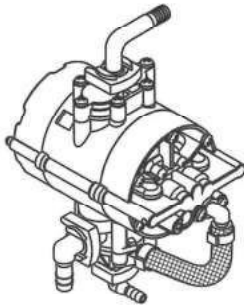




SHURFLO® BEVERAGE GAS PUMP 166-296-XX



Shurflo's Beverage Gas Pump supplies syrup under pressure to a post-mix dispenser, which mixes the syrup with water to an exact ratio (brix). The pump is used in conjunction with non-pressurized Bag-In-Box (B-I-B) containers and a bag connector (Q.D.) fitting. The pump can be operated on regulated CO₂, nitrogen or compressed filtered air. The compressed gas drives the pump and is not in contact with the syrup. Separate syrup and gas chambers prevent contamination, foaming and purging of the tubing when the B-I-B has emptied.

The pump retains pressure in the outlet line, operating only when syrup is needed. When the dispenser valve is opened, the pump reacts to the pressure drop by operating to maintain pressure in the line. When the dispenser is closed, the incoming gas and output syrup pressures equalize and the pump stops. Actual dynamic line pressure is dependant upon system losses as outlined in the section "Pumping Capability".

The automatic "sold-out" feature within the pump ensures consistent syrup delivery right up to the moment the B-I-B is empty. Vacuum produced by the pump evacuates the syrup within the bag. Once the preset vacuum point is achieved and held, incoming gas pressure to the pump is shutoff causing the outlet syrup pressure to drop to zero. When a new B-I-B is installed, the pump automatically restarts and pressurizes the system. The Shurflo Beverage Gas Pump ensures quality from the first drink to the last.

APPLICATION INFORMATION

Beverage Gas Pumps are intended for soda syrups and low viscosity concentrates that do not contain solids.

The use of a Shurflo Juice Pump (-09) is recommended for concentrates containing soft solids, classed as round, up to 0.025 in. [0.6 mm] or that are of higher viscosity than soda syrups.

Standard gas pump models are for installations where geographic elevation is less than 5000 ft. [1523 m]. For elevations above 5000 ft. specific high altitude models with a reduced sold-out spring rate must be used to compensate for the loss in atmospheric pressure. For further application and model information please contact Shurflo. Installation Instructions

TECHNICAL SPECIFICATIONS

Motor Design	Twin Chamber Double Diaphragm
Materials of Construction	Polypropylene, Silicone, EDPM, Santoprene, 300 Stainless Steel, FDA sanctioned, NSF Listed, CE, S-K
Power Source	CO ₂ , Nitrogen, or compressed filtered air
Operating Pressure	20 psi. min. [0.14 MPa, 1.4 bar] / 85 psi. max. [0.58 MPa, 5.8 bar] static
Maximum Stroke Rate	2 strokes/sec; intermittent duty (consult factory)
Displacement	3.4 oz. per cycle [101 cc]
Automatic Sold Out	20-24" Hg. [68-81 kPa] activation (wet). No reset required. High altitude models: 16-18" Hg. [54-61 kPa]
Temperature Limits	34° - 120°F [1.1° - 49°C]
Weight	1 lb. [.45 kg]
Available* Liquid Fittings	1/4" [6 mm], 3/8" [10 mm], and 1/2" [13 mm] barb elbows, straights; and 90° configurations; plastic or stainless. John Guest® straight tube; plastic.
Available* CO ₂ / Air / Exhaust Fittings	1/4" [6 mm] barb elbows or "T"s; plastic or brass; with internal check valve 1/4" [6 mm] barb elbows or straights; plastic (no c/valve), plastic (no c/valve), Muffler Kit.

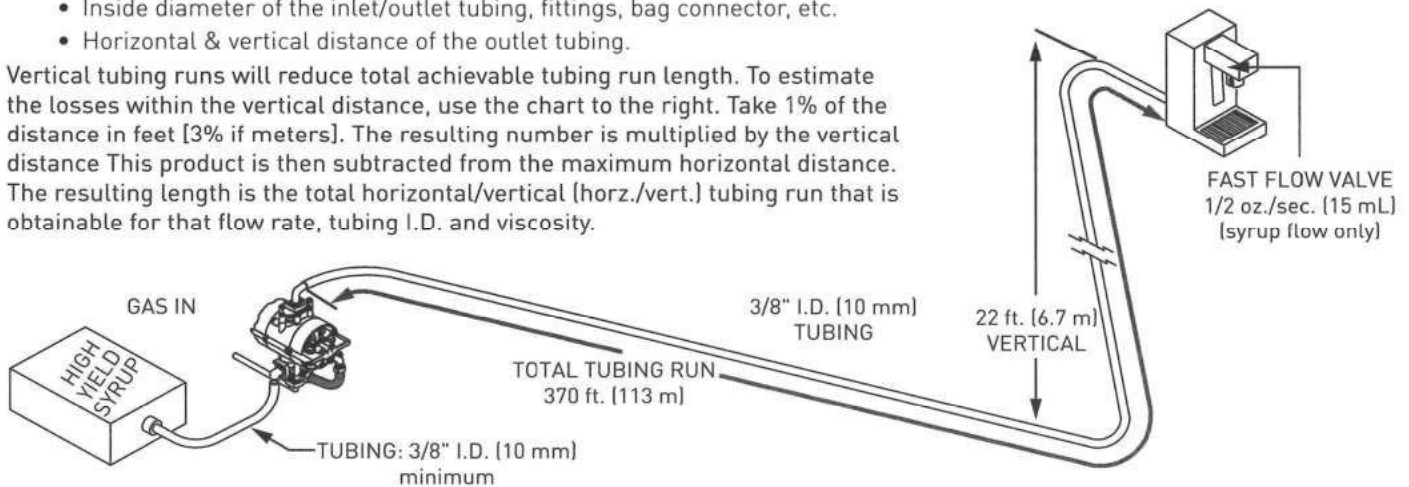
*Pump assembly part number determines fitting configuration. Metric fittings dimensions are approximation to U.S. inch size.

PUMPING CAPABILITY

The distance syrup can be delivered is limited by inherent factors (restrictions) within the inlet & outlet sides of the beverage dispensing system. Due to variances in system configuration and equipment, an accurate determination of pressure drop is difficult. Before deciding on a system's tubing size, Shurflo recommends estimating system losses by considering the following:

- Syrup viscosity and temperature (coldplate, re-circ., etc.).
- Total syrup flow rate of valve(s) connected to a pump.
- Inside diameter of the inlet/outlet tubing, fittings, bag connector, etc.
- Horizontal & vertical distance of the outlet tubing.

Vertical tubing runs will reduce total achievable tubing run length. To estimate the losses within the vertical distance, use the chart to the right. Take 1% of the distance in feet [3% if meters]. The resulting number is multiplied by the vertical distance. This product is then subtracted from the maximum horizontal distance. The resulting length is the total horizontal/vertical (horz./vert.) tubing run that is obtainable for that flow rate, tubing I.D. and viscosity.



The chart indicates that heavy syrup with 1/2 oz./sec [15 mL] flow-rate (per the illustration) can be sustained over a horizontal distance of 500 ft. [152M] when 3/8" I.D. [10 mm] tubing is used.

Feet: Take 1% of 500 ft. $(500 \times 1\%) = 5$. Which then is multiplied by the 22 ft. vertical, $(22 \times 5) = 110$ ft. Subtract this product from the 500 ft. $(500 - 110) = 390$. The results indicate a 390 ft. tubing run (horz./vert.) is possible, while the example only requires a distance of 370 ft.

Meters: Take 3% of 152 m $(152 \times 3\%) = 4.56$. Which then is multiplied by the 6.7 m vertical, $(4.56 \times 6.7) = 30.5$ m. Subtract this product from the 152 m $(152 - 30.5) = 121.5$. The results indicate a 121.5 m tubing run (horz./vert.) is possible, while the example only requires a distance of 113 m.

Note: Had the example above resulted in a value that was equal to, or less than the necessary total tubing run, consider a larger I.D. tubing or installation of a pump(s) in series using a Shurflo Vacuum Regulator.

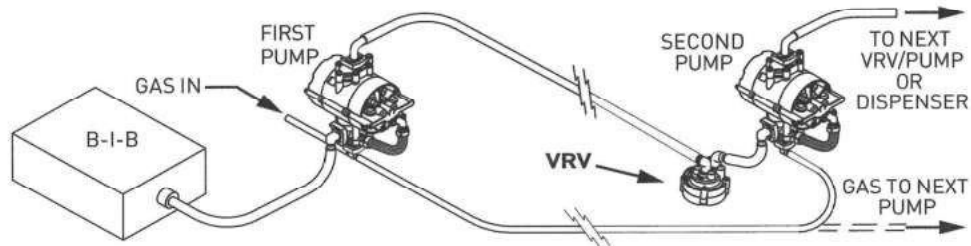
		Maximum Horizontal Tubing Lengths by Viscosity																	
		(distances are intended as a guide only. (cPs = Centipoise)																	
		Diet Soda Syrup (5 cPs ± 3)									Standard Soda Syrup (20 cPs ± 3)					Heavy Soda Syrup (35 cPs ± 3)			
Flow Rate/sec	ounces	0.5	0.75	1.0	1.5	2.0	2.5	3.0	3.5	0.5	0.75	1.0	1.5	2.0	0.5	0.75	1.0	1.5	
	ml	15	22.5	30	45	60	75	90	105	15	22.5	30	45	60	15	22.5	30	45	
1/4" I.D. (6 mm)	Feet	500+	500	453	212	102	64	32	—	500	133	79	32	10	129	75	53	26	
	Meters	152+	152	138	65	31	19	9	—	152	40	24	9	3	39	23	16	8	
3/8" I.D. (10 mm)	Feet	500+	500+	500+	500+	500	398	297	212	500	500	388	193	127	500	345	239	127	
	Meters	152+	152+	152+	152+	152	121	90	65	152	152	118	59	39	152	105	73	39	
1/2" I.D. (13 mm)	Feet	500+	500+	500+	500+	500+	500	500	500	500+	500+	500	500	366	500+	500+	500	425	
	Meters	152+	152+	152+	152+	152+	152	152	152	152+	152+	152	152	112	152+	152+	152	129	

Distances shown are the results of tests conducted at 70°F [21°C] ambient with a static pressure of 85 psi. [0.58 MPa, 5.8 bar] to the pump. All distances assume a dynamic pressure of 35 psi. [0.24 MPa, 2.4 bar] at the dispenser to maintain brix.

PUMPS IN SERIES FOR LONG DISTANCES

Long tubing runs or high vertical lift can be achieved by installing pumps in series. Standard Shurflo Beverage pumps are not designed to have positive pressure on the inlet side. The Shurflo Vacuum Regulating Valve (VRV) allows the pump to receive liquid from a pressurized source. By positioning a VRV at the inlet of the secondary pump, incoming pressure is reduced to zero, permitting syrup to be drawn in under vacuum.

Shurflo can recommend several other methods to meet the requirements for a particular installation, including Pressurized Inlet Pumps or Accumulators. Contact Shurflo for more information.



INSTALLATION GUIDELINES

As indicated on the pump, the outlet port is to be mounted up .

Pumps are to be mounted at the same level or higher than the B-I-B. The best choice is to have the pump above the B-I-B.

INLET tubing from the B-I-B to the pump use; 3/8" I.D. [10 mm] minimum, heavy wall (1/8" [3 mm]) clear, NSF listed vacuum tubing. Inlet tubing should not have excessive length. Tubing that is allowed to drape down can trap air in the B-I-B creating a potential for pump "sold-out" problems. **The maximum** vertical distance from the bottom of the B-I-B to the pump must not exceed 5 ft [1.5 m]. Maximum inlet tubing length is 10 ft. [3 m].

If plumbing multiple B-I-B's to a pump, B-I-B's should be "Teed" side-by-side horizontally, rather than one on top of the other (vertically).

OUTLET tubing from the pump to the dispenser should be high pressure rated and NSF listed. Consult "Pumping Capability" (page 2) for appropriate tubing I.D.

Always cut CO₂ and outlet tubing at least 2 ft. [0.6 m] longer to provide a "service loop" so the B-I-B rack can be moved for cleaning or service.

Use new (clean), 1/4" I.D. [6 mm], flexible, high pressure, braided tubing from the CO₂ / air regulator to the pump.

NEVER connect a transfer tank "system" in series with a B-I-B system. Syrup contaminants in old components may work their way through the air supply causing premature failure of the gas pump. Gas used to operate pumps **MUST** be clean and contain no contaminants (syrup, oil, rust, water, etc). Air compressors may be used with proper particle filters and moisture separators. Air storage tanks should be drained regularly. Pumps subjected to contaminated air are not covered by warranty.

⚠ WARNING ASPHYXIATION HAZARD: High concentrations of CO₂ or N₂ can be fatal as it will displace the air from non-ventilated areas. Pumps operated by CO₂ or N₂ must be in well ventilated areas. A manifolded exhaust vented to the outside is recommended. CO₂ detectors with alarms must be used with CO₂ powered pumps."

⚠ WARNING ASPHYXIATION HAZARD: If placed in a confined area (basement, closet, cooler box, etc,) exhaust fans with the capability of changing the room air on a continuous basis should be used, or the exhaust manifolds must be vented to the outside. CO₂ detectors with alarms must be used in the confined area.

Exhaust manifolds can be used to vent CO₂ or N₂ outside of confined areas.

All tubing connections must be secured with stainless steel, stepless Oetiker® clamps.

Cable-tie all tubing securely to prevent kinks or sags that inhibit performance or cause damage to the pump fittings.

Machinery is to be operated and maintained by trained personnel.

START-UP PROCEDURE

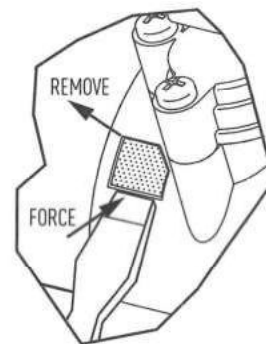
1. Confirm that all tubing connections are properly clamped, fittings are tight, and tubing is not kinked. Install bag connector to the B-I-B.
2. Adjust gas regulator to about 20 psi. [0.14 MPa, 1.4 bar] allowing the pump to stroke slowly.
3. Operate the valve until all air trapped within the tubing has been purged.
4. Once the air has been purged, adjust the CO₂ regulator to the pressure necessary to maintain the desired brix. The most efficient gas usage occurs at 40 psi. [0.28 MPa, 2.8 bar]. MAXIMUM static gas pressure to the pump is 85 psi. [0.59 MPa, 5.9 bar], minimum 20 psi. [0.14 MPa, 1.4 bar].
5. Flow rates that result in a stroke-rate of more than two strokes per second will decrease pump life. (Consult factory) Pump failure due to "overrunning" is not covered by the limited warranty.
6. To prevent air from entering the system always leave the bag connector attached to the empty B-I-B until a new B-I-B can be installed. Air entered into the system, via air in the bags or vacuum leaks, may cause brix fluctuation, foaming, spitting, non-operation of the vacuum sold-out or pump "run-on" with the valve closed. Symptoms of this kind can lead to a misdiagnosis of the pump.

MOUNTING CLIP KNOCKOUT REMOVAL

Removal of the knockout tabs from the pump housing is only necessary if the pump will be installed onto a Shurflo Mounting Board. Depending on board style, spring clip orientation varies. Ensure spring clip position and corresponding knockout tabs before removal.

The knockout tabs must not be pushed into the housing cavity. Failure to remove the tab from the housing will cause the spring clips not to engage completely, making the mounting insecure.

1. Position the pump on its side, in a secure location where the pump can be held firmly.
2. Place an appropriate sized flat blade screwdriver into the indentation as shown. Breaking the tabs at this particular indentation facilitates complete tab removal.
3. Break the tabs loose by either pressing firmly, or striking the screwdriver handle solidly with your palm.
4. The tab should break away from the housing, allowing it to be popped-out with the screwdriver.



Removal of the aluminum mounting bracket may be required to permit full engagement of the spring clips. Screw torque 15-18 in/Lb. [17-20 N•m]

PUMP SANITIZING / WINTERIZING

SANITIZING

Sanitization of the Shurflo Beverage Gas Pump is required. **The frequency of Sanitization is dependant on the concentrate type and its manufacturer's requirements.** Factors which also affect the frequency of this procedure are:

- temperature
- concentrate volatility
- facility conditions
- installation and equipment

The sanitizing procedure fulfills a required 10 minute contact time with a 200 ppm Sodium Hypochlorite solution.

Refer to Shurflo Service Bulletin #1025 for the NSF listed sanitizing procedure for the Shurflo pump (only).

WINTERIZING

Pumps that are subjected to freezing [below 32° F [0°C]] must be purged of fluid to prevent damage. Refer to Shurflo Service Bulletin #1025 for complete winterizing procedure.

NOTE: Refer to the equipment manufacturer's instructions for sanitizing and winterizing procedure for carbonators, dispensers and tubing.

NOTE: Pumps that have been winterized and/or out of service for a period of time should be sanitized prior to being placed back in service.

NOTE: Never apply pressure to the pump's liquid inlet. Pressurized tanks may damage internal components if used to sanitize or purge fluid from the pump (operating or not).

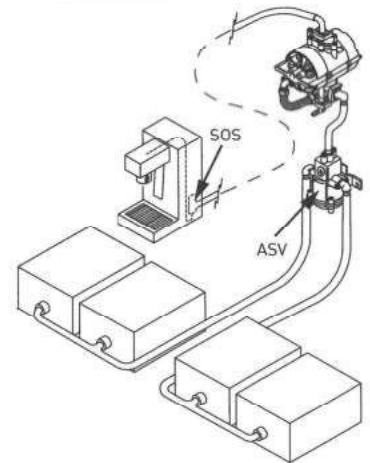
BEVERAGE SYSTEM ACCESSORIES

AUTOMATIC SELECTOR VALVE (ASV)

Eliminate the chore of replacing B-I-B's during peak business periods. Teeing B-I-B's together still causes them to empty at the same time. An ASV permits multiple B-I-B's to be connected to a particular pump. Once the B-I-B(s) on one side have completely emptied the ASV automatically switches sides to full B-I-B's. An ASV allows uninterrupted drink dispensing with the ability to replace empty B-I-B's at a more convenient time.

SOLD-OUT-SWITCH (SOS)

The SOS kit prevents the dispensing of syrup starved drinks by interrupting water flow at the dispenser valve. An exceptionally useful feature for lemon lime (clear) sodas and drivethru windows. The SOS senses the pressure drop in the syrup line caused by an empty B-I-B and interrupts power to the valves' electric solenoid. The SOS automatically resets with the installation of a full B-I-B



TROUBLESHOOTING GUIDE

Problem	Cause
DOES NOT OPERATE / GAS APPLIED / DISPENSER VALVE OPEN	<ul style="list-style-type: none"> a. B-I-B empty or inlet tubing pinched off activating vacuum "sold-out". b. Gas regulator over-pressurizing. (Pump stalled) c. Outlet tube kinked or restricted. d. Operated without fluid for excessive period. (Dry run) e. Transfer tube and gas lines contaminated (syrup, rust, oil, etc.) [ensure clean gas supply, change out all contaminated pumps] f. Internal damage of control cover.
OPERATES BUT WILL NOT PRIME / DISPENSER VALVE OPEN [consult Start-up Procedure for proper priming]	<ul style="list-style-type: none"> a. Pump valves have no moisture/dry. [add water/syrup to the inlet port with pump stroking slowly] b. Vacuum leaks at Q.D., barb fitting clamps, or inlet fitting o-ring. c. Debris in valve seats or warped/swollen valves.
DOES NOT ACHIEVE SOLD-OUT WITH EMPTY B-I-B	<ul style="list-style-type: none"> a. Vacuum leaks at Q.D., barb fitting clamps, or inlet fitting o-ring. b. Excessive amount of air in B-I-B from improper packaging. c. Air trapped in outlet tubing and/or pump fluid chambers.
AIR IN INLET AND/OR OUTLET TUBING	<ul style="list-style-type: none"> a. Vacuum leaks at Q.D. o-ring or barb fitting clamps. b. Vacuum leaks at inlet fitting; o-ring pinched or missing. c. Large amounts of air noticed only in the outlet tubing when pump operates. [diaphragm/piston assemblies ruptured]
STROKES WITH DISPENSER VALVE CLOSED	<ul style="list-style-type: none"> a. Air trapped in outlet tubing and/or pump fluid chambers. [open outlet and purge air, check for vacuum leaks, or air in B-I-B] b. Debris in outlet valves or warped/swollen valves.
FLUID FROM EXHAUST OR VISIBLE WITHIN GAS INLET TUBING	<ul style="list-style-type: none"> a. Carbonator check valve. b. Ensure clean gas supply. c. Diaphragm/piston assemblies ruptured. [change out all contaminated pumps]
GAS BLOWING FROM EXHAUST CONTINUOUSLY	<ul style="list-style-type: none"> a. Control cover subjected to contaminated gas supply or damaged. [ensure clean gas supply, change out all contaminated pumps]

LIMITED WARRANTY

Shurflo warrants new Beverage Gas Pumps to be free from material and workmanship defects (under normal use and service) for a period of five (5) years from the date of manufacture. An additional 30 days may be added to allow for storage and transit delays. In any event, the total limited warranty period will not exceed sixty one (61) months from date of manufacture.

The limited warranty will not apply to pumps that were improperly installed, misapplied, or not suitable with components of other manufacturers. The limited warranty will not apply to pumps subjected to fluids that are incompatible with pump materials, or pumps operated by a contaminated air supply. Shurflo will not warrant any pump that is physically damaged or modified outside the Shurflo factory.

All Shurflo gas pumps should be returned to the authorized distributor where they were purchased. Shurflo's obligation under this warranty policy is limited to repair or replacement. Pumps found not defective (under the terms of this limited warranty) are subject to charges to be paid by the returnee for the testing and packaging of "sanitized & tested good" units.

No credit or labor allowances will be given to the returnee for pumps returned as defective. Warranty replacements will be shipped on a freight allowed basis. Shurflo reserves the right to choose the method of transportation.

This limited warranty is in lieu of all other warranties, expressed or implied, and no other person is authorized to give any other warranty or assume obligation or liability on Shurflo's behalf. Shurflo shall not be liable for any labor, damage or other expense, nor shall Shurflo be liable for any indirect, incidental or consequential damages of any kind incurred by the reason of the use or sale of any defective product or part. This limited warranty covers beverage products distributed within the United States of America. Other countries should consult with the distributor for any deviation from this document.



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