

11.9 CU. IN. 4-BOLT HYDRAULIC SPOOL VALVE GEROLER MOTOR

User Manual



Please read this manual before use.

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SPECIFICATIONS

Max. Continuous Pressure	2,320 PSI
Rotation	Bi-Directional
Displacement	11.9 Cubic Inches
Case Drain	7/16-20 SAE
Max. Torque	3,579 in-lb
Max. Speed	304 RPM
Shaft Diameter	1 in.
Port Size	7/8-14 SAE
Horsepower Rating	21.2 HP
Model	BMRS-200-H4
Mounting Type	4-Bolt Flange
Max. Continuous Flow	15.8 GPM
Operating Temperature	-40°F to 176°F (-40°C to 80°C)
Weight	18 lb

PERFORMANCE DATA

FLOW		Pressure	725	1015	1305	1450	1740	2030	2320 Max. Cont.	2538	2900 Max. Int.
1 GPM	Torque (in-lb)	1169	1603	2108	2321	2746					
	Speed (RPM)	24	22	18	13	10					
3 GPM	Torque (in-lb)	1196	1648	2126	2339	2790	3153	3570			
	Speed (RPM)	49	47	45	43	38	33	24			
5 GPM	Torque (in-lb)	1160	1621	2108	2303	2781	3171	3579	3880	4411	
	Speed (RPM)	99	97	94	92	88	83	74	64	56	
8 GPM	Torque (in-lb)	1116	1577	2064	2250	2755	3145	3561	3818	4305	
	Speed (RPM)	149	147	144	141	135	126	113	105	91	
11 GPM	Torque (in-lb)	992	1497	2020	2215	2719	3118	3543	3774	4225	
	Speed (RPM)	200	197	194	191	185	174	160	151	127	
13 GPM	Torque (in-lb)	842	1382	1958	2179	2657	3100	3525	3729	4163	
	Speed (RPM)	252	249	246	243	238	228	212	194	161	
16 GPM	Torque (in-lb)	691	1284	1887	2108	2560	3029	3419	3649	4066	
	Speed (RPM)	304	301	298	294	286	276	262	243	218	
18 GPM (Max. Cont.)	Torque (in-lb)	593	1196	1825	2020	2454	2976	3322	3614	4013	
	Speed (RPM)	355	353	349	340	329	316	300	288	257	
20 GPM (Max. Int.)	Torque (in-lb)	514	1107	1745	1949	2392	2843	3189	3525	3915	
	Speed (RPM)	382	379	373	362	350	337	322	312	278	

Cont. = Maximum Continuous Operation. Int. = Maximum operating range for 6 seconds per minute.

INTRODUCTION

The BMRS series is a high torque/low speed hydraulic motor. This compact unit is efficient and quiet, suitable for light to medium duty applications such as grain augers and elevators, salt and sand spreaders, car wash and sweeper brushes, conveyors, winches, scissor lifts and similar applications.

FUNCTIONS

The BMRS hydraulic motor has an advanced gear set, a shaft distribution flow design and inner rollers to reduce friction, leading to a longer life and more efficient motor. The motor has Viton seals that offer better compatibility to different types of hydraulic fluid as well better higher temperature performance. The case drain equalizes the return pressure on the shaft seal to prevent blow outs and maximizes the motor's efficiency.

There are four different shafts available that can be swapped out for the standard shaft (see Parts List).

- Shaft, Replacement (#9)
- Shaft, 6-Spline (#9.1)
- Shaft, .315 Crosshole (#9.2)
- Shaft, .406 Crosshole (#9.3)
- Shaft, 13-Spline (#9.4)

SAFETY

WARNING! Read and understand all instructions before using this device. The operator must follow basic precautions to reduce the risk of personal injury and/or damage to the equipment.

Keep this manual for safety warnings, precautions, operating or inspection and maintenance instructions.

HAZARD DEFINITIONS

Please familiarize yourself with the hazard notices found in this manual. A notice is an alert that there is a possibility of property damage, injury or death if certain instructions are not followed.

WARNING! This notice indicates a specific hazard or unsafe practice that could result in severe personal injury or death if the proper precautions are not taken.

CAUTION! This notice indicates a potentially hazardous situation that may result in minor or moderate injury if proper practices are not taken.

NOTICE! This notice indicates that a specific hazard or unsafe practice will result in equipment or property damage, but not personal injury.

WORK AREA

1. Operate in a safe work environment. Keep your work area clean, well lit and free of distractions.
2. Keep anyone not wearing the appropriate safety equipment away from the work area.

PERSONAL SAFETY

WARNING! Wear personal protective equipment approved by the Canadian Standards Association (CSA) or American National Standards Institute (ANSI).

PERSONAL PROTECTIVE EQUIPMENT

1. Always wear impact safety goggles that provide front and side protection for the eyes.
2. Wear gloves that provide protection based on the work materials or to reduce the effects of tool vibration.
3. Non-skid footwear is recommended to maintain footing and balance in the work environment.
4. Wear protective clothing designed for the work environment and device.

PERSONAL PRECAUTIONS

Control the device, personal movement and the work environment to avoid personal injury or damage to device.

1. Do not operate any device when tired or under the influence of drugs, alcohol or medications.
2. Avoid wearing clothes or jewelry that can become entangled with the moving parts of a device. Keep long hair covered or bound.
3. Use the correct device for the job. This device was designed for a specific function. Do not modify or alter this device or use it for an unintended purpose.

GENERAL SAFETY PRECAUTIONS

HYDRAULIC SAFETY

IMPORTANT! Seek immediate, professional medical treatment if hydraulic fluid penetrates the skin. Do not wait for the appearance of symptoms. An infection or toxic reaction may occur from the exposure.

1. The hydraulic components require regular inspection. Replace damaged hydraulic parts with the same manufacturer's components.
2. Do not attempt makeshift repairs to a hydraulic system. Such repairs can fail suddenly and create a hazardous condition.
3. Use wood or cardboard to check for hydraulic fluid leaks instead of hands
4. Never exceed the load capacity of the hydraulic device (see Specifications).
5. Do not adjust relief setting of hydraulic system.
6. Escaping hydraulic fluid under pressure may have sufficient force to penetrate the skin.
 - 6.1 Always check for leaks wearing a face shield or safety goggles.
 - 6.2 Wear rubberized gloves.
 - 6.3 Wear protective clothes.
 - 6.4 Do not use your hands to detect a leak. Use a piece of cardboard or paper and watch for discoloration to find a hydraulic fluid leak.

PARTS IDENTIFICATION

WARNING! Do not operate the device if any part is missing. Replace the missing part before operating. Failure to do so could result in a malfunction and personal injury.

Remove the parts and accessories from the packaging and inspect for damage. Make sure that all items in the parts list are included.

Contents:

- Hydraulic Geroler Motor
- A Hydraulic Input Port A
- B Hydraulic Output Port B
- C Mounting Flange
- D Output Shaft
- E Housing
- F Case Drain
- G End Plate
- H Geroler Housing
- I End Plate Bolts

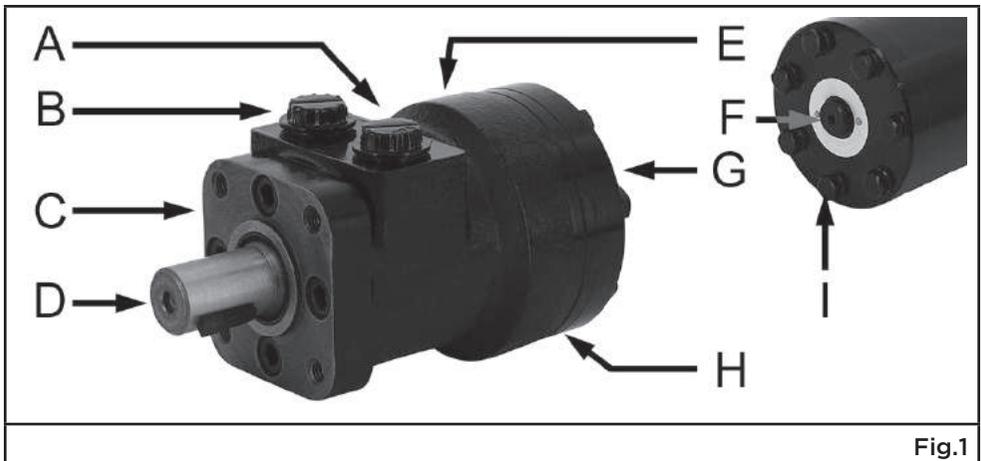


Fig.1

ASSEMBLY

When this manual refers to a part number, it refers to the included Parts List.

The hydraulic motor is preassembled and ready for installation. There are a range of optional cylindrical shafts available at Princess Auto Ltd. if the job requires a different range of gear ratios or shaft lengths. Changing the shaft requires the user to disassemble the motor.

PREPARING THE AREA

Clean the work area until it is free of debris and dust before disassembling the motor. Contaminates can adhere to oil coating the parts and may damage the mechanism. Have a clean container ready to place the parts during the disassembly process.

TOOLS REQUIRED

- 1/2 in. Wrench or Socket
- 5/16 in. Allen Wrench
- 3/16 in. Allen Wrench
- Torque Wrench
- Vise, Bulldog or similar style
- Soft Jaws to protect the motor in vise. Pieces of hard rubber or wood boards can be used.
- Plastic hammer
- Welding torch or Heat gun capable of reaching a temperature of 500 °F (260 °C).
- Cyanoacrylate glue AKA instant glue
- Solvent (acetone or methylene chloride)
- Wire brush (to clean screws of glue)

DISASSEMBLE THE MOTOR

CAUTION! The motor is heavy. When placing the motor in the vise, support it from underneath until firmly clamped into place. Be careful not to pinch your fingers when closing the vise jaws.

These instructions are to disassemble the motor before placing into service. If the seals or the shaft are being swapped out after the motor has been in service, drain oil from the hydraulic circuit and clean the outer surface around the ports before disconnecting.

Do not separate seals, o-rings or washers from their parts when just replacing the shaft before initial service.

REMOVING SCREWS AND BOLTS

The screws are held in place with cyanoacrylate glue or instant glue. Heat the housing around the screws with a welding torch or heat gun for approximately 5 to 10 seconds. The glue will release at a temperature between 300 to 500 °F (149 to 260 °C). Remove heat as soon as the screw is loose to avoid damaging the motor.

Blow loose debris and glue from the screw holes with dry air. The set glue in the holes does not need to be removed, unless it interferes with the screws.

Remove the cyanoacrylate glue left in the screw threads with a combination of soaking the screws in acetone or methylene chloride and working with a wire brush. Leave to dry before reinserting into the housing.

Consult the manufacturer's instructions on curing time when reapplying the instant glue. Some instant glues can be combined with a curing agent that will decrease the curing time.

WARNING! Follow the manufacturer's Material Safety Data Sheet instructions before handling cyanoacrylate glue, acetone or methylene chloride. Avoid inhaling or coming in contact with all three. Become familiar with first aid/medical instructions before using the glue or solvents.

DISASSEMBLY

A plastic hammer may be required to loosen some parts after the motor has been in service.

1. Remove the Woodruff Key (#10) by hand.
2. Clean the motor's exterior of oil and debris. Ensure both Plugs (#17) are still in place during cleaning.
3. Place the geroler motor in a vise with the flange face down. Close the vise on either side of the flange. The vise should have soft jaws or a protective material between the motor and jaws.
4. Remove the Inlet and Outlet Plugs (#17). Loosen with a 1/2 in. wrench, then complete removal by hand.
5. Remove the Drain Plug (#29) with a 3/16 in. Allen wrench.
6. Remove the End Cover (#25) by loosening all Screws (#27) with a 1/2 in. wrench. Complete screw removal by hand.
7. Remove the geroler set as one unit. Do not separate the Stator (#22), Roller (#23) and Rotor (#24) while removing them. Put aside as a single unit.

8. Remove the Drive Link (#21).
9. Remove the Distributor Plate (#20).
10. Remove the Axial Needle Bearing (#8) on the bottom of the Shaft (#9).
11. Hold the motor from underneath and loosen the vise.
12. Turn motor with the flange facing upward and position so vise clamps on either side of the inlet and outlet ports. Tighten the vice to secure. Do not clamp across the housing as pressure can distort the housing shape.
13. Use 5/16 in. Allen head spanner to remove the Flange Screws (#1).
14. Remove the Front Cover (#4). This will contain the Dust Seal (#3) and Shaft Seal (#5).
15. Remove the second Axial Needle Bearing (#8) and Shaft (#9).
16. Remove both Check Valves (#12) and Balls (#13) from the Housing.

CLEANING AND PREPARING COMPONENTS

1. Check all mating surfaces for scratches and burrs that may leave openings that will allow leaks. Replace any damaged part.
2. Clean parts in a compatible solvent and blow dry with air. Do not use paper or fabric cloth to dry as fibers left behind could damage the hydraulic system.

NOTICE! Ketone based solvents like acetone or methylene chloride can ruin Viton seals. Take precautions to keep the solvents from coming into contact with the seals. Should contact occur, replace the seal even if there does not appear to be any damage to prevent the possibility of leaks under pressure.

3. Check areas that will contact the seals during reassembly for burrs or sharp edges. Remove nicks and burrs with a stone made of novaculite (also called Arkansas stone). Do not use a file or grinder to remove the edges.
4. Lubricate all mating surfaces with grease or petroleum jelly as they are being reassembled.
5. Replace the shaft before replacing the seals and o-rings.

REPLACING THE SHAFT

1. Mark the rear end of shaft to identify the location of a commutation slot (see B in Fig. 3). This will be required later to set the shaft rotation.
2. Apply petroleum jelly or lubricant to the shaft.
3. Insert the shaft's base into the Housing (#15) without forcing it in. Once the wide part of the shaft is positioned, gently tap the shaft's end with your fingers until it slides into place. Once it has slid into place, push down to seat the shaft.
4. Go to section Rebuild the Motor or Replacing the Seals

REPLACING THE SEALS

After a period of use, the worn rubber and plastic components should be replaced. Princess Auto Ltd. has a Viton seal kit for this motor. Lubricate all seals with grease or petroleum jelly before placing. A clean plastic hammer may be required to tap the seals into place.

1. Fit the replacement O-ring (#19) in the groove of the geroler set between the Geroler set (#22, #23, #24) and the End Cover (#25).
2. Fit the replacement O-ring (#19) in the groove on the Distributor Plate (#20).
3. Fit the replacement O-ring (#19) into the groove on the posterior end of the Housing (#15).
3. Fit the replacement O-ring (#7) between the Thrust Washer (#6) and Axial Needle Bearing (#8).
4. Remove and replace the Shaft Seal (#5) from the Front Cover (#4). Access the seal from the rear of the front cover.
5. Remove and replace the Dust Seal (#3) from the front.
6. Replace the O-ring (#11) on each end of both Check Valves (#12).
7. Go to the Rebuild the Motor section.

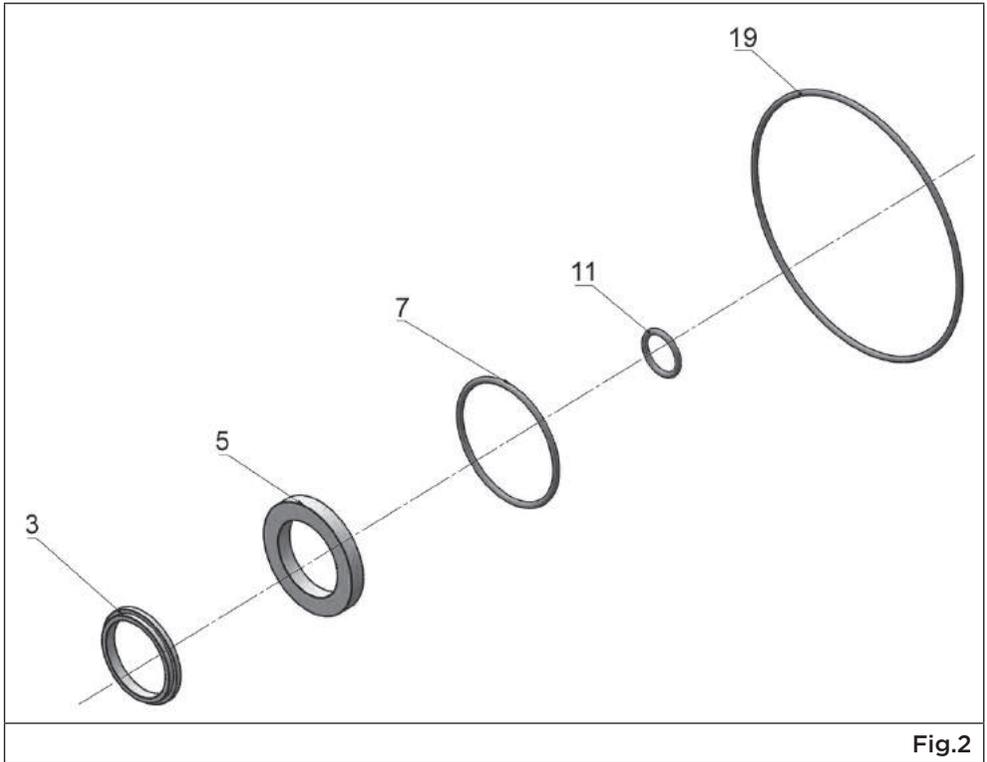


Fig.2

REBUILD THE MOTOR

1. Place Balls (#13) in Check Valve (#12). Close up after the sealing surface has been stamped.
2. Begin with the flange facing upward with the shaft in place. Clamp the vise on either side of the inlet and outlet ports until tight.
3. Place an Axial Needle Bearing (#8) onto the shaft.
4. Place an O-ring (#7) onto the axial needle bearing.
5. Place the Thrust Washer (#6) onto the o-ring and press down gently to seat.
6. Place the Front Cover (#4) over the shaft and press into position on the Housing (#15).
7. Apply a small amount of instant glue to the end of each screw before reinserting through the front cover into the housing.
8. Tighten the screws in increments with a torque wrench equipped with an Allen head adapter until they are between 398 and 442 in-lb. Alternate between screws so an even pressure is applied to the seals and o-rings. Wipe off any residue with one of the solvents mentioned earlier.

9. Hold the motor housing from underneath and release from the vise. Flip over so the rear opening is up. Again clamp on the flange so as not to distort the housing.
10. Align the mark for the commutation slot (B) with hole C in the housing (see Fig. 3).
 - 10.1 Also place a mark on the outer housing to assist in aligning for later steps.
11. Push down on the base of the shaft to firmly seat it against the front cover seal.
12. Place the Axial Needle Bearing (#8) in the space created by step 11.
13. Place the O-ring (#19) it in the housing seal groove. Tap into place with the clean plastic hammer if needed.
14. Place the Distributor Plate (#20) and Drive Link (#21) in the internal spline of the Shaft (#9).
 - 14.1 Align the gear teeth of the rotor (A) and the Drive Link (#21) with the mark on the housing, then put them into the Housing (#15). The drive link will rotate clockwise.
15. Place the End Cover (#25) over the gear wheel set and turn it to align the screw holes.
16. Install the Washers (#26) and fasten the Screws (#27) using a hexagon socket and 354 to 398 in-lb of torque.
17. Install the Washer (#28) and fasten the Plug (#29) using a hexagon socket and 221 to 265 in-lb of torque.
18. Press the Woodruff Key (#10) into the key slot using a plastic hammer.

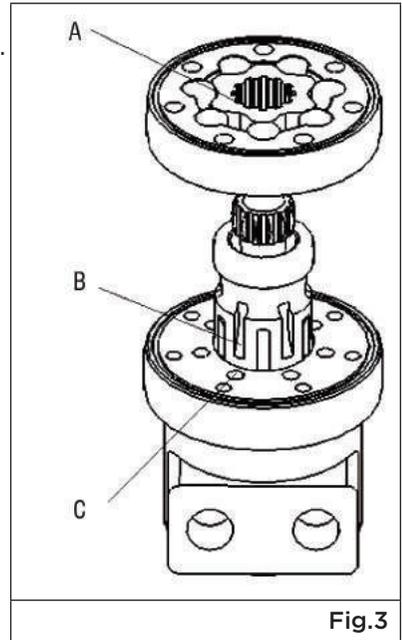


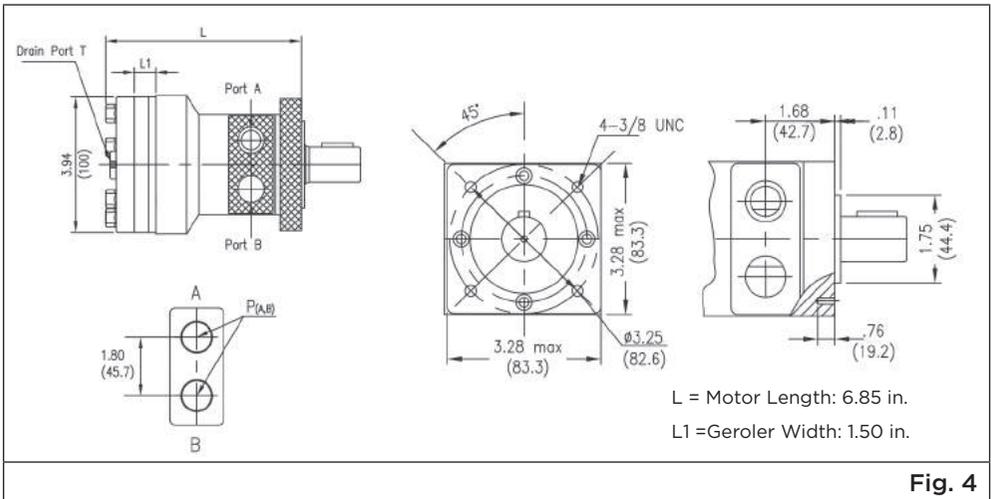
Fig.3

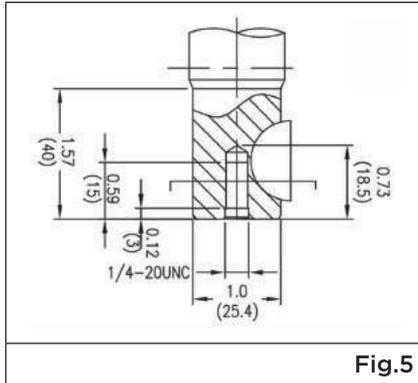
INSTALLATION

The hydraulic motor is one component of the hydraulic circuit. Place the motor after the control mechanism such as a variable flow valve spool. Check that the pressure hoses connecting the motor to the hydraulic circuit can withstand the circuit's maximum pressure.

1. Place the geroler motor into position and bolt onto a frame or appliance. Check the output shaft is properly connected to the appliance, depending on the application, before tightening the bolts.
2. Ensure motor is full of oil prior to attaching hoses.
3. Connect a hydraulic pressure hose from the Directional Control Valve to the motor's inlet port.
4. Connect another hydraulic pressure hose from the Directional Control Valve to the motor's outlet port.
5. Bleed the air from the system and check for leaks.
6. Proceed to prepare the rest of the hydraulic circuit.

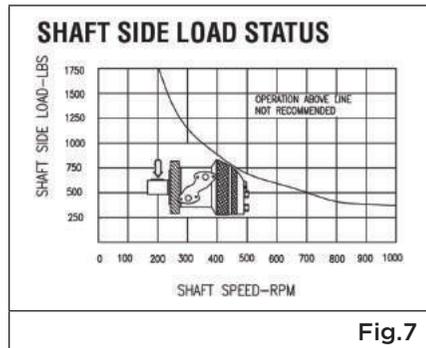
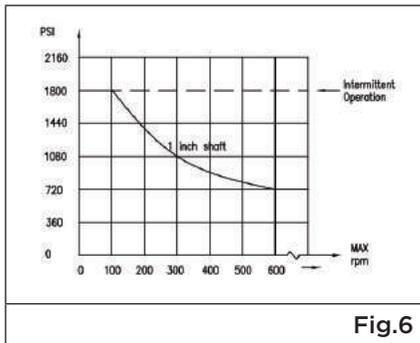
INSTALLATION DIMENSIONS





MOTOR CASE DRAIN

Connect the motor's case drain to the reservoir to avoid damaging the motor's shaft seal, when the pressure in the motor's case (and return line) exceeds the maximum Continuous Pressure (see Specifications). The case drain hose should run directly to the reservoir and not be connected into another return line. Connecting the case drain has several other advantages including flushing contamination from the motor case, helping cool the motor and extending the shaft seal life.



SIDE SHAFT LOAD

The motor performance when set up for use with a side load application is outlined in Fig. 7. Operating the motor beyond the capacity indicated by the curved line may harm the motor.

OPERATION

Connect the motor output shaft to the appliance and the flow of oil through the motor will provide the power to operate the appliance.

The motor is bi-rotational and the output shaft will rotate in the direction of the oil flow through the input and output ports.

Oil flow is controlled with a Directional Control Valve built into the hydraulic circuit. Flow Control Valves reduce the flow rate of oil from the hydraulic system to the hydraulic motor.

The higher the max. torque of the motor, the lower the motor's RPM. Ensure the correct size geroler motor is selected for the task. A geroler motor with a larger displacement will provide greater torque.

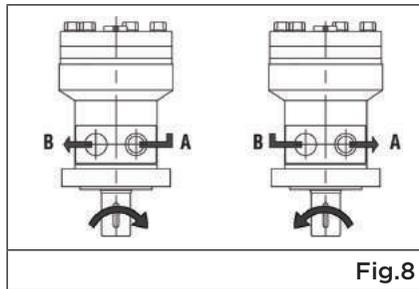


Fig.8

MAINTENANCE

1. Maintain the device with care. A device in good condition is efficient, easier to control and will have fewer problems.
2. Inspect the device components periodically. Repair or replace damaged or worn components.
3. Follow instructions for lubricating and changing accessories.
4. Have damaged or worn components repaired or replaced by an authorized technician.
5. When servicing, use only identical replacement parts. Replace damaged parts immediately.
6. Maintain the device's label and name plate. These carry important information. If unreadable or missing, contact Princess Auto Ltd. for replacements.

WARNING! Only qualified service personnel should repair the device. An improperly repaired device may present a hazard to the user and/or others.

LUBRICATION

The geroler motor is self-lubricating. Only use a good quality anti-wear hydraulic oil with an ISO rating suitable for the maximum operating temperature.

The hydraulic oil will break down if the temperature range is exceeded during operation. Do not exceed the manufacturer's recommended temperature limits.

Oil filtration and cleanliness should meet ISO cleanliness level of 19/16/13. The filtration system should use filters between 10 to 30 microns.

Seals and rubber/plastic washers can be protected with petroleum jelly or grease during rebuilding.

DISPOSAL

Recycle a device damaged beyond repair at the appropriate facility.

Contact your local municipality for a list of disposal facilities or by-laws for electronic devices, batteries, oil or other toxic liquids.

IMPORTANT! DO NOT pollute the environment by allowing uncontrolled discharge of waste oil.

DISPOSAL OF HYDRAULIC FLUID

Do not drain hydraulic jack oil into the sewer system or dispose in an uncontrolled location. Hydraulic fluid may take up to a year to breakdown in the environment and the ingredients may still be toxic. Contact your local municipality for proper disposal instructions or locations.

TROUBLESHOOTING

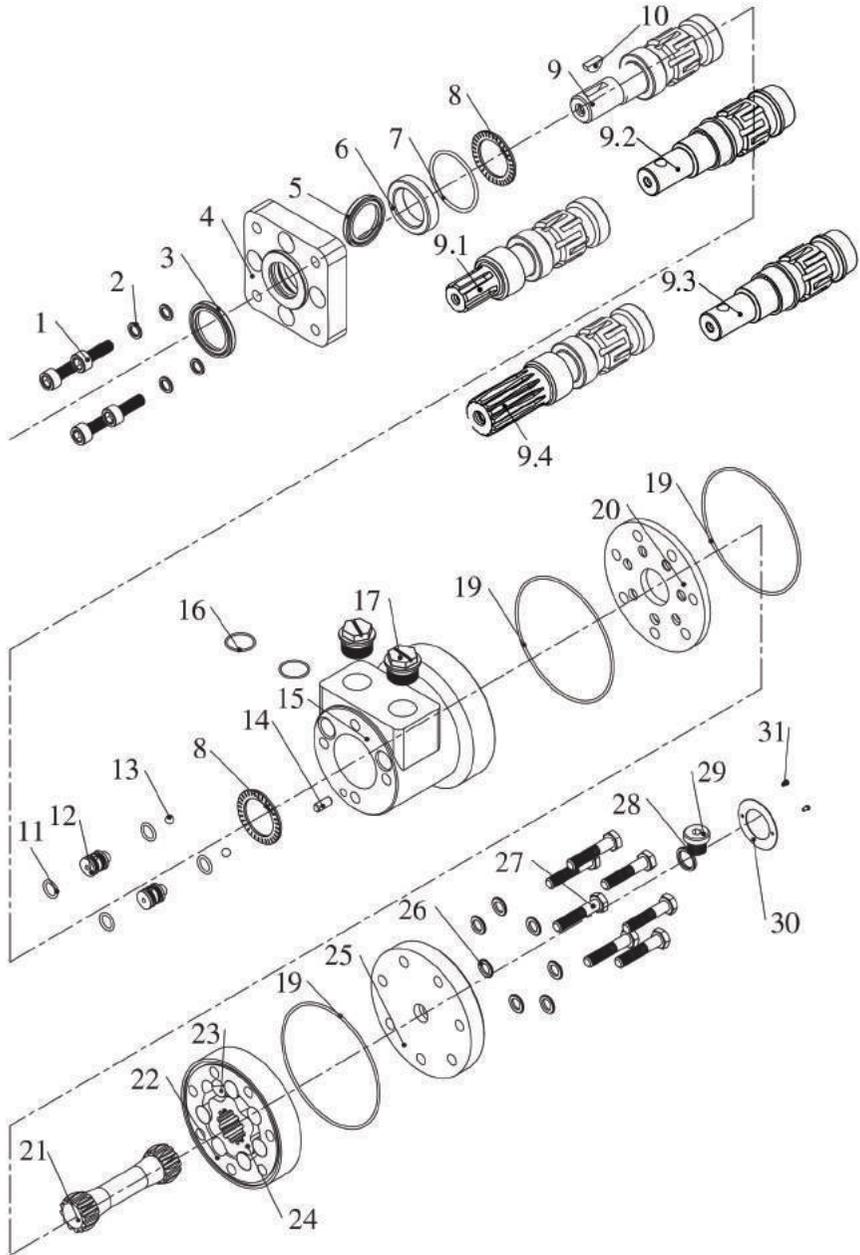
Contact Princess Auto Ltd. for a solution if the device does not function properly or parts are missing. If unable to do so, have a qualified technician service the device.

Problem (s)	Possible Cause (s)	Suggested Solution (s)
Motor turning in wrong direction.	Incorrect piping between control valve and motor.	Check circuit to determine correct piping.
Motor not developing proper speed or torque.	<ol style="list-style-type: none"> 1. Incorrect setting or blocked valves in hydraulic circuit. 2. The motor does not generate enough torque, because the working pressure is too low. 3. Pump not delivering sufficient pressure or volume. 	<ol style="list-style-type: none"> 1. Check system pressure and reset relief valve. 2. Check the pressure level in the system and correct the setting of the pressure limit valve, if necessary. 3. Check pump delivery and pressure.
External oil leakage from motor.	<ol style="list-style-type: none"> 1. Gasket leaking (may be due to case drain not being connected if this is required). 2. Perspiration between the coupling surfaces on the motor (passive oil or fluid residues). 3. Porous castings. 4. Shaft sealing ring leaks. 	<ol style="list-style-type: none"> 1. Replace gasket. (if drain line required, it must be piped directly to reservoir). 2. Clean the motor and see whether the problem persists. 3. Contact Princess Auto Ltd. for solution. 4. Replace sealing ring. Kit available at Princess Auto Ltd.

Problem (s)	Possible Cause (s)	Suggested Solution (s)
The motor is noisy.	<ol style="list-style-type: none"> 1. Coupling misaligned. 2. Vibration or rattling of motor/coupling due to worn or damaged components. 3. Aeration or cavitation caused by pressure imbalance or air entering hydraulic system. 	<ol style="list-style-type: none"> 1. Align unit and check condition of seals, bearings and coupling. 2. Replace worn and damaged components. 3. Tighten leaking connections. Fill reservoir to proper level (with rare exception all return lines should be below fluid level in reservoir). Bleed air from system. Replace shaft seal (and shaft if worn). If bearings are breaking, contact the Princes Auto Ltd. for a solution.

Problem (s)	Possible Cause (s)	Suggested Solution (s)
<p>Motor heated.</p>	<ol style="list-style-type: none"> 1. Fluid heated-system pressure too high. 2. Fluid heated-fluid dirty or low supply. 3. Fluid heated-incorrect fluid viscosity. 4. Fluid heated-worn pump, valve, motor, cylinder or other component. 	<ol style="list-style-type: none"> 1. Install pressure gauge and adjust to correct pressure (keep at least 125 PSI difference between valve settings). 2. Change filters and also system fluid if improper viscosity; fill reservoir to proper level. 3. Change filters and also system fluid if improper viscosity; fill reservoir to proper level. 4. Overhaul or replace.

PARTS BREAKDOWN



PARTS LIST

PARTS#	DESCRIPTION	QTY
1	Screw	4
2	Washer	4
3	Dust Seal	1
4	Front Cover (H4 Flange)	1
5	Shaft Seal	1
6	Thrust Washer	1
7	O-ring	1
8	Axial Needle Bearing	2
9	Shaft - Replacement (8490898)	1
9.1	Shaft - 6 Spline (8490906)	1
9.2	Shaft .315 Crosshole (8490948)	1
9.3	Shaft .406 Crosshole (8490930)	1
9.4	Shaft 13-Spline (8490914)	1
10	Woodruff Key	1
11	O-ring	4
12	Check Valve	2
13	Ball	2
14	Pin	1
15	Housing	1
16	O-ring	2
17	Plug	2
18	---	---
19	O-ring	3
20	Distributor Plate	1
21	Drive Link	1
22	Stator	1
23	Roller	7
24	Rotor	1
25	End Cover	1

PARTS#	DESCRIPTION	QTY
26	Washer	7
27	Screw	7
28	Washer	1
29	Drain Plug	1
30	Name Plate	1
31	Rivet	2

