

# Operating & Maintenance Instructions FrostGuard Revolution S20 & S30

(Briggs & Stratton engine - 14 hp - 1-cylinder)



**It's strictly forbidden to operate the FrostGuard if you haven't read this manual.**

Year of construction: .....

Type: S20 / S30

Serial number: .....

## **Make life easy: buy our AGROFROST Frost Alarm!**

This manual must be used according to the European legislation. It must be considered as a part of the machine. The manual must be kept with the machine until the final dismantle as described in the European legislation. The purpose of this manual is to help use and maintain the FrostGuard safely.

The user manual must be kept by the owner or the user on a safe, dry and sun protected place on the working area. It must always be available to consult. When the manual is damaged, the user must ask AgroFrost for a new one.

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## POINTS OF ATTENTION IN THIS MANUAL



Hint: to give suggestions and advice to ease certain tasks



Attention: a remark with extra information to call your attention for possible problems



Warning: to call your attention for avoiding danger

## ABOUT THE USERS OF THE FROSTGUARD

- Required user characteristics.

Persons allowed to drive a tractor by law and familiar with the driving of a tractor may operate the FrostGuard. They must be at least 18 years old and be able of all their physical and psychical capacities. They must read this manual before using the FrostGuard.



Someone who **has not read** this manual cannot use the FrostGuard safely.

- The profile of the user.

This user manual is created for two main groups:

- The user: the person who operates the FrostGuard
- The mechanic: the person who does the assembling, maintenance and repairs

Members of both groups must read this manual attentively before using the FrostGuard and before doing any repairs or maintenance on the FrostGuard.

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## 1 Introduction

### 1.1 INTENDED CONDITIONS OF USE OF THE FROSTGUARD

The FrostGuard is a rotating motor driven machine equipped with a powerful fan and a gas burning installation on the side. It generates a lateral laminar flow of hot air to treat crops and trees with.

The FrostGuard may only be used outdoors where there is natural ventilation.

At the end of the season, the FrostGuard needs to be stored indoor with the propane bottles removed from the machine. The propane bottles must be stored outside, according to the prescriptions of the fire insurance company.

### 1.2 IMPROPER USE OF THE FROSTGUARD



The FrostGuard may not be used indoors or outdoors in a closed area without natural ventilation.

It is strictly prohibited to use the machine if not all safety requirements as described in Chapter 2, are complied. The FrostGuard cannot be used, when one or more of the following parts are missing, loose, damaged or incomplete:

- Air outlet
- All the doors / side panels
- A fully loaded battery

Furthermore, it is strictly prohibited:

- **to use the FrostGuard on slopes with gradients of more than 20%.**
- to carry a charge of any kind in any circumstances on the machine;
- to transport persons or loads on the machine;
- to weld or to make any changes whatsoever on the original design of the FrostGuard.

### 1.3 POSITIONING THE FROSTGUARD IN THE ORCHARD, VINEYARD OR FIELD

Ask your dealer for the ideal setup of the machines. Or send a plan of your orchard/vineyard by e-mail to [info@agrofrost.be](mailto:info@agrofrost.be) Agrofrost will send you back instructions for the ideal set up.

### 1.4 WHEN TO START? – WHEN TO STOP?

The starting temperature depends on the flowering stage.

**Once the buds are in balloon stage or in full flowering, it's very important that the machine is started up before the wet temperature drops below 0 °C (+0,3 °C).**



**When the wet temperature outside the treated orchard/vineyard is positive again, the machine may be stopped.**

**If you use the Auto Start System, we strongly recommend putting the starting temperature at + 0.5 °C. (33°F)**

## 2 Safety

In this chapter, the FrostGuard's most important safety aspects will be explained. It is essential that everybody who works with the FrostGuard reads attentively the contents of this chapter.

The most important safety and health risks related to using the FrostGuard are listed in paragraph 2.2. The FrostGuard is designed to reduce these risks as much as possible.

The safety precautions to be observed and to be taken by the FrostGuard user are listed in paragraph 2.3.

The safety advices for technicians come up in paragraphs 2.4 and the symbols found on the FrostGuard are clarified in paragraph 2.5.

### 2.1 IMPORTANT: NOT TO BE USED IN CLOSED AREAS

**It is not allowed to use the FrostGuard in a closed area, because of three reasons:**



- The burner consumes oxygen. Therefore, the supply of fresh air is very important.
- The engine produces carbon monoxide. This is an odorless, colorless, poisonous gas. Breathing carbon monoxide can cause nausea, fainting or death.
- If gas would escape because of a gas leak, it could create life threatening situations in a closed area because of the danger of explosions.

### 2.2 SAFETY AND HEALTH RISKS: RESIDUAL RISK

The residual safety- and health risks related to parts of the FrostGuard are being mentioned below together with a series of measures that are taken to keep these residual risks as little as possible.

- Presence of propane gas (= combustible)
  - Risk of explosion in closed space has been averted by use of safety components and the explicit ban on indoor use.
  - The design of the FrostGuard also reduces the risk of the presence of accumulated gas. If the FrostGuard is working with all the cover plates present, the inlet air stream will flow throughout the FrostGuard and carries any possible accumulated gas through the fan before ignition has started.
  - Various safety components are built in the gas installation. The suppliers of these components ensure that have been inspected by an official inspection service.
  - Ignition of the gas is built in and works from a distance. The user ignites the machine in a safe way from a safe position.
  - An electric valve is built in. It stays only open automatically when the burner is working. If the flame goes out, the valve will close immediately.
  - When the energy supply is cut off, the machine cannot function, because the pilot will have gone out.
- Presence of propane under pressure.

There are 3 pressure regulators for pressure relief.

  - There is one pressure regulator outside the machine. This should be set to 1.5 bar.
  - The first one inside the machine is sealed and reduces the incoming pressure 1 bar. There is no need to alter the preset value.
  - The second regulator inside the machine is used to adjust the air temperature.
- Presence of high temperatures
  - At the ignition on the inlet of the burner: the ignition is entirely shielded from contact with the user by the isolated inlet. There's no chance for contact with the ignition flames.
  - At the outlet of the fan: when the machine is working, the flow of the air prevents touching the inside of the outlet of the fan. When the user stops working with the machine, he must leave the fan running for **at least 2 minutes**, so the additional outlet of the fan can cool sufficiently (30°C). There is a thermometer and a warning pictogram on the outlet of the machine. So, the user can check the temperature before he starts to store the outlet. However, there is no shielding to prevent the user to touch the fan outlet of the machine.

- Uncontrolled use of the FrostGuard
  - The use of control panels simplifies and secures the operation of the FrostGuard. See chapter 6.
- There are 4 heat sensors incorporated, all at the outlet of the fan.
  - a. One heat sensor will shut down the machine when the temperature exceeds 150 °C.
  - b. One heat sensor is connected to the temperature gauge to show the working temperature.
  - c. One heat sensor will activate the alarm when the working temperature exceeds 120 °C.
  - d. One heat sensor will activate the alarm when the working temperature drops below 50 °C.
- Presence of rotating parts
  - Covering the exhaust pipe isn't possible because this exhaust is needed for applying a laminar air flow. Because of this, there is an extra sensor that controls if the exit pipe is mounted.
  - S20 models: When the 4-pole plug next to the exit pipe is not inserted, the engine will not start. If the exit pipe is taken away during operation, the engine will stop immediately.

**EXTRA WARNINGS:  
DO NOT PUT YOUR HANDS IN THE EXHAUST FAN**

- Dangerous situations involving third parties
  - A fixed safety zone of 10 meters around the FrostGuard must be observed: no other people but the user may be in that safety zone.



When disconnecting the propane supply to the burner, for any reason, always keep the machine running for another 3 minutes to remove any amassed gas and to cool down the heat sensors of the electric valve. Only after the electric valve has closed automatically other people may enter the safety zone.

## 2.3 SAFETY PRECAUTIONS

### **Before use**

First read attentively the instructions in the manuals of the FrostGuard. The user has to be acquainted with operating the controls of the machine.

- The guards/doors must all be in their place. The FrostGuard cannot be used, when one or more of the guards/doors are missing, loose, damaged or incomplete.
- Check the propane connections for leaks with the leak spray.

### **During use**

- When the machine is activated, make sure that no other people come within the safety zone, being 10 meters around the machine. Keep children away from the machine. Do not let them without supervision if they could come within the safety zone, being 10 meters around the machine.
- Remain within hearing distance when the machine is working. The acoustic alarm could go off, indicating that there is need for intervention.
- Do not let the machine work without all the cover plates: it is important for the cooling of the engine that all the plates/doors are in place.
- Beware of the fact that the entire machine is rotating. Therefore, don't come too close. You might influence the working of the machine.
- Always keep the engine running at a stable pace (full throttle). When the number of revs lowers, the exhaust temperature will rise sharply. The guards on the exhausts will also heat up, which results in potential danger of burns.



### **When changing the propane bottles and ending operation**

- Always close the propane bottles after use, and before changing them on the machine.
- Use leak spray to check the connections of the propane cylinders for leaks after connection the gas hoses to the bottles.

### **2.4 SAFETY ADVICE ON MAINTENANCE, REPAIRS AND STORAGE**

- All screws and nuts must be tightened firmly, to keep the machine safe and in optimal condition.
- The FrostGuard must be stored inside, but not with the propane bottles on it. Store the FrostGuard horizontally in a dry place.
- Always use genuine spare parts. Using non-genuine spare parts can enhance the chances of damage, even if they fit on the machine.
- Replace damaged warning and instruction stickers.
- All the flexible propane hoses must be replaced every 5 years.

### **2.5 EXPLANATION PICTOGRAMS**



FLAMMABLE  
MATERIALS



CAUTION - DANGER



HOT SURFACE



MOVING PARTS



FIRE: OPEN FLAMES  
AND SMOKING  
PROHIBITED

### 3 Transport and Storage

#### 3.1 TRANSPORT



- **Before transporting or moving the machine, make sure it's in the transport position. You can rotate the machine – WITHOUT THE ENGINE RUNNING - by pushing on the black button on the control box 'C' (see picture).**
- When you want to transport the machine by road, you need to fix the machine firmly onto the transportation vehicle.
- If it is necessary to hoist the FrostGuard, you can buy a set of liftings eyes that can be mounted on the machine.
- When you transport the machine towards the field, the FrostGuard can be moved with a tractor that is equipped with a forklift. The forks of the forklift should support the main frame.
- Do not drive faster than 5 km/hour during transport in the field.



#### 3.2 STORAGE

##### During the season

During the period of use, you can leave the FrostGuard standing in the field for a while. The FrostGuard is protected against all weather conditions.

##### After the season

Make sure that the FrostGuard is cleaned as described in chapter 7.

Store the FrostGuard in a covered, dry place and horizontally, even when storing it for a short while.

Store the FrostGuard in a place where you don't need to cover it, because underneath a cover arises condensation. In this way, the risk of absorbing moisture by insulation incorporated in the machine is avoided.



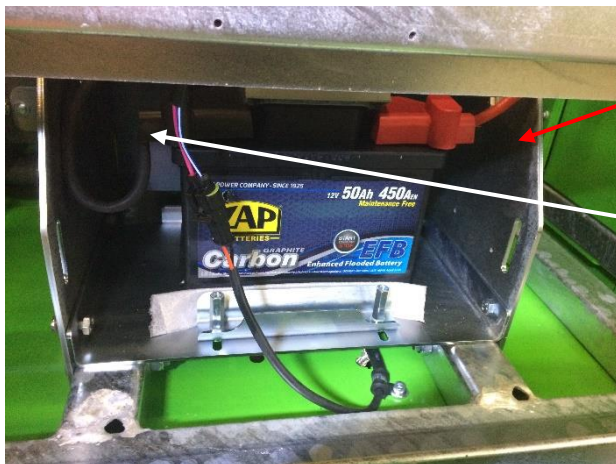
**The propane bottles must be removed every time the machine is stored indoor.  
The propane bottles or tanks must be stored outdoor, according to the prescriptions of the fire department and your insurance company.**

When you store the FrostGuard during summer and autumn, it is better that **you take the battery out** of the FrostGuard. You can use it elsewhere or you can use a trickle charger to keep it in the best condition.

To take out the battery, you just need to unscrew the battery connectors.  
First disconnect the negative pole with the black wire, then the other one.

To install the battery again, you can't connect this in a wrong way, because one of the connectors is slightly bigger than the other.

Reconnect the positive pole and the red wire first.



Positive pole (red wire)

Negative pole (black wire)

## 4 First use and preparation



Mount all the pieces that are delivered separately.  
The FrostGuard can be equipped with different systems for the propane bottles.  
Every system is delivered with its own mounting instructions. Follow these instructions.

**S20: Pay special attention to the swivel connection at the top of the FrostGuard in case you do not use the 4 bottle holders that are mounted on the machine. The flexible propane hose that comes from the propane tank needs to be high enough above this point because the FrostGuard is turning around. By turning around, it could get stuck if the hose is not installed high enough.**

### 4.1 FIRST USE

You need to install the FrostGuard properly. Make sure it is placed in its best possible position: parallel or as close as possible to parallel with the terrain, if the slope is not more than 15%. Otherwise, you must level out the machine until the angle is not more than 15%.

For obtaining the best results, it needs to be levelled with its surroundings as well: for the best results the air needs to travel close to the ground over a distance of  $\pm 50$  to 60 meter.

Make sure everything is tested in advance: use the leak spray to test the propane connections.  
Check if the battery is connected.

Supply enough spare propane bottles. Make sure that these are within easy reach, so changing them can be done as quickly as possible. Put the necessary tool out as well: a 28 mm open-end spanner. (In some countries, the open-end spanner maybe of a different size as 28 mm)



After connecting the gas hoses, check the gas connections with the leak spray.

### 4.2 SET UP THE FROSTGUARD WITH 4 GAS CYLINDER HOLDERS ON THE MACHINE.

On all models, it's possible to mount 4 bottle holders for the propane bottles.

- Put the cylinders in the holders and fix them with the straps.
- Connect all the cylinders to the gas hoses.
- After connecting the gas hoses, check the propane connections with the leak spray.
- You need to use them all together, otherwise the cylinders will freeze. (open all the valves)
- Make sure there is enough propane to last all night. (**consumption = 10 kg / h**)



### 4.3 SET UP THE FROSTGUARD WITH CONTAINER FOR 5 OR 6 GAS CYLINDERS.

- Put the cylinders in the container and fix them with the straps.
- Connect all the cylinders to the gas hoses.
- **Make sure to connect the heating pipe to the container, otherwise the cylinders will freeze.**
- After connecting the gas hoses, check the gas connections with the leak spray.
- You need to use the gas cylinders all together, otherwise the cylinders will freeze.
- Make sure there is enough gas to last all night.
- Make sure the container is in the high position if used with S20, so the hot air can pass under the container.



+



#### 4.4 SET UP THE FROSTGUARD WITH A GAS TANK OF 300 KG, 500 KG OR BIGGER.

It's also possible to use bigger gas tanks for the gas supply. Because the distance from the gas tank to the machine has a big influence on the gas supply, please ask the manufacturer how to set it up if your tank is more than 5 meters away.

A special heating pipe can be delivered if using a tank, smaller than 500 kg. The tank needs to be warmed with the special heating pipe, and the distance between tank and machine may not exceed 5 meters. You need a special gas hose for the gas supply (and a special heating pipe to warm up the tank if the tank is smaller than 500 kg)

If you want to use big storage tanks, with an underground pipeline network, please ask the manufacturer how to set it up.

#### 4.5 SETTING THE GAS PRESSURE.

If you use a bottle rack, container or a tank, near the machine or on a larger distance, there must always be a pressure limiter installed at the beginning of the propane line. (This propane line can be a rubber hose or a PE-line).

**The gas pressure at the entrance of the machine will be regulated by the pressure limiter. It should be approx. 1,5 bars. This is the pressure whilst the engine is running, the burner is ignited, the temperature outside is approx. 0 °C and the temperature of the burner is between 70 and 90 °C. (158 and 194 °F)**



**Before you open the gas bottles, make sure that they are in a vertical position for at least 10 minutes.**

## 5 Positioning of the machines in the orchard / vineyard.

### 5.1 ORCHARDS

The distances to respect between multiple machines depend on the density of the trees.

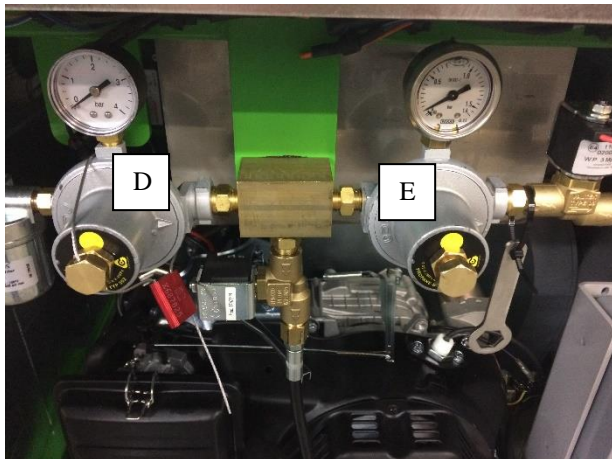
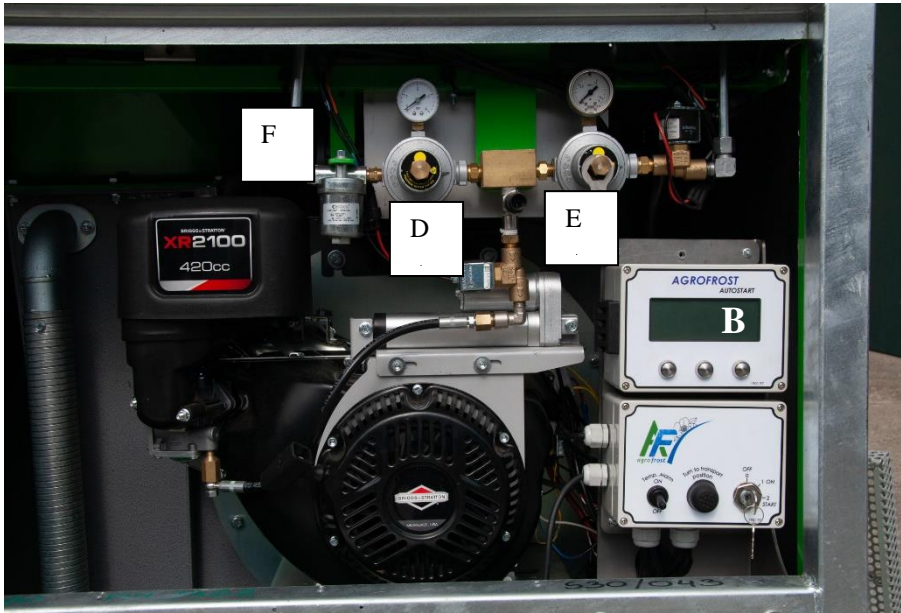
- If trees are planted 4 x 4 or 4 x 5 or 5 x 5 or ... the FrostGuard will protect a round area of approx. 1 hectare.
- If trees are planted 0.5 x 3 or 1 x 3.5, the machine will protect an oval area of approx. 70 x 110 m.

### 5.2 VINEYARDS

- In vineyards, we recommend keeping a maximum distance between the machines of 70 to 80 meters.
- Be aware that vines that are very close to the ground are more difficult to protect than vines of which the lowest buds/leaves are at a height of 60 or 80 cm.
- **We strongly recommend putting 1 row of paraffin candles on the wind side. When temperatures drop below -3 °C, or in case of wind, it's very helpful to put one row of candles on the complete outside of the vineyard.**

## 6 Operating the FrostGuard.

### The controls



**Control box  
Manual start**

- A main switch / key With this switch the FrostGuards engine can be started or turned off.  
0 = all functions shut off  
1 = electric power on control box  
2 = to start the engine
- B Screen Shows status of the machine. (RPM of engine, burner temperature etc.)
- C Push button To rotate the machine into transport position.
- D First Regulator This regulator is sealed and preset in the factory. It should give a reading of approximately 0.9 – 1.1 bar whilst the machine is operating.
- E Second Regulator This is regulator is used to adjust the working temperature of the burner. The temperature must be between 75 and 85 °C.
- F Gas filter Gas filter; can be cleaned
- G Alarm switch To switch acoustic alarm on/off

## 7 Using the machine with MANUAL START.

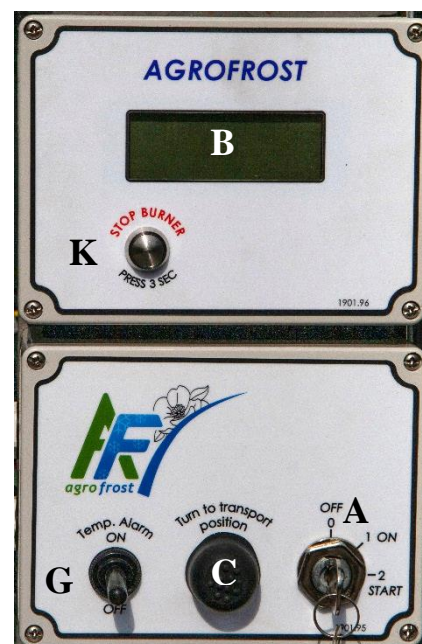
### 7.1 THE CONTROL BOXES

The lower control box has a key, a switch and a push button.

- The key (A) is used to start the engine.
- The push button (C) is used to rotate the machine manually.
- The switch (G) is to activate the acoustic alarm.

The upper control box has a screen and a push button.

- The screen (B) shows all relevant information.
- The push button (K) stops the burner if pressed for 3 seconds.



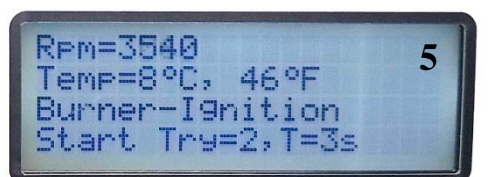
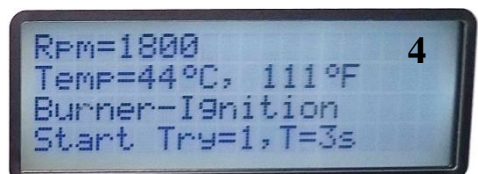
**S20 only: before you start, place the exit pipe in the gliders and plug the 4-pole plug into the 4-pole socket. If the plug is not inserted, the engine will not start.**

**S30 only: make sure that the exit pipe does not point towards you when you start the machine. In that case, first make it turn away from you by pushing the black button “C” on the control box.**

**Please note that the machine (S20) or exit pipe (on the S30) start only turning from the moment that the burner is ignited.**

### 7.2 STARTING PROCEDURE.

1. Open all the gas cylinders or gas tanks (propane supply).
2. Turn the key (A) to position '1 - ON'.  
The screen will show "Rpm=0 – Temp=.°C, ..°F - Burner=Off"
3. Start the engine by turning the ignition key (A) to position '2 – START'. The engine will run idle for 1 minute to warm it up.
4. After 1 minute, the engine goes to **Full Throttle**. The engine accelerates and the burner will ignite after a few seconds. The screen shows that the burner is igniting.
5. If the burner does not ignite from the first time, the screen will show "Burner-Fault" and the machine will do two more attempts to ignite. This will also be shown on the screen, where you can read "Try=2" or "Try=3". Normally, the burner ignites from the first time.



6. When the burner has ignited, it will be shown on the screen “Burner – Ok”. The yellow and green LED on the blue box (burner controller) light up. Go to point number 9.



7. If the burner did not ignite, the screen will show following message: “General-Fault”. In this case, turn the key (A) to ‘0 – OFF’.



8. Restart from point 3. When the engine goes to Full Throttle, check the pressure on the second pressure regulator (E). Probably the gas pressure is too low and there is not enough gas supply to ignite the burner. While the burner ignites, the gas pressure should be at least 0.5 bar. If this is not the case, adjust the pressure.



9. Check the gas pressure on the sealed pressure regulator (D) (=the left one). It should indicate approx. 0,8 bar.

10. Check the gas pressure on the other pressure regulator (E). It should indicate approx. 0,5 bar.

11. **Check the temperature with the small digital thermometer.** There is a small hole on top to the outlet pipe of the fan, near the fan’s exit. Put the thermometer in this hole to verify the temperature. (The temperature is also shown on the control box)

12. The correct temperature is between 75 °C and 85 °C. It can take up to 10 minutes before the machine is warmed up so do not start changing the gas pressure immediately after start-up to change the temperature.

13. If necessary, adjust the gas pressure (E) to get a temperature of 80-85 °C (photo 8). **Do not exceed 85 °C.** After adjusting the gas pressure, wait long enough until the temperature is stable before you make another correction. Check the temperature at the beginning of the fan’s exit pipe with the small digital temperature to read the exact temperature.

14. **ATTENTION:** if for some reason the speed of the engine is too low, the burner will shut off, and the screen will show ‘Burner-Off-Low Speed’.



15. **ATTENTION: if the temperature goes above 150 °C, as shown on picture 16, the burner will shut off after 15 seconds, the machine starts working on low speed, the red light will flash and the horn will blow. The screens indicate “Burner-General Fault”. Stop the machine by turning the key to position “0-OFF”**



16. Once the machine is running, you can switch the acoustic alarm on, using the switch (G) ‘Temp Alarm ON-OFF’ on the control box. The alarm will sound when the temperature is too low (< 55 °C) or too high (> 130 °C). Do not switch it on before the temperature has reached his normal operating temperature, otherwise the alarm will sound immediately.



### 7.3 STOPPING PROCEDURE.

1. Switch the alarm off - switch (**G**) - when it is active.
2. Press the (**K**) button (Stop burner) on the upper box for 3 seconds to stop the burner. The burner will stop. The screen will show "Burner-Off – Low Speed".
3. Let the engine run for at least 2 minutes to cool down the fan.
4. Turn the key (**A**) on the control box to '**0 – OFF**'.
5. Close all gas cylinders.
6. **Before transporting or moving the machine, make sure it's in the transport position. You can rotate the machine – WITHOUT THE ENGINE RUNNING - by pushing on the black button (C) on the control box.**

### 7.4 DURING OPERATION

**Keep all doors closed during operation. If some doors are left open, the cooling of the engine might be compromised.**

Check the temperature after 10 minutes and adjust the pressure to obtain an air temperature of 80 °C. If the temperature remains stable, you can leave the FrostGuard.

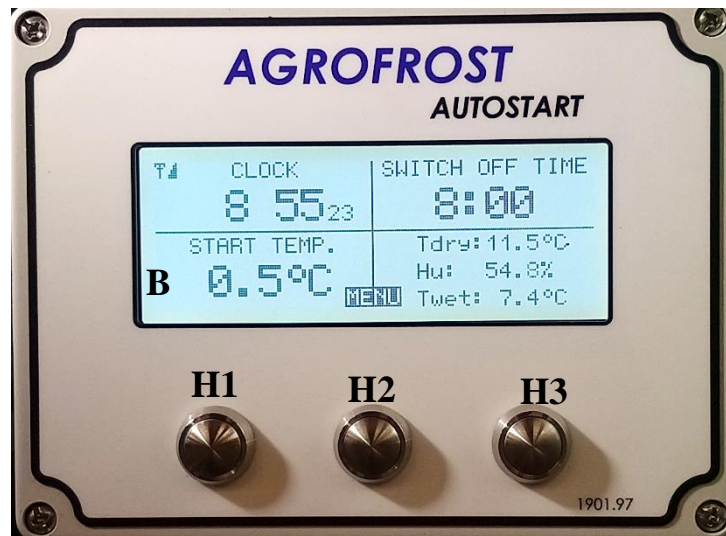
The normal working pressure will be approx. 0,5 bar. However, this could change depending on air temperature, humidity, wind etc. Always let the engine run at full throttle.

### 7.5 REPLACING THE GAS CYLINDERS DURING OPERATION

When the temperature drops 20 degrees in a few minutes, the propane cylinders must be replaced. It is of course recommendable to keep the replacing time as short as possible, and below 10 minutes.

1. Switch the alarm off - switch (**G**) - when it is active.
2. Press the (**K**) button (Stop burner) on the upper box for 3 seconds to stop the burner. The burner will stop. The screen will show "Burner-Off – Low Speed".
3. Let the engine run for at least 2 minutes to cool down the fan.
4. Turn the key (**A**) on the control box to '**0 – OFF**'.
5. Disconnect the propane bottles and take them out of the holders or container.
6. Put new bottles in. Fix all bottles with the straps, connect all the bottles and open them ALL.
7. Check the connections with the LEAK-spray. To start the FrostGuard again, the start procedure must be followed.

## 8 Using the machine with AUTO-START



### 8.1 THE CONTROLS

The upper control box has a screen (**B**) and 3 push buttons.

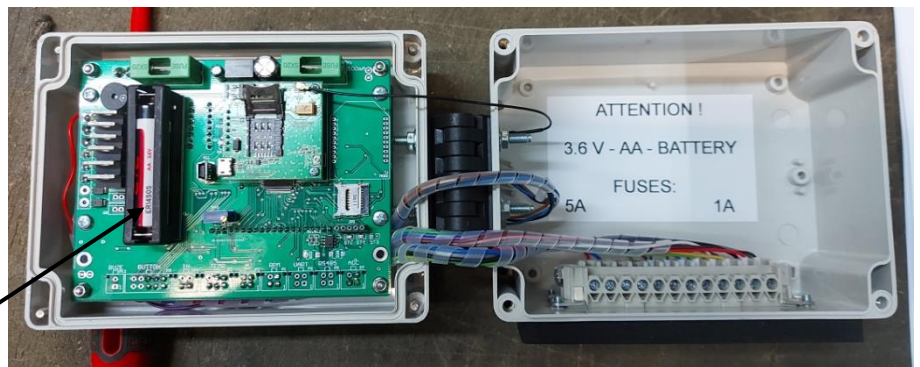
- The screen (**B**) shows all relevant information about the status of the machine or when programming the auto start system. The start screen (see above) shows the actual time, the switch off time, the start temperature, the wet and dry temperature and the humidity.
- The 3 push button (**H1 – H2 – H3**) are used for programming the auto start system.
  - o **H1** is used to go back in the menu system (the screen shows **BACK**) or to lower the value of the selected number during programming (the screen shows **DOWN**).
  - o **H2** is used to enter the menu or to confirm and save the data in the control box.
  - o **H3** is used to go to the next item in the menu (the screen shows **NEXT**) or to increase the value of the selected number during programming (the screen shows **UP**).
- You can see on the screen, just above the push buttons, the actual function. According to the position in the menu, these functions change. In the picture above, button **H2** is used to enter the **MENU**.

It is possible to use a SIM-card to get information from the system, or to stop and start the machine. To put the Sim-card in, open the upper control box and insert the SIM-card in its holder in the center of the circuit board.

On the left side of the control box, there are 3 connections:

- One input for the Antenna (if SIM-card is used)
- One input for the Outdoor Temperature Sensor
- One input for the Gas Pressure Sensor

The 3.6V-AA-Battery is for the clock.



### When using the AutoStart for the first time, reset the AutoStart!

This is how you do it:

- Press the middle button **H2 ENTER** before you switch the ignition key to position "ON"
- Switch the ignition key to position "ON" and hold the **ENTER** button until you hear a beep.
- The reset is performed and saved. All stored phone numbers and PIN-code are deleted.



We recommend doing this every time you change the SIM-card.

## 8.2 SIM-CARD AND PIN-CODE

When you switch the machine on, and there is no SIM-card inserted, the screen will show “SIM CARD ERROR”.

You can use the machine without SIM CARD. Just press the left button **BACK** to go to the main menu.

If you want to use a SIM CARD, shut the power off, open the box and insert the SIM CARD.

Make sur to RESET the system. This is how you do it:



- Press the middle button **H2 ENTER** before you switch the ignition key to position "ON"
- Switch the ignition key (A) to position '1 – ON' and hold the **ENTER** button until you hear a beep.
- The reset is performed and saved. All stored phone numbers and PIN-code are deleted.



When the symbols for the network and antenna are flashing or when you see the key symbol, the box is not connected to the network, probably because you still have to enter the right PIN CODE.

How to do so is explained in paragraph 8.3.7.1

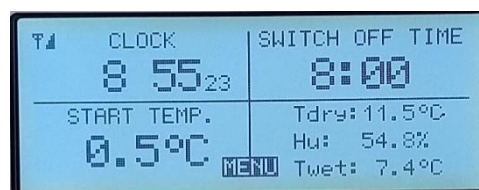


## 8.3 PROGRAMMING THE AUTO START BOX

### 8.3.1 Changing the start temperature.

To change the start temperature (= temperature at which the machine must start up):

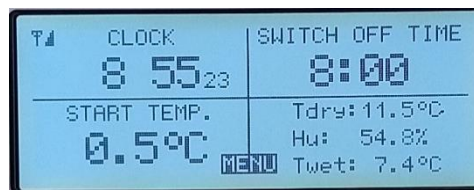
- Press the middle button **MENU**.
- The screen will show “START TEMPERATURE”.
- Press the middle button **ENTER** to change the start temperature.
- The screen shows “TEMPERATURE”.
- Adjust the temperature by using the left **DOWN** or right button **UP**.
- Press the middle button to confirm **ENTER**.
- The screen will show “DATA SAVED”.
- The screen will than show again “START TEMPERATURE”.
- You can go to the next menu item **NEXT** or back **BACK** to the start screen.



### 8.3.2 Setting the clock.

To change the clock (it's important to adjust the clock to the actual time because the machine stops in the morning at a programmed time):

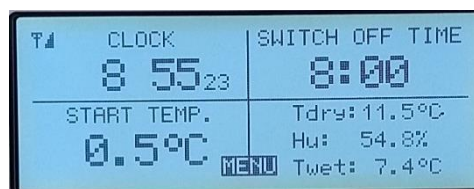
- Press the middle button **MENU**
- Press the right button **NEXT** until the screen shows "CLOCK SET".
- Press the middle button **ENTER** to change the time.
- Adjust the first digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the second digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the third digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the fourth digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- The screen will show "DATA SAVED".
- The screen will than show again "CLOCK SET".
- You can go to the next menu item **NEXT** or back **BACK** to the start screen.



### 8.3.3 Setting the switch off time.

To change the switch off time (= the time at which the machine will stop in the morning after an automatic start):

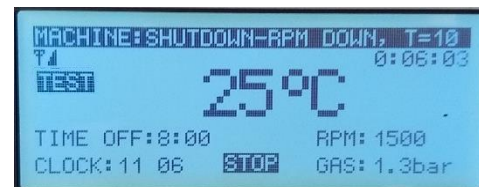
- Press the middle button **MENU**
- Press the right button **NEXT** until the screen shows "SWITCH OFF TIME"
- Press the middle button **ENTER** to change the time.
- Adjust the first digit by using the left **DOWN** or right button **UP**.
- Press the middle button to confirm **ENTER**
- Adjust the second digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the third digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the fourth digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- The screen will show "DATA SAVED"
- The screen will than show again "SWITCH OFF TIME"
- You can go to the next menu item **NEXT** or back **BACK** to the start screen.



### 8.3.4 Test Mode

You can test the auto start system by activating the test mode. You can also use this to just start up the machine:

- Press the middle button **MENU**
- Press the right button **NEXT** until the screen shows “TEST MODE”.
- Press the middle button **ENTER** for 3 seconds.
- The control box beeps 3 times, and the red light comes.
- The engine starts and runs “idle” to warm it up. The screen shows “ENGINE: WARMING”.
- After 1 minute, the engine goes to full throttle for 1 minute to charge the battery. The screen shows “ENGINE: BATTERY CHARGING”.
- The engine returns to “idle” for 15 seconds.
- Then the engine goes again to full throttle and the burner ignites. The machine will start turning. The screen shows “BURNER WARMING”.
- In case the machine does not start, it will make 3 more attempts.
- If the machine still does not work properly after 4 attempts, the screen will show “GENERAL FAULT”.
- If the machines start up normally, and when all parameters are ok after 1 minute, the screen shows “MACHINE WORKS OK”.
- To stop the test procedure, press the middle button **STOP** for 3 seconds. The burner stops.
- The engine keeps running to cool down the burner. The screen shows “MACHINE: SHUTDOWN-COOLDOWN”.
- When the temperature of the burner is below 40 °C, the engine slows down. The screen shows “MACHINE: SHUTDOWN-RPM DOWN”.
- The engine stops. The screen shows “MACHINES: STOP”.
- The screen returns to the start screen and the machine is ready for auto start.



**ATTENTION: in TEST MODE, the machine is not sending SMS messages.**

### 8.3.5 Temperature Mode – Celsius or Fahrenheit

To change between Celsius and Fahrenheit:

- Press the middle button **MENU**
- Press the right button **NEXT** until the screen shows “TEMPERATURE MODE”
- Press the middle button **ENTER** to change.
- Use the left **DOWN** or right button **UP** to select “CELSIUS” or “FAHRENHEIT”
- Press the middle button to confirm **ENTER**
- The screen will show “DATA SAVED”
- You can go to the next menu item **NEXT** or back **BACK** to the start screen.



### 8.3.6 Diagnostics

The Diagnostics Screen shows useful information:

- Press the middle button **MENU**.
- Press the right button **NEXT** until the screen shows “DIAGNOSTICS”.
- Press the middle button **ENTER** to access the information.
- The screen shows the gas pressure, the temperature of the burner, the battery voltage, wet and dry temperature and relative humidity.
- Press the middle button to exit **EXIT**
- The screen will show again “DIAGNOSTICS”.
- You can go to the next menu item **NEXT** or back **BACK** to the start screen.

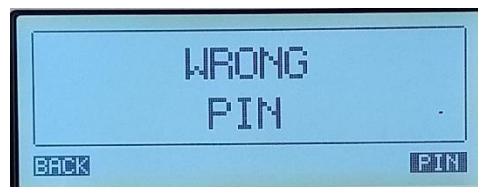
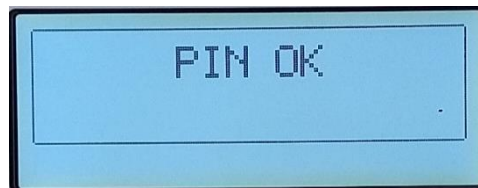
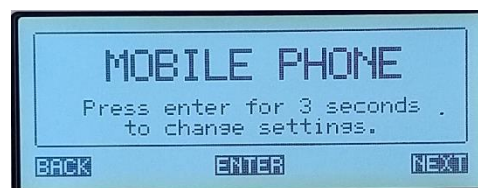


### 8.3.7 Mobile Phone Settings

If you use a SIM-card to send warnings, to receive information and to start or stop the machine, you have to put the PIN-code in the system and the phone numbers that needs to receive the warnings.

#### 8.3.7.1 To set the PIN-code:

- Press the middle button **MENU**
- Press the right button **NEXT** until the screen shows “MOBILE PHONE”
- Press the middle button **ENTER** for 3 seconds to enter this menu.
- The screen shows “MOBILE PHONE PIN SET”.
- Press the middle button **ENTER** to enter the PIN-CODE
- The screen shows “PIN SET” and the number that is stored.
- Adjust the first digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the second digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the third digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- Adjust the fourth digit by using the left **DOWN** or right button **UP**
- Press the middle button to confirm **ENTER**
- The screen shows “DATA SAVED”
- If the PIN-code is ok, the screen shows “PIN OK”.
- The screen shows “MOBILE PHONE PIN SET”
- You can go to the next menu item **NEXT** (“MOBILE PHONE USERS”) to setup the phone numbers to receive the warnings or back **BACK** to the start screen
- If you have entered the wrong code, the screen shows “WRONG PIN”. You then have 2 options:
  - o with the left button **BACK**, you can go back to the main menu.
  - o with the right button **PIN**, you can enter the PIN-code again.



- **Warning: if you enter the wrong code 3 times, the SIM-card will be blocked and you will need the PUK-code to unblock it. Unblocking the SIM-card must be done in a mobile phone.**

### 8.3.7.2 To store the mobile phone numbers:

- Press the middle button **MENU**.
- Press the right button **NEXT** until the screen shows “MOBILE PHONE”
- Press the middle button **ENTER** for 3 seconds to enter this menu
- Press the right button **NEXT** until the screen shows “MOBILE PHONE USERS”
- Press the middle button **ENTER** to enter the menu
- If there is already a phone numbers stored for the first phone number “Tel1”, it will show on the screen. If you want to keep this number, just press **ENTER** and the program will go to “Tel2”. If the field is empty, send an SMS with the next “N” to the SIM-card in the control box, from the mobile phone of which you want to store the number.
- After a few seconds, the phone number will show on the screen behind “Tel1:”. Press **ENTER** to store the number.
- You can also press the right button **DELETE** to delete a number.
- Repeat this for the following numbers “Tel2” and “Tel3” or just press **ENTER** if you do not want to store more numbers.
- After you have entered the last number, the screen shows “DATA SAVED”
- The screen shows “MOBILE PHONE USERS”
- You can only go back **BACK** to the start screen.



Please note that you can store a maximum of 3 phone numbers. If a warning is send out, it will go to every number that is stored.



## 8.4 START UP PROCEDURE IN AUTO-START MODE

Once you have programmed the control box, you can use the machine in Auto Start Mode. To do so, just put the key "A" on the lower control box in position "1 - ON". Make sure that all gas cylinders are open.

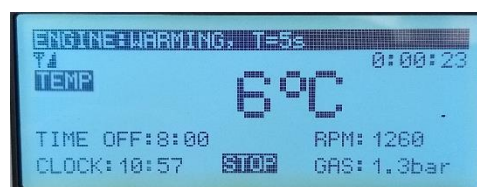
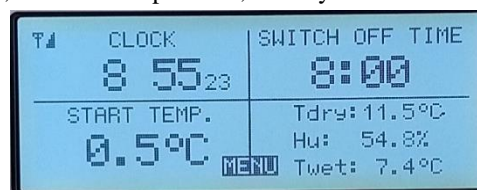
The following screen should come up, showing the time, the switch off time, the start temperature, the dry and wet temperatures and the relative humidity. You can check the status of the machine by sending SMS "INFO".

When the outside temperature drops below the start temperature, the machine will start up and sends SMS to the 3 phone numbers.

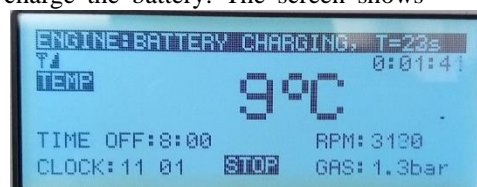
The following things will happen:



- The control box beeps 3 times and red warning light flashes.
- The engine starts and runs "idle" to warm it up. The screen shows "ENGINE: WARMING".



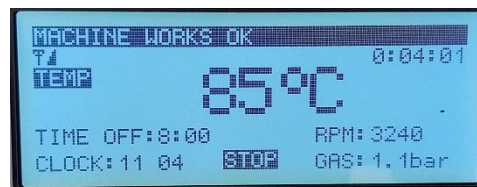
- After 1 minute, the engine goes to full throttle for 1 minute to charge the battery. The screen shows "ENGINE: BATTERY CHARGING".
- The engine returns to "idle" for 15 seconds.
- Then the engine goes again to full throttle and the burner ignites. The machine will start turning. The screen shows "BURNER WARMING".
- In case the machine does not start, it will make 3 more attempts.



- \*\*\* If the machine still does not work properly after 4 attempts, you will receive the message "GENERAL FAULT" on your phone.



- If the machines start up normally, and when all parameters are ok after 1 minute, the screen shows "MACHINE WORKS OK". You receive again a message to tell you that the machines work ok.

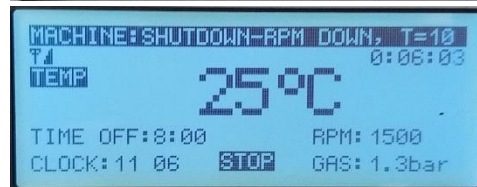


- When in the morning, the switch off time is reached, the machine will automatically stop.
- You can also stop the machine by pressing the middle button **STOP** for 3 seconds, or by sending a text message "STOP".
- The burner stops.



- The engine keeps running to cool down the burner. The screen shows "MACHINE: SHUTDOWN-COOLDOWN". The system sends SMS "MACHINE SHUTDOWN"

- When the temperature of the burner is below 40 °C, the engine slows down. The screen shows "MACHINE: SHUTDOWN-RPM DOWN"



- The engine stops. The screen shows "MACHINES: STOP". The system sends SMS "MACHINE STOP"
- The screen returns to the start screen and the machine is again ready for auto start.



\*\*\* = if the machine fails to start up, probably the gas pressure is too low, and the temperature of the burner does not reach 40 °C after 1 minute. Check the gas pressure on the second gas pressure gauge when the machine starts up. If necessary, adjust the pressure.

## 8.5 HOW TO START UP THE MACHINE?

There are 3 ways to start the machine:

- Automatically, based on the start temperature. The screen shows **TEMP** on the left side.
- By using the Test Mode. The screen shows **TEST** on the left side.
- By sending the text message “START”. The screen shows **SMS** on the left side. For this, the machine must be switched on and must be waiting for auto start.



## 8.6 HOW TO STOP THE MACHINE?

There are 3 ways to stop the machine:

- It stops when it reaches the switch off time.
- In Test Mode, press the middle button **STOP** to stop the machine.
- Send the text message “STOP”.
- Close all gas cylinders after use, unless the machine must be ready for the next auto start.

## 8.7 IMPORTANT TO KNOW:

- If the temperature of the burner exceeds 150 °C, you will receive a message and the machines shuts off.
- If the temperature of the burner becomes too low (< 40 °C), you will receive a message.
- If the gas pressure becomes too low (< 0.5 bar), you will receive a message.
- If there is a problem with the gas pressure sensor, you will receive a message.
- When the outside temperature sensor is broken, you will receive a message. You can still start the machine in Test Mode or by sending the text “START”.



- You can see on the screen when messages are received are sent.

## 8.8 DURING OPERATION

**Keep all doors closed during operation. If some doors are left open, the cooling of the engine might be compromised.**

Check the temperature after 10 minutes and adjust the pressure to obtain an air temperature of 80 °C. If the temperature remains stable, you can leave the FrostGuard.

The normal working pressure will be approx. 0,5 bar. However, this could change depending on air temperature, humidity, wind etc.



## 8.9 REPLACING THE GAS CYLINDERS DURING OPERATION

When the temperature drops 20 degrees in a few minutes, the propane cylinders must be replaced. It is of course recommendable to keep the replacing time as short as possible, and below 10 minutes.

The machine will also send a warning when the gas pressure becomes too low.

1. Press the (H2) button **STOP** on the upper box for 3 seconds to stop the burner. Or send SMS “STOP”.
2. The machine will go through it’s stop procedure.
3. Turn the key (A) on the control box to ‘0 – OFF’.
4. Disconnect the propane bottles and take them out of the holders or container.
5. Put new bottles in. Fix all bottles with the straps, connect all the bottles and open them ALL.
6. Check the connections with the LEAK-spray.
7. To start the FrostGuard again, send “START” or put the machine in TEST MODE. (In TEST MODE, it will not send you messages if there is a problem).

## 8.10 THE USE OF TEXT MESSAGES – WARNINGS

If a SIM-card is installed, and the PIN-CODE and phone numbers are stored in the control box, the system will send messages to all installed phone numbers in following cases:

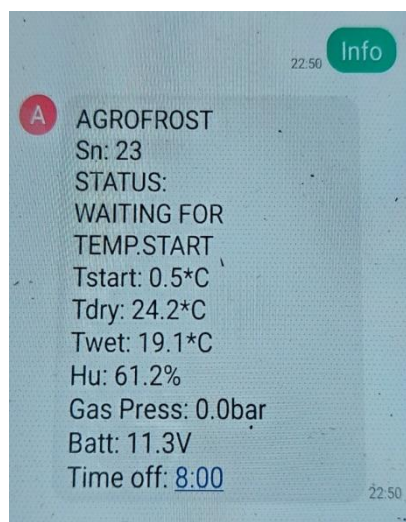
- Every time the machine starts up automatically.
- When the machine works ok after an automatic start up, it will send all data like rpm of engine, temperature of burner etc.
- When the machine could not start up after 4 attempts. It will send a “GENERAL FAULT” message.
- When the temperature sensor is not connected or broken.
- When the gas pressure sensor is not connected or broken.
- When the temperature of the burner is too high (>150 °C) or too low (< 40°C).
- When the gas pressure is too low (< 0.5 bar): this means that the gas bottles are almost empty and need to be replaced as soon as possible.
- When the machine stops because of malfunction.
- When the machine starts cooling down because it has reached the switch off time.
- When the machine stops because it has reached the switch off time.

You can send next messages to the system:

- ‘N’: to store the number of your mobile phone in the system during set up.
- ‘INFO’: if you send this to the system, it will respond with all relevant data.
- ‘START’: to start up the machine remotely
- ‘STOP’: to stop the machine remotely
- ‘TEL’: shows the 3 stored numbers

**Attention: you can send these messages only from the numbers that are programmed in the system. If you send if from another phone, it will have no effect.**

### A few examples of messages



### 8.11 THE UPPER CONTROL BOX – MANUAL START



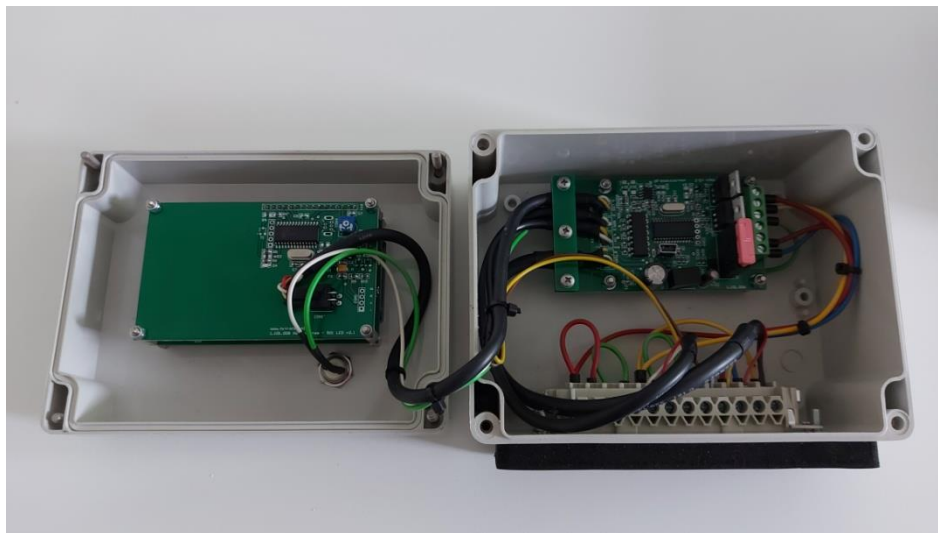
Each machine is also delivered with an extra upper control box for manual start. If there is a problem with the auto start system, you can replace the upper control box so the machine can still be used in manual mode.

To replace the auto start box with the manual start box:

- Take out the screw on top of the upper box (auto start control box).
- Lift the box up so it comes loose from the lower box.
- Put the manual box on top of the lower box.
- Fix the box by putting the screw back in.

This box has a screen that shows information like RPM of the engine and temperature of the burner. There is also a push button top stop the burner.

Please consult chapter 6 to operate in manual mode.



On the left side the LCD Screen and STOP Button Burner.  
On the right side the Circuit board with the 4 amp Fuse.

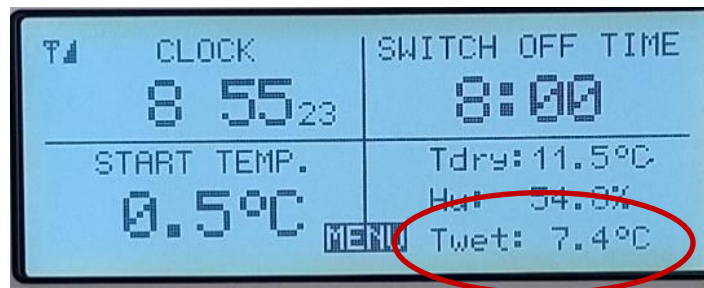
## 8.12 ADDITIONAL INFORMATION

If you don't use the program during more than 1 minute, the screen will return to the main menu.

**After a RESET of the SYSTEM, the following factory settings will be restored:**

START TEMPERATURE (+ 0.5°C °)  
SWITCH OFF TIME ( 8:00 )  
TEMPERATURE MODE (CELCIUS)  
PIN ( 0000 )  
USER LIST ( EMPTY )

When the outside temperature drops below the “START TEMPERATURE”, the wet temperature “**Twet**” starts flashing for 3 minutes.



If you have stopped the FrostGuard manually during the night and the FrostGuard Auto-start switch off time is 8:00, it will restart when the outside temperature reaches again the start temperature you set. (for example, at - 0,5 °C )

The auto-start sends a text message when the machines restarts.

Note: After this restart, the FrostGuard will run until the next morning (until switch off time) unless you shut it down. You can do this remotely by sending the SMS text "**STOP**".

**When the temperature sensor of the burner is defective or disconnected, the FrostGuard will be switched OFF. It will also send you a text message to warn you.**

## 9 Maintenance – Cleaning

### 9.1 CLEANING

You can clean the outside of the FrostGuard by hand, but you may not use a high-pressure cleaner. You can use a garden hose, but not nearby electrical parts or sensors. Don't use water inside of the machine.

### 9.2 MAINTENANCE

#### 9.2.1 Burner

The burner does not require any maintenance.

#### 9.2.2 Engine

There is a manual for the engine, provided by the manufacturer of the engine. As the manual of the engine is also part of the manual of the machine, you need to follow all the instructions written in that manual to. does not replace any other actions written in the manufacturer's manual.

The most important issues about the engine are:

Check the oil level every 20 hours.

Replace the oil of the engine every 75 hours of operation.

If the machine did not operate 75 hours a year, you need replace the oil every year in the beginning of the working season.

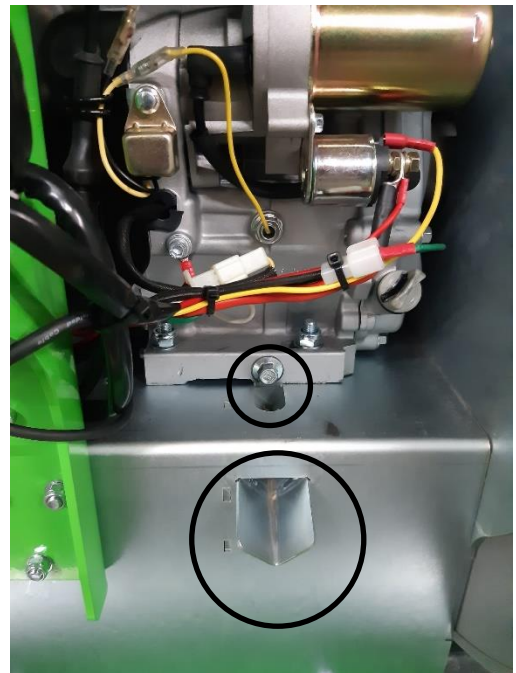
The drain hole of the engine is just above a metal angle bar that collects the oil. Place a reservoir at the end of the bar.

Clean the air filter with compressed air every 75 hours of operation.

Replace the air filter every 225 hours of operation.

If the machine did not operate 75 hours a year, you must clean it every year in the beginning of the working season.

Mandatory replacement is every 3 years.



Clean the gas filter when necessary!!



### 9.2.3 Annual maintenance to prevent corroding.

To prevent corroding, these parts need to be sprayed with oil (WD40) once a year.

- all key locks on the machine need to be treated as well.



### 9.2.4 Propane hoses: obligatory to replace every 5 years.

The propane hoses need to be replaced every 5 years. There is a date mark on each hose that indicates the year of fabrication. You are obliged to contact your local supplier or Agrofrost to have them replaced before they expire. For instance: hoses with 2012 written on it should be replaced before end 2017.

## 9.3 WARRANTY – SCRAPPING – SPARE PARTS LIST.

### 9.3.1 Warranty

The warranty covers the parts that are defective from the start, and that are produced by AGROFROST. This warranty expires when it is a matter of normal wear, when a malfunction is caused by incorrect operation or maintenance of the machine, in case the user has not observed the instructions in the manual, or when non-genuine parts, not produced by AGROFROST are used.

We do not accept complaints about changes that will be introduced in the future to improve the machine.

It is important that the document, called “INSTALLATION PROCEDURE” is filled up and send back to the address of the manufacturer: AGROFROST NV – Kunstlaan 56 – 1000 Brussels - BELGIUM

If this document is not sent back, the manufacturer reserves the right to cancel any warranty.

### 9.3.2 Scrapping

The following table gives an overview of the correct way of disposal of the different parts, in case the FrostGuard has to be dismantled.

Part	Way of disposal
Bearings	scrap
Oil from the gearbox	chemical waste
Frame and cover plates	scrap
Screws, bolts, washers	scrap
Gaskets	container for synthetic material
Insulation	construction / building waste

### 9.3.3 Parts list

If you need a parts list, you can ask for it at the manufacturer.

Send an e-mail to: [info@agrofrost.be](mailto:info@agrofrost.be) !!

## 10 EC Declaration of Conformity

### EC Declaration of Conformity.

**We declare under our own responsibility that the machine complies with the safety and health requirements established by the European Directive 2006/42/EG.**

EN standard codes:

BS EN 1672-2:2005+A1:2009 ; BS EN ISO 14123-2:2015 ; BS EN ISO 12100:2010 ;  
BS EN 1005-1:2001+A1:2008 ; EN 894-1:1997+A1:2008 ; BS EN 1037:1995+A1:2008 ;  
BS EN ISO 13857:2008 ; BS EN 60204-1:2006+A1:2009 ; BS EN ISO 13850:2006 ;  
BS EN ISO 13850:2015 ; BS EN 61310-1:2008 ; BS EN ISO 14119:2013 ;  
BS EN ISO 13732-1:2006

Manufacturer : Agrofrost S.A.  
Address : Kunstlaan 56 – 1000 Brussels - Belgium  
Telephone : +32 495 517689  
Fax : +32 3 2958428

Authorized representative : Patrik Stynen  
Address : Kunstlaan 56 – 1000 Brussels - Belgium

Machine : FrostGuard Revolution Type .....

Serial number : .....

Production date : .....

Year in which CE mark was affixed : .....

Signature:

**Agrofrost NV**  
Kunstlaan 56  
B-1000 Brussels (Belgium)  
Tel.: +32 495 517689  
[www.agrofrost.eu](http://www.agrofrost.eu) - [info@agrofrost.be](mailto:info@agrofrost.be)



Patrik Stynen  
Director