



PolyBlend PB16-0.4

USFilter Stranco Products
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PolyBlend

Model #PB16-0.4

INSTALLATION, OPERATION, AND MAINTENANCE INFORMATION**CONTENTS**

Overview	Warranty
Installation	Appendixes
Operation	Drawings
Maintenance	

**READ THIS MANUAL BEFORE YOU
INSTALL, OPERATE, OR SERVICE THIS
UNIT.**

OVERVIEW**SAFETY PRECAUTIONS**

- ☐ Ensure that the control panel is grounded to avoid possible electrical shock or damage to equipment.
- ☐ Before servicing, turn off all power and assure power "lockout" to avoid possible electric shock.
- ☐ Disconnect external power to the control panel before removing or replacing fuses.

SPECIFICATIONS

Pump	Diaphragm
Inlet	1/2" FPT, Water Supply
	5/8" Hose Barb, Polymer Supply
Outlet	1/2" FPT, Solution Discharge
Water Capacity	16 GPH Primary
Polymer Capacity	0.4 GPH
Pressure Rating	100 PSI
Electrical Supply	120/1/60, 6 Amps
Dimensions	23" H x 10" W x 16" D
Weight	51 lbs.
Motor(s)	(1) 1/6 HP, 120VAC, 3.6 AMPS

INSTALLATION**LOCATION**

Select a location that provides:

- Electrical Supply
- Potable Water (Clean)
- Proximity to the Point of Use
- Easy Handling and Storage of Polymer
- Access to Unit
- Protection Against Severe Weather

UNPACKING

Examine package contents for damage. Report any to freight forwarder. Check plastic bag(s) for contents against individual packing list(s).

NOTE: Disregard any moisture; this unit was wet tested.

CONNECTIONS

- Use Teflon tape on threads. Use joint compound (pipe dope) in small amounts, if necessary.
- Do not over-tighten fittings.
- Insure that supply water pressure is **less than 100 psi.**
- Install water isolation valve with unions.
- Insure that neat polymer feed line has a **flooded suction.**

NOTE: To enhance performance, reduce the number of piping turns and elevation changes.

STORAGE

Store in atmosphere controlled environment. Protect from extreme temperature (above 110°F, 52°C, below 32°, 0°C) and wide ambient temperature fluctuations.

Protect from direct weather exposure, i.e., sun, rain, high wind, etc.

OPERATION

GENERAL

This PolyBlend unit will perform the following functions: meter polymer dosage, regulate mixing water, provide uniform dilution and activation, operate on-line continuously, and feed solution to the point of use.

Neat polymer from the metering pump and dilution water controlled by the solenoid valve enter the mixing chamber. Dilution and activation occur, yielding prepared solution ready for use.

Neat polymer dosage rate is adjusted at pump face or at electronic controller (REM-1D, SCR, etc.). Primary dilution (and post dilution) water are controlled by individual flow control valves.

START-UP

- Step 1: Switch pump to external mode at pump face.
- Step 2: Prime polymer pump, using priming kit provided with unit.
- Step 3: Place unit power switch in Off position.
- Step 4: Energize power circuit that feeds unit. Solenoid opens. Allow mixing chamber to fill with water by opening primary dilution water control valve.

NOTE: Do not turn mixer motor on until chamber is filled with water, running dry will damage mechanical seal.

- Step 5: Place unit power switch in On position. Mixing chamber motor starts.
- Step 6: Access REM-1D controller to turn pump On/Off and for polymer output adjustment. Output can also be adjusted at pump face by varying the stroke length.

NOTE: For optimum pump performance, keep stroke frequency as high as possible. This is done by decreasing the stroke length setting. More stroke repetition with a shorter length is better than fewer strokes with a long stroke length. If stroke length is too short, pump prime may be affected.

Step 7: Adjust water flow at mixing chamber by turning control valve. (The other control valve should be turned for post-dilution adjustment, if applicable.)

NOTE: Do not run polymer pump unless water flow is established. Polymer alone can plug discharge plumbing.

WATER PRESSURE

This unit is equipped with a flow regulator. The inlet water flow rate is maintained as pressure fluctuates. With the low dilution water rate of this unit, the regulator prevents pressure surges that could cause flow increases and affect solution concentrations. This device is factory set and not field-adjustable.

SOLUTION OUTPUT

Unit output is determined by setting pump stroke length and stroke frequency together with setting dilution water flow. Establish desired solution volume and solution concentration, then proceed.

EXAMPLE: 100 GPH (380 LPH) of .5% polymer solution desired. A 2 GPH (7.6 LPH) diaphragm pump is used.

— Determine neat polymer requirement.

$$(100 \text{ GPH}) \times (.005) = 0.5 \text{ GPH neat polymer}$$
$$(380 \text{ LPH}) \times (.005) = 1.9 \text{ LPH neat polymer}$$

— Determine pump usage.

$$(0.5 \text{ GPH}) \div (2 \text{ GPH}) = 25\% \text{ pump capacity}$$
$$(1.9 \text{ LPH}) \div (7.6 \text{ LPH}) = 25\% \text{ pump capacity}$$

— Set Controls

A 2 GPH (7.6 LPH) pump @ 100% stroke length and 25 strokes per minute will deliver 0.5 GPH (1.9 LPH). However, 2 GPH (7.6 LPH) pump @ 50% stroke length and 50 strokes per minute will also deliver 0.5 GPH (1.9 LPH) with a more homogeneous mix.

NOTE: Do not exceed polymer concentrations of 1% in the PolyBlend.

MAINTENANCE

SHUTDOWNS

If out of service more than one week, flush mixing chamber.

- Turn pump off.
- Place unit power switch in On position to establish water flow for five minutes.

If out of service for more than two weeks, flush pump and mixing chamber.

- Connect pump suction to a container of mineral oil (not water).
- Place unit power switch in On position to establish water flow.
- Turn pump on and run for three minutes.
- Turn pump off.
- Continue water flow for five additional minutes.
- Drain water from chamber and piping to prevent freezing.

MAINTENANCE

1. Clean ancillary water and/or polymer strainers weekly.
2. Flush system monthly following one-week procedure.
3. Refer to the appendix for specific information on drawings, part identification, and components.

RECOMMENDED SPARE PARTS

<u>QTY.</u>	<u>PART #</u>	<u>DESCRIPTION</u>
1	K2341002	Kit includes parts below:
1	SP-155PBX	Pump Liquid End
1	7802910	Chamber Mechanical Seal
1	1450318	Belt, Chamber
1	1414001	Bearing, Chamber Base
1	1410002	Bearing, Chamber Top
1	28391-1	Pump Head

PUMP REPLACEMENT

<u>QTY.</u>	<u>PART #</u>	<u>DESCRIPTION</u>
1	AA771-155PBX	Pump

SPECIAL TOOLS

No special tools needed for operation, maintenance, and repair of components.

LUBRICATION

No lubrication is required.

PREDICTED LIFE SPAN

There is no predicted life span of wear parts as each application and operation varies.

OPERATING PROCEDURES

For normal operation, once settings are adjusted based on operation parameters, the system can simply be turned ON or OFF. Special operating instructions for Seasonal operation do not apply.

EMERGENCY OPERATING INSTRUCTIONS

Emergency operating instructions do not apply to USFilter-Stranco equipment. In case of an emergency, **TURN OFF POWER TO STOP RUNNING.**

DISASSEMBLY, REPAIR, & REASSEMBLY

This equipment is an open-frame design. It allows for easy removal of all components. There are no special procedures for removal of parts. If assistance is required, contact USFilter Stranco Technical Service at 800-882-6466.

PB16
TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
NO WATER FLOW	<ul style="list-style-type: none"> • Closed valve on water supply • Blocked solenoid valve • Closed or clogged discharge line • Rate control valve closed 	<ul style="list-style-type: none"> • Make sure valve is open • Disassemble and clean valve • Remove any blockages or open any closed valves • Make sure valve is open
PUMP WON'T PUMP CHEMICAL	<ul style="list-style-type: none"> • Pump is in off position • No water flow • Blocked pump discharge line • Back pressure is too high • Differential pressure is too high 	<ul style="list-style-type: none"> • Make sure pump is turned on • Make sure all water valves (supply and discharge) are open • Take discharge line apart, check for blockage and clean if necessary • Reduce back pressure on unit • Adjust pressure switch
CLOGGED INJECTION CHECK VALVE	<ul style="list-style-type: none"> • Debris or clumps in polymer • Valve is stuck open allowing water into polymer line 	<ul style="list-style-type: none"> • Check polymer supply for contamination • Remove valve from chamber and clean it
PUMP WON'T STOP	<ul style="list-style-type: none"> • Water flow is still established • Pump is in internal mode 	<ul style="list-style-type: none"> • Shut off water valve or power to the unit • Switch pump to external mode

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PolyBlend® Warranty

USFilter Stranco warrants equipment of its manufacture and bearing its trademark to be free of defects in workmanship and materials. If the customer gives USFilter Stranco prompt written notice of a breach of this warranty within the Warranty Period (as defined below), USFilter Stranco shall, at its sole option and as the customer's exclusive remedy, either repair or replace at no charge, or refund the purchase price paid with respect to, any part or product of its manufacture that is returned to the factory freight prepaid and found to be in breach of this warranty. If USFilter Stranco determines that any claimed breach is not, in fact, covered by this warranty, the customer shall pay USFilter Stranco's then customary charges for any repair or replacement. The foregoing warranty is conditioned upon the customer's (i) operating and maintaining the equipment in accordance with all applicable product instructions, (ii) not making any unauthorized repairs or alterations, and (iii) not being in default of any payment obligation to USFilter Stranco. This warranty does not cover damage caused by chemical action or abrasive material (including, without limitation, particulates in the makeup water), damage caused by handling or during transportation, or damage arising from misuse, installation or any other cause beyond USFilter Stranco's control. Standard units not in outdoor configurations are not warranted in outdoor applications.

Warranty Period – The warranty begins with the date of shipment and extends for a period of twenty-four (24) months. However, if start-up of the product by an authorized USFilter Stranco technician occurs within twelve (12) months after the date of shipment, and if a USFilter Stranco start-up report form is filed with USFilter Stranco within 30 days of start-up, the warranty period begins with the date of start-up. If a non-potable water source is used as primary or secondary dilution water to the PolyBlend unit, the warranty period shall not exceed ninety (90) days from the date of shipment.

PolyBlend HydroForce® Warranty

The PolyBlend HydroForce® mixing assembly is covered for the life of the product by the limited warranty set forth herein, provided that the limited lifetime warranty extends only to the original user of the product.

30-Day Guarantee -- Each product of USFilter Stranco's manufacture is covered by a 30-day 100% buy-back guarantee of customer satisfaction. If customer is dissatisfied with the product's performance for any reason, the product can be returned to USFilter Stranco for a full refund of the sale price. In order to take advantage of the 30-day guarantee the product must have received only normal use and care and the customer must request the refund prior to the expiration of thirty (30) calendar days from the date of shipment.

No representative has authority to change or modify the foregoing warranties in any respect. However, representatives are free to offer service contracts and preventive maintenance agreements on their own, acting independently of USFilter Stranco. **THE WARRANTIES SET FORTH ABOVE ARE USFILTER STRANCO'S SOLE AND EXCLUSIVE WARRANTIES. USFILTER STRANCO MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, AND ALL SUCH EXPRESS OR IMPLIED WARRANTIES ARE HEREBY DISCLAIMED.**

LIMITATION OF LIABILITY:
NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, USFILTER STRANCO SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND USFILTER STRANCO'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE EQUIPMENT SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE EQUIPMENT. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.

Whether in or out of warranty, a Return Materials Authorization number (RMA) is required and can be obtained by calling our customer service department telephone at 800.882.6466. Have the make, model, and serial number of the item being returned. Reference the RMA number on the outside of the shipping container.

Differential Pressure Switch

Location of Differential Pressure Switch

The high pressure port connects to the inlet manifold between the solenoid valve and the rotameter/rate-adjusting valve. The low pressure port connects to the discharge side of the rotameter.

Function of Differential Pressure Switch

The differential pressure switch ensures sufficient water flow is present before the polymer pump is energized. This integral, automatic safety feature eliminates the problem of overfeeding neat polymer to an application without proper dilution.

In operation, the rate valve is adjusted to produce the desired flow through the system. This causes a pressure drop to occur across the valve which is applied to the differential pressure switch.

If supply pressure decreases enough to affect flow rate or if back pressure between the PolyBlend and the point of solution application increases enough to affect flow rate, the differential pressure across the rotameter and valve decreases. This causes power to be interrupted to the polymer pump and prevents damage to the mixing system caused by extremely high viscosity developing in the mixing chamber.

<p>NOTICE: If system pressure or flow are <u>not adequate</u>, investigate the cause of lack of flow. (For example, inadequately sized piping can produce inadequate flow.) To avoid undesirable water dilution conditions and damage to equipment, do not bypass or adjust the differential pressure switch for a lower pressure/flow setting.</p>
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Question: *Why doesn't the polymer pump turn off when I turn the water off using the rotameter?*

The differential pressure switch senses flow on either side of a pressure drop. Because the rotameter is the sensing point, the rotameter closing is the only cause of loss of flow that the differential pressure switch cannot see.

Test the differential switch by turning off the source water or the discharge flow. (See step 5 on the next page.)

Differential Pressure Switch

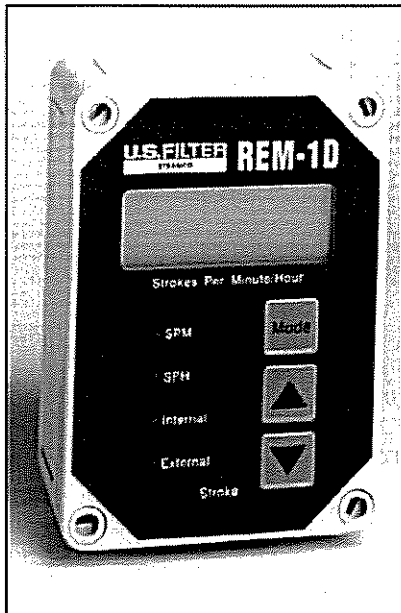
Adjusting the Differential Pressure Switch

Adjust the PolyBlend differential pressure switch only if pressure and flow to the system **are adequate**.

The adjustment logic is the **opposite** of what you might expect. The PolyBlend differential pressure switches have a red light (on the left side) that lights up whenever source water flow is too low and the polymer pump is disabled. The pump stops pumping when the flow is too low. Low flow may be from lack of incoming water or from too much back pressure on the outgoing side.

	Adjustment		System Reaction
1.	Turn the PolyBlend rotameter until water flow is at maximum on the flow gauge.		
2.	Screw in the <i>differential pressure knob</i> until the red alarm light goes on.		Polymer pump is disabled.
3.	Back off the differential pressure knob until the red alarm light goes off.		The pump starts again.
4.	<p>4a.</p> <p>If you want very close control of flow, leave the knob at this setting.</p> <p><i>At this setting, any loss of flow (as observed by the rotameter) results in the pump being disabled.</i></p>	<p>4b.</p> <p>If you want to make the system "more forgiving" prior to shutdown, continue to turn the knob another 1-2 turns.</p> <p><i>The further you turn the knob, the more flow can be lost before the pump is disabled.</i></p>	Step 4 determines how "forgiving" the system is before it shuts down due to inadequate flow.
5.	<p>To test sensitivity and operation, turn off the water at the source or the solution at the discharge.</p> <p>The float in the flow meter will fall more for the control knob setting described in step 4b than for 4a (above).</p>		As the source or discharge is turned off, the float in the flow meter falls and the pump is disabled.
6.	Set the rotameter for the desired flow.		Retest (as in step 5).

DIGITAL DISPLAY PUMP CONTROLLER



General Description

The REM-1D Digital Display Controller serves as either a pump remote control station or a proportional pump controller (4-20 mA input) or both. The REM-1D can be used to vary the output of any Liquid Metronics (LMI) Series A7, B7, or C7 metering pump when those pumps are placed in the external mode. This is truly a "plug-n-play" accessory. A simple connection of 4-conductor cable from the control unit to the external input jack of the LMI pump is all that is required for start-up. Power is supplied by a 15 VDC source from the LMI pump through the 4-conductor cable.

The controller output, in the form of contact closures of 80 ms duration, triggers the LMI pump. In the internal mode, output is 0-100 strokes-per-hour (sph) or 0-100 strokes-per-minute (spm). A touch of the pressure-sensitive membrane keys varies the output, which is displayed in large, easy-to-read LCD digital format. In the external mode, output is from 0-100 sph or 0-100 spm directly proportional to the 4-20 mA analog input signal. Ten feet of 3-conductor cable and connectors are supplied as standard for the 4-20 mA application. Zero and span adjustments may be done through the outside keys of the controller.

In the "OFF" position, the 15 VDC power source will be present, but the controller output will be zero. The display will read OFF. The rugged, polycarbonate NEMA 4X enclosure is easily wall-mounted near the associated pump, or can be remotely located,

CUSTOMIZING YOUR CHEMICAL FEED SYSTEM

Benefits

- Provides remote control option
- Improves dosage control
- Enhances treatment program efficiencies
- Makes changing dosage easy
- Allows operator to link dosage to process variables
- Expands range of precise pump control
- Designed for industrial applications

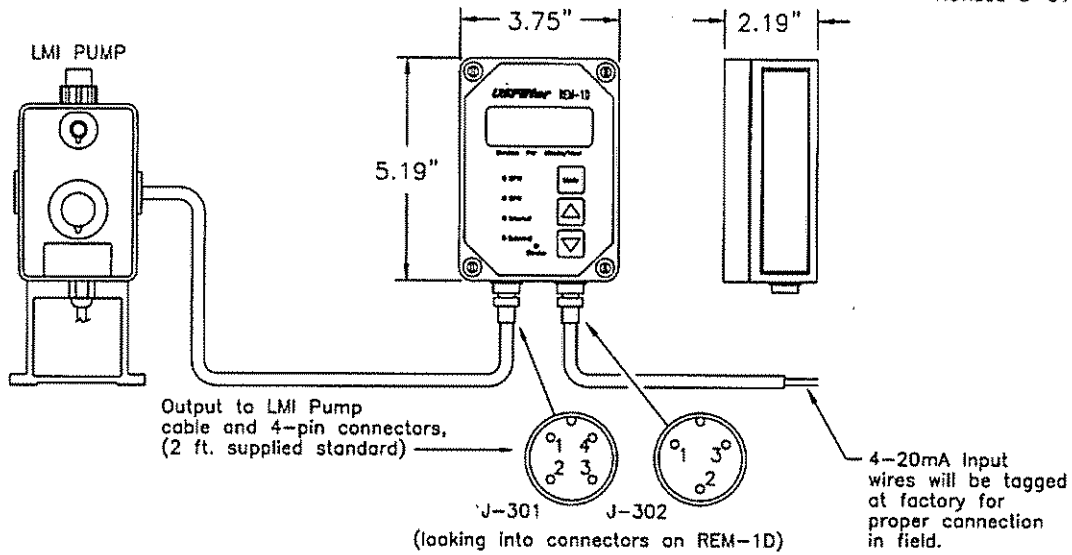
Features

- Solid-state microprocessor core
- Push-button control
- Large, easy-to-read display
- Remote control
- Proportional control (4-20 mA input) strokes-per-minute, strokes-per-hour
- Internal or external control
- NEMA 4X enclosure

USFilter

REM-1D

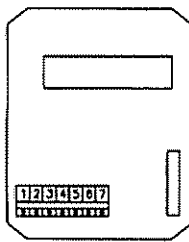
Revised 3-01



STRANCO PART NOS.

RM1974183 CABLE
2723001 3 PIN CONNECTOR
25643 4 PIN CONNECTOR

NOTE: J-301 PIN NUMBERS CORRESPOND TO IDENTICAL PIN NUMBERS ON LMI PUMP REMOTE SIGNAL INPUT CONNECTORS.



CONNECTIONS INSIDE REM-1D

T #2 WHITE
T #4 BLACK
T #3 GREEN
T #1 RED
T #6 BLACK
T #7 GREEN
T #5 RED

J-301, J-302 CONNECTORS

J-301, Pin #1
J-301, Pin #3
J-301, Pin #2
J-301, Pin #4
J-302, Pin #2
J-302, Pin #1
J-302, Pin #3

CABLE CONNECTIONS

RED Future Use
WHITE Power - (Common)
GREEN Pump Trigger (+15VDC)
BLACK Power + (+15VDC)
BLACK Signal Common
WHITE Future Use
RED 4-20 mA Signal

4-Pin Connector J-301
3-Pin Connector J-302
External Control
4-20mADC
220Ω Input Impedance

ZERO AND SPAN ADJUSTMENTS

Press MODE Key to enter external mode.

1. To Set Display/Output Ranges:

- Press MODE key to enter external mode.
- Press all 3 keys simultaneously and release. SPM and SPH LEDs will light up.
- Use UP/DOWN ARROW keys to set maximum display range.
- Press MODE key to accept and then INTERNAL and EXTERNAL LEDs will light up.
- Use UP/DOWN ARROW keys to set minimum display range.
- Press MODE key to accept and return to normal operation.

2. To Calibrate 4mA Point:

- Input 4mA into REM-1D.
- Press and hold DOWN ARROW key.
- Press MODE key (while still pressing DOWN ARROW key).

3. To Calibrate 20mA Point:

- Input 20mA into REM-1D.
- Press and hold UP ARROW key.
- Press MODE key (while still pressing UP ARROW key).

* NOTE: GASKET KIT P/N K7809901 AVAILABLE FOR PANEL MOUNTING.

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DIAPHRAGM PUMP INFORMATION

WARNING: ALWAYS wear protective clothing, face shield, safety glasses and gloves when working near or performing and maintenance or replacement on your pump. See MSDS Sheet from polymer supplier for additional precautions.

OUTPUT ADJUSTMENT CONTROLS

In most external controlled pumps the uppermost knob serves as speed control. Graduations for the Speed Knob appear directly on the face of the control panel. The largest knob below is Stroke Control.

1. Speed adjustment: Speed control provides adjustment of the percent of maximum strokes per minute. Turning this clockwise increase stroke frequency. **Note AA7 Series Only:** When operating pump in the external mode, the speed control knob should be fully turned counter clockwise. A click indicates pump is in external mode.

2. Stroke Adjustment; Stroke control provides adjustment of percent of maximum Liquifram (diaphragm) travel. Turning this knob counterclockwise increases percent output per stroke. Only adjust while pump is running.

PRIMING THE PUMP

Hold tip of syringe firmly in fitting with one hand while using the other hand to pull back on plunger. Repeat until a small amount of polymer is drawn into the syringe. The pump is now primed.

PUMP CALIBRATION

Perform calibration if your system application requires it. Normally calibration is NOT required.

You will need:

- A watch
- A calculator
- Calibrated cylinder (with at least 1000 ml capacity).

- Length of hose or tubing (same I.D. as pump ports)

1. Maintain all usual connections to the PolyBlend unit except disconnect the polymer suction line at pump input. The flow meter and pump setting should be those used for normal service.

2. Connect hose or tubing to the pump input. Place the free end of the tubing in the graduated cylinder.

3. Fill the cylinder with polymer to its measured capacity (for example, 1000 ml etc.).

4. Turn on the metering pump. Allow the pump to run until all air has been exhausted from the tubing and pump and polymer is injected into the mixing chamber.

5. Stop the pump.

6. Refill the cylinder to the measured capacity.

7. Start the pump again, and start timing as the pump runs. For best results, let the pump run long enough to pump at least half of the polymer out of the graduated cylinder. (in general, the longer the calibration period, the greater the accuracy of the measurement).

8. Stop the pump. Record the time and level of the polymer remaining in the cylinder. Fill in the following equation to find the volume of polymer pumped per one unit of time (a minute, an hour, or a day).

$$\frac{\text{Starting ml} - \text{Remaining ml}}{\text{Calibration period}} = \text{ml/Time}$$

9. Compare the actual volume pumped to the desired volume, and adjust pump controls.

10. Check volume again to confirm the new settings.

PRESSURE CONTROL (B and C series only)

A capped potentiometer is located on the face plate of the diaphragm pump. This potentiometer is for pressure control or power to the pump solenoid. Since the PolyBlend unit is equipped with a 20 PSI backpressure/check valve, the potentiometer should be set for full power or full clockwise.

NOTE: This is preset at the factory. In a case where obvious over-pumping is present, this potentiometer may be adjusted counter-clockwise.

Liquifram (Diaphragm) Replacement

When replacing the Liquifram, valve balls, seal rings and the injection check valve spring should also be replaced.

1. Carefully depressurize, drain and disconnect the pump discharge and suction lines. Place the suction tubing into a container of mineral oil. Turn the pump on to flush the head assembly. Once the pump head has been flushed, lift the suction tubing out of the mineral oil and continue to pump air into the pump head until the pump head is purged.

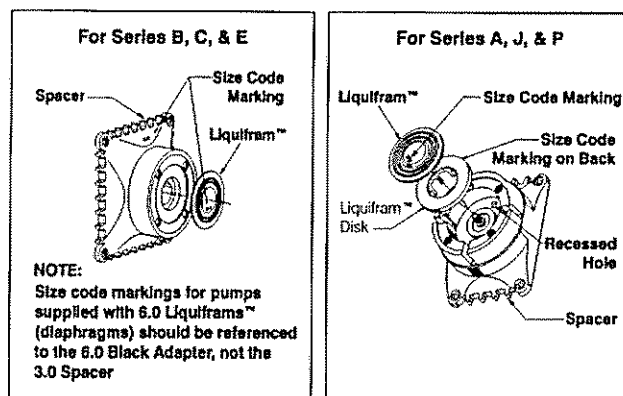
2. Start the pump. While running, set the stroke knob to zero and turn the pump off.

NOTE: See section on proper zeroing.

3. With the unit off, unscrew the Liquifram by carefully grasping the outer edge of the Liquifram and turning it counter clockwise. Discard old Liquifram disk if so equipped (locate behind the Liquifram) and check that the size code matches the size code on the replacement Liquifram (see illustration).

4. Reinstall the disk so alignment pin on the disk (if present) seats in the recessed hole in the EPU.

WARNING: Take care not to scratch the Teflon face of the new Liquifram.

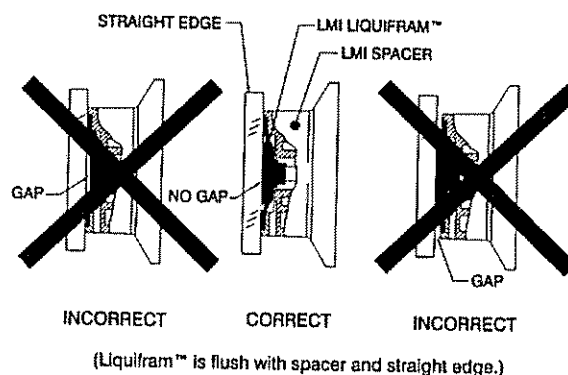


5. Start the pump and turn the stroke knob to the setting indicated on the Stroke Setting Chart which matches the pump model number located on the pump dataplate. With the pump stoking (running), screw on the new Liquifram clockwise until the center begins to buckle inward. Stop the pump.

Liquifram Stroke Setting Chart

<u>Pump Series</u>	<u>Stroke Knob Settings</u>
A11 AA, B72, C72,	90%
C77	70%

6. Grasp the outer edge of the Liquifram and adjust by screwing it in or out so that the center of the Liquifram is flush with the outside of the spacer edge (see illustration).



7. Once the Liquifram is properly positioned, remount the pump head to the spacer using the four (4) screws. Tighten in a crisscross pattern. After one week of operation, recheck the screws and tighten if necessary.

Seal Ring, Ball and Injection Check Valve Spring Replacement

1. Carefully depressurize, drain and disconnect the discharge and suction lines. Place the suction tubing into a container of mineral oil. Turn the pump on to flush the head assembly. After flushing, lift the suction tubing out of the mineral oil and continue to pump air into the pump head until the pump head is purged. If the liquid cannot be pumped due to Liquifram rupture, with protective gloves, carefully disconnect the tubing and four screws to remove the head. Immerse the head in mineral oil or other neutralizing solution.

IMPORTANT: Before disassembling valves, note the orientation of seal ring and ball. (See illustration).

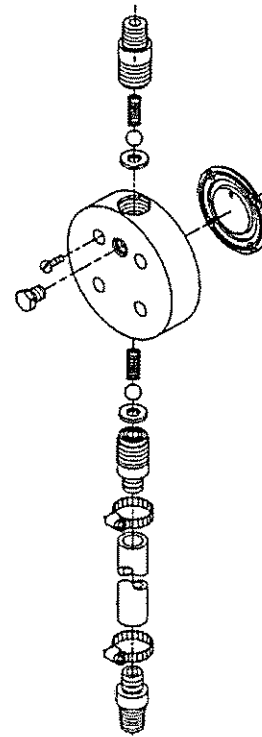
2. Carefully disconnect one tubing connection and fitting at a time and remove the worn seal ring and ball. Carefully loosen sealing by prying side to side using a small screw driver through the center hole of the seal ring.

3. Install new seal ring and ball in each location.

IMPORTANT: Note correct orientation.

4. Install the new spring valve in the Injection Check Valve.

Seal Ring, Ball and Injection Check Valve Spring Replacement



Order of Installation

Check Pump for Proper Zeroing (Stroke Knob)

1. With pump running, turn stroke knob counter clockwise toward zero or end of black or red band.

2. LISTEN to the clicking as the pump is running. The pump should operate quietly at the zero position (no clicking).

3. If the pump continues to click at zero or stops clicking before zero is reached, the pump must be reset.

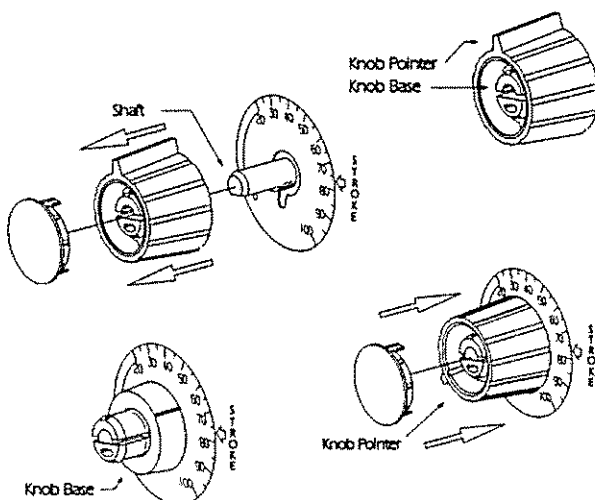
Type I – Push on Knob Rezeroing and Stroke Knob Disassembly and Assembly

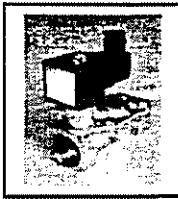
1. Remove stroke knob from the pump by grasping the knob firmly and pulling it toward you.
2. Pry off the yellow cap.
3. Place the knob on a flat surface.
4. Using needle nose pliers, squeeze the inner section up together while lifting the outer section up.
5. Push the inner section back onto the “D” shaped stroke shaft.
6. With the pump running, zero the pump by turning the inner section of the knob counter clockwise until the pump stops clicking.
7. Position the outer section of the knob so that the pointer aligns with zero on the nameplate or end of the black or red band.
8. Push down on the outer section (a snap sound indicates parts are locked together).
9. Replace the yellow cap over the outer section of the knob, aligning the tabs on the cap with the slots inside the knob.

Type III Collet Knob Rezeroing and Stroke Knob Disassembly and Assembly

1. Remove yellow cap.
2. Hold knob with soft jaw pliers.
3. Disconnect knob by loosening 5/16” (8mm) collet nut. There is no need to remove nut.
4. Remove knob by pulling towards you.
5. With pump running, zero the pump using a screwdriver to turn the stroke shaft counter-clockwise until the pump just stops clicking.
6. Pump is now zeroed.
7. Position knob at zero, or the end of the low range band, and tighten 5/16” (8mm) collet nut.
8. Replace yellow cap.

Stroke Knob Assembly (Type I)





INSTALLATION, OPERATING & MAINTENANCE INSTRUCTIONS
2-WAY N.C. AND N.O. PILOT OPERATED VALVES
3/8", 1/2", 3/4" and 1" NPT
1-1/4", 1-1/2" and 2" NPT
WATER VALVE TYPES: 7321B



DESCRIPTION

The 7321B valves are 2-way, pilot operated diaphragm valves requiring a minimum operating pressure differential to insure valve operation. Valves are available in normally closed (N.C.) and normally open versions of brass construction. Valves may be ordered with either NEMA 2, 4, 4X integrated coils for ordinary locations or NEMA 4, 4X, 7, and 9 for hazardous locations: Divisions I and II; Class I, Groups A, B, C, and D; Class II, Groups E, F, and G. Additional solenoid coils and enclosures are offered as described in our catalog.

PRINCIPLES OF OPERATION

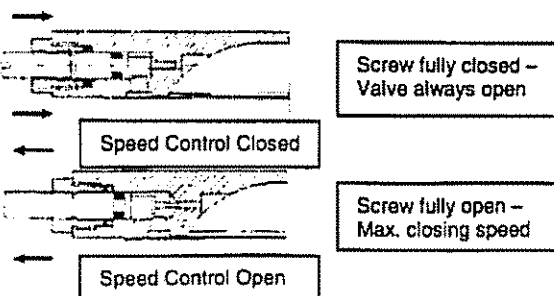
Normally Closed type: 7321B

De-energized: A flow arrow on the body indicates flow direction. Ports are not marked. Pressure is connected to the inlet port. The fluid enters the valve below the diaphragm assembly, flows through the diaphragm bleed hole and fills the cavity above the diaphragm. The diaphragm is pressed against the main orifice by the force of the plunger spring and the fluid pressure sealing the main orifice. The plunger seals the diaphragm pilot orifice and there is no flow through the valve.

Energized: Low differential pressure operation: With very low differential pressure, energizing the coil creates a magnetic force sufficient to lift the plunger off the pilot orifice and vents the pressure above the diaphragm. The venting creates a pressure imbalance across the diaphragm, which causes the diaphragm to open the valve main orifice allowing flow through the valve. The valve will remain open as long as the coil is energized.

Metering Valves (Closing Speed):

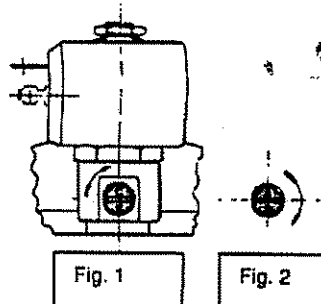
Metering described is optional – these descriptions and operating instructions apply only to valves that have been equipped with the appropriate metering.



Valves with the metering screw feature located in the cover function the same as the above valves except during de-energizing the closing of the diaphragm assembly is slowed by adjustment of a speed control metering stem.

Manual Overrides Valves:

Manual overrides described are optional – these descriptions and operating instructions apply only to valves that have been equipped with the appropriate manual override.



The unit is shipped with a manual override feature. The manual control is used to operate the valve without connecting the coil. The slotted control screw has two positions:

Closed: To function, turn the slotted screw component located in the cover below the sleeve tube so the letter "C" is in the upper position of the screw head (Fig. 1).
Open: To function, turn the slotted screw head so the letter "A" is in the upper position of the screw head (Fig. 2).

Normally Open type: 7322B

De-energized: A flow arrow on the body indicates flow direction. Ports are not marked. Pressure is connected to the inlet port. The fluid enters the valve below the diaphragm assembly lifting the diaphragm open allowing flow through the valve. The valve will remain open as long as the coil is de-energized.

Energized: The plunger moves, closing the pilot orifice, which causes the pressure to build up above the diaphragm. The increased pressure and the diaphragm spring cause the diaphragm to close the main orifice,

stopping flow through the valve. The valve will remain closed as long as the coil is energized.

NOTE: When the valve is removed from the box, the diaphragm will be closed. Line pressure will open the valve.

CAUTION: A minimum operating pressure differential is required for proper valve operation. Consult nameplate rating.

FLUID CODES

Listed below are the codes utilized by Underwriters Laboratories (UL) and the Canadian Standards Association (CSA) for various common fluids. The codes for those fluids that are approved or certified by the agencies for use with each valve are printed on the outside of the individual packaging.

CODE	FLUID
S	- Steam
W	- Water or other aqueous nonflammable liquids

For the maximum fluid temperatures, as well as valve ambient limitations, check the valve part number on the nameplate and refer to the catalog.

INSTALLATION INSTRUCTIONS

Mounting position and pressure limits: Valves can be mounted directly on piping and are designed to operate in any position. However, for optimum life and performance the valves should be mounted vertically upright so as to minimize wear and reduce the possibility of foreign matter accumulating inside the sleeve area possibly resulting in valve failure.

Line pressure must conform to nameplate rating.

Piping: Remove protective closures from the ports. Connect line pressure to the upstream port. An arrow on the body indicates direction of flow. Use of Teflon tape, thread compound or sealants are permissible, but should be applied sparingly to male pipe threads only.

CAUTION: Do not allow foreign particles, Teflon tape, or thread compound to enter valve. Only the wrench flats provided on the body ports should be used in applying the torque. Tightening torque should not exceed the following values for each port size:

3/8" NPT - 250 in-lbs. 1/2" NPT - 350 in-lbs.
3/4" NPT - 450 in-lbs. 1" NPT - 600 in-lbs.
1-1/4" NPT - 700 in-lbs. 1-1/2" NPT - 750 in-lbs.
2" NPT - 950 in-lbs.

Do not use sleeve or enclosure as a lever when applying torque. Connect outlet line to opposite port. Only use wrench flats provided on the body when applying torque.

Media filtration: For protection of the valve, install a suitable strainer or filter in the inlet side as close to the valve as possible. Recommended strainer of 100 microns or better. Dirt or foreign material in the media may cause excessive leakage, wear, or in exceptional cases,

malfunction. Clean periodically depending on service conditions.

Lubrication: Lubrication is not required although air line lubrication will substantially increase valve life.

CAUTION: Valve types with an "E" in the 10th position of part number have parts made from ethylene propylene rubber and must not be exposed to petroleum based lubricants or other hydrocarbons.

ELECTRICAL CONNECTION: Electrical supply must conform to nameplate rating. Connect coil leads or terminals to the electrical circuit using standard electrical practices in compliance with local authorities and the National Electrical Code.

Do not power coil until it has been fitted and the retaining washer and screw have been installed to prevent possible coil damage from overheating.

WARNING: Valves to be installed in Hazardous Locations must be outfitted with Hazardous Location coils only. Verify nameplate data and coil part number before installing the valve.

WARNING: Turn off electrical power before connecting the valve to the power source.

If the coil assembly is located in an inconvenient orientation, it may be reoriented to facilitate installation. Loosen coil assembly nut, rotate coil assembly to desired position, and then retighten the nut with an input torque of 43-53 in-lbs.

DIN Coil and Various Cable Option Terminations: Loosen cable screw and remove plastic housing from DIN coil. Do not remove the gasket from the DIN spades on the coil. Separate the plastic block from the housing with a small screwdriver to expose the electrical terminations. Feed the lead wires through the DIN connector housing and attach them to the appropriate screw terminal. Snap the plastic block back into place. Replace the plastic housing onto the DIN spades and tighten the screws. To secure the housing and coil together. Apply 20 to 30 in-lbs. torque to the mounting screw.

DIN Coil and Terminal Box Assembly (Coil / Option Codes D1DB, D2DB, D3DB): Loosen cover screws and swing cover 90° toward the conduit hub in order to access the interior space. Separate the plastic block containing the screw terminals from the metal enclosure using a small Flathead screwdriver. Feed the lead wires through the conduit hub and attach them to the appropriate screw terminal. For electrical connection within the terminal box, use field wire that is rated for 90° C or greater. Snap the plastic block back into place inside the metal enclosure. Replace the cover and hand-tighten the cover screws. Place the gasket over the DIN spades on the coil and press the terminal box and coil together. Secure the terminal box to the coil using the mounting screw provided. Apply 20 to 30 in-lbs. torque to the mounting screw.

Screw Terminal Coil and Terminal Box Assembly (Coil / Option Codes S1TB, S2TB, S3TB): Loosen cover screws and swing cover 90° toward the conduit hub in order to access the interior space. Feed the lead wires through the conduit hub and attach them to the

appropriate screw terminal. For electrical connection within the terminal box, use field wire that is rated for 90° C or greater. Replace the cover and hand-tighten the cover screws. Press the terminal box and coil together. Secure the terminal box to the coil using the mounting screw provided. Apply 20 to 30 in-lbs. torque to the mounting screw.

CAUTION: When the DIN or Screw Terminal coils are used with the Terminal Box Assembly, be sure to apply a wrench to the wrench flats on the conduit hub when installing electrical conduit.

Coil/enclosure temperature: Standard valves are supplied with coils designed for continuous duty service. Normal free space must be provided for proper ventilation. When the coil is energized continuously for long periods of time, the coil assembly will become hot. The coil is designed to operate permanently under these conditions. Any excessive heating will be indicated by smoking and/or odor of burning coil insulation.

For the maximum valve ambient conditions, as well as the fluid temperatures, check the valve part number on the nameplate and refer to the catalog to determine the maximum temperatures.

MAINTENANCE

Note: Depending on service conditions, fluid being used, filtration, and lubrication, it may be required to periodically clean and/or replace worn components. See Disassembly Instructions.

CAUTION: Do not expose plastic or elastomeric materials to any type of commercial cleaning fluid. Parts should be cleaned with a mild soap and water solution.

DISASSEMBLY INSTRUCTIONS

WARNING: Depressurize system and turn off electrical power to the valve before attempting repair.

The valve body need not be removed from the line.

To remove the coil assembly:

For both ordinary and hazardous location constructions, unscrew the nut on the top of the coil assembly. The wave washer and coil assembly can now be removed.

To disassemble the pressure vessel:

CAUTION: Do not use a pipe wrench directly on the sleeve tube.

Use a 7/8" (22mm) wrench or an adjustable wrench to remove the sleeve tube. The plunger, return spring and flange seal may be removed.

Unscrew the four (4) or (6) cover screws. The diaphragm assembly, return spring, and O-ring can now be removed. On metering valves, the speed control feature can also be removed at this time. If the cover cannot be easily lifted off the body, laterally tap the cover or gently pry the cover from the body. Care must be taken not to damage the diaphragm, cover or body.

Replacement Parts: When ordering replacement parts kits, specify valve number and voltage from nameplate. Parts kits are available for each valve. Parts included in each kit are marked with an asterisk (*). See section drawing and component tabulation.

REASSEMBLY INSTRUCTIONS

WARNING: Valves equipped with Hazardous Location coils must use Hazardous Location replacement coils only. Verify nameplate data and coil part number before installing the replacement coil.

To reassemble the pressure vessel:

Refer to exploded view drawings. Assemble the O-ring into the body groove. For valves with the metering feature, replace the O-rings and reassemble the speed control device at this time. Install the diaphragm assembly into the body. Making sure the diaphragm tab is located over the outlet port of the body. Line up the diaphragm bolt holes with the appropriate bolt and flow holes in the body. Install the screws and tighten screw with a torque of 70-80 in-lbs for the 3/8" and 1/2" sizes and 125-150 in-lbs for the larger port size valves. Avoid damaging the main orifice when placing the diaphragm assembly in the valve.

Install the manual override (where applicable) into the cover prior to sleeve assembly. Insert the manual override into the valve cover. Rotate the override until the large flat surface of the override is facing out of the cover. This orientation is required for proper sleeve assembly.

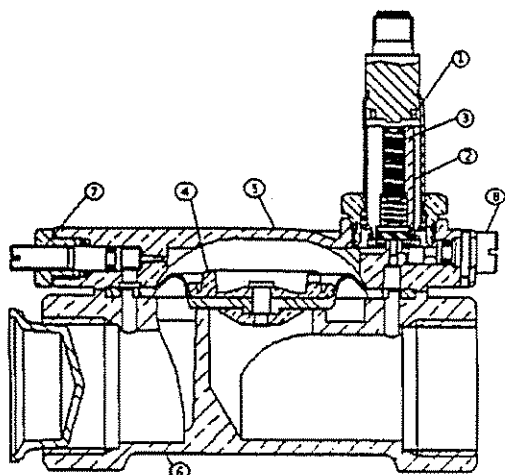
If the sleeve was removed from the cover, install the plunger and spring into the sleeve. Tighten the sleeve assembly with an input torque of 230-250 in-lbs.

With the coil assembly repositioned on the sleeve, slide the wave washer over the sleeve and tighten coil assembly nut with an input torque of 43-53 in-lbs.

After re-assembly, it is advisable to thoroughly check for leakage and for correct operation of the valve.

Refer to the Installation Instructions for remaining installation procedures.

TROUBLE SHOOTING	
PROBLEM	PROCEDURE
Valve fails to operate.	<ol style="list-style-type: none"> 1. Check electrical supply with voltmeter. Voltage must agree with nameplate rating. 2. Check coil with ohmmeter for shorted or open coil. 3. Make sure that pressure complied with nameplate rating.
Valve is sluggish or inoperative - electrical supply and pressure check out.	<ol style="list-style-type: none"> 1. Disassemble valve as per the Disassembly Instructions. Clean out any extraneous matter. The plunger must be free to move without binding. 2. Check the diaphragm for tears and for clogged or obstructed bleed hole or pilot orifice. Torn diaphragm must be replaced. 3. Check all springs, if broken, replace.
External leakage at sleeve flange to cover joint.	<ol style="list-style-type: none"> 1. Check that sleeve is torqued to 260-270 in-lbs. 2. Check flange seal for damage. Replace if defective.
External leakage at flange joint between body and cover.	<ol style="list-style-type: none"> 1. Check that cover screws are torqued with an input torque per reassembly instructions. If leakage persists, replacement of diaphragm assembly or flange O-ring may be required and/or bodies or covers with damaged sealing surfaces may have to be replaced.
External leakage at metering speed control device.	<ol style="list-style-type: none"> 1. Check O-rings for damage. Replace if necessary.
Internal Leakage	<ol style="list-style-type: none"> 1. Disassemble valve as per the Disassembly Instructions. Remove extraneous matter. Clean parts in a mild soap and water solution. 2. Examine diaphragm sealing surface for dirt. Remove all foreign particles. Examine orifice for nicks. Damaged parts must be repaired or replaced. 3. Check plunger return spring. Replace if broken.



Normally Closed Valve (typical)

Part	Description
1	Sleeve Assembly
2	Plunger Assembly
3	Plunger Spring
4	Diaphragm Assembly
5	Cover
6	Body
7	Metering Stem (optional)
8	Manual Override Stem (optional)

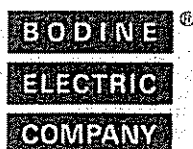
* Parts included in repair kit. Contact Parker Skinner Valve for repair kit number based on selected valve.

DECLARATION

Parker's Skinner Valve Division certifies its valve appliance products comply with the essential requirements of the applicable European Community Directives. We hereby confirm that the appliance has been manufactured in compliance with the applicable standards and is intended for installation in a machine or application where commissioning is prohibited until evidence has been provided that the machine or application is also in compliance with EC directives.

The data supplied in the Skinner valve catalogs and general Installation, Operating & Maintenance Instructions are to be consulted and pertinent accident prevention regulations followed during product installation and use. Any unauthorized work performed on the product by the purchaser or by third parties can impair its function and relieves Parker Hannifin of all warranty claims and liability for any misuse and resulting damage.

A separate Declaration of Conformity or Manufacturer's declaration is available upon request. Please provide valve identification numbers and order serial numbers of products concerned.



MOTOR/GEARMOTOR SAFETY, INSTALLATION, USE, AND MAINTENANCE INFORMATION

Bodine Electric Co., 2500 W. Bradley Pl., Chicago, IL 60618 U.S.A.

Form P/N 074 00045 Printed in U.S.A. (CH)

Congratulations . . . and thanks on your selection of a Bodine Motor/Gearmotor. With your new drive unit you will find yourself enjoying the same high performance and relatively trouble free operation that have been characteristic of Bodine products since 1905. We call it ADE (After Delivery Economy).

The Bodine Electric Company prides itself on the quality of design and manufacture of its products. Great care is taken in an attempt to provide products free of defective design, workmanship, or materials. It will be considered a favor to have cases of unsatisfactory service from Bodine products brought to our attention.

SAFETY

"The use of electric motors and generators, like that of all other utilization of concentrated power, is potentially hazardous. The degree of hazard can be greatly reduced by proper design, selection, installation, and use, but hazards cannot be completely eliminated. The reduction of hazard is the joint responsibility of the user, the manufacturer of the driven or driving equipment, and the manufacturer of the motor or generator."

Bodine products are designed and manufactured to comply to applicable safety standards and in particular to those issued by ANSI (American National Standards Institute), NEMA (National Electrical Manufacturers Association), U.L. (Underwriters Laboratories, Inc.), and CSA (Canadian Standards Association).

Most Bodine products are "third party approved" with respect to construction. Motors and gearmotors having component recognition by U.L. Inc. have a "C" or "A" symbol in the left-most unlabeled space on the bottom row of their nameplates. Those that are CSA certified have a "C" mark in the same location. If you need specific information regarding the "third party approval" of Bodine products, contact your Bodine representative, or the home office.

However, since even well-built apparatus can be installed or operated in a hazardous manner, it is important that safety considerations be observed by the user. With respect to the load and environment, the user must properly select, install, and use the apparatus—for guidance on all three aspects see safety standards publication No. ANSI/NEMA MG-2.

■ Standards Publication No. ANSI/NEMA MG-2. "Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators."

Available from:
National Electrical Manufacturers Assoc.
2101 L Street N.W.
Washington, D.C. 20037, U.S.A.

SELECTION

Before proceeding with the installation, the user should review the application to confirm that the proper drive has been selected. This should be done after reading this notice and all applicable safety standards. If in doubt, contact your Bodine Representative or the Home Office if there is no Representative in your area. Any selection or application suggestions made by Bodine are only to assist the customer—and in all cases, determination of fitness for purpose or use is solely the customer's responsibility.

Unless otherwise agreed to by Bodine, all

nameplate ratings are based on the following normal operating conditions:

1. Duty—8 hours per day; 5 days per week if nameplated continuous duty (CONT), without frequent reversals or starts and stops. Products intended for intermittent duty show a time rating on the nameplate based on keeping the winding temperature within the maximum allowable temperature of the insulation system when the motor is started with windings within 5°C of the ambient temperature.
2. Ambient temperature 0 to 40°C (104°F).
3. Load—Uniform and free from shock or high inertia.
4. Voltage—Within 10% of nameplate rating.
5. Frequency—Within 5% of nameplate rating.
6. Combined variation of voltage and frequency—Within a total of 10% providing frequency variation does not exceed 5%.

Consult Bodine if variations from the above conditions are contemplated.

INSTALLATION

It is the responsibility of the equipment manufacturer or individual installing the apparatus to take diligent care in installing it. The National Electrical Code (NEC), sound local electrical and safety codes, and when applicable, the Occupational Safety and Health Act (OSHA) should be followed when installing the apparatus to reduce hazards to persons and property.

Inspection

Examine for damage from shipment before connecting. Any claim(s) for shipping damage should be made to the freight carrier. Do not attempt to turn the output shaft of a gearmotor with an externally applied torque arm.

Mounting

Any screws, or similar devices, that penetrate the motor frame either for mounting the Bodine product or mounting something to the product should be limited in length so as not to come in contact with, or in close proximity to, intended features that conduct electricity. Spacings as high as .158" may be required based on voltages and circuitry involved. Consult factory if necessary.

Preferred mounting positions for Bodine products are illustrated in selection literature. Gearmotor mountings other than those shown are not recommended on some gearmotors due to (a) the possibility of gearhead lubricant leakage into the motor portion and (b) possible leakage from gearhead breather and oil level holes. Also, for parallel-shaft gearmotors, the proper lubricant quantity provided for horizontal mounting is not sufficient for vertical mounting. By making the proper adjustments (normally done at the factory), mountings other than the preferred positions of gearmotors are possible.

Connection

Follow nameplate for voltage, frequency, and phase of power supply. See accompanying wiring diagram as to connections for rotation (and capacitor, resistor, relay, protector, if required). When connecting, make sure that your motor/gearmotor is securely and adequately grounded—failure to ground properly may cause serious injury to personnel. (If wiring diagram shipped with drive unit becomes lost or missing, contact Bodine, providing serial number (NO) and (TYPE) information shown on the nameplate of the unit).

Wiring

For wire sizes and electrical connections refer to the National Electric Code (NEC)—Article 430—"Motors, Motor Circuits, and Controllers" and/or applicable local area codes. If extension cords are used, they should be kept short for minimum voltage drop. Long or inadequately sized cords can cause motor failure, particularly with hard starting loads when current draw tends to be at its highest.

USE

Additional Safety Considerations

The chance of electric shocks, fires, or explosions can be reduced by giving proper consideration to the use of grounding, thermal and over current protection, type of enclosure, and good maintenance procedures.

The following information supplements the foregoing safety considerations: This information is not purported to be all-inclusive and the aforementioned references should be consulted.

1. Do not insert objects into the ventilation openings of products.
2. Sparking of starting switches in AC motors so equipped, and of brushes in commutator type motors, can be expected during normal operation. In addition, open-type enclosures may eject flame in the event of an insulation failure. Therefore, avoid, protect from, or prevent the presence of flammable or combustible materials in the area of motors/gearmotors.
3. Bodine totally enclosed products are not explosion proof or dust ignition proof nor does Bodine offer such products for hazardous locations (flammable/explosive gas, vapor, dust). When dealing with hazardous locations, an approved explosion proof or dust ignition proof product is the recommended approach. Exceptions are allowed by the National Electrical Code: The NEC and the NEMA safety standard should be studied thoroughly before exercising this option.
4. Open, ventilated motors are suitable for clean, dry locations where cooling air is not restricted. Enclosed motors/gearmotors are suitable for dirty, damp locations. For outdoor use, wash downs, etc., enclosed motors must be protected by a cover while still allowing adequate air flow.
5. Moisture will increase the electrical shock hazard of electrical insulation. Therefore, consideration should be given to the avoidance of (or protection from) liquids in the area of motors. Use of totally enclosed motors/gearmotors will reduce the hazard if all openings are sealed.
6. Products equipped with thermal protectors are labeled "THERMALLY PROTECTED." If severe over-loading, jamming, or other abnormal operating conditions occur, such heat sensitive protectors operate to open the electric power supply circuit. Motors/gearmotors with "automatic" thermal protectors MUST NOT be used where automatic restarting of the drive unit could be hazardous in that clothing or parts of the human body could be in electrical or physical contact with a machine that starts unexpectedly when the thermal protector cools down. MANUAL RESET protectors or suitable electric supply disconnect devices/procedures should be used where such hazards could be created.

- The windings of DC stepper motors, or their switching transistors, must be disconnected from the DC power source to avoid unexpected motion. If not, extraneous signals could turn on the power transistors and generate motion.
- Some oil-type capacitors contain a non-PCB impregnate which is *flammable*. Such capacitors are identified by means of a Warning Label and, in addition, are stamped "NON-PCB." The user has to provide at least .57 in. (14.5mm) clearance beyond the terminal blades for case expansion to allow an internal safety switch to permanently open and electrically disconnect the capacitor. The internal pressure sensitive switch is designed to prevent the expulsion of the flammable dielectric medium if excessive temperatures are generated by electrical operation. Do not discard such capacitors into open fire as excessive external heat could cause them to explode.
- Motors/gearmotors which employ capacitors, can develop more than nameplate voltage across the capacitor and/or capacitor winding (depending on design). Also, overdrive voltages may be many times greater than a stepper motor's continuous voltage rating. Suitable precautions should be taken when applying such motors.
- Abnormal conditions such as cut-out switch failure, or a partial winding failure can very occasionally cause some AC motors/gearmotors to start in a direction reverse from normal. Also, use a capacitance or resistance value other than that recommended for Hy-Sync™ motors may result in unpredictable reverse operation. Susceptibility to unplanned reversing under such conditions is greatest when the motor's actual load is light relative to its rated load. One-way clutches or similar devices are advisable if unexpected reverse rotation is unsafe in the application.
- Do not rely upon self-locking gears or permanent magnet, stepper, Hy-Sync™, or energized motors to hold a load in place if movement could result in personal injury. Mechanical locking devices should be used in such applications.
- For motors driven by electronic controls, do not use a function of the control for safety interlock purposes. An independent switch or relay should be used. On stepper motors, the device should be between the control and the motor.

Before Starting

- Before attempting to start, check all connections and fuses.
- Proper consideration should be given to rotating members: Before starting, be sure keys, pulleys, etc. are securely fastened. *Proper guards should be provided to prevent hazards to personnel while rotating.*
- Other mechanical considerations include proper mounting and alignment of products and safe loads on shafting and gearing.

Starting

- The motor/gearmotor should be test-started in an unloaded state (because of possible reaction torque, the drive should be securely mounted when starting—even when unloaded).
- If the drive unit does not start promptly and run smoothly, disconnect at once.
- If unable to correct the problem, contact your purchase source, or a Bodine Authorized Service Center, describing the trouble in detail. Include the serial number, type, and other nameplate data. Do not dismantle the product—unless authorized by Bodine, removing screws voids the warranty.

MAINTENANCE

IMPORTANT—Before servicing or working on equipment, disconnect power source (this applies especially to equipment using automatic restart devices instead of manual restart devices and when examining or replacing brushes

on brush-type motors/gearmotors).

Clean regularly to prevent dirt and dust from interfering with ventilation or clogging moving parts.

Brush Type Motors/Gearmotors—The wear rate of brushes is dependent upon many parameters (armature speed, amperage duty cycle, humidity, etc.). For optimum performance, brush-type motors and gearmotors need periodic user-maintenance. The maintenance interval is best determined by the user. Inspect brushes regularly for wear (replace in same axial position). Replace brushes when their length is less than 1/4 inch (7mm). Periodically remove carbon dust from commutator and inside the motor—this can be accomplished by occasionally wiping them with a clean, dry, non-linting cloth. Do not use lubricants or solvents on the commutator. If necessary, use No. 0000 or finer sandpaper only to dress the commutator. Do not use solvents on a non-metallic endshield if the product is so equipped.

Products Employing Capacitors—Before servicing motors/gearmotors employing capacitors, always discharge the capacitor by placing a conductor across its terminals before touching the terminals with any part of your body.

LUBRICATION INSTRUCTIONS

Motor Ball Bearings (not gearhead bearings)—are grease lubricated and do not normally require re-lubrication or replacement for a period of approximately five years if run under normal operating conditions (defined above). More adverse conditions generally require more frequent servicing. Do not over-grease ball bearings as shortened life can result.

Motor Sleeve Bearings (not gearhead sleeve bearings)—sleeve bearing motors are identified by the presence of oil holes or oilers on the motor endshields. Motor sleeve bearings should be re-lubricated every six months or 1000 operational hours (whichever comes first) when used under normal operating conditions as defined above. For motors under (4) inches in diameter, re-lubricate with 5-6 drops of SAE No. 10 non-detergent oil (Bodine #LO-30). For larger diameter motors, re-lubricate with 5-6 drops of SAE #20 non-detergent oil (Bodine #LO-17). More severe conditions will require more frequent servicing. Do not over-lubricate.

Gearhead Lubrication—Gearmotors consists of a motor portion and a gearhead portion. The previous sections dealt with motor bearings—the following text concerns gearhead (gear and gear-shaft bearing) lubrication.

A. Oil Lubricated Gearmotors (identified by the presence of an oil level sight gauge or plug marked "Oil Level"). Oil lubricated gearheads are shipped with a red plastic plug in their vent holes. *Remove red plastic plug from oil fill vent hole before starting.* (Gearbox must be vented to prevent internal pressure build-up as the unit heats up.) When operating under normal operating conditions, check oil level every 4 to 5 months or 600 operating hours—whichever occurs first.

1. Type "10" Gearheads: These gearmotors are identified by the "10" appearing after a hyphen in the TYPE box

on the nameplate. For example: **NCI-1000** (where the identifying designators are illustrated and a "10" indicates the location of any other number or letter). Refill "10" gearheads to the indicated oil level with a good quality rust and oxidation inhibited oil conforming to AGMA#5 (SAE#50 non-detergent) with a viscosity range of 918-1122 SUS @ 100°F, viscosity index of 90 minimum, and pour point of 0°F (minus 17.8°C) max., or Bodine lubricant #LO-38. Do not over-fill.

2. Oil Lubricated Gearmotors other than Type "10": These gearmotors can be identified as follows: examine the nomenclature in the "TYPE" box on the nameplate; if any of the combinations of numbers and letters defined below appear after a hyphen, the gearmotor is oil lubricated. (The identifying designators are illustrated and a "10" symbol indicates the position of any other number or letter).

-30RHL	-50RHL	-30RJ
-5F	-5N	-5H

Examples: NCI-34RHL (-30RHL)
32D5BEPM-5F (-5F)

Refill these gearmotors to oil level indicated on the respective product with a good quality worm gear oil conforming to AGMA #5 EP compounded (SAE #90) oil, or Bodine lubricant #LO-23. Do not over-fill.

3. Note: For test and run-in of gearmotors that are applied to equipment for resale, remove red plastic vent hole plug from oil fill vent hole. If gearmotor may be tipped during shipment, replace plastic plug and include instructions to remove the plug before operating the gearmotor.

B. Grease Lubricated Gearmotors: Grease lubricated gearmotors can be identified as follows: examine the nomenclature in the "TYPE" box on the nameplate; if any of the combinations of numbers and letters defined below appear after a hyphen, the gearmotor is grease lubricated. (The locations of the identifying designators are illustrated and a "10" symbol indicates the position of any other number or letter).

-200A	-200C	-10R	-10RH*	-30R*
-10RG	-30RH	-50R*	-W3	-E3

Examples: NSI-12R (-10R)
42R5BFCI-E3 (-E3)

The above gearmotors are supplied with sufficient grease to last for the "design life" of the gearmotors. Some right-angle gearheads may have oilers on their output shaft hubs. The oilers should be relubricated every three months with 5-6 drops of SAE #20 non-detergent oil (Bodine #LO-17).

C. General—The above recommended lubricants may be purchased in one pint containers from the Bodine Electric Company, 2500 West Bradley Place, Chicago, Illinois 60618, U.S.A., or a Bodine Authorized Service Center. Gearmotors should be re-lubricated only with recommended lubricants for maximum life of gears, bearings, and seals.

BODINE LIMITED WARRANTY

The Bodine Electric Company warrants all products manufactured by it to be free of defects in workmanship and materials when used under Normal Operating Conditions and when applied in accordance with nameplate specifications. This warranty shall be in effect for a period of twelve months from date of purchase or eighteen months from date of manufacture, whichever comes first.

The Bodine Electric Company will repair or replace at its option, any of its products which has been found to be defective and is within the warranty period, provided that the product is shipped freight prepaid, with previous authorization, to Bodine's plant in Chicago, Illinois 60618 U.S.A., or to the nearest Bodine Authorized Service Center. At its option, all return shipments are F.O.B. Bodine's plant or Authorized Service Center. Bodine is not responsible for removal, installation, or any other incidental expenses incurred in shipping the product to or from Bodine.

This warranty is in lieu of any other expressed or implied warranty—including (but not limited to) any implied warranties of merchantability and/or fitness for a particular use or purpose.

Bodine's liability under this warranty shall be solely limited to repair or replacement of the Bodine product within the warranty period and Bodine shall not be liable, under any circumstances, for any consequential, incidental or indirect damages or expenses associated with the warranted products.

Commutators and/or brush wear and its associated effects are a normal occurrence and are not covered by this warranty unless otherwise agreed to by Bodine in writing.

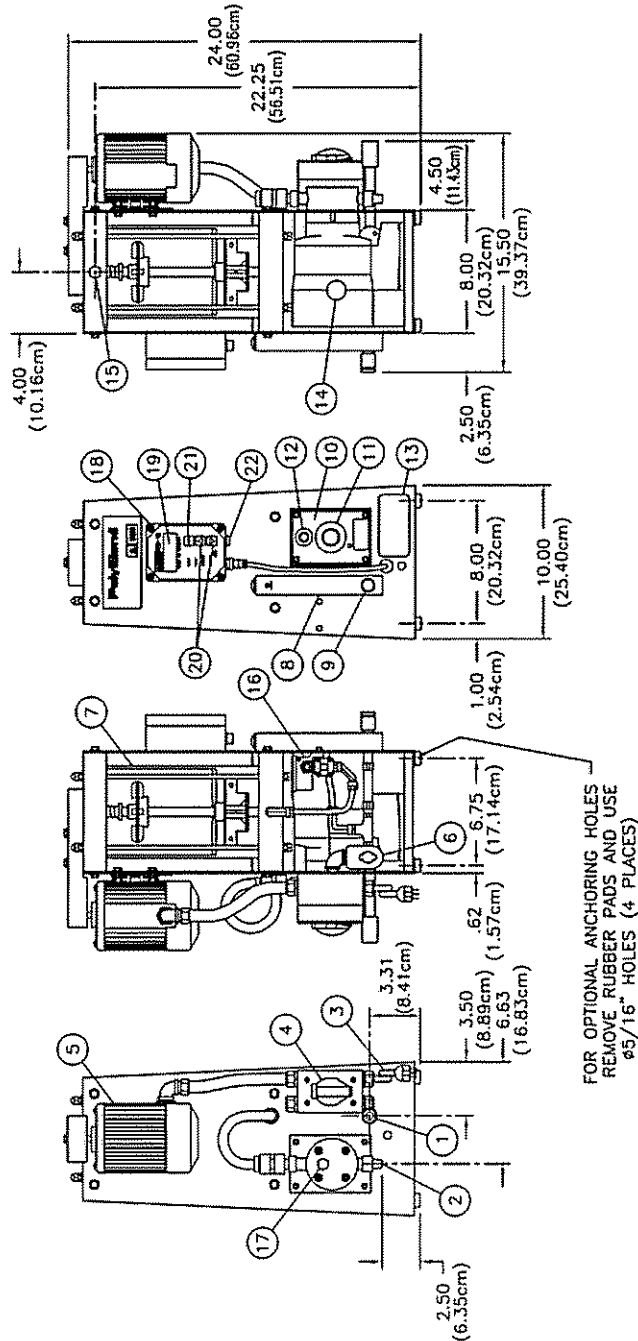
Any Bodine product which is damaged due to misuse, abuse, negligence or has been modified or dismantled without the knowledge or written consent of Bodine, is not covered by this warranty.

Motor/Gearmotor Serial No. _____ Purchase Date _____ Installed By _____

DRAWING NUMBER:
PB100

NOTICE - U.S. Filter/Stranco CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED ON THIS DRAWING. IT IS ISSUED IN CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND MAY NOT BE REPRODUCED OR USED TO MANUFACTURE ANYTHING HEREON WITHOUT DIRECT WRITTEN CONSENT FROM U.S. Filter/Stranco TO THE USER.

PB UNIT	PUMP OUTPUT	ROTAMETER RANGE
PB16-0.4	0-0.42GPH	1-16GPH
PB16-1	0-1GPH	1-16GPH
PB16-2	0-2GPH	1-16GPH
PB50-0.4	0-0.42GPH	4-50GPH
PB50-1	0-1GPH	4-50GPH
PB50-2	0-2GPH	4-50GPH
PB100-0.4	0-0.42GPH	10-100GPH
PB100-0.6	0-0.6GPH	10-100GPH
PB100-1	0-1GPH	10-100GPH
PB100-2	0-2GPH	10-100GPH
PB100-1A	0-3.8LPH	38-375LPH
PB100-0.4K	0-1.6LPH	38-375LPH
PB100-1K	0-3.8LPH	38-375LPH
PB100-2K	0-7.6LPH	38-375LPH



KEY	DESCRIPTION
1	WATER INLET, 1/2" (F)NPT
2	POLYMER INLET, 5/8" O.D. BARB
3	POWER CORD
4	MIXER MOTOR SWITCH w/THERMAL OVERLOAD
5	MIXER MOTOR
6	SOLENOID VALVE, (WATER)
7	MIXING CHAMBER
8	ROTAMETER
9	RATE VALVE
10	DIAPHRAGM PUMP
11	STROKE LENGTH KNOB

12	STROKE RATE/EXTERNAL SELECTOR SWITCH
13	SERIAL PLATE
14	EXTERNAL INPUT SIGNAL CONNECTOR
15	SOLUTION OUTLET, 1/2" (F)NPT
16	DIFFERENTIAL PRESSURE SWITCH
17	PRIMING PORT, (POLYMER)
18	DIGITAL DISPLAY PUMP CONTROLLER, (REM-1D)
19	LCD DISPLAY
20	INPUT KEYS
21	MODE SELECTOR KEY
22	4-20mA DC INPUT

US Filter
STRANCO PRODUCTS
BRADLEY, IL

DRAWING TITLE:
GENERAL ARRANGEMENT
PB100
(STANDARD UNIT)

SCALE: 1/8" = 1"

SHEET 1 OF 1

DATE: 01-05-94

DESIGNED BY: BRIAN DISMANG

CHECKED BY: GG (ON FILE)

APPROVED BY: JRC (ON FILE)

DATE: 11-15-00

WEIGHT: N/A

REVISION: 5

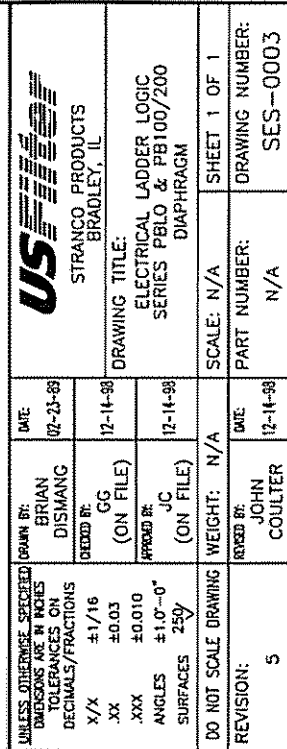
DESIGNED BY: JOHN COULTER

DATE: 11-15-00

PART NUMBER: PB100

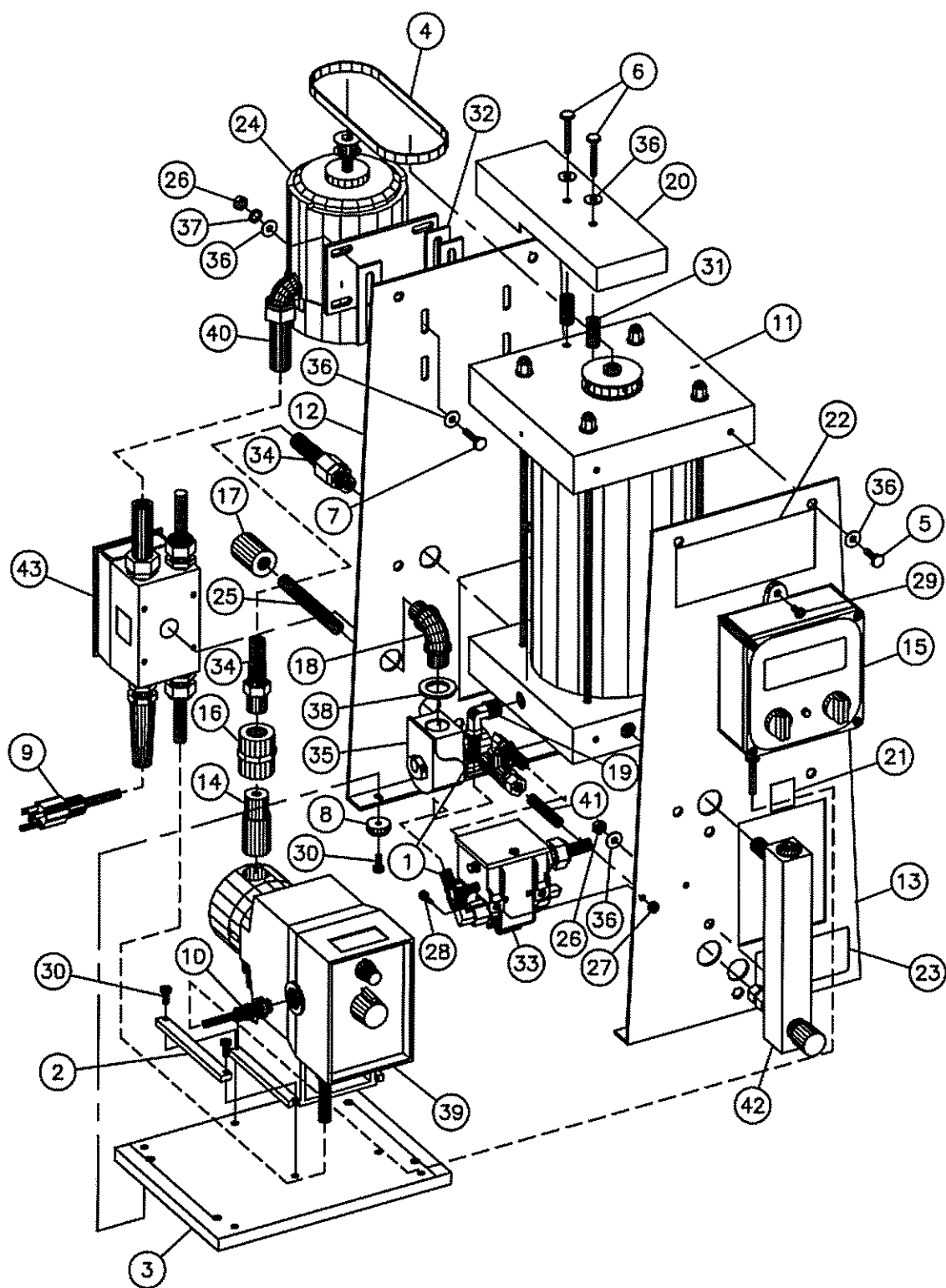
DRAWING NUMBER: PB100

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OVERALL

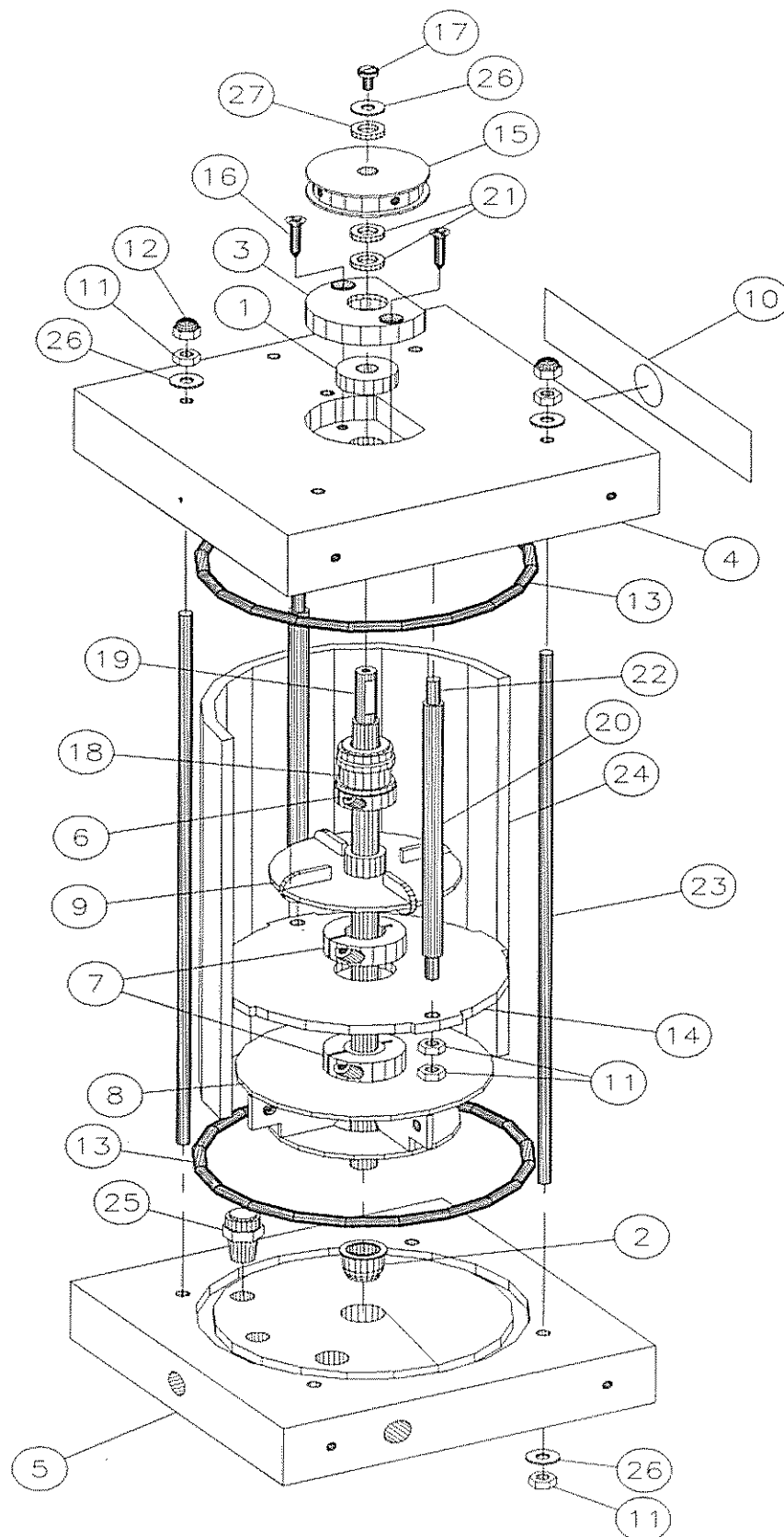
ITEM	P/N	DESCRIPTION	QTY	UM
1	10342	TUBING, 3/8" OD X 1/4" ID, POLYETHYLENE	1.00	FT
2	10746	BRACKET, PUMP	2.00	EA
3	1364001	BASE SUB-ASSY. PB100-0	1.00	EA
4	1450318	BELT	1.00	EA
5	1600312	BOLT, HH, 1/4-20 X 3/4 SS	8.00	EA
6	1600324	BOLT, HH, 1/4-20 X 1-1/2 SS (CAP SCREW)	2.00	EA
7	1600366	BOLT, HH, 1/4-20 X 1 SS	4.00	EA
8	1890001	BUMPER, RUBBER	4.00	EA
9	1983001	CABLE, ASSY, 110V, 8FT, GROUNDED, MALE PLG, 16/3	1.00	EA
10	1984005	CABLE ASSY.	1.00	EA
11	*****	CHAMBER ASSY, MIXING SML FRM (SEE SECTION)	1.00	EA
12	2383001	CHASSIS, BACK	1.00	EA
13	2383002	CHASSIS, FRONT	1.00	EA
14	26033	VALVE	1.00	EA
15	2846006	CONTROLLER, REM-1D	1.00	EA
16	2930004	CPLG, PVC, SCH 80 1/2 FPT	1.00	EA
17	2930420	CPLG, RED, SS 1/2 X 1/4 FT X T	1.00	EA
18	3579864	ELBOW, CONDUIT	1.00	EA
19	3581604	ELBOW, 90, BRASS 3/8 OD X 3/8 MPT	1.00	EA
20	4681310	BELT GUARD	1.00	EA
21	5551209	LABEL, WATER FLOW	2.00	EA
22	5551210	LABEL, POLYBLEND	1.00	EA
23	5554000	LABEL, SERIAL PLATE	1.00	EA
24	5902001	MOTOR	1.00	EA
25	5963028	NIPPLE, SS 1/4 X 4"	1.00	EA
26	6020031	NUT, 1/4-20, HEX SS	6.00	EA
27	6020962	NUT, 8-32, HEX	2.00	EA
28	7771558	SCREW, MACH, SS PAN HD, PHIL, 8-32 X 1/2	2.00	EA
29	7772506	SCREW, MACH, 304SS PAN HD, SLTD, 10-32 X 3/8	2.00	EA
30	7772508	SCREW, MACH, 10-32 X 1/2, SLTD PS, SS	8.00	EA
31	8140001	SPACER	2.00	EA
32	8141001	SPACER, MOTOR SHIM	3.00	EA
33	8724903	SWITCH, DIFF. PRESSURE	1.00	EA
34	9414002	TUBE BRAIDED SS, 1/2" MPT X 3/8" MPT X 14" LG*	1.00	EA
35	9571301	VALVE SOLENOID	1.00	EA
36	9740300	WASHER, SS, FLAT 1/4"	9.00	EA
37	9740330	WASHER, SS, INT TOOTH, 1/4"	4.00	EA
38	9748300	WASHER, SS, FLAT 1/8"	1.00	EA
39	*****	PUMP (SEE SECTION)	1.00	EA
40	RM2702060	CONDUIT, SEALTITE 3/8"	1.00	FT
41	RM9414061	TUBE, RIGID 304 SS 3/8"OD X 1/4"ID	1.00	FT
42	*****	FLOWMETER (SEE SECTION)	1.00	EA
43	1672002	BOX JUNCTION SUB-ASSY.	1.00	EA



MIXING CHAMBER 2340101

ITEM	PART NO.	DESCRIPTION	QTY.
1	1410002	BEARING	1
2	1414001	BEARING, THRUST	1
3	1419001	BEARING, FLANGE CARRIER	1
4	2124002	CAP, TOP, MIXING CHAMBER	1
5	2124003	CAP, BOTTOM, MIXING CHAMBER	1
6	2650001	COLLAR, 1/2" I.D.	1
7	2650002	COLLAR, 3/4" I.D.	2
8	5173304	IMPELLER	1
9	5173305	IMPELLER, SECONDARY	1
10	5551002	LABEL - DISCHARGE	1
11	6020031	NUT, HEX HD., 1/4"-20	12
12	6023031	NUT, ACORN, 1/4"-20, S.S.	4
13	6091801	O-RING	2
14	6676002	PLATE, BAFFLE	1
15	7071201	PULLEY	1
16	7772216	SCREW, 10-32 X 1"	2
17	7772506	SCREW, 10-32 X 3/8"	1
18	7802910	SEAL, MECHANICAL	1
19	7854303	SHAFT, IMPELLER	1
20*	8140005	SPACER ROD	2
21	8143011	SPACER	2
22	8603002	STUD	2
23	8603004	ROD	4
24	9412606	TUBE, ACRYLIC	1
25	9572304	VALVE, INJ. CHECK	1
26	9740300	WASHER, FLAT, 1/4"	9
27	8143010	SPACER	1

*Factory personnel identify item #20 as part RM6600021, which must be cut to a length of 6-3/4 inches. For replacements, request P/N 8140005 to receive spacer rods, which are pre-cut to the appropriate length.



FLOWMETER

ITEM	PART NO.	DESCRIPTION	QTY.	UM
1	4290102	FLOWMETER, KING, 16GPH	1	EA
2	6091301	O-RING, BUNA N	2	EA
3	1040093	ADAPTER, SPUD	1	EA
4	2735634	CONNECTOR, TUBE, 1/4" FPT X 3/8" OD COMP.	1	EA
5	1048401	ADAPTER, FLOWMETER	1	EA
6	9579301	VALVE, KING	1	EA

Flowmeter Assembly - P/N 4300102

