

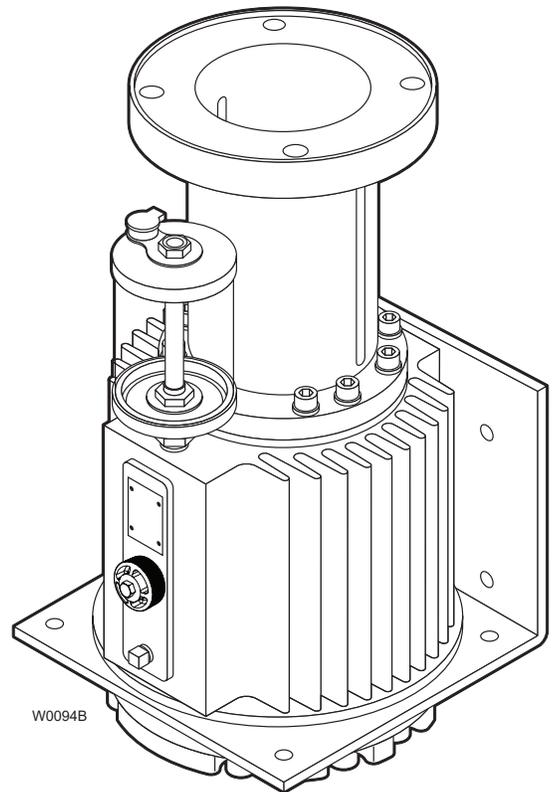
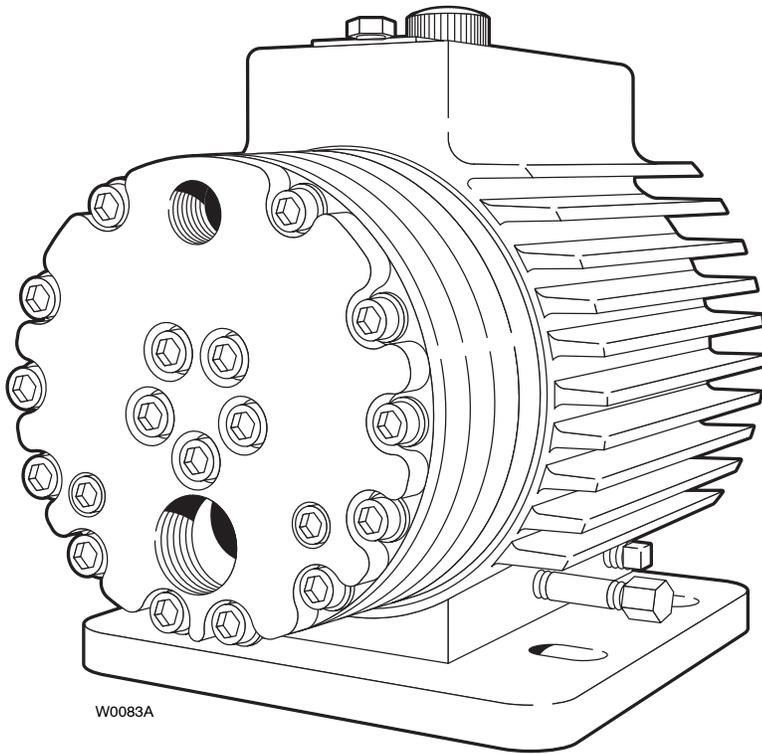
Installation, Operation & Maintenance

D15-991-2400 Rev B

Hydra-Cell[®]

Seal-less Pumps

Models: D15, G15 and D17, G17



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D/G15 & D/G17 Specifications

Max Pressure

Metallic Heads:	1500 psi (103 bar) @ 1750 rpm (D/G15-E & D/G17-E only)
	2000 psi (138 bar) @ 1450 rpm;
	2500 psi (172 bar) @ 1150 rpm

Capacity @ Rated Pressure

	rpm	psi	bar	gpm	l/min
D/G15-X &	1450	500	34	13.8	52.3
D/G17-X	1450	1500	103	13.3	50.2
	1450	2000	138	13.0	49.2
	1150	2500	172	10.1	38.1
D/G15-E &	1750	500	34	15.5	58.7
D/G17-E	1750	1500	103	14.8	56.2
	1450	2000	138	12.0	45.5

Delivery @ Rated Pressure

	psi	bar	gal/rev	liter/rev
D/G15-X &	500	34	0.0095	0.0360
D/G17-X	1500	103	0.0092	0.0346
	2000	138	0.0090	0.0339
	2500	172	0.0088	0.0331
D/G15-E &	500	34	0.0089	0.0335
D/G17-E	1500	103	0.0085	0.0321
	2000	138	0.0083	0.0314

Max Inlet Pressure 500 psi (34 bar)

Max Temperature 250°F (121°C) – consult factory for correct component selection for temperatures from 160°F (71°C) to 250°F (121°C)

Inlet Port	D15 & D17	1-1/4 inch NPT
	G15 & G17	1-1/4 inch BSPT

Discharge Port	D15 & D17	3/4 inch NPT
	G15 & G17	3/4 inch BSPT

Shaft Diameter	1-1/8 inch (28.58 mm)
Shaft Rotation	Reverse (bi-directional)
Bearings	Tapered roller bearings
Oil Capacity	2.2 US quarts (2.1 liters)
D/G17 (with oil bottle)	2.9 US quarts (2.8 liters)
Weight	145 lbs (66 kg)

All D/G15 & D/G17 pumps with serial number 411940 and above are equipped with Wanner Engineering's new generation diaphragm position control technology, referred to throughout this manual as "DPC". Pumps with serial numbers lower than 411940 are referred to as "non-DPC".

Calculating Required Horsepower (kW)*

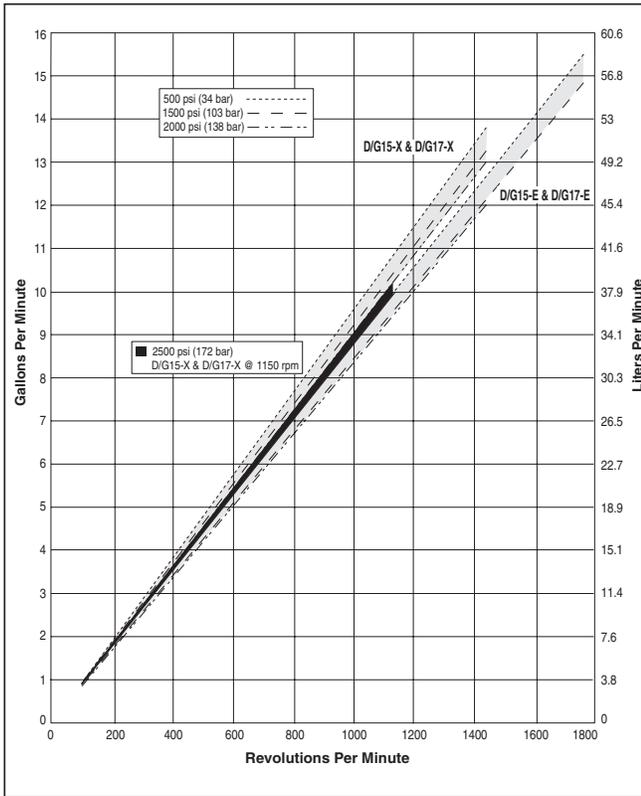
$$\frac{80 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460 - \left(\frac{\text{psi} - 500}{20}\right)} = \text{electric motor HP}^*$$

$$\frac{80 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511 - \left(\frac{\text{bar} - 35}{4}\right)} = \text{electric motor kW}^*$$

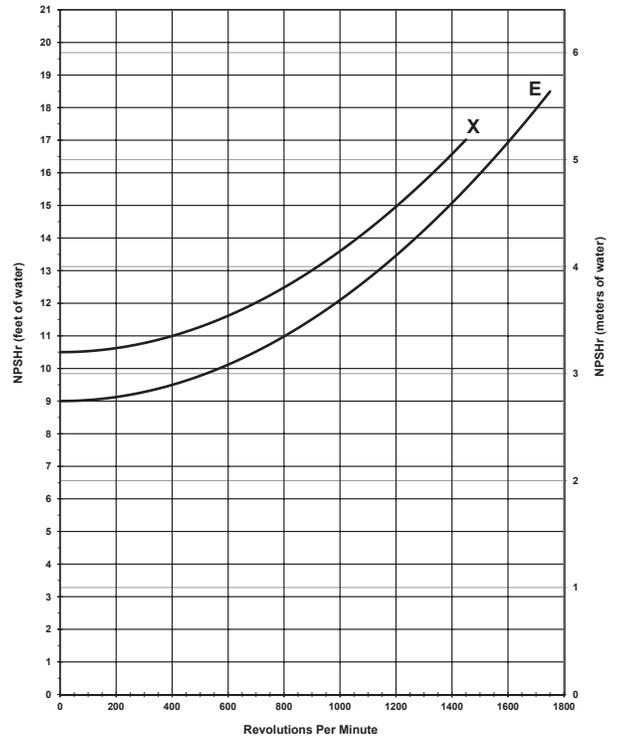
* rpm equals pump shaft rpm. HP/kW is required application power. Use caution when sizing motors with variable speed drives.

D/G15 & D/G17 Specifications

Performance



Net Positive Suction Head – NPSHr

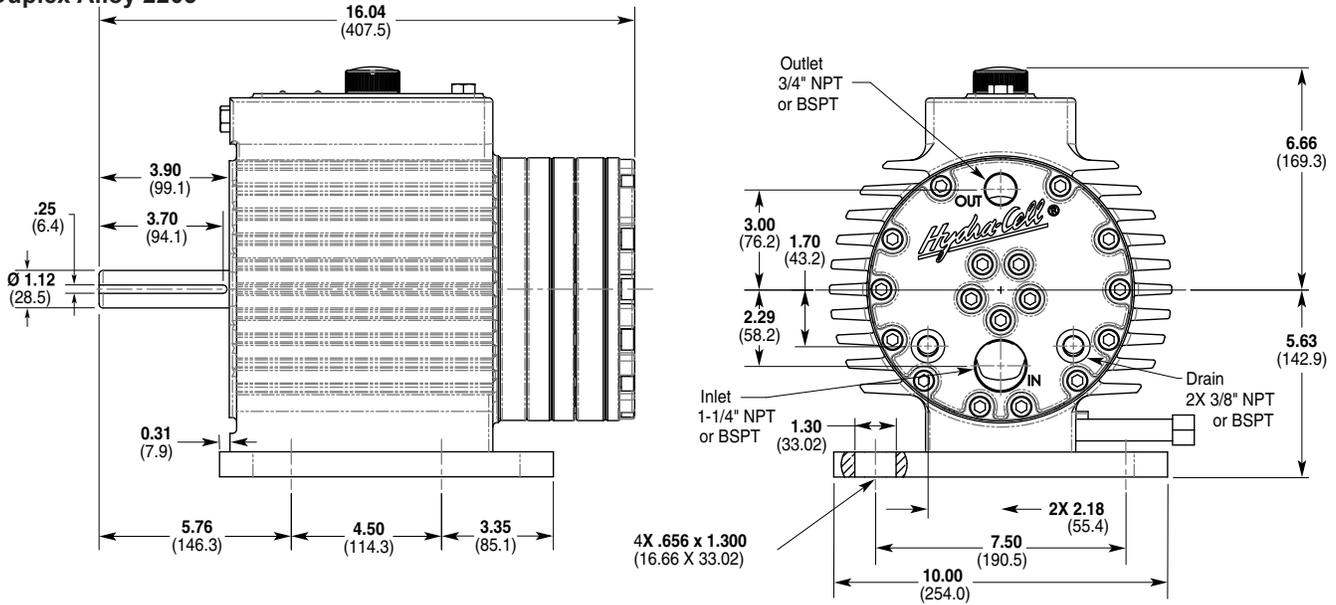


*Pump NPSHr performance based on randomly selected pumps with water at 70°F (21°C)

D/G15 & D/G17 Representative Drawings

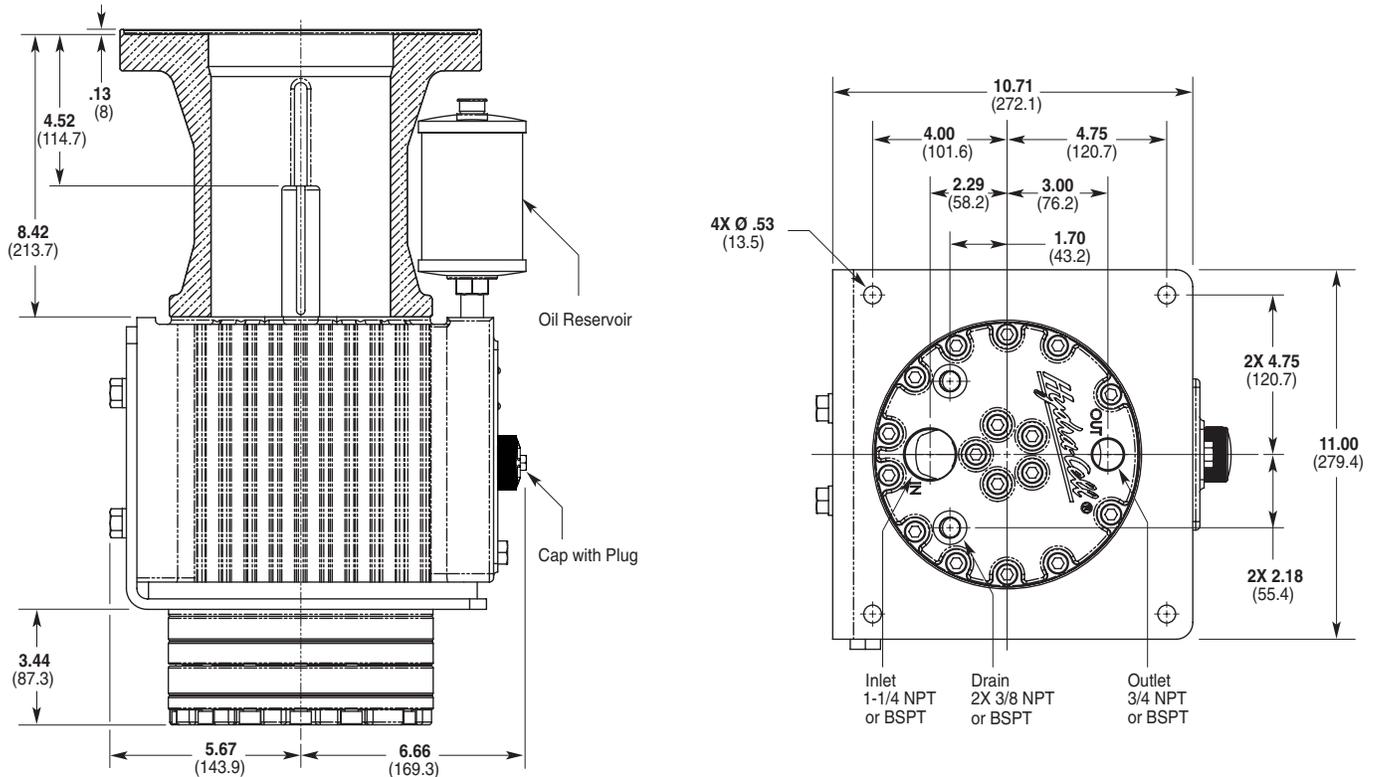
D/G15 Models for Horizontal Mounting Inches (mm)

Brass
 316L Stainless Steel
 Hastelloy C
 Duplex Alloy 2205



D/G17 Models for Vertical Mounting Inches (mm)

Brass
 316L Stainless Steel
 Hastelloy C
 Duplex Alloy 2205



D/G15 & D/G17 Installation

Location

NOTE: The numbers in parentheses are the Reference Numbers on the exploded view illustrations found later in this manual.

Locate the pump as close to the supply source as possible.

Install it in a lighted, clean space where it will be easy to inspect and maintain. Allow room for checking the oil level, changing the oil, and removing the pump head (manifold, valve plate and related items).

Mounting

The pump shaft can be rotated in either direction.

To prevent vibration, securely attach the pump and motor to a level, rigid base.

On a belt-drive system, align the sheaves accurately: poor alignment wastes horsepower and shortens the belt and bearing life. Make sure the belts are properly tightened, as specified by the belt manufacturer.

On a direct-drive system, align the shafts accurately. Unless otherwise specified by the coupling manufacturer, maximum parallel misalignment should not exceed .015" and angular misalignment should be held to 1 degree maximum. Careful alignment extends life of the coupling, pump, shafts, and support bearings. Consult coupling manufacturer for exact alignment tolerances.

Safety Precautions

General Remarks

These safety / installation instructions contain fundamental information and precautionary notes and must be kept available to all associated with the operation of the pump. Please read them thoroughly prior to installation, electrical connection and commissioning of the unit. It is imperative that all other operating instructions relating to the components of individual units are followed.

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Each pump must be labeled by the end user to warn of any hazards that the system process may produce; e.g. corrosive chemicals or hot process etc.

All personnel involved in the operation, maintenance, inspection and installation of the pump must be fully qualified to carry out the work. The personnel's responsibilities, competence and supervision must be clearly defined by the operator. To the extent that if the personnel in question is not already in possession of the requisite know how, appropriate training and instruction

must be provided. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by all the responsible personnel.

When installing a Hydra-Cell pump in conjunction with a motor or motor and frequency controller the relevant manuals must be referred to for electromagnetic compatibility. The installation should conform to EN 61800 and EN 60204 as applicable.

All safety instructions in this manual and all relevant local health and safety regulations must be followed.

Attention must be paid to the weight of the pump before attempting to lift either manually or selecting appropriate lifting equipment.

Important Precautions

Adequate Fluid Supply. To avoid cavitation and premature pump failure, be sure that the pump will have an adequate fluid supply and that the inlet line will not be obstructed. See "Inlet Piping".

Positive Displacement. This is a positive-displacement pump. To avoid severe system damage if the discharge line ever becomes blocked, install a relief valve downstream from the pump. See "Discharge Piping".

Safety Guards. Install adequate safety guards over all pulleys, belts, and couplings. Follow all codes and regulations regarding installation and operation of the pumping system.

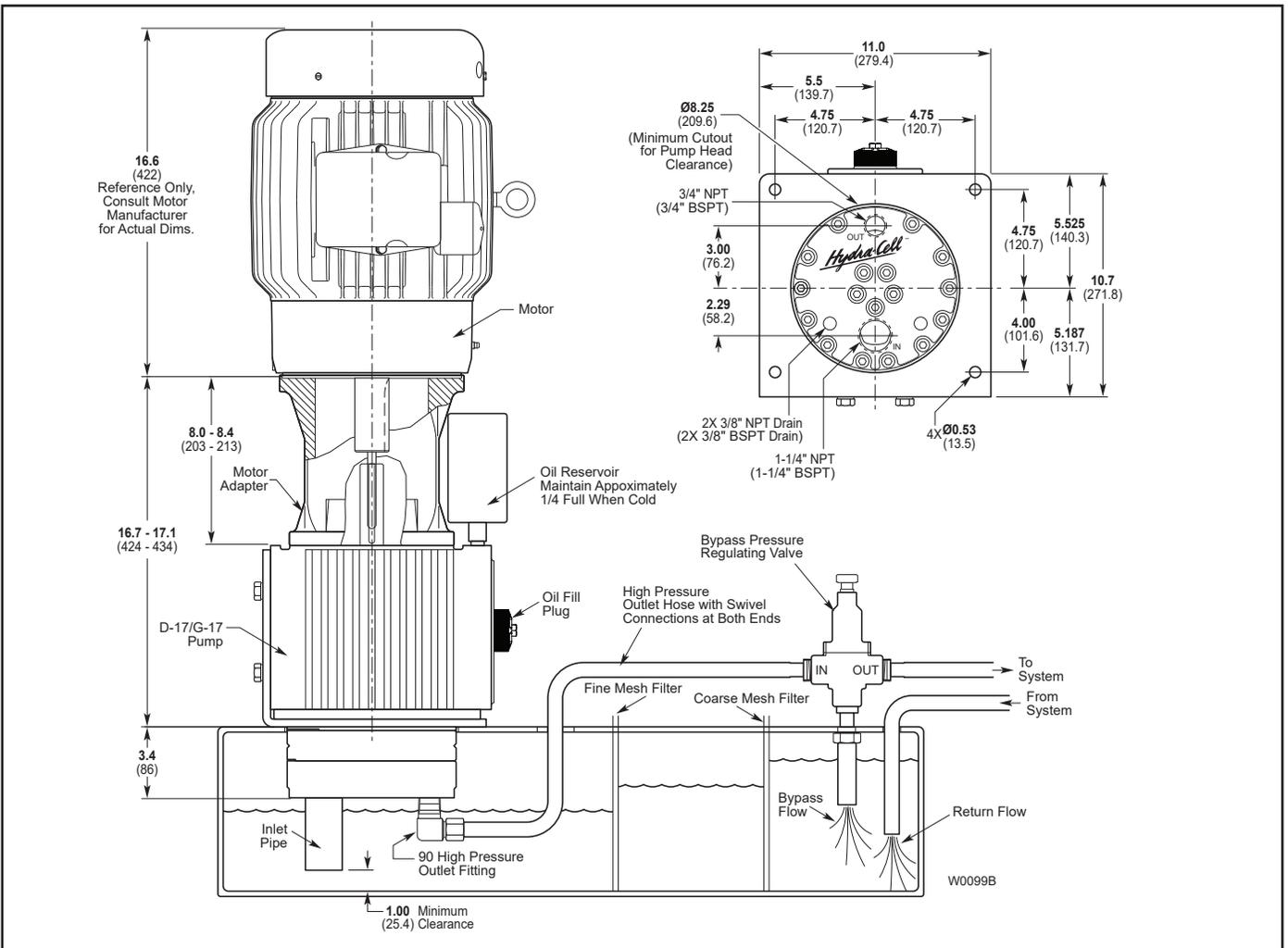
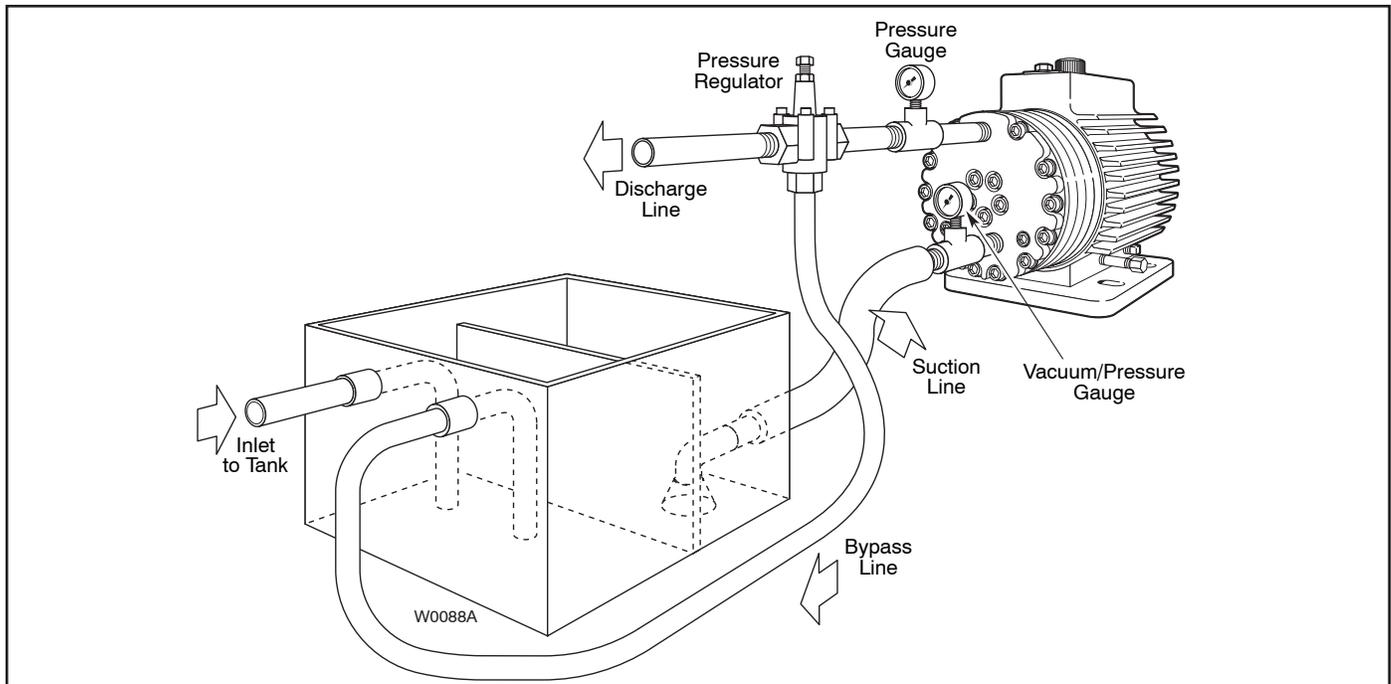
Shut-Off Valves. Never install shut-off valves between the pump and discharge pressure regulator, or in the regulator bypass line.

Freezing Conditions. Protect the pump from freezing. See also the Maintenance Section.

Consult the Factory for the following situations:

- Extreme temperature applications (above 160° F or below 40° F)
- Pressure feeding of pumps
- Viscous or abrasive fluid applications
- Chemical compatibility problems
- Hot ambient temperatures (above 110° F)
- Conditions where pump oil may exceed 200° F because of a combination of hot ambient temperatures, hot fluid temperature, and full horsepower load — an oil cooler may be required

D/G15 & D/G17 Installation



D/G15 & D/G17 Installation

Inlet Piping (Pressure Feed)

CAUTION: When pumping at temperatures above 160° F (71° C), use a pressure-feed system.

Install draincocks at any low points of the suction line, to permit draining in freezing conditions.

Provide for permanent or temporary installation of a vacuum gauge to monitor the inlet suction. To maintain maximum flow, vacuum at the pump inlet should not exceed 7 in. Hg at 70° F (180 mm Hg at 21° C). Pressure at the pump inlet should not exceed 500 psi (34.5 bar); if it could get higher, install an inlet pressure reducing regulator.

Do not supply more than one pump from the same inlet line.

Supply Tank

Use a supply tank that is large enough to provide time for any trapped air in the fluid to escape. The tank size should be at least twice the maximum pump flow rate.

Isolate the pump and motor stand from the supply tank, and support them separately.

Install a separate inlet line from the supply tank to each pump.

Install the inlet and bypass lines so they empty into the supply tank below the lowest water level, on the opposite side of the baffle from the pump suction line.

If a line strainer is used in the system install it in the inlet line to the supply tank.

To reduce aeration and turbulence, install a completely submerged baffle plate to separate the incoming and outgoing liquids.

Install a vortex breaker in the supply tank, over the outlet port to the pump.

Place a cover over the supply tank, to prevent foreign objects from falling into it.

Hose and Routing

Size the suction line at least one size larger than the pump inlet, and so that the velocity will not exceed 1-3 ft/sec (0.3 to 0.9 m/s):

For pipe in inches: Velocity (ft/sec) = 0.408 x GPM/Pipe ID²

For pipe in mm: Velocity (m/sec) = 21.2 x LPM/Pipe ID²

Keep the suction line as short and direct as possible. A maximum of 3 feet (1 m) is recommended.

Use flexible hose and/or expansion joints to absorb vibration, expansion, or contraction.

If possible, keep the suction line level. Do not have any high points to collect vapor unless these high points are vented.

To reduce turbulence and resistance, do not use 90° elbows. If turns are necessary in the suction line, use 45° elbows or arrange sweeping curves in the flexible inlet hose.

If a block valve is used, be sure it is fully opened so that the flow to the pump is not restricted. The opening should be at least the same diameter as the inlet plumbing ID.

Do not use a line strainer or filter in the suction line unless regular maintenance is assured. If used, it should have a free-flow area of at least three times the free-flow area of the inlet.

Install piping supports where necessary to relieve strain on the inlet line and to minimize vibration.

Inlet Piping (Pressure Feed)

Provide for permanent or temporary installation of a vacuum/pressure gauge to monitor the inlet vacuum or pressure. Pressure at the pump inlet should not exceed 500 psi (34.5 bar); if it could get higher, install an inlet pressure reducing regulator.

Do **not** supply more than one pump from the same inlet line.

D/G15 & D/G17 Installation

Inlet Calculations

Acceleration Head

Calculating the Acceleration Head

Use the following formula to calculate acceleration head losses. Subtract this figure from the NPSHa, and compare the result to the NPSHr of the Hydra-Cell pump.

$$H_a = (L \times V \times N \times C) \div (K \times G)$$

where:

H_a = Acceleration head (ft of liquid)

L = Actual length of suction line (ft) — not equivalent length

V = Velocity of liquid in suction line (ft/sec) [V = GPM x (0.408 ÷ pipe ID²)]

N = RPM of crank shaft

C = Constant determined by type of pump — use 0.04 for the D-15 and G-15 Hydra-Cell pumps

K = Constant to compensate for compressibility of the fluid — use: 1.4 for de-aerated or hot water; 1.5 for most liquids; 2.5 for hydrocarbons with high compressibility

G = Gravitational constant (32.2 ft/sec²)

Friction Losses

Calculating Friction Losses in Suction Piping

When following the above recommendations (under “inlet Piping”) for minimum hose/pipe I.D. and maximum length, frictional losses in the suction piping are negligible (i.e., H_f = 0) if you are pumping a water-like fluid.

When pumping more-viscous fluids such as lubricating oils, sealants, adhesives, syrups, varnishes, etc., frictional losses in the suction piping may become significant. As H_f increases, the available NPSH (NPSHa) will decrease, and cavitation will occur.

In general, frictional losses increase with increasing viscosity, increasing suction-line length, increasing pump flowrate, and decreasing suction-line diameter. Changes in suction-line diameter have the greatest impact on frictional losses: a 25% increase in suction-line diameter cuts losses by more than two times, and a 50% increase cuts losses by a factor of five times.

Consult the factory before pumping viscous fluids.

Minimizing Acceleration Head and Frictional Losses

To minimize the acceleration head and frictional losses:

- Keep inlet lines less than 3 ft (1 m) long
- Use at least 1-1/2 in. (38 mm) I.D. inlet hose
- Use soft hose (low-pressure hose, noncollapsing) for the inlet lines
- Minimize fittings (elbows, valves, tees, etc.)
- **Use a suction stabilizer on the inlet.**

Net Positive Suction Head

NPSHa must be equal to or greater than NPSHr. If not, the pressure in the pump inlet will be lower than the vapor pressure of the fluid— and cavitation will occur.

Calculating the NPSHa

Use the following formula to calculate the NPSHa:

$$NPSHa = P_t + H_z - H_f - H_a - P_{vp}$$

where:

P_t = Atmospheric pressure

H_z = Vertical distance from surface liquid to pump centerline (if liquid is below pump centerline, the H_z is negative)

H_f = Friction losses in suction piping

H_a = Acceleration head at pump suction

P_{vp} = Absolute vapor pressure of liquid at pumping temperature

NOTES:

- In good practice, NPSHa should be 2 ft greater than NPSHr
- All values must be expressed in feet of liquid

Atmospheric Pressure at Various Altitudes

Altitude (ft)	Pressure (ft of H ₂ O)	Altitude (ft)	Pressure (ft of H ₂ O)
0	33.9	1500	32.1
500	33.3	2000	31.5
1000	32.8	5000	28.2

Discharge Piping

NOTE: Consult the Factory before manifolding two or more pumps together.

Hose and Routing

Use the shortest, most-direct route for the discharge line.

Select pipe or hose with a **working pressure** rating of at least 1.5 times the maximum system pressure. EXAMPLE: Select a 3000-psi W.P.-rated hose for systems to be operated at 2000-psi-gauge pressure.

Use about 6 ft (1.8 m) of flexible hose between the pump and rigid piping to absorb vibration, expansion or contraction.

Support the pump and piping independently. Size the discharge line so that the velocity of the fluid will not exceed 7-10 ft/sec (2-3 m/sec):

For pipe in inches: Velocity (ft/sec) = 0.408 x GPM/Pipe ID²

For pipe in mm: Velocity (m/sec) = 21.2 x LPM/Pipe ID²

D/G15 & D/G17 Installation

Pressure Regulation

Install a pressure regulator or unloader in the discharge line. Bypass pressure must not exceed the pressure limit of the pump.

Size the regulator so that, when fully open, it will be large enough to relieve the full capacity of the pump without overpressurizing the system.

Locate the valve as close to the pump as possible and ahead of any other valves.

Adjust the pressure regulating valve to no more than 10% over the maximum working pressure of the system. Do not exceed the manufacturer's pressure rating for the pump or regulator.

Route the bypass line to the supply tank, or to the suction line as far as possible from the pump (to reduce the chance of turbulence and cavitation).

If the pump may be run for a long time with the discharge closed and fluid bypassing, install a thermal protector in the bypass line (to prevent severe temperature buildup in the bypassed fluid).

CAUTION: Never install shutoff valves in the bypass line or between the pump and pressure regulator or relief valve.

Provide for permanent or temporary installation of a pressure gauge to monitor the discharge pressure at the pump.

For additional system protection, install a safety relief valve in the discharge line, downstream from the pressure regulator.

Before Initial Start-Up

Before you start the pump, be sure that:

- All shutoff valves are open, and the pump has an adequate supply of fluid.
- All connections are tight.
- The oil level is 1/4 in. (6 mm) above the cast surface in the upper oil reservoir.
- The pipe plug in the pump housing has been removed and the oil reservoir (36) has been installed. The reservoir allows for oil expansion during pump operation, and serves as a sight glass for monitoring condition and level of the oil. Fill the oil reservoir 1/4 full when the pump is cold.
- The relief valve on the pump outlet is adjusted so the pump starts under minimum pressure.
- All pulleys and belts are properly aligned, and belts are tensioned according to specification.
- All pulleys, belts and shaft couplings have adequate safety guards.

Initial Start-Up Procedure

1. Turn on power to the pump motor.
2. Check the inlet pressure or vacuum. To maintain maximum flow, inlet vacuum must not exceed 7 in. Hg at 70° F (180 mm Hg at 21° C). Inlet pressure must not exceed 500 psi (34.5 bar).
3. Listen for any erratic noise, and look for unsteady flow. If the pump does not clear, refer to the Trouble-shooting Section.
4. If the system has an air lock and the pump fails to prime:
 - a. Turn off the power.
 - b. Remove the pressure gauge or plug from the tee fitting at the pump outlet (refer to the illustration on page 3).

NOTE: Fluid may come out of this port when the plug is removed. Provide an adequate catch basin for fluid spillage, if required. Fluid will come out of this port when the pump is started, so we recommend that you attach adequate plumbing from this port so fluid will not be sprayed or lost. Use high-pressure-rated hose and fittings from this port. Take all safety precautions to assure safe handling of the fluid being pumped.

- c. Jog the system on and off until the fluid coming from this port is air-free.
 - d. Turn off the power.
 - e. Remove the plumbing that was temporarily installed, and reinstall the pressure gauge or plug.
5. Adjust the discharge pressure regulator to the desired operating and bypass pressures. Do not exceed the maximum pressure rating of the pump.
 6. After the pressure regulator is adjusted, set the safety relief valve at 100 psi (7 bar) higher than the desired operating pressure. To verify this setting, adjust the discharge pressure regulator upward until the relief valve opens. Follow the recommendations in the above NOTE (step 4b) for handling the fluid that will come from the relief valve.
 7. Reset the discharge pressure regulator to the desired system pressure.
 8. Provide a return line from the relief valve to the supply tank, similar to the bypass line from the pressure regulator.

D/G15 & D/G17 Maintenance

NOTE: The numbers in parentheses are the Reference Numbers on the exploded view illustrations found later in this manual.

Daily

Check the oil level and the condition of the oil. The oil level should be 1/4 in. (6 mm) above the cast surface in the upper oil reservoir.

For the D/G17, the oil reservoir should be 1/4 full.

Use the appropriate Hydra-Oil for the application (contact Wanner Engineering if in doubt).

CAUTION: If you are losing oil but don't see any external leakage, or if the oil becomes discolored and contaminated, one of the diaphragms (22) may be damaged. Refer to the Fluid-End Service Section. Do not operate the pump with a damaged diaphragm.

CAUTION: Do not leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as discovered, and replace it with clean oil.

Periodically

Change the oil after the first 100 hours of operation, then change according to the guidelines below. When changing, remove the drain plug cap (28) at the bottom of the pump so all oil and accumulated sediment will drain out. Then, remove the magnetic plug (35) and clean all accumulated debris from it. Replace the magnetic plug and drain plug cap and refill with the appropriate Hydra-Oil.

Hours Between Oil Changes @ Various Process Fluid Temperatures

Pressure	RPM	<90°F (32°C)	<139°F (60°C)	<180°F (82°C)
<1500 psi (100 bar)	<1200	4,000	3,000	2,000
	<1750	2,000	1,500	1,000
<2000 psi (140 bar)	<1200	2,000	—	1,500
	<1450	1,500	—	1,000
<2500 psi (170 bar)	<1200	1,500	—	1,000

NOTE: Minimum oil viscosity for proper hydraulic end lubrication is 16-20 cST (80-100 SSU).

NOTE: Use of an oil cooler is recommended when process fluid and/or hydraulic end oil exceeds 180°F (82°C).

CAUTION: Do not turn the drive shaft while the oil reservoir is empty.

Check the inlet pressure or vacuum periodically with a gauge. If vacuum at the pump inlet exceeds 7 in. Hg (180 mm Hg), check the inlet piping system for blockages. If the pump inlet is located above the supply tank, check the fluid supply level and replenish if too low.

CAUTION: Protect the pump from freezing. Refer also to the "Shutdown Procedure".

Shutdown Procedure During Freezing Temperatures

Take all safety precautions to assure safe handling of the fluid being pumped. Provide adequate catch basins for fluid drainage and use appropriate plumbing from drain ports, etc. when flushing the pump and system with a compatible antifreeze.

1. Adjust the discharge pressure regulating valve so the pump runs under minimum pressure. Stop the pump.
2. Drain supply tank; open any draincocks in system piping and collect drainage; remove plugs (0) from manifold and collect drainage.
3. Close draincocks in system piping and replace manifold plugs.
4. Fill supply tank with enough antifreeze to fill system piping and pump.
Note: disconnect the system return line from the supply tank and connect it to a separate reservoir.
5. Start the pump and allow it to run until the system is filled with antifreeze. Note: if the system has an airlock and the pump fails to prime, follow step 4 of the Initial Start-up Procedure to clear the air.
6. When mostly antifreeze is flowing from the system return line stop the pump. Connect the system return line back to the supply tank and circulate the antifreeze for a short period.
7. It is also good practice to change the oil in the Hydraulic End before storage for an extended period. This will remove any accumulated condensation and sediment from the oil reservoir. Drain and refill the Hydraulic End with the appropriate Hydra-Oil and operate the pump for a short period to assure smooth performance.

D/G15 & D/G17 Service (Fluid End)

NOTE: The number in parentheses are the Reference numbers on the illustration in the Fluid End Parts section.

This section explains how to disassemble and inspect all easily serviceable parts of the pump. Repair procedures for the hydraulic end (oil reservoir) of the pump are included in a later section of the manual.

CAUTION: Do not disassemble the hydraulic end unless you are a skilled mechanic. For assistance, contact Wanner Engineering (TEL 612-332-5681 or FAX 612-332-6937) or the distributor in your area.

CAUTION: Do not remove the four socket-head capscrews (29) that go through the cylinder housing (25), unless you are repairing the hydraulic end of the pump.

Tools and Supplies

The following tools and supplies are recommended for servicing the pump:

- Straightedge (at least 8 in. long)
- Grease or petroleum jelly
- 1/2" drive torque wrench, rated to at least 50 ft-lbs (70 N-m)
- Emery cloth and Scotch-Brite™ pad
- 11/16" socket (3/8" or 1/2" drive)
- 19 mm socket (1/2" drive)
- 3/8" drive socket wrench with extensions
- 1/2" drive socket wrench with extensions
- T30 torx drive
- Wanner Hydra-Oil (appropriate Grade, as determined by digit 12 of your pump model number).
- Anaerobic seal sealant (for shaft seals if servicing Hydraulic End)
- Wanner D-15 Tool Kit, which includes the following:
 - Valve seat puller
 - Plunger guide lifter
 - 3/32 x 6 in. T-handle hex wrench
 - 8 mm hex bit socket (1/2" drive)
 - Shaft rotator
 - Seal protector
 - Seal inserter
 - 5/16" hex Allen wrench
 - 7/16" 8-point socket (3/8" drive)
 - 6 mm hex Allen wrench

Service Procedures

Begin with the pump assembly removed from the system, and the pump disconnected from the motor and motor adapter. Secure the pump baseplate (32) to a stable workbench with clamps, or bolts and nuts (the bolts passing through the unused holes in the solid portion of the baseplate).

1. Remove Manifold and Valve Plate (4, 26)

- a. **Manifold.** Use the 8 mm hex bit socket included in the Wanner D-15 Tool Kit to remove the 12 capscrews (2) and five capscrews (1) at the front of the manifold. Remove and inspect the manifold for warping or wear around the inlet and outlet ports and flow channels. If wear is excessive replace the manifold. To check if the manifold is warped, place a straightedge across it; check both sides. A warped manifold should be replaced.
- b. **Valve Plate.** Using the 8 mm hex bit socket remove capscrew (24). Remove and inspect the valve plate in the same manner as the manifold, for excessive wear or warping. Replace if necessary.

CAUTION: Don't turn the pump drive shaft while the manifold and valve plate are off the pump, except when removing diaphragms or repriming the hydraulic cells.

2. Remove and Inspect Valves (9-20)

NOTE: Wanner Valve Kits include items and all O-rings for sealing the manifold to the valve plate. The five inlet and five outlet valve assemblies are different in size and face in opposite directions.

- a. Remove the inlet valve seat (10) using the seat puller tool included in the Wanner D-15 Tool Kit. Inspect the valve seat for wear, and replace if necessary.

NOTE: Whenever any valve or seat is replaced it is recommended to replace all valve assemblies to ensure the most reliable operation. All necessary parts are included in a replacement Valve Kit.
- b. Remove the remaining inlet valve components (11-14) and outlet valve components (17-20) by hand or with a small needle nose pliers.
- c. Check the spring retainers (14, 20) and replace if worn, cracked, or damaged.
- d. Check the valve springs (12, 19) and replace if worn, broken, or shorter than a new spring. Never attempt to stretch a used spring.
- e. Check the valves (11, 18) for wear or damage and replace if necessary. Polishing of the valves during operation is normal. If you can feel a ridge in the valve surface the valve should be replaced.

NOTE: Pumps with plastic spring retainers (14, 20) include a Tetra Seal (13, 17 - square section O-ring) between the spring retainer and valve seat. Pumps with metal spring retainers do not include a Tetra Seal.

D/G15 & D/G17 Service (Fluid End)

- f. Reinstall the valve assemblies:
- Clean the valve ports and shoulders in the valve plate (26) with a Scotch-Brite pad or fine emery cloth. Wash the valve plate after cleaning, and lubricate the valve ports with a compatible grease, oil, or petroleum jelly.
 - Install new O-rings (9, 15) on seats (10, 16) and lubricate all O-rings.
 - Inlet Valves (five center, larger valves). Insert the spring retainer (14) into the valve plate (26), followed by the Tetra seal (13) if spring retainer is plastic. Insert the spring (12) into the retainer, followed by the valve (11) onto the spring. Finally, insert seat (10) with new O-ring into the valve bore with the larger I.D. chamfer (seating surface) facing down, towards the valve.
 - Outlet Valves (five outer, smaller valves). Insert the outlet seat (16) with new O-ring into the valve bore with the larger I.D. chamfer (seating surface) facing up. Insert a Tetra Seal (17) if valve spring retainers are plastic. Insert the valve (18) and spring (19) onto the seat. Finally, insert the spring retainer (20) into the valve bore.
 - Make sure the springs are all properly nested into the spring retainers to ensure proper valve performance.

3. Inspect and Replace Diaphragms (22)

- Lift a diaphragm by one edge, and turn the pump shaft until the diaphragm moves up to "top dead center". This will expose machined cross-holes in the spool valve (55) behind the diaphragm.
- Insert a 3/32 x 6 in. hex wrench through one of the machined cross-holes, to hold the diaphragm up and to keep the valve plunger from rotating. The proper size tool is included in the Wanner Tool Kit. (Don't remove the tool until the new diaphragm is installed in step "f" below.)
- Unscrew the diaphragm. Use a T30 Torx bit, and turn counterclockwise.
- Inspect the diaphragm carefully. A damaged diaphragm generally indicates a pumping system problem and replacing only the diaphragm will not solve the larger problem. Inspect the diaphragm for the following:
 - **Half-moon marks.** Usually caused by cavitation of pump (See Troubleshooting section).
 - **Concentric circular marks.** Usually caused by cavitation of pump (See Troubleshooting section).
 - **Small puncture.** Usually caused by sharp foreign object in fluid, or by ice particle.
 - **Diaphragm pulled away** from center screw or from cylinder sides. Usually caused by fluid being frozen in pump, or by overpressurization of pump.
 - **Diaphragm stiff and inflexible.** Usually caused by pumping fluid incompatible with diaphragm material, or diaphragm operated at temperatures below rated capability.
 - **Diaphragm edge chewed away.** Usually caused by overpressurizing system.

CAUTION: If a diaphragm has ruptured and foreign material or water has entered the oil reservoir, do not operate the pump. Check all diaphragms, then flush the reservoir completely (as outlined below) and refill it with fresh oil. Never let the pump stand with foreign material or water in the reservoir, or with the reservoir empty.

- Clean away any spilled oil.
- Install a new diaphragm and tighten to 18 in.-lbs (203 N-cm).
- Repeat the above inspection procedure (and replacement, if necessary) with the other four diaphragms.

4. Flush Contaminant from Hydraulic End

(only if a diaphragm has ruptured)

- With the valve plate and manifold still removed (see above), remove the oil drain cap (28) allow all oil and contaminant to drain out.
- Fill the reservoir with compatible solvent, manually turn the pump shaft to circulate the kerosene, and drain. Dispose of this contaminated fluid properly.
- Repeat the flushing procedure (step "b" above).
- Fill the reservoir with fresh oil, manually turn the pump shaft to circulate the oil, and drain again.
- Refill the reservoir. If the oil appears milky, there is still contaminant in the reservoir. Repeat the flushing procedure until the oil appears clean.

5. Prime the Hydraulic Cells

Method #1 (system head pressure less than 2 psi)

- With the pump **horizontal and the fluid end head removed**, fill the reservoir with the appropriate Hydra oil for the application. Have a catch basin for oil that leaks from behind the diaphragms when priming. Catch the oil and dispose of it properly; **do not reuse it.**
- All air in the oil within the hydraulic cell (behind the diaphragm) must be forced out by turning the shaft (and thus pumping the piston). A Shaft Rotator is included in the Wanner D-15 Tool Kit. Rotate the shaft two revolutions and refill the reservoir. Rotate it two more revolutions and refill again. Continue to do this until the oil that is being pumped from the back of all five diaphragms is free of air.
- Wipe excess oil from the cylinder housing (25) and diaphragms (22).
- Ensure that the oil level is 1/4 in (6 mm) above the cast surface in the upper oil reservoir.
- Replace oil fill cap (30).

D/G15 & D/G17 Service (Fluid End)

Method #2 (with system head pressure greater than 2 psi)

NOTE: This simple and clean method of priming the Hydra-cells requires an inlet head pressure of at least 5 feet (1.5 m) or 2 psi (.14 bar). This pressure is required to hold the diaphragms back while the piston moves to force out the air.

- a. Completely assemble pump.
- b. Fill reservoir with correct Hydra-oil. For D/G17, remove Oil Bottle and fill to top of fill port.

When tank head pressure is being used to prime, use the following steps:

- c. Install pump in system and connect tank supply line to pump inlet. Connect pump discharge line. Leave end of line open to allow air to pass out.
- d. Slowly turn pump shaft by hand and watch for bubbles at oil reservoir fill opening. This will take several rotations. When no more bubbles come out and reservoir level has dropped about 1" (25 mm), hydraulic cells are primed.
- e. For D/G17, replace reservoir (30) and complete installation.

6. Reinstall Valve Plate and Manifold (26, 4)

- a. Reinstall the valve plate (26), with the valve assemblies installed as outlined above, onto the cylinder housing center spud and alignment pin (8).
- b. Install capscrew (24) with flat washer (3) through center hole in valve plate and torque to 45 ft-lbs (60 N-m).
- c. Install new O-rings (5, 6, 7) into the grooves in the front side of the valve plate. Use grease or petroleum jelly to hold them in place.
- d. Reinstall the manifold (4) over alignment pin (8), engaging the center spud of the manifold into the center of the valve plate.
- e. Install capscrews (1) with flat washers (3) through the five center holes in the manifold. Thread each capscrew in several turns, but do not torque.
- f. Install capscrews (2) with flat washers (3) through the twelve outer holes at the perimeter of the manifold. Thread each capscrew in several turns, but do not torque.
- g. Return to the five capscrews at the center of the manifold and alternately tighten opposite bolts until all are secure. Torque to 45 ft-lbs (60 N-m).
- h. Return to the twelve capscrews at the perimeter of the manifold and alternately tighten opposite bolts until all are secure. Torque to 45 ft-lbs (60 N-m).
- i. Recheck all capscrews for tightness and proper torque, starting with the five at the center of the manifold, then the twelve at the perimeter.

D/G15 & D/G17 Service (Hydraulic End)

NOTE: The numbers in parentheses are the Reference Numbers on the exploded view illustrations found later in this manual.

This section explains how to disassemble and inspect the hydraulic end (oil reservoir) of the pump.

CAUTION: Do not disassemble the hydraulic end unless you are a skilled mechanic. For assistance, contact Wanner Engineering (612-332-5681) or the distributor in your area.

CAUTION: The four socket-head capscrews (31) that screw through the cylinder housing (25) into the pump housing hold these parts together. Do not remove these four screws except when repairing the hydraulic end.

NOTE: The following service procedures refer several times to the Wanner D-15 Tool Kit. We strongly urge you **not to repair** the hydraulic end of the pump without using the tools in this Kit (available from Wanner Engineering or your local distributor). Refer also to the list of tools and supplies in the Fluid-End Service Section.

Service Procedure

NOTE: Before Step 1 Remove Pump Housing, scribe a line on the perimeter of the cylinder housing and onto the pump housing. This will simplify alignment during reassembly.

1. Remove Pump Housing

- Remove the manifold and valve plate, and the diaphragms, from the pump. Refer to the Fluid-End Service Section
- Drain the oil from the pump housing by removing the drain plug cap (28). Dispose of the oil properly.
For D/G17 only: Drain the oil from the pump housing by removing plug (36), then tipping the pump up onto the cylinder housing (25). Remove oil reservoir (39), clean and set aside. Return the pump to its secure horizontal position.
- Check the shaft for sharp burrs. Smooth any burrs, to prevent scarring the seals (47) when removing the shaft.
- Reinsert two perimeter bolts (2) through the cylinder housing (25) into the pump housing (39), at the 10 and 2 o'clock positions, to support the parts as the pump is being disassembled.
- Remove the four socket-head capscrews (31) loosening alternately so the cylinder housing separates evenly from the pump housing. Slide the cylinder housing out on the two bolts (2) that were inserted for support in Step d above. The preload on the piston return springs will push the cylinder housing out of the pump housing. Remove the support bolts and cylinder housing assembly.
NOTE: the piston assemblies will be free to slide out of the cylinder housing, so keep the cylinder housing orientated with pistons up, for later disassembly.
- Remove the shaft assembly (45) sliding the shaft out of the seals (47). The parts are heavy.
- Remove the bearing adjustment plate (43) and inspect the bearing cup (45A). Inspect all parts for wear, and replace if necessary.
- Inspect the cam and bearings (45), and the bearing cup (45B) in the housing. If the bearings are pitted or binding,

or if the bearing cup in the housing is worn, contact Wanner Engineering.

CAUTION: If a bearing cup or bearing cone is replaced, they must be replaced as a pair or premature failure will result.

2. Disassemble Pistons

Inspect and clean all parts of the hydraulic piston assemblies (61). Replace all O-rings and any other parts that are worn or damaged.

3. Reassemble Pistons

- Drop a ball (59) into each opening in the bottom of the piston assembly (60).
NOTE: Using grease on the O-rings, and lubricating the parts, will aid in assembly.
- Insert a retaining washer (58) and O-ring (57) to hold the balls in place.
- Insert a valve plunger (55) into the valve cylinder (56). Slide priming spring (54), spacer (53), and overfill spring (52) over the valve plunger (55), inside the valve cylinder (56).
- Insert an O-ring (51) into the spring retainer (50).
- Slide the assembled valve cylinder (56), valve plunger (55), priming spring (54), spacer (53), and overfill spring (52) into the spring retainer (50).
- Slide the complete cylinder-and-retainer assembly into the piston assembly.
- Insert a piston return spring (49) into the piston assembly, with the larger end going into the piston first. This is a tight fit, and can best be done by "screwing" the spring in counterclockwise.
- Repeat the above procedure for the other four pistons.

4. Remove Shaft Seals (47)

Inspect the shaft seals (47) before continuing. If they look damaged in any way, replace them. Remove by pounding them out from inside the pump housing. Replace both shaft seals at the same time. Clean the bore in the housing using emery cloth or Scotch-Brite™.

5. Reassemble Pump Housing (39), Cam Assembly (45), and Cylinder Housing (25)

- With the pump housing vertical and the baseplate removed, set it with the open end up on a workbench. Grease the groove at the face of the housing and install O-ring (48). Set aside.
- Set the cylinder housing, with the diaphragm pockets facing down, onto smooth, clean, 4" high blocks. Insert the bearing adjustment plate (43), with the bearing cup (45A) and dowel pin (44) into the cylinder housing. The dowel pin engages into the largest of the five slots in the cylinder housing.
- Insert the five piston assemblies into the cylinder housing.

D/G15 & D/G17 Service (Hydraulic End)

- d. Set the cam assembly onto the cylinder housing sub-assembly such that the piston feet support the cam assembly and the nose bearing is centered over bearing cup (45A). Note: the cam assembly will be able to move from side to side slightly, as the nose bearing is not fully engaged into the bearing cup.
- e. If the shaft seals (47) are still in the pump housing, slide the seal protector (from the D-15 Tool Kit) over the shaft. Pick up the pump housing, lining up the marks made earlier on it and the cylinder housing. Slowly lower the pump housing over the shaft until the bearing cup (45B) rests on the upper bearing of the cam assembly.
- f. Start the four capscrews (31) by hand, using the 6 mm hex Allen wrench from the Wanner D-15 Tool Kit. Thread them through the counter bored holes in the cylinder housing, engaging the threads into the pump housing. Two full turns of each screw should be able to be achieved before noticeable resistance is met from the piston return springs. If this cannot be done remove the pump housing and check alignment of the cam assembly to the cylinder housing subassembly.
- g. Install baseplate (32) onto pump housing using capscrews (34) and lockwashers (33). The longer end (stamped FRONT) of the baseplate goes toward the cylinder housing. Apply thread locker (e.g. Loctite 242) to the threads of the capscrews and torque to 45 ft-lbs (60 N-m).
- h. Lift the pump assembly off of the 4" blocks and set it onto the workbench. Tip the pump assembly so it sits upright on the baseplate.

Return to the four cylinder housing capscrews (31) and tighten them to establish and maintain an even gap between the cylinder housing and pump housing. This will draw the cylinder housing into the pump housing, compressing the five piston return springs and the six disk springs that pre-load the cam assembly. Note: there is very minimal clearance between the cylinder housing pilot diameter and the main pump housing bore, so it is very important to alternately tighten the four capscrews, until the housings are flush together. The last 1/8" (3mm) requires more force to bring the housings together as all of the springs are nearing their maximum compression. Torque all four capscrews to 15 ft-lbs (20 N-m). Remove the shaft seal protector.

6. Install Shaft Seals (47)

- a. Apply a thin film of grease on the seal protector tool (included in the Wanner D-15 Tool Kit). Slide both seals onto the tool, with the spring side of the seals toward the open end of the tool. Apply a heavier coat of grease between the seals and press them together.
- b. Apply an anaerobic seal sealant or bearing retaining compound (e.g. Loctite 601 or 609) to the outside diameter of the seals.
- c. Apply a light film of grease to the pump shaft and slide the seal protector (with seals) over the shaft.
- d. Slide the seal inserter tool (included in the Wanner D-15 Tool Kit) over the seal protector tool, and press the seals completely into place. Tap the tool with a soft mallet to firmly seat the seals flush to the pump housing.

7. Reinstall Diaphragms (22)

- a. Screw the plunger guide lifter (from the Wanner Tool Kit or Repair Kit) into the valve plunger (55). Pull out to expose the cross holes in the plunger. Rotate the shaft until the piston is at top dead center.
- b. Insert the 3/32-in. T-handle hex wrench (from the Wanner Tool Kit), through the plunger hole — to hold the plunger away from the cylinder housing (25), and to keep the plunger from turning when the diaphragm is being installed.
- c. Place diaphragm (22) and follower (23) onto valve plunger (21).
- d. Hold the T-handle hex wrench to secure the valve plunger, and torque the diaphragm insert to 18 in.-lbs (203 N-cm) using a T30 Torx Drive.
- e. Repeat the above procedure for the plungers and diaphragms of the other four cylinders.
- f. Fill the reservoir with fresh oil and prime the pump, as outlined in the Fluid-End Service Section.

8. Reassemble Pump

Reassemble the pump as outlined in the Fluid-End Service Section.

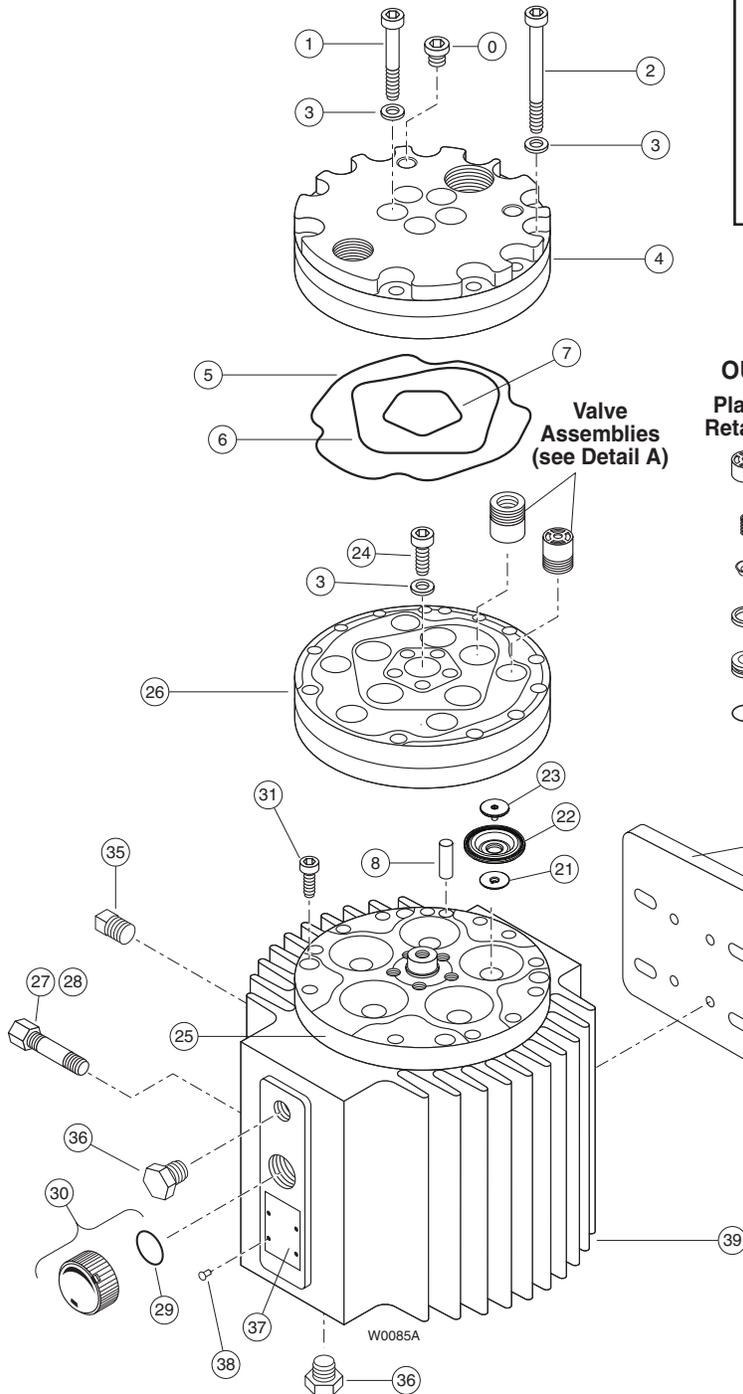
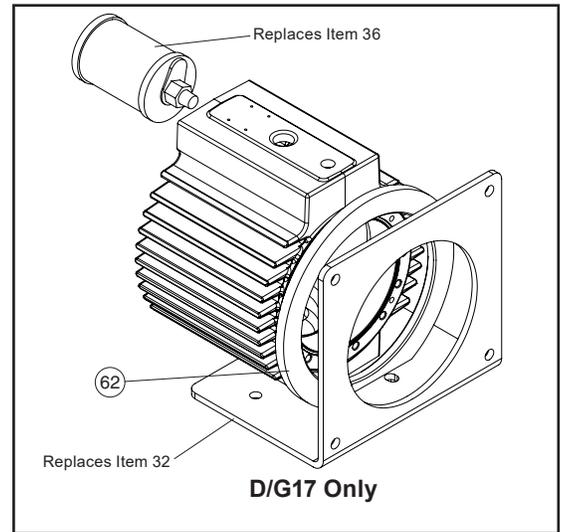
D/G15 & D/G17 Troubleshooting

Problem	Probable Cause	Solution
Motor/Pump Does Not Operate:	No power.	Supply correct power according to motor requirements.
	Blown fuse/tripped circuit breaker.	Replace/reset, eliminate circuit overload.
	Shaft coupling to pump not in place.	Install proper coupling hardware (see parts list).
	Current overload - motor.	Motor not rated for pump operating conditions - install proper motor.
	Thermal overload - motor.	Motor not rated for pump and/or ambient operating conditions - supply cooling or install proper motor.
	Faulty motor drive/controller.	Repair/replace.
	Faulty motor.	Repair/replace.
	Low liquid level in supply tank (if low-level shut-off is used).	Fill tank.
No Delivery	Supply tank empty.	Fill tank.
	Loss of prime	Re-prime using Initial Start-Up Procedure.
	Inlet line or strainer clogged.	Clear debris and flush, or replace.
	Inadequate supply pressure at pump inlet.	Increase supply pressure by raising fluid level in tank, raising tank, or pressurizing suction tank.
	Inlet line too restrictive.	Increase inlet line diameter and/or decrease inlet line length.
	Fluid viscosity too high.	Reduce viscosity if possible (by heat or some other means). Increase inlet line diameter and/or decrease inlet line length. Increase supply pressure.
	Vapor lock/cavitation.	Increase inlet pressure. Decrease fluid temperature.
	Pump valves held open or worn out.	Clear debris and flush, or replace (see Fluid End Service)
	System relief valve actuating.	Adjust relief valve, or repair, clean, or replace with new relief valve.
Delivery Too Low and/or Erratic	Review all Probable Causes and Solutions in Problem 2 No Delivery above.	
	Air leak(s) in inlet line.	Locate all leaks and repair.
	System back pressure too low.	Adjust back pressure valve to higher setting. Install back pressure valve if none in system.
	Pumped fluid characteristics changed.	Monitor supply tank temperature to determine if fluid is too hot (leading to cavitation) or too cold (increasing fluid viscosity). Stabilize temperature at suitable level to resolve problem. Check for entrapped air in the fluid supply system.
	Inlet supply pressure changed.	Monitor inlet supply pressure (at the pump) to determine if it is too low, causing a starved condition/cavitation. Stabilize pressure at suitable level to resolve problem.
	Oil condition in pump hydraulic end changed.	Check oil level - if low evaluate for source of leakage. Consult factory for hydraulic end service.
Change oil per recommended guidelines in maintenance section.		
Delivery Too High and/or Erratic.	System back pressure too low.	Adjust back pressure valve to higher setting. Install back pressure valve if none in system.
	Inlet supply pressure changed.	Monitor inlet supply pressure (at the pump) to determine if it is too high, causing a "flow-through" condition. Stabilize pressure at suitable level to resolve problem.

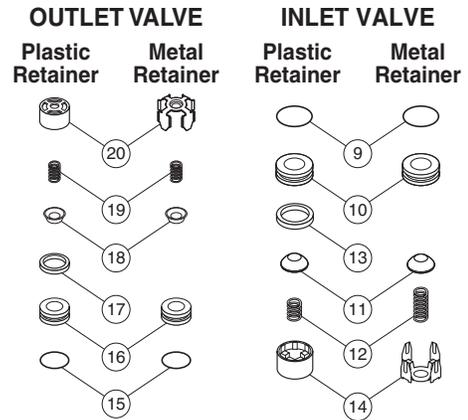
D/G15 & D/G17 Fluid End Parts

Bolt Torque Specifications

Ref. #	Assembly Torque
1	45 ft-lbs (61 Nm)
2	45 ft-lbs (61 Nm)
23	18 in-lbs (203 N-cm)
24	45 ft-lbs (61 Nm)
34	45 ft-lbs (61 Nm)



DETAIL "A" (Valve Assemblies)



D/G15 & D/G17 Fluid End Parts

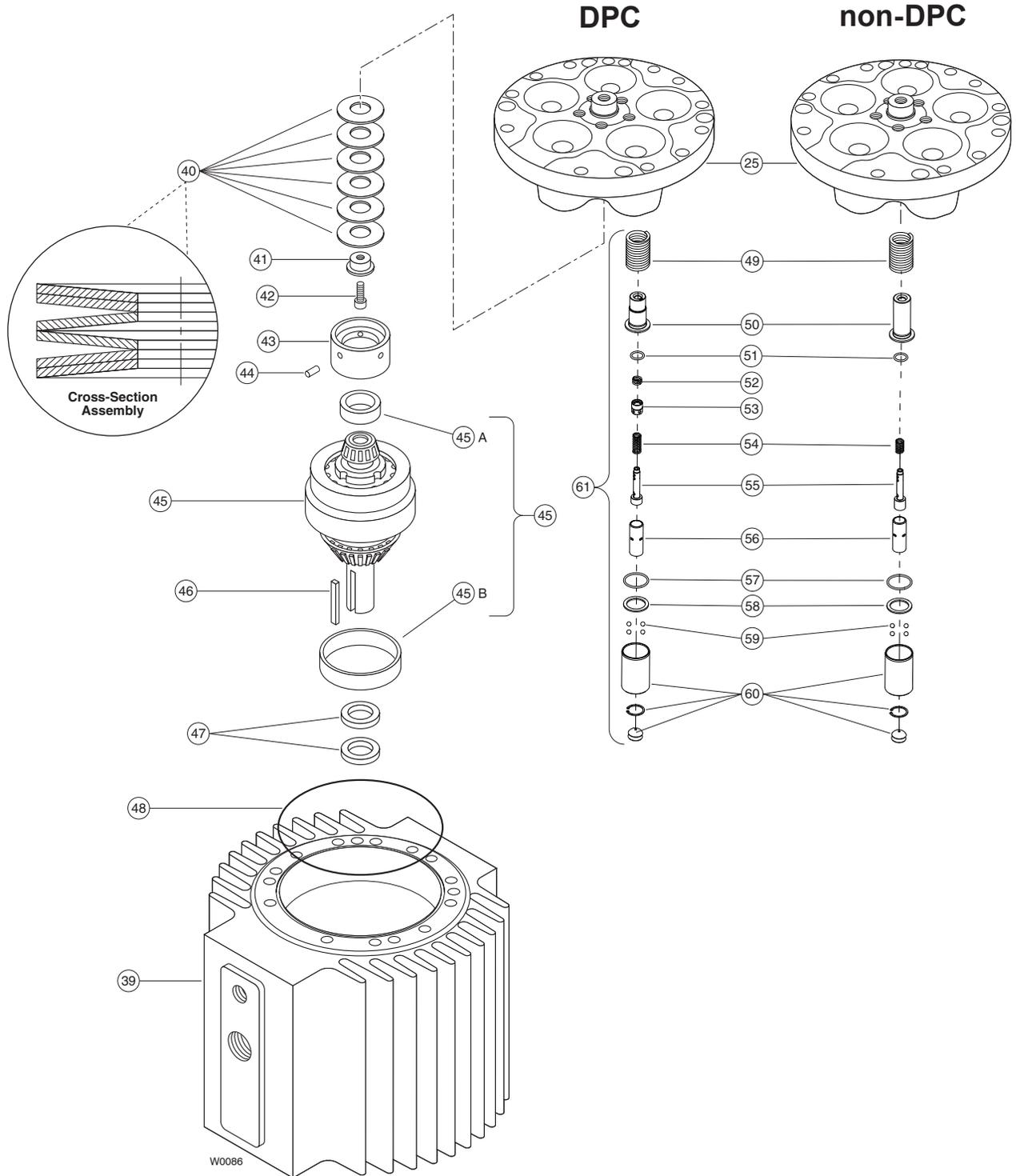
Ref. No.	Part Number	Description	Quantity/ Pump	Ref. No.	Part Number	Description	Quantity/ Pump
0	D25-038-2211	Plug, 316 SST.....	2	17	D03-092-2110	Tetra Seal, outlet, Buna.....	5
1	G15-081-2010	Screw, socket-head-cap, M10 x 1.5 x 85mm.....	5		D03-092-2111	Tetra Seal, outlet, FKM.....	5
2	G25-024-2010	Screw, socket-head-cap, M10 x 1.5 x 120mm.....	12		D03-035-2119	O-ring, PTFE.....	5
3	D11-048-2011	Washer, flat.....	18	18	D03-021-1015	Valve, outlet, 17-4 SST, HT.....	5
4	D15-004-1010	Manifold, brass, NPT.....	1		D03-021-1011	Valve, outlet, Nitronic 50.....	5
	D15-004-1012	Manifold, 316L SST, NPT.....	1		D03-021-1016	Valve, outlet, tungsten carbide.....	5
	D15-004-1018	Manifold, Hastelloy C, NPT.....	1		D03-021-1017	Valve, outlet, Hastelloy C.....	5
	D15-004-1029	Manifold, Duplex Alloy 2205, NPT.....	1	19	D15-022-3113	Valve Spring, outlet, Hastelloy C.....	5
	G15-004-1010	Manifold, Brass, BSPT.....	1		D15-022-3114	Valve Spring, outlet, Elgiloy.....	5
	G15-004-1012	Manifold, 316L SST, BSPT.....	1		D15-022-3115	Valve Spring, outlet, 17-7 SST.....	5
	G15-004-1018	Manifold, Hastelloy C, BSPT.....	1	20	D03-023-1010	Retainer, outlet valve spring, 17-7 SST.....	5
	G15-004-1029	Manifold, Duplex Alloy 2205, BSPT.....	1		D03-023-1017	Retainer, outlet valve spring, Hastelloy C.....	5
5	D15-037-2110	O-ring, outer manifold, Buna.....	1		D03-023-2310	Retainer, outlet valve spring, Celcon.....	5
	D15-037-2111	O-ring, outer manifold, FKM.....	1		D03-023-2316	Retainer, outlet valve spring, Nylon.....	5
	D40-073-2118	O-ring, outer manifold, PTFE.....	1		D03-023-2317	Retainer, outlet valve spring, Polypropylene.....	5
6	D15-073-2110	O-ring, middle manifold, Buna.....	1		D03-023-2318	Retainer, outlet Valve Spring, PVDF.....	5
	D15-073-2111	O-ring, middle manifold, FKM.....	1	21	K15-017-1015	Plunger.....	5
	D15-073-2118	O-ring, middle manifold, PTFE.....	1	22	K15-018-2320	Diaphragm, Buna.....	5
7	D40-035-2120	O-ring, inner manifold, Buna.....	1		K15-018-2312	Diaphragm, Neoprene.....	5
	D40-035-2121	O-ring, inner manifold, FKM.....	1		K15-018-2315	Diaphragm, FKM.....	5
	D40-035-2118	O-ring, inner manifold, PTFE.....	1		K15-018-2325	Diaphragm, Aflas.....	5
8	D15-026-2210	Pin, dowel.....	1		D15-018-1220	Diaphragm, Buna-N-XS, (non-DPC).....	5
9	D10-035-2110	O-ring, inlet valve seat, Buna.....	5		D15-018-1215	Diaphragm, FKM-XT, (non-DPC).....	5
	D10-035-2111	O-ring, inlet valve seat, FKM.....	5	23	K15-017-1010	Single piece follower.....	5
	D10-035-2118	O-ring, inlet valve seat, PTFE.....	5	24	G10-089-2010	SHCS, M10 x 1.5 x 30mm.....	1
10	D15-020-1010	Valve Seat, inlet, 17-4 SST, HT.....	5	25	K15-002-1010	Cylinder housing.....	1
	D15-020-1011	Valve Seat, inlet, Nitronic 50.....	5		G15-002-1000	Cylinder housing, (non-DPC).....	1
	D15-020-1016	Valve Seat, inlet, tungsten carbide.....	5	26	D15-003-1010	Valve Plate, Brass.....	1
	D15-020-1017	Valve Seat, inlet, Hastelloy C.....	5		D15-003-1012	Valve Plate, 316L SST.....	1
11	D10-021-1015	Valve, inlet, 17-4 SST, HT.....	5		D15-003-1018	Valve Plate, Hastelloy C.....	1
	D10-021-1011	Valve, inlet, Nitronic 50.....	5		D15-003-1027	Valve Plate, Duplex Alloy 2205.....	1
	D10-021-1016	Valve, inlet, tungsten carbide.....	5	27	D25-077-2210	Pipe, Brass.....	1
	D10-021-1017	Valve, inlet, Hastelloy C.....	5	28	D25-078-2210	Pipe Cap, Brass.....	1
12	D10-022-3117	Valve Spring, inlet, Elgiloy.....	5	29	D10-080-2110	O-ring, Buna.....	1
	D10-022-3123	Valve Spring, inlet, Hastelloy C.....	5	30	D03-039-1030	Cap with O-ring, oil fill.....	1
	D10-022-3116	Valve Spring, inlet, 17-7 SST.....	5		*D03-039-1210	Cap with O-ring, oil fill.....	1
13	D10-092-2110	Tetra Seal, inlet, Buna.....	5	31	C22-015-2014	SHCS, M8 x 1.25 x 30.....	4
	D10-092-2111	Tetra Seal, inlet, FKM.....	5	32	D15-025-1010	Base Plate.....	1
	D10-092-2118	O-ring-PTFE.....	5		*D15-025-1011	Base Plate.....	1
14	D10-023-1010	Retainer, inlet valve spring, 17-7 SST.....	5	33	G35-084-2010	Lockwasher.....	4
	D10-023-1017	Retainer, inlet valve spring, Hastelloy C.....	5	34	G35-087-2010	HHCS, M12 x 1.75 x 35mm.....	4
	D10-023-2310	Retainer, inlet valve spring, Celcon.....	5	35	D35-111-2010	Plug, magnetic.....	1
	D10-023-2326	Retainer, inlet valve spring, Nylon.....	5	36	D25-038-2210	Plug, Brass.....	2
	D10-023-2327	Retainer, inlet valve spring, Polypropylene.....	5		*A01-117-3400	Reservoir.....	1
	D10-023-2328	Retainer, inlet valve spring, PDVF.....	5	37	D10-040-2410	Name Plate.....	1
15	D25-046-2110	O-ring, outlet valve seat, Buna.....	5	38	D10-112-2200	Rivet.....	4
	D25-046-2111	O-ring, outlet valve seat, FKM.....	5	39	G15-001-1010	Pump Housing.....	1
	D03-035-2118	O-ring, outlet valve seat, PTFE.....	5	62	*D15-025-1012	Gasket Plate.....	1
16	D15-020-2010	Valve Seat, outlet, 17-4 SST, HT.....	5				
	D15-020-2011	Valve Seat, outlet, Nitronic 50.....	5				
	D15-020-2016	Valve Seat, outlet, tungsten carbide.....	5				
	D15-020-2017	Valve Seat, outlet, Hastelloy C.....	5				

* Parts For D/G17 Only

D/G15 & D/G17 Hydraulic End Parts

Bolt Torque Specifications

Ref. #	Assembly Torque
40	15 in-lbs (20 Nm)



D/G15 & D/G17 Hydraulic End Parts

40	D15-075-3110	Spring, disk.....	6
41	D15-112-1010	Guide, disk spring	1
42	G15-115-2010	SHCS, M8 x 1.25 x 10mm.....	1
43	K15-012-1011	Plate, bearing adjustment	1
	D15-012-1011	Plate, bearing adjustment, (non-DPC).....	1
44	D15-110-2210	Pin, dowel.....	1
45	K15-007-1210	(X) Cam Assembly, 14 gpm @ 1550 rpm	1
	D15-007-1210	(X) Cam Assembly, 13 gpm @ 1450 rpm (non-DPC)	1
	K15-007-1214	(E) Cam Assembly, 15 gpm @ 1750 rpm	1
	D15-007-1214	(E) Cam Assembly, 15 gpm @ 1750 rpm (non-DPC)	1
45a	K15-011-2911	Bearing Cup	1
	D15-011-2911	Bearing Cup (non-DPC).....	1
45b	D15-010-2911	Bearing Cup, Tapered	1
46	D25-085-2210	Key, shaft.....	1
47	H25-031-2112	Seal shaft	2
48	D15-037-2110	O-ring, Buna.....	1
49	D10-019-3110	Spring, piston return.....	5
50	K15-042-1010	Return spring guide.....	5
	D15-042-1010	Return spring guide (non-DPC)	5
51	K15-046-2110	O-ring, Buna.....	5
	D10-046-2110	O-ring, Buna (non-DPC)	5

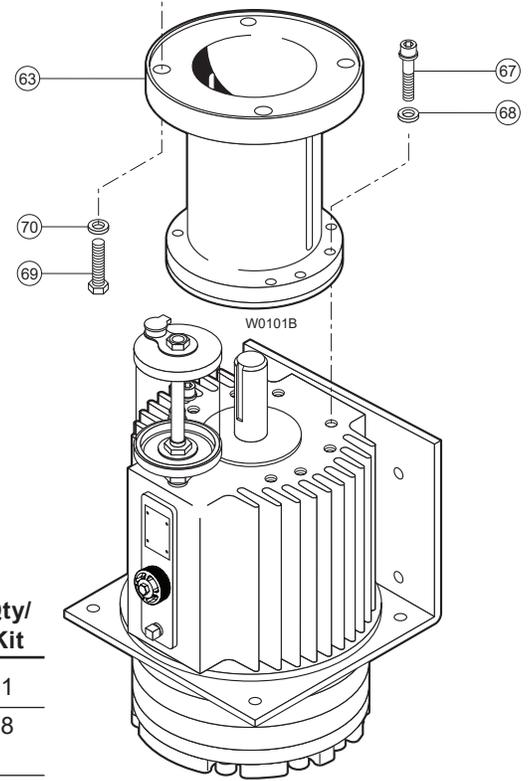
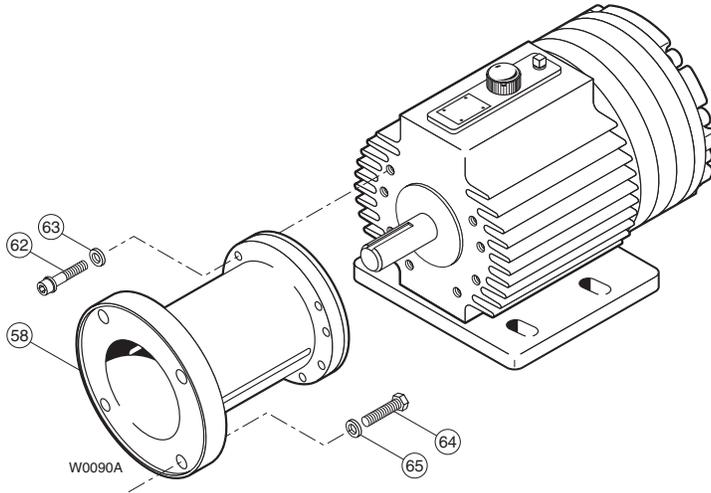
52	K15-045-3110	Overfill spring	5
53	K15-150-1000	Bias spring spacer.....	5
54	K15-045-3111	Priming spring	5
	D10-045-3110	Priming spring (non-DPC).....	5
55	K15-044-1010	Spool, valve.....	5
	D15-044-1010	Spool, valve (non-DPC)	5
56	K15-043-1010	Sleeve, valve	5
	D10-043-1010	Sleeve, valve (non-DPC).....	5
57	D10-034-2110	O-ring, Buna.....	5
58	D10-041-1010	Washer, retaining	5
59	D10-015-3010	Ball, steel.....	20
60	D15-014-1209	Piston (with foot, retainer and balls).....	5
61	K15-014-1210	Piston Assembly	5
	D15-014-1210	Piston Assembly (non-DPC)	5

D/G15 & D/G17 Pump Motor Adapter Kits

D15 & D17 Pump/Motor Adapter Kit

For NEMA 182/256TC C-Face Motors (Complete Kit Part No. A04-041-1200)

For NEMA 284/286TC C-Face Motors (Complete Kit Part No. A04-041-1202)



Ref No.	Description	A04-041-1200	A04-041-1202	Qty/Kit
63	Pump/Motor Adapter	A04-041-1000	A04-041-1002	1
67	Cap Screw, Socket-head, M10	G03-068-2010	G03-068-2010	8
68	Lockwasher, split, M10	G25-048-2010	G25-048-2010	8
69	Cap Screw, Hex-head, 1/2"	M10-110-2000	M10-110-2000	4
70	Lockwasher, split 1/2"	M10-111-2000	M10-111-2000	4

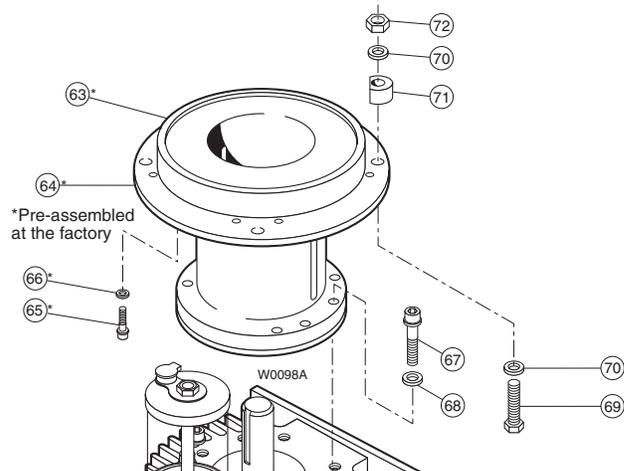
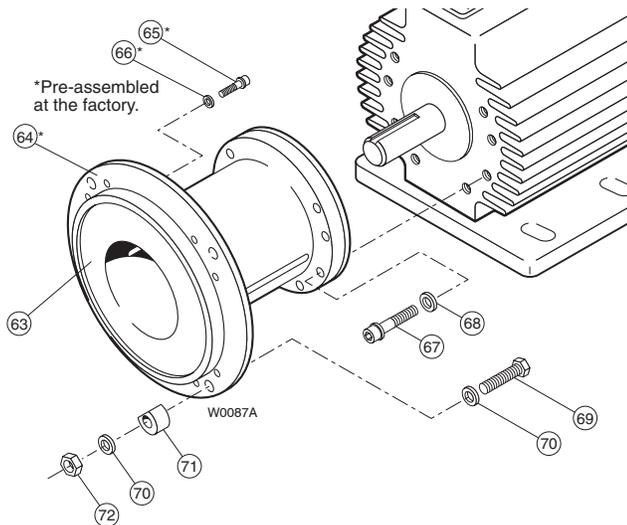
D/G15 & D/G17 Pump Motor Adapter Kits

G15 & G17 Pump/Motor Adapter Kit

For IEC 160 B-14-Face Motors (Complete Kit Part No. AD4-041-1203)

For IEC 132 B5 Flange Face Motors (Complete Kit Part No. A04-041-1201)

For IEC 160/180 B5 Flange Face Motors (Complete Kit Part No. A04-041-1205)



Ref No.	Description	A04-041-1203	A04-041-1201	A04-041-1205	Qty/ Kit
63	Pump/Motor Adapter	A04-041-1003	A04-041-1001	A04-041-1005	1
64	Clamping Ring		A04-120-1005	A04-120-1005	1
65	Screw, Cap Socket-head		G03-029-2010 M6	G10-087-2010 M10	8
66	Lock Washer		D03-050-2010 1/4 in.	G25-048-2010 M10	8
67	Cap Screw, Socket-head	G03-068-2010	G03-068-2010	G03-068-2010	8
68	Lockwasher, split	G25-048-2010	G25-048-2010	G25-048-2010	8
69	Cap Screw Socket-head	A04-043-2010 M12	G40-101-2010 M12	A04-046-2016 M16	4
70	Lockwasher, split	M10-111-2000 1/2"	M10-111-2000* 1/2"	A04-044-2016* 5/8"	4
71	Spacer		A04-120-1011	A04-120-1015	4
72	Hex Nut		A04-045-2010	A04-045-2016	4

* Quantity/Kit =8

D/G15 & D/G17 Series Replacement Parts Kits

TO ORDER REPLACEMENT PARTS KIT: A Replacement Parts Kit contains 11 digits corresponding to customer-specified design options.

1	2	3	4	5	6	7	8	9	10	11
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Digit	Order Code	Description
1-3		Pump Configuration
	D15	For all D15 Pumps
	D17	For all D17 Pumps
	G15	For all G15 Pumps
	G17	For all G17 Pumps
4		Kit Designator
	K	Complete Fluid End Kit
	D	Diaphragm Kit
	V	Valve Kit (diaphragm not included)
5-6		Pump Head Version
	52	non-DPC
	54	DPC
7		Diaphragm & O-ring Material
	A	Aflas diaphragm / PTFE o-ring
	G	FKM
	P	Neoprene
	T	Buna-N
8		Valve Seat Material
	D	Tungsten Carbide
	H	17-4 Stainless Steel
	N	Nitronic 50
	T	Hastelloy C
	X	Not included in Diaphragm Kit
9		Valve Material
	D	Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
	T	Hastelloy C
	X	Not included in Diaphragm Kit
10		Valve Springs
	E	Elgiloy®
	H	17-7 Stainless Steel (high viscosity option - requires 50 psi/3.4 bar suction pressure)
	T	Hastelloy® C
	X	Not included in Diaphragm Kit

Digit	Order Code	Description
11		Valve Spring Retainers
	C	Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	T	Hastelloy C
	Y	Nylon (Zytel)
X	Not included in Diaphragm Kit	

Kit Contents

Part Number*	Description	Qty	Kit Designator		
			K	D	V
K15-018-___	Diaphragm (DPC)	5	•	•	
D15-018-___	Diaphragm (non-DPC)	5	•	•	
D15-037-___	O-ring, outer manifold	1	•	•	•
D15-073-___	O-ring, middle manifold	1	•	•	•
D40-035-___	O-ring, inner manifold	1	•	•	•
D10-035-___	O-ring, valve seat, inlet	5	•		•
D15-020-___	Valve seat, inlet	5	•		•
D10-021-___	Valve, inlet	5	•		•
D10-022-___	Valve spring, inlet	5	•		•
D10-092-___	Tetra seal, inlet	5	•		•
D10-023-___	Retainer, valve spring, inlet	5	•		•
D25-046-___	O-ring, valve seat, outlet	5	•		•
D15-020-___	Valve seat, outlet	5	•		•
D03-092-___	Tetra seal, outlet**	5	•		•
D03-021-___	Valve, outlet	5	•		•
D03-022-___	Valve spring, outlet	5	•		•
D10-023-___	Retainer, valve spring, outlet	5	•		•
A01-113-3400	Threadlocker	1	•	•	

* Last four digits of part numbers with ___ refer to specific material of construction.

** Not included with metal spring retainers.

D/G15 & D/G17 - Warranty

Limited Warranty

Wanner Engineering, Inc. ("Wanner") extends to the original purchaser of equipment supplied or manufactured by Wanner and bearing its name, a limited one-year warranty from the date of purchase against defects in material or workmanship, under normal use and service, and provided the equipment is installed, operated and maintained in accordance with instructions supplied by Wanner. Wanner will repair or replace, at its option, defective parts without charge if: (a) you provide written notice of any defect within thirty (30) days from the discovery of the defect; (b) the claim is received by Wanner before the expiration of the warranty period; and (c) such parts are returned with transportation charges prepaid to Wanner Engineering, Inc., 1204 Chestnut Avenue, Minneapolis, Minnesota 55403. A return goods authorization must be received prior to the return of the defective part. No allowance will be made for repairs undertaken without Wanner written consent or approval.

Notwithstanding anything to the contrary, this warranty does not cover:

1. Electric motors (if applicable) not manufactured by Wanner. The warranties, if any, on such equipment are assigned to you by Wanner (without recourse) at the time of purchase.
2. Normal wear and/or damage caused by or related to abrasion, corrosion, abuse, negligence, accident, faulty installation or tampering which impairs normal operation.
3. Transportation costs.

This limited warranty is exclusive, and is in lieu of any other warranties (oral, express, implied or statutory) including, but not limited to, implied warranties of merchantability and fitness for a particular purpose; warranties of non-infringement; warranties arising from course of dealing or usage of trade or any other matter. Any descriptions of the equipment, drawings, specifications, and any samples, models, bulletins, or similar material used in connection with the sale of equipment are for the sole purpose of identifying the equipment and are not to be construed as an express warranty that the equipment will conform to such description. Any field advisory or installation support is advisory only. Every form of liability for direct, special, incidental or consequential damages or loss is expressly excluded and denied. All liability of Wanner shall terminate one (1) year from the date of purchase of the equipment.



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