

# Bosworth Maple Products

Guzzler Vacuum Pumps & SapCheck Monitoring / Control System



# Guzzler Products for the Maple Syrup Industry

## MOTORIZED GUZZLER® PUMPS FOR VACUUM PRODUCTION

Bosworth’s motorized Guzzler diaphragm pumps are used to establish vacuum on maple sap collection lines. Unlike expensive vacuum pumps that require a releaser to isolate sap from the pump, Guzzler pumps can both establish the vacuum and transfer sap. Guzzler motorized pumps are available with 115VAC and 24VDC motors. With wetted valves, they can generate up to 28 in of Hg vacuum.

Bosworth’s single diaphragm pumps can be used on up to **400 taps**. Bosworth’s “double-diaphragm” pump can establish vacuum on up to **800–900 taps**.



## SAPCHECK® PUMP MONITORING AND CONTROL SYSTEM

Bosworth’s patented SapCheck pump monitoring and control system is designed to address the remote monitoring needs of the small sugarbush. Requiring access only to the cellular network at the sugarbush, SapCheck enables users to remotely monitor vacuum levels and temperature using cell phone text messages. Users receive text message alerts for low vacuum and sap “tank-full” conditions. Additionally, SapCheck allows remote control to start and stop your pump at any time, as well as to auto-start/stop based on temperature at the sugarbush. SapCheck—it’s what you need when you can’t be there. To quote one user, “I wouldn’t be without it!”

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## “G2” Guzzler Double Diaphragm Pumps

- Ideal for vacuum production on **up to 800 taps**
- Available with **115 VAC or 24 VDC** motor
- Capacity: 19.8 gpm (2.5 cfm)
- **No releaser** required
  - *Creates vacuum and transfers fluid*
- Buna-N diaphragm and silicone umbrella valves made of **FDA-approved materials**
- **Reversible manifold** with 1-1/4 in Female inlet/outlet ports
- Ships with **two spare diaphragms**

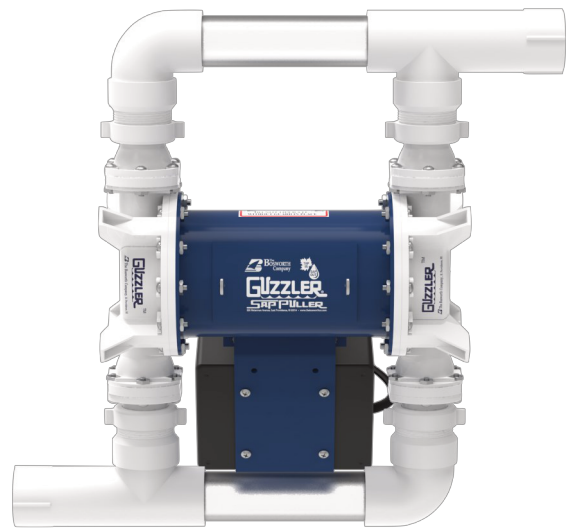


**G2-0501N**

**Model # G2-0501N-071-98-7171-BP**

### 115 VAC Motor

- 1/8 hp, 72 rpm
- Water resistant enclosure
- Full Load: 1.6 Amps
- Run-time Power Requirement: ~ 120 watts



**G2-0504N**

**Model # G2-0501N-071-98-7171-TK**

### 24 VDC Motor

- 1/8 hp, 60 rpm brushless DC motor
- Full Load: 6.0 Amps
- Up to 50 hours operation pulling dry vacuum; 12 hours transferring water at capacity under vacuum\*

\* Powered by two (2) 24 VDC 60-amp hour batteries

# Motorized Guzzler Vacuum Pumps

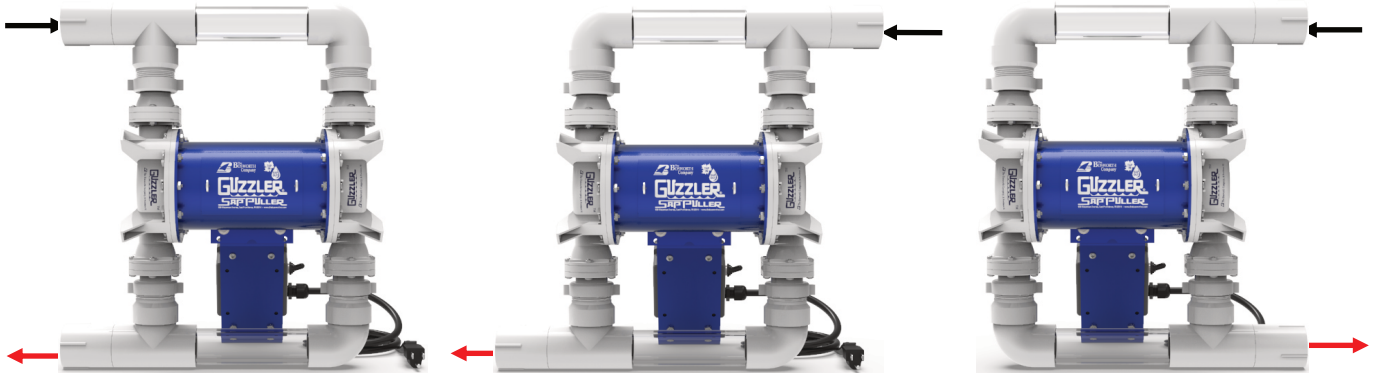
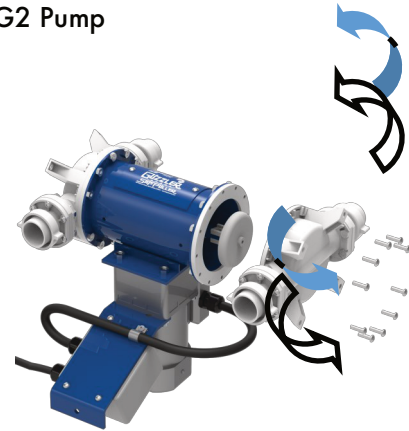
## Reversible Manifolds in G2 Pumps

Manifolds can be easily detached and reconfigured



Different manifold configurations for G2 Pump

Rotate pump bodies to invert inlet



Different manifold configurations for G2 Pump, with pump inlet and outlet reversed

## Motorized Guzzler Vacuum Pumps

### “GE” Guzzler Single Diaphragm Pump

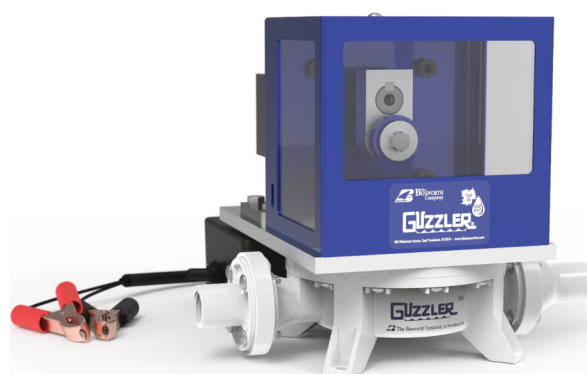
- Ideal for vacuum production on **up to 400 taps**
- Available with **115 VAC or 24 VDC** motor
- Transfers at 9.9 gpm (1.3 cfm)
- **No releaser** required
  - *Creates vacuum and transfers fluid*
- Buna-N diaphragm and silicone umbrella valves made of **FDA-approved materials**
- Available with 1" Smooth, 3/4" F, 3/4" M, 1-1/4" F, 1-1/2" Smooth and 1-1/2" M ends
- Ships with **spare diaphragm**



#### GE-0401N / GE-0501N

##### 115 VAC Motor

- 1/8 hp, 72 rpm
- Water resistant enclosure
- Full Load: 1.6 Amps
- Run-time Power: ~120 watts
- Available ends:
  - GE-0401N: 3/4" F, 3/4" M, 1" Smooth
  - GE-0501N: 1-1/4" F, 1-1/2" Smooth, 1-1/2" M



#### GE-0404N / GE-0504N

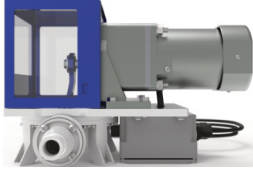
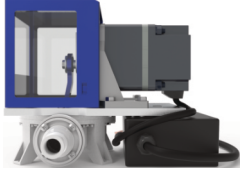
##### 24 VDC Motor

- 1/8 hp, 60 rpm, brushless DC motor
- Full Load: 6.0 Amps
- Up to 50 hours operation pulling dry vacuum; 20 hours transferring water at capacity under vacuum\*
- Available ends:
  - GE-0404N: 3/4" F, 3/4" M, 1" Smooth
  - GE-0504N: 1-1/4" F, 1-1/2" Smooth, 1-1/2" M

\* Powered by two (2) 12 VDC 60-amp hour batteries

## Motorized Guzzler Vacuum Pumps

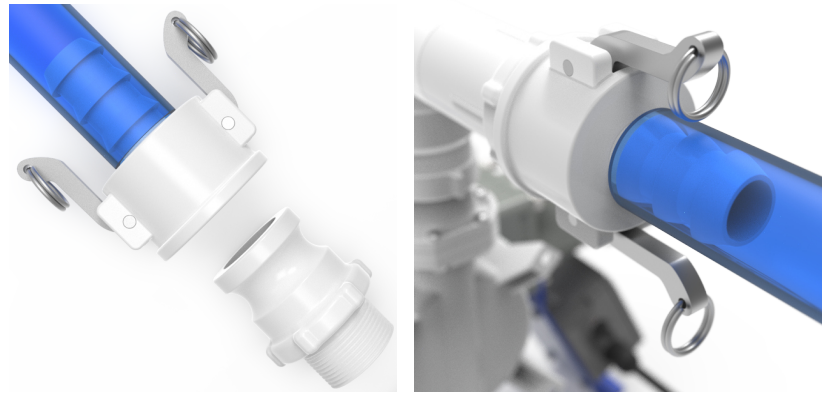
### “GE” Guzzler Single Diaphragm Pumps: Popular Models

	Motor Type	Description
		
GE-0401N-071-58-4141-BP	115 VAC, 72 rpm	FDA-approved materials for wetted components. Umbrella valves; 3/4" F (tapped) inlet/outlet.
GE-0401N-071-58-4242-BP	115 VAC, 72 rpm	FDA-approved materials for wetted components. Umbrella valves; 3/4" M (threaded) inlet/outlet.
GE-0401D-061-18-4242-BP	115 VAC, 72 rpm	Gray acetal plastic pump body & flanges. Duckbill valves; 3/4" M (threaded) inlet/outlet.
GE-0501N-071-58-7171-BP	115 VAC, 72 rpm	FDA-approved materials for wetted components. Umbrella valves; 1-1/4" F (tapped) inlet/outlet.
GE-0501N-071-58-8282-BP	115 VAC, 72 rpm	FDA-approved materials for wetted components. Umbrella valves; 1-1/4" M (threaded) inlet/outlet.
GE-0501D-061-18-7171-BP	115 VAC, 72 rpm	Gray acetal plastic pump body & flanges. Duckbill valves; 1-1/4" F (tapped) inlet/outlet.
		
GE-0404N-071-58-4141-TK	24 VDC, 60 rpm	FDA-approved materials for wetted components. Umbrella valves; 3/4" F (tapped) inlet/outlet.
GE-0404N-071-58-4242-TK	24 VDC, 60 rpm	FDA-approved materials for wetted components. Umbrella valves; 3/4" M (threaded) inlet/outlet.
GE-0404D-061-18-4242-TK	24 VDC, 60 rpm	Gray acetal plastic pump body & flanges. Duckbill valves; 3/4" M (threaded) inlet/outlet.
GE-0504N-071-58-7171-TK	24 VDC, 60 rpm	FDA-approved materials for wetted components. Umbrella valves; 1-1/4" F (tapped) inlet/outlet.
GE-0504N-071-58-8282-TK	24 VDC, 60 rpm	FDA-approved materials for wetted components. Umbrella valves; 1-1/4" M (threaded) inlet/outlet.
GE-0504D-061-18-7171-TK	24 VDC, 60 rpm	Gray acetal plastic pump body & flanges. Duckbill valves; 1-1/4" F (tapped) inlet/outlet.

# Guzzler Pump Accessories and Service Kits

## Pump Quick-Connect Fittings

Made of FDA-approved material



Model #	Size	Accommodates
QR-01-M6-B6	3/4" Male NPT x 3/4" Barbed End	GE-0401, GE-0404 pumps with 3/4" Female ends
QR-01-M10-B10	3/4" Male NPT x 3/4" Barbed End	GE-0401, GE-0504, G2-0501, G2-0504 pumps with 1-1/4" Female ends

## Pump Service Kits help keep your Guzzler running

*Includes replacement diaphragm and valves (Umbrella Valve kits include O-Rings)*



**Duckbill Valve Service Kit**



**Umbrella Valve Service Kit**

Model #	Description	Compatible with
SK-0400N-71	Service Kit for '400 Series "N" pumps. Contains Buna-N diaphragm and two silicone umbrella valves. (FDA-approved materials)	GH-0400N-3, GH-0400N-5, GE-0401N, GE-0404N, GE-0401D, GE-0404D
SK-N4N0X-61	Service Kit for '400 Series pumps. Contains Buna-N diaphragm and two duckbill valves.	GE-0401D, GE-0404D
SK-0500N-71	Service Kit for '500 Series "N" pumps. Contains Buna-N diaphragm and two silicone umbrella valves.	GH-0500N-3, GH-0500N-5, GE-0501N, GE-0504N, G2-0501N, G2-0504N
SK-N500X-61	Service Kit for '500 Series "N" pumps. Contains Buna-N diaphragm and two duckbill valves.	GE-0501D, GE-0504D

# SapCheck - Remote Monitoring and Control

## Remote Monitoring and Control

- Easy to use— send/receive text messages from your cell phone
- Designed for the smaller sugar-bush
- Complete system—includes controller and all sensors
- Easy to install
- Supports communications from multiple users
- Available in US and Canada
- Available with Seasonal Cell Phone plans - buy only what you need.



### REMOTE MONITORING

Receive status messages on your cell phone with ...

- Current vacuum
- Current temperature
- Pump status (on / off)

### REMOTE CONTROL

Send easy-to-use text commands to ...

- Start pump
- Stop pump
- Temperature-activated auto start/stop

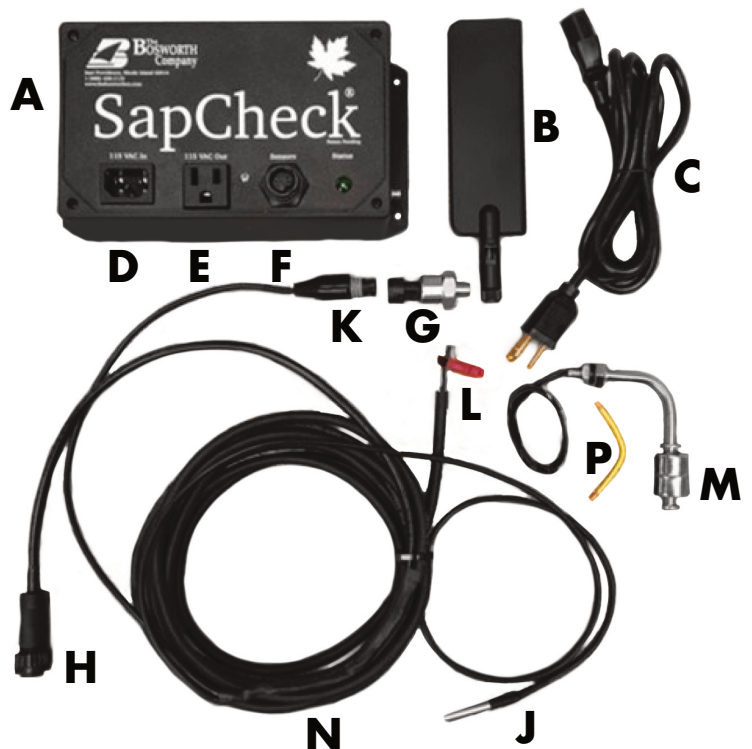
### REAL-TIME ALERTS

Receive text messages alerting you to ...

- Loss of vacuum
- Sap collection tank full

## Equipment

- SapCheck Controller (A)
- Antenna (B)
- Power Cord (C)
- Power In to Controller (D)
- Power Out from Controller (E)
- Multi-Sensor Connector (F)
- Vacuum Sensor transducer with female connector (G)
- Multi-Sensor Wire with Connector (H) and temperature sensor (J) and male Vacuum Sensor connector (K) and two terminated Float Switch wires (L)
- Tank Float Switch (M)
- 12' insulated Float Switch Cable (N)
- Float Switch By-Pass wire (P)





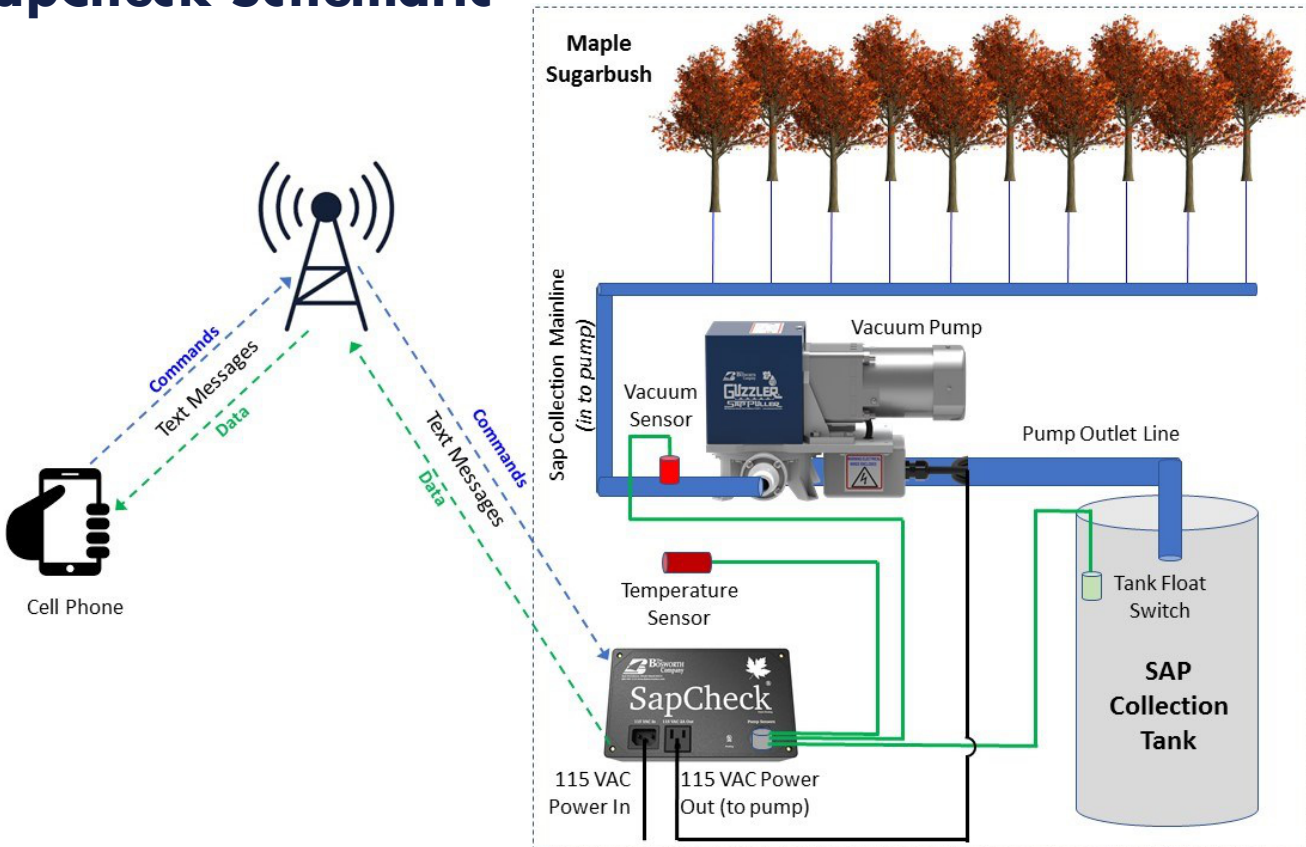
# SapCheck Accessory - Heat Source PowerToggle

- Automatically powers a heat source when it turns the pump off.
- Install in same enclosure with pump and heat source
- Simple setup
  - Power Toggle unit plugs directly into SapCheck outlet power plug
  - Plug pump into Power Toggle
  - Plug heat source into Power Toggle
- Heat source can be heat lamp, light fixture, etc.
  - any device up to 3 amp load



Keep ice from forming in your pump.

## SapCheck Schematic



## Frequently Asked Questions – Guzzler Pumps

	Question	Answer
1	How much vacuum can a Guzzler produce?	<p>When used for creating vacuum on maple sap collection lines, Guzzler pumps can generate up to 28 in of Hg vacuum, depending on how leak-free your maple sap collection lines are. Both our single and double diaphragm pumps are 'low-cfm' pumps, so even small leaks can reduce the vacuum you are able to achieve.</p> <p>Umbrella valves produce the best vacuum, followed by duckbill valves. There are "best practices" related to pump installation that can improve the vacuum a Guzzler can achieve. (See #7.) For example, the valves seal much better when wet. As a result, users often plumb a line from their collection tank back to the pump inlet to ensure that at least a small amount of sap is always flowing through the pump to keep the valves wet.</p>
2	How many taps can a Guzzler support?	<p>Our single diaphragm pumps (GE-0401, GE-0404, GE-0501, GE-0504) can be used to produce vacuum on up to 400 taps. Our double diaphragm pumps (G2-0501, G2-0504), with double the capacity, can create vacuum on up to 800-900 taps, though some have had success using the pump on as many as 1000 taps.</p>
3	Do the G2 Double diaphragm pumps produce higher vacuum than single diaphragm pumps?	<p>Both our double and single diaphragm pumps produce the same amount of vacuum. The double diaphragm pumps have twice the capacity of single diaphragm pumps. In terms of vacuum service, the double diaphragm pump has twice the cfm (cubic feet of air per minute) rating as the single diaphragm pump.</p>
4	Does a Guzzler pump need a releaser?	<p>No releaser is required. Because they are self-priming pumps, Guzzler pumps can both establish a vacuum and transfer fluid.</p>
5	Can a Guzzler run dry?	<p>Yes, Guzzler pumps can pump air as well as fluids, so a Guzzler pump can operate when there is no fluid to pump. This is why the pump can be used to establish and maintain a vacuum.</p>
6	What is the best valve for creating vacuum with a Guzzler pump?	<p>Umbrella valves typically provide a little better vacuum (~1in. Hg) than the duckbill valve, which is the next best valve to use. Liquid being transferred by Guzzler pumps equipped with umbrella valves should be relatively free of any materials in suspension. In the '400 series pumps, the umbrella valve openings are as small as 3/16 inch in diameter and may become blocked if the fluid...</p>

## Frequently Asked Questions – Guzzler Pumps

#	Question	Answer
6	What is the best valve for creating vacuum with a Guzzler pump?	contains material. Some maple sap farmers use duckbill valves in their 400 pumps at the beginning of the maple season because they do a much better job of passing fluid that contains materials. They then switch to umbrella valves once the sap is running clear. Umbrella valves in '500 series pumps have a 3/8 inch diameter pore, and can tolerate slightly larger materials in suspension, so there is less of a need to begin with '500 series duckbill valves and then switch to umbrellas.
7	Are there any installation tips for increasing vacuum with a Guzzler?	<p>Guzzler pump valves seal better when they are wet. Running with dry valves, Guzzler's generate 19-20 in Hg, but when the valves are wet, that can climb to as much as 28 in Hg. Consequently, some users plumb a line that allows a small amount of collected sap to feed back into the pump, so that the valves always remain wet, even when there is no "new" sap flowing into the pump.</p> <p>Additionally, some have found that introducing a small upside-down "U" shaped bend in the line between the pump outlet and the sap collection tank increases the vacuum. This small upward bend ensures that there is always a wall of sap at the outlet valve, preventing air from being sucked back into the pump when the outlet valve is transitioning from open to closed.</p> <p>This same effect can be accomplished by mounting the single diaphragm pump vertically with the outlet above the inlet.</p>
8	What kind of power generator should I use with the 115VAC Guzzler pumps?	<p>The 115 motors used by our GE and G2 pumps are very efficient 1/8 HP motors that draw 1.6 amps at full load. Full load occurs only at startup. Most of the running time of the pump, the motors draw about 1 amp, which means that the run-time load of a GE or G2 pump is close to 120 watts, the equivalent of powering 2 60-watt light bulbs.</p> <p>Because of the peak load that needs to be supported to get the pump started - especially under cold weather conditions - we recommend using a 1,000 watt generator that can reliably deliver 115 VAC power. With most such generators, you can expect a gallon of gas to operate your GE or G2 pump for 10-14 hours.</p>
9	Are there battery-powered versions of Guzzler pumps?	<p>Yes, the GE-0404N and GE-0504N are single diaphragm pumps that feature a 24V brushless DC motor. The same motor drives the G2-0504N double diaphragm pump. When powered by two (2) 12 VDC 60 amp-hour batteries connected in series, the single diaphragm pumps will pull a dry vacuum for up to 50 hours; up to 20 hours when transferring water at full capacity.</p> <p>When powered in the same fashion, the G2-0504N double diaphragm pump will pull a dry vacuum for up to 40 hours and will transfer water at full capacity for up to 12 hours between battery charges.</p>

## Frequently Asked Questions – Guzzler Pumps

#	Question	Answer
10	Can Guzzler pumps run 24/7?	<p>Guzzler pumps use continuous duty motors that easily support continuous operation. However, the elastomers (i.e., diaphragms and valves) in a Guzzler pump tend to fatigue and wear out over time. Under factory testing, our diaphragms last on the order of 1 million cycles. While this may seem like a lot of cycles, a pump running continuously at 72 rpm will reach one million cycles in a little over 10 days!</p>
11	How long do Guzzler diaphragms last?	<p>Operating conditions can significantly impact diaphragm lifetime, and operating conditions vary drastically from installation to installation. When we test diaphragms at the factory, we achieve lifetimes on the order of 1 million cycles. These tests are conducted for the pump pulling 22 in Hg vacuum and transferring water. Pulling a higher vacuum will result in greater mechanical forces on the diaphragm, which will tend to shorten diaphragm lifetime. Pumping ice or slush through a Guzzler can abrasively score the surface of a diaphragm, thus shortening its lifetime.</p> <p>Operating conditions that subject the diaphragm to back pressure can substantially shorten diaphragm lifetime. This can occur if the pump is used to “push” sap up to a collection tank requiring more than 3 feet of vertical lift. Additionally, plumbing that presents a flow path with a number of right-angle bends or reduced outlet tubing diameter between the pump outlet and the tank can also result in substantial back pressure on the diaphragm.</p> <p>Users report a full range of experiences, from those whose diaphragms last a couple weeks, to those who report that they change them once in a season. We recommend always having a spare diaphragm on hand. Guzzler single pumps ship with one spare diaphragm. Guzzler double pumps ship with two spare diaphragms.</p>
12	Will ice damage my Guzzler pump?	<p>Yes, if ice forms inside your Guzzler pump, it can crack the plastic pump body or pump flanges. In particular, if you start your Guzzler when the pump body contains frozen sap, the motor will drive the ice through the bottom of the plastic pump body.</p> <p>Some users disconnect their Guzzler from their sap line at the end of the day and drain it to be sure it is not full of water that might freeze and damage components. To drain it, run the pump for several seconds while disconnected from your line so that it can pump out any residual sap. Then turn the pump off and tip it to drain any remaining sap left in the pump.</p> <p>Other users keep their Guzzler in a “doghouse” structure that is heated by a light bulb. This can keep any ice from forming overnight in the pump. (Be sure that the doghouse does admit some airflow around the pump, as ventilation is necessary to keep the motor from overheating.)</p> <p>Finally, some users include a wire-mesh type of screen in their mainline just before it connects to the Guzzler, to keep ice in the line from being sucked into the pump.</p>

## Frequently Asked Questions – Guzzler Pumps

#	Question	Answer
13	What are the limitations of using a Guzzler?	<p>Guzzler's are "low cfm" pumps and transfer air at approximately 1 cfm. Consequently, even very small leaks in maple sap collection lines can admit air into the tap lines at a faster rate than Guzzler's can remove it, resulting in a loss of vacuum. Guzzler pumps perform best when sap lines are well-managed to eliminate leaks.</p> <p>Guzzler pumps can be damaged by ice. Users should take care to prevent ice from entering or forming within the pump. There are a variety of ways of doing this. (See #12, <i>Will ice damage my Guzzler pump?</i>)</p> <p>Finally, users should expect to periodically replace diaphragms and/or valves in the pumps. These elastomers are the "consumables" in the pump. We recommend always having a spare diaphragm and valve set on hand.</p>
14	How long a mainline can a Guzzler support?	<p>The longer the main line, the more air that the pump will need to evacuate from the system when first starting up. This simply means that it will take longer for the pump to reach a good vacuum. As long as the lines are free of leaks, having longer lines will not compromise the amount of vacuum that the pump will produce. Users have reported success with Guzzlers on mainlines as long as 2600 feet. The most important factor is to have good grade on the line so that the pump's vacuum is applied at the tree taps, as opposed to expending vacuum lifting sap up to the pump against a negative grade.</p>
15	Can I use a Guzzler to both create vacuum as well as "push" sap to a higher delivery point above the pump's outlet?	<p>In principle, Guzzler pumps can be used to create both negative (vacuum-producing) pressure on the inlet side and positive (so-called pump "head") pressure on the outlet side. However, this greatly increases the mechanical forces on the diaphragm, thus shortening diaphragm lifetime. We recommend that head pressures be kept to a minimum for maple sap applications, in order to prolong diaphragm lifetime under conditions of creating and maintaining vacuum.</p>

## Frequently Asked Questions – SapCheck

#	Question	Answer
1	What is SapCheck?	<p>SapCheck® is an innovative remote monitoring system for maple sap collection in maple sugarbushes. SapCheck consists of an controller unit together with three sensors - a vacuum sensor, a temperature sensor, and a tank float switch to detect when sap has reached a targeted level in the collection tank.</p> <p><b>SapCheck requires the ability to send and receive text messages at the sugarbush.</b> No internet or data service is needed. Using simple text messaging commands, users can monitor vacuum and temperature conditions at the sugarbush, receive low-vacuum alerts as well as “tank full” alerts on their cellphones, remotely start and stop their vacuum pump, and automatically start and stop their pump based on temperature values they specify. SapCheck is intended for use at smaller sugarbushes where more expensive internet-based monitoring systems may not be cost-justified.</p>
2	What information does SapCheck monitor?	<p>Current temperature at the sugarbush; current vacuum at the pump; whether the pump is on or off; and whether sap has reached the “Sap Alert Level” in your collection tank. You can ask status information from SapCheck at any time, or text SapCheck to automatically send you status reports on a regular basis.</p>
3	What alerts does SapCheck send you?	<p>SapCheck provides two alerts: a "Loss of Vacuum" alert and a "Sap at Tank Alert Level" notification. You text SapCheck the low-vacuum value at which you want to receive a text alert. Where you install the Tank Float Switch will determine the sap level at which you will receive the "Tank Alert Level" notice.</p>
4	Can SapCheck be used to control a pump?	<p>Yes, you can turn your pump on/off remotely via text messages to SapCheck. You can also set a temperature at which SapCheck will automatically turn your pump on, and another at which it will automatically turn your pump off. You will receive text notices when this happens.</p>
5	Does SapCheck work will all Guzzler pumps?	<p>SapCheck works only with 120VAC Guzzler pumps.</p>
6	Does SapCheck work will other pumps?	<p>SapCheck works with any 120VAC pump using up to 1/2HP motors. You can use SapCheck to control a 120VAC relay to control larger pumps. SapCheck can work with any 120VAC device so long as it does not draw more than 370 watts of power.</p>
7	How does SapCheck communicate?	<p>SapCheck communicates by sending and receiving cell phone text messages. If you can text, you can use SapCheck.</p>

## Frequently Asked Questions – SapCheck

#	Question	Answer
8	Does SapCheck need Internet service at the Sugarbush?	No, SapCheck does not need Internet access to operate, just the ability to send/receive text messages via cell phone service.
9	Can more than one cell phone user communicate with SapCheck?	Yes, SapCheck supports multiple SapCheck users, allowing SapCheck to be used by a team of people managing a sugarbush. Text commands allow a new cell phone number to be added or deleted from SapCheck's list of authorized users.  An authorized user can text SapCheck to specify their status as Active or Inactive. Active users can text SapCheck commands and receive alerts. Inactive users will neither receive status information nor alerts, but can change their status back to Active by texting a simple command.
10	Are SapCheck communications secure?	SapCheck will accept text commands only from cell phone numbers on its list of authorized users. SapCheck ignores text messages received from other phone numbers.
11	Is there a communications charge for SapCheck?	You purchase a SapCheck Support Plan from The Bosworth Company that provides text-based communication over the cellular network as well as software updates. Support Plans can be purchased that provide from 1 - 6 months of communications, with a limit of up to 3,000 text messages per month. (Messages that SapCheck sends or receives are counted as messages.) Plans can be renewed seasonally.
12	What is needed at the sugarbush for SapCheck to work?	You need the ability to send and receive text messages at your sugarbush. You do not need the ability to connect to the internet. You also need 120VAC power either from mains, a pure sine wave generator or a pure sine wave inverter and battery/ photovoltaic (solar). SapCheck generally draws less than 8 watts when operating, but don't forget about your pump's power consumption.
13	What comes with SapCheck?	SapCheck includes the Controller Unit and power cord, and three sensors: a vacuum sensor, a temperature sensor, and a tank float switch. You also get all the wiring you need to connect everything up.
14	How far away can my collection tank be from SapCheck?	SapCheck comes with 12 feet of cord connecting the float switch to the Controller Unit. Feel free to cut/splice onto this cord to lengthen it as needed.
15	Is SapCheck easy to install?	Yes! SapCheck can be installed in as little as 30 minutes. You need to tap a hole (3/8 NPT) to install the vacuum gauge in your mainline, mount your float to your collection tank, and plug everything in.



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