

# A measured step forward™

Operations & Maintenance Manual

**1700 Series - Model 1710**



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## Features

The Model 1710 metering pumps are of the hydraulically actuated diaphragm type. They are accurate over the whole range of delivery rate settings and ideally suited for pumping corrosive or toxic liquids because only static seals are used.

Delivery rate setting of the pump can be accurately adjusted while the pump is in operation and locked at any desired value.

Hydraulic actuation of the diaphragm insures long life of this essential part, even under conditions of high-pressure applications. Positive return of the pre-stressed elastomeric diaphragm to a fixed stop at the end of each suction stroke gives the pump high suction lift capability and enhances accuracy. A built-in adjustable relief valve is provided to protect the pump against damage arising from excessive backpressure in the system.

A wide variety of standard base mounted electric motors (for which replacements are readily available) can be used to drive the pump.

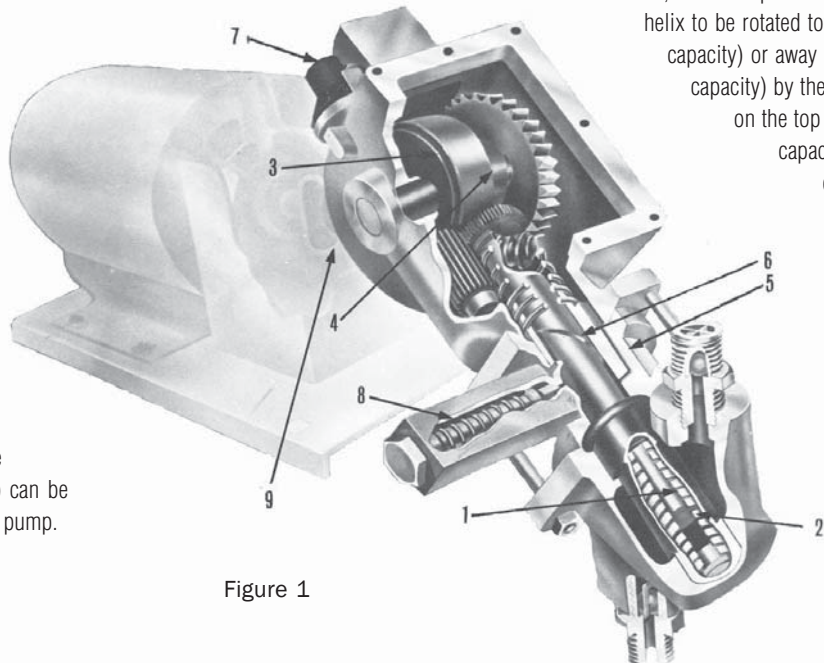


Figure 1

## Description & Principle of Operation

The Model 1710 metering pumps are delivered as horizontal (floor-mounted) or vertical (wall-mounted) units; simplex and duplex variations are available. The internal parts are similar for all these variations. For illustration, the simplex variation will be described below (see fig. 1 on next page). The pumping unit consists of the base, the pump, and the electric motor.

## Pump Operation

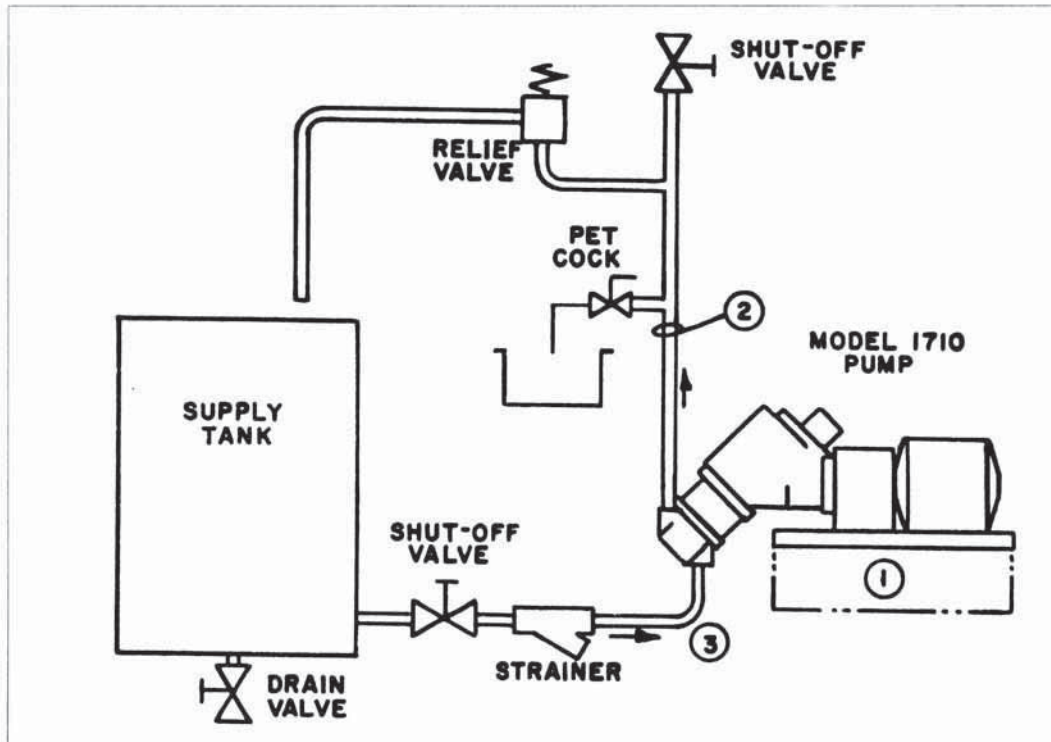
During the suction stroke, the simultaneous retraction of the plunger (1), and contraction of the diaphragm (2) (expanded by the previous discharge stroke) draws a precise amount of process fluid through the inlet check valve into the pumping chamber that surrounds the tubular diaphragm. The plunger is retracted by a spring. An eccentric (3) rotates inside a cam roller (4). The plunger is spring loaded against the face of this roller. Rotation of the eccentric creates reciprocating motion of the plunger. A stationary bypass port (5) uncovered on completion of each suction stroke fills and vents the hydraulic system.

During the discharge stroke this port is closed by the plunger helix (6), capturing and pressurizing some hydraulic fluid. This expands the diaphragm and displaces an identical amount of process fluid through the discharge check valve. The pressure on the exterior and interior of the diaphragm is essentially equal at any time and all forces are uniformly distributed over the entire area of the diaphragm.

Capacity is determined by the stroking rate of the plunger and the position of the plunger helix in relation to the bypass port during the discharge stroke. The plunger is free to rotate on the face of the cam roller, while reciprocating. This allows the plunger helix to be rotated toward the port (to decrease capacity) or away from the port (to increase capacity) by the adjustment knob (7) mounted on the top of the pump. Whenever the capacity control port is opened during any portion of the

discharge stroke, displaced hydraulic fluid is expelled through the port into the hydraulic fluid reservoir and the diaphragm is at rest.

The process side of the pump is also designed to eliminate process fluid entrained vapors by the vertical passageway around the diaphragm connecting the suction and discharge check valves.



1. Fasten pump to substructure – 4 3/8" bolt
2. Avoid stress on suction and discharge connections – use pipe supports where required.
3. Suction line size must not be less than inlet connection size.

## Built-in Pressure Relief Valve (8)

In case of overpressure, a relief valve located in the cylinder adapter bypasses hydraulic fluid from the cylinder to the hydraulic reservoir. The purpose of the valve is to protect pump against damage by excessive pressure, which could be caused by the pump in a restricted outflow situation, such as when starting up against a closed valve or blockage in the discharge line.

This valve is manually adjustable and is factory set to atmospheric pressure. As a result, the pump will not meter until valve is reset according to the pressure needed for the particular system. How to reset valve is explained under Item 7 of section "OPERATION" (on Page 4) and in section "INTERNAL PRESSURE RELIEF VALVEREADJUSTMENT OF SETTING" (on page 5).

## Installation – General

The Model 1710 metering pumps are built as horizontal or as vertical units. "Horizontal" and "Vertical" refer to the position of the mounting surface to which the pump base can be attached. Both the horizontal and vertical type are made from the same parts and subassemblies, permitting easy conversion of a unit of one type into the other. The only restriction is to always use ball bearing or all angle sleeve bearing electric motors on the vertical unit. (On the horizontal unit any sleeve bearing motor may be used). Make sure that the flow is upward through the check valves (direction marked by and arrow).

## Installation Electric

1. Check motor nameplate and compare power supply requirements with characteristics of available power.
2. Check motor rotation which must be as indicated by the arrow on the flange of the pump housing.
3. Electrical installation including motor control and overload protection must be in accordance with applicable codes and local ordinances.

## Operation

### Precaution

When metering pumps are used for pumping corrosive, toxic or otherwise hazardous liquids caution should be exercised during the installation, start-up, operation and maintenance of the pumps to assure personnel safety.

Your employer's safety procedures for protection of eyes, skin, etc. should be very carefully followed.

### Start Up

1. Remove cap from oil filling opening. Fill pump housing with oil to the mark cast on the outside of the housing, using the oil furnished with the pump. Replace cap.
2. Open suction shutoff valve and petcock in discharge line. With flooded suction this allows pump and piping to fill by gravity. Close petcock when system is completely free of air. (Keep petcock open for suction lift installations; see paragraph 5).
3. Release setscrew freeing capacity control shaft. Turn capacity control dial to graduation 0.
4. Start pump and operate at 0 setting for approximately three minutes
5. Turn capacity control dial to graduation. When there is suction lift instead of flooded suction, discharge will not begin for some time, depending upon height of lift, line size and pump capacity. Dry operation during priming will not harm pump. Wetting check valve balls when possible with water or process fluid prior to start-up will speed up priming operation. Close petcock when pump is primed and free of air.
6. Set capacity control approximately to the value desired for actual operation. Lock setscrew holding control shaft.
7. With a screwdriver, turn stem of internal relief valve clockwise until pulsation felt in stem just stops. (The pulsation of the stem or lack of it can be felt by placing the tip of a finger over its end or by holding the screwdriver lightly against it.) Pulsation of stem occurs when pressure relief valve is bypassing hydraulic fluid. When pulsation stops, this means that pump is delivering full capacity as set into discharge line.
8. Correct capacity setting to achieve exact discharge rate as required.

## Capacity Control Adjustment

### General

Pump capacity control has been readjusted in the factory. However, the compressibility of the specific process fluid, at the specific discharge pressure, affects delivery rate. To make use of graduations of the capacity control follow the procedure below.

1. Make sure that the pump is delivering the process fluid at system pressure
2. Release control shaft lock-screw; turn capacity control to 100 graduation on capacity control dial and record maximum pump output.

3. Determine and record pump output at a number of other capacity control settings.
4. Plot graph of pump output versus capacity control settings. Effect of compressibility will be noted by zero output occurring at some capacity control setting above zero.

## Internal Pressure Relief Valve Readjustment of Setting

For readjustment of the internal relief valve setting, stop pump. With a screwdriver, turn relief valve stem counterclockwise until hitting stop. (Pressure setting of valve=atmospheric.) Start pump. With a screwdriver turn stem of internal relief valve clockwise until pulsation felt in stem just stops. (The pulsation of the stem or lack of it can be felt by placing the tip of a finger over its end or by holding the screwdriver lightly against it.) Pulsation of stem occurs when pressure relief valve is bypassing hydraulic fluid. When pulsation stops, this means that pump is delivering full capacity as set into discharge line.

Do not attempt to set the relief valve for a pressure which exceeds the rated pressure of the pump shown on the name plate by more than the 20% because loss of protection of pump would result.

## Maintenance

### Oil Change

Charge oil after 240 hours of operation after start-up. Subsequent oil changes should be made every 6 months (approximately). Drain oil from housing by removing the lower of the two plugs located in the flange of the housing adjacent to the liquid end. After oil has been drained, replace plug. Remove cap from oil filling orifice. Fill pump housing, using fresh oil in accordance with the table below. Replace cap. Examples of oil grades recommended for lubricating 1710 pump (ambient temperature above 50°F). Any equivalent is also acceptable.

<u>Supplier</u>	<u>Grade</u>
Texaco Oil	Meropa Lub #2
Mobil Oil Corp.	Mobil Gear 629
Exxon Co.	Spartan EP, Grade 2
Amoco Oil Co.	Amogear EP, Lubricant Grade 2

### Replacing the Diaphragm

Replace the diaphragm one year after start-up and annually thereafter unless experience indicates more frequent need. Use following routine:

1. Shut off pump and close shutoff valves in the suction and discharge lines. Drain process fluid from lines if possible.
2. Disconnect pipe unions on the suction and discharge lines.
3. Drain oil from housing by removing the lower of the two plugs located in the flange of the housing (adjacent to the liquid end). After oil has been drained, replace plug.
4. Remove the four bolts holding the cylinder. Hold cylinder with firm grip while unscrewing bolts because piston return spring will try to push it out of your hand. Remove the cylinder together with the diaphragm and diaphragm support.
5. Remove piston return spring from inside of the diaphragm support in the case of the ¼" and 1" sizes, and also steel washer and nylon washer which may either come off the end of the piston together with the piston return spring or stick to the shoulder of the piston and have to be removed separately
6. Clamp cylinder in a vise and pry the diaphragm free by inserting two blunt flat objects right and left between the cylinder and the flange of the diaphragm at the same time from both sides. After diaphragm has been moved upward approximately a quarter of an inch, continue to lift it by hand and remove it from the cylinder.
7. Clean inside of cylinder.
8. Place new diaphragm into cylinder and make sure that the bottom of diaphragm touches the bottom of the cylinder cavity; i.e. that the small flange on the closed end of the diaphragm did enter the locating portion at the bottom of cylinder cavity. If old diaphragm is to be discarded, remove disc and diaphragm support. Push do not pull support from diaphragm. This can be more easily accomplished by cutting the small closed end from the old diaphragm. Lubricate the inner surface of the diaphragm. Place retaining disc on the end of the diaphragm support and hand drive diaphragm support into diaphragm as far as possible; then press with the vise (holding bottom of the cylinder against one jaw and the outer end face of the diaphragm support against the other jaw). Stop pressing when retaining disc hits bottom of the diaphragm. This can be felt by a sudden increase in the resistance against driving the diaphragm support deeper into the diaphragm cavity.
9. Replace nylon washer and steel washer on the end of the piston in this sequence for the ¼" and 1" sizes (not required in ½" size). Put piston return spring into the diaphragm support, put whole cylinder assembly back into place and fasten the four bolts holding the cylinder. In the case of the ¼" and 1" sizes, this operation can be done easier after the eccentric has been brought into the position in which its eccentricity is away from the piston. (In this case the piston return spring must be compressed least when putting cylinder back into place.)
10. Refill pump housing with oil. It is recommended to tie in diaphragm replacement with planned oil change, or in any case to fill with fresh oil according to the table given under maintenance.
11. Reassemble suction and discharge lines and restart pump according to procedure given in the start-up chapter.

### **Cleaning or Replacing the Check Valves**

1. Shut off pump and close shut-off valves in the suction and discharge lines. Drain process fluid from lines if possible.
2. Disconnect pipe unions in the suction and discharge lines and remove the portions of piping connected to the check valves (if any).
3. Remove old check valves by unscrewing them from cylinder
4. Clean check valves. Inspect visually for signs of wear on guides, balls and seats. To check seat, fill check with water from top. If water holds or seeps out slowly, valve can be reinstalled.
5. Apply pipe dope sparingly and on the male threads of the valves only.
6. Screw cleaned or new check valves into place.
7. Reassemble pipe unions and restart pump according to procedure given under Start Up.

## Troubleshooting

Problem	Possible Cause	Recommended Action
Diaphragm	Improper diaphragm rupture material (affected by chemical) or too low process fluid temperature.	Replace diaphragm of correct material. *Check oil temperature in housing and process fluid temperature at the inlet. Make sure that oil temperature is above 50°F and that process fluid temperature does not exceed 170°F for pumps having Hypalon diaphragm, or 190°F for pumps having Viton diaphragm.
Underfeed	Pump vapor bound	Allow pump to operate at 100% capacity control setting and against low discharge pressure to eliminate entrapped air and/or vapor.
	Dirty or worn check valves	Clean or replace check valves.
	Insufficient net positive suction head.	Improve life expectancy for the newly installed diaphragm by taking the steps as applicable from the following list: * Make sure that suction line valves are fully opened; * Make sure that suction line strainer is clean; * Make sure there is no other obstruction of the suction line; * Increase fluid level in supply tank; * Check fluid viscosity against order specifications and increase suction line size if too small under the circumstances; or relocate pump to a lower elevation and/or closer to the supply tank to reduce suction line length.
	Internal pressure relief valve is bypassing hydraulic fluid.	Check discharge pressure and in case it exceeds maximum pressure rating of the pump, reduce pressure to proper level not exceeding the pressure rating. If the discharge pressure has not been found excessive, or if the bypassing through the internal pressure relief valve continues after the correction of the discharge pressure has been made.
Overfeed	Insufficient discharge line back pressure.	Provide higher discharge line break pressure. (Install a backpressure valve in the discharge line if needed).
Erratic delivery	Same reasons as those which cause underfeed or overfeed.	Follow instructions given above for correction of Underfeed (Item 2) and Overfeed (Item 3).
Overheating of pump and/or motor	Excessive discharge line backpressure.	Reduce discharge line pressure to a value not exceeding maximum pressure rating shown on the pump nameplate.
	Internal pressure relief valve is bypassing hydraulic fluid	Follow instructions given above for correcting underfeed appearing because internal pressure relief valve is bypassing hydraulic fluid (Item 2d)
Failure of pump to start or pump stops running	Electrical circuit opened.	Check electrical circuit to motor and repair defect.
	Excessive discharge pressure	Check and reduce discharge pressure to a value not exceeding maximum pressure rating shown on the pump nameplate.

## Safety Precautions

The diaphragm metering pump is designed to pump various liquids into pressurized systems. By nature, the application of these pumps may present circumstances under personal hazards can exist. All personnel who may have occasion to install, operate or maintain these pumps should be provided with the opportunity to read this instruction manual or be advised of its contents. Awareness of potential hazards can prevent accidents and injury.

## Danger from Liquids Handled

The liquid being pumped may be hazardous due to corrosivity, acidity or toxicity. Suitable personal protective equipment should be used at all times to protect from liquid or vapor. Consult your employer.

## Damage from Pressurized Liquid

All systems containing liquid and/or air under pressure present the potential for unexpected discharge of liquid in a violent manner. In operation and servicing of the pump, all parts of the pump and attached piping which contain liquid should be treated cautiously until it is known with certainty that they have been depressurized and drained.

## Danger from Electrical Hazard

Since these pumps are electric motor driven and may include electric components, the hazard of electrical shock can exist. Installation and wiring of electrical components should be in accordance with the applicable codes.

## Operational Hazards

To avoid personal injury, the following guidelines should be adhered to:

1. Do not operate pump with coupling and shaft guards removed.
2. Do not operate pump with electrical component enclosures not in place.
3. When venting cylinders or piping during start up, liquid will be discharged under pressure. Suitable caution should be taken to avoid contact with the liquid and to avoid spillage or spraying of liquid.
4. Any leakage or spillage of liquid should be cleaned up without delay.

## Safety

1. Before operating pump or attempting to service, become familiar with contents of Instruction Manual
2. Observe all precautions established by plant safety procedures.
3. Observe all chemical handling instructions provided by the chemical supplier and/or plant regulations.
4. Do not operate pump with closed valves in suction and/or discharge lines
5. Do not paint over or remove nameplates, labels or tags
6. In disassembly of pump, precautions should be taken for the possibility that a diaphragm rupture may have allowed pumped liquid to enter the lubrication oil system.
7. If motor replacement is required, be certain that speed is the same as the original motor.
8. If pump is to be used for other than original service, first ascertain that pump is suitable for new conditions (pressure and material compatibility with liquid to be pumped).
9. Establishment of and adherence to a regular maintenance program can prevent problems by early detection of unusual conditions (e.g. unusual noise, overheating and wetness indicating leakage).

### Code Number Configuration

171	—	—	—	9	—	—	—	—
Product Code	Number of Heads	Plunger Diameter	Head/Check Material	Capacity Adjustment	Speed	Diaphragm Material	Motor Frame Size	Check Valves
	1. Simplex 2. Duplex	1. 1/2" 5. 3/4" 2. 1" N. Non-standard	0. Cast Iron/316SS 2. 316SS/316SS 4. 316SS/Alloy 20 Chks 6. 316SS/Tung. Carb 8. Polypro/ Polypro N. Non-standard	9. Manual	1. 58 3. 173	1. Hypalon 2. Viton N. Non-standard	1. Flat 48 Frame 2. Flat 56 Frame 3. Floor Stand/ 48 frame 4. Floor Stand/ 56 Frame	1. Single 2. Double G. Spray Guard H. H <sub>2</sub> O <sub>2</sub> Service
	1. Simplex	8. 1.4"	0. Cast Iron/316SS 2. 316SS/316SS 4. 316SS/Alloy 20 Chks 6. 316SS/Tung. Carb 8. Polypro/ Polypro N. Non-standard		3. 173 4. 230			

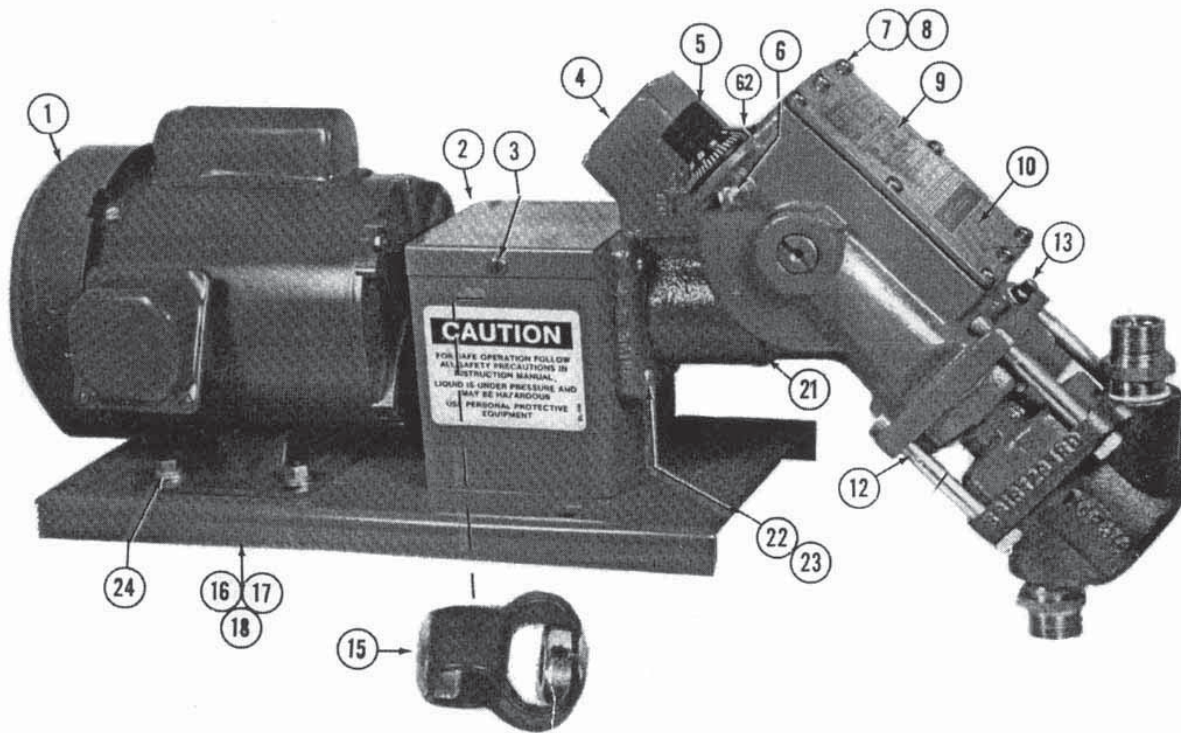


Figure 1 - Common Parts



## Common Parts

(See Figure 1 and 2)

Ref. No.	Part Name	1/2", 3/4", 1" Plunger	1.4" Diameter Plunger
2	Coupling Guard	816735	816735
3	6-32 x 1/4" screw (before 1/76)	4170063678	4170063678
3	10-32 x 1/4" screw (before 1/76)	417063716	417063716
3A	#10 washer	4170037054	4170037054
4	plug	180256-30	180256-30
5	dial assembly	816839	816839
6	10-32 x 1" thumb screw	4170058126	4170058126
7	10-32 x 1/2" screw	4170063720	4170063720
8	#10 internal lockwasher	4170036321	4170036321
9	nameplate	260355	260355
10	cover - simplex	816743	816743
10	cover - duplex	816889	816889
12	3/8" - 24 x 3 cap screw	816212-26	816212-26
13	1/8" pipe plug	416121001	416121001
15	coupling	200443	200443-1
16	5/16" - 18 x 3/4" bolt	4170011036	4170011036
17	5/16" - 18 x hex bolt	4170022026	4170022026
18	5/16" washer	4170037056	4170037056
19*	cover gasket - simplex	816744	816744
19*	cover gasket - duplex	816890	816890
20	gasket	816833	251361
21	housing - simplex	816727	250629
21	housing - duplex	816888	816888
22	3/8" - 24 x 7/8" cap screw	816212-33	816212-33
23	3/8" spring lockwasher	4170036025	4170036025
24	baseplate	816734	816734
62	1/16" dia. x 1/4" groove pin	4170044002	4170044002

\* Recommended spare parts

**Note:** Complete housing assembly in Photo 2 includes reference numbers 44, 46, 49 and all parts listed under common parts.

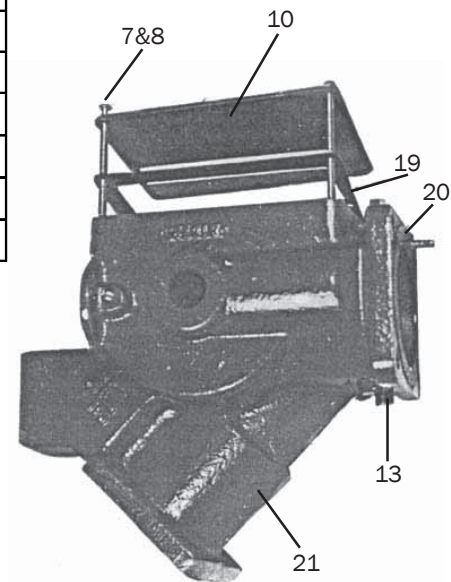


Figure 2 - Pump Housing

### Part Number according to Plunger Diameter

Ref. No.	Part Name	1/2"	3/4"	1"	1.4"
26	Washer	816835-5	816835-1	816835-3	816835-9
27	Washer	816835-4	816835	816835-2	816835-8
30	Adapter (Simplex) before 5/95	816731	816732	816733	250630
30	Adapter (Duplex) before 5/95	816840	816841	816842	NA
30A	Adapter (Simplex) after 5/95	260731	260732	260733	260630
30A	Adapter (Duplex) after 5/95	260840	260841	260842	NA

### Miscellaneous (not shown)

Ref. No.	Part Name	Quantity	Plunger Diameter
35*	Gear Lubricant (1 Qt.)	1 per head	Y302950
36A	Floorstand	1	216026
36B	Riser	1	219238
36C	5/16" - 18x 1-14" screw	4	417-0052-126
36D	5/16" -18 nut	4	417-0022-026
36E	5/16" lockwasher	4	417-0036-024
36F	5/16" flatwasher	4	417-0037-056

\* Recommended spare parts

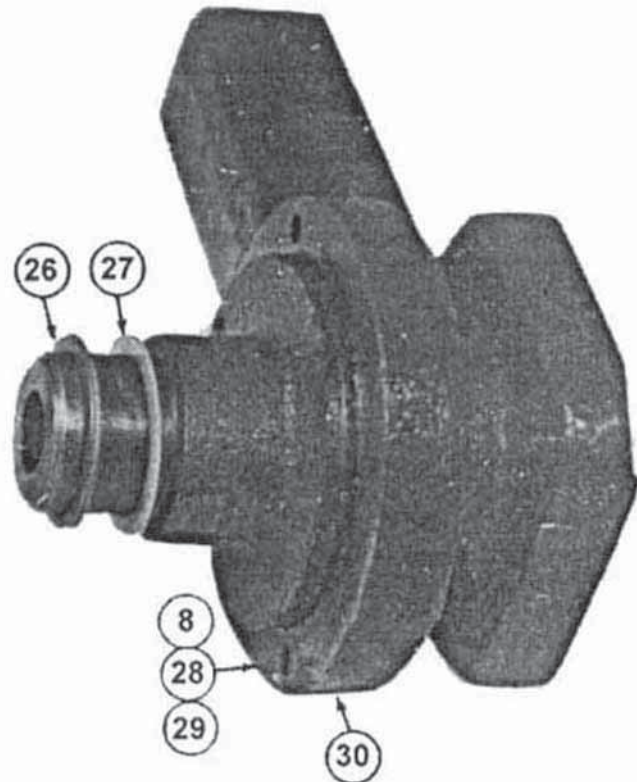
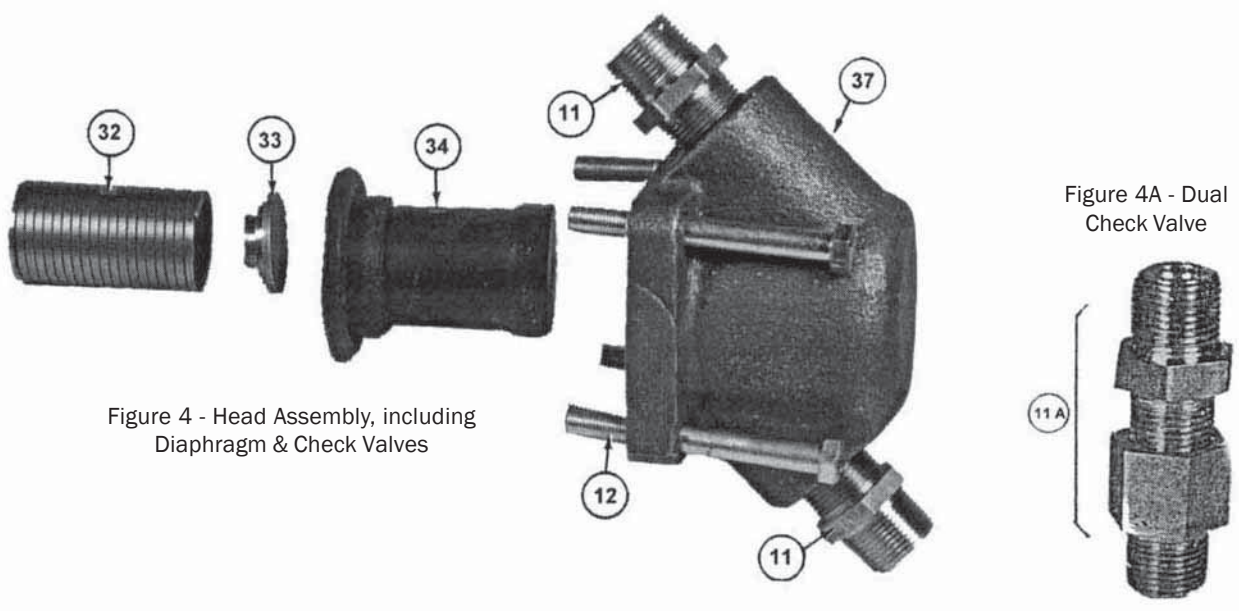


Figure 3 - Plunger Adapter

**Part Number according to Plunger Diameter (see Fig. 4 and 4A)**

Ref. No.	Description	Material	Qty.	1/2"	3/4"	1"	1.4"
37	Head	Cast Iron	1	816728	816729	816730	250627
		316SS	1	816728-1	816729-1	816730-1	250627-1
		PP	1	See page 10	See page 10	See page 10	See page 10
11	Single Check Valve	316SS	1	816040-11	816040-2	816040-2	816040-2
		Tung. Carb.	1	816406-11	816406	816406	816406
		PP	1	See page 10	See page 10	See page 10	See page 10
11A	Dual Check Valve Assembly	316SS	2	804300-3	804300-5	804300-5	804300-5
		Alloy 20	2	See page 9	See page 9	See page 9	See page 9
32	Diaphragm Support	Steel	1	816834	816834-1	816834-2	816834-3
33	Retaining Disk	Steel	1	816803	816804	816805	251301
34	Diaphragm	Hypalon	1	816736	816737	816738	250600
		Viton	1	816736-1	816737-1	816738-1	250600-1



**Part Number according to Plunger Diameter(see Fig. 5, 6 & 7)**

Ref. No.	Description	1/2", 3/4" & 1" 38 & 58 SPM	1/2", 3/4" & 1" 114 & 173 SPM	1.4" 173 SPM	1.4" 230 SPM
39	Bearing	20171-2	200171-2	251300	251300
40	Seal	212463-1	212463-1	212463-1	212463-1
41	Washer	200444	200444	200444	200444
42	Retaining Ring	417-0101-009	417-0101-009	417-0101-009	417-0101-009
43	Bearing	200171-1	200171-1	200171-1	200171-1
44	Worm Shaft (simplex)	816745	816745-1	816745-1	816745-2
44A	Worm Shaft (duplex)	816745	816745-1	-	-
45	O-Ring	413-0568-113	413-0568-113	413-0568-113	413-0568-113
46	Worm Gear Shaft (simplex)	816747	816747	816747	816747
46A	Worm Gear Shaft (duplex)	816892	816892	-	-
47	Retaining Ring	417-0109-027	417-0109-027	417-0109-029	417-0109-029
48	Bearing Ring	816802	816802	816802	816802
49	Worm Gear (simplex)	816746	816746-1	250639-1	250639
49A	Worm Gear (duplex)	816891	816891	-	-
50	Bushing (simplex)	816748	816748	816748	816748
50A	Bushing (duplex)	816893	816893	816893	816893
51	Adjusting screw	816749	816749	816749	816749

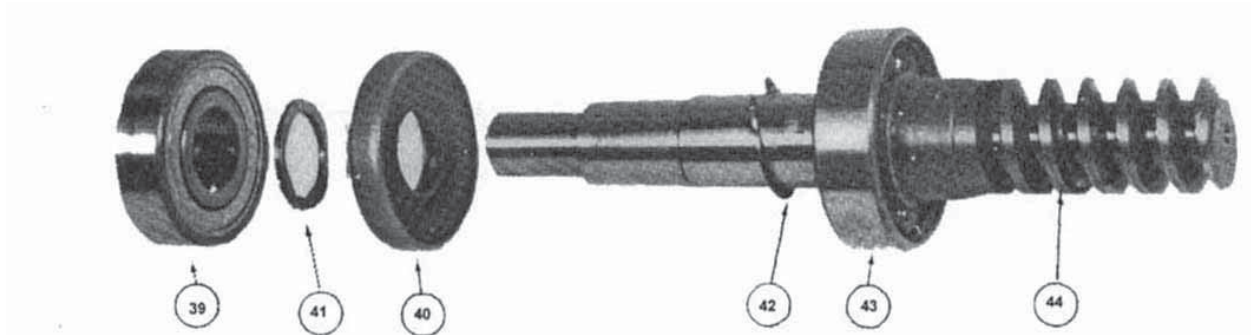


Figure 5 - Input Shaft Assembly

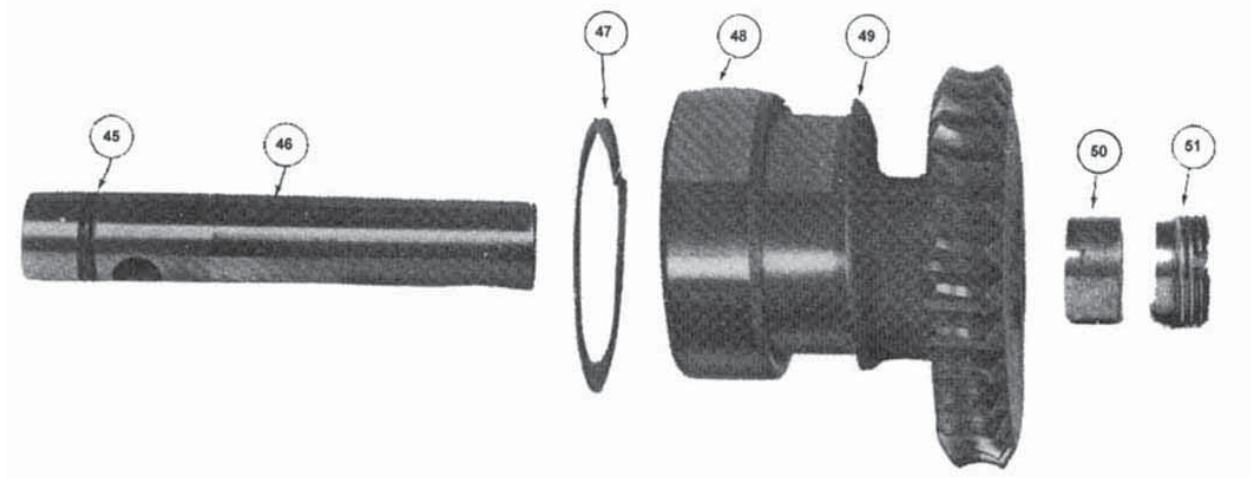


Figure 6 - Worm Gear, Simplex Assembly

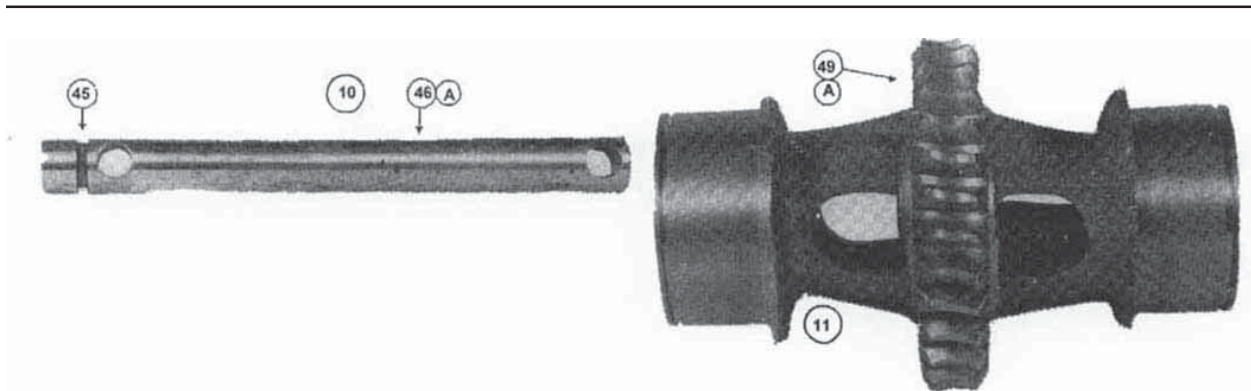
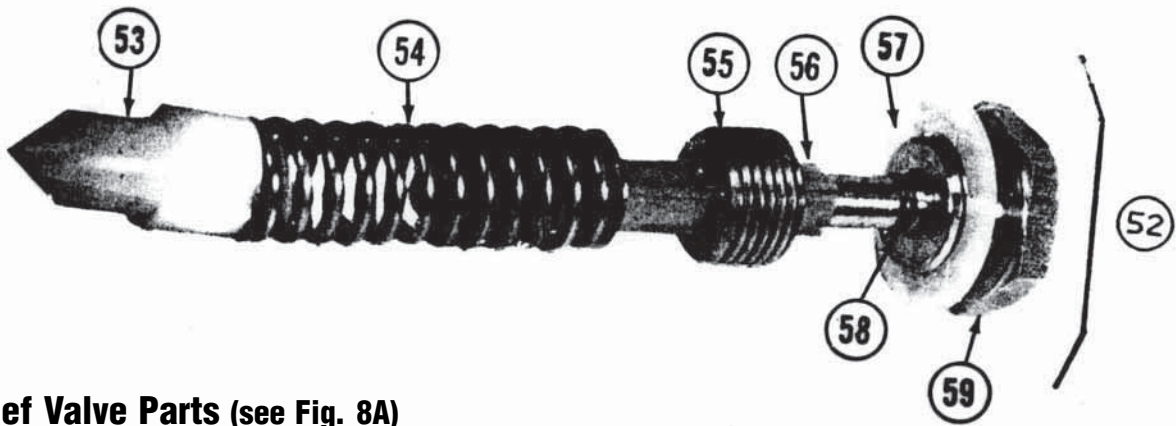


Figure 7 - Worm Gear, Duplex Assmebly

**Relief Valve Parts (see Fig. 8)**

Ref. No.	Part Name	Part Number
52	Complete Assembly (Metal Head)	816725-7
53	Poppet	816750
54	Spring Metal (all)	260363
	Polypro 1/2	260146
	Polypro 3/4	260145
	Polypro 1	260144
	Polypro 1.4	260363
55	Adjusting Screw	816793
56	Adjusting Rod	816792
57	Washer	816835-7
58	O-Ring	4130568007
59	Nut	816794

Figure 8 - Old Style Relief Valve (before 5/95)



**Relief Valve Parts (see Fig. 8A)**

After 5/95 use for ALL plunger diameters

Ref. No.	Part Name	Part Number
90	Washer (copper)	Y945381
91	O-Ring(viton)	Y302953
92	Relief Valve (50-200psi)	Y945733-01
92	Relief Valve (200-900psi)	Y945733-02
92	Relief Valve (900-2000Ppsi)	Y945733-03

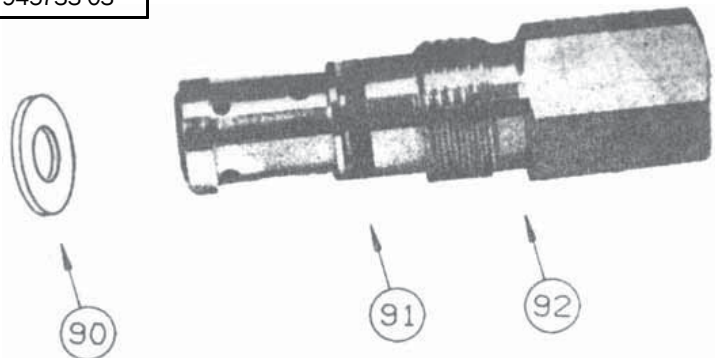


Figure 8A - New Style Relief Valve (after 9/95)

(see Fig. 9 & 10)

Ref. No.	Part Name	1/2"	3/4"	1"	1.4"
61	Knob	816839	816839	816839	816839
63	O-Ring	4130568010	4130568010	4130568010	4130568010
64	Shaft	816741	816741	816741	816741
65	Retaining Ring	4170101003	4170101003	4170101003	4170101003
66	Pinion gear	816742	816742	816742	816742
67	10-32 x 1/4" setscrew	815497-4	815497-4	815497-4	815497-4
69	6-32 x 1/4" setscrew	4170057164	4170057164	4170057164	4170057164
71	Finger Spring Water	182175-3	182175-3	182175-3	182175-3
72	Piston Assembly	816836	816836-1	81636-2	250599
73	Lift Spring (See Note)	DS-46-183	DS-46-174	DS-46-175	DS-46-187
75	Piston & Common Parts Assembly	816725-4	816725-5	816725-6	--

**Note:** 1/2" spring is internal. 3/4", 1" and 1.4" springs are external.

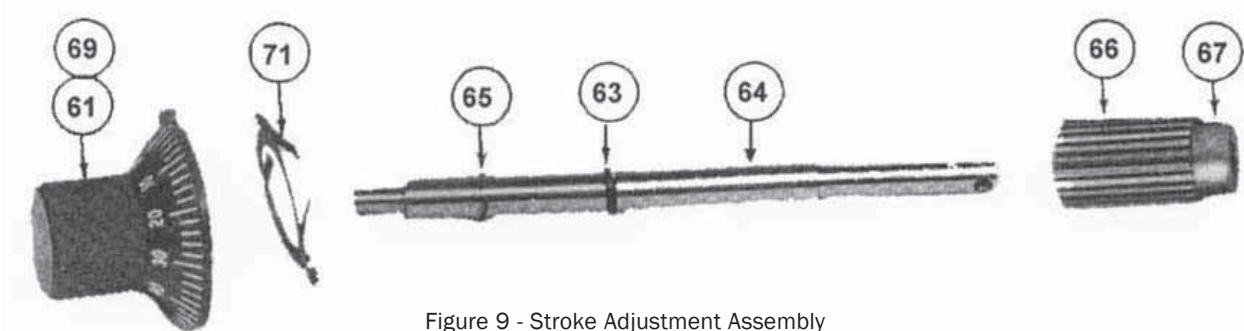


Figure 9 - Stroke Adjustment Assembly

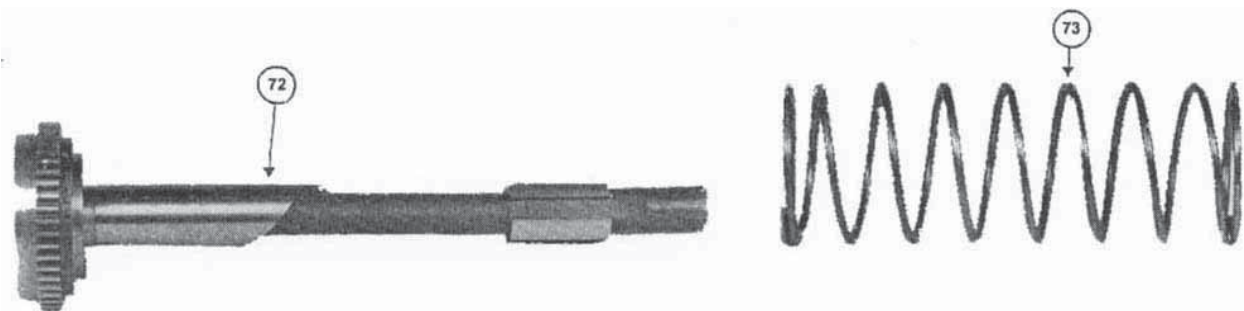


Figure 10 - Plunger Assembly

**Standard Option for Double Ball Alloy 20 Check Valve  
(see Fig. 11)**

Ref. No.	Part Name	1/2"	3/4", 1", 1.4"
11C	Check Valve Complete	Y933958-84	Y933959-84
101	Retainer	Y933948-82	Y933939-82
102	Guide Half	Y019395-84	Y019393-94
103	Ball	Y933950-82	Y933940-82
104	Seat	Y933946-84	Y933938-84
105	O-Ring	Y948548-01	Y948548-02
106	Body	Y933945-84	Y933937-84

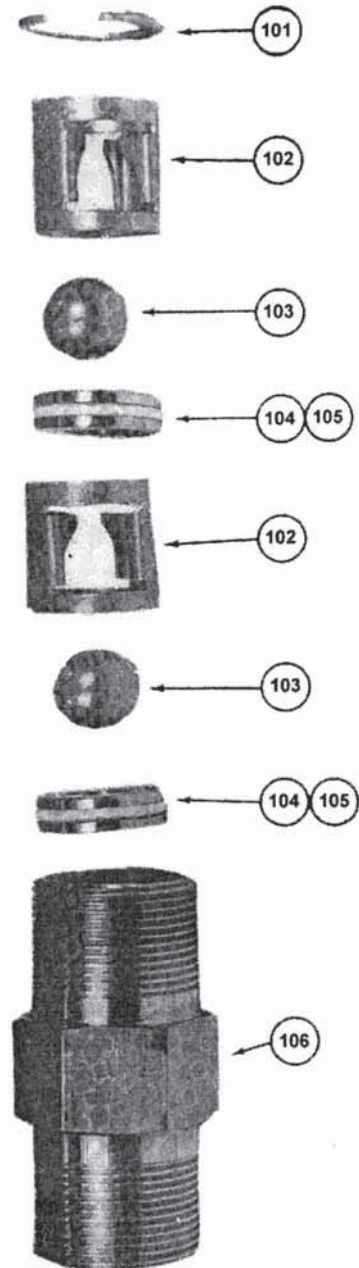


Figure 11 - Alloy 20 Check Valve



**Polypropylene Cylinder (see Fig. 12)**

Ref. No.	Description	Qty. per Assembly	1/2"	3/4"	1"	1.4"
	Liquid End Assy (Includes Items 1-11)	1	260092	260092-1	260092-2	260092-3
111	Cylinder	1	260075	260075-1	260075-2	260075-3
112	Body	2	260089-2	260086-2	260086-2	260086-2
113	Clamp Plate	2	260073	260073	260073	260073
114	Cap Screw	4	4170052132	4170052133	4170052133	4170052133
115	Lockwasher	4	4170036024	4170036024	4170036024	4170036024
116	Adapter	2	260090	260074-2	260074-2	260074-2
117	Ball	2	G1012-TFE	G1013-TFE	G1013-TFE	G1013-TFE
118	Seat	2	260091	26088-4	260088-4	260088-4
119	Cap Screw	4	4170052488	4170052488	4170052488	4170052488
120	Lockwasher	4	4170036025	4170036025	4170035025	4170036025
121	Back Plate	1	260085	260085	260085	260085-1
122	O-Ring (VIT)	4	814590	814591	814591	814591
122	O-Ring (HYP)	4	814589	814592	814592	814592

O-Rings to be ordered separately

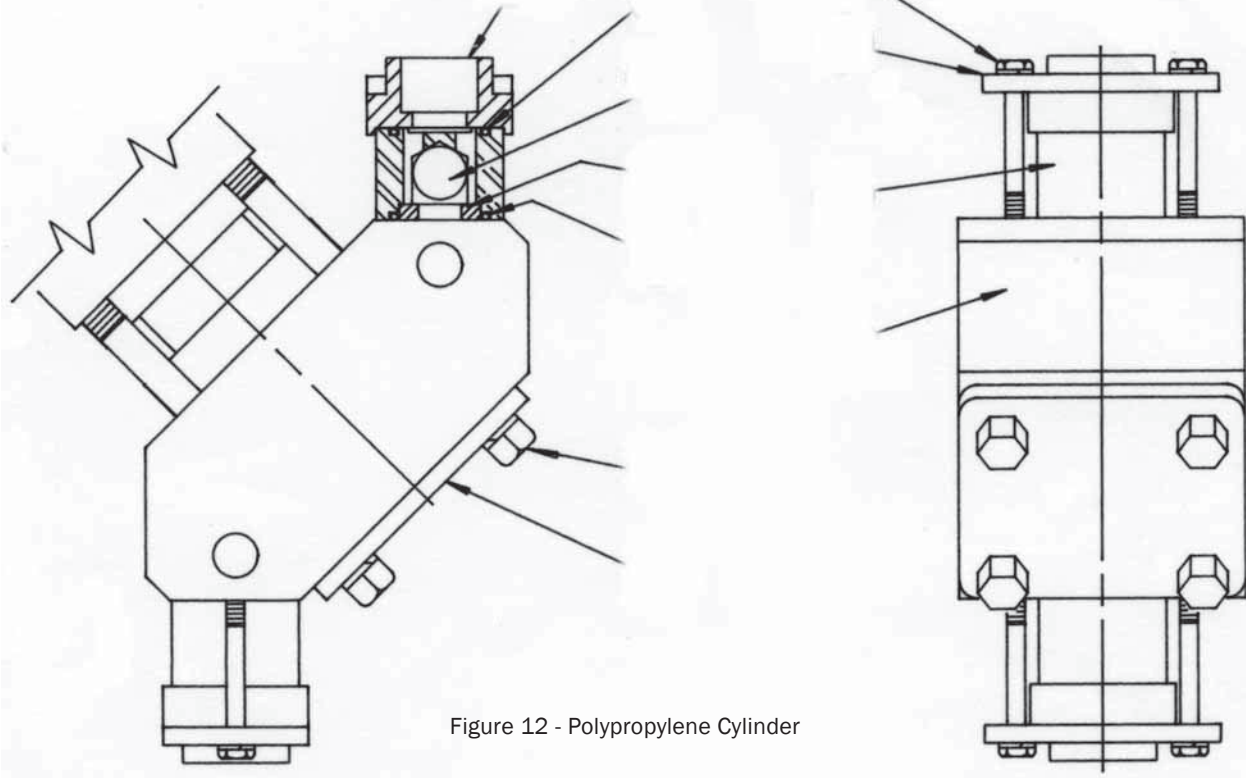


Figure 12 - Polypropylene Cylinder



Accessories



Chemical Feed Systems



Measuring and Control Technology



Transfer Pumps

Metering Pumps

