GOFERMENTOR NET OPERATING MANUAL

Revision 4.1 Hardware 3.00 019123 DRAFT

www.GOfermentor.com

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1. WHAT IS THE GOFERMENTOR?

Introducing the first truly revolutionary device for winemaking. Traditional winemaking fermentors have changed little in the last 500 years - the only major change being the move from open wood vats to temperature controlled stainless-steel tanks. The **GOfermentor** brings 21st century technology, developed originally for the manufacture of pharmaceuticals, to modern winemaking. This technology dramatically reduces the capital and operating cost for a winery. No significant installation is necessary: a fermentation system can be set up within minutes in any room. No cleaning is required which dramatically reduces labor requirements. No waste water treatment is needed as the process uses essentially no wash water. And, finally, the **GOfermentor** provides better control of fermentation parameters, minimal exposure to air, and automated cap management, thereby reliably producing a better quality wine.

The **GOfermentor** currently available has a nominal volume of 1000 liters. This can be used for a batch size ranging from 200lbs to 1 ton of grapes per run. This makes it ideal for small winery operations, and also for experimental runs in large wineries. It can be used for either red or white wine production. In the case of red wine, the built-in punch system manages the cap, and is also used at completion of fermentation to press out the wine. With white wine, the punch system is used to press out the grape juice prior to fermentation and can later also be used for *bâtonage* (stirring up the settled yeast).

The **GOfermentor** provides a more controlled environment than fermentation in an open bin. The single-use fermentation liner is delivered clean, and the fermentation is performed entirely inside this sealed environment. This minimizes potential contamination. Even punch-down of the cap is done without exposing the fermenting *must* to air. The built-in punch system can operate automatically and it ensures that the cap remains moist while maximum flavor and color is extracted under control of the winemaker. The punch system is coupled with a strainer assembly to function as a very effective bladder press, eliminating the need for a dedicated press in the winery.

Optional accessories allow the monitoring and control of temperature. This enables each fermentation to be conducted at its optimal temperature.

The **GOfermentor** eliminates the high capital and installation cost of conventional stainless steel fermentation tanks. Minimal capital and operating labor costs are obvious advantages over the traditional fixed stainless-steel tanks. However, often overlooked is the cost and environment impact of washing. Conventional fermentation tanks must be thoroughly washed before and after use. This requires the use of polluting detergents, physical scrubbing, and lots and lots of rinse water. It is estimate that rinse water typically accounts for 3-7X the tank volume. Washing a 300 gallon fermentation tank wastes 900 to 2100 gallons of fresh water. With the **GOfermentor**, there is no wash water usage. The reusable outer container does not contact the *must* so a simple wipe down is sufficient. The fermentation liner is delivered empty, clean, and folded. These liners are made of USP grade biodegradable plastics which are free from plasticizers/leachables and are certified for use in pharmaceutical operations. There is no need to rinse or clean this liner before use. After the wine is pressed out at the end of the fermentation the liner contains the residual pomace. The entire liner can be taken to the vineyard and the pomace dumped back as a natural fertilizer for the vines as it is not contaminated with any detergents. The empty used liner can simply be sent to municipal landfill where it quickly biodegrades. The used liner does not contain any hazardous or toxic chemicals.

BENEFITS

The **GOfermentor** provides many benefits to the winery:

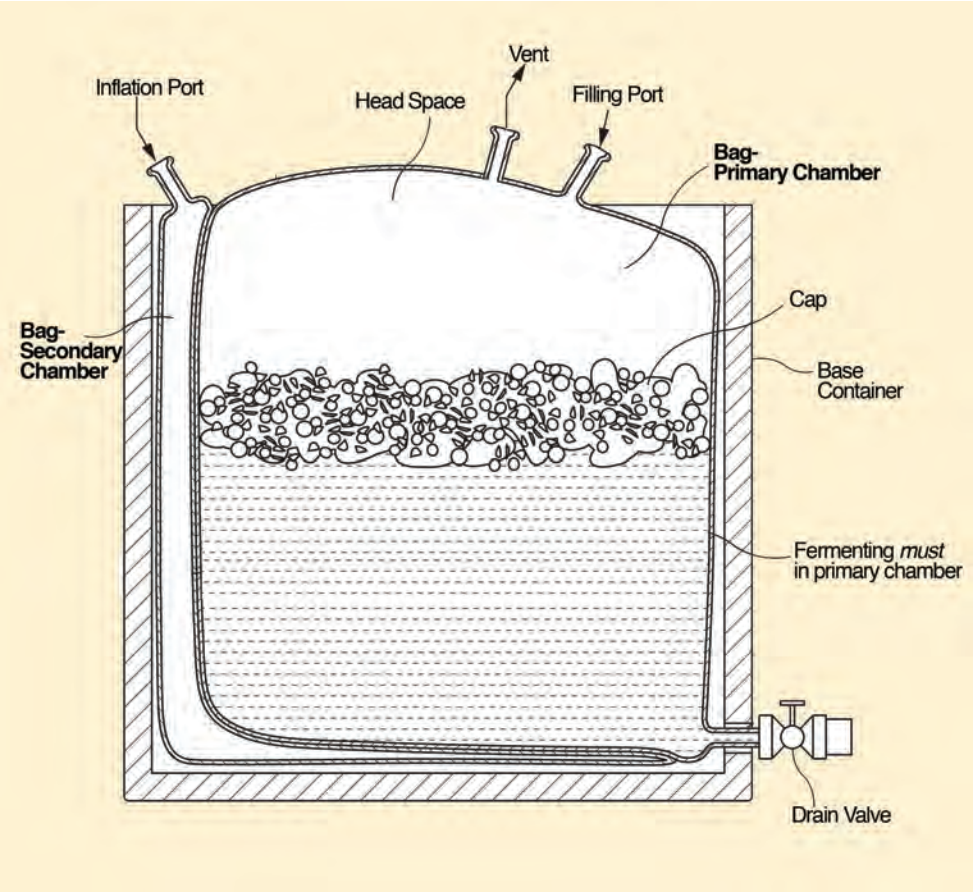
1. A clean and closed environment for the fermentation. No open operations result in minimal oxidation. This also can reduce the need to add sulfites. No “reductive” aromas.
2. Minimal capital expenditures.
3. Single-use design eliminates cleaning with a huge reduction in water consumption.
4. Integral automated punch ensures proper cap management with excellent flavor and color extraction.
5. Integral press design eliminates the need for labor intensive pressing and cleaning. Pressing can be done without any air contact. Eliminates the need for a costly press and water usage to clean it.
6. Portable clean operation. Grapes can be destemmed and crushed at the vineyard and pumped into the GOfermentor. Truck the filled GOfermentor to the winery and start the fermentation. All the mess and cleaning is confined to just the vineyard.
7. Urban microwineries – the GOfermentor makes the urban microwinery possible. It is portable, compact, needs no water or utilities, minimal staff needed. 4’x4’ space and 120 volts household power receptacle.

2. COMPONENTS

The **GOfermentor** consists of two major components:

1. **GOBASE - Reusable outer container with control panel** – This rigid plastic container holds the fermentation liner in position. The container can be moved by pallet jack or forklift. It is also DOT certified for truck shipment. Since the wine does not contact the outer container, it can be reused between batches by simply wiping down the surfaces. The container also folds down for storage when not in use. A panel with electrical components, inflation pump, and valves attaches to the rigid container for automatic control of punch, temperature, and other functions.

2. **GOLINER - Single-Use Fermentation Liner** – The fermentation is conducted entirely inside a flexible plastic liner. This liner has 2 chambers – a primary chamber where the fermenting *must*, or juice, is contained, and a secondary chamber that is used solely for inflation. The two chambers share a common wall, however it is important to note that the air used to inflate the second chamber does in no way come in contact with the fermenting *must* in the primary chamber. The GOLINER is supplied clean and ready for use. It is intended for only one use.



3. INSTALLATION

The **GOfermentor** is designed to be portable. There is essentially no installation other than placing the unit in position and connecting to a standard electrical outlet.

3.1 WHAT DO YOU NEED TO PROVIDE?

- Floor space 48x48inches by 60inches height. Minimum doorway width 46 inches.
- Pallet jack or truck to move 200 lb (90Kg) GOBASE unit.
- Standard household-type electric service 110 VAC 5amp. Optional 220 VAC.
- Chilled water or glycol supply if using optional GOCOOLER heat exchanger plate.

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3.2 WHAT DO YOU NEED TO ORDER FROM US?

REQUIRED

- GOFERMENTOR NET
- GOBASE outer container
- GOLINER single-use dual chamber fermentation liners. Need one per batch. Sold in packs of 3.

OPTIONAL

- GOTEMP sample tube/temperature probe for temperature measurement and sampling (recommended).
- GOCOOLER heat exchanger plate for temperature control (requires GOTEMP and recirculating coolant).

3.3 EQUIPMENT SETUP

Setting up the **GOfermentor** for winemaking is easy and should take less than 15 minutes. First set up the rigid GOBASE unit. Then install the single-use GOLINER.

GOBASE

1. Set the rigid GOBASE in a suitable area. Open the folded sides and push them until they lock in place.
2. Check that there is no debris inside the GOBASE that might damage the GOLINER.
3. Assemble the support rail and hose support pole to the control panel (Appendix A2). Using the support rail hang the control panel on the **front right of the GOBASE. The front of the GOBASE is the side with the drop down door**. Just place the support rail over the lip of the GOBASE and let the control panel hang against the front of the GOBASE.

OPTIONAL GOCOOLER HEAT EXCHANGER PLATE

For temperature control, the optional GOCOOLER heat exchanger plate is necessary. It also requires the **GOTEMP** sampler/temperature probe.

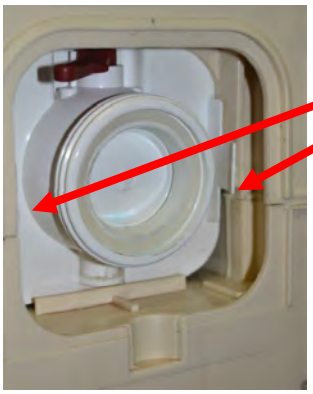
1. Assemble the coolant pipes to the heat exchanger plate (Appendix A6).
2. Place the GOCOOLER on the bottom of the GOBASE with the vertical coolant lines **towards the back**. The back side is the side opposite the drop-down door. If you need additional cooling, you can place two cooling plates in the GOBASE (Appendix A6). The GOLINER will be placed direct on top of the heat exchanger plate. DO NOT PLACE THE GOCOOLER OVER THE DRAIN OPENING.
3. Connect a coolant inlet hose (user-supplied) to the control valve (1/2” NPT) and the coolant return hose (also user-supplied) to the outlet fitting (½” NPT).

GOLINER

1. Remove the GOLINER carefully from its packaging. Remove and discard any packing materials.
2. Place the GOLINER inside the GOBASE. The GOLINER has 4 ports (see Page 5):

    a. TOP FILL PORT: This port is used to fill the liner, to make additions and to sample the GOLINER. It should face up and be positioned towards the front.
    b. TOP VENT PORT: This port is located near the top center of the liner and is used to vent gas out of the liner.
    c. BOTTOM DRAIN PORT: This port has a built-in valve and locking collar. It will be installed in the bottom drain fitting on the front of the GOBASE.
    d. INFLATION PORT: This port is used to inflate the secondary chamber of the GOLINER. It is located in the blue section of the GOLINER and marked AIR ONLY. It should face towards the rear.

3. Reach inside the GOBASE bottom discharge opening and pull the BOTTOM DRAIN PORT towards you. Pull until the tabs on either side of the BOTTOM DRAIN PORT lock into the corresponding ribs on the GOBASE as shown below.



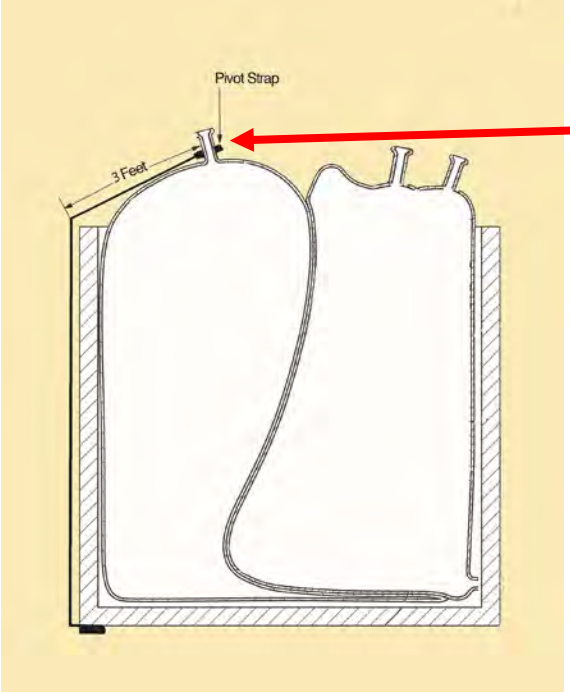
Make sure tabs are locked into the grooves on both sides!

DO NOT remove the tamperproof flange and green cap

The discharge port is not typically used in GOfermentor operation. It is used to lock the GOLINER into the base so it does not pull out during punching.

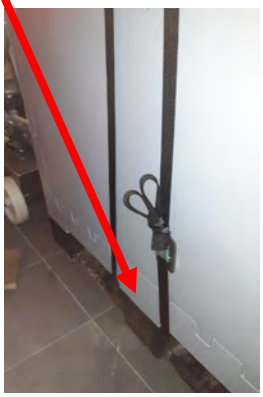
BOTTOM port – note the green cap has been removed to better show the locking tabs

4. Use the supplied PIVOT STRAP to support the inflation port. Wrap the blue inflation port a few times with the strap and anchor it through the middle leg of the GOBASE as shown in the figure below. Use the grip to secure the strap. The length of the strap from the GOBASE lip to the blue port should be about 3 feet.



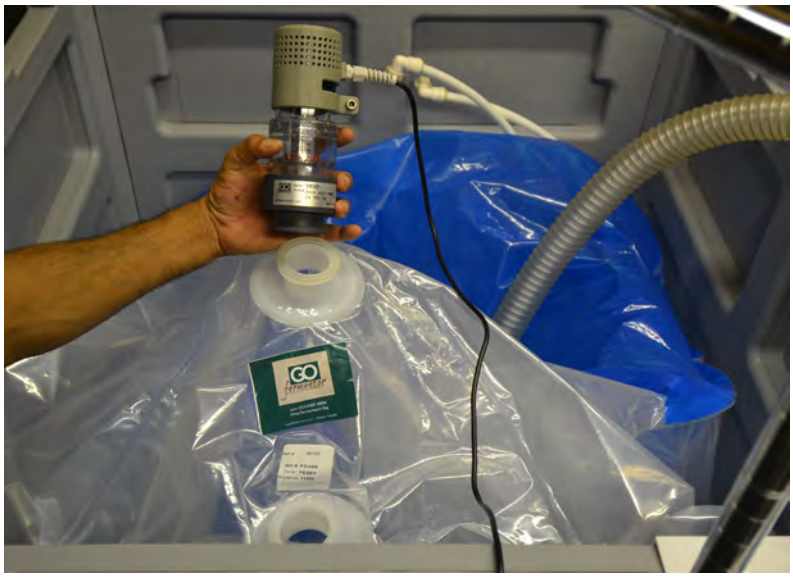
Double loop and/or knot PIVOT STRAP around blue inflation port to prevent from slipping off

Loop around middle leg and adjust length using grip clamp

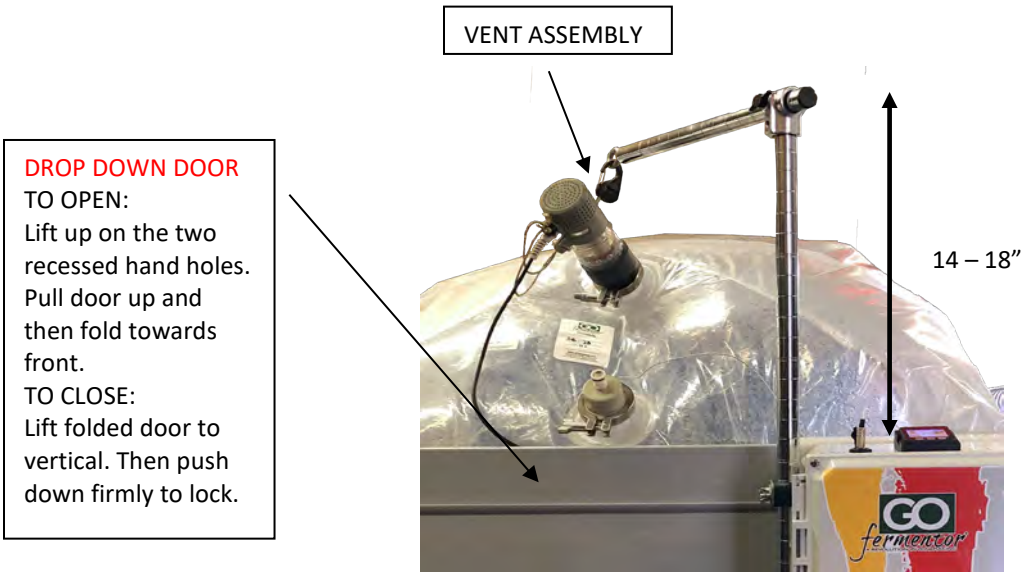


Note: During punching operations the slack may not be taken up completely but the PIVOT STRAP is **essential** during pressing to hold the air chamber vertical and in position.

5. Connect the VENT VALVE on to the VENT port using the supplied TriClamp and gasket. The VENT port is the **middle port** (located between the sampling port and the blue inflation port).



6. Use the supplied suspension cord to hang the VENT VALVE from the support pole located on the left side of the GOFERMENTOR control panel. The keeps the VENT assembly from falling into the GOBASE. Adjust the cord so that VENT assembly is above the lip of the outer container.



7. Plug the cable on VENT VALVE into the jack labeled VENT, located next to the power entry cable.

8. Connect the INFLATION port to the fitting on the right side of the control panel using the supplied INFLATION HOSE. The TriClamp end connects to the liner and the quick-connect end connects to the control panel.

9. Power up the control panel. Once the MAIN CONTROL window is displayed press the PUNCH button and verify that the VENT valve opens. You will hear a click and you can see the valve open about ½" through the clear VENT valve assembly. Press the flashing CANCEL button and verify that the valve closes. The VENT assembly is actuated electrically during PUNCH operations. It also has a spring-loaded pressure relief valve that automatically vents if the GOLINER pressurizes beyond safety limits.

FIRST TIME SETUP – if you are setting up the GOfermentor for the first time you need to connect the controller to the internet using WiFi. See SECTION 6 for instructions. If you do not have internet access then refer to Appendix 4 to disable internet functionality.

10. Now repeat initiating the PUNCH operation but now allow the inflation chamber to inflate. This pulls the inflation chamber into the correct position. You can cancel the PUNCH after the inflation chamber appears to be fully inflated.

PERFORMING A PUNCH WITH THE EMPTY LINER IS CRITICAL AS THIS OPERATION PULLS THE INFLATION LINER OUT FROM UNDERNEATH THE FERMENTATION CHAMBER. THIS ENSURES THAT AN EFFICIENT PUNCH CAN BE PERFORMED WHEN THE LINER IS FULL OF MUST. OTHERWISE PORTIONS OF THE INFLATION LINER CAN BE TRAPPED UNDER THE FERMENTATION CHAMBER AS IT IS FILLED. THIS PREVENTS THE INFLATION LINER FROM PUSHING COMPLETELY AGAINST THE MUST AND CAN CAUSE INCONSISTENT PUNCHING.

NOTE: NO AIR WILL BE INTRODUCED INTO THE FERMENTATION LINER.

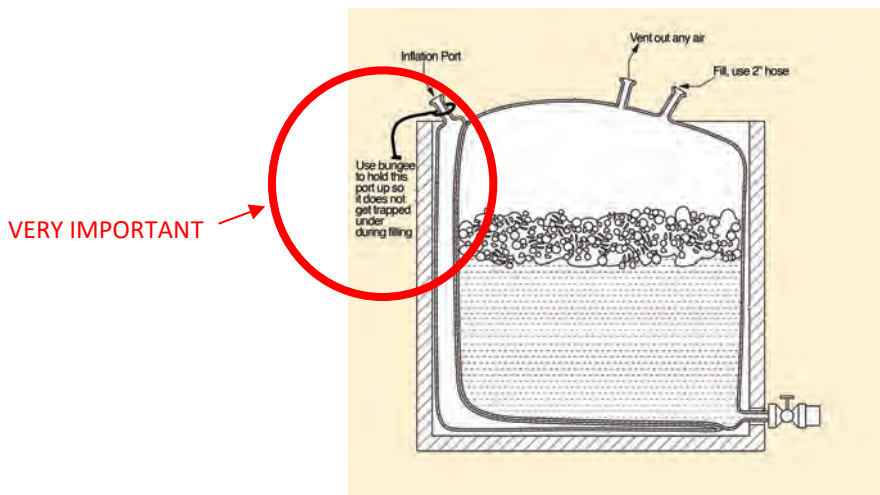
You have now completed the GOLINER installation. The next operations are different depending if you are making red wine or white wine.

4. RED WINE OPERATIONS

Ensure the **GOfermentor** is setup as described earlier in Section 3.3.

FILLING WITH MUST

1. Connect the destemmer outlet with a 2 inch TriClamp hose to the FILL port (closest to front).
2. Run the destemmer/crusher and use its internal pump or external *must* pump to transfer the required amount of crushed grapes into the GOLINER (max 1 ton). **Some must pumps introduce air. It is best to remove the VENT valve assembly to allow air to flow unrestricted from the vent port. Reattach when filling is complete.**
3. Disconnect the fill hose. If you are using the optional GOTEMP sampler/temperature probe insert this into

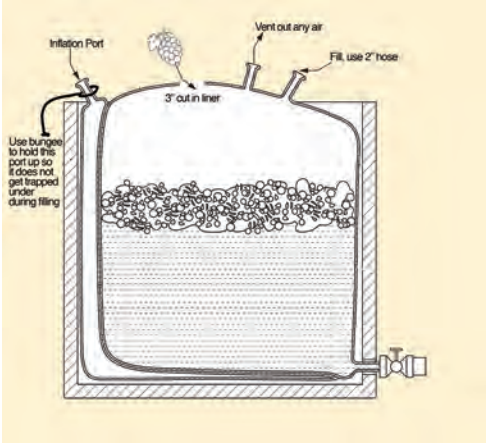


CONNECT THE INFLATION HOSE

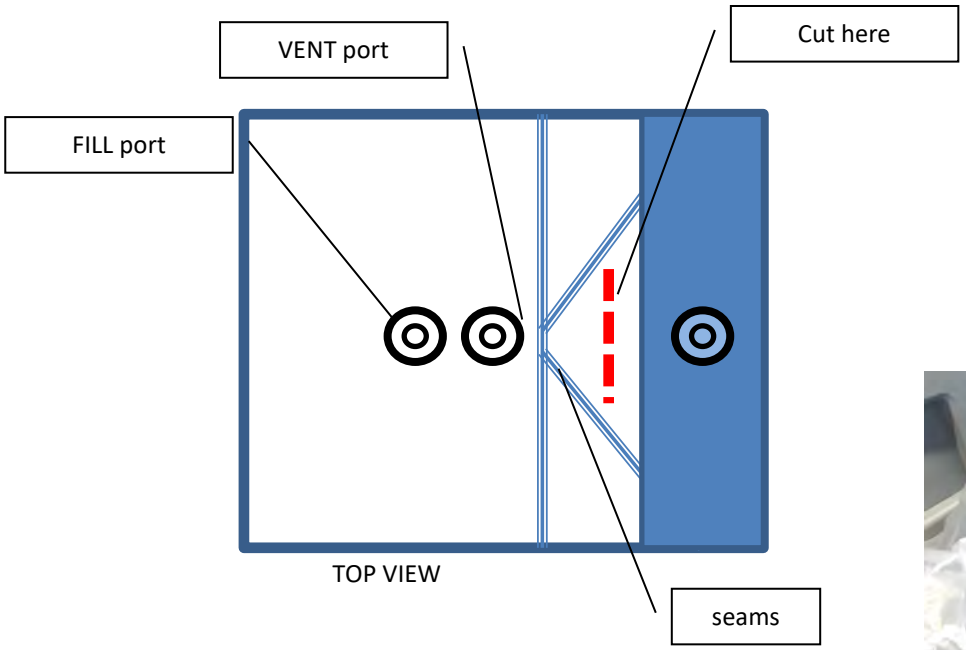
1. Connect the inflation hose to the camlock adaptor on the INFLATION port (located on the BLUE chamber). Connect the other end of the INFLATION hose to the blower outlet located on the right side of the control panel.

ALTERNATIVE FILLING METHOD

1. In the event a *must* pump is not available, or any other reason the 2 inch TriClamp opening can't be used, an opening can be cut into the top of the GOLINER. Use of whole clusters not recommended.



2. Placement of the cut is crucial and should be made inside the triangle formed by seams between the vent port and the inflation chamber, making sure not to cut into any of the welded seams of the liner. We recommend a cut no longer than 24 inches



3. Apply tape along the length of the cut on both sides and fold over the edges. This will help hold the cut open and also help during closing the liner after filling.

4. Once finished filling, the cut is easily closed with tape. Ensure surface is clean and dry before applying tape. First apply a few small strips perpendicularly along the cut to “stitch” it together and to align the 2 sides. Then apply a few more long strips parallel to the cut to seal it closed.



You can use duct tape but special food-grade tape is available – please contact tech@GOfermentor.com

DO NOT ATTEMPT to fill the liner with crushed grapes from the BOTTOM DRAIN port. This is impossible.

MUST ADJUSTMENT

1. Samples of the *must* may be taken from the top FILL port and any additions can be made by opening the TriClamp cap cover or by removing the GOTEMP sampling/temperature probe.
2. Inoculation with yeast is also done through the FILL port.

INITIAL OXYGENATION

1. Usually sufficient oxygen is introduced during the fill, but additional oxygen can be added to the *must* in order to get vigorous yeast growth after pitching.
2. This can be done by connecting a tube (with connection adapter) to the sampler fitting and blowing air into the fermentor. In this manner, the air is introduced near the bottom ensuring efficient oxygenation.

New users always ask why the GOfermentor does not produce “reductive” aromas. The thought is that because it is closed system it should be a “reductive environment” and result in stinky odors. The traditional method to avoid “reductive” aromas is to add oxygen. Actually, “reductive” aromas are the result of yeast stress, and caused by high temperatures or nutrient limitations. The GOfermentor never produces “reductive” aromas because the unique punching action moves the *must* around continuously, reducing temperature gradients and resuspending settled yeast. There is usually no need to add air after the initial yeast pitching.

TEMPERATURE PROBE/SAMPLING TUBE

1. Place a TriClamp gasket and slide the GOTEMP sampler/temperature probe down through the FILL port

2. Use the supplied TriClamp to secure the sampler/temperature probe.
3. Plug the temperature probe cable into the jack located on the front panel.
4. Power up the control panel and verify that temperature is displayed.

CLEANING THE SAMPLING TUBE

At the end of fermentation, it is necessary to clean the sampling tube.

1. Unscrew the metal tip of the sampler and wash it with a brush. Take care not to damage the white temperature probe.
2. Detach the coupling tube from the HAND SAMPLER and insert it into the female quick coupling on the GOfermentor sampling tube. This opens the flow path. Now force hot water through the coupling tube to flush out the sampling tube.
3. Detach the coupling tube and reassemble the metal tip.

SAMPLING USING HAND SAMPLER

Sampling is performed by connecting the hand sampler. Connect the coupling tube to the sampler. Push the quick-connect coupler on the coupling tube onto the mating socket on the sampling tube. This will open the flow path to the collection bottle. Now pump the handle to draw the sample into the collection bottle. Disconnect the sampler by pressing the release button on the mating socket. Remove the sampler. Unscrew the bottle to pour out the sample.

Coupling tube

Hand Sampler

Connect to open sample path

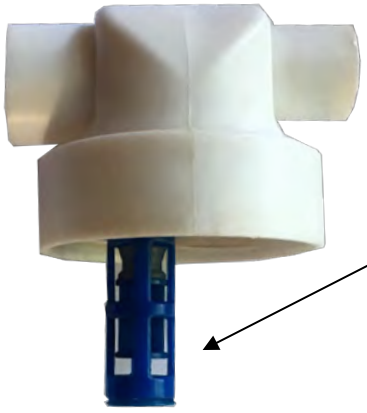
Pump handle to fill collection bottle

Sample fills collection tube

CLEANING THE SAMPLER

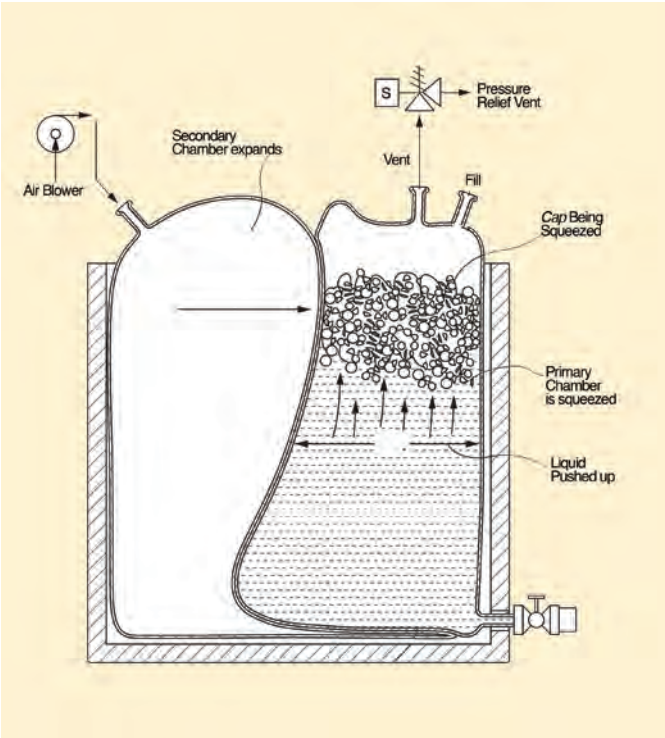
Dip the coupling tube on the sampler into a container of water and pump to flush the flow path into the collection bottle. Remove and rinse the collection bottle. Reattach the bottle for next use.

NOTE: Do not operate the hand sampler without liquid. Hand pumping in air will cause the overflow valve in the sampler to bind up. This can also happen if there is water in the mechanism. You will then need to remove the sample bottle and free the valve as shown below:



The valve is in this cage. If it is stuck up then the sampler will not pump. Shake it so it moves freely up and down and stays in the down position.

PUNCH OPERATION



Punch of the cap may be initiated at any time in the fermentation. It can also be performed after initial *must* adjustment to mix nutrient additions if desired.

The punch operation can be initiated manually or on a scheduled basis. For manual operation select the PUNCH operation using the OPER button. PUNCH should be displayed over the OPER button.

1. The status box on the panel should show READY indicating that the unit is ready for punching. Press the START button to manually initiate the punch cycle.
2. The START button will change to CANCEL indicating that a punch is now in progress. You can press the CANCEL button at any time to instantly cancel the punch.
3. The PUNCH sequence will first open the VENT valve to deflate the fermentation chamber to the atmosphere. After a few minutes the blower will come on and the secondary chamber will inflate pushing on the fermentation chamber upwards. This in turn forces the liquid and cap in the fermentation chamber up and also pushes the gas out. At a preset pressure, the blower will turn off and the secondary chamber will deflate. After 10 seconds or so the blower will come on again and this cycle will repeat for the preset punch time (typically 2 minutes).
4. The system will then reset, and the VENT valve will close and the fermentation chamber will slowly reinflate with the CO2 generated by the fermentation. Excess pressure will automatically be vented through the spring-loaded pressure relief in the VENT assembly. This ensures that the GOLINER cannot overinflate beyond safety limits (nominal 0.7psig).

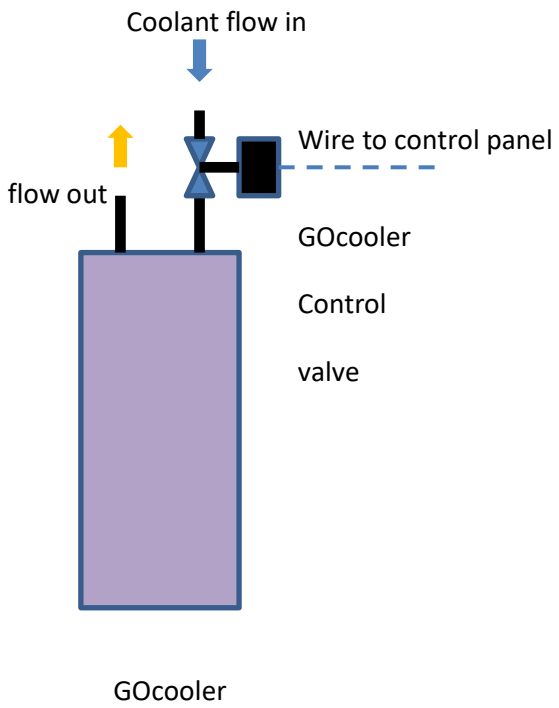
The controller enables the punch to be done automatically on a user-set schedule. Timing and duration of the punch cycle can also be adjusted. Punch cycles are recorded on the event log.

NOTE: You may need to adjust the PUNCH pressure setpoint depending on the must volume (SETUP). For small volumes 15” H2O is good, while for a large volume (> 600Kg) you should use a higher pressure (20” H2O) to get an effective punch.

IMPORTANT: To get an effective punch all the gas in the headspace should be forced out of the fermentation liner chamber. Increase the vent duration as necessary to ensure that all the gas is vented out. If gas is left in the headspace the liquid will not be punched properly.

TEMPERATURE MONITORING

Temperature is monitored continuously by a probe positioned in the center and about 8 inches from the bottom and can be displayed in either degrees C or F. The controller also has the ability to control temperature by regulating flow of coolant through the optional GOCOOLER heat exchanger plate.

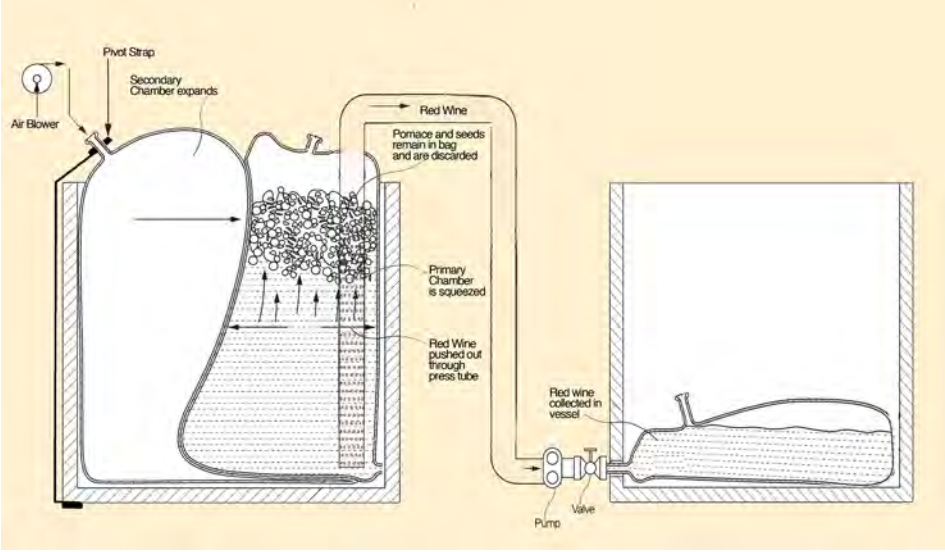


PRESSING OUT THE WINE

The **GOfermentor** built-in press system can be used to gently press out the wine. Use of the feature eliminates the need for an external press and performs the pressing operation without any damaging exposure to air. It is recommended the punching be discontinued several days prior to the anticipated pressing. At this late stage in the fermentation most of the desired components and color should have already been extracted from the cap and further punching is not useful. More importantly, discontinuing punching allows the cap to flocculate upwards and clear wine collect below it. This increases the free-run and makes pressing faster.

1. When ready for press, **remove the TEMPERATURE PROBE/SAMPLING tube from the liner**.
2. Insert the supplied PRESS tube into this port and secure with a TriClamp.
3. Remove the VENT valve assembly and close with 2" TriClamp gasket, cap, and clamp.
4. CHECK that PIVOT strap is secure and correct length (4' from GOBASE upper lip).
5. Connect the TriClamp outlet port on the PRESS tube to a wine transfer pump. Use a crush-proof reinforced hose rated for vacuum.
6. The pressing tube will retain most of the seeds and skins, so an inexpensive self-priming flexible impeller pump, or pneumatic diaphragm pump are good choices. Place a strainer inline to protect the pump from any debris that may go through the press tube.

The configuration should look as follows:



7. Start the wine transfer pump to transfer the free-run wine. At first, the pump will simply remove the head space gas and you should see the headspace collapsing. If you do not observe the headspace being removed, there is an air leak into the headspace or the pump is insufficient. You must resolve this otherwise the pressing operation is not possible. The wine will start to flow once all the gas is removed. Avoid pumping too fast as this will draw in the cap.
8. Once the free run flow stops you can start to press out the residual liquid in the *pomace*. For this, initiate the PRESS operation to squeeze the cap gently to press out the wine. The PRESS operation is run several times with a hold period between each press+hold cycle to maximize the yield. The whole

process is automatic. You set the number of cycles (typically 3), hit the PRESS button, and walk away. Pressing takes about 90 minutes (3 cycles).

9. When pressing is complete, disconnect and remove the pressing tube. Remove all fittings in preparation for lifting out the liner.

   NOTE: It is useful to have a variable speed reversible pump. Sometimes the pressing can clog due to buildup of pomace. A few seconds of reverse flow can clear this blockage and then normal press can be resumed.

DISPOSAL

At the end of pressing a tight mass of skins and seeds will remain in the GOLINER. Remove all fittings and twist the top of the liner. Use a lifting strap to form a lift point as shown below:

Release locking tabs to remove liner

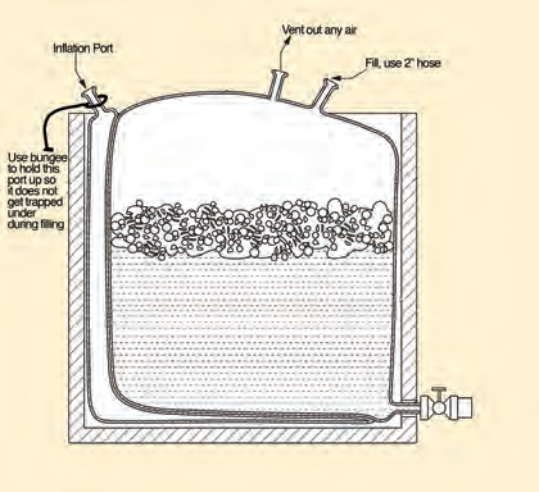
Using a suitable device, lift the GOLINER out of the GOBASE using a lifting strap. A manual automotive engine lift is an economical choice if a winch or forklift is not available. The GOLINER may be taken to the vineyard and slit open to disperse the pomace as fertilizer. The empty GOLINER is then simply folded up and discarded as household waste. There are no toxic chemicals in the used GOLINER and it will biodegrade in a landfill. The GOBASE never contacts the *must* so it can simply be wiped down and setup with a new GOLINER for the next fermentation.

5. WHITE WINE OPERATIONS

The **GOfermentor** must first be setup as described earlier in Section 3.3. For white wine production you will need two GOBASE units and two GOLINERS.

FILLING WITH GRAPES

1. Connect the destemmer outlet with a 2 inch TriClamp hose to the FILL port (closest to front).
2. Run the destemmer/crusher and use its internal pump to transfer the required amount of crushed grapes into the GOLINER (max 1 ton). **Some must pumps introduce air. It is recommended that the VENT valve assembly be removed to allow air to flow unrestricted from the vent port. Reattach when filling is complete.**
3. Disconnect the fill hose. Use a TriClamp cap to close off the fill port.

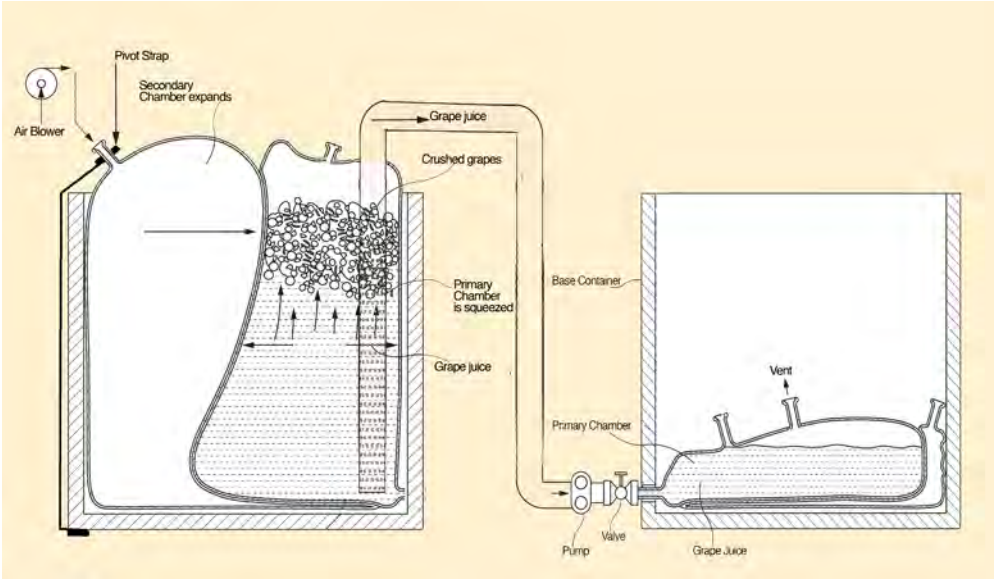


PRESSING OUT THE JUICE

The **GOfermentor** built-in press system can be used to gently press out the grape juice free of skins and stems. Use of the feature eliminates the need for an external press and performs a very gentle pressing operation without any damaging exposure to air. After filling the GOLINER with grapes:

1. Insert the supplied PRESS tube into FILL port and secure with a TriClamp.
2. Close off the VENT port with a 2” TriClamp gasket, cap, and clamp.
3. CHECK that PIVOT strap is secure and correct length (8’).
4. Connect the TriClamp outlet port on the PRESS tube to a wine transfer pump. Use a crush-proof reinforced hose rated for vacuum.
5. The pressing tube will retain most of the seeds and skins so an inexpensive flexible impeller pump is a good choice. Place a strainer inline to protect the pump from any debris that may go through the press tube. Connect the discharge of the pump to another GOLINER where the fermentation will be conducted.

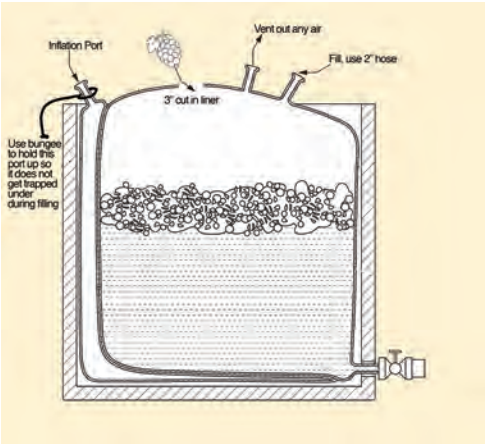
6. The configuration should look as follows:



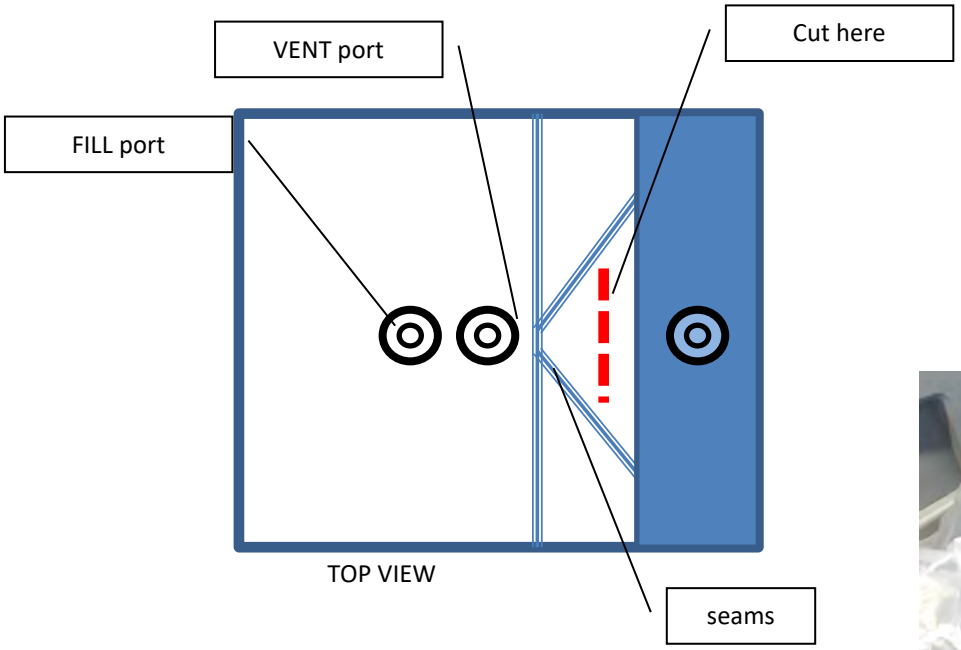
7. Start the wine transfer pump to transfer the free-run juice. At first, the pump will simply remove the headspace gas and you should see the headspace collapsing. The juice will start to flow once all the gas is removed.
8. Start the PRESS cycles by selecting PRESS -> START. The PRESS operation is run several times with a **hold** period between each **press** period to maximize the yield. The whole process is automatic. You set the number of cycles (typically 3), hit the START button and walk away. Pressing takes about 90 minutes (3 cycles).
9. When pressing is complete, disconnect and remove the pressing tube. Remove all fittings in preparation for lifting out the liner. Prepare the second GOLINER for fermentation by connecting the vent and inflation lines (if *bâtonage* is desired). Insert the temperature probe/sampling tube as described earlier for red wine production.

ALTERNATIVE METHOD OF FILLING

1. In the event a must pump is not available, or any other reason the 2in TriClamp opening can't be used, an opening can be cut into the top of the GOLINER. Use of whole cluster not recommended.



2. Placement of the cut is crucial and should be made inside the triangle formed by seams between the vent port and the inflation chamber, making sure not to cut into any of the welded seams of the liner. We recommend a cut no longer than 24 inches



3. Apply tape along the length of the cut on both sides and fold over the edges. This will help hold the cut open and also help during closing the liner after filling.

4. Once finished filling, the cut is easily closed with tape. Ensure surface is clean and dry before applying tape. First apply a few small strips perpendicularly along the cut to “stitch” it together and to align the 2 sides. Then apply a few more long strips parallel to the cut to seal it closed.



You can use duct tape but special food-grade tape is available – please contact tech@GOfermentor.com

DO NOT ATTEMPT to fill the liner with crushed grapes from the BOTTOM DRAIN port. This is impossible.

IMPROVING JUICE YIELD

The key to good juice yield is patience. Regardless of pressure, it takes time for the juice to disengage from the pulp. The GOfermentor is automated so you can set it up to do 3 -5 cycles with 1-2 hours of wait time between cycles which will improve yield. There is no downside since the grapes are protected from air. It just takes a few hours of unattended operation. You should get fairly dry pomace and yields of 140 to 160 gallons per ton.

ADJUSTMENT AND FERMENTATION IN COLLECTION LINER

Adjust the *must* by additions through the top FILL port. Add yeast and perform the fermentation. A GOfermentor is not essential for white wine as no punching is necessary, however, it is recommended to use a GOfermentor and set the punch mechanism to activate twice a day. This significantly reduces temperature gradients and also disperses any settled yeast, reducing the risk of a “reductive” stinky fermentation.

COOLING AND SAMPLING

For white wine it is highly recommended to use the optional GOCOOLER heat exchanger plate and the GOTEMP sampler/temperature probe for temperature control. Temperature is monitored continuously by a probe positioned in the center and about 8 inches from the bottom. If coolant temperature is not cold enough it may be necessary to use an additional cooling plate (Appendix A6).

Sampling is done as described earlier for red wine.

BATONAGE

The GOfermentor makes it easy to stir up the lees during fermentation and aging. The punch operation used in red wine production is used to perform the bâtonage. Simply press the PUNCH button and the primary fermentation chamber will be compressed and pushed upwards, effectively dispersing the settled yeast.

RACKING

Connect a hose to either the VENT or FILL port and use a wine pump to suck the wine out of the GOLINER to a collection liner, tank, or barrel for post-fermentation operations. Allow the port to descend as the wine is removed and stop pumping when you reach the lees. Disconnect and discard the used GOLINER.

6. OPERATION OF CONTROLS

The GOfermentor NET is an IOT (internet-of-things) device. It is best to operate it via the smartphone App available from the Android Play store or Apple App Store. To work with the app the GOfermentor must be connected to the internet using WiFi. If there is no internet access available the GOfermentor can be operated solely from the device display panel, however remote functionality will not be available. Refer to Appendix A4 for instructions on how to permanently disable WiFi (not recommended).

6.1 USING SMARTPHONE CONTROL APP

FIRST TIME USER REGISTRATION

1. You will receive an email from Blynk robot@blynk.cloud on the email address you provided to us at the time of your GOfermentor order. Click on the link in this email to setup a Blynk account. You can provide a password of your choice. Close the sign up window when you are done.

   What is a Blynk account?
   An account is an email+password combination
   Each GOfermentor is assigned to an account. This gives it secure ownership. Only this account can view or control this GOfermentor. The account holder can extend invites so other users can share access.

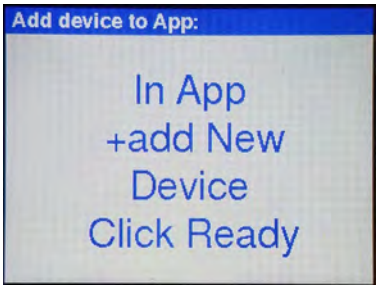
2. Download the Blynk IoT app (**not Blynk legacy**) to your mobile device from either Android play store or Apple App store.

LOGGING IN

1. Open the Blynk app and login using your email address and password. You will see tile display showing you all the devices you can access.

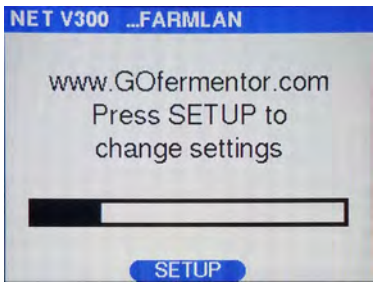
ADDING DEVICES

Power up the GOfermentor NET unit you want add and control to you Blynk app. After the startup screen you should see the following screen on the GOfermentor display:



If it gets stuck in this startup screen:

Cycle power OFF/ON. Hit the SETUP button within 30 seconds and select option Reset WIFI. Unit will restart and show the +add New Device screen.



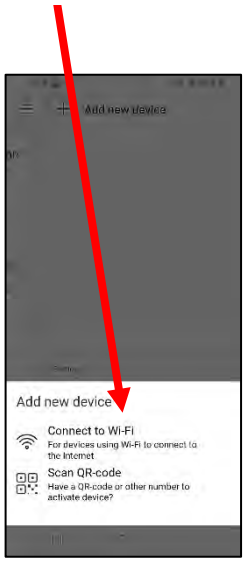
Open the Blynk app and login using your email address and password you selected on sign up. You will see a tile display showing you all the devices you can access.

If you do not have any devices yet, then click to add the first device.

To add additional new devices, first click the 3 lines in the top right corner

Next click “Add new Device”.

Select Connect to WiFi



Verify that the NET lcd display still shows **In App, +Add New Device**. Now click “Start” on the app. screen. Click “Continue” on next screen.

The App will search for compatible devices, when displayed, click on the name of found device. Device names will be similar to “Blynk-GOFERMENTORxxxx”

It will display “Connection Successful” once connected.

Next choose your Wi-Fi network from the list. **These MUST be 2.4 gHz networks. GOfermentor does not connect to 5 gHz**.

Now type in your WiFi network password (**not Blynk password**), remember this is case sensitive. Click the option to remember these settings if you plan on using it for other devices.

In a moment, the app and device will pair and configure the Wi-Fi credentials.

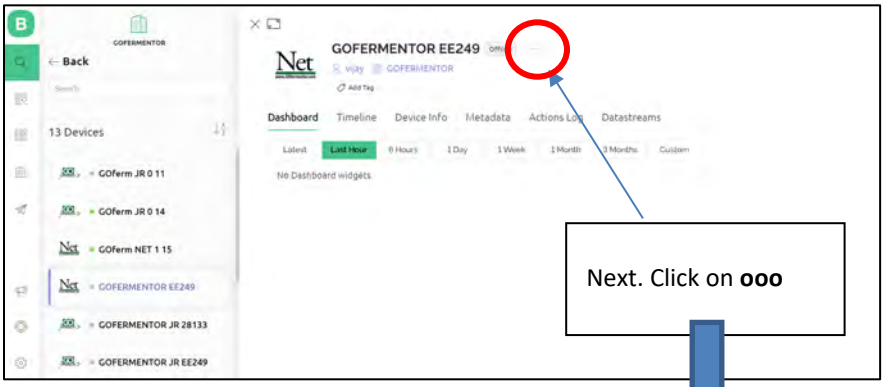
C indicates device is online

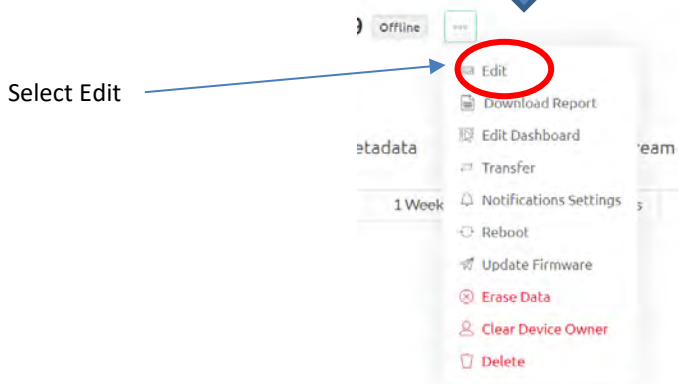
If successfully connected the following screen will be shown in the app and also the devices display will show the home screen.

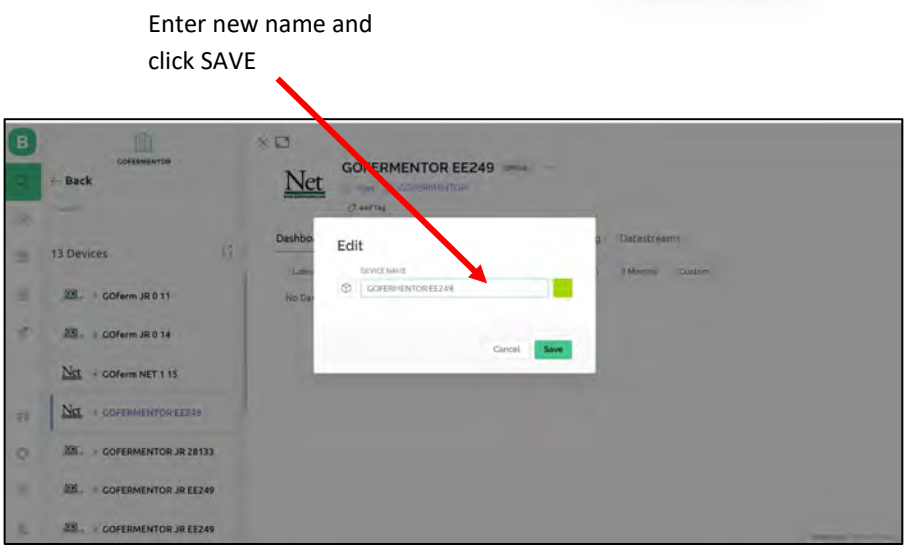
CHANGING THE DEVICE NAME

When you add a new device to your mobile app it will be given a default device name. You can change this name to something that is more meaningful and easier to remember.

Login into your Blynk console by clicking on **blynk.cloud** in any web browser and enter your username and password (same as the mobile app). Next click on **my Devices** and select the one you wish to rename. For example, click on GOFERMENTOR EE249 to change it's name. You will see the info page for this device.



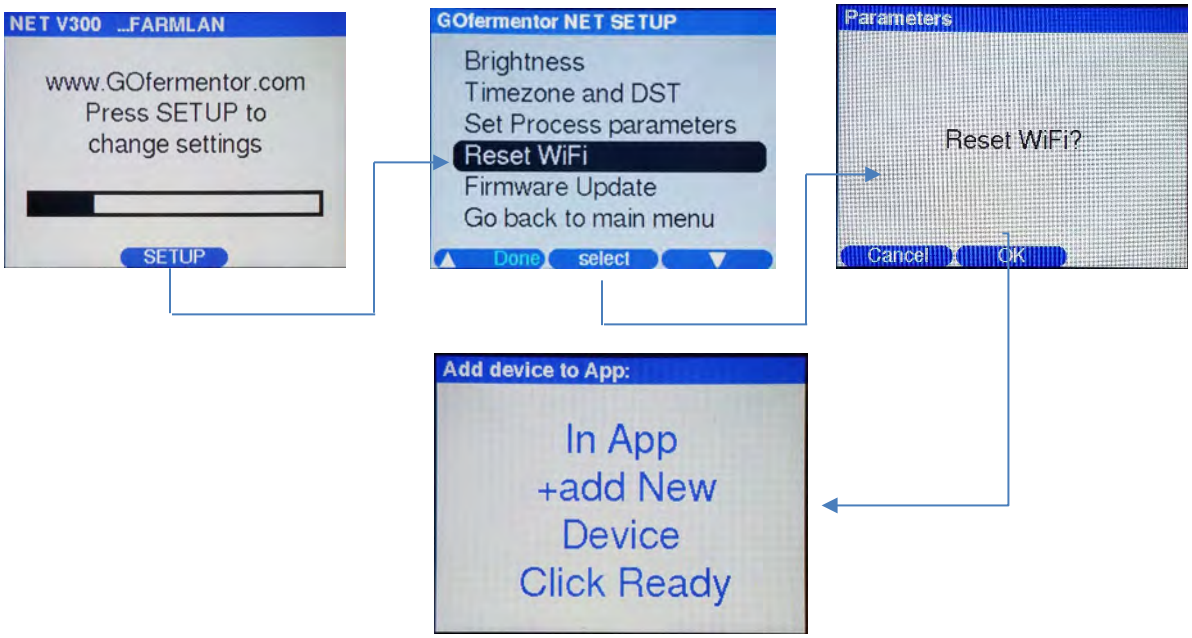




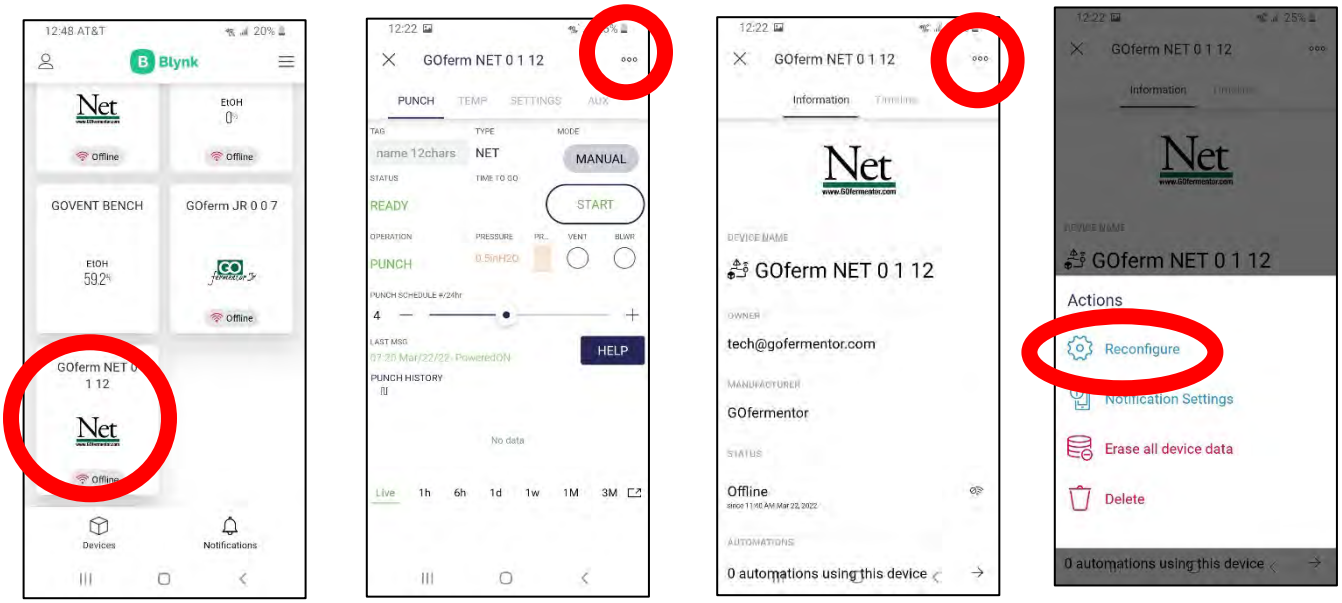
CHANGING THE WIFI SSID (LAN)

If you move the GOfermentor to a new location that is out of range of the original LAN (SSID) you assigned it the first time, you can easily change the WiFi SSID:

Cycle power on the GOfermentor and click the center button within 30 seconds. This will force the controller enter the SETUP menu, from here select “Reset WiFi”, confirm OK and wait for the reboot.



Now open the app, select the device you are wanting to change. Then tap the three dots in the upper right corner. On the next screen, tap the three dots in the upper right corner again. Finally tap on the “Reconfigure” option to reinitiate the pairing process. Confirm your selection when asked.



You will follow the same directions as adding a new device as listed in the previous section.

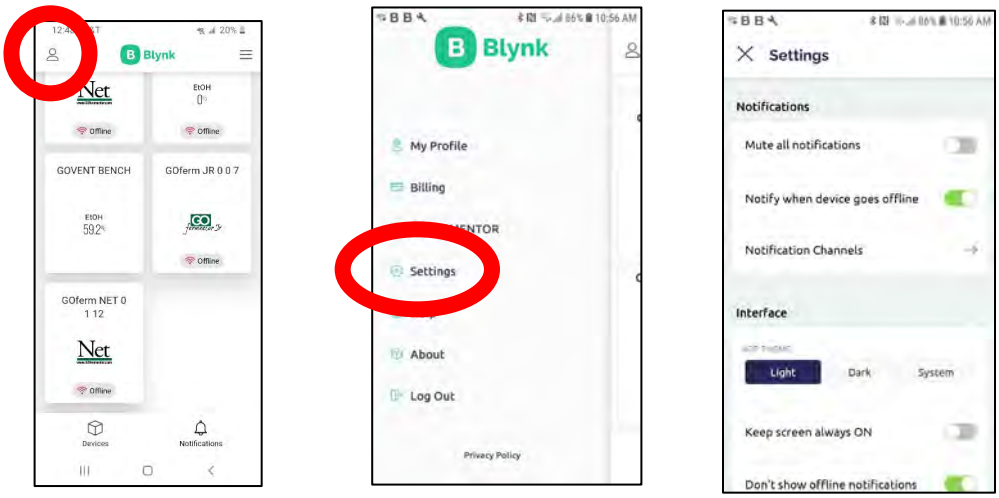
DEVICE INFORMATION AND TIMELINE

The Blynk app shows all the devices you are allowed to view on a tiled display. Click to bring up a particular NET display.

First tab shows you **Information** about the device. Clicking on **Timeline** will show you all the timestamped alarms and events.

APP SETTINGS

1. Click on icon (left top).
2. Click on Settings. The settings pertain to how notifications are handled. You turn notifications ON and OFF and also control how you wish to be notified.



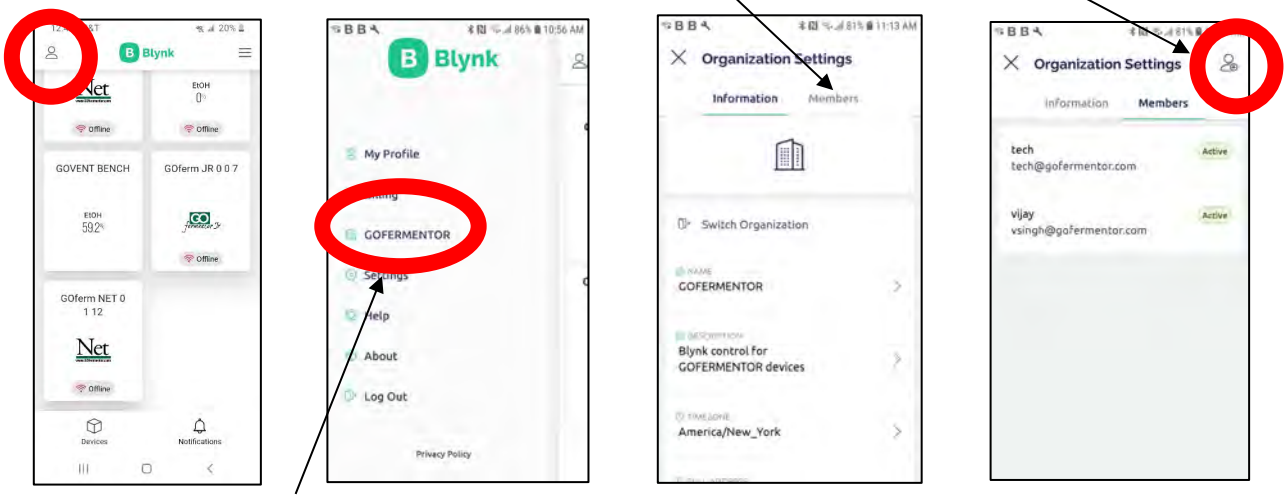
SHARING DEVICES

A user can allow others access to their devices. This involves adding new users to your ORGANIZATION:

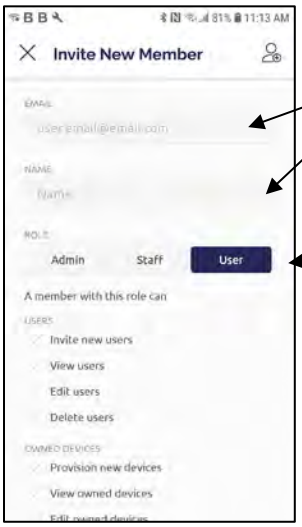
Click on icon (left top)

Click on Members

+invite new member



Select your ORGANIZATION
(GOFERMENTOR is just example.)



Provide a valid email and user name

Select ROLE as **USER** (will NOT allow user to pick Admin or Staff).

Scroll to bottom and click **INVITE**. Email will go to the new user with a link to sign up on Blynk.

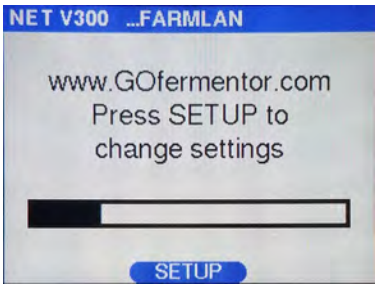
The new user should then download the Blynk app and login with their email and chosen password. They can now view and control all the devices in the ORGANIZATION.

ALL DEVICES in the ORGANIZATION will be visible to all members of the particular ORGANIZATION. Devices in other ORGANIZATIONS are not visible.

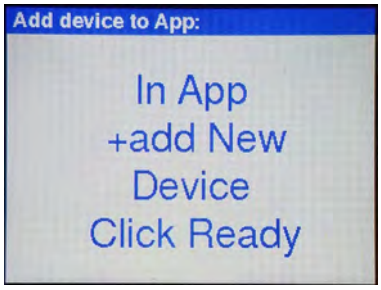
6.2 NET LOCAL CONTROLLER OPERATION

FIRST TIME USE

The unit is controlled by the 3 silver buttons with corresponding captions on screen. A WiFi internet connection is required. First set up the WiFi connection using the SmartPhone app as described in SECTION 6.1. On power you will see the startup screen. If you click SETUP you will get the SETUP menu.



If you get this screen on the GOfermentor controller screen on power up, you need to add the GOfermentor device to the SmartPhone App as described in SECTION 6.



The GOfermentor MUST be connected to WiFi internet to provide remote monitoring and control using the SmartPhone App. It is recommended to use the SmartPhone App for all operations. The local control panel on the GOfermentor is only for backup operation and for certain operations not possible from the App which include:

1. Set date/time zone/DST
2. Reset the WiFi SSID
3. Change parameters
4. Perform PRESS operation

OPERATING THE BUTTONS

The GOfermentor panel has just three buttons. If a button has only one function, then the caption is printed in the center of the button. If the button has two functions, then both are printed on the caption – the function on the left is printed in white and corresponds to a short click. The caption on the right is printed in cyan and is activated by a long click. Each button can have up to 2 functions.

ELEMENTS OF THE DISPLAY

Shows **C** when connected to cloud

Shows if internet connected

Shows **A** when App connected

TAG
User assigned label from App

Local time

WiFi signal

VENT status

Measured temperature

BLOWER status

Control setpoint

UNIT status

COOL or HEAT

Temperature controller status OFF or ON

Current Mode MANUAL or AUTO

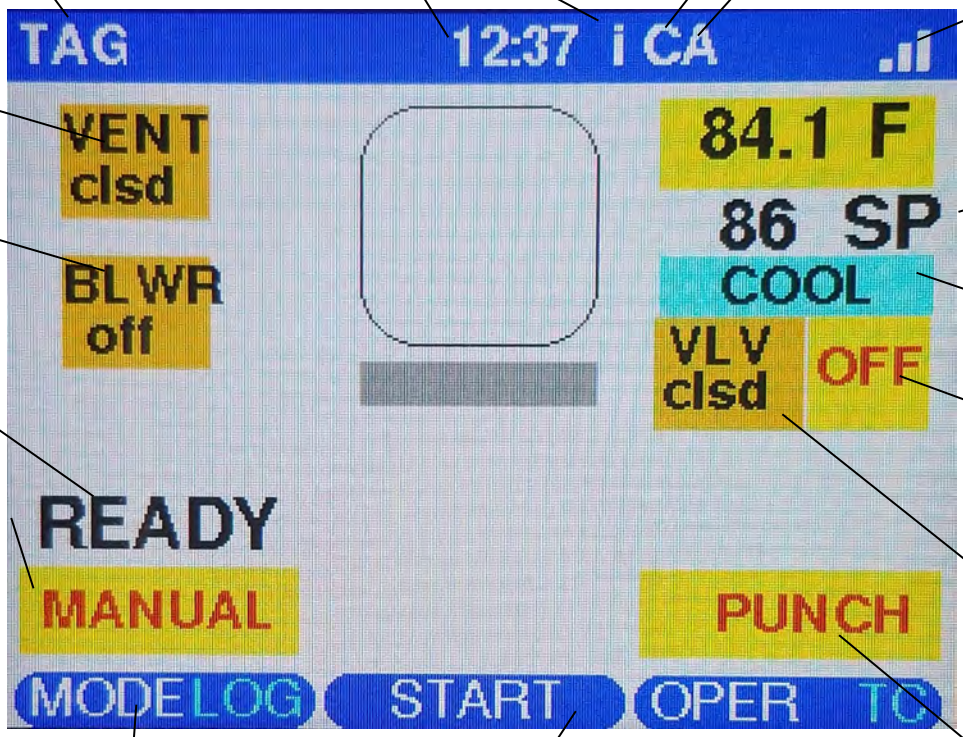
Temperature valve status

Current operation

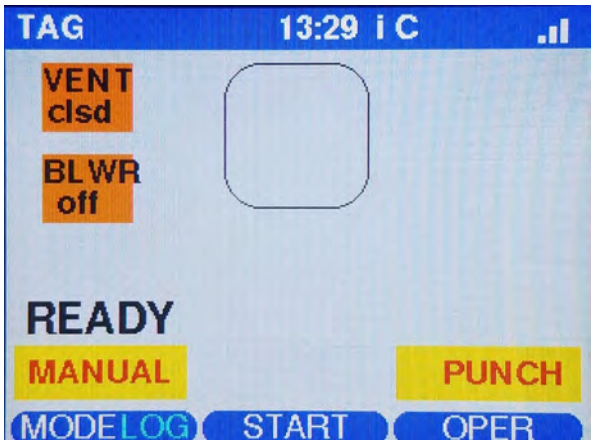
Short click toggles mode: MANUAL / AUTO
Long click displays event log and device settings

Pressing this button starts the operation. Caption then changes to CANCEL

Short click toggles OPERATION – PUNCH / PRESS
Long click to change temperature control (TC)

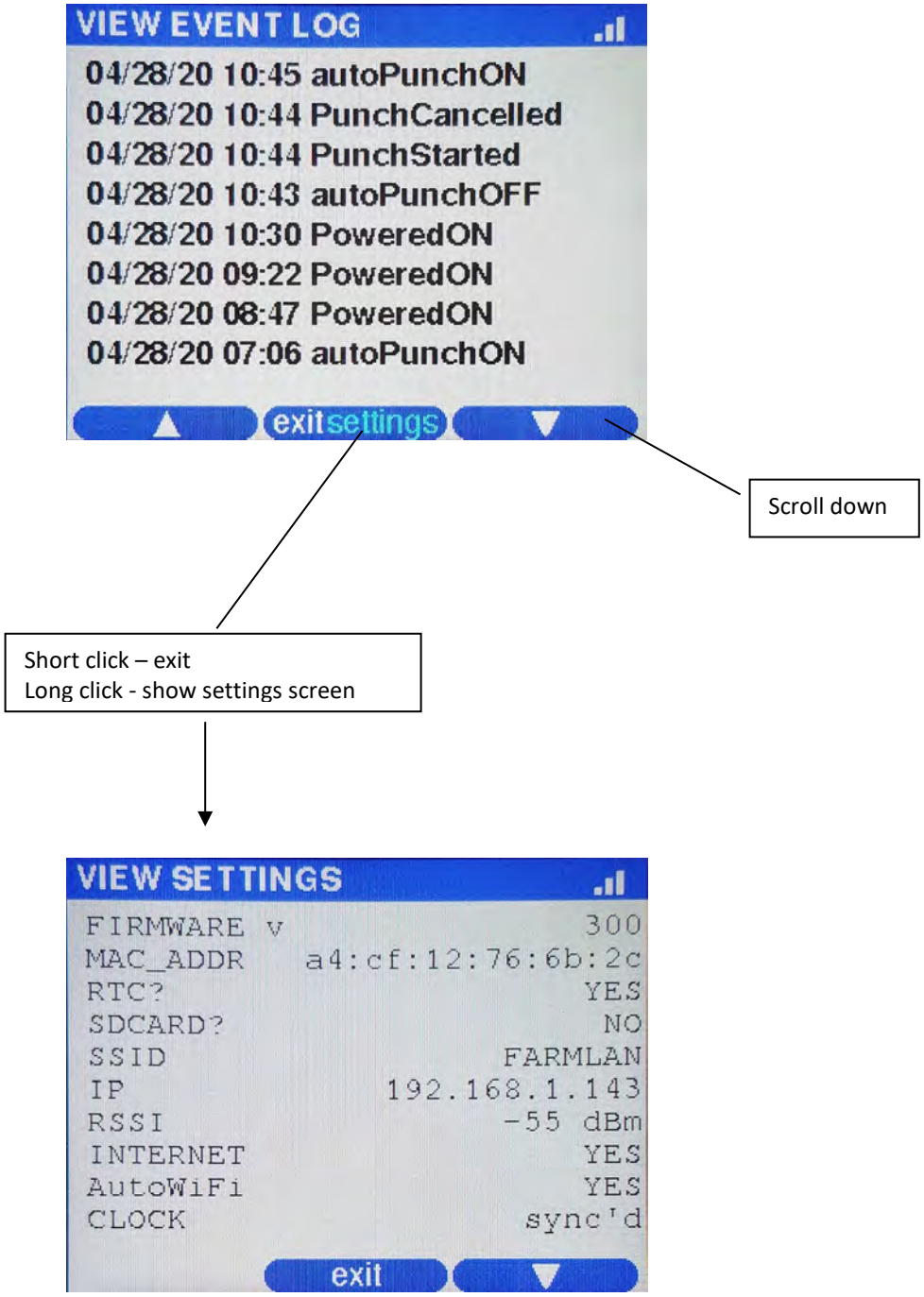


If temperature is not enabled you will see instead:



VIEWING THE EVENT LOG

The last 12 events are retained in a log file. You can view the log by holding down the button under the MODE LOG caption. The log file will look like this.

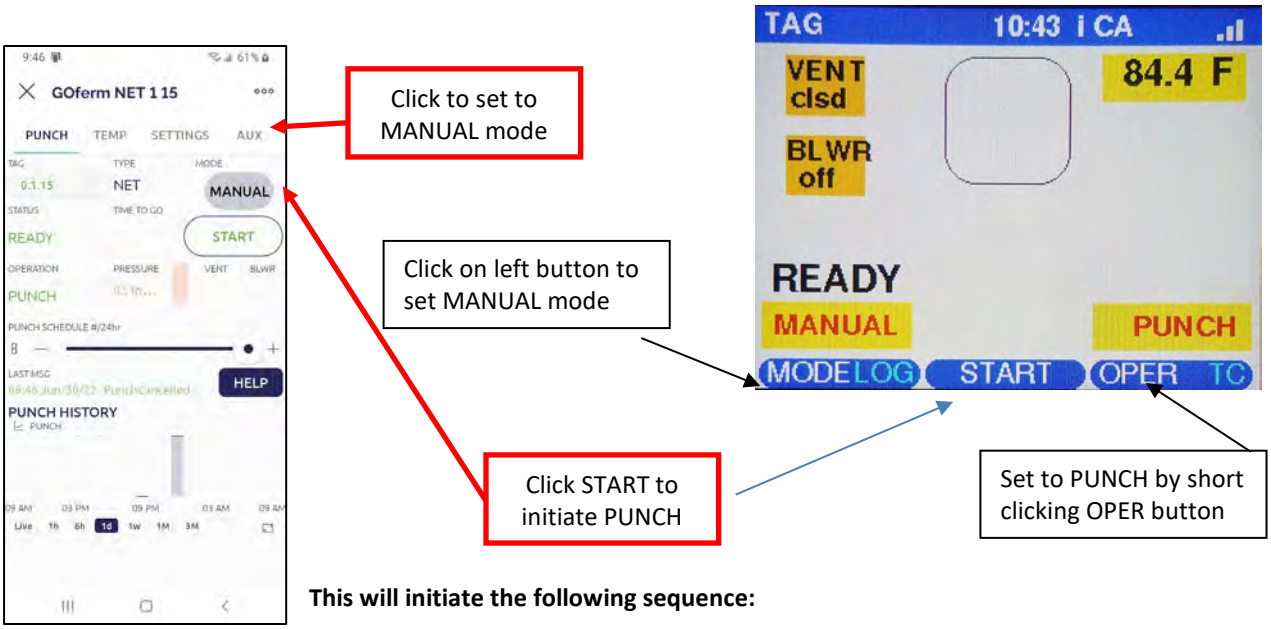


6.3 PUNCHING

The GOfermentor is unique in its ability to perform automatic punch-down. The inflatable chamber is the key to this operation. The punch-down can be performed manually by pressing the START button on the App or controller. Punch can also be done automatically on a preset schedule.

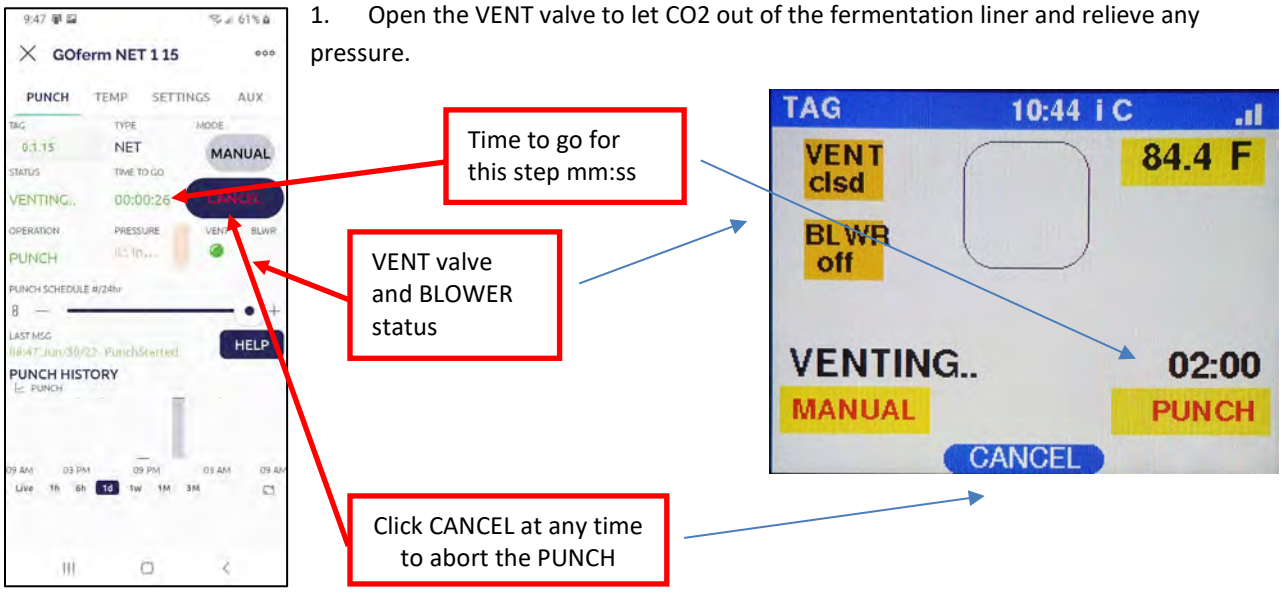
MANUAL PUNCH:

1. Select **PUNCH** operation by short clicking **OPER** button on controller until **PUNCH** is displayed above it.
2. Check mode is set to **MANUAL**.
3. Click **START.**
4. The **START** button now changes to **CANCEL**. Clicking this button will cancel the punch sequence.

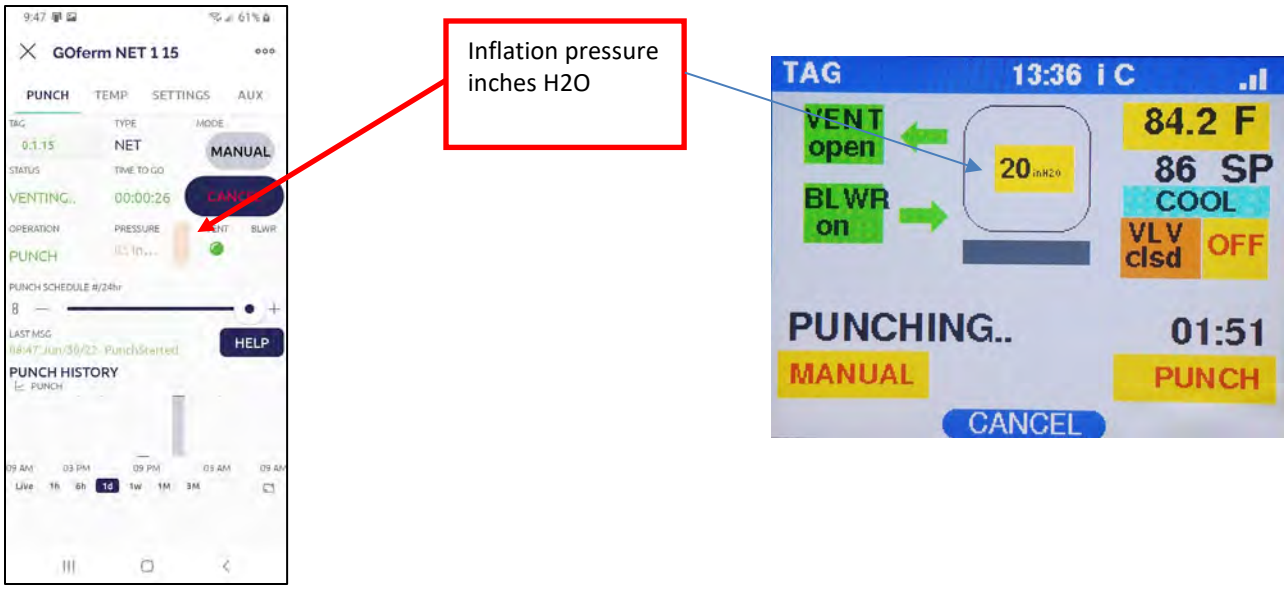


This will initiate the following sequence:

1. Open the VENT valve to let CO2 out of the fermentation liner and relieve any pressure.



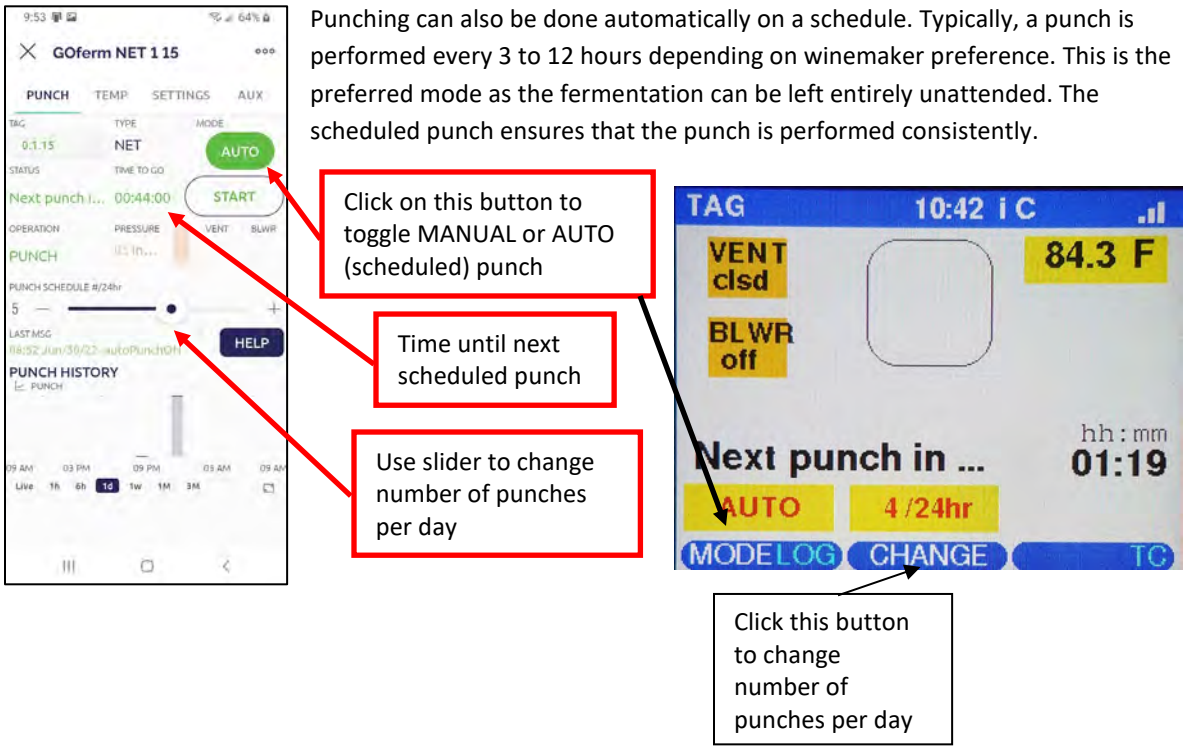
2. Once the VENTING is complete, the controller will turn on the blower to inflate the air chamber. This forces the liquid up in the liner. This wets and compresses the crust of skins and seed (the “cap”). Takes about 2 minutes (can change in *Settings*).



3. After PUNCHING is complete the air chamber automatically deflates. This allows the liquid to return to the lower part of the liner and the” cap” gets dispersed. This completes the punch cycle.

The whole punch cycle takes about 5 minutes, and progress is shown on the local control panel screen. The operation is entirely automatic and only requires initiation by selecting the PUNCH operation and then clicking the START button. The unit automatically regulates the inflation pressure to prevent over-inflation. The liquid should rise in the liner, but not overflow.

SCHEDULED PUNCH



Punching can also be done automatically on a schedule. Typically, a punch is performed every 3 to 12 hours depending on winemaker preference. This is the preferred mode as the fermentation can be left entirely unattended. The scheduled punch ensures that the punch is performed consistently.

Punches start at midnight and are then spaced at equal intervals over 24 hours. The following table tells you the time each punch occurs. For example, if you select 4 punches per day, they are at midnight, 6 am, noon, and 6 pm.

Note that if you select say 2 punches and you set this before noon then, the first scheduled punch will happen at noon not midnight. The next at midnight and so on.

PUNCHES ->	1	2	3	4	5	6	7	8
TIME	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
		12:00	8:00	6:00	4:48	4:00	3:25	3:00
			16:00	12:00	9:36	8:00	6:51	6:00
				18:00	14:24	12:00	10:17	9:00
					19:12	16:00	13:43	12:00
						20:00	17:08	15:00
							20:34	18:00
								21:00

The number of punches per day is determined by the winemaker. The default value of 4 per day is correct for most varietals. Very tannic grapes such as Petite syrah and Cabernet sauvignon can benefit from a more aggressive punch schedule, whereas thin-skinned grapes such as Pinot noir should be punched less frequently.

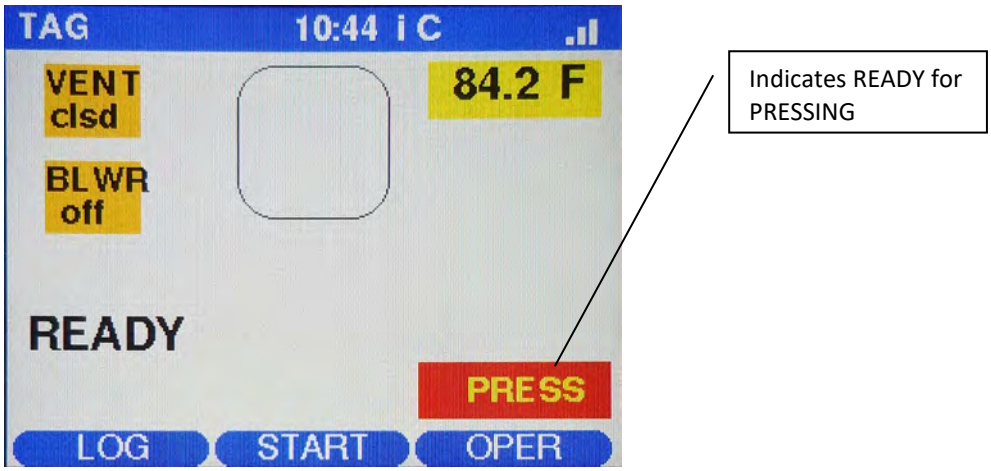
6.4 PRESSING

One of the unique features of the GOfermentor is the ability to function as a press at the end of fermentation. The fermented *must* does not need to be transferred out of the fermentor for pressing. The waste skins and seeds are left behind in the fermentation liner and can be easily discarded without any mess, cleaning, or handling.

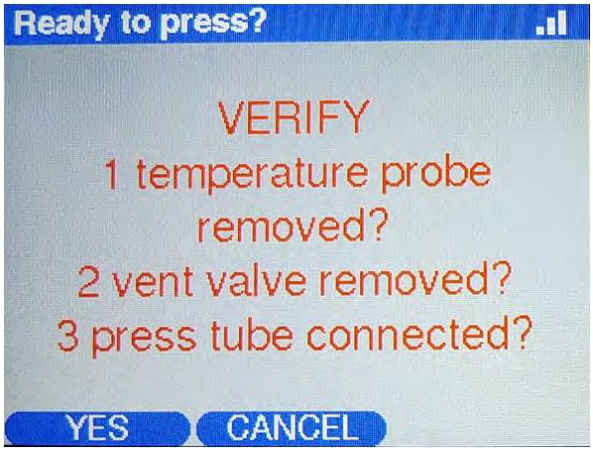
To perform the pressing operation:

1. Remove the temperature/sampling probe (if used) and insert and secure the PRESS tube.
2. Remove the VENT valve assembly and cap securely with TriClamp cap, gasket, and clamp.

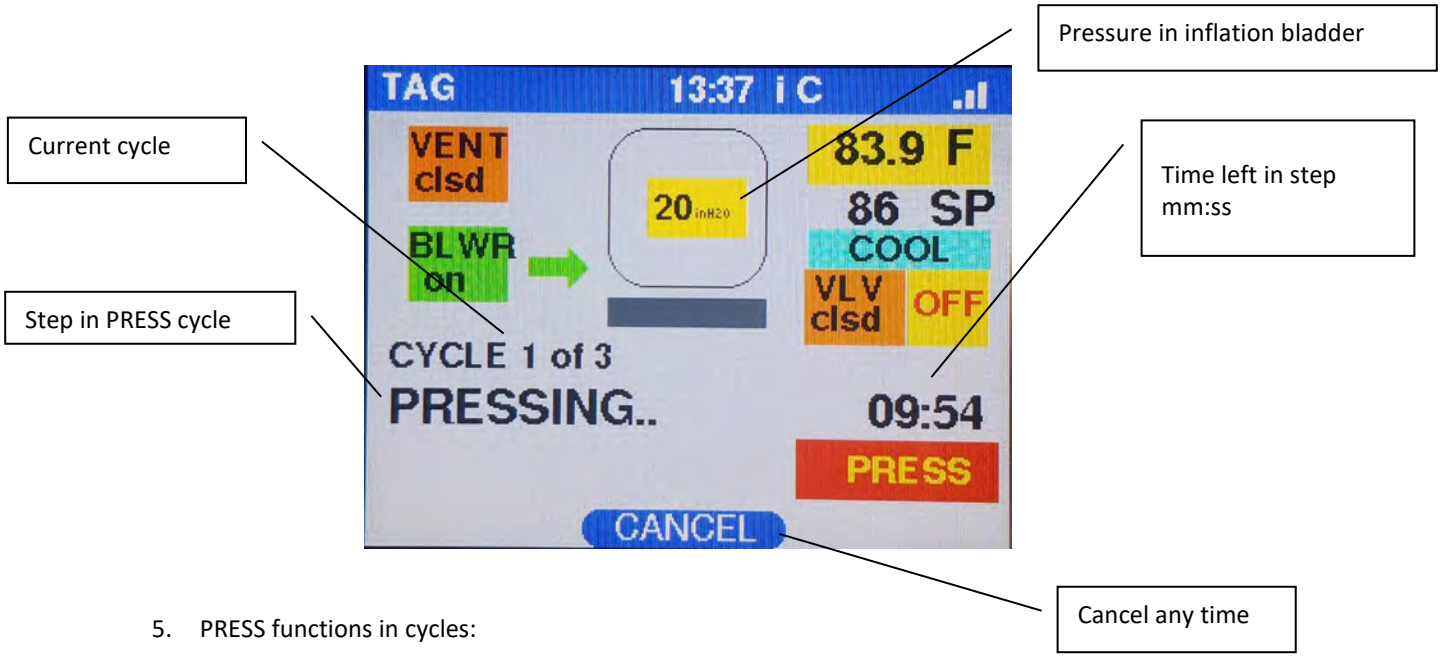
The PRESS operation cannot be done using the App. For safety reasons PRESS can only be performed using the control panel. Select the PRESS operation by clicking the MODE button until PRESS is displayed above OPER:



3. Press START and you will be asked for confirmation:



4. Select YES if you are ready to PRESS. It will timeout in 30 seconds.

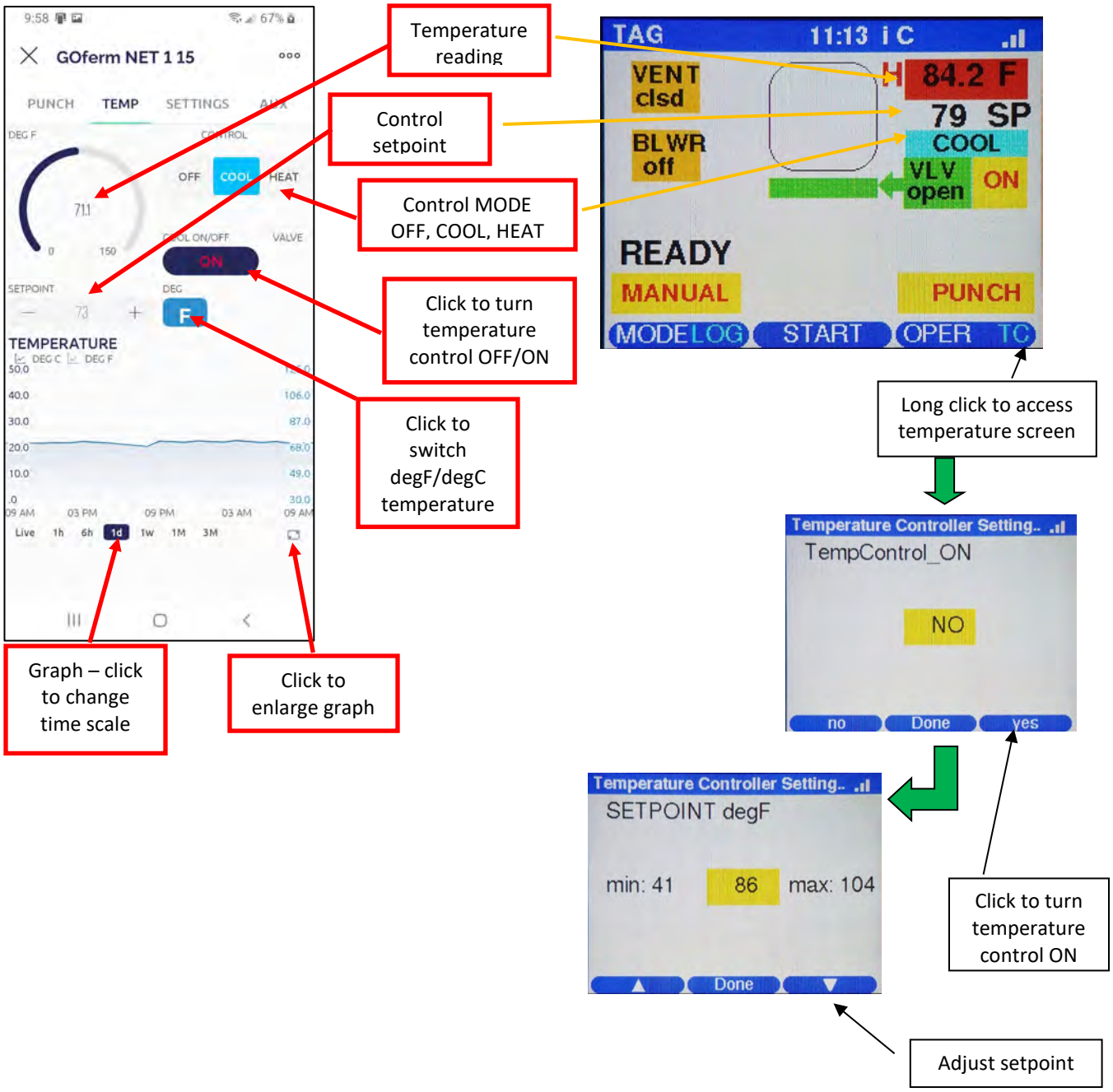


5. PRESS functions in cycles:

   a. Each cycle starts with PRESSING. Here the inflation chamber is pressurized. Then a HOLDING period when it is allowed to be de-pressurized.
   b. Typically, the cycle is repeated 3 times to maximize yield.
   c. Cycle number, PRESSING, HOLDING time, and pressure during pressing can be set by the user (Appendix A5).

6.5 TEMPERATURE CONTROL

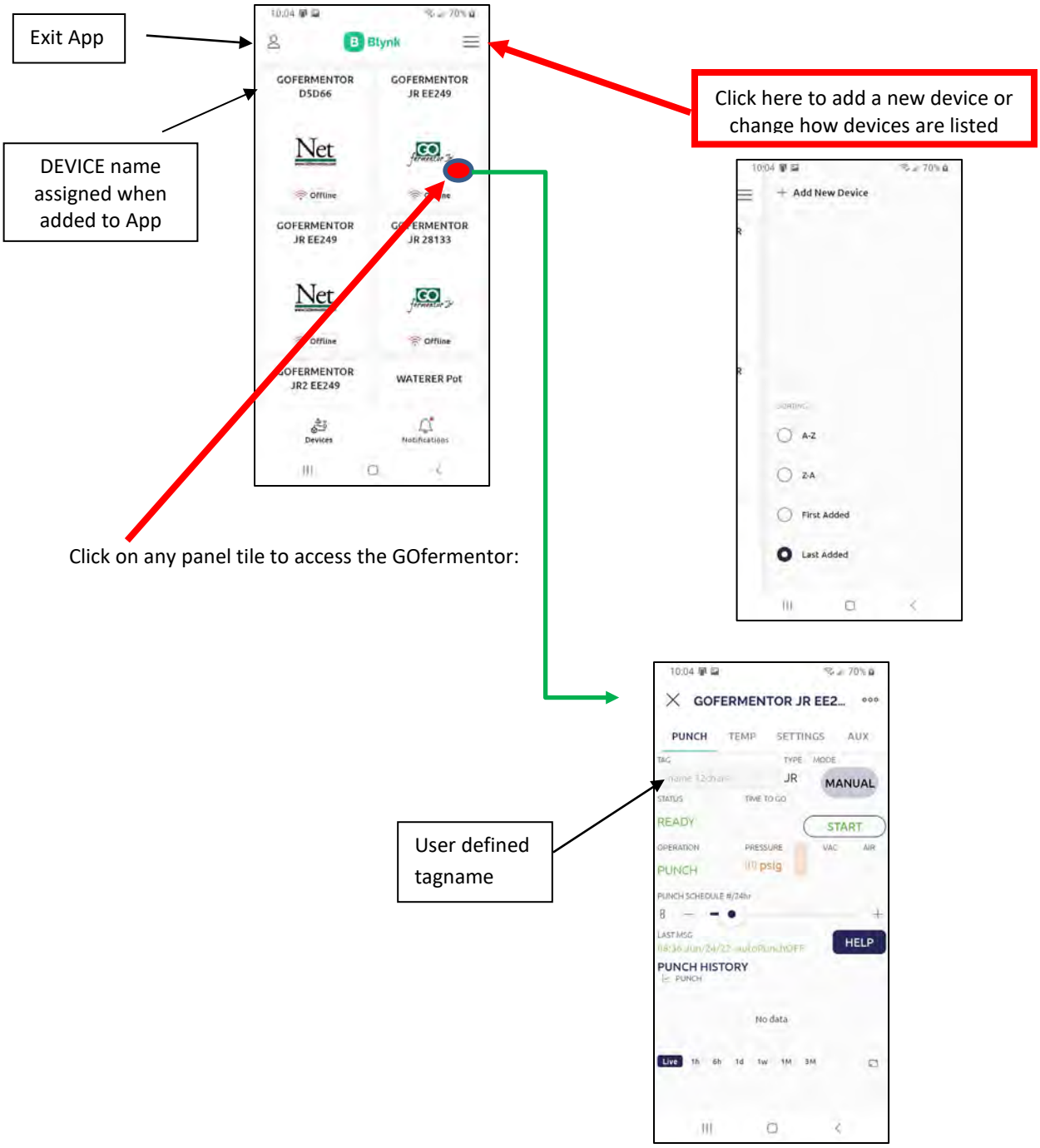
If temperature control is ENABLED and a temprature probe is connected the GOfermentor will monitor and control temperature. The main screen has a tab to access the temperature functionality.



6.6 GOFERMENTOR APP ADDITIONAL FEATURES

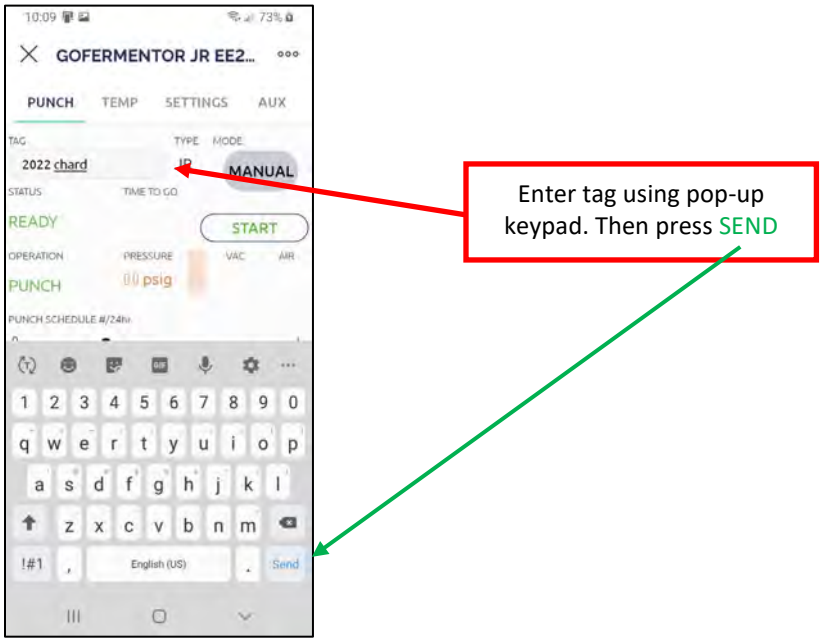
MULTIPLE GOFERMENTOR PANEL DISPLAY

All GOfermentors in the login account are shown when the App is opened:



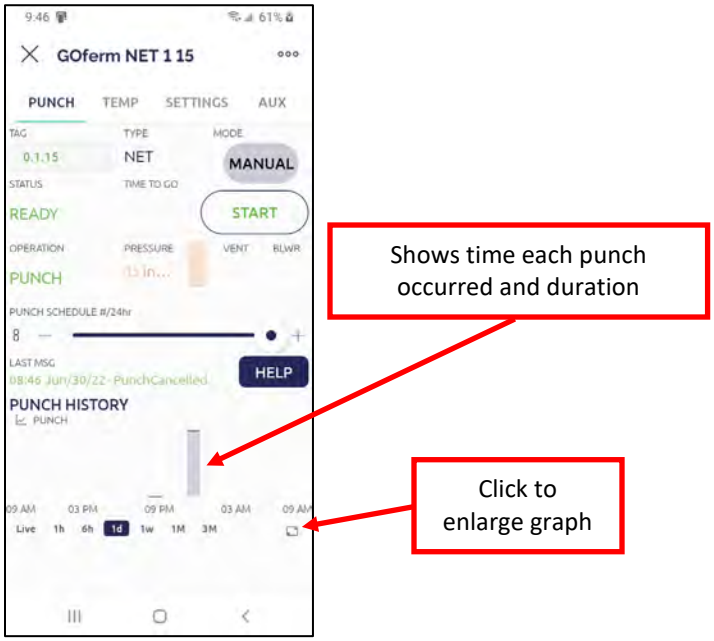
TAG LABEL

The GOfermentor can be assigned a tag from the App. This could be the batch number or some other information that helps you identify the unit. The tag is also shown the controller display.



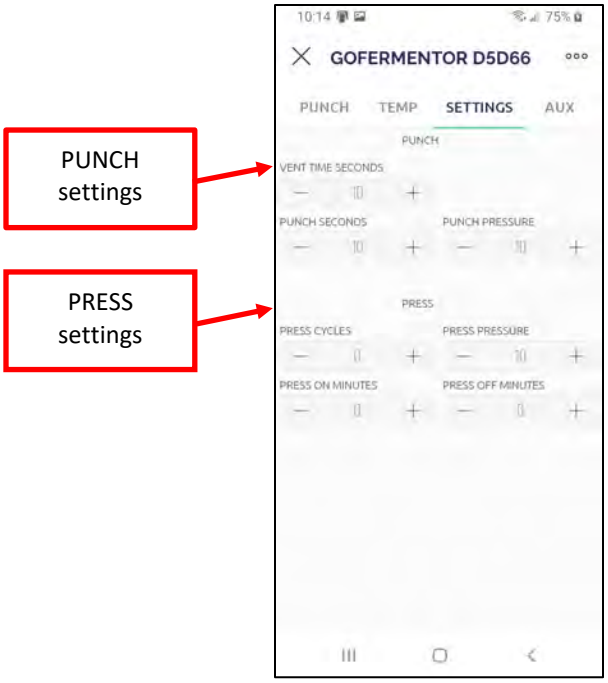
PUNCH HISTORY

You can see the punch history and duration on the main PUNCH tab:



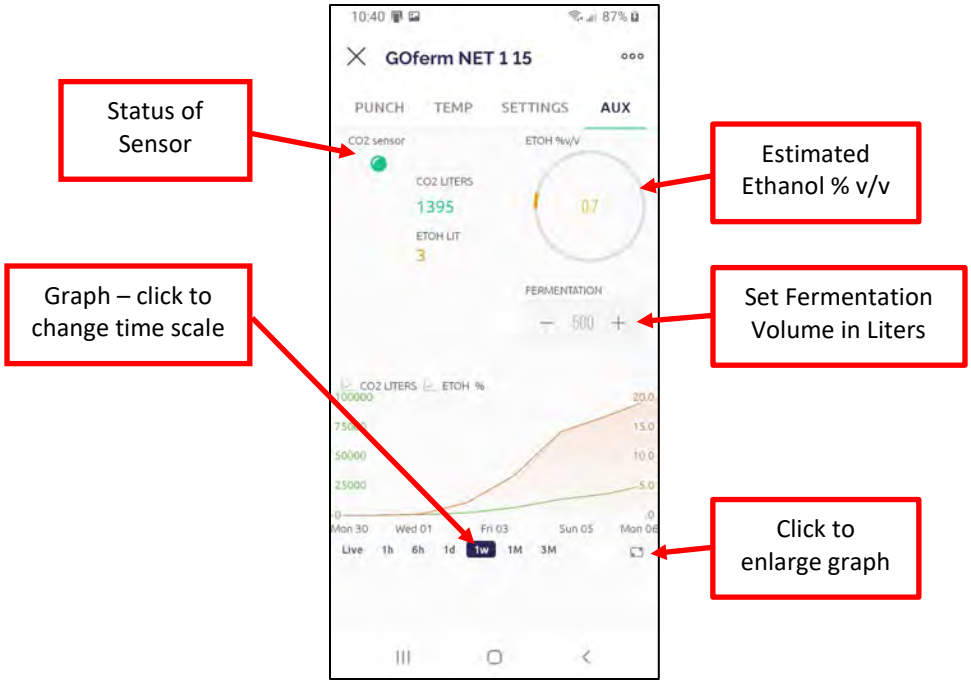
SETTINGS

Various settings (see Appendix A5 for details of each parameter) can be adjusted from the SETTINGS tab:



AUX SCREEN

The optional ethanol concentration data derived from CO2 evolution from the GOfermentor can be accessed from the AUX screen. You must have the GOvent equipped with gas flow sensing hardware.



APPENDICES

A1. SPECIFICATIONS

GOFERMENTOR SPECIFICATIONS

PART #	**GOBASE**
Description	Plastic outer container for GOLINER
Dimensions (LxWxH)	46”x46”x45” (1155mmx1155mmx1132mm)
Dimensions collapsed (LxWxH)	46”x46”x18” (1155mmx1155mmx453mm) can stack 5 high
Weight (tare without lid)	225 lb (90Kg)
Weight (maximum)	2640 lb (1200Kg)
Maximum fill volume	275 gallons (1040 liters)
Drain	Bottom discharge with locking flange
Certified for truck and rail shipping	Includes locking shipping lid.

PART #	**GOCONTROLLER NET**
Description	GOfermentor control panel NET
Dimensions (LxWxH)	12”x13”x7”. Attaches to GOBASE container
Weight	10 lb (4.5Kg)
LCD display	Color TFT with pushbuttons
Communications	WiFi built-in
Punch control	Manual using pushbutton or user defined interval
Temperature sensor	Requires GOTEMP sensor. Range 1 to 50 C accuracy 0.2 C
Temperature controller	Requires optional GOCOOLER HX cooling plate
Power requirement (control panel)	115 VAC 5A. Standard USA plug.

STANDARD ACCESSORIES INCLUDED WITH NET CONTROLLER

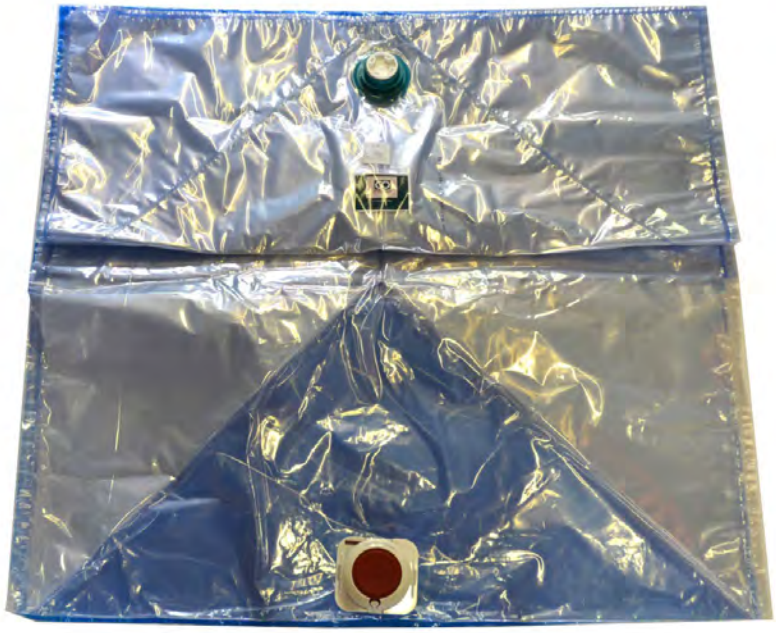
PART#	DESCRIPTION	FUNCTION	
VENT	Vent valve assembly	Pressure relief/vent valve assembly with 2” TriClamp	
IFLTHOSE	Inflation hose	6 ft 2”ID flexible duct with connectors	
PRESS TUBE	Perforated stainless tube assembly for pressing	Insert in 2” FILL port during pressing. Connect to wine pump to remove strained wine/juice.	
GOTEMP	Sampling tube + Temperature probe.	Temperature probe and dip tube. Fits into 2“ TriClamp FILL port. Includes hand sampler.	 
PIVOT STRAP	16’ webbing strap with clip	Support inflation chamber during punch and press operations	

OPTIONAL ACCESSORIES

PART#	DESCRIPTION	FUNCTION	
DN502TC	Drain valve adapter	DIN50 to 2” TriClamp adapter to connect 2” TriClamp to GOLINER bottom outlet valve	
GOCOOLER	Stainless steel heat exchanger plate with ½“ NPT connections for water or glycol.	Lay-in cooling plate with temperature control valve. Installs under GOLINER to provide cooling or heating. User needs to connect to ½” NPT inlet and outlet ports and provide recirculating heating/cooling fluid. Requires GOTEMP temperature probe. Does not include chiller, circulation pump, or connecting hoses.	

GOLINER SPECIFICATIONS

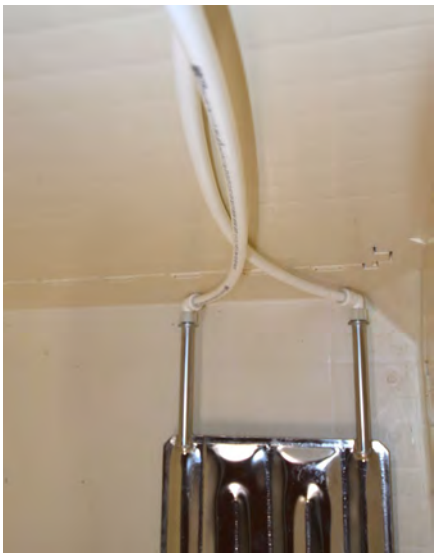
PART #	**GOLINER1000**
Description	Single-use wine fermentation liner with air inflation chamber
Product contact film	2 ply metallocene linear low-density polyethylene
FDA-approved resins	Meets FDA 21 CFR 177.1520 for food contact.
EU-approved resins	EU 10/2011 & EU 1935/2004
Additives	None. No BPA. No animal or GMO derived components.
Non-product contact film (blue)	5.0 mil Nylon
Fill port	2” TriClamp
Vent port	2” TriClamp for VENT valve assembly
Drain port (tamper-evident)	DIN50 ball valve (use DN502TC adaptor to 2” TriClamp)
Air Inflation port (blue)	2” TriClamp
Minimum operating capacity	200 lb. (90 Kg) crushed grapes
Maximum operating capacity	2000 lb. (900Kg) crushed grapes
Liners per box	3



GOCOOLER

PART #	GOCOOLER
Description	Flat heat exchanger for cooling and heating
Heat exchange surface	14”x31.5” (360mmx800mm)
Material of construction	Stainless steel 304 + PVC
Weight	20lb (9Kg)
Power	24 VDC ball valve 1 A. Supplied from GOfermentor control panel
Process connections	½” NPT
Notes	Requires user-supplied chiller and recirculation

Set against REAR wall of GObase (opposite to dropdown door).



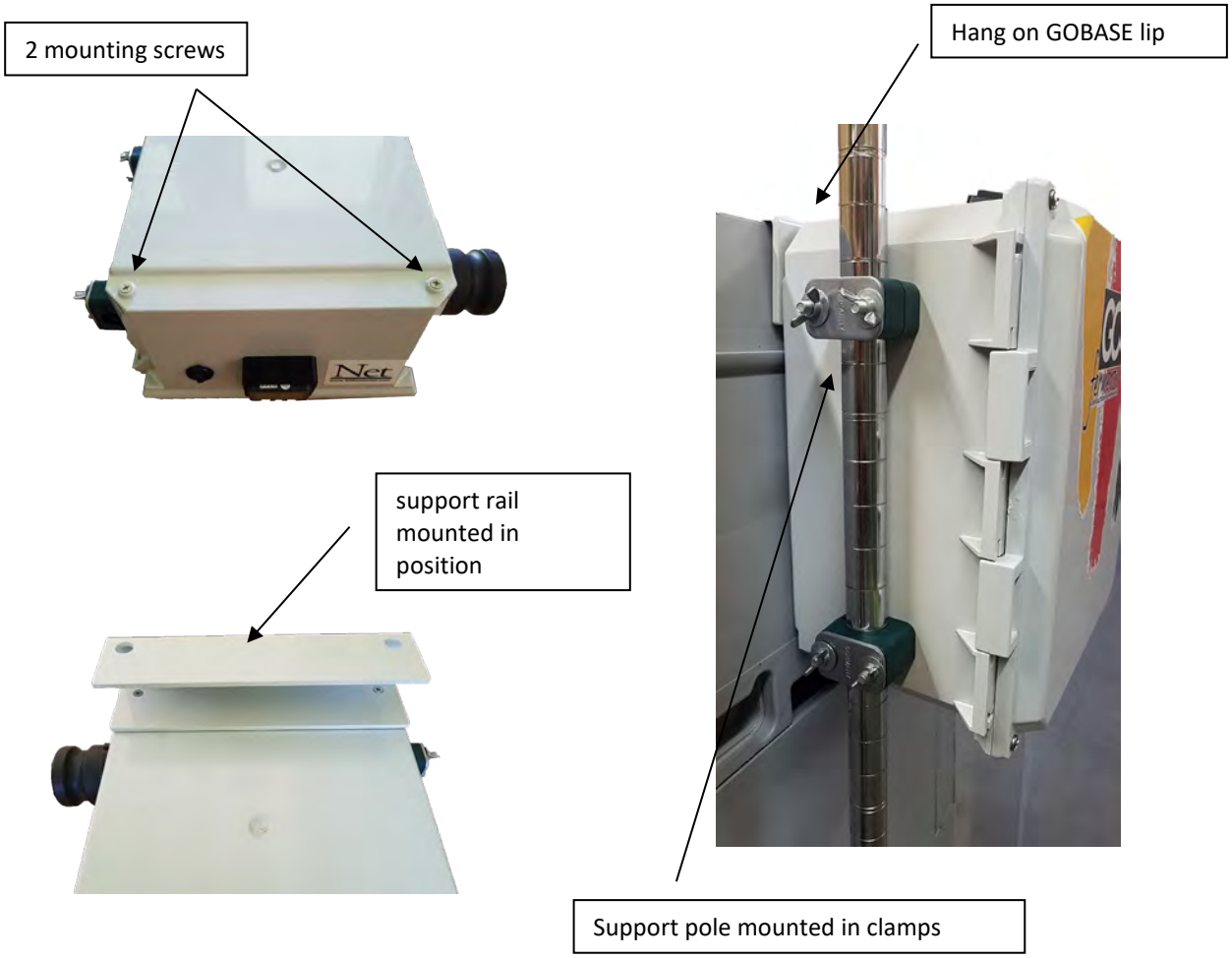
Drop down door on this side of GObase

A2. NET CONTROL PANEL ASSEMBLY INSTRUCTIONS

The control panel is shipped with a 1) support rail and 2) a 3-piece vent support pole. Minimal assembly is required.

1. Unscrew the two large screws on the back of the control panel
2. Place the support rail against the control with the large holes facing out.
3. Reattach the 2 screws fastening the support rail to the control panel.
4. Screw the two sections of the support pole together to form a 32 inch pole. Now attach the section with the eyebolt section by attaching the end on the support pole and tightening the thumbscrew. Insert the longer section of the support pole into the two brackets on the side of the control so that it is positioned about 12 inches above the control panel. The eyebolt is used to suspend the VENT assembly.
5. Hand-tighten the wing nuts to secure the support pole from sliding.

The control panel is now assembled and ready to be hung on the GOBASE.



A3. TROUBLESHOOTING ALARMS AND ERRORS

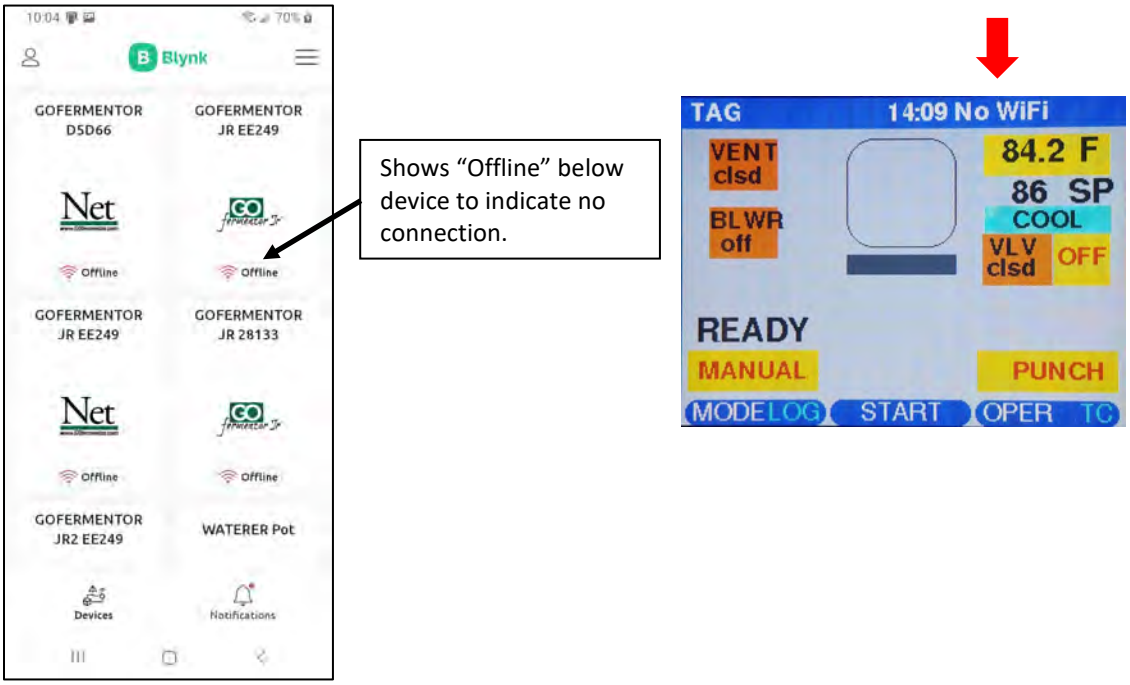
Solutions to common problems and questions. Please look at the website – www.GOfermentor.com for an updated list of FAQs.

Liners appear to inflate too much!	For small volumes you may want to lower the trip pressure. While it may look scary, the pressure controller will not let you over pressurize the liner (>20inH2O). Vents in the inflation hose prevent damaging overpressure even in the event of pressure controller failure.
Liner inflation does not seem to move the cap much. Make sure you inflate the empty liner BEFORE filling.	For large volumes try raising the pressure to 20 inches H2O. Increase the punch duration so that ALL the gas in the headspace is forced out during the punch.
I cannot press all the liquid out	The pressing is very gentle to maximize quality. You may perhaps get a 3-5 liters less than with a conventional press, however the time and effort to get this poorer quality "hard press" is not worth it.
Flow rate while pressing drops to zero but there is still material in the liner	Reverse the must pump for a few seconds to back flow into the liner. This will clear any pomace lodged in the drain valve. Then resume normal operation. May need to reposition the Press tube.
My liner is leaking	This is very rare. If the leak is in the headspace – just tape it shut. For a liquid leak the only option is to pump out the must to another GOLINER using a must pump. Remember – you must only FILL through the TOP port.
I cannot remove the drain valve to take out the liner.	Pull the drain valve out so that it is flush against the lower flange. Now use pliers to pop the tabs off.
I do not have any means to lift the used liner out of the base.	Ideally a forklift or crane is used to lift the liner containing the used pomace out. But you can tip the whole base on to its side and then pull the liner out.

A4. OPERATION WITHOUT INTERNET ACCESS

The GOfermentor NET is an IOT (internet-of-things) device. It is intended to be permanently connected to the internet. It is not recommended to operate the GOfermentorNET without continuous internet connection via WiFi. However, in the event that internet connection is not available, the equipment can be configured to operate without the internet. It will not have remote access via SmartPhone app and firmware updates cannot be made. You will also need to set the real-time clock on first power up. The clock has battery backup and will retain correct time later when power is switched off. The controller will display **No WiFi.**

If the GOfermentor is connected to the internet and then connection is accidentally lost, it will continue to operate normally except that no remote access is possible.
If connection to the WiFi router is lost, the controller will display **WIFI LOST** and the App will show the device is "Offline". The unit will periodically try to reconnect.
If internet service fails, the controller will reboot and display **INET FAIL**. A manual reboot of the controller will be needed to restore connection.



To disable WiFi/internet:

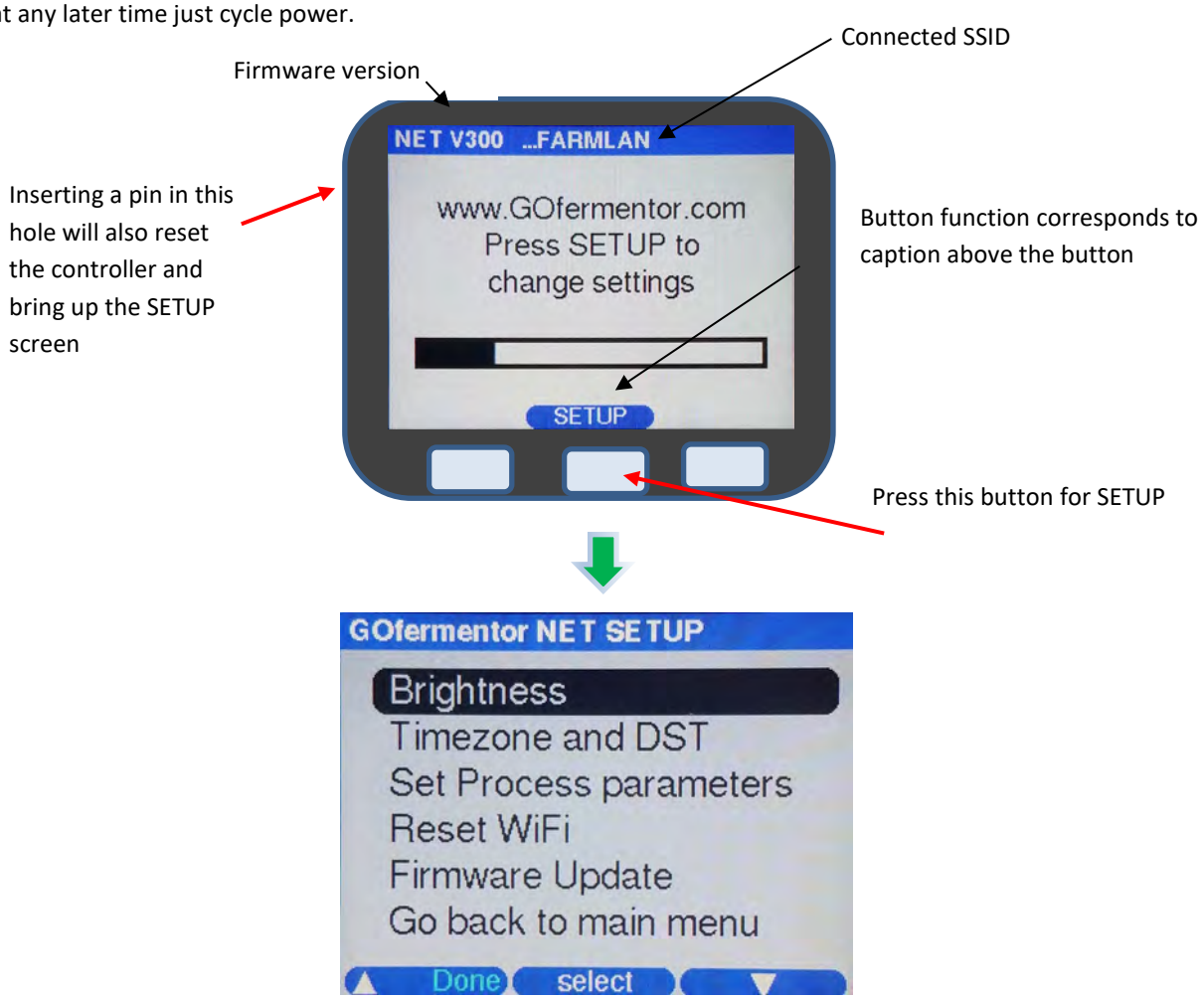
1. **Cycle power and press SETUP within 30 seconds**
2. **Select option SET PROCESS PARAMETERS**
3. **Press OK**
4. **AutoWiFi is displayed. Press NO to disable. Press DONE**
5. **WiFiEnbl is displayed. Press NO to disable. Press DONE**
6. **Now keep pressing DONE until the header displays CLOCK settings**
7. **Enter the current local time at the prompts.**
8. **Press DONE until the end of the menu and unit will reset.**

The GOfermentor will now show the main control screen and all actions are enabled. The header will show **NoWiFi** indicating the WiFi and internet access is disabled. Clock time is displayed using internal battery backed up RTC.

A5. NET CONTROLLER CONFIGURATION

SETUP MENU

On power up click the center button within 30 seconds to enter the setup menu. If you need to enter setup menu at any later time just cycle power.



BRIGHTNESS

BACKLIGHT BRIGHTNESS SET THE DISPLAY BRIGHTNESS.	- DEFAULT 50%
INACTIVITY TIMEOUT SET BACKLIGHT TIMEOUT.	- ALWAYS ON

TIMEZONE AND DST

Set the local time zone relative to UTC. EST is -5. PST is -8. Set Daylight Savings Time to ON if daylight saving time is currently in effect. GOfermentor always handles time in UTC and local time is only for display purposes.

SET PROCESS PARAMETERS

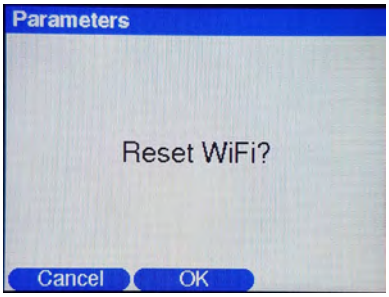
Certain process parameters can be set by the user to customize the programming. Select SET PROCESS PARAMETERS to change. Changes are retained on power off. If you mess up simply select DEFAULT and the unit will reset to factory settings. Be aware that this will also erase any logged events.

Only advanced users should change these parameters. Consult with tech@GOfermentor.com .

PARAMETER	DESCRIPTION	RANGE	DEFAULT
CO2Enbl	CO2 SENSOR ENABLED	NO/YES	NO
AutoWiFi	RETRY WIFI IF CONNECTION LOST	NO/YES	YES
WiFiEnbl	ENABLE WIFI CONNECTIONS	NO/YES	YES
VentSecs	VENT TIME (SECS) BEFORE PUNCH	10 TO 255	120 SECONDS
PunchSecs	PUNCH TIME (SECONDS)	10 TO 255	120 SECONDS
PunchinH2O	PUNCH INFLATION PRESSURE INH2O	10 TO 20	20 INH2O
BOFFsecs	BLOWER OFF ON HIGH PRESSURE (SECS)	0 TO 20	10 SECONDS
Cycles	NUMBER OF PRESS CYCLES	0 TO 10	3 CYCLES
PressON	PRESS TIME (MINUTES)	0 TO 60	10 MINUTES
PressOFF	PRESS HOLD TIME (MINUTES)	0 TO 60	10 MINUTES
PressinH2O	PRESS PRESSURE INH2O	0 TO 20	20 INH2O
HR	LOCAL TIME- HOUR	0 TO 23	SET BY INTERNET
MIN	LOCAL TIME - MIN	0 TO 59	SET BY INTERNET
MONTH	LOCAL TIME- MON	1 TO 12	SET BY INTERNET
DAY	LOCAL TIME -DAY	1 TO 31	SET BY INTERNET
YY	LOCAL TIME - YEAR	0 TO 99	SET BY INTERNET
TempControl_ON	TEMPERATURE CONTROL ON	NO/YES	UNUSED
TSPx5	TEMP SETPOINT DEGC X 5	25 TO 200	150 (30 C)
DEGF	DISPLAY IN DEG F	NO/YES	YES
TempEnbl	TEMPERATURE SENSOR ENABLED	NO/YES	YES
TCTRLMode	NONE = 0 COOLING = 1 HEATING = 2	0 TO 2	1 (COOLING)
CO2yield	CORRECTION FACTOR FOR CO2 YIELD CALC	80 TO 100	100

RESET WIFI

If you cannot connect to a WiFi network because you moved the unit to another location, or the network no longer exists, then select the **Reset WiFi** option and press OK. This will make the controller “forget” the network it wants to connect to and will now behave as brand-new unconfigured device. Then open the GOfermentor SmartPhone app and add this as a new device as described in SECTION 6.1. The GOfermentor will then connect to this new network. This new network (SSID) is set for the next power up.



A6. GOCOOLER ASSEMBLY INSTRUCTIONS

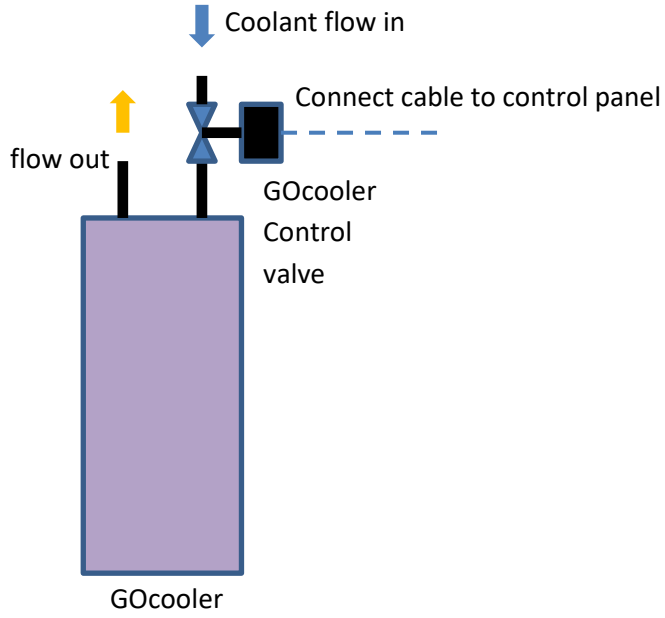
The GOCOOLER is shipped as two components – 1) stainless-steel heat exchanger plate and 2) plastic piping with electric control valve.

1. Place the stainless heat exchanger plate in the GOBASE. It should be positioned inside the GOBASE on either side of the drain port with the inlet and outlet tubing towards the back side. Do not obstruct the drain port. TUBING MANIFOLD MUST BE ON BACK WALL. DO NOT PLACE ON THE SIDES.
2. Place the control valve assembly on the back lip of the GOBASE and connect the tubing from the heat exchanger plate to the valve assembly.
3. Connect your cooling and return fluid lines to the control valve assembly (1/2" NPT).
4. Check for leaks, then install the fermentation liner.

The electric valve has a cable with a DC barrel plug that must be plugged in to the jack marked VALVE which is located on the right side on the control panel near the power entry cable.

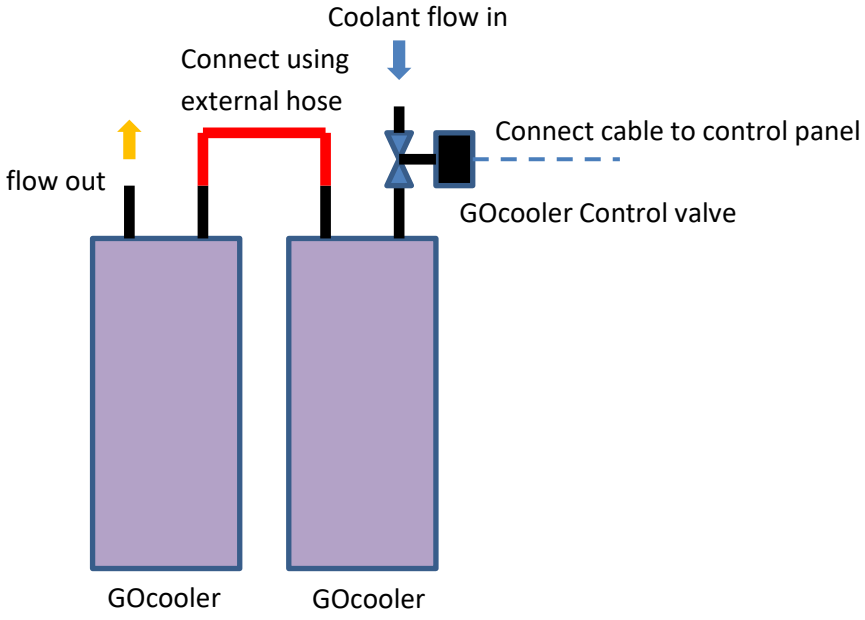
SINGLE COOLER OPERATION

The piping diagram for temperature control is shown:



DUAL COOLER OPERATION

In a hot environment, or if coolant available is not sufficiently cold it is possible to increase the cooling capacity by utilizing two GOCOOLERs in series. They are placed inside the GOBASE on either side of the bottom drain valve. The piping diagram is shown below:



HEATING OPERATION

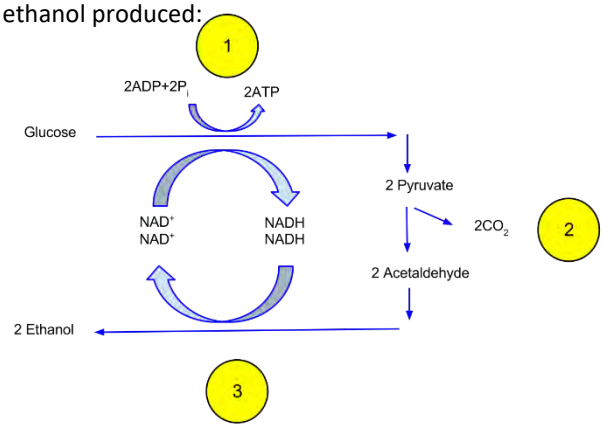
The GOCOOLER can also be used for heating up the must. This is especially useful for refrigerated grapes. The piping is the same as for cooling. The only difference is that the “COOLANT” temperature is higher than the desired heating setpoint and the GOfermentor controller is set to HEAT instead of COOL mode (TCTRLMODE set to 2).

A7. ETHANOL ESTIMATOR (OPTIONAL)

Instantly determine the ethanol concentration is your fermenting wine. GOFermentor NET option.

Determining alcohol concentration in fermenting wine is the holy grail of the winemaker. In addition to determining when the sugar is depleted, knowing the rate of ethanol production can provide insight into whether the fermentation is "stuck", complete, or progressing normally. While ethanol can be measured – all methods require removing a sample and performing an analysis. Refractive index measurement is inexpensive, but requires careful compensation. Other offline methods include tedious enzymatic methods, distillation, ebulliometry, or expensive FTIR instruments.

True online measurements involve either weight-loss monitoring or measuring gas evolution. Weight monitoring is not very practical at small scale because compensation needs to be made for sample removals, evaporation etc. Measuring the volume of gas evolved is much easier. Once fermentation is underway, the evolved gas is almost entirely CO2 with some water vapor and evaporating ethanol. The stoichiometric equation below shows the relationship between CO2 evolved and ethanol produced:



Based on this equation for every mole of CO2 vented, a corresponding mole of ethanol is produced. If the fermentation is conducted in a closed bag or vessel then by measuring the cumulative amount of CO2 vented, it is possible to estimate the amount of ethanol that has been produced to that point in time. Since we are interested in estimating the concentration of ethanol in v/v %, we need to calculate the liters of ethanol co-produced with 1 liter of CO2. From stoichiometry:

EtOH (liters) = CO2 (liters) x 0.00243

The concentration can then simply be determined by dividing by the fermentation volume:

EtOH v/v% = EtOH(liters)/fermentation volume(liters) * 100

Fermentation Volume Estimation:

Accurate estimation of the fermentation volume is needed for calculation of the ethanol concentration.

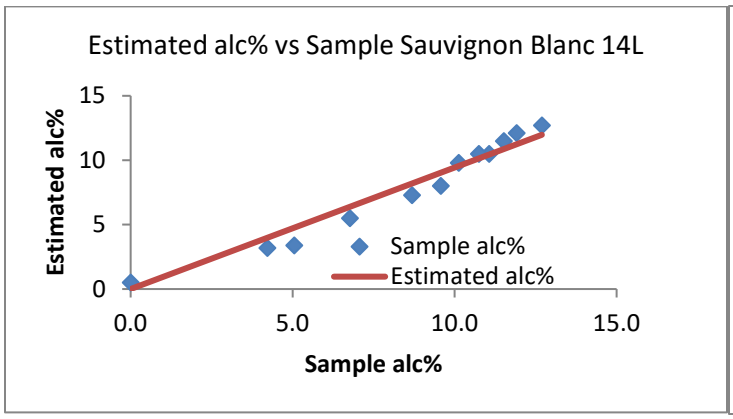
For white wine or any fermentation of only liquid, the volume of juice is entered as liters into the app.

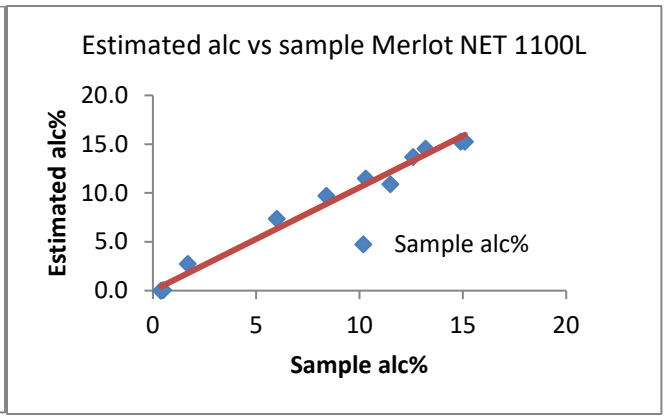
For red wine or any fermentation on skins, multiply the weight in kilograms by 80% to calculate the volume.

Data Analysis – Accuracy of ethanol estimation solely from evolved CO2:

Fermentations were run in GOfermentorNET and GOfermentorJR. In the NET, volumes ranged from 500 to 1100 liters of grape *must*. In the smaller JR device, the fermentation volumes ranged from 12 to 40 liters of grape *must*. Several different varietals were used. Both red and white wine fermentations were conducted. Ethanol concentration was determined periodically by taking samples and analyzing using a Foss OenoFoss FTIR instrument. This instrument was calibrated for the type of wines being made.

CO2 offgas volume was measured using the GOvent sensor. Predicted ethanol was calculated using the previous equations and then plotted versus the measured sample ethanol concentration. The relationship is linear as predicted by stoichiometry, and the regression R^2 is better than 0.99. Typical plots are shown in the figures below:

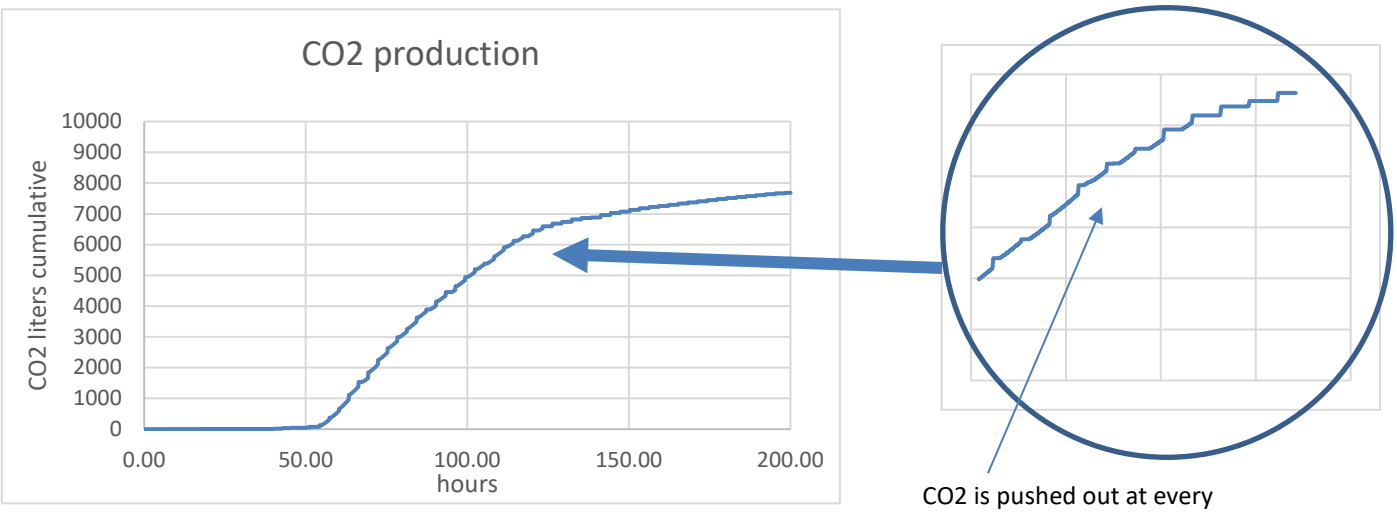




The linear relationship allows the prediction of ethanol concentration in real-time from the measured cumulative volume of gas vented. With a knowledge of fermentation volume, the accuracy of the predicted ethanol concentration can be better than ± 0.25% v/v. This is certainly sufficient for process monitoring.

Data Analysis – Monitoring of fermentation process ethanol concentration:

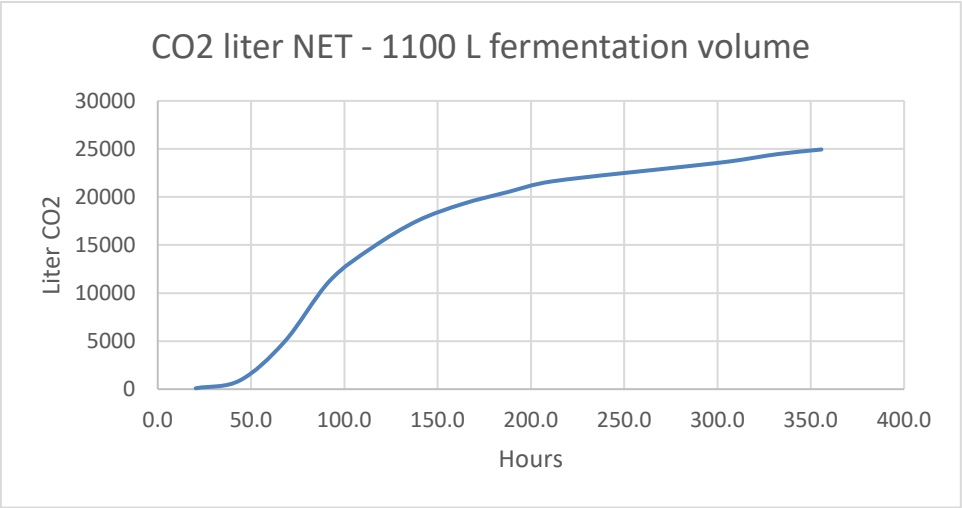
Here is an example of CO2 gas evolution in real-time as the fermentation progresses.



CO2 is pushed out at every punch. "staircase" effect

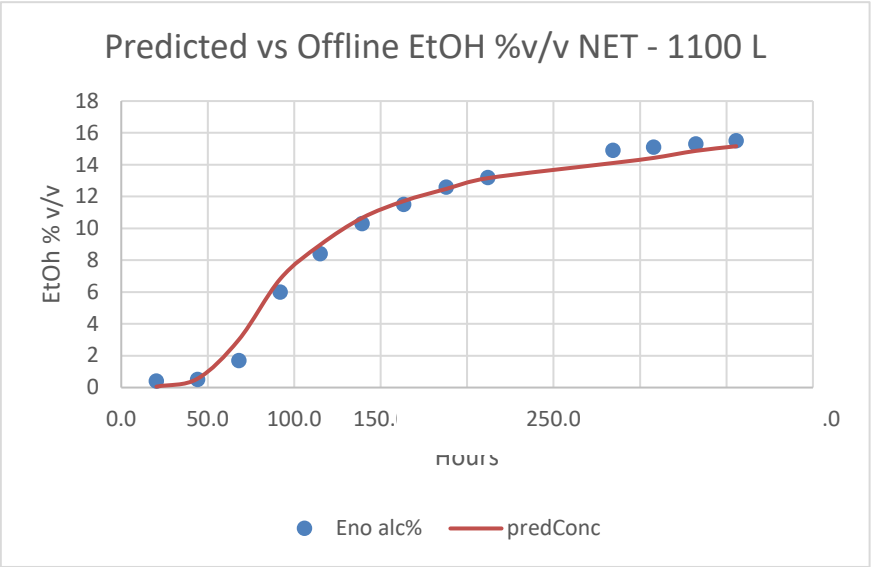
This graph has several interesting features. Firstly, note that the CO2 released is a stepwise function. This is due to the unique automated punch capabilities of the GOfermentor in which most of the gas is expelled during a punch operation. In this operation, the vent valve is forced open, and CO2 is expelled out of the fermenting *must* by the pressure applied by the inflating secondary chamber. Each step in the graph is a punch operation. No gas is essentially expelled until the next punch unless pressure builds up and is released by the spring in the vent valve. The cumulative CO2 and the rate of change is indicative of the fermentation trend: lag, exponential increase, and final flattening. Ethanol production and concentration can be estimated from the CO2 evolution.

Here is another dataset from a Merlot fermentation performed in GOfermentor NET. It was run at maximum capacity of 1 ton of grapes (approx. 1100 liters of *must*).



The fermentation lasted just over 14 days. A cumulative 25,000 liters of CO2 was evolved and the trend in time is shown in the above figure. Note that monitoring the CO2 profile is very helpful is understanding the lag in the beginning and then the rapid fermentation, followed by the eventual flattening as all the sugar is consumed. It is easy to identify a “stuck” fermentation.

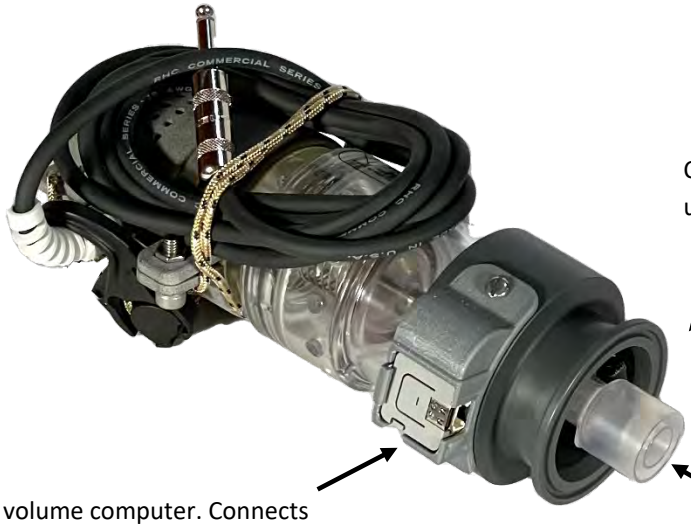
Ethanol was estimated automatically in real-time from the CO2 data and is shown below. The orange line is the estimated ethanol concentration. Samples were taken and assayed daily. These measurements are shown as blue dots. The predicted values are within +/- 0.25 %v/v proving the utility of the GOvent estimation system.



GOfermentor NET has a vent valve that is used to release gas from the liner. It is actuated automatically by the GOfermentor controller and will also release gas automatically in the event of overpressure.

The GOvent NET replaces the original vent valve with a vent valve with internal gas flow sensing. Any gas (CO2) from the liner can only be released through the vent valve. The volume of CO2 released (compensated for temperature, pressure, and humidity) is measured continuously. Cumulative gas volume measurements are transmitted to the NET controller and displayed on the control screen. The estimated ethanol production and concentration in the liner can be viewed on the GOfermentor internet NET app (android or ios).

New NET devices can be ordered with gas measuring vent instead of the standard vent. Older units (prior to 2022) require a simple controller box retrofit. Please contact tech@GOfermentor.com.



NEW GOvent valve with gas volume sensor for use with GOfermentor NET.

A8. WARRANTY, LIABILITY, AND RETURNS POLICY

The GOfermentor hardware is warranted to be free of defects in material or workmanship for 12 months after delivery to the first purchaser for use, providing that the units have not been misused. Since we have no control over the operation, we cannot guarantee against failure or loss of product in the unit. Our obligations hereunder, at our option, are limited to the replacement, repair or refund of the purchase, and parts which upon examination prove to be defective within the warranty period.

Disposable items, such as liners, are meant for single-use. They are warranted against any defects and will be replaced if found to be defective. Damage caused by improper installation or user error is not covered under the warranty. Unused liners cannot be returned.

In no circumstances are we liable for any product loss due to the use of our product. The user is cautioned that this is new technology and they agree to accept the risk inherent in using new technology.

RETURNS

- Call or email tech@GOfermentor.com if you have any problems with the GOfermentor. In most cases we can resolve the issue.
- Email accounts@GOfermentor.com for a Return Material Authorization (RMA) number before returning any item.
- Put the RMA on the outside of the shipping label.

A9. TERMS AND CONDITIONS OF SALE

When you purchased your GOfermentor you agreed to the following Terms & Conditions of Sale. If for some reason you feel that you are unable to abide by these conditions please return the equipment in as-new condition for a full refund (minus shipping charges). Contact accounts@GOfermentor.com for Return Authorization.

The following Terms and Conditions of Sale (hereinafter, this "Agreement") constitute a binding agreement between you (hereinafter, "PURCHASER") and Engineering Investments, LLC dba GOfermentor ("hereinafter "COMPANY").

COMPANY and PURCHASER are sometimes hereinafter referred to individually as a "Party" and jointly as "the Parties."

1. **DEFINITIONS.** As used in this Agreement,
   a) "Effective Date" means the date on which Purchaser purchases any Product(s) (as defined below).
   b) "Party" refers to PURCHASER or COMPANY individually, and "the Parties" refers to PURCHASER and COMPANY jointly.
   c) "Product(s)" means any of the Products sold or provided to PURCHASER by COMPANY.
2. **COMMENCEMENT OF AGREEMENT.** This Agreement takes effect upon purchase by PURCHASER of any of the Products and constitutes good and valuable consideration for COMPANY's sale of such Product(s) to PURCHASER. PURCHASER acknowledges and agrees that s/he has entered into this Agreement voluntarily, intelligently, and with full knowledge of its consequences.
3. **LIMITED WARRANTY AND EXCLUSIONS**.
   a) **Limited Warranty**. COMPANY warrants that all Products shall be free from defects in workmanship and materials under normal use and conditions for a period of one (1) year from the date of purchase, except that with respect to GOliner and SmartBarrel Liners (or any other Product that has a one-time use), the foregoing warranty expires upon use. THIS LIMITED WARRANTY IS GRANTED ONLY TO THE ORIGINAL PURCHASER AND IS VOID UPON SALE OR TRANSFER OF THE PRODUCT TO ANY THIRD PARTY.
   b) **What is not covered by the Limited Warranty**. The Limited Warranty does not cover (i) the use of any Product for other than its intended purpose; (ii) normal wear and tear; (iii) damage caused by faulty installation; (iv) failure to follow instructions; (v) lack of reasonable care; (vi) misuse; (vii) abuse; (viii) accident; (ix) alteration; (x) modification; (xi) tampering; (xii) any negligent act or omission on the part of any person other than COMPANY; or (xiii) repair or service not expressly authorized by COMPANY in writing.
   c) **Exclusion of all other warranties**.
      (i) Except for the Limited Warranty provided in Section 3.a above, all Products are sold "as is" and COMPANY expressly disclaims all other warranties, whether express or implied, including any implied warranties of merchantability, quality, or fitness for a particular purpose. No oral or written information or advice given by COMPANY or any of its representatives shall create any warranty, express or implied, or in any way alter the scope of the Limited Warranty or the Parties rights or remedies provided in this Agreement.
      (ii) Some jurisdictions do not allow the exclusion of implied warranties, so some of the exclusions contained in this Agreement may not apply to PURCHASER. In such event, any implied warranty shall be limited in duration to ninety (90) days from the date of invoice or to the minimum period prescribed by law, and the remedy for breach of such implied warranties shall be limited to the Sole and Exclusive Remedy specified in Section 4 below.

(iii) By purchasing any Product, PURCHASER acknowledges and agrees that COMPANY has made no representations or warranties, express or implied, to or for the benefit of PURCHASER which contradict any of the foregoing.

4. **PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND LIMITATIONS ON LIABILITY**.

a) **Sole and Exclusive Remedy**. All warranty claims must be made by PURCHASER within the Warranty Period for the applicable Product and are subject to verification by COMPANY. In the event of any breach of warranty, COMPANY will, at COMPANY's option and expense, repair or replace the Product. This remedy is intended to be the sole and exclusive remedy of the buyer under this contract. Should this Sole and Exclusive Remedy fail of its essential purpose, however, COMPANY will return the purchase price of the Product to PURCHASER minus the shipping costs for return of the Product to COMPANY. PURCHASER and COMPANY further agree that, regardless of the failure of the Sole and Exclusive Remedy, COMPANY will not be liable for any consequential damages of any kind or nature whatsoever, including but not limited to the loss of grapes, or dissatisfaction with the quality of wine produced using any of the Products.

b) **Limitations on Liability**. IN NO EVENT SHALL COMPANY OR ITS PRINCIPALS, OFFICERS, EMPLOYEES, OR REPRESENTATIVES ("COMPANY'S RELATED PERSONS") BE LIABLE TO PURCHASER OR ANY OTHER PERSON FOR ANY LOST PROFITS, LOST BUSINESS OPPORTUNITY, LOSS OF PRODUCT OR PRODUCTION, LOSS OF GOOD WILL, OR ANY CONSEQUENTIAL, INDIRECT, SPECIAL, INCIDENTAL, OR PUNITIVE DAMAGE INCURRED BY PURCHASER ARISING OUT OF OR RELATED TO THIS AGREEMENT OR TO PURCHASER'S USE OR MISUSE OF, OR INABILITY TO USE, ANY PRODUCT. THESE LIMITATIONS SHALL APPLY REGARDLESS OF WHETHER COMPANY OR ITS RELATED PERSONS WERE ADVISED, KNEW, OR SHOULD HAVE KNOWN OF THE POSSIBILITY OF SUCH DAMAGE.

c) **Intention of the Parties to Exclude Consequential Damages.** The Parties intend the exclusion of consequential damages in Sections 4.a and 4.b above as independent agreements apart from the Sole and Exclusive Remedy provided herein.

5. **ASSUMPTION OF RISK and RELEASE AND WAIVER**.

a) **Assumption of Risk**. PURCHASER acknowledges that the Products are currently experimental in nature and assumes any and all risks and liabilities associated with the use or misuse of, or inability to use, any of the Products, whether or not such risks are now known to PURCHASER.

b) **Release and Waiver**. In consideration of being permitted to purchase any of the Products, PURCHASER, on behalf of him/herself and his/her personal representatives, guardians, heirs, successors, assigns, and any other person claiming through PURCHASER ("PURCHASER's Related Persons"), hereby releases, waives, and discharges COMPANY and COMPANY's Related Persons from any and all claims, demands, losses, expenses, and damages of any kind or nature whatsoever, and covenants not to sue COMPANY or COMPANY's Related Persons in connection therewith.

c) **Indemnification**. PURCHASER, on behalf of him/herself and PURCHASER's Related Persons shall and hereby does indemnify and hold harmless COMPANY and COMPANY's Related Persons from and against any and all claims, demands, losses, expenses, and damages of any kind or nature whatsoever (i) resulting from or arising out of the use, misuse or inability to use any of the Products, or (ii) resulting from any claim, demand, lawsuit, or action by PURCHASER or PURCHASER's Related Persons that would constitute a breach of any obligation, covenant or promise by PURCHASER in this Agreement.

6. **Non-Applicability of United Nations Convention on Contracts for the International Sale of Goods**. The Parties hereby agree that the United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement.

7. **Governing Law and Exclusive Venue**. Any and all matters of dispute between the Parties, whether arising out of or related to this Agreement or from alleged extra-contractual dealings, interactions, or facts prior to or subsequent to the purchase of any Product, including, without limitation, claims for fraud, misrepresentation, negligence, or any other alleged tort or violation of contract (collectively, "Claims"), shall be governed by and construed, interpreted and resolved in accordance with the laws of the **State of New Jersey**, regardless of the

legal theory upon which such matter is asserted and without regard to the State of New Jersey's choice of law provisions. All Claims shall be submitted exclusively to the federal and state courts of competent jurisdiction located in **Somerset County, New Jersey**, and the Parties hereby unconditionally and irrevocably consent and submit to such exclusive jurisdiction and venue, and waive any objection they may now or hereafter have with respect thereto.

8. **California Code of Civil Procedure Section 1542**, If California Code of Civil Procedure Section 1542 is, for any reason, found applicable to the purchase of any of the Products or this Agreement, Purchaser hereby acknowledge and agrees as follows:

   a) California Code of Civil Procedure section 1542 provides that: “”A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him must have materially affected his settlement with the debtor;”

   b) PURCHASER hereby expressly waives any and all rights and/or benefits that s/he may have against COMPANY and COMPANY's Related Persons under California Civil Code section 1542 or any other statute or common law principles of similar substance and effect; and

   c) PURCHASER represents, acknowledges, and agrees that s/he is knowingly and voluntarily waiving the provisions of California Civil Code section 1542 as a part of this Agreement.

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