

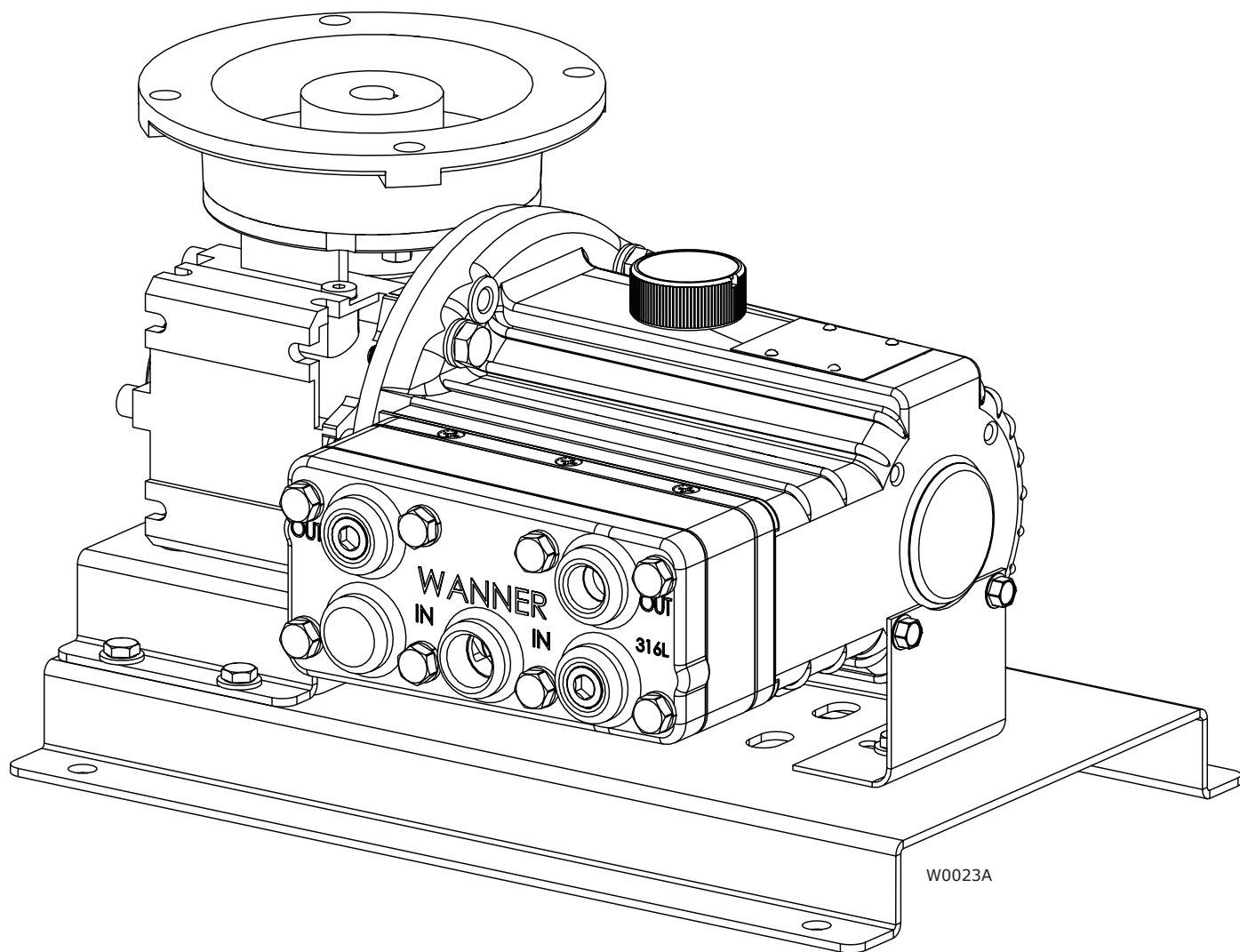
# Hydra·Cell<sup>®</sup>

METERING SOLUTIONS™

## P200 Metering Pump

### Installation, Operation & Maintenance

P200-991-2400C



W0023A



Wanner Engineering, Inc.



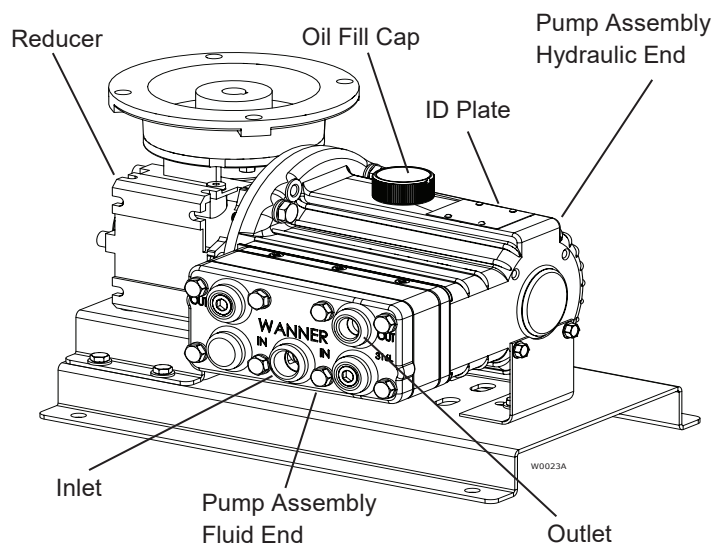
**Metallic pump shown**



# P200 Contents

	<b>Page</b>
Operation .....	2
Specifications .....	2
Dimensions .....	4
Installation .....	5
Calibration .....	7
Maintenance .....	7
Fluid End	
Service .....	8
Parts List .....	10
Hydraulic End Parts List.....	12
Reducer Parts List.....	13
Troubleshooting.....	14
Replacement Parts Kits .....	15
Warranty.....	16

## Component Identification



## P200 Operation

**Hydra-Cell Metering Solutions Pumps** are hydraulically-actuated, hydraulically-balanced diaphragm metering pumps that exceed API 675 performance standards of  $\pm 1\%$  steady state accuracy,  $\pm 3\%$  linearity and  $\pm 3\%$  repeatability.

**Due to their multiple diaphragm design**, the P Series metering pumps, with the exception of the P100, provide virtually "pulse-free" linear flow. Unlike conventional single diaphragm metering pumps, this linear flow reduces the need for pulsation dampeners and increases the reliability, performance, and safety of the metering pump system.

**Pump operation and plunger activation** are accomplished through a crankshaft (P100, P200 and P300) or wobble plate (P400, P500 and P600). Horizontal disk check valves allow for the pumping of particulates that ordinarily collect on vertical ball check valves common to conventional metering pumps.

**P Series pumps** utilize speed to adjust flow rate through a motor and variable-frequency drive (VFD), eliminating the need for mechanical adjustment.

## P200 Specifications

<b>Diaphragms per Liquid End</b>	3 (non Kel-Cell pistons)
<b>Flow Control</b>	Electronic variable speed drive
<b>Steady State Accuracy</b>	$\pm 1\%$
<b>Linearity</b>	$\pm 3\%$
<b>Repeatability</b>	$\pm 3\%$
<b>Maximum Pressure</b>	
Metallic Heads:	1000 psi (69 bar)
Non-Metallic Heads:	PVDF: 350 psi (24 bar)
	Polypropylene: 250 psi (17 bar)
<b>Maximum Inlet Pressure</b>	250 psi (17 bar)
<b>Fluid Operating Temperatures*</b>	
Metallic Head:	250°F (121°C)
Non-Metallic Head:	140°F (60°C)
* Consult factory for correct component selection for temperatures from 160°F (71°C) to 250°F (121°C).	
<b>Inlet Port</b>	1/2 inch NPT or BSPT
<b>Discharge Port</b>	3/8 inch NPT or BSPT
<b>Maximum Solids</b>	200 microns
<b>Shaft Rotation</b>	Bi-directional
<b>Pump Head Material</b>	Brass, PVDF, Polypropylene, 316L Stainless Steel, and Hastelloy C
<b>Materials Used</b>	See Replacement Parts Kits Section for individual pump materials.
<b>Oil Capacity</b>	1.0 US quart (0.95 liters)
<b>Weight (less motor)</b>	
Metallic Heads:	41.8 lbs (19 kg)
Non-Metallic Heads:	32.8 lbs (14.9 kg)



# P200 Specifications (Cont'd)

## Performance Maximum Flow at Designated Pressure - Imperial

All Pumps (gph)		Metallic Pump Heads Only (gph)		Pump rpm	Gear Ratio	Motor rpm
100 psi	250 psi	500 psi	1000 psi			
3.378 (1/4)	3.321 (1/4)	3.249 (1/4)	3.128 (1/4)	30	60:1	1800
4.059 (1/4)	3.994 (1/4)	3.911 (1/4)	3.776 (1/4)	36	50:1	
5.072 (1/4)	5.015 (1/4)	4.908 (1/4)	4.748 (1/4)	45	40:1	
6.758 (1/4)	6.686 (1/4)	6.555 (1/4)	6.353 (1/4)	60	30:1	
8.107 (1/4)	8.022 (1/4)	7.873 (1/4)	7.637 (1/4)	72	25:1	
10.130 (1/4)	10.027 (1/4)	9.849 (1/4)	9.563 (1/2)	90	20:1	
13.503 (1/4)	13.369 (1/4)	13.14 (1/4)	12.77 (1/2)	120	15:1	
20.248 (1/4)	20.052 (1/4)	19.73 (1/4)	19.19 (1/2)	180	10:1	
26.993 (1/4)	26.735 (1/4)	26.32 (1/4)	25.62 (1/2)	240	7.5:1	
40.483 (1/4)	40.101 (1/4)	39.49 (1/2)	38.46 (3/4)	360	5:1	
53.97 (1/4)	53.47 (1/2)	52.66 (3/4)	51.30 (1)	480	7.5:1	3600
80.95 (1/4)	80.20 (1/2)	79.01 (3/4)	76.98 (1.5)	720	5:1	

( ) Required Motor hp

## Performance Maximum Flow at Designated Pressure - Metric


All Pumps (lph)		Metallic Pump Heads Only (lph)		Pump rpm	Gear Ratio	Motor rpm
7 bar	17 bar	34 bar	69 bar			
10.65 (0.18)	10.48 (0.18)	10.25 (0.18)	9.868 (0.25)	25	60:1	1500
12.81 (0.18)	12.60 (0.18)	12.34 (0.18)	11.91 (0.37)	30	50:1	
16.00 (0.18)	15.82 (0.18)	15.48 (0.18)	14.98 (0.37)	37.5	40:1	
21.32 (0.18)	21.09 (0.18)	20.68 (0.18)	20.04 (0.37)	50	30:1	
25.57 (0.18)	25.31 (0.18)	24.83 (0.18)	24.09 (0.37)	60	25:1	
31.96 (0.18)	31.63 (0.18)	31.07 (0.18)	30.17 (0.37)	75	20:1	
42.59 (0.18)	42.17 (0.18)	41.46 (0.18)	40.29 (0.37)	100	15:1	
63.87 (0.18)	63.25 (0.18)	62.23 (0.25)	60.55 (0.55)	150	10:1	
85.15 (0.18)	84.34 (0.18)	83.01 (0.25)	80.80 (0.55)	200	7.5:1	
127.7 (0.18)	126.5 (0.18)	124.6 (0.37)	121.3 (0.75)	300	5:1	
170.3 (0.18)	168.7 (0.37)	166.1 (0.55)	161.8 (0.75)	400	7.5:1	3000
255.4 (0.18)	253.0 (0.55)	249.2 (0.55)	242.8 (0.75)	600	5:1	

( ) Required Motor kW

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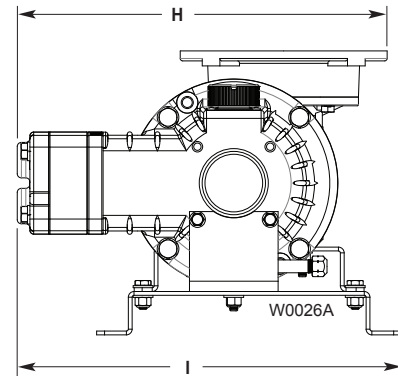
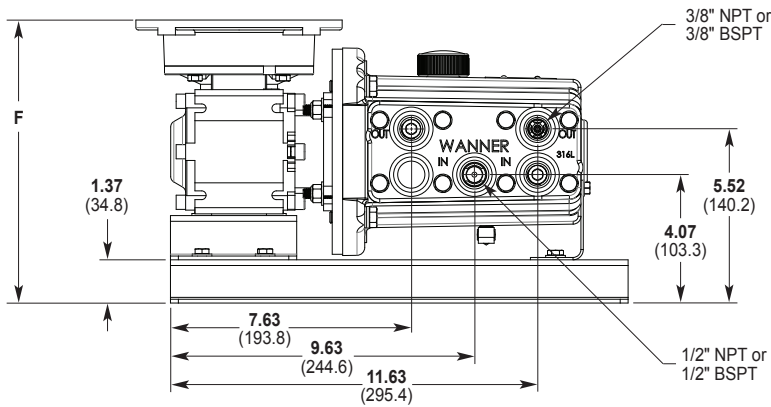
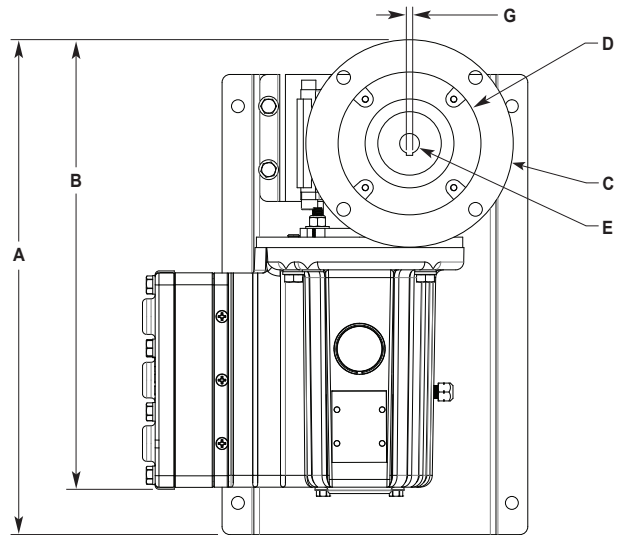
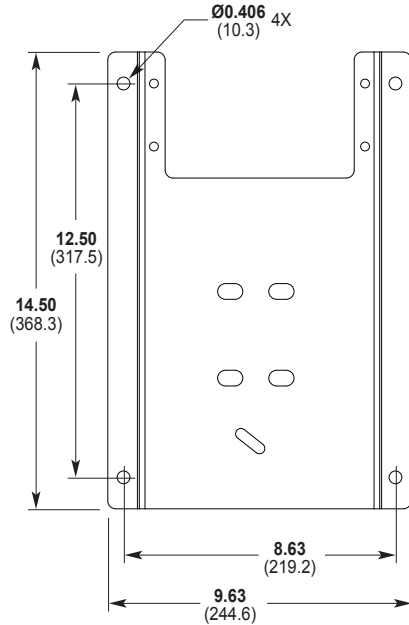
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# P200 Dimensions



## P200 Models: Metallic and Non-Metallic



### Dimensions in Inches (Millimeters)

Input Frame Size	A	B	C	D	E	F	G (Square Key)	H		I	
								Metallic Pump Head	Plastic Pump Head	Metallic Pump Head	Plastic Pump Head
NEMA 56C	15.59 (396.1)	14.17 (359.8)	Ø 6.54 (Ø 166)	Ø 4.50 (Ø 114.3)	Ø 0.62 (Ø 15.7)	8.97 (227.8)	0.187 (4.7)	11.68 (296.7)	12.06 (306.3)	12.14 (308.3)	12.51 (317.75)
IEC 63 B5	15.08 (383)	13.65 (346.7)	Ø 5.51 (Ø 140)	Ø 3.74 (Ø 95)	Ø 0.43 (Ø 11)	8.80 (223.5)	0.157 (4)	11.17 (283.7)	11.55 (293.4)	12.14 (308.3)	12.51 (317.75)
IEC 71 B5	15.48 (393.2)	14.05 (356.7)	Ø 6.30 (Ø 160)	Ø 4.33 (Ø 110)	Ø 0.55 (Ø 14)	8.80 (223.5)	0.196 (5)	11.56 (293.6)	11.94 (303.3)	12.14 (308.3)	12.51 (317.75)
IEC 80 B5	16.26 (413)	14.835 (376.7)	Ø 7.87 (Ø 200)	Ø 5.12 (Ø 130)	Ø 0.75 (Ø 19)	8.80 (223.5)	0.236 (6)	12.35 (313.7)	12.72 (323)	12.14 (308.3)	12.51 (317.75)

# P200 Installation

## Location

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

Install the pump system in a lighted clean space where it will be easy to inspect and maintain.

## Motor and Controller

The **P Series pump shaft** can rotate in either direction, therefore direction of motor shaft rotation is not critical.

**Flow rate** is determined by motor speed, which is controlled using an inverter duty constant torque motor and VFD. Flow rate functions can also be easily controlled using the Hydra-Cell Control Freak and appropriate motor.

## Accessories

Consult installation drawing below for typical metering fluid system components. Contact Wanner Engineering or the distributor in your area for more details.



## 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** on page 6.

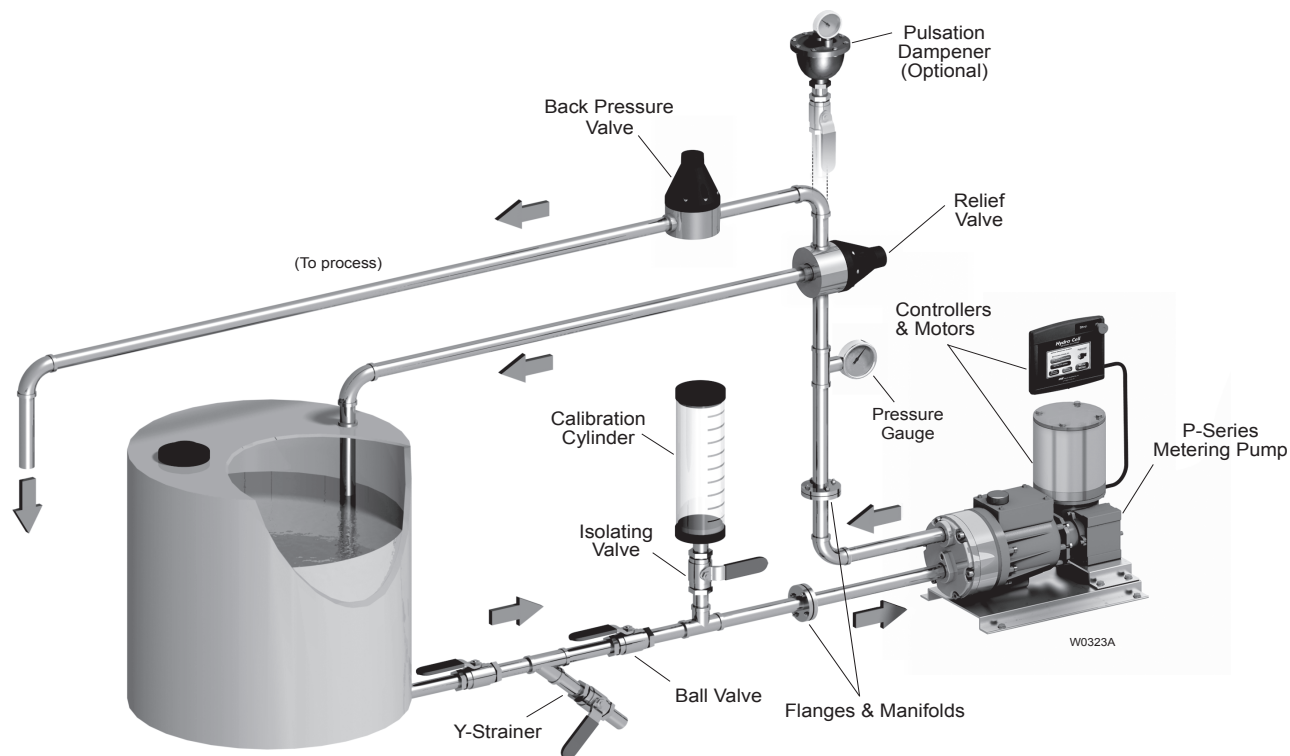
**Positive Displacement.** This is a positive-displacement pump. To avoid severe system damage if the discharge line ever becomes blocked, install a relief valve downstream from the pump. See **Discharge Piping** on page 6.

**Safety Guards.** 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.

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)



Typical Metering Installation

# P200 Installation (Cont'd)

## 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.

These safety / installation instructions do not take local regulations into account. The operator must ensure that such regulations are observed by all, including the personnel carrying out the installation.

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.

## Inlet Piping

Provide for permanent or temporary installation of a compound pressure gauge to monitor the inlet pressure. To maintain maximum flow, the pump inlet should be under flooded suction conditions at all times. **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.

Install a separate inlet line from the supply tank to each pump. Place a cover over the supply tank, to prevent foreign objects from falling into it.

## Hose Sizing and Routing

To minimize acceleration head and frictional losses, size the suction line at least one size larger than the pump inlet, and keep the suction line as short and direct as possible.

Recommendations:

- Keep inlet lines less than 3 ft. (1 m) long
- Use at least 5/8" (16 mm) I.D. inlet hose
- Minimize fittings (elbows, valves, tees, etc.)

Support the pump and piping independently.

## Inlet Piping (Pressure Feed)

Provide for permanent or temporary installation of a pressure gauge to monitor the inlet pressure. Pressure at the pump inlet should not exceed 250 psi (17.3 bar). For higher pressures install a pressure reducing valve. **Do not supply more than one pump from the same inlet line.**

**Note: System back pressure must exceed the pump inlet pressure by at least 15 psi (1 bar) in order to prevent flow thru.**

## Discharge Piping

### 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 1500 psi (103 bar) W.P. rated hose for a system to be operated at 1000 psi (69 bar) gauge pressure.

Support the pump and piping independently.

### Pressure Regulation

**Install a pressure relief valve in the discharge line.** Bypass pressure must not exceed the pressure limit of the pump.

Size the valve 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 relief 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 valve.

Route the bypass line to the supply tank.

**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.

### Minimum Discharge Pressure

To ensure proper capacity control, a minimum discharge pressure of 50 psi (3.5 bar) is recommended.



# P200 Installation (Cont'd)

## Initial Start-Up Procedure

Before you start the pump, be sure that:

1. All shut-off valves are open, and pump has adequate supply of fluid.
2. All connections are tight.
3. The oil level is 3/4 in. (20 mm) from the top of the fill port.
4. Open priming valve on system back pressure valve so pump starts under minimum pressure. See Typical Metering Installation drawing.

Turn on power to pump motor and:

1. Check inlet pressure or vacuum. To maintain maximum flow, pump inlet should be under flooded suction conditions at all times. Inlet pressure must not exceed 250 psi (17.3 bar).
2. Observe any erratic noise or flow.
3. Jog pump on and off until fluid coming from priming valve is air-free.
4. Close priming valve.
5. Perform pump calibration. See Calibration Procedure.

## Calibration

**Note: Each metering pump or pump system must be calibrated to determine the pump speed required for the desired flow rate.**

Accurate calibration depends on pump discharge pressure and system conditions. When calibrating the pump or system, it is useful to plot capacity curves for future reference. Observe on the curve, that pump capacity decreases slightly as discharge pressure increases.


In order to achieve the best possible results, perform calibration under actual process conditions. Follow these steps:

1. Run pump for 20 minutes at actual process conditions. If process system cannot be used, circulate back to supply tank through pressure relief valve (see Typical Metering Installation drawing). If required system pressure is less than 50 psi (3.5 bar) back pressure valve must be installed and set to produce minimum of 50 psi (3.5 bar) pressure at pump head.
2. Determine maximum pump speed required for all system conditions that need to be satisfied. Measure pump delivery at this maximum speed using system calibration cylinder, flow meter, or similar container. This is the "rated capacity" for pump.
3. Measure pump delivery at 100%, 75%, 50%, 25%, and 10% of maximum speed just determined. Let pump run for 5 minutes at setting before taking capacity measurement.

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# P200 Maintenance

## Periodically

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

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

1. Check inlet pressure periodically with gauge.
2. Change oil according to hours guidelines in table.
3. Change oil as follows:
  - a. Remove drain plug (60), and allow oil and contaminants to drain completely. Catch oil and dispose of properly. Reinstall drain plug.
  - b. Add suitable Hydra-Oil for the application and pump components.
  - c. Insure oil level is 3/4 in. (20 mm) from the top of the fill port.

## Pump Operation Hours Between Oil Changes at Various Process Fluid Temperatures

Pressure	<90°F (32°C)	<139°F (60°C)	<180°F (82°C)
<b>Metallic Pump Head</b>			
<800 psi (55 bar)	8,000	5,000	3,000
<1200 psi (83 bar)	4,000	3,000	2,000
<b>Non-Metallic Pump Head</b>			
<250 psi (17 bar)	4,000	3,000	—

**Note: Minimum oil viscosity for proper hydraulic end lubrication is 16-20 cST (80-100 SSU). P-Series replacement parts kits (complete kits and diaphragm kits) include suitable oil for each P Series pump configuration.**

**CAUTION: If you are losing oil but don't see any external leakage, or if the oil becomes discolored and contaminated, the diaphragm (17) may be damaged. Refer to the Fluid End Service and Troubleshooting Sections. Do not operate the pump with a damaged diaphragm.**

# P200 Fluid End Service

**Note:** The reference numbers in parentheses are shown in the Fluid End Parts List.

This section explains how to disassemble and inspect all easily-serviceable parts of the pump.

**CAUTION:** Disassembly of the hydraulic end of the pump should be performed only by a qualified technician. For assistance, contact Wanner Engineering (612-332-5681) or the distributor in your area.

## 1. Remove Manifold (3), Valve Plate (12)

- Remove eight bolts (1) around manifold (3).
- Remove manifold (3).
- Inspect manifold (3 for warping or wear around inlet and outlet ports. If wear is excessive, replace manifold.  
To check if manifold is warped, remove O-rings (4) and place straightedge across it. If warped replace.
- Remove two socket-head capscrews (14).
- Inspect the valve plate (12) as in step c. Replace if necessary.

## 2. Inspect Valves (5-11)

The three inlet and three outlet valve assemblies are identical and face opposite directions. Inspect each valve as follows:

- Check spring retainer (10), and replace if worn.
- Check valve spring (8). If shorter than new spring, replace (do not stretch old spring).
- Check valve (7). If worn excessively, replace.
- Remove valve seat (6) and O-ring (5). A seat puller is included in Wanner Tool Kit.

Inspect valve seat for wear, and replace if necessary. A new O-ring should be installed.

- Check the dampening washer (11), and replace if worn.
- Reinstall inlet and outlet valve assemblies:

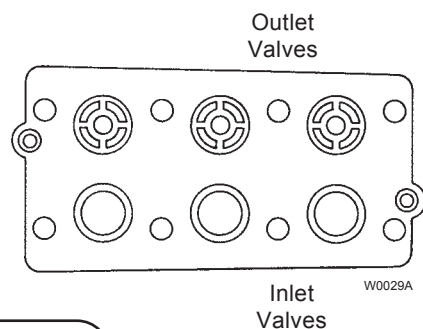
- Clean valve ports and shoulders with emery cloth, and lubricate with lubricating gel or petroleum jelly.
- Install O-ring (5) on valve seat (6).

- Inlet Valves** (3 lower valves in illustration below). Insert spring retainer (10) into valve plate (12). Then insert spring (8), valve (7), Tetra seal (9), valve seat (6), and dampening washer (11). A flat Tetra seal O-ring (9) goes between spring retainer (10) and valve seat (6) when plastic retainer is used.

- Outlet Valves** (3 upper valves in the illustration). Insert dampening washer (11), valve seat (6), Tetra seal (9), valve (7), spring (8), and spring retainer (10). Install flat Tetra seal O-ring (9) between spring retainer (10) and valve seat (6) when plastic retainer is used.

### Installing Inlet and Outlet Valves

Note: this end of valve plate is wider.



W0029A

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# P200 Fluid End Service (Cont'd)

## 3. Inspect and Replace Diaphragms (17)

- Lift diaphragm (17) by one edge, and turn pump shaft (use the shaft rotator from the Wanner Tool Kit) until diaphragm moves up to "top dead center". This will expose machined cross holes in plunger shaft behind diaphragm.
- Insert hex wrench through one of the machined cross holes, to hold diaphragm (17) up. The proper size tool is included in the Wanner Tool Kit. (Don't remove tool until new diaphragm is installed in step f below.)
- Unscrew diaphragm (17). Use 5/16 in. (8 mm) open-end wrench, and turn counterclockwise.
- Inspect diaphragm (17) carefully. A damaged diaphragm generally indicates a pumping system problem. Replacing diaphragm only, will not solve the larger problem. Inspect diaphragm for following:
  - **Puncture.** Usually caused by sharp foreign object in fluid.
  - **Diaphragm pulled away** from sides. Usually caused by fluid being frozen in pump, or by over-pressurization of pump.
  - **Diaphragm becoming stiff** and losing flexibility. Usually caused by pumping fluid that is incompatible with diaphragm material.
  - **Diaphragm edge chewed away.** Usually caused by over-pressurizing system.

**CAUTION: If a diaphragm has ruptured and foreign material or water has entered the oil reservoir, do not operate the pump. Check the diaphragm, then flush the reservoir completely (see Flush Contaminant from Hydraulic End paragraph) 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. Apply Loctite #242 Thread locker to threads of new diaphragm (17) (or old one).
- Install diaphragm (17) and tighten to 10 in-lbs (113 N-cm).
- Repeat above inspection procedure with other two diaphragms (17). Replace if necessary.

## 4. Flush Contaminant from Hydraulic End

### (Only if diaphragm has ruptured)

- With valve plate and manifold still removed (see above), remove brass cap (60). Allow all oil and contaminant to drain out.
- Fill reservoir with compatible solvent. Manually turn pump shaft to circulate compatible solvent, and drain. Use the shaft rotator provided in Wanner Tool Kit (Part No. A03-175-1105). Dispose of contaminated fluid properly.
 

**CAUTION: If you have EPDM diaphragms, or if food grade oil is in the reservoir, do not use kerosene or solvents. Instead, flush with the same lubricant that is in the reservoir.**

- Repeat step b flushing procedure.
- Fill reservoir with fresh oil and manually turn pump shaft to circulate oil. Drain oil.
 

**Note: P Series replacement parts kits (complete kits and diaphragm kits) include the correct oil for each specific P Series pump configuration.**
- Refill reservoir with fresh oil. If oil appears milky, there is still contaminant in reservoir. Repeat steps c and d until oil appears clean.

## 5. Prime Hydraulic Cells

- If necessary, with the pump horizontal, fill the reservoir with the correct Hydra oil for the application. Insure oil level is 3/4 in. (20 mm) from the top of the fill port.
 

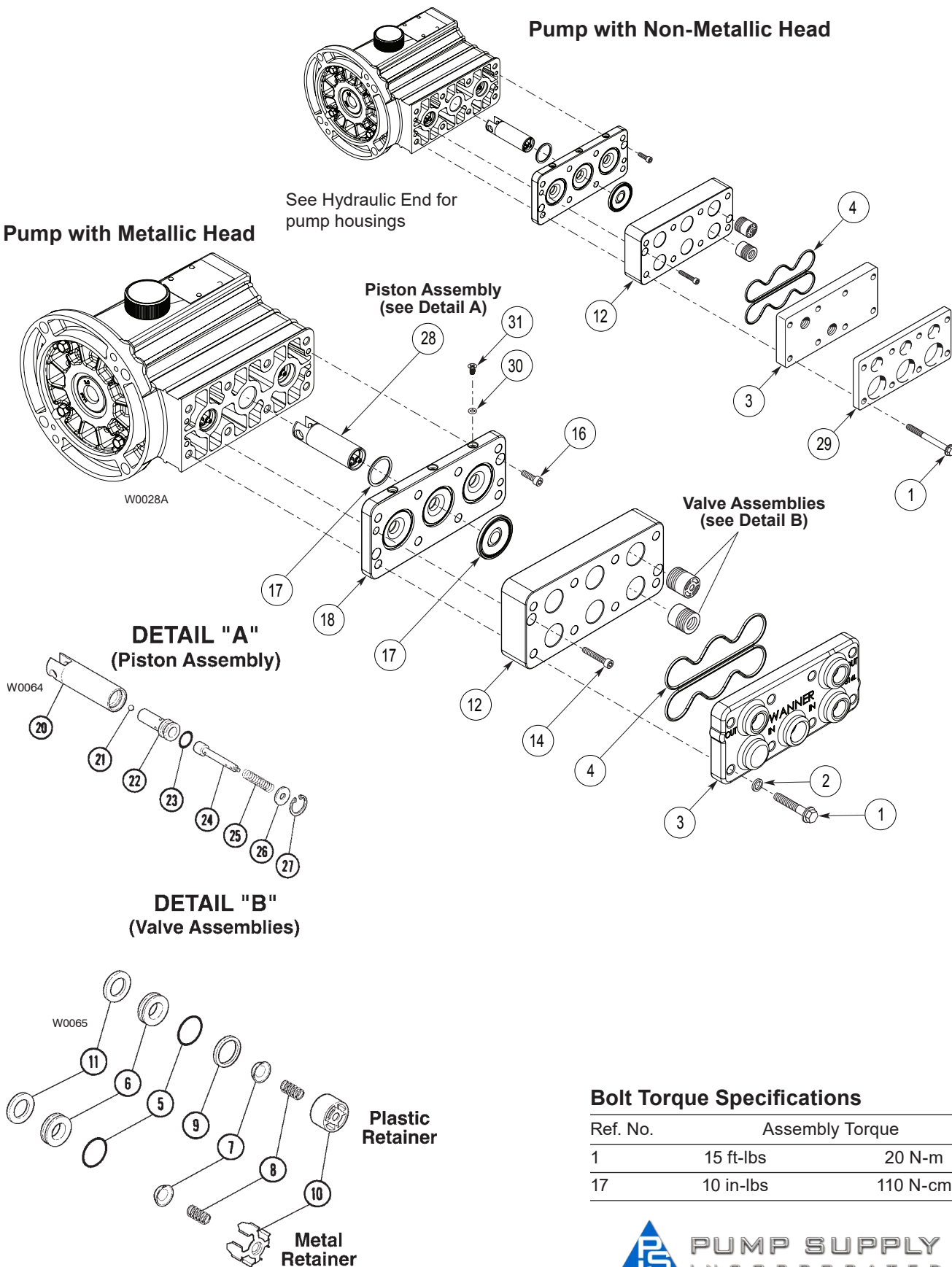
**Note: P Series replacement parts kits (complete kits and diaphragm kits) include the correct oil for each specific P Series pump configuration.**
- Air behind the diaphragm must be evacuated by turning the shaft and pumping the piston. Remove the screw (31) and o-ring (30) from the top of the Diaphragm plate (18) to aid in the purging of air from the hydraulic cylinders. Any air in the hydraulic end will cause the pump to have loss in flow and re-priming will be necessary.
- Turn or jog the shaft until a bubble-free flow of oil comes out or is at the surface of each access hole in the diaphragm plate (18). Remember that the oil level is 3/4 in. (20 mm) from the top of the fill port. Watch the oil level in the reservoir; if it gets too low during priming, air will be drawn into the pistons (inside the hydraulic end). Reinstall the screw (31) and o-ring (30) for each access hole as they are primed.
- Wipe excess oil from the diaphragm plate (18) and diaphragms (17).

## 6. Reinstall Valve Plate (12), Manifold (3)

- Reinstall valve plate (12), with valve assemblies installed as outlined above, onto diaphragm plate (18). Tighten two socket-head capscrews (14) evenly and snugly to compress outer diaphragm beads and hold valve plate (12) in place.
- Reinstall the O-rings (4) on rear side of manifold (3). Use petroleum jelly or lubricating gel to hold them in place.
- Reinstall manifold (3) onto valve plate (12).
- Insert bolts (1) with washers (2), around edge of manifold (3), and alternately tighten opposite bolts until all are secure. Torque to 15 ft-lbs (20 N-m).
- Recheck all bolts for tightness and proper torque.



# P200 Fluid End Parts List



### Bolt Torque Specifications

Ref. No.	Assembly Torque	
1	15 ft-lbs	20 N-m
17	10 in-lbs	110 N-cm



# P200 Fluid End Parts List

Ref No.	Part Number	Description	Quantity/ Pump	Ref No.	Part Number	Description	Quantity/ Pump
1	D03-024-2014	Bolt, hex-hd, SST*	8	13	D25-038-2211	Plug, 316 SST, NPT	2
	G03-024-2012	Bolt, hex-hd, SST, metric*	8		D25-038-2017	Plug, Hastelloy C, NPT	2
	D03-024-2012	Bolt, hex-hd, SST**	8		G25-038-2211	Plug, 316 SST, BSPT	2
	G03-024-2013	Bolt, hex-hd, SST, metric**	8		G25-038-2017	Plug, Hastelloy C, BSPT	2
2	C22-014-2012	Washer, SST*	8	14	D03-029-2010	Cap Screw, Soc-hd, 1"	2
3	D03-004-1010	Manifold, Brass, NPT	1		G03-029-2010	Cap Screw, Soc-hd, 25 mm	2
	D03-004-1012	Manifold, 316 SST, NPT	1	16	D03-088-2010	Cap Screw, Soc-hd, 3/4"	2
	D03-004-1017	Manifold, Hastelloy C, NPT	1		G03-088-2010	Cap Screw, Soc-hd, 20 mm	2
	D03-004-1050	Manifold, Polypropylene, NPT	1	17	D03-018-1212	Diaphragm, Neoprene	3
	D03-004-1053	Manifold, PVDF, NPT	1		D03-018-1213	Diaphragm, EPDM	3
	G13-004-1010	Manifold, Brass, BSPT	1		D03-018-1215	Diaphragm, FKM	3
	G13-004-1012	Manifold, 316 SST, BSPT	1		D03-018-1220	Diaphragm, Buna-N	3
	G13-004-1017	Manifold, Hastelloy C, BSPT	1		D03-018-1218	Diaphragm, PTFE	3
	G13-004-1050	Manifold, Polypropylene, BSPT	1		D03-018-1225	Diaphragm, Aflas	3
	G13-004-1053	Manifold, PVDF, BSPT	1		K03-018-1225	Diaphragm, Aflas (1)	3
4	D25-073-2110	O-ring, Manifold, Buna-N	2		K03-018-1240	Diaphragm, Buna-N (1)	3
	D25-073-2111	O-ring, Manifold, FKM	2		K03-018-1242	Diaphragm, Neoprene (1)	3
	D25-073-2112	O-ring, Manifold, Neoprene	2		K03-018-1243	Diaphragm, EPDM (1)	3
	D25-073-2113	O-ring, Manifold, EPDM	2		K03-018-1245	Diaphragm, FKM (1)	3
	D25-073-2118	O-ring, Manifold, PTFE	2		K03-018-1248	Diaphragm, PTFE (1)	3
5	D25-046-2110	O-ring, Valve seat, Buna-N	6	18	D03-002-1000	Diaphragm Plate	1
	D25-046-2111	O-ring, Valve seat, FKM	6		K03-002-1022	Diaphragm Plate (1)	1
	D03-035-2112	O-ring, Valve seat Neoprene	6	19	D03-075-2110	O-ring, Diaphragm plate, Buna-N	3
	D03-035-2113	O-ring, Valve seat, EPDM	6		D03-075-2111	O-ring, Diaphragm plate, FKM	3
	D03-035-2118	O-ring, Valve seat, PTFE	6	20	D03-014-1004	Piston	3
6	D03-020-1001	Valve Seat, 316 SST	6	21	D10-015-3010	Ball	3
	D03-020-1017	Valve Seat, Hastelloy C	6	22	D03-043-1000	Valve Cylinder	3
	D03-020-3300	Valve Seat, Ceramic	6	23	D03-034-2110	O-ring, Valve cylinder, Buna-N	3
7	D03-021-1011	Valve, Nitronic 50	6		D03-034-2111	O-ring, Valve cylinder, FKM	3
	D03-021-1017	Valve, Hastelloy C	6	24	D03-044-1000	Valve Plunger	3
	D03-021-3300	Valve, Ceramic	6	25	D03-045-3110	Spring, Sleeve valve	3
8	D03-022-3113	Valve Spring, Hastelloy C	6		D03-045-3111	Spring, Sleeve valve for PTFE diaphragms	3
	D03-022-3114	Valve Spring, Elgiloy	6	26	D03-049-1000	Washer	3
9	D03-092-2110	Tetra Seal, Buna-N	6	27	D03-048-2210	Snap Ring	3
	D03-092-2111	Tetra Seal, FKM	6	28	D03-014-1210	Piston Assembly (2)	3
	D03-092-2112	Tetra Seal, Neoprene	6	29	D03-100-1033	Manifold Support Plate	1
	D03-092-2113	Tetra Seal, EPDM	6	30	102-210	O-ring, FKM	3
	D03-035-2118	O-ring, PTFE	6	31	D10-030-2010	Screw, Flat-hd, 316L SST	3
10	D03-023-1017	Retainer, Valve spring, Hastelloy C	6				
	D03-023-2317	Retainer, Valve spring, polypropylene	6				
	D03-023-2318	Retainer, Valve spring, PVDF	6				
11	D03-125-1017	Washer, Dampening, Hastelloy C	6				
	D03-125-2317	Washer, Dampening, polypropylene	6				
	D03-125-2318	Washer, Dampening, PVDF	6				
12	D03-003-1010	Valve Plate, Brass***	1				
	D03-003-1012	Valve Plate, 316 SST***	1				
	D03-003-1027	Valve Plate, Hastelloy C***	1				
	D03-003-1050	Valve Plate, Polypropylene***	1				
	D03-003-1053	Valve Plate, PVDF***	1				
	K03-003-1021	Valve Plate, 316L SST (1)	1				
	K03-003-1022	Valve Plate, Brass (1)	1				
	K03-003-1023	Valve Plate, Hastelloy C (1)	1				
	K03-003-1050	Valve Plate, Polypropylene (1)	1				
	K03-003-1053	Valve Plate, PVDF (1)	1				

\* For use with Metallic Pump Head models only.  
 \*\* For use with Non-Metallic Pump Head models only.  
 \*\*\* Non Kel-Cell.  
 (1) New diaphragm design released 4/2015. Consult factory with pump serial number to determine correct valve and diaphragm plate.  
 (2) Piston Assembly includes: items 20 through 27.



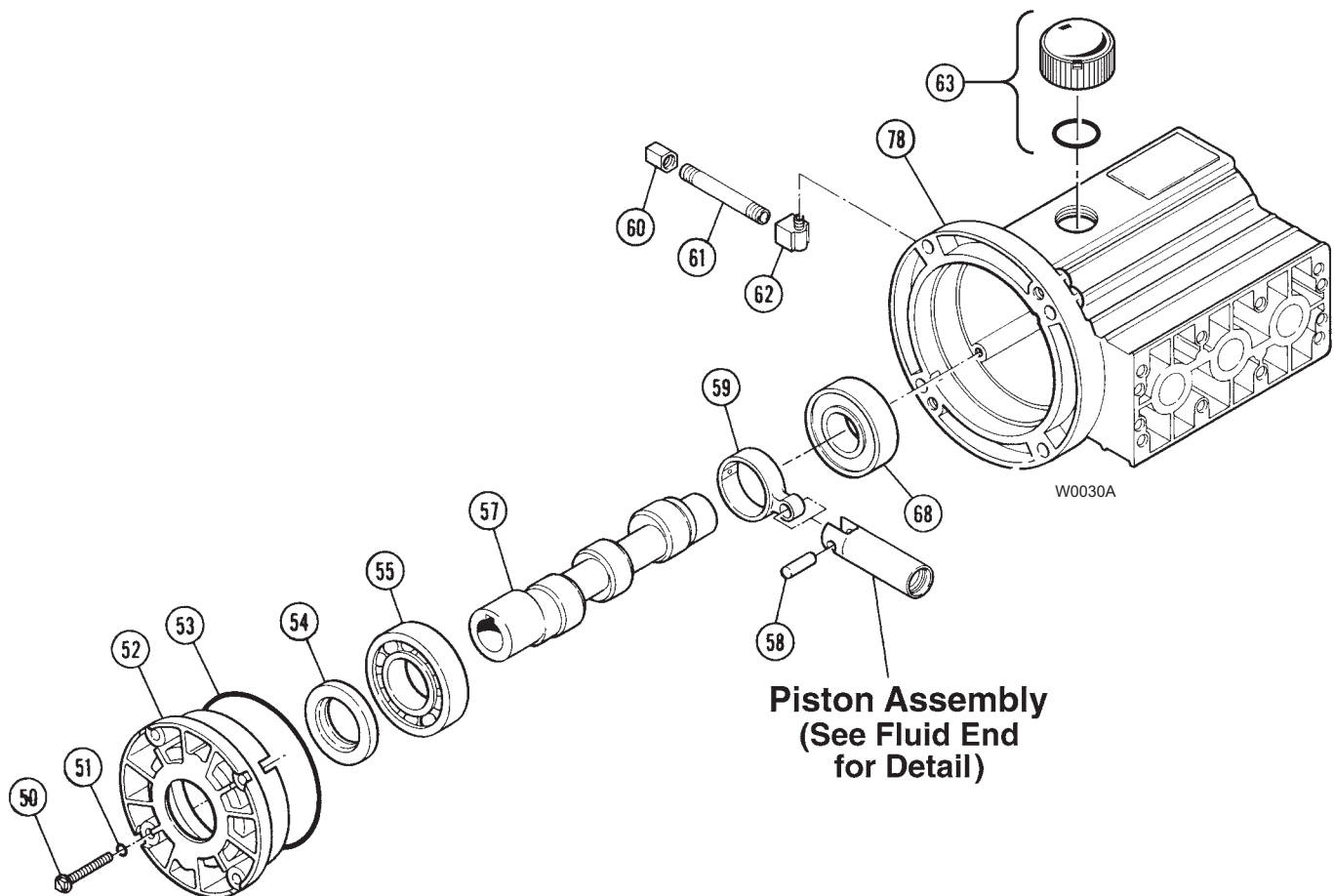
# P200 Hydraulic End Parts Lists

Ref No.	Part Number	Description	Quantity/ Pump
50	D03-086-2010	Cap Screw, Hex-hd, with washer .....	4
	G03-086-2010	Cap Screw, Hex-hd, with washer .....	4
51	D25-047-2110	O-ring, Back cover screw, Buna-N .....	4
	D25-047-2111	O-ring, Back cover screw, FKM .....	4
52	D03-131-1000	Back Cover .....	1
53	D03-037-2110	O-ring, Back cover, Buna-N .....	1
	D03-037-2111	O-ring, Back cover, FKM .....	1
54	D03-031-2110	Seal, Buna-N .....	1
	D03-031-2111	Seal, FKM .....	1
55	D03-011-2910	Back Bearing .....	1
57	M03-009-1003	(X) Hollow Shaft, 5/8" I.D. ....	1
	M13-009-1003	(X) Hollow Shaft, 24 mm I.D. ....	1
58	D03-133-1000	Pin .....	3
59	D03-132-1000	Connecting Rod .....	3
60	D10-078-2210	Cap, Brass, 1/8", NPT .....	1

Ref No.	Part Number	Description	Quantity/ Pump
61	D10-077-2210	Pipe, Brass, 1/8", NPT .....	1
62	D10-076-2210	Elbow, Brass, 1/8", NPT .....	1
63	D03-039-1030	Cap with O-ring, Oil fill .....	1
68	D03-010-2910	Front Bearing .....	1
78	D03-001-1033	Pump Housing .....	1
	G13-001-1033	Pump Housing, Metric .....	1

## Hydraulic End Service

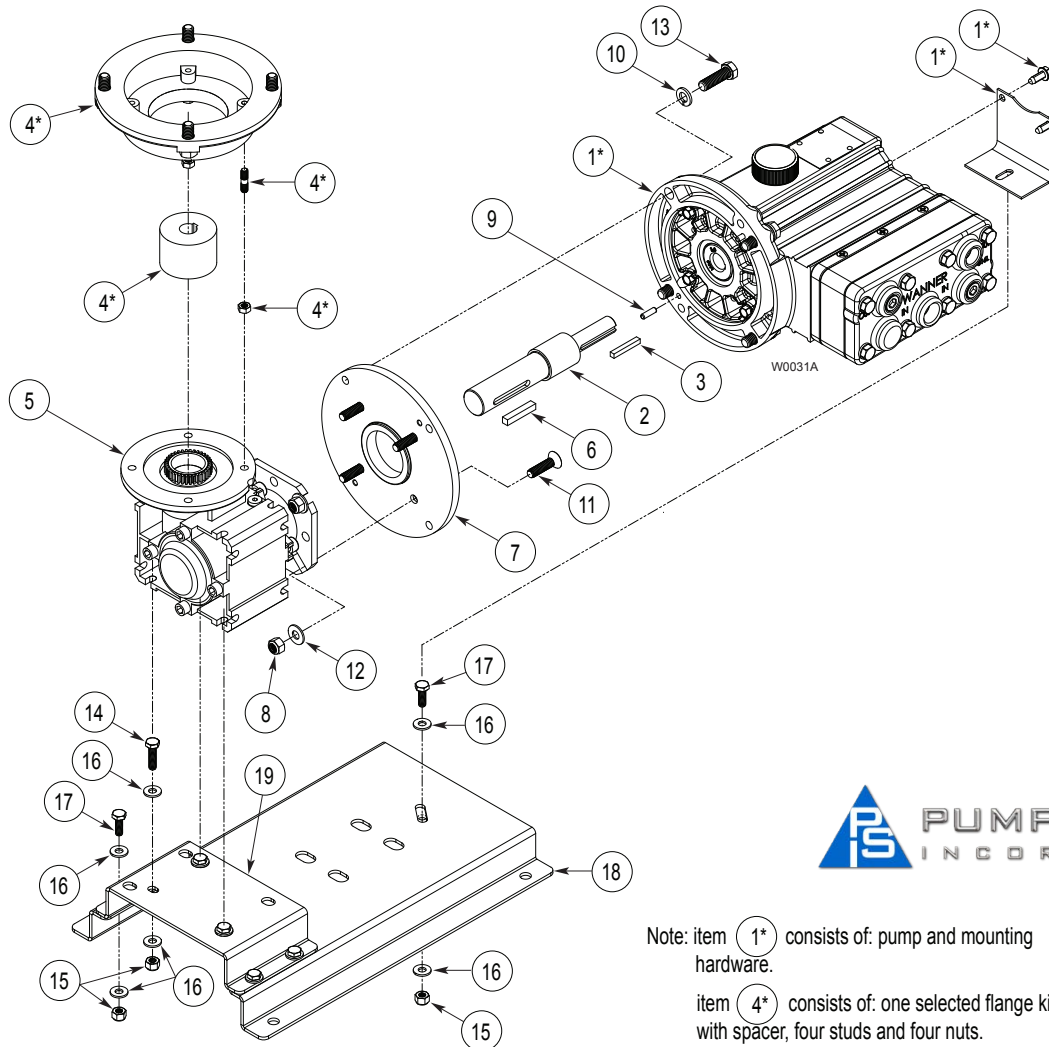
**CAUTION:** Disassembly of the hydraulic end of the pump should be performed only by a qualified technician. For assistance, contact Wanner Engineering (612-332-5681) or the distributor in your area.



# P200 Reducer Parts List

Ref No.	Part Number	Description	Quantity/ Pump
1		P200 Pump Assembly, NPT..... Ref P200 Pump Assembly, BPST ..... Ref	
2	112-580 112-582	Shaft, P100/P200.....1 Shaft, P200, Metric. ....1	
3	D10-085-2210 112-046	Key, 0.1875 SQ x 1.00 LG, Steel .....1 Key, 8 x 7 x 20 mm .....1	
4	112-555 112-558 112-559 112-560	Input Flange Kit, NEMA 56C Adapter .1 Input Flange Kit, IEC 63 B5 Adapter ...1 Input Flange Kit, IEC 71 B5 Adapter ...1 Input Flange Kit, IEC 80 B5 Adapter ...1	
5	112-411 112-410 112-409 112-408 112-407 112-406 112-405 112-404 112-403 112-402	Reducer, 5:1 ratio .....1 Reducer, 7.5:1 ratio .....1 Reducer, 10:1 ratio .....1 Reducer, 15:1 ratio .....1 Reducer, 20:1 ratio .....1 Reducer, 25:1 ratio .....1 Reducer, 30:1 ratio .....1 Reducer, 40:1 ratio .....1 Reducer, 50:1 ratio .....1 Reducer, 60:1 ratio .....1	

Ref No.	Part Number	Description	Quantity/ Pump
6	D25-085-2210	Key, 1/4 SQ x 1.40 LG .....1	
7	D03-100-1014	Adapter, P200 .....1	
8	100-938	Locknut, 5/16-18.....4	
9	D03-026-2211	Dowel Pin, 3/16 .....2	
10	D25-048-2012	Lockwasher, .375, 316 SST .....4	
11	D03-101-2013	Screw, 5/16-18 x 1.25, FSHCS .....4	
12	100-915	Washer, Flat, 5/16, SST, .....4	
13	S1256-020	Screw, 3/8-16 x 1.25 HHCS, SST .....4	
14	100-659	Screw, 1/4-20 UNC-2A x 1, HHCS, SST.. 3	
15	100-063	Locknut, 1/4-20, SST .....8	
16	100-663	Washer, Flat, 1/4, SST .....16	
17	100-062	Screw, 1/4-20 UNC-2A x .75, HHCS, SST.. 5	
18	112-016 112-012	Baseplate, Pump, cs .....1 Baseplate, Pump, SST .....1	
19	112-017 112-013	Baseplate, Gearbox, cs.....1 Baseplate, Gearbox, SST .....1	



Note: item 1\* consists of: pump and mounting hardware.

item 4\* consists of: one selected flange kit, with spacer, four studs and four nuts.

# P200 Troubleshooting

Problem	Probable Cause	Solution
<b>Motor/Pump Does Not Operate</b>	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.
<b>No Delivery</b>	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.
<b>Delivery Too Low and/or Erratic</b>	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.
	Pump OK - Calibration system or flow meter error.	Evaluate components and repair/correct problem(s).
	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.
<b>Delivery Too High and/or Erratic</b>	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.
	Pump OK - Calibration system or flow meter error.	Evaluate components and repair/correct problem(s).

# P200 Replacement Parts Kits

TO ORDER REPLACEMENT PARTS KIT: A Replacement Parts Kit contains 9 digits corresponding to customer-specified design options.

1	2	3	4	5	6	7	8	9
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Digit	Order Code	Description
1-2	<b>P2</b>	<b>Pump Configuration</b> For all P200 Pumps
3	<b>K</b>	<b>Kit Designator</b> Complete Fluid End Kit §
	<b>D</b>	Diaphragm Kit §
	<b>V</b>	Valve Kit (diaphragm not included)
4-5	<b>51</b>	<b>Pump Head Version</b> Standard
	<b>52</b>	New design for pumps after s/n: 317930
6	<b>B</b>	<b>Spring Retainers (Dampening Washers)</b> For brass pump head (Hastelloy C)
	<b>M</b>	For PVDF pump head (PVDF)
	<b>P</b>	For Polypropylene pump head (polypropylene)
	<b>S</b>	For 316L Stainless Steel pump head (Hastelloy C)
	<b>T</b>	For Hastelloy C pump head (Hastelloy C)
	<b>X</b>	Not included in Diaphragm Kit
7	<b>A</b>	<b>Diaphragm &amp; O-ring Material</b> Aflas (with PTFE O-rings)
	<b>M</b>	Aflas (with PTFE O-rings, FKM drive case elastomers and Mesamoll II oil)
	<b>E</b>	EPDM (EPDM Compatible oil)
	<b>G</b>	FKM (Standard oil)
	<b>S</b>	FKM (Food-contact oil)
	<b>X</b>	FKM (Synthetic oil)
	<b>J</b>	PTFE for version 51 (Food-contact oil)
	<b>J</b>	PTFE for version 52 (Food-contact oil)
	<b>W</b>	PTFE for version 51 (Synthetic oil)
	<b>W</b>	PTFE for version 52 (Synthetic oil)
	<b>P</b>	Neoprene (Standard oil)
	<b>R</b>	Neoprene (Food-contact oil)
	<b>Z</b>	Neoprene (Synthetic oil)
	<b>T</b>	Buna-N (Standard oil)
	<b>F</b>	Buna-N (Food-contact oil)
	<b>Y</b>	Buna-N (Synthetic oil)
8-9		<b>Check Valve Material (Spring/ Valve Seat / Valve)</b>
	<b>SS</b>	Elgiloy/ 316L SST / Nitronic 50
	<b>TT</b>	Hastelloy C / Hastelloy C/ Hastelloy C
	<b>SC</b>	Elgiloy / Ceramic / Ceramic
	<b>TC</b>	Hastelloy C / Ceramic / Ceramic
	<b>XX</b>	Not included in Diaphragm Kit

§ Includes hydraulic end oil.

*New diaphragm designs require new parts for P200 pumps using older diaphragm designs. To convert your P200 to the new diaphragm design will require the following parts:*

Part Number	Description	Qty
102-210	O-ring, FKM (for diaphragm plate)	3
D10-030-2010	Screws, Flat-hd, 316L SST	3
K03-002-1022	Diaphragm Plate, new design	1
K03-003-10XX	Valve Plate (to match liquid end material)	1

## Kit Contents

Part Number*	Description	Qty	Kit Designator		
			K	D	V
D03-018-____	Diaphragm	3	•	•	
D25-073-____	O-ring, manifold	2	•	•	•
D03-035-____ or D25-046-____	O-ring, valve seat†	6	•		•
D03-020-____	Valve seat	6	•		•
D03-021-____	Valve	6	•		•
D03-022-____	Valve spring	6	•		•
D03-092-____	Tetra seal‡	6	•		•
D03-023-____	Retainer, valve spring	6	•		•
D03-125-____	Washer, dampening	6	•		•
A01-113-3400	Thread locker	1	•	•	
	Hydraulic end oil	(1.5 qt)	•	•	

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

† D03-035 is provided for EPDM, PTFE or Neoprene Diaphragm and O-rings; D25--046 is provided for FKM-XT or Buna-N-XS Diaphragm and O-rings.

‡ Not included with metal spring retainers.

## P200 Tool Kit

The P200 Tool Kit (Part No. A03-175-1106) contains the tools listed below. These tools are used to assist in the repair and maintenance of the P200. See the maintenance sections of this manual for specific application.

Ref. No.	Tool Part No.	Tool Description	Quantity/Kit
1	A03-125-1020	Holder, Plunger .....	1
2	A03-195-1200	Shaft Rotator .....	1
3	A03-196-1000	Lifter, Plunger guide .....	1
4	A03-124-1200	Lever Assembly .....	1
5	A03-117-1000	Seat Puller, D03 .....	1
7	A03-126-1500	Tool Box .....	1



# P200 Warranty

## Limited Warranty

Wanner Engineering, Inc. extends to the original purchaser of equipment manufactured by it and bearing its name, a limited one-year warranty from the date of purchase against defects in material or workmanship, provided that the equipment is installed and operated in accordance with the recommendations and instructions of Wanner Engineering, Inc. Wanner Engineering, Inc. will repair or replace, at its option, defective parts without charge if such parts are returned with transportation charges prepaid to Wanner Engineering, Inc., 1204 Chestnut Avenue, Minneapolis, Minnesota 55403.

This warranty does not cover:


1. The electric motors (if any), which are covered by the separate warranties of the manufacturers of these components.
2. Normal wear and/or damage caused by or related to abrasion, corrosion, abuse, negligence, accident, faulty installation or tampering in a manner which impairs normal operation.
3. Transportation costs.


This limited warranty is exclusive, and is in lieu of any other warranties (express or implied) including warranty of merchantability or warranty of fitness for a particular purpose and of any non-contractual liabilities including product liabilities based on negligence or strict liability. Every form of liability for direct, special, incidental or consequential damages or loss is expressly excluded and denied.

**Illinois Location:**  
(847) 841-7867  
860 Church Rd Elgin, IL 61

**Minnesota Location:**  
(651) 758-7867  
330 Mill Bay South Suite  
Afton, MN 55001

PumpSupplyInc.com





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INCORPORATED