OPERATING INSTRUCTIONS & PARTS MANUAL

HYDRAULIC GEAR PUMPS

MODELS 4F649 THRU 4F659

Concentric P/N 2690098
Revised 02/06/2012

READ CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

⚠ WARNING! ⚠

MODELS 4F649, 4F650 AND 4F651 ARE INTENDED TO BE USED AS BI-ROTATIONAL PUMPS ONLY. THE REMAINING MODELS CAN BE USED AS BI-ROTATIONAL PUMPS AND/OR FLUID MOTORS.

	649	650	651	652	653	654	655	656	657	658	659
PUMPS	X	X	X	X	X	X	X	X	X	X	X
FLUID MOTORS	N/A	N/A	N/A	X	X	X	X	X	X	X	X

Description

Our hydraulic pumps/fluid motors are highly efficient and specifically designed for bi-directional rotation. They utilize an external gear fixed displacement design and are of a durable cast iron construction. They incorporate an internally lubricated ball bearing on the drive shaft which will withstand up to 150 lb. side load.

They can be used for direct drive or for belt driven applications. As hydraulic pumps they are suitable for use in a wide variety of material handling, agricultural, and construction equipment applications; in addition to machine tools, robotics, and other types of machinery. As fluid motors, typical examples of applications are hose reel drives, index tables, conveyor drives, lawn mowers and many other applications where rotary motion is required.

Unpacking

Due to cast iron construction, very little damage can occur during transit. Do not remove the plastic shipping plugs from the ports until ready for installation. This will keep dirt or foreign material from entering the system. Check carton for the following loose components: (1) pump/fluid motor assembly, (1) 4-bolt mounting gasket, (4) 5/16-18" UNC x 3/4" mounting bolts with lockwashers, and (1) square drive key should be taped to drive shaft. If any of these components are missing or there is any noticeable damage, please contact the office where item was purchased.

Specifications

Cast iron hydraulic pump/fluid motor, bi-rotational, 4-bolt 4F17 mounting, 11 tooth gears, 1.50" shaft extension, 0.50" shaft diameter with 0.125" square x 1" drive key, 400 PSI shaft seal, side porting with SAE straight thread ports, internally lubricated ball bearing for side loads to 150 lbs.

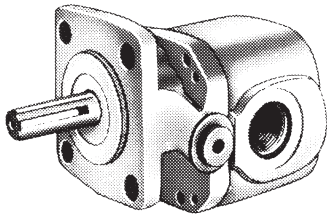


Figure 1

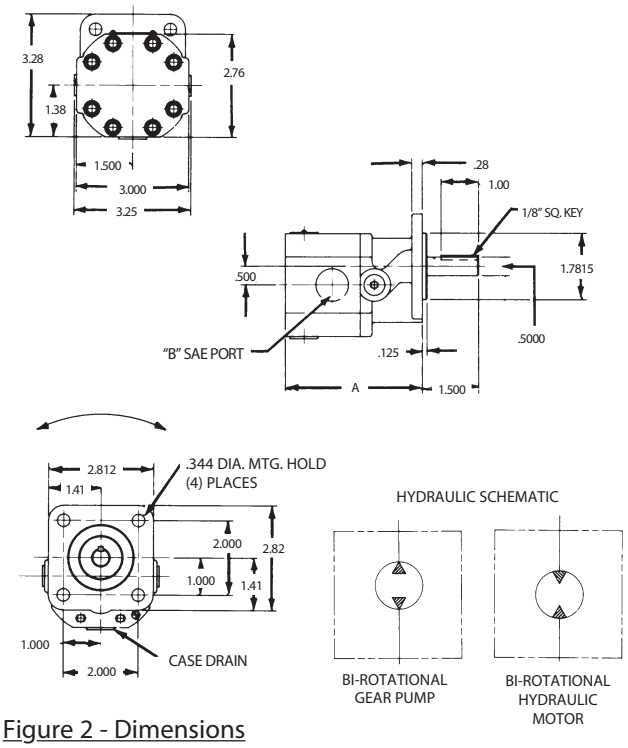


Figure 2 - Dimensions

PUMP/FLUID MOTOR DIMENSIONAL DATA

MODEL	DIMENSIONS	
	A	B
4F649	3.16"	9/16-18
4F650	3.16"	9/16-18
4F651	3.16"	3/4-16
4F652	3.16"	3/4-16
4F653	3.69"	3/4-16
4F654	3.69"	7/8-14
4F655	3.69"	7/8-14
4F656	3.69"	7/8-14
4F657	3.69"	7/8-14
4F658	4.20"	7/8-14
4F659	4.20"	7/8-14

General Safety Information

⚠ WARNING! ⚠

DISCONNECT POWER AND RELEASE ALL SYSTEM PRESSURE BEFORE SERVICING THIS EQUIPMENT.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
2. Never exceed the maximum operating speed or pressure.
3. When using AC motors, ground the motor properly by wiring with a grounded, metal-clad raceway system, using a separate ground wire connected to bare metal of the motor frame, or other suitable means.
4. Guard all moving parts.
5. Drain all liquids from the system before servicing.
6. Check hoses and connections for security before each use.
7. Periodically check the pump/fluid motor and system components.
8. Provide a means of pressure relief for pumps whose discharge line can be shut off or obstructed.
9. Wear safety glasses at all times when working with pumps/fluid motors.
10. Keep work area clean, uncluttered and properly lighted; replace all unused tools and equipment.
11. Keep visitors at a safe distance from the work area.
12. Make the workshop child-proof with padlocks, master switches, and by removing start keys.
13. Do not operate an engine in an enclosed area.
14. Do not spill gasoline on hot engine surfaces.
15. Store gasoline only in an approved container.
16. Keep dirty and oily cleaning rags in a tightly closed metal container.
17. Check engine oil level before operating the engine.
18. Familiarize yourself with the controls and emergency shutdown procedures.
19. Never operate the equipment when you are fatigued.
20. All system components pressure ratings should be greater than maximum system pressure.
21. Guard all moving parts.
22. Replace all guards when servicing is complete.

Assembly

Models 4F649 through 4F659 are packaged fully assembled and require no further assembly.

Installation

MOUNTING PUMP/FLUID MOTOR ASSEMBLY TO FLEXIBLE COUPLING DRIVE SYSTEMS

1. Assemble the flexible coupling half to the pump/fluid motor shaft.

⚠ CAUTION ⚠

Do not force coupling half onto drive shaft; it must be a slip fit for adjustment and to avoid internal damage.

2. Tighten the setscrew and insert rubber spider in coupling half.
3. Assemble the other coupling half loosely to the engine/motor shaft.
4. Bolt the pump/fluid motor loosely to the SAE type four bolt mounting pump adapter as furnished by the equipment manufacturer.
5. Align the shafts to make sure they are on center with each other.
6. Tighten the mounting bolts.
7. Mate the coupling halves together, allowing 1/16" gap between halves.
8. Check the alignment again.

IMPORTANT: THE GAP IN THE COUPLING HALVES IS TO PREVENT END LOADING OF THE PUMP/ FLUID MOTOR DRIVE.

9. Tighten the setscrew in the mating coupling half.
10. Remove plastic shipping plugs from the inlet and outlet ports.
11. Squirt clean oil into pump for pre-lubrication and start-up.
12. Turn shaft coupling slowly to ensure proper shaft alignment and coupling installation.
13. Connect inlet and outlet lines with an SAE straight thread fitting and tighten.

⚠ CAUTION ⚠

Flush all lines and fittings of contamination.

⚠ WARNING! ⚠

THREADS ARE SAE, *NOT* NPTF. USING INCORRECT FITTINGS COULD DAMAGE THE HYDRAULIC COMPONENT OR CAUSE PERSONAL INJURY.

NOTE: Do not use teflon tape; the O-ring provides the seal and teflon tape is not required.

14. When using the assembly as a pump keep inlet hose short and of adequate size to avoid pump cavitation.

NOTE: Cavitation is recognized by excessive noise and foaming of hydraulic fluid.

⚠ CAUTION ⚠

Never run assembly without hydraulic oil.

15. At initial start-up, turn the drive shaft several times by hand to prime.
16. Bleed all air from the system to prevent erratic operation.
17. After several cycles, check the reservoir oil level and refill as necessary.

OUR FLUID MOTOR SPECIFICATIONS

STOCK NO.	DISP. CU.IN./REV.	MAX. PRESSURE CONT.	INTER.
4F652	0.194	3000	3500
4F653	0.258	3000	3500
4F654	0.323	3000	3500
4F655	0.388	3000	3300
4F656	0.453	2750	3025
4F657	0.517	2500	2750
4F658	0.647	2000	2200
4F659	0.711	1800	2000

PUMP/FLUID MOTOR DIMENSIONAL DATA

MODEL	DIMENSIONS A	DIMENSIONS B
4F649	3.16″	9/16-18
4F650	3.16″	9/16-18
4F651	3.16″	3/4-16
4F652	3.16″	3/4-16
4F653	3.69″	3/4-16
4F654	3.69″	7/8-14
4F655	3.69″	7/8-14
4F656	3.69″	7/8-14
4F657	3.69″	7/8-14
4F658	4.20″	7/8-14
4F659	4.20″	7/8-14

FLUID MOTOR PERFORMANCE DATA

MODEL	FLOW RANGE GPM	INLET PRESSURE 500 PSI TORQUE IN-LBS.	500 PSI SPEED RPM	1000 PSI TORQUE IN-LBS.	1000 PSI SPEED RPM	1500 PSI TORQUE IN-LBS.	1500 PSI SPEED RPM	2000 PSI TORQUE IN-LBS.	2000 PSI SPEED RPM	2500 PSI TORQUE IN-LBS.	2500 PSI SPEED RPM	3000 PSI TORQUE IN-LBS.	3000 PSI SPEED RPM
4F652	1	12	1102	26	1013	40	925	54	837	68	748	81	660
	2	12	2293	26	2204	40	2116	54	2027	68	1939	81	1850
	3	12	3483	26	3395	40	3306	54	3218	68	3130	81	2041
	4	12	4674	26	4586	40	4497	54	4409	68	4320	81	4230
4F653	2	16	1702	34	1613	53	1525	72	1437	90	1348	108	1260
	3	16	2597	34	2509	53	2420	72	2332	90	2244	108	2155
	4	16	3493	34	3404	53	3316	72	3227	90	3139	108	3051
	5	16	4388	34	4299	53	4211	72	4123	90	4034	108	3946
4F654	2	20	1341	43	1253	66	1165	90	1076	113	988	136	900
	4	20	2772	43	2683	66	2595	90	2507	113	2418	136	2330
	6	20	4202	43	4114	66	4025	90	3937	113	3849	136	3760
	7	20	4917	43	4829	66	4741	90	4652	113	4564	136	4475
4F655	3	24	1697	52	1609	80	1520	108	1432	136	1344	163	1255
	5	24	2880	52	2800	80	2711	108	2623	136	2534	163	2446
	6	24	4079	52	3990	80	3902	108	3813	136	3725	163	2041
	8	24	4674	52	4586	80	4497	108	4409	136	4320	163	4232
4F656	4	28	1951	60	1862	93	1774	126	1686	159	1597	–	–
	6	28	2971	60	2882	93	2794	126	2706	159	2617	–	–
	8	28	3991	60	3902	93	3814	126	3725	159	3637	–	–
	10	28	5000	60	4922	93	4834	126	4745	159	4657	–	–
4F657	5	32	2145	69	2057	106	1968	144	1880	181	1792	–	–
	7	32	3039	69	2950	106	2862	144	2774	181	2685	–	–
	9	32	3932	69	3844	106	3756	144	3667	181	3579	–	–
	11	32	4826	69	4738	106	4649	144	4561	181	4472	–	–
4F658	6	40	2053	86	1965	133	1877	180	1788	–	–	–	–
	9	40	3124	86	3036	133	2948	180	2859	–	–	–	–
	11	40	3838	86	3750	133	3662	180	3573	–	–	–	–
4F659	7	44	2185	95	2097	146	2009	–	–	–	–	–	–
	10	44	3160	95	3072	146	2983	–	–	–	–	–	–
	12	44	3810	95	3721	146	3633	–	–	–	–	–	–

Installation (Continued)

NOTE: Be sure adequate cooling for the hydraulic oil is provided. Excessive temperatures can cause damage to oil and/or system components. Cooling of oil is especially important on systems where continuous operation is required. Cooling requirements must be based on: duty cycle, pressure/flow, ambient temperatures, oil and component maximum temperature specifications, and reservoir capacity. Systems operating at excessively high temperatures can be hazardous and may cause property damage and/or personal injury.

NOTE: When the ambient temperature is below 32°F, allow the pump to operate unloaded for several minutes to warm the oil in the reservoir.

Operation

1. At initial start-up, start and stop several times (jog) to allow the assembly to prime. After lines are full, the pump may be operated at full speed.
2. Bleed all air from hydraulic system to prevent erratic operation.
3. Recheck reservoir oil level after a few complete cycles of the hydraulic system and refill if necessary.

Fluid Motor Operation

1. The reason for the high pressure oil seal and seal check valves in the fluid motor is to provide bidirectional rotation without adding an independent drain line from the oil seal chamber. However, if you plan to operate the fluid motor(s) in series with other equipment or with "down stream" (outlet) pressure exceeding 400 PSI, then the case drain port must be utilized. The case drain feature can be used by removing the steel 7/16-20 SAE O-ring plug (see Specification drawing) and plumbing this port back to "tank" (low pressure line returning to reservoir).

⚠ WARNING! ⚠

BE SURE TO DISCONNECT POWER AND RELEASE ALL SYSTEM PRESSURE BEFORE SERVICING THIS EQUIPMENT.

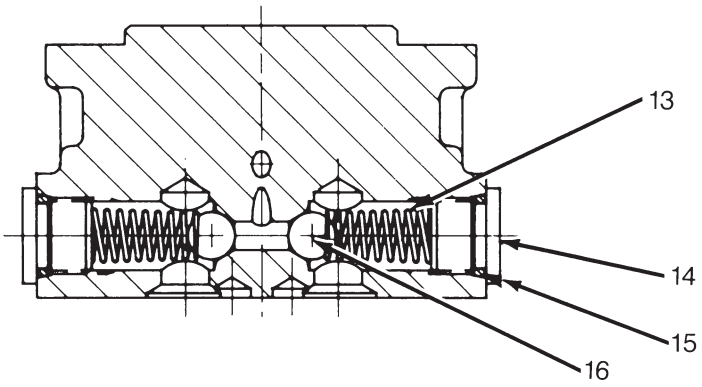
Maintenance

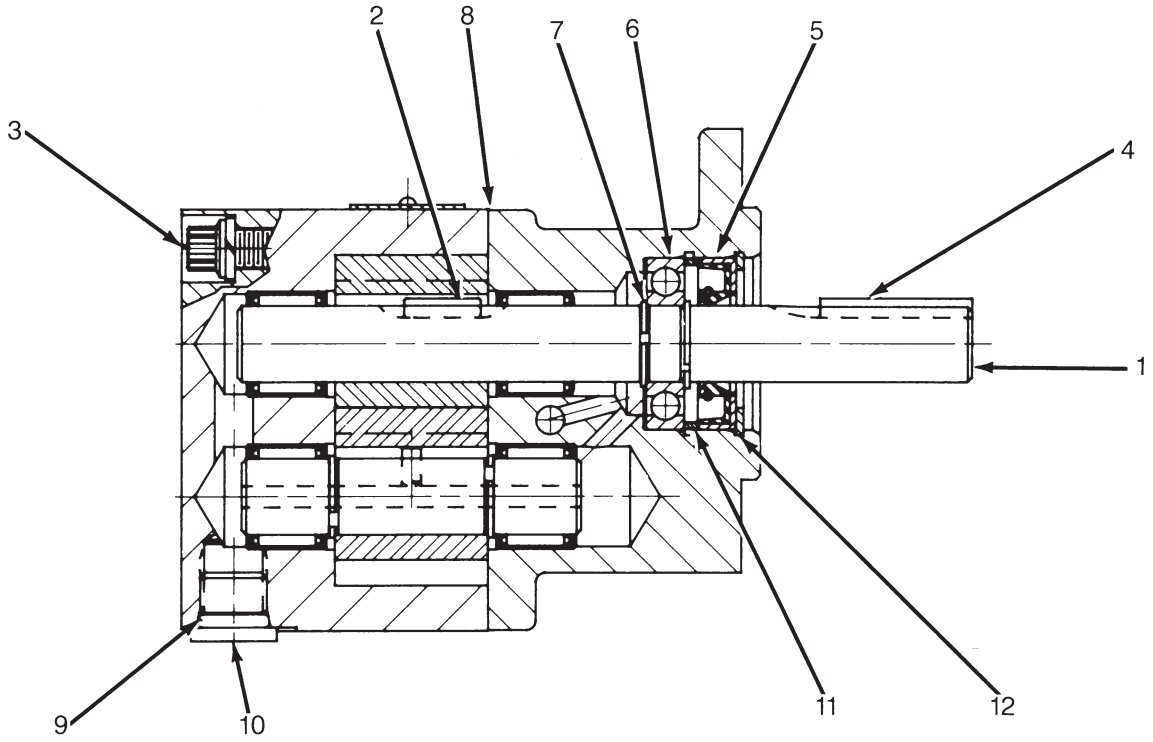
1. Keep the reservoir filled with hydraulic fluid. Recommended Hydraulic Fluids: use a good grade of automatic transmission fluid (ATF).
2. Make frequent inspection of hydraulic fluid and change if contaminated.
3. To fill the reservoir with clean oil:
   Use a clean funnel fitted with a fine mesh wire screen. Do not use a cloth strainer. Most pump/fluid motor failure, valve malfunctions, and short unit life can be traced directly or indirectly to dirt or other foreign material (water, chips, lint, etc.) getting into, or already in, the hydraulic system.
4. Keep the unit clean of dirt and foreign materials.
5. Keep electrical connections clean.

Notes

Toubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Pump does not develop full pressure	1. System relief valve set too low, or leaking 2. Oil temp is too high 3. Pump is worn out 4. Double acting cylinder piston seals are cut or worn out	1. Check system relief valve for proper setting with pressure gauge in outlet line 2. Let oil cool below 140°F 3. Replace worn parts or pump 4. Replace or repair cylinder
Motor won't start	1. Loose connection 2. Circuit breaker tripped 3. Voltage drop 4. Seized pump 5. Start up load is higher than motor torque capability	1. Check wiring 2. Reset circuit breaker 3. Use heavier gauge wire 4. Replace pump 5. Use larger motor or reduce operating pressure
Will not pump oil (Motor runs but cylinder does not move, or moves slowly)	1. No oil in reservoir 2. Motor rotating wrong direction 3. Oil level low 4. Suction strainer is clogged 5. Double acting cylinder piston seals are cut or worn out 6. Reservoir breather is dirty or clogged 7. Bi-rotational check valve leaking	1. Check oil level, refill 2. Change rotation of prime mover or reverse inlet and outlet hoses 3. Add oil as needed 4. Clean suction strainer 5. Replace or repair cylinder 6. Clean reservoir breather and reinstall 7. Remove check valve on pressure side. Clean and reassemble.
Pump motor unit is noisy	1. Low oil level 2. Air in system 3. Suction strainer or inlet filter is clogged	1. Add oil as needed 2. Bleed air from highest fitting in system by loosening fitting very slightly and operating unit until bubbling of air stops, then tighten 3. Clean suction strainer or inlet filter
Motor operating slow or stalling	1. Excessive slipping of gears due to overheating of oil 2. Excessive wear on the sides of gear housing due to oil contaminants	1. Check system. Add oil if needed. Oil cooler may be necessary to keep oil at normal operating temperatures 2. Check condition of oil and replace if contaminated
Motor speed is erratic	1. Motor operating below minimum recommended speed of 750 RPM 2. Air in system	1. Increase minimum operating speed to 750 RPM or more 2. Bleed air from system





ORDER REPLACEMENT PARTS BY CALLING TOLL FREE

1-800-323-0620

Please provide following information:

- Model Number
- Serial Number (if any)
- Part Description and Number as shown in Parts List

Address parts correspondence to:

Parts Company of America

1657 Shermer Road

Northbrook, IL 60062-5362 U.S.A.

Replacement Parts List for Models 4F649 thru 4F659

REF NO.	DESCRIPTION		PART NO.	QTY.
1	Drive shaft	4F649	2350268	1
		4F650	2350268	1
		4F651	2350266	1
		4F652	2350266	1
	Drive shaft	4F653	2720319	1
		4F654	2720320	1
		4F655	2720321	1
		4F656	2720322	1
	Drive shaft	4F657	2720323	1
		4F658	2720225	1
		4F659	2720226	1
2	Drive gear key	4F649	2230021	1
		4F650	2230021	1
		4F651	2250022	1
		4F652	2250022	1
	Drive gear key	4F653	2230078	1
		4F654	2230078	1
		4F655	2230080	1
		4F656	2230080	1
	Drive gear key	4F657	2230080	1
		4F658	2230082	1
		4F659	2230082	1
3	Screw 1/4-20 x 1 1/2 Grade 8	4F649	*2130070	8
		4F650	*2130070	8
		4F651	*2130070	8
		4F652	*2130070	8
	Screw 1/4-20 x 1 1/2 Grade 8	4F653	*2130070	8
	Screw 1/4-20 x 2 Grade	4F654	*2130072	8
		4F655	*2130072	8
		4F656	*2130072	8
	Screw 1/4-20 x 2 Grade 8	4F657	*2130072	8
	Screw 1/4-20 x 2 1/2 Grade 8	4F658	*2130075	8
		4F659	*2130075	8
4	Square key .12 x .12 x 1.00		*2250011	1
5	Shaft seal		*2120093	1
6	Ball bearing		*2030011	1
7	Snap ring		2240013	2
8	Gasket kit		†2300482	1
9	O-ring (ARP 904-N-90)		*2120123	1
10	Case drain plug (Steel) 7/16-20 SAE		2420113	1
11	Spacer ring		2590001	1
12	Snap ring		2240016	1
13	Spring		2110056	2
14	Steel plug 1/2-20 SAE		*2420114	2
15	O-ring (ARP 905-N-90)		*2120076	2
16	Nylon ball		2870009	2
Δ	Mounting screw 5/16-18 x 3/4 (not shown)		*2130087	4
Δ	Mounting gasket (not shown)		2260064	1
Δ	5/16 Lockwasher (not shown)		*2150042	4

(*) Standard hardware item, available locally.
(†) NOTE: This Gasket Kit contains more gaskets than you will require. Use the same color gasket that was in the pump/fluid motor assembly, discard remaining gaskets.
(Δ) Not shown.