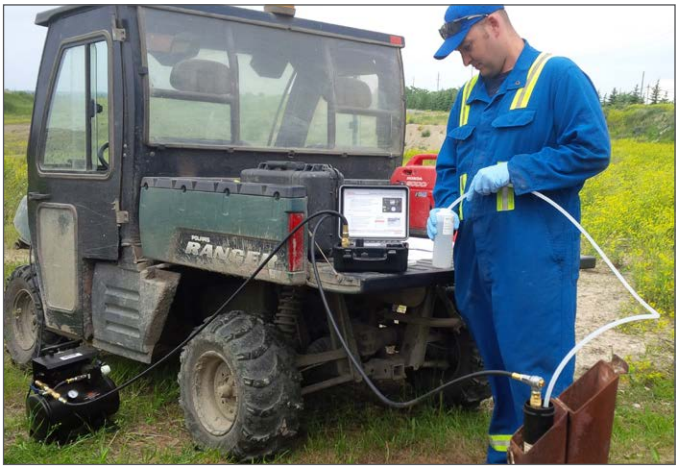
# Sampling Groundwater

**Using Model 407 and 408 Pumps**



## Introduction

Retrieving a groundwater sample using a Bladder Pump or Double Valve Pump, requires answers to two questions - how much pressure and how much volume of drive gas is required? The drive gas is usually air or nitrogen delivered through portable gas cylinders or an air compressor. Portability to the site and the pressure requirement for the application, are the main deciding factors.

## Pumping Pressure

Determining the amount of applied pressure (in psi) to retrieve a sample, is simple. 1 psi of pressure can raise a 2.3 ft. column of water, which is about half of the column height of water in feet, expressed as psi.

E.g. If the Bladder Pump's intake is at 100 ft. below ground surface, you will require approximately 50 psi of pressure to bring a sample to ground surface. If you are sampling with a Double Valve Pump, then this calculation is made from ground level to static water level (as a minimum, but can be made from total pump depth to maximize purging rates). Therefore, if a Double Valve Pump is 100 ft. below ground surface, and static water level is at 50 ft., you can select a pressure of between 25 and 50 psi. With both Bladder Pumps and Double Valve Pumps, add an extra 10 psi to allow for "line loss".

***Tip:*** What do you do when your pneumatic pump is properly connected, yet there is no sample discharge? A simple 'trick', is to submerge the sample discharge line into a clear container of water. During the drive cycle, you should see bubbles. An aggressive blast of air bubbles can mean that there is no water available, while a steady mild bubbling indicates that the pump is operating and the sample water is on the way up!

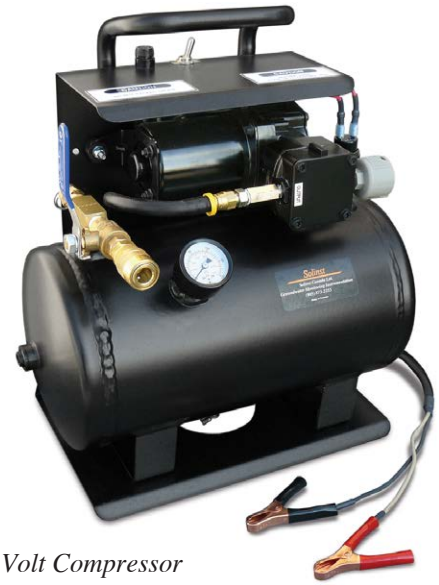
## Drive Gas

If your groundwater sampling protocol does not specify which drive gas to use, then consider these points: *Portability* and *Suitability*.

*Portability*: Keep in mind that a larger volume air tank means a larger and heavier air compressor.

*Suitability*: If the larger size air compressor is not suitable for your sampling needs, then you will need to choose a bottled gas supply, such as a nitrogen tank, to provide portability and sufficient pressure to lift water to ground surface. Generally, you should allow for 10 L of nitrogen to push 1 L of water.

The selection of either compressed nitrogen or air, to use as the drive gas, is also made based on the availability, as well as the potential for affecting groundwater sample quality.



*Solinst 12 Volt Compressor*

## Solinst 12 Volt Compressor

When the Solinst 12 Volt Compressor is turned ON, the compressor motor will continue running until it reaches a maximum tank pressure of 125 psi. At this point, the compressor motor will turn off automatically. When the drive cycle on the Pump Controller is activated, the compressor tank supplies air through the drive line to the pump. The compressor motor will remain off until the tank pressure drops to 90 psi. At 90 psi, the compressor motor automatically switches to ON, and stays ON until 125 psi pressure is produced in the air tank.

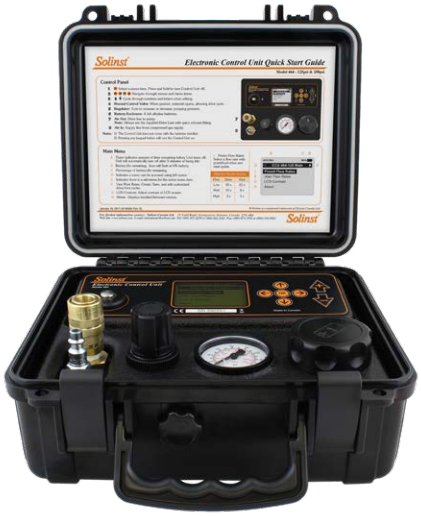
To ensure a long life with any air compressor, operate it so that the compressor motor is not always ON, which can lead to

*Continued overleaf...*

overheating the motor. To help maximize the life of your Solinst 12 Volt Compressor, we suggest using a conservative 50% duty cycle and a maximum 100 ft. pumping application depth.

Two key specifications on the 12 Volt Compressor Operating Instructions are, the 2 US Gal (7.6 L) tank volume, and the auto ON at 90 psi (~200 ft.). In other words, if your Bladder Pump intake was 200 ft. below ground surface, after about three drive cycles from the Pump Controller, the compressor motor would turn ON, and stay ON, if the vent time was less than 3 times the drive time. As described earlier, the longer vent time allows the air compressor to catch-up, for these deeper pumping applications.

To use your Solinst 12 Volt Compressor for sampling applications deeper than 100 ft., consider using for shorter durations, and with good pumping conditions, such as high water column above the pump to provide good recharge, longer vent time for the air compressor to refill, and cool ambient air temperatures to help reduce heat on the compressor motor. As with any air compressor, avoid long term overheating of your compressor motor.



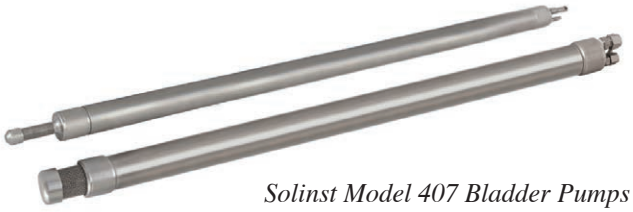

*Solinst Model 464 Pump Controller*

## Pump Controller - Setting the Timers

Turn the regulator on the Pump Controller, to the calculated pressure needed to push water to ground surface. To help protect the Pump Controller from damage due to moisture, always position the Pump Controller physically higher than the sample discharge and wellhead. This helps prevents a syphoning effect, where the gravity back-flow of sample water can enter into the Pump Controller, and cause unnecessary damage.

### 407 Bladder Pump

To initially set the timers when using a 407 Bladder Pump, start with this quick tip: submerge the sample discharge line into a clear container of water, push the Manual Control Valve on the Pump Controller, and count the number of seconds until you stop seeing air bubbles in the container of water. When the air bubbles stop, the bladder is fully compressed and that is the end of the drive time. When the intake of the Bladder Pump is shallower than 100 ft., set the vent time twice as long as the drive time. For example: if it took 8 seconds of drive time to fully collapse the bladder, you should allow 16 seconds for the vent time to refill the bladder. When the Pump intake is deeper than 100 ft., the vent time will be closer to 3 to 4 times the drive time. Adjust the vent time as needed for deeper applications and to achieve an ideal flow rate for your sampling needs.



*Solinst Model 407 Bladder Pumps*

### 408 Double Valve Pump

Calculating the drive and vent times for a 408 Double Valve Pump (DVP), has a different approach. If the goal of your sampling method, is to not allow the drive gas into the Double Valve Pump itself, then you can determine that volume, by evacuating the water in both the drive line to the Pump, and the sample line from the Pump.

Push the Manual Control Valve on the Pump Controller and count the number of seconds until you stop seeing water discharge, and gas starts to be expelled from the tubing. This time period is the maximum drive time to completely empty the DVP assembly. Now, set the drive time on the Pump Controller to a time about 40% of this evacuation time. For example, if it took 20 seconds to completely evacuate the drive and sample lines, set the drive time on the Pump Controller to 40% of 20 seconds (0.4 x 20 seconds = 8 seconds). Why 40%? Generally, half of the total time was used to empty the drive line tube, and the other half of the time was used to empty the sample line. As a factor of safety, 40% of the total time should be sufficient to ensure that the drive gas stays above the DVP itself.

This calculation is based on the well recharge, being capable of 'keeping-up' with the sample discharge. If you start noticing drive gas within the sample discharge, shorten the drive time until the water sample is discharged without the presence of drive gas.

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