

# Pocket Bellows Pumps



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# Pocket Bellows Metering Pumps Overview

Pocket Bellows Metering Pumps are the most economical metering pump on the market while maintaining the high quality standards of a Gorman-Rupp Industries product. PBMP line of bellows metering pumps are ideal for low flow, low pressure metering applications where a fixed flow rate is required.

Like the Mini Bellows Metering Pump line, the Pocket Bellows metering pumps are constructed entirely of plastic and uses GRI's time-proven bellows technology to provide an accurate chemically-resistant metering pump with a long life, at an economical price. The only difference is the Pocket Bellows line utilizes a fixed crank mechanism.

## Bellows Metering Pump Operation:

The Pocket Bellows Metering Pumps operate on a positive displacement principle. The rotation of the motor shaft is transmitted into an up and down linear motion through an adjustable concentric crank mechanism. This motion provides a continuous compressing and relaxing force on the bellows module, forcing fluid between two check valves located in the module's valve body.

## Optimum Operating Conditions:

Optimum operating conditions consist of a 6" minimum suction life and a discharge head of not less than 6". Pumps must be mounted vertically with the valve body at the top to obtain maximum metering accuracy. For conditions where a positive suction head condition exists, an anti-siphon spring or anti-siphon spring kit can be added to aid the poppet valve seal properly during operation. See pages 8 and 9 for Accessories.

## Flow Rates:

The flow rate of the bellows module is regulated by three factors:

1. Diameter of the bellows,
2. Speed of the gearmotor,
3. Adjustment of the module stroke length.

The full stroke displacement and discharge pressure of the pump is dependent on the size of the bellows as shown below. If higher discharge pressure is required, please consult factory for an OEM solution.

POCKET BELLOWS MODULE FLOW RATE CHART								
Bellows Size	1/2"		3/4"		1"		1 1/2"	
Full Stroke Displacement (ml)	0.4		1.5		4.5		10.0	
Max Discharge Pressure (psi)	5		5		5		2.5	
Motor RPM	Max Flow per Module (ml/min)							
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
8	2.7	3.2	10.0	12.0	30.0	36.0	66.7	80.0
15	5.0	6.0	18.7	22.5	56.3	67.6	125.0	150.0
24	8.0	9.6	30.0	36.0	90.0	108.0	200.0	240.0



## Pocket Bellows Metering Pump Specifications:

**Flow Rates** — Range from 2.7 ml/min to 240 ml/min

**Max Discharge Pressures** — Range to 6 psi.

**Max Fluid Temperature** — To 140°F (60°C)

**Note:** Reduce pressure rating by 50% for fluid temperatures over 120°F (49°C).

**Viscosity/Slurries** — Maximum fluid viscosity is 5,000 centistokes. Poppet valves can handle fine slurries. Duckbill valves are recommended for heavy slurries or fibrous materials. Heavy slurries should be flushed from the pump before *shutdown*.

### MAXIMUM DRY AND WET PRIMING SPECIFICATIONS • Feet (Meters)

Bellows Sizes	Dry Prime 50% of Full Stroke	Dry Prime 100% of Full Stroke	Wet Prime 50% of Full Stroke	Wet Prime 100% of Full Stroke
1/2"	2.50 (.76)	8.67 (2.64)	5.83 (1.78)	17.17 (5.23)
3/4"	1.08 (.33)	3.75 (1.14)	2.50 (.76)	6.25 (1.91)
1"	3.08 (.94)	8.33 (2.54)	6.25 (1.91)	14.25 (4.34)
1 1/2"	4.33 (1.32)	11.00 (3.35)	9.58 (2.92)	20.58 (6.27)
2"	8.08	16.67 (5.08)	12.75 (3.89)	23.50 (7.16)

**Note:** All testing is done with water at an ambient temperature of 80 degree F. If specific gravity or viscosity of fluid being pumped is significantly greater than water (1.0), please consult factory.

## Materials in Contact with Solution:

**Connectors** — Polypropylene

**O-Rings (Elastomers)** — EPT/EPDM or Viton®/Fluoroelastomer

**Poppet/Duckbill Valves** — EPT/EPDM or Viton®/Fluoroelastomer

**Bellows** — Standard Polypropylene Materials

Additional materials available, refer to OEM Section for details.

## Pump Selection:

The PBMP pump selection procedure is detailed in the Pump Selection Guide on pages 6 and 7. Select a bellows size that meets your pressure requirements. Select a model with the bellows size that provides your required flow while operating closest to full stroke capacity. Best metering accuracy occurs when bellows modules operate at 50% or more of maximum output. For 24 hour continuous duty service, use one of the heavy-duty models.

Select a valve and O-ring combination and tubing connectors for each bellows from the selection charts at the end of this section. Specify duckbill valves if heavy slurries or fibrous materials are being pumped.

Refer to the Chemical Resistance Section to help determine compatibility.

## Features

- Average repeatability from stroke-to-stroke,  $\pm 0.75\%$
- Self-priming
- Superior corrosion resistance
- Simple flow adjustment
- Dry run capability
- No dynamic seals
- Economical



## OEM Options

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GRI specializes in the design and manufacturing of customized pumps for the OEM market. If you are unable to find the pump for your needs, please contact us and a technical sales member with discuss with you your requirements and all available OEM options.

### Motors

#### Speeds

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Standard synchronous motor speeds are 8, 15 and 24 RPM at 60 Hz. Custom speeds available in shaded pole and DC motors, please consult factory.

#### Voltages

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Standard voltages are 115V, 50/60 Hz or 230V, 50/60 Hz. However, the following special voltages are also available: 12 and 24VDC.

#### Designs

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The standard motor is an AC voltage synchronous motor. Depending on the type of pocket bellows metering pump, the following motor types are available: shaded pole, and DC.

#### Poppet Valves and O-Rings

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The standard elastomers for the poppet valves and O-rings are EPT/EPDM and Viton®/Fluoroelastomer. These elastomers have historically been able to handle the vast majority of the applications in which we've been involved. However, Butyl, Hydrin, Kel-F®, Silicone and Nitrile can be supplied for chemicals requiring such materials.

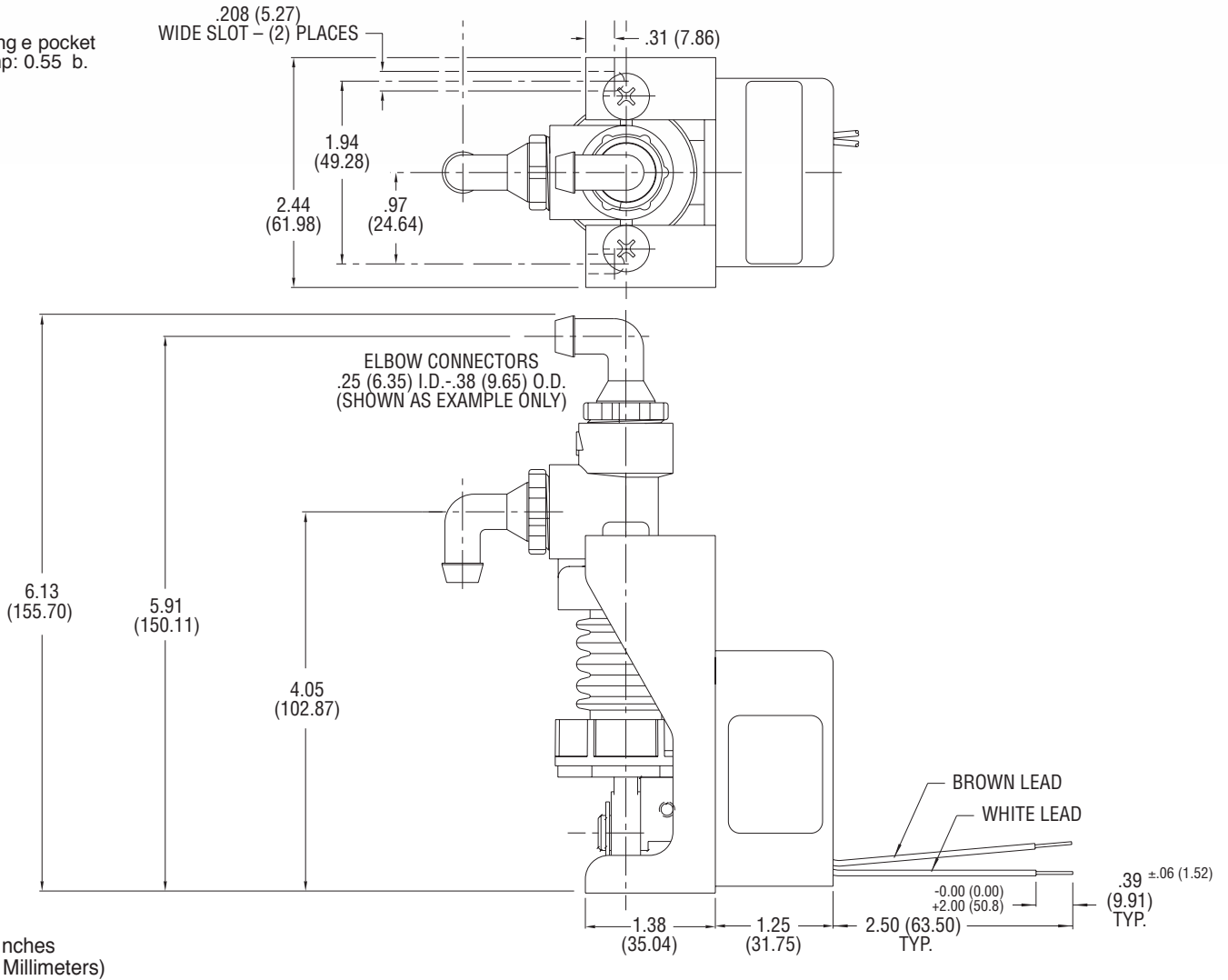
#### Duckbill Valves and O-Rings

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Duckbill valves are required in those applications where heavy slurries or fibrous materials are being pumped. Heavy slurries should be flushed from the bellows before pump is shut down. Duckbill valves are available in the same elastomers as the poppet valves.



Weight of single pocket bellows pump: 0.55 lb.



# Pump Selection Guide

**POCKET BELLOWS PUMPS**

- Using **Chart A** and **B**, select a bellows module and a motor RPM combination whose maximum output meets or exceeds your flow requirements. Then refer to **Chart D** to select an appropriate model number. If T-head valve body is required, please consult factory.
- Using **Chart C**, select the appropriate X-code for each module's O-ring, and poppet or duckbill valve elastomers. Refer to example.

(Order notes continued on following page.)

**Order Notes:** When ordering a pocket bellows model, refer to steps 1 through 3 and follow the example provided.

**Example:** The model number and codes for a pump with 1" bellows module, with EPT/EPDM elastomers and 3/8" barbed connector, driven by a 115V, 50/60 Hz, 8 RPM motor would be: 16503-050 X-112 T-003.

**CHART A**

**BELLOWS MODULE OUTPUT**

Bellows Size	1/2"	3/4"	1"	1 1/2"
Full Stroke Displacement (ml)	.4	1.5	4.5	10.0

**CHART B**

**TYPICAL FLOW**

Typical Flow (ml/min)	Bellows Size							
	1/2"		3/4"		1"		1 1/2"	
Motor RPM	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
8	2.7	3.2	10.0	12.0	30.0	36.0	66.7	80.0
15	5.0	6.0	18.7	22.5	56.3	67.5	125.0	150.0
24	8.0	9.6	30.0	36.0	90.0	108.0	200.0	240.0

**CHART C**

**O-RING AND POPPET/DUCKBILL VALVE OPTIONS**

Materials	Bellows Size					
	1/2"		3/4"		1" & 1 1/2"	
	Poppet	Duckbill	Poppet	Duckbill	Poppet	Duckbill
EPT/EPDM	X-002	X-092	X-162	X-172	X-112	X-032
Viton®/Fluoroelastomer	X-006	X-096	X-166	X-176	X-116	X-036

**CHART D**

<b>SELECTED POCKET BELLOWS PUMPS</b>				
<b>Model Number</b>	<b>RPM @ 60 Hz</b>	<b>Bellows Size</b>	<b>Volts</b>	<b>Hz</b>
16501-050	8	½"	115	50/60
16501-053	8	½"	230	50/60
16502-050	8	¾"	115	50/60
16502-053	8	¾"	230	50/60
16503-050	8	1"	115	50/60
16503-053	8	1"	230	50/60
16504-050	8	1½"	115	50/60
16504-053	8	1½"	230	50/60
16501-051	15	½"	115	50/60
16501-054	15	½"	230	50/60
16502-051	15	¾"	115	50/60
16502-054	15	¾"	230	50/60
16503-051	15	1"	115	50/60
16503-054	15	1"	230	50/60
16504-051	15	1½"	115	50/60
16504-054	15	1½"	230	50/60
16501-052	24	½"	115	50/60
16501-055	24	½"	230	50/60
16502-052	24	¾"	115	50/60
16502-055	24	¾"	230	50/60
16503-052	24	1"	115	50/60
16503-055	24	1"	230	50/60
16504-052	24	1½"	115	50/60
16504-055	24	1½"	230	50/60

3. Using **Tubing Connector Chart**, select one T-code for each X-code chosen from Chart C.

**POCKET BELLOWS PUMPS  
Pump Selection Guide**

(continued)

## Tubing Connectors

<b>T-CODES</b>			
<b>T-Code</b>	<b>For Elastomeric Tubing Size</b>	<b>Connector Type</b>	<b>Bellows Module Size</b>
T-001	⅛" I.D. x ¼" O.D.	Barbed Compression	½" & ¾"
T-002	¼" I.D. x ⅜" O.D.	Barbed Compression	½" & ¾"
T-003	⅜" I.D.	Barbed	1" & 1½"
T-004	½" I.D.	Barbed	1" & 1½"
T-008	⅜" I.D.	Elbow Swivel, Barbed	1" & 1½"
T-009	½" I.D.	Elbow Swivel, Barbed	1" & 1½"
T-011	¼" I.D.	Elbow Swivel, Barbed	1"
T-013	4mm (⅝") I.D.	Elbow Swivel, Barbed	½" & ¾"
T-014	¼" I.D.	Barbed	1"

# Bellows Pump

## Accessories

**POCKET BELLOWS PUMPS**

### Check and Foot Valves

Check and foot valves are used to maintain a pump's prime or to prevent backflow through a pump in applications with long suction lengths. Check valves can be positioned in-line on the suction or discharge side of the pump; foot valves on the suction side only. To order, refer to the chart on this page.



#### Single Check Valve

**Opening Pressure:**

1 psi (spring loaded)

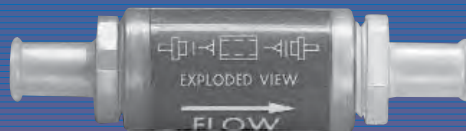
**Materials in Contact with Solution:**

*Body, valve seat, connectors, screen (149 Micron) — Polypropylene*

*O-rings — EPT/EPDM, Viton®/Fluoroelastomer*

*Spring — Hastelloy® C*

**Options:** 1/2" or 3/8" I.D. tubing connectors



#### Dual Check Valve

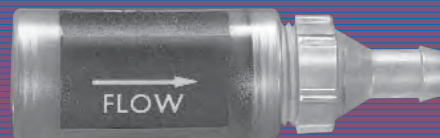
**Opening Pressure:**

.2 psi (two poppets located in series)

**Materials in Contact with Solution:**

*Body, connectors — Polypropylene*

*Poppet valves and O-rings — EPT/EPDM*



#### Foot Valve

**Opening Pressure:**

1 psi (spring loaded)

**Materials in Contact with Solution:**

*Body, valve seat, connectors, screen (149 Micron) — Polypropylene*

*O-rings — EPT/EPDM, Viton®/Fluoroelastomer*

*Spring — Hastelloy® C*

**Options:** 1/2" or 3/8" I.D. tubing connectors

Elastomer	Single Check Valves		Dual Check Valves	Foot Valves	
	3/8" I.D. Tubing	1/2" I.D. Tubing	3/8" I.D. Tubing	3/8" I.D. Tubing	1/2" I.D. Tubing
EPT/EPDM	15099-002	15099-018	12171-004	15101-002	15101-018
Viton®/Fluoro-elastomer	15099-006	15099-022	—	15101-006	15101-022



## Anti-Siphon Spring Kits

Anti-siphon springs are available to springload poppet valves. Use of these springs produces more positive shutoff of poppet valves and permits use of the pump where there is a positive pressure on the suction side. Available for the 1", 1½", and 2" models. To order, select the proper spring material and O-ring by referring to the Chemical Resistance Section. The appropriate kit can then be chosen based on the blow-off pressure (PSI) required.



(Valve extends on required on y on suction port.)

Spring	O-Ring (Elastomer) Material			
	EPT/EPDM		Viton®/Fluoroelastomer	
	.5 PSI	5 PSI	.5 PSI	5 PSI
Monel	02501-112	02501-113	02501-124	02501-525
316 S.S.	02501-114	02501-115	02501-126	02501-127
Hastelloy® C	02501-116	02501-117	02501-128	02501-129

Kits include valve extension or suction port. Kits do not include poppet valve.

# Replacement *Kits*

## POCKET BELLOWS PUMPS

### Bellows Module Kits

Proper selection of bellows module and poppet valve replacement kits depends on the X-code of the model number and not on the pump type (ie. single, tandem).



Materials	Bellows Size			
	½"	¾"	1"	1½"
EPT/EPDM	02501-702	02501-705	02501-708	02501-711
Viton®/ Fluoroelastomer	02501-703	02501-706	02501-709	02501-712

## POCKET BELLOWS PUMPS - REPLACEMENT KITS

### Poppet Valve and O-Ring Kits

The standard elastomers for the poppet valves and O-rings are EPT/EPDM, and Viton®/Fluoroelastomer. These elastomers have historically been able to handle the vast majority of the applications in which we've been involved. However, Butyl, Hydrin, Kel-F®, Silicone and Nitrile can be supplied for chemicals requiring such materials.



½" and ¾" Poppet Kit



1" and 1½" Poppet Kit

Materials	½" Bellows	¾" Bellows	1" Bellows	1½" Bellows
EPT/EPDM	02500-318 (X-002)	02500-318 (X-002)	02500-605 (X-112)	02500-605 (X-112)
Viton®/Fluoroelastomer	02500-317 (X-006)	02500-317 (X-006)	02500-609 (X-116)	02500-609 (X-116)

### Duckbill Valve and O-Ring Kits

Duckbill valves are required in those applications where heavy slurries or fibrous materials are being pumped. Heavy slurries should be flushed from the bellows before the pump is shut down. The standard elastomers are EPT/EPDM and Viton®/Fluoroelastomer. However, Butyl, Hydrin, Kel-F®, Silicone and Nitrile can be supplied.



½" and ¾" Bellows Kit



1" and 1½" Bellows Kit

*(Valve extension required only on suction port.)*

Materials	½" Bellows	¾" Bellows	1" Bellows	1½" Bellows
EPT/EPDM	02500-597 (X-092)	02500-597 (X-092)	02500-322 (X-032)	02500-322 (X-032)
Viton®/Fluoroelastomer	02500-601 (X-096)	02500-601 (X-096)	02500-319 (X-036)	02500-319 (X-036)

### Tubing Connector Kits

Connectors are made from polypropylene and are designed for use with soft vinyl and similar tubing.

T-Code	Kit Part Number
T-001	02500-312
T-002	02500-635
T-003	02500-352
T-004	02500-353
T-005	02500-258

T-Code	Kit Part Number
T-006	02500-259
T-007	02500-260
T-008	02500-261
T-009	02500-354

T-Code	Kit Part Number
T-011	02501-337
T-012	02501-246
T-013	02501-541
T-014	02501-673

**Note:** Kit includes two connector nuts and connectors



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