATION CONSTANT VOLUME PUMP

DISASSEMBLY

Disassemble the pump after draining, if full of oil, by removing socket head cap screw (5) holding end cap (4) in place. The outer bearing race (26) can now be removed exposing bearing rolls and cylinder and piston assemblies. Remove piston shoe retainer and pistons (27) as a unit, taking care not to loose the ball (31) from the hold-down assembly, and marking the position of the pistons in the cylinder barrel so that they may be re-assembled in the same position.

Next, remove the cylinder assembly (24) by pulling on the inner bearing race (26). When removing this part, the port plate (22) may cling to the porting surface of the cylinder barrel due to the film of oil on the surface. The port plate is not attached to the cylinder barrel and a few light taps should cause it to break loose. The plate catches on the splined shaft (20) when this occurs and can later be removed. In the event that it does not catch on the spline, be careful that the port plate does not drop from the barrel after the latter has cleared the pump. In handling all parts removed, be extremely careful to keep them clean and free from harmful bumps or scratches on critical surfaces.

To remove the port plate (22) should it stick in place in the body (1), insert on opposite sides, two brass rods of the same diameter as the width of the sausage porting. By squeezing together on the rods, a grip can be obtained and the plate removed.

REASSEMBLY

To change rotation requires a different port plate. The bleed slot must be on the opposite end of the pressure port, or the end which is uncovered first as the piston port moves past it.

The port plate (22) is assembled in the pump by inserting it over the shaft and into the pilot bore on the body (1), making sure the dowel pin (23) is fitted in the proper hole causing the port plate to be indexed in the direction of pump rotation. Be sure the port plate is not binding. Check by hand to see that it will move slightly and freely.

Replace the cylinder and hold down assemblies and place the ball (31) in position on the socket holding it in place with a light grease.

Replace the piston assembly (27) with pistons in the same position as when removed. The lapped surfaces must be free of scratches. Check to see that the pistons move freely in the cylinders.

Assemble the bearing outer race (26) and the end cap (4) with the "O" ring (2) in place on the body (1) and the gasket (5A) under the cap. Due to the unevenly spaced holes, the parts can go together only two ways, 180° apart. Be sure the cam plate (32) is in proper relation to the pressure port, the thick side of the cam plate should be on the opposite side from the bleed slot. Interchange the pressure and suction flanges.

CAUTION: ALWAYS REFILL THE HOUSING OF THE PUMP WITH CLEAN OIL OF THE TYPE BEING USED BEFORE OPERATING AGAIN.

SERVICE TIPS FOR PUMPS

Difficulties	Probable Cause	Remedy
INSUFFICIENT FLOW	1. Clogged filters; restriction in suction lines.	1. Flush filters and replace elements; remove and blow out lines.
	2. Air in suction lines due to loose unions, low oil level or pump worn internally.	2. Tighten all unions in suction lines, check oil level, examine pump parts.
INSUFFICIENT PRESSURE	1. Pump not delivering oil due to wear.	1. Check internal parts.
	2. Relief valve faulty.	2. Check relief valve parts.
CHATTERING OR VIBRATION IN HYDRAULIC SYSTEM	1. Air in system.	1. Cycle pressure in system by opening and closing bypass valve.
	2. Coupling misaligned.	2. Correct
PUMP MAKING NOISE	1. Restricted intake line.	1. Pump must receive oil freely or pump will cavitate.
	2. Air leak in pump intake lines.	2. Test by pouring oil on all pipe joints. Listen for change in sound of operation. Tighten joints as required.

*Table I Recommended Oil Specifications**

Viscosity Index . . . . . 90 min.
Maximum Viscosity at Starting temperature . . . . . 7500 SUS

At low pressure, low flow and/or low speed.

Maximum viscosity at full power . . . . . 750 SUS
Minimum viscosity at full power . . . . . 70 SUS
Optimum viscosity for maximum life . . . . . 130 SUS
Rust and oxidation inhibitors . . . . . yes
Anti-foam additive . . . . . yes

It is recommended that the fluid used be a petroleum base R & O oil meeting Denison standard HF-1. These preferred fluids do not contain anti-wear additives.

Fluids meeting Denison standard HF-2 are acceptable for use but may require reduced operating conditions. These fluids are similar to HF-1 but do contain anti-wear additives.

For most effecient operation, inlet oil temperature should be 125 F – 135 F and should not exceed 160 F.

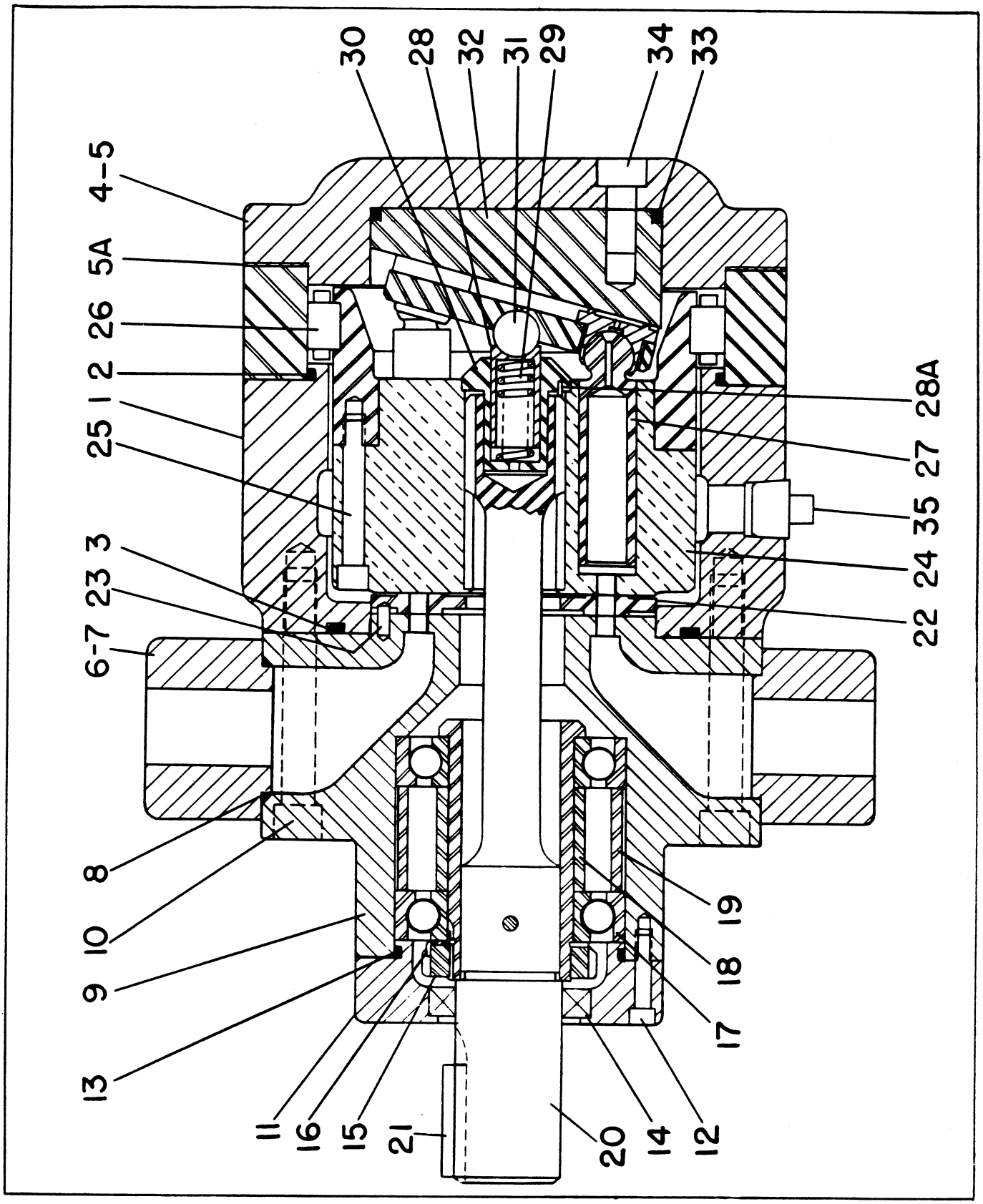
When it becomes necessary to use petroleum base fluids which do not meet this specification or special fire resistant hydraulic fluids, a Denison representative should be consulted.

* It is suggested that a fluid certification be provided to insure conformance to this specification.

PARTS LIST FOR DENISON CONSTANT VOLUME PUMP

REF. NO.	DESCRIPTION	PART NO.			QTY
		600 SERIES	700 SERIES	800 SERIES	
1	Pump Body	035-11835	035-11811	035-15451	1
2 (S)	"O" ring 70-6230-24 (ARP-246) "O" ring 70-6230-43 (ARP-265)	671-00246 --------	-------- --------	-------- 671-00265	1 2
3 (S)	"O" ring 70-6230-19 (ARP-241) "O" ring 70-6230-32 (ARP-254) "O" ring 70-6227-68 (ARP-441)	671-00241 -------- --------	-------- 671-00254 --------	-------- -------- 671-00441	1 1 1
4	End cap	035-14286	035-11814	035-11268	1
5	S.H.C. screws	358-16300 3/8-16 x 2¾	358-20320 1/2-13 x 3	358-24360 5/8-11 x 4	6
5A (S)	Vellumoid gasket Vellumoid gasket	035-11900 --------	-------- 035-11899	-------- --------	1 2
6	Flange - pressure Flange - suction	035-10233 035-11840	035-11832 035-11831	035-11761 035-11267	1 1
7	S.H.C. screws 5/8-11 x 2 S.H.C. screws 3/4-10 x 2 S.H.C. screws 3/4-10 x 2½	358-24240 -------- --------	-------- 358-26240 --------	-------- -------- 358-26280	4 8 8
8 (S)	"O" ring 70-6227-25 (ARP-220) "O" ring 70-6230-4 (ARP-226) "O" ring 70-6230-8 (ARP-230)	671-00220 -------- --------	-------- 671-00226 --------	-------- -------- 671-00230	2 2 2
9	Port block	035-11836	035-11812	035-15450	1
10	S.H.C. screws	358-16300 3/8-16 x 2¾	358-20340 1/2-13 x 3½	358-24360 5/8-11 x 4	6
11	Seal retainer	035-14368	035-11821	035-11281	1
12	S.H.C. screws 10-24 x 1/2 S.H.C. screws 1/4-20 x 1¼ S.H.C. screws 5/16-18 x 1½	358-10080 -------- --------	-------- 358-12180 --------	-------- -------- 358-14200	4 6 6
13 (S)	"O" ring 70-6230-8 (ARP-230) "O" ring 70-6230-14 (ARP-236) "O" ring 70-6230-24 (ARP-246)	671-00230 -------- --------	-------- 671-00236 --------	-------- -------- 671-00246	1 1 1
14 (S)	Shaft seal	620-50326	620-50771	620-51326	1
15	Shaft lock nut	341-10007	035-17681	035-18132	1
16	Shaft lock washer	350-01007	350-01010	350-01013	1
17	Shaft bearing (matched pairs)	230-20207 20207-DB	230-20210 20210-DB	230-20213 20213-DB	1
18 & 19	Shaft bearing spacers (matched sets)	S15-99887	S15-99888	S15-99889	1
20	Shaft & sleeve assembly	S15-00465	S15-00509	S15-00494	1
21	Shaft key	211-10016	035-20101	035-20102	1
22	Port plate - right hand Port plate - left hand	035-16506 035-16507	035-18543 035-18542	035-15455 035-16464	1 1
23	Dowel pin	324-20808 1/8 x 1/2	324-21208 3/16 x 1/2	324-21610 1/4 x 5/8	1
24	Cylinder barrel	035-11837	035-11816	035-15452	1
25	S.H.C. screws 1/4-20 x 1½ S.H.C. screws 5/16-18 x 2¼ S.H.C. screws 3/8-16 x 2½	358-12200 -------- --------	-------- 358-14260 --------	-------- -------- 358-16280	7 7 7
26	Barrel bearing	035-12421	035-11897	035-12420	1
27	Piston & shoe assembly (7 pistons, 7 shoes, & shoe retainer)	S15-01017 (25-2378)	S15-00511 (25-1523)	S15-01021 (25-2437)	1
28	Spring socket	035-13343	035-13342	035-13344	1
28A	Spring retainer pin	325-04040 1/16 x 1/4	325-04040 1/16 x 1/4	324-20806 1/8 x 3/8	1
29	Hold down spring	035-18530	035-22174	035-22215	1
30	Spring retainer	035-10240	035-11818	035-11278	1
31	Steel ball H & G	201-16001 1/2"	201-24001 3/4"	201-28001 7/8"	1
32	Cam plate	035-14285	035-13377	035-13441	1
33 (S)	"O" ring 70-6230-12 (ARP-234) "O" ring 70-6230-22 (ARP-244) "O" ring 70-6230-31 (ARP-253)	671-00234 -------- --------	-------- 671-00244 --------	-------- -------- 671-00253	1 1 1
34	S.H.C. screw (Nylok)	358-16146 3/8-16 x 7/8	358-20166 1/2-13 x 1	358-24186 5/8-11 x 1¼	1
NS	Washer	035-11185	035-13616	035-13654	1
35	Sq. Hd. pipe plug	488-13044 AN913-4D	488-13064 AN913-6D	488-13064 AN913-6D	1 1
NS	Soc. pipe plug	431-90800 1/2"	431-91200 3/4"	431-91200 3/4"	3
NS	Mounting bracket w/screws	S15-00600	S15-00700	S15-00800	1
NS	Mounting flange w/screws	S15-00602	S15-00702	S15-00802	1
(S)	Seal kit	S15-15244	S15-15248	S15-15262	1

OLD MODEL NO.	SERIES	NEW MODEL NO.
PA-072-560-L	600	PF06-007-51L
PA-072-560-R	600	PF06-007-51R
PA-202-570-L	700	PF07-020-51L
PA-202-570-R	700	PF07-020-51R
PA-352-580-L	800	PF08-035-51L
PA-352-580-R	800	PF08-035-51R



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HÄGGLUNDS DENISON CORP., 1220 Dublin Road, Columbus, Ohio U.S.A. 43216
Call 1-800-982-0030 for the distributor nearest you

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