

# SERVICE INSTRUCTIONS

## OILGEAR TYPE "MFQ<sub>A</sub>" & "MFW" FIXED DISPLACEMENT BI-DIRECTIONAL MOTORS

### PURPOSE OF INSTRUCTIONS

These instructions are written to simplify your work when installing, operating and maintaining these Oilgear motors. Your acquaintance with the construction, principle of operation and characteristics of these units will help you obtain satisfactory performance, reduce down-time and increase the units life. Some units have been modified from those described in this bulletin and other changes may be made without notice.

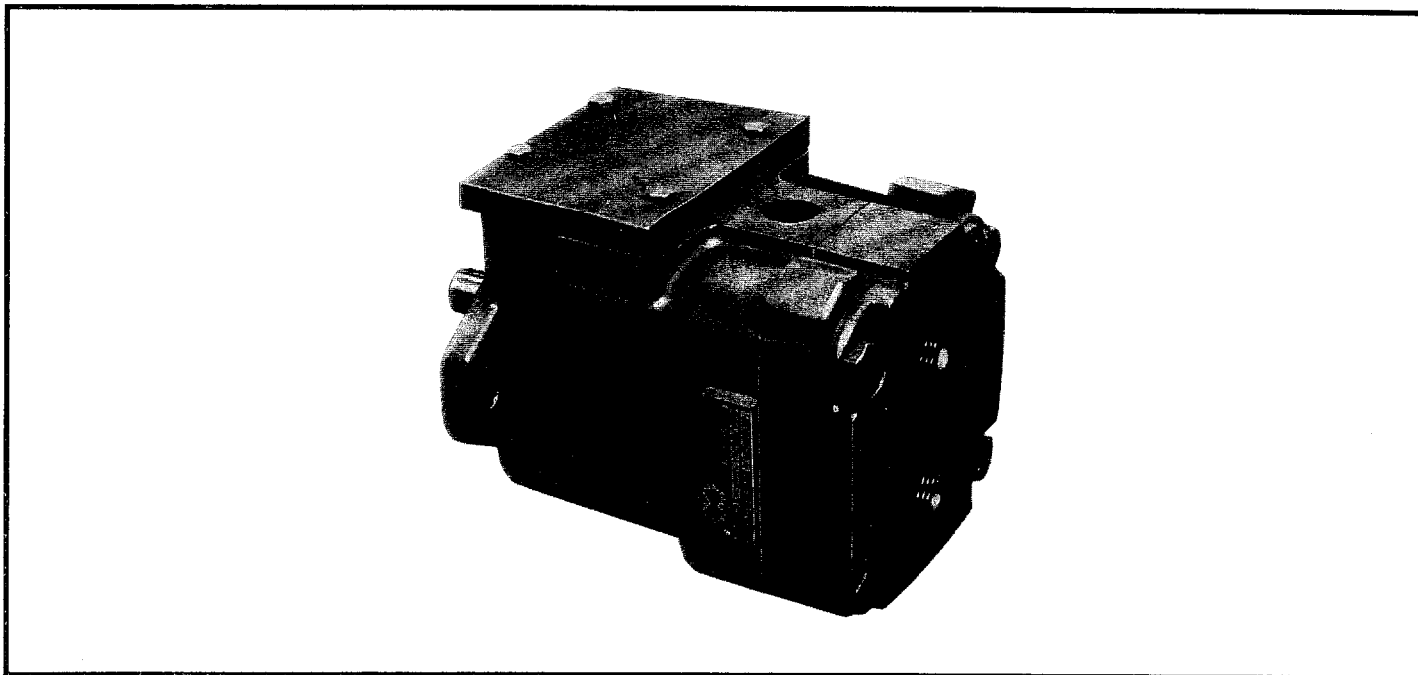


Figure 1. Typical Oilgear "MFQ<sub>A</sub>" Bi-Directional Motor (55296).

### REFERENCE MATERIAL

Specifications, "MFQ <sub>A</sub> " Motors .....	Bulletin 57015
Fluid Recommendations .....	Bulletin 90000
Contamination Evaluation Guide .....	Bulletin 90004
Filtration Recommendations .....	Bulletin 90007
Piping Information .....	Bulletin 90011

## I. PREPARATION AND INSTALLATION

**NOTE:-** Parts drawing and lists are located on pages 7 and 8. To aid in location of parts, numerals parenthesised (##) in text correspond to parts list Item Numbers.

### A. MOUNTING

The motors may be mounted in any position. But, for convenience the recommended mounting position is with the driveshaft axis on a horizontal plane and with case drain "Port 1" on the top side. Secure the unit to a rigid mounting surface. See Section "B" on "Piping and Fittings".

### B. PIPING AND FITTINGS

See reference "Piping Information" bulletin and individual circuit diagram before connecting motor to system.

Arrange case drain line so motor case remains full of fluid (non-siphoning) at less than 25 psi (1,7 bar). Each drain line must be separate, unrestricted, full sized and connected directly to the reservoir below the lowest fluid level. Drain tubing should not incorporate a "suction break". Provisions for opening this line without draining (siphoning) reservoir should be made.

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2300 So. 51st. Street  
Milwaukee, WI 53219

System and motor must be protected against over-loads by separate high pressure relief valves. Pressure at motor "Port A" provides right hand rotation (when facing shaft) and pressure at motor "Port B" provides left hand rotation.

### C. FLUID FILLING

**"MFQ" & "MFW" Motors use 150-300 SSU VISCOSITY FLUIDS**, meeting or exceeding lubricating specifications of SAE10W API Engine Service Classifications - SC, CC or SE (or ISOVG32 thru 68) is recommended, viscosity range 150-300 SSU at 100°F (37,7°C). **For fire resistant fluids**, phosphate ester hydraulic fluids can be used in accordance with manufacturers recommendations.

**Remove case drain line at the motor and fill the motor case with hydraulic fluid.**

### D. DRIVE

Before putting coupling on motor shaft, turn the shaft a few times with a spanner wrench to be sure parts are free:

Table 1. Torque to Turn Shaft

Size Unit	Approx. Torque to Turn Shaft	
	foot pounds	Nm.
06, 10	1.7 - 2.1	2,3 - 2,8
15, 20	2.9 - 3.3	4,0 - 4,5

Size and install coupling per manufacturers instructions.

### CAUTION:

**Do not use a drive, press or shrink fit. Unit must be ordered with an outboard shaft bearing if overhung loads are present.**

Misalignment of "MFQ<sub>A</sub>" or "MFW" motor shafts to driven shaft should not exceed 0.005" (0,13 mm) Total Indicator Readout (TIR) in any plane.

## II. CONSTRUCTION

Fold out page 8 and refer to figures 2 and 8. A driveshaft (1) runs through the centerline of the motor housing (5), swashblock (11) and valve plate (22). Motor cylinder barrel (18) is splined to driveshaft. A bearing (3) supports the outboard end of the driveshaft. A bushing, integral with the valve plate, supports the inboard end. The motor cylinder barrel is carried in a journal type cylinder bearing (12). A roller bearing is used on "MFQ<sub>A</sub>" and a hydrodynamic bearing is used on "MFW" Motors. The valve plate (22) has two crescent shaped ports. Piston/shoe assemblies (15) in the cylinder barrel are forced against a swashblock (11), by hydraulic pressure through "Port A" or "B", and the wedge shaped swashblock limits the piston stroke.

## III. PRINCIPLE OF OPERATION

See Figure 3. Fluid under pressure delivered to one port of the motor flows through the corresponding valve plate crescent port and into the piston bores open to that crescent. Those pistons are forced against the swashblock which is at a fixed angle with respect to the driveshaft and face of the cylinder.

See Figure 4. Pressure forces the pistons outward, following the slope of the swashblock, which causes the cylinder and driveshaft to turn. Bridge segments in the valve plate separate the crescent connected to "Port A" from the crescent connected to "Port B". At the point where each piston reaches it's outermost stroke, the piston reaches and crosses the bridge segment.

Pressure at "Port A" provides right hand rotation (facing the driveshaft), pressure at "Port B" provides left hand rotation.

As the cylinder continues to rotate the (outermost) piston crosses the bridge segment and is connected to the other (return) crescent port. The swashblock angle forces pistons connected to the (return) crescent port inward, during this half revolution, which discharges the fluid through the valve plate and out through the return line.

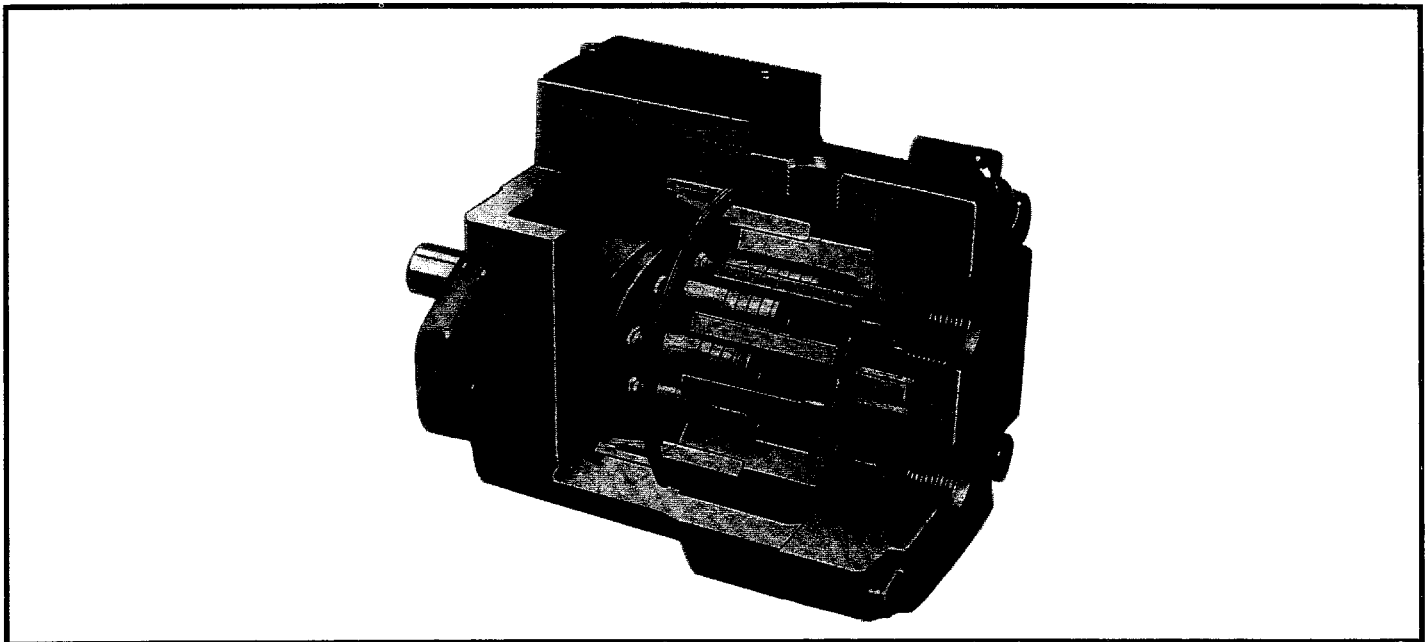


Figure 2. Cutaway of typical Oilgear "MFQ<sub>A</sub>" & "MFW" Fixed Displacement Motor. (55292)

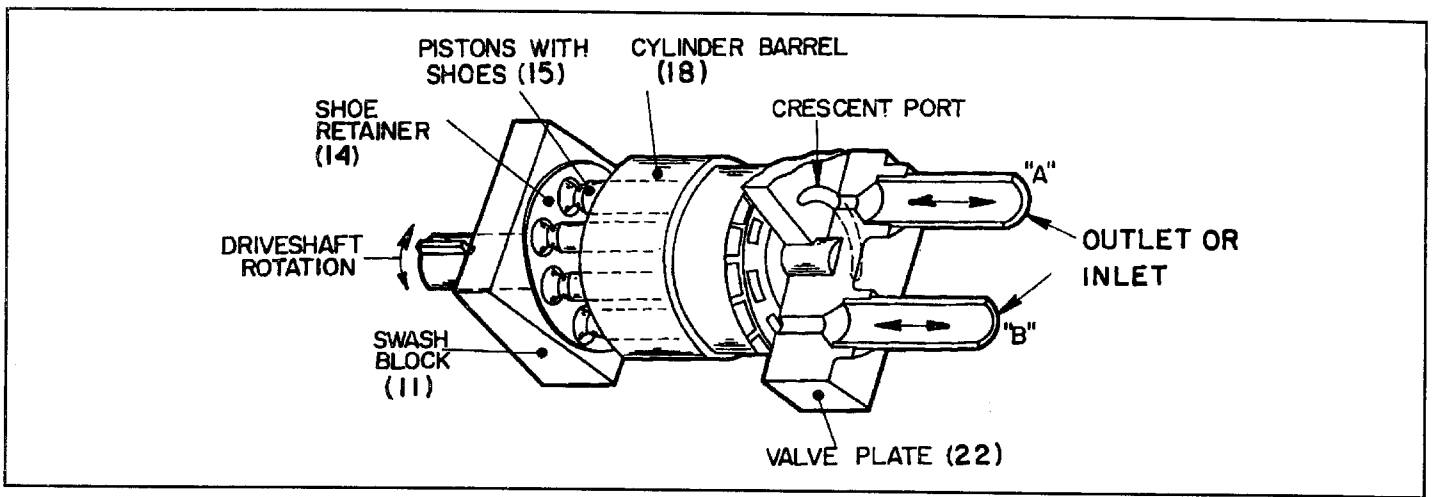


Figure 3. Oilgear "MFQ<sub>A</sub>" and "MFW" Rotating Mechanism Diagram Shown From Right Side of Motor (E51341).

#### IV. SPECIFICATIONS

See reference material and individual application circuits for exceptions.

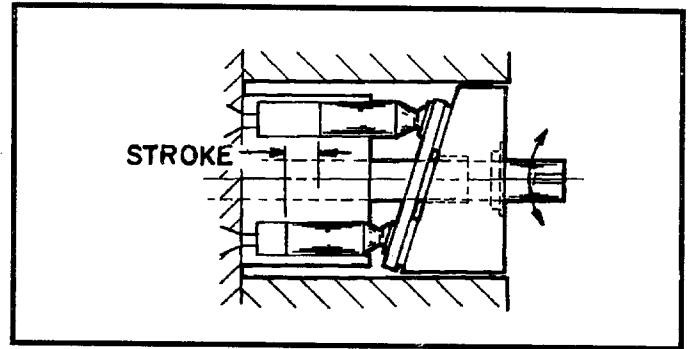


Figure 4. Swashblock Angle [plan (top) view] (E51341)

Table 2. Nominal Performance Data for "MFQ<sub>A</sub>" and "MFW" Motors with 150-300 SSU Viscosity Fluids.

Frame Size	Unit Size	Displacement, Theoretical Maximum		Pressure								Speed			Torque at Contin. Pres. & Max. Displ.		Output at 1800 rpm, Cont. Pres. Max. Displ.		Inertia	
				Maximum		Continuous		MFQ <sub>A</sub> Break-away		MFW Break-away		MFQ <sub>A</sub> Min.	MFW Min.	MFW Max.						
		cipr	mlpr	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar	rpm	rpm	rpm	lb. in.	N.m.	hp.	Kw
A	06	0.86	14,1	4500	310	4000	276	250	17,2	500	34,5	100	600	3000	465	52,5	13,3	9,9	0,029	0,0012
	10	1.35	22,1	3500	242	3000	207	250	17,2	500	34,5	100	600	3000	562	63,5	16,1	11,9	0,029	0,0012
B	15	2.06	33,8	4000	276	3500	242	250	17,2	330	22,8	100	600	3000	1030	116,4	30,0	22,4	0,130	0,0055
	20	2.83	46,4	3000	207	2500	173	250	17,2	330	22,8	100	600	3000	960	108,5	27,5	20,5	0,130	0,0055

Table 3. Nominal Dimensions & Weights

Unit Size	Length		Width		Height		Weight	
	in.	mm.	in.	mm.	in.	mm.	lbs.	kg.
06 & 10	9	227	5	130	5	131	25	11,4
15 & 20	11	274	7	175	7	172	42	19,1

#### V. MALFUNCTIONS AND CAUSES

##### A. LOSS OF SPEED

1. Insufficient delivery volume.
2. Worn or grooved cylinder barrel (18) and/or valve plate (22) matching surfaces.

3. Worn piston/shoe assemblies (15) or piston bores in cylinder (18).

##### B. EXCESSIVE NOISE

1. Air entering system.
2. Fluid too cold or viscosity too high.
3. Broken or worn piston/shoe assemblies (15).

## C. EXCESSIVE HEATING

1. Excessive peak load operation.
2. Worn or grooved cylinder barrel (18) and/or valve plate (22) matching surfaces.

## VI. TESTING

To check for worn motor, measurement of the leakage can be made from the motors case drain while the motor is under full load. After the unit is warm, either install a flow meter in the drain line or have the flow from the drain line directed into a large container or reservoir. The motor case must remain full of fluid during the test.

### CAUTION:

**Limit discharge to prevent dropping reservoir fluid below "Low" level.**

With an accurate high pressure gage in the pressure line, start pump and stall (load) motor to raise system pressure to maximum (as governed by system relief valve). Read the flow meter, or time the case drain flow into a known size container and calculate the flow rate in terms of gallons per minute (gpm). The leakage should conform with Table 4. Additional leakage indicates wear, but does not become critical until it impairs performance.

Table 4. "MFQ<sub>A</sub>" and "MFW" Motor Nominal Case Slip vs High Pressure at 1800 rpm (viscosity of 160 SSU).

Pump Size	Case Slip at Indicated Pressure			
	Pressure		Slip	
	PSI	bar	GPM	lpm
06	4000	275	0.65	2,5
10	3000	205	0.65	2,5
15	3500	240	1.0	3,8
20	2500	170	1.0	3,8

## VII. DISASSEMBLY

### A. GENERAL

Refer to Figure 8. It will be advantageous to tag similar parts (particularly screws, plugs and o'rings) during disassembly to be certain they don't become confused with similar parts and to assure they will be returned to original location. Do not remove (locator) roll pins unless they are deformed or otherwise in need of replacement.

### B. PREPARATION

For disassembly and assembly, a crane and/or sling capable of handling 150 lb. loads will be useful (particularly when working on larger size units).

When disassembling or assembling unit, we recommend choosing an area where no traces of dust, sand or other abrasive particles, which could damage the unit, are in the air. We also recommend not working near welding, sand blasting, grinding benches and the like. Place all parts on a CLEAN surface. To clean parts which have been disassembled, it is important to use CLEAN solvents. All tools and gages should be CLEAN and lint free rags used to handle and dry parts.

**WARNING: NEVER attempt to remove or install any components or assemblies while unit and system is running. Always stop the pump, shut-off power and release pressure from the system before servicing or testing. Be sure provisions have been made so case drain line can be disconnected from unit without causing the line to drain (siphon) the reservoir.**

Disconnect motor from driven shaft and piping. Usually, it is necessary to remove motor from its' mounting before case can be drained.

After removing motor from mounting, but before disassembly, cap or plug all ports and clean the outside of the unit thoroughly to prevent entry of dust into the system.

Refer to Figure 8. Depending upon what part or parts are to be inspected, it may not be necessary to completely take apart all assemblies.

**NOTE: disassembly of motor not required if only shaft seal needs replacing. See section "E. Driveshaft Group" instructions.**

### C. VALVE PLATE GROUP

Block unit on bench with driveshaft facing down. Remove valve plate (22) by alternately turning out the four hex. head screws (25) until "free" and then lifting the valve plate straight up. Remove valve plate gasket (21) and o'ring (28).

### D. ROTATING GROUP

**WARNING: Extreme care must be taken to not damage cylinder wear surface (that matches against the valve plate), bearing diameter or piston shoes. The use of a sling and/or assistance from others and use of proper lifting techniques are strongly recommended to prevent personal injury (particularly when working on larger units).**

Place the motor in a horizontal position and remove the rotating group by turning shaft (1) slowly while pulling the cylinder barrel (18) from the housing. Place assembly on a clean soft surface (to prevent damage to cylinder barrel/wear plate face).

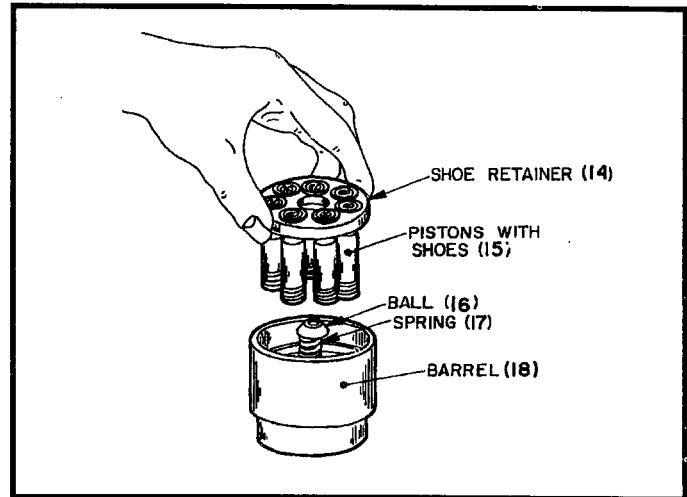


Figure 5. Rotating Group Disassembly (E51341).

See Figure 5. Lift off shoe retainer (14) with piston/shoe assemblies (15), remove fulcrum ball (16) and shoe retainer spring (17).

If necessary, the cylinder bearing (12) can be withdrawn from the housing after removing retainer ring (13). On "MFW" mo-

tors, note the position of the bearing locating pin. "MFQ<sub>A</sub>" motors do not have this pin.

## E. DRIVESHAFT GROUP

Remove drive key (2) if used and driveshaft retainer ring (29). Grasp outboard end of driveshaft (1) and pull out from motor housing. Remove shaft retainer ring (4) and front driveshaft bearing (3). Remove seal retainer (6) and shaft seal (7) from housing only if necessary.

## F. SWASHBLOCK GROUP

If necessary, the swashblock (11) can be pulled out. The swashblock is located by pin (20) and can be pulled from the housing.

## VIII. INSPECTION

Clean all parts thoroughly. Inspect all seals and o'rings for hardening, cracking or deterioration and replace if necessary. Check all locating pins for damage and springs for cracking or signs of fatigue.

**WARNING:** Always wear safety goggles when using solvents or compressed air. Failure to wear safety goggles could result in serious personal injury.

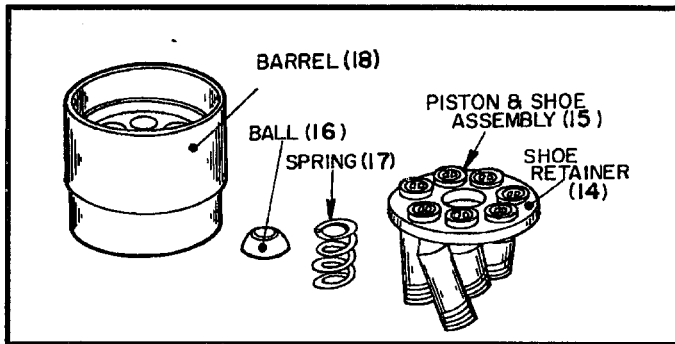


Figure 6. Rotating Group Inspection (E51341)

### A. VALVE PLATE GROUP

Inspect the valve plate (22) surface, that mates with the cylinder barrel (18), for excessive wear or scoring. Remove minor defects by lightly stoning the surface with a hard stone that is flat to within 0.001" (0.03mm). Be sure to stone lightly. Any excessive stoning will remove the hardened surface. If wear or damage is extensive, replace the valve plate (as part of Valve Plate Assembly Kit 79) and cylinder barrel (18).

### B. ROTATING GROUP

Inspect cylinder barrel (18) piston bores and face that mates with the valve plate for wearing or scoring. Remove minor defects by lightly stoning the surface with a hard stone that is flat to within 0.001" (0.03mm). Be sure to stone lightly. Any excessive stoning will remove the hardened surface. If defects can not be removed by this method, replace the cylinder barrel as part of Rotating Group Kit 73. Inspect cylinder bearing (12) and matching cylinder barrel surface for galling, pitting, roughness, damage and replace if necessary. Check all piston/shoe assemblies (15) to be sure they ride properly on the swashblock.

See Figure 7. Piston shoe must pivot smoothly, but end play should not exceed 0.003" (0,076mm). Check end play as follows: Place square end of piston on bench and hold down firmly. Pull on end of shoe with other hand and note end play. A good piston/shoe fit will have no end play, but the shoe must rotate

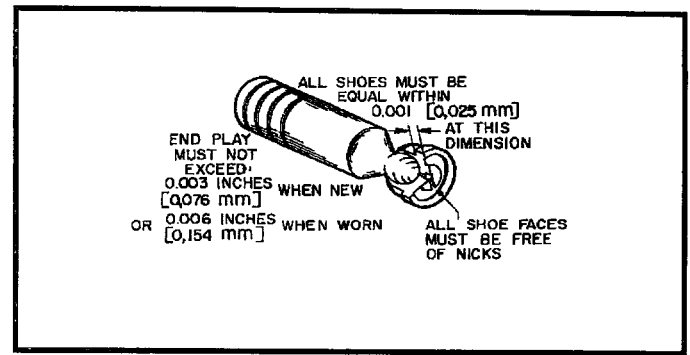


Figure 7. Piston and Shoe Inspection (E51341).

and pivot on the piston ball. Inspect each shoe face for nicks and scratches. Measure the shoe thickness [the part held between shoe retainer (14) and swashblock (11)]. All shoes must be equal within 0.001" (0,025 mm). If a single piston/shoe assembly needs to be replaced, all piston/shoe assemblies must be replaced. Replace as part of Piston/Shoe Kit 87. When installing a new rotating group kit, make sure pistons are free in their bores.

### C. SWASHBLOCK GROUP

Inspect the swashblock (11) and swashblock wear plate (34) [used only on size 06 and 10 units] for wear or scoring. If damage is extensive, replace swashblock as part of Swashblock Kit 82.

### D. DRIVESHAFT GROUP

Check shaft seal (7) for deterioration or cracks. Replace if necessary. Examine the sealing area of the driveshaft (1) for scoring or wear. Inspect the front shaft bearing (3) for roughness, galling, pitting or binding. Check shaft and splines for wear. If driveshaft is bent, scored or worn excessively or if bearing is bad, replace as part of Shaft and Bearing Kit 74. Inspect bushing in valve plate (22). If replacement is necessary, the bushing is not available as a loose item. It is included when ordering Valve Plate Kit 79.

## IX. ASSEMBLY

Refer to Figure 8. The procedure for assembling the motor is basically the reverse order of disassembly. During assembly, install new gaskets and o'rings (Kit 77). Apply a thin film of CLEAN grease or hydraulic fluid to sealing components to ease assembly. If a new rotating group (Kit 73) is used, lubricate thoroughly with CLEAN hydraulic fluid. Apply fluid generously to all wear surfaces.

### A. SWASHBLOCK GROUP

If removed, press shaft seal (7) into front of motor housing (5) and then place housing on bench with mounting flange side down. Place swashblock (11) and wear plate (34) [size 06 and 10 only] into housing - center properly [a locating hole in the swashblock and a pin (20) in the housing must match].

**For "MFW" Motor only,** position the hydrodynamic barrel (12) into the case so the pin (in the bearing) will be located at 6:00 o'clock position between swashblock and motor housing. Tap bearing into place if necessary, using extreme care to not damage the bearing. The bearing should be square to the axis of the pump. Insert retainer ring (13) to hold in place.

**For "MFQ<sub>A</sub>" Motors only,** insert roller type cylinder bearing (12) square with the axis of the motor. If it is necessary to tap the bearing in place, use extreme caution not to distort the bearing. Insert retaining ring (13) to hold in place.

## B. DRIVESHAFT GROUP

Place housing on it's side with axis horizontal and then install seal retainer (6). Place front driveshaft bearing (3) onto driveshaft and lock in place with shaft retaining ring (4). Lubricate shaft seal (7) and shaft, then insert driveshaft and bearing assembly into motor housing (5) and lock in place with driveshaft bearing retainer ring (29).

## C. ROTATING GROUP

See previous Figure 5. Place the cylinder barrel (18), wear surface down, on a clean cloth. Place the shoe retainer spring (17) in the center of the barrel with fulcrum ball (16) on top of it. Insert the piston/shoe assemblies (15) into the shoe retainer (14).

As an unit, fit the pistons into bores of the cylinder barrel DO NOT FORCE. If aligned properly, the piston will fit smoothly.

**WARNING: Assistance from others and proper lifting technique is strongly recommended to prevent personal injury while assembling large size motor.**

The rotating group can now be carefully installed over the tail of the driveshaft (1) and into the motor housing (5). When installing the rotating group, support the weight of the cylinder barrel (18), as cylinder spline is passed over the tail shaft to avoid scratching or damage. Push cylinder forward until the cylinder spline reaches the driveshaft spline. Then, rotate the cylinder or driveshaft slightly to engage shaft splines. Continue to slide cylinder forward until it encounters the cylinder bearing (12). Lifting the tail shaft slightly helps cylinder barrel (18) and cylinder bearing (12) engagement. Continue pushing cylinder forward until piston shoes contact the swashblock. At this point, the back of the cylinder should be located slightly outside the back of the motor housing.

## D. VALVE and TOP PLATE GROUP

Block motor housing on bench with open end facing up. Install new o'ring (28) and gasket (21) on housing. Make sure the tail end of shaft engages bushing while positioning the valve plate (22) on pins (19) and housing. Finger tighten hex. head cap screws (25). Starting with screw closest to o'ring (28) position, and then alternately, tighten screws per Table 9.

Place top plate gasket (36) and o'ring (35) in place and fasten top plate (38) to motor case using hex. head cap screws (37) torqued per Table 9.

Table 9. Valve and Top Plate Torques

Unit Size	Valve Plate		Top Plate	
	Ft. lbs.	N.m.	Ft. lbs.	N.m.
6, 10	15	20,4	8.3	11,3
15, 20	37	50,3	8.3	11,3

SEE SECTION "I. PREPARATION and INSTALLATION

IT IS RECOMMENDED THAT SPARE OR REPLACEMENT PARTS BE ORDERED AS PART OF THE FOLLOWING KITS.

### ITEM NO. DESCRIPTION

#### HOUSING & PINS

<b>Kit No. 72</b>	
5.	Housing, Motor
7.	Seal, Shaft
19.	Pin, Roll
20.	Pin, Swashblock Locating

#### ROTATING GROUP

<b>Kit No. 73</b>	
14.	Retainer, Shoe
15.	Assemblies, Piston/Shoe
16.	Ball, Fulcrum
17.	Spring, Shoe Retainer
18.	Barrel, Cylinder

#### SHAFT & BEARING

<b>Kit No. 74</b>	
1.	Driveshaft
2.	Key, Driveshaft
3.	Bearing, Front Driveshaft
4.	Ring, Shaft Retainer
6.	Retainer, Seal
29.	Ring, Driveshaft Bearing Retainer

#### GASKET & SEAL

<b>Kit No. 77</b>	
7.	Seal, Shaft
21.	Gasket, Valve Plate
23.	Seal, O'ring
28.	Seal, O'ring
36.	Gasket, Top Plate

#### VALVE PLATE

<b>Kit No. 79</b>	
21.	Gasket, Valve Plate
22.	Plate, Valve
23.	Seal, O'ring
24.	Plug, SAE
25.	Screw, Hex. Hd.
28.	Seal, O'ring

#### SCREWS, KEY & TAG

<b>Kit No. 80</b>	
2.	Key, Driveshaft
25.	Screw, Hex. Hd.
26.	Plate, Name
27.	Screw, Drive

#### ROTATING GROUP BEARINGS

<b>Kit No. 81</b>	
12.	Bearing, Cylinder Barrel

#### SWASHBLOCK

<b>Kit No. 82</b>	
11.	Swashblock
34.	Plate, Swashblock Wear (size 06 or 10 only)

#### SHOE RETAINER & BALL ASSEMBLY

<b>Kit No. 86</b>	
14.	Retainer, Shoe
16.	Ball, Fulcrum

#### PISTON/SHOE ASSEMBLY

<b>Kit No. 87</b>	
15.	Assembly, Piston/Shoe

## X. PARTS LIST

Parts used in this assembly are per Oilgear specifications. Use Oilgear parts to ensure compatibility with assembly requirements. When ordering replacement parts, be sure to include motor type designation and serial number. To assure seal and packing compatibility, specify type of hydraulic fluid used.

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1A	Driveshaft, w/Keyway	17.	Spring, Shoe Retainer
1B	Driveshaft, w/SAE Spline	18.	Barrel, Cylinder
2	Key, Driveshaft	19.	Pin, Roll
3.	Bearing, Front Driveshaft	20.	Pin, Swashblock Locating
4.	Ring, Shaft Retainer	21.	Gasket, Valve Plate
5.	Housing, Motor	22.	Plate, Motor Valve
6.	Retainer, Seal	25.	Screw, Hex. Hd.
7.	Seal, Shaft	26.	Plate, Name
11.	Swashblock	27.	Screw, Drive
12.	Bearing, Cylinder, "MFW" = Hydrodynamic "MFQ <sub>A</sub> " = Roller	28.	Seal, O'ring
13.	Ring, Retainer	29.	Ring, Driveshaft Bearing Retainer
14.	Shoe, Retainer	34*	Plate, Swashblock Wear
15.	Assembly, Piston/Shoe	35.	Seal, O'ring
16.	Ball, Fulcrum	36.	Gasket, Top Plate
		37.	Screw, Hex. Hd.
		38.	Plate, Top.

\* Size 06 or 10 only

### O'RING SIZES

ARP 568 Uniform Size Number — Durometer

ITEM NO.	Motor Size	
	06 & 10	15 & 20
23	902 - 90	902 - 90
28	010 - 90	010 - 90

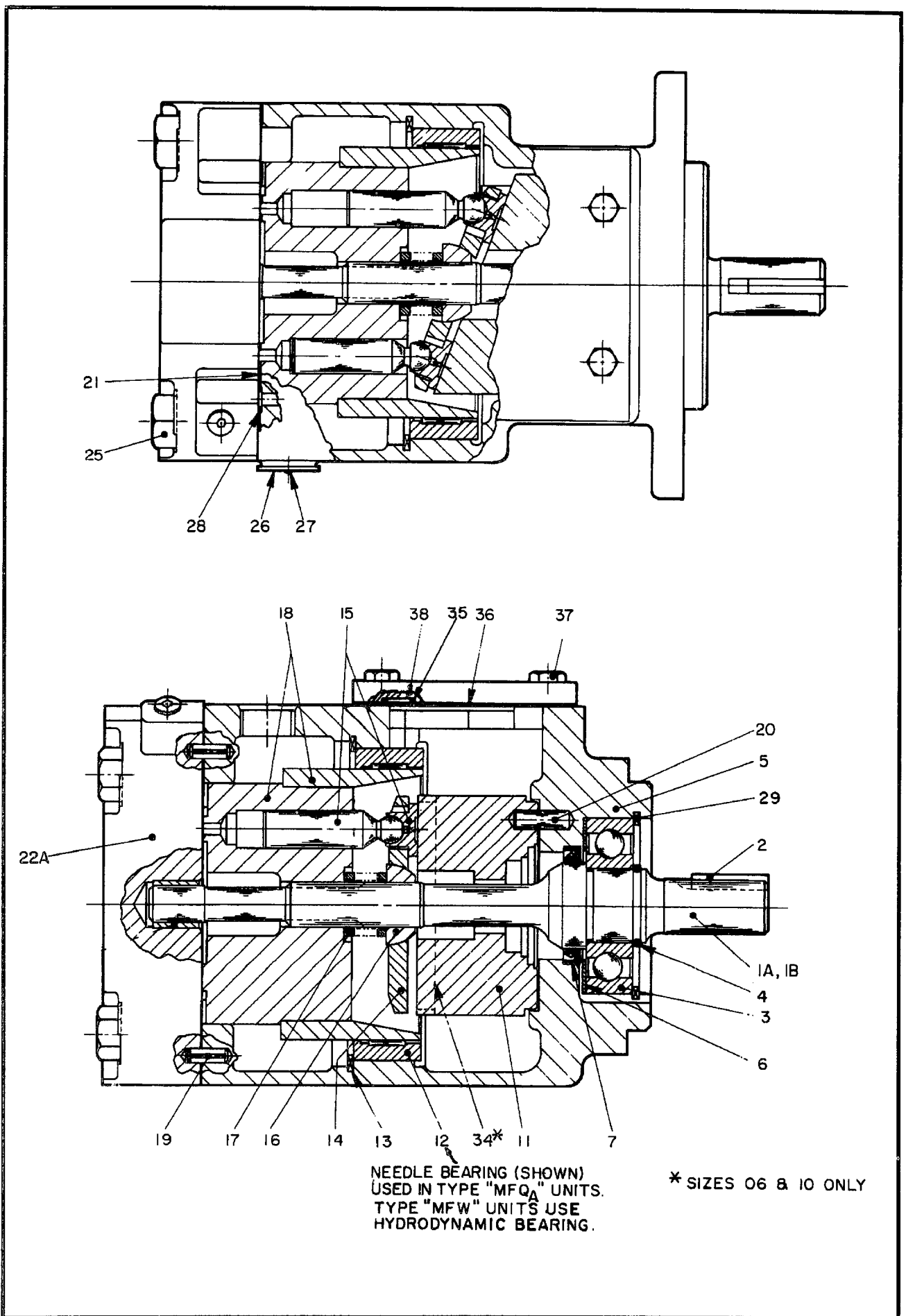


Figure 8. Parts Drawing, "MFQ<sub>A</sub>" and "MFW" motors. (E51341).

PLEASE FOLD OUT FOR PARTS DRAWING AND LIST

## XI. AFTER SALES SERVICES

Oilgear builds products that last. However, it is the nature of this type of machinery to require proper maintenance regardless of the care that goes into its manufacture. Oilgear has several service programs to help you.

### "STAY-ON-STREAM" SERVICE

By signing up for Oilgear's "Stay-On-Stream" program you can prepare for problems before they happen. Certain field tests such as fluid testing, slip testing and electronic profile recording comparisons can be performed by our field service people or your own trained personnel. These tests can indicate problems before they become "down-time" difficulties.

### SERVICE SCHOOLS

Oilgear holds schools to train your maintenance personal. A "general" hydraulic or electronic school is conducted in our Milwaukee plant on a regular basis. "Custom" schools, specifically addressing your particular hydraulic and electrohydraulic equipment can be conducted in your plant.

## SPARE PARTS AVAILABILITY

Prepare for future needs by stocking Oilgear original factory parts. Having the correct parts and necessary skills "in-plant" enables you to minimize down-time. Oilgear has developed parts kits to cover likely future needs. Oilgear field service technicians also stand ready to assist your maintenance people in trouble-shooting and repairing equipment.

### OILGEAR EXCHANGE SERVICE

Standard replacement pumps and motors are available to users of Oilgear equipment where comparable units will be returned in exchange. When standard replacements must be modified to replace units which are special, shipment will depend on availability of parts, assembly and test time necessary.

To obtain this service, place an order for an exchange unit and provide the serial number and type designation. The replacement unit will be shipped F.O.B. our factory. Milwaukee, Wisconsin. User retains the replacement and returns the worn unit prepaid to The Oilgear Company for reconditioning and test. When the unit is reconditioned and stocked, the user is billed the cost of reconditioning or a flat rate exchange price if one has been applied to that particular type of unit.



**THE OILGEAR COMPANY**

2300 So. 51st. Street  
Milwaukee, WI 53219



# INSTRUCTIONS

BULLETIN M-1A

## HYDURA TYPE "MFQ" BI-DIRECTIONAL MOTORS



Figure 1. Photo of typical "MFQ" Bi-Directional Motor

To the User and Operator of "MFQ" Motors:

Your acquaintance with these instructions will help you attain satisfactory performance, reduce shut-downs and increase the unit's life. We are confident the Hydura unit will operate satisfactorily if these instructions are adhered to. Some Hydura units have been modified from those described in this bulletin and other changes may be made without notice.

### I. INSTALLATION

#### A. MOUNTING

Type "MFQ" motors can be mounted in any position. Secure motor to a rigid mounting surface.

#### B. CONNECTIONS

Use a system relief valve to protect against overload. Pressure at port "A" provides right hand rotation, pressure at port "B" provides left hand rotation, when facing shaft. Fill case with hydraulic fluid prior to initial startup. Arrange case drain line so case remains full of fluid (non-siphoning) at less than 5 psi (0,3 bar). Drain must be unrestricted, full sized and connect directly to reservoir below fluid level. No other connections to drain line are permitted.

#### C. POWER AND STARTING

Provide an easy slip fit for coupling and fasten with a set screw above the key. **CAUTION: Do not use a drive, press or shrink fit.** Unless the unit is

ordered with an outboard bearing, it cannot have overhung loads.

#### D. FLUIDS

To assure long unit life, use clean petroleum oil or fire resistant fluid at all times. Petroleum oil should meet or exceed lubricating specifications of SAE 10W API Engine Service classification SC or CC, or 150 VG 32 through 68, viscosity range 150-330 SSU @ 100° F (37,7C). Fire resistant fluids such as phosphate ester hydraulic fluids used in accordance with fluid manufacturers recommendations can be used.

### II. PRINCIPLE OF OPERATION

Fluid under pressure delivered to one port of the motor flows through the corresponding valve plate crescent and into the piston bores open to that crescent. Each piston is forced against the swash block which has a fixed angle with respect to the drive-shaft. Pressure behind the bores during half of the cylinder revolution, forces the pistons outward, following the slope of the swash block, which causes the cylinder and driveshaft to turn. Bridge segments in the valve plate separate the "A" crescent from the "B" crescent. Fluid delivered to port "A" provides right hand rotation, to port "B" provides left hand rotation when facing shaft. As the cylinder turns, the angle of the swash block forces the pistons inward during the other half revolution, which discharges the fluid out the opposite crescent in the valve plate.

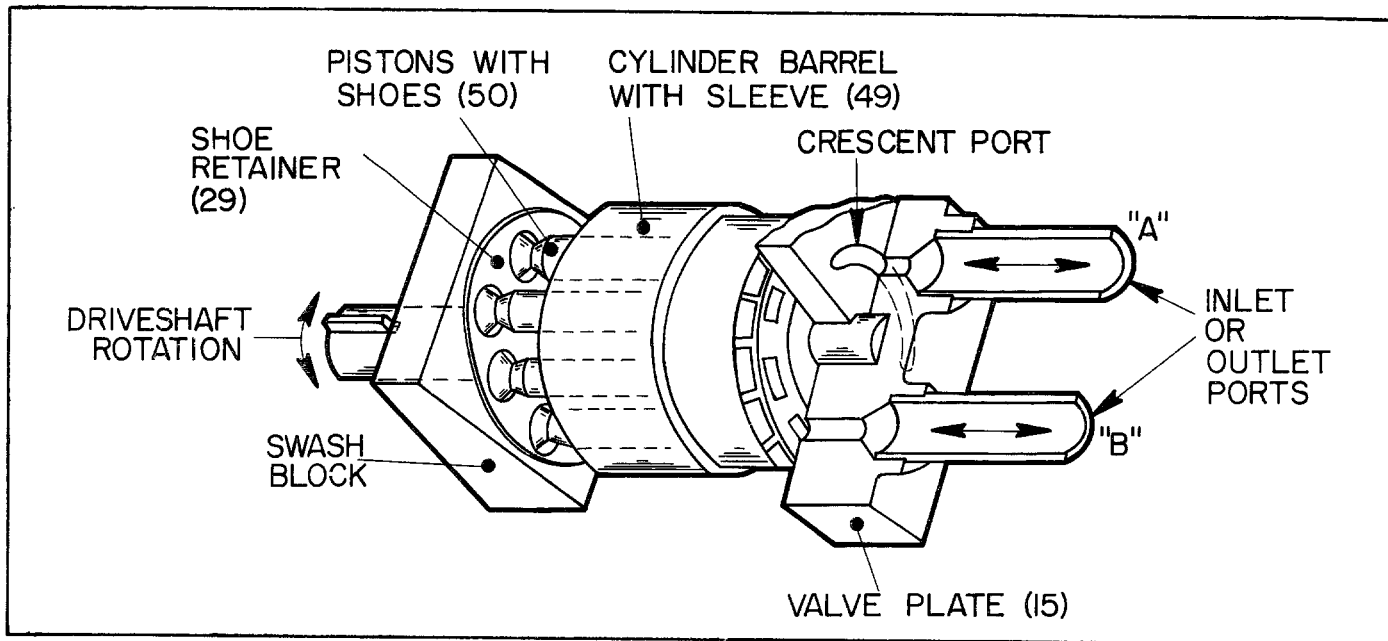


Fig. 2 Rotating Mechanism Diagram (510237)

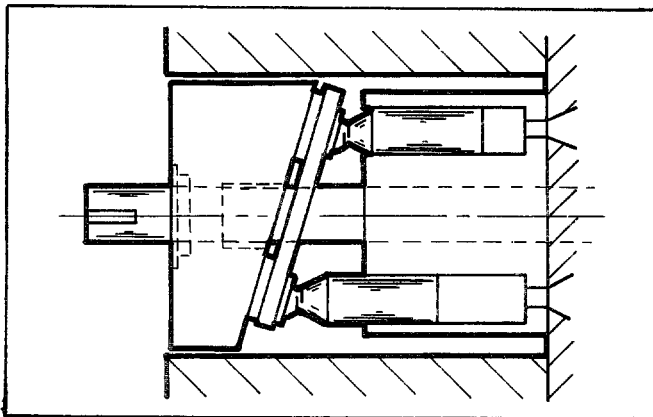


Fig. 3. Swash Block Angle (Top View) (510237)

### III. GENERAL OVERHAUL PROCEDURES

**CAUTION:** — Before breaking a circuit connection, make sure power is off and system pressure has been released.

Disconnect all hydraulic lines and completely drain fluid from the case and hydraulic system. The system may have been contaminated by a component breakdown or environment. In these cases, inspect and clean all system components, flush hydraulic lines and reservoir, discard used fluid. Use clean fluid to obtain maximum life when restoring unit to service. It is imperative that the fluid power system be thoroughly clean before putting it in service.

**CAUTION:** — Absolute cleanliness is essential when working on a hydraulic system. Always work in a clean area. Dirt and foreign materials entering a system can result in serious damage or inadequate operation.

After removing motor from mounting and before disassembly, cap or plug all ports and clean the outside of the unit thoroughly to prevent entry of dirt into the system.

### IV DISASSEMBLY

Be sure to place all parts on a clean surface. Remove four hex head cap screws (11) and lift off top plate (5). Remove the gasket (12).

A. **PISTON ROTATING GROUP** — Block unit on bench with driveshaft (37, 37A) pointed down. Remove valve plate (15) by removing four hex head screws (4) and lifting straight up. Remove gasket (1). The bearing sleeve (16) remains in the valve plate.

Place unit in a horizontal position. Remove rotating group by slowly turning the shaft while pulling out the cylinder barrel and sleeve assembly (49).

Position the rotating group as shown in figure 4 and lift out parts as shown.

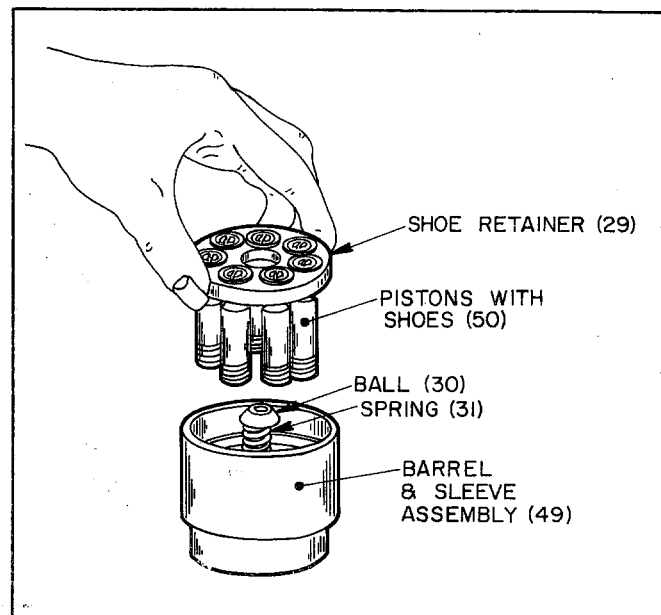


Fig. 4. Disassembly of Rotating Group (510237)

## B. DRIVESHAFT/SWASH BLOCK ASSEMBLY —

Remove any coupling or shaft key (10) on driveshaft. Remove retaining ring (26) from bore inside of case. Place unit in a vertical position with driveshaft pointed down. Gently tap the shaft end upwards (fig.5).

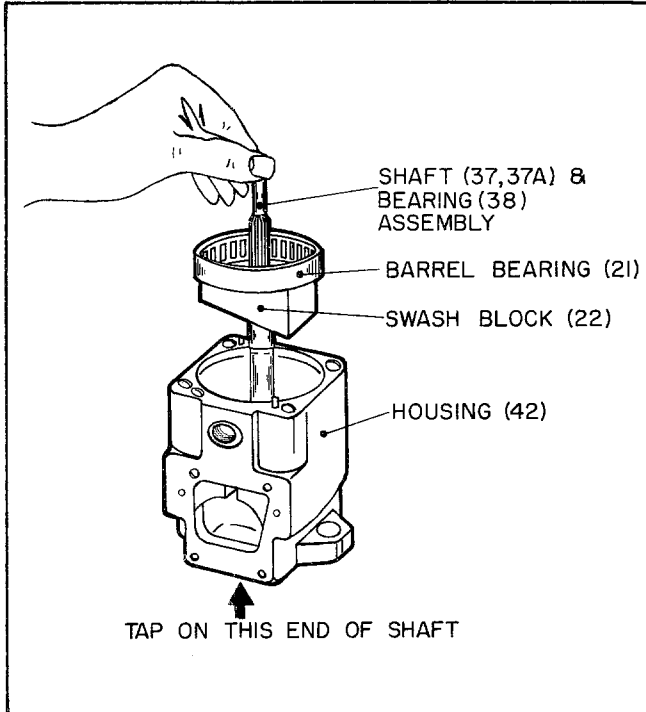


Fig. 5 Driveshaft/Swash Block Removal (510237)

The shaft (37,37A), driveshaft bearing (38), swash block (22), swashblock plate (27, size 06/10 only), and barrel bearing (21) should lift out as a unit.

C. DRIVESHAFT SEAL — Remove retaining ring (46) and the driveshaft seal (43) can be pressed into case if replacement is necessary, according to the procedure outlined in assembly section (Section V).

## IV. INSPECTION AND REPAIR

Clean all parts thoroughly with mineral spirits prior to inspection and after any stoning or machining.

A. VALVE PLATE — inspect flat surface that meets with the cylinder barrel (49) for excessive wear or scoring. To remove minor defects, stone lightly with a hard stone that is flat to within 0.001 inch (0,03 mm). Be sure to stone lightly. If wear or damage is extensive, replace the valve plate (15).

B. ROTATING GROUP — (Fig. 6 — Rotating Group Inspection). Inspect the cylinder barrel (49) for wear and scoring in the bores and on the surface that meets the valve plate (15). Lightly stoning or lapping the surface will remove minor defects. If defects are extensive, replace the cylinder barrel. Check the piston and shoe assemblies (50) to make sure they are riding properly on the swash block (22). Check each shoe for nicks and scratches, and for smooth pivot action on the piston. For maximum service between overhauls, if one piston and shoe subassembly needs to be replaced, it is recommended that all of them be replaced. Make sure pistons are free in their bores when replacing a new rotating group (fig. 7 - Piston and Shoe Inspection).

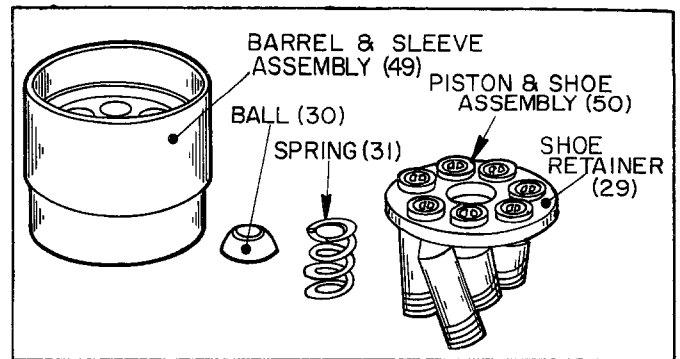


Fig. 6. Rotating Group Assembly (510237)

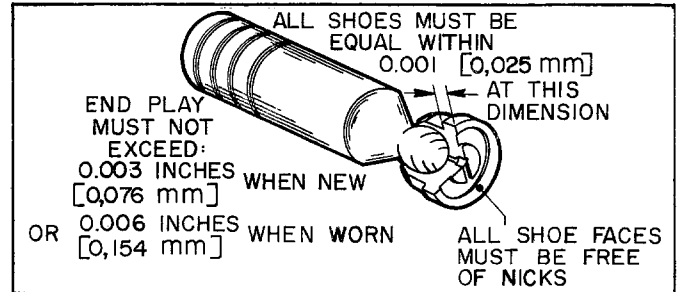


Fig. 7. Piston & Shoe Inspection (510237)

C. SWASH BLOCK — Inspect for wear and scoring. Lightly stone to remove minor defects. If there is extensive wear or damage, replace the swash block (22).

D. BEARINGS AND DRIVESHAFT — Inspect bearings for roughness or excessive play. If shaft bearing (38) needs replacing, press on inner race surface only and lock in place with retaining ring (39). Examine the sealing area of the shaft for scoring or wear.

## V. ASSEMBLY

Install new gaskets, seals, and O'Rings during assembly. Apply a thin film of grease or clean hydraulic fluid to ease assembly of gaskets and seals.

Place cylinder barrel (49), wear surface down, on a clean cloth. Place the barrel spring (31) in the center of the barrel.

Place the ball joint (30) on top of the spring. Insert pistons (50) and shoe retainer (29) as a unit into the piston bores. Do not force. When properly aligned the pistons should slide in easily.

Place housing (42) on it's side. Press (on inner race) bearing (38) on driveshaft (37, 37A) and lock in place with retaining ring (39). If shaft seal (43) was removed, press in from outer side of housing with fingers or tap in with a socket slightly smaller than the bore if the seal fits snugly. Press until snap ring snaps into it's groove in the housing. Lubricate the seal and shaft and insert the driveshaft and bearing assembly. Turn the motor so the shaft end is pointed down. Place the swash block (22) over the shaft bearing (38) and center it. The locating hole and the pin (44) in the housing must match. Insert barrel bearing (21) square with the axis of the motor. If it is necessary to tap the bearing in

place, use extreme caution not to distort the bearing. Place retaining ring (26) in to hold bearing in place.

Place the motor on it's side and insert the rotating group assembly.

With open end of motor up, install roll pins (45) and gasket (1). Position valve plate (15) with driveshaft bearing sleeve (16) on housing. Tighten cap screw closest to the O'Ring first, then tighten the opposite screws as you would when mounting a tire on an automobile.

To mount the top plate (5), turn the motor on it's side, case drain port pointing up. Add the gasket (12), then the plate (5) and four cap screws (11).

#### STANDARD RATINGS

Unit Size		06	10	15	20
Theor.	CIPR	0.85	1.44	2.05	2.82
Displ.	ml/rev.	13,9	23,6	33,6	46,2
Operating	Rated	1800	1800	1800	1800
Speeds	Max.	3000	2400	3000	2400
Rated					
Continuous	PSI	3000	2000	3000	2000
Pressure	BAR	206,9	137,9	206,9	137,9
Output					
Continuous	in. lb.	350	390	850	775
Torque	Nm	39,4	43,9	95,7	87,3

When ordering replacement kits and parts, be sure to include type designation, serial number, item number and description.

ITEM	QTY.	KIT NO.	DESCRIPTION
1	1	77	Gasket, Valve Plate
2	1	80	Name Plate
3	2	80	Screw, Drive
4	4	80	Screw, Hex. Head Cap
5	1		Plate, Top
10	1	80	Key, Shaft
11	4		Screw, Hex. Head Cap
12	1	77	Gasket, Top Plate
15	1	79	Plate, Valve
16	1	79	Sleeve, Bearing
21	1	81	Bearing, Roller
22	1	82	Swash Block
26	1	81	Ring, Retaining
27(06/10 only)	1	82	Plate, Swash Block
29	1	73	Retainer, Shoe
30	1	73	Ball, Retainer
31	1	73	Retainer, Spring
37	1	74	Shaft, Standard
37A	1	74	Shaft, Spline
38	1	74	Bearing, Ball
39	1	74	Ring, Retaining
42	1	72	Housing, Motor
43	1	72 & 77	Seal, Shaft
44	1	72	Pin, Dowel
45	2	72	Pin, Roll
46	1	72	Ring, Retaining
49	1	73	Barrel & Sleeve Assem.
50	Note 1	73	Piston & Shoe Assembly

Note 1: 7 pistons for size 06 & 10  
9 pistons for sizes 15, 20

It is recommended that spare or replacement parts be ordered as a part of the following kits.

#### #72 HOUSING AND PINS

ITEM	QUANTITY	DESCRIPTION
42	1	Housing, Motor
43	1	Seal, Shaft
44	1	Pin, Dowel
45	2	Pin, Roll
46	1	Ring, Retaining

#### #73 ROTATING GROUP

ITEM	QUANTITY	DESCRIPTION
29	1	Retainer, Shoe
30	1	Ball, Retainer
31	1	Retainer, Spring
49	1	Barrel & Sleeve Assembly
50	*	Piston & Shoe Assembly

\*7 - 06/10, - 9 - 15/20

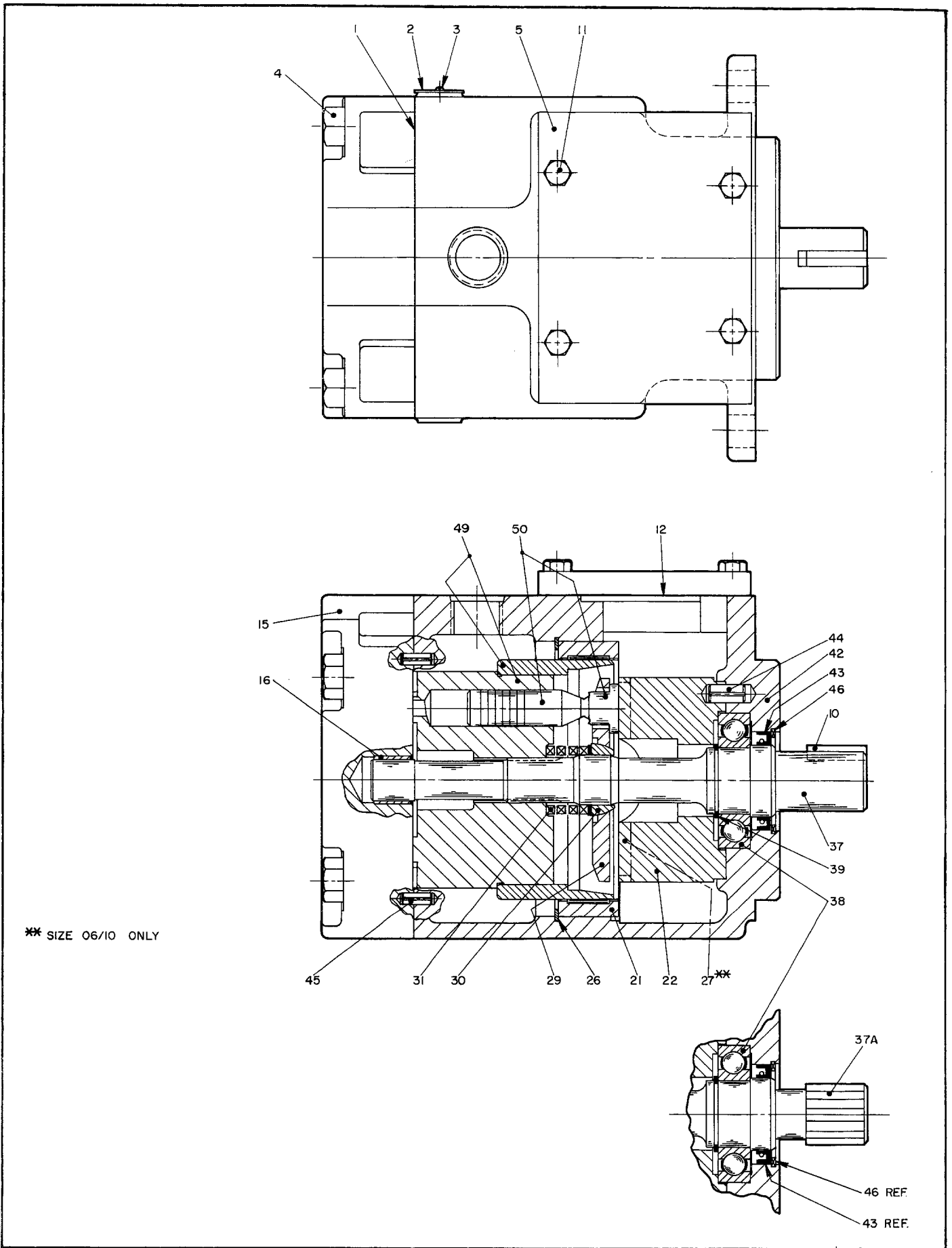


Fig. 8 Parts Drawing, Hudura Type "MFQ" Bi-Directional Motors (510237)

#74 SHAFT & BEARING

ITEM	QUANTITY	DESCRIPTION
37, 37A	1	Driveshaft (37-Standard 37A-Spline)
38	1	Bearing, Ball
39	1	Ring, Retaining

#77 GASKET & SEAL

ITEM	QUANTITY	DESCRIPTION
1	1	Gasket, Valve Plate
12	1	Gasket, Top Plate
43	1	Seal, Shaft

#79 VALVE PLATE

ITEM	QUANTITY	DESCRIPTION
15	1	Plate, Valve
16	1	Bearing, Sleeve

#80 SCREWS, KEY, TAG

ITEM	QUANTITY	DESCRIPTION
2	1	Name Plate
3	2	Screw, Drive
4	4	Screw, Hex. Hd. Cap
10	1	Key, Shaft

#81 ROTATING GROUP BEARING

ITEM	QUANTITY	DESCRIPTION
21	1	Bearing, Roller
26	1	Ring, Retaining

#82 SWASH BLOCK

ITEM	QUANTITY	DESCRIPTION
22	1	Swash Block
27(06/10 only)	1	Plate, Swash Block

## NOTES

