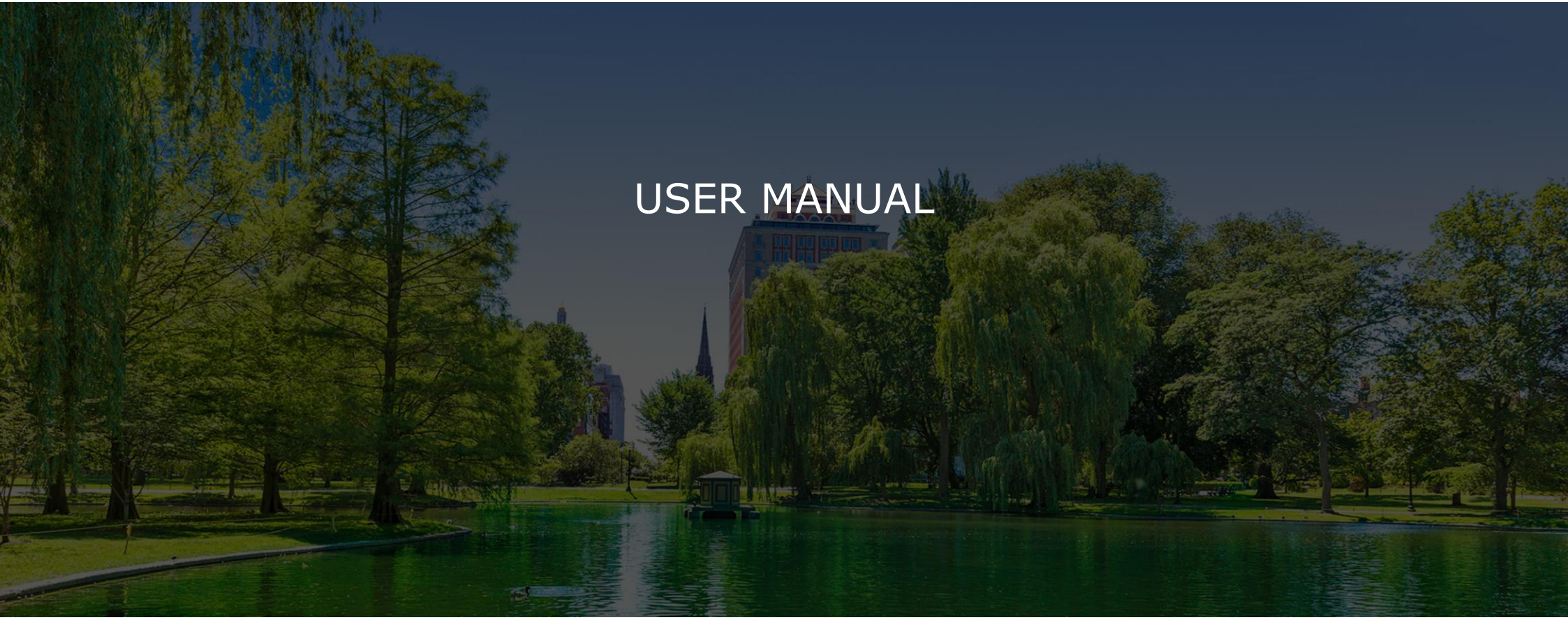
weedingtech

Foamstream

M600



USER MANUAL

ENGLISH (EU) – 16/05/2018 – ISSUE 3

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1 Safety Information

To ensure safety while operating the M600, please carefully read the following information.

1.1 Operator Attention

WARNING

- Read and understand this user manual before operating the M600.
- The M600 should only be used by trained operators.
- Proper PPE is to be worn at all times while operating the M600 (see section 3).
- Major repair work should only be carried out by professionally trained service engineers.

1.2 Carbon Monoxide Hazards

WARNING

- Boiler and generator exhaust contains poisonous carbon monoxide gas.
- Never run the M600 indoors, even if a door or window is open. **ONLY USE IN A WELL VENTILATED AREA.**
- Do not use the M600 in potentially explosive atmospheres.

1.3 Electric Shock Hazards

WARNING

- Do not operate the M600's electrical components with wet hands.
- Do not expose the generator to rain, moisture, or snow.
- Always ensure electric cables are in good condition.

1.4 Fire and Burn Hazards

WARNING

- LPG and diesel are explosive and flammable. Always ensure spark or fire source point away while refueling.
- Do not refill diesel while machine is in use.
- Clean up any overflowing fuel prior to turning on the M600.
- Never smoke while operating the M600.
- Do not touch the working components in the M600 while in use or immediately following use. Allow sufficient time to cool before servicing.
- Shut off generator by closing LPG supply to prevent unburned gas from remaining in the system.

1.5 Generator Fuel Warning

WARNING

NEVER USE PETROL IN THE M600. ONLY USE LPG TO FUEL THE GENERATOR.

If the generator is used outside the M600 as a backup generator and petrol is used, follow the instructions below prior to using the M600.

- **Remove all remaining petrol from generator and clean all spills and allow to dry/evaporate before putting the generator back inside the M600.**
- Turn the fuel switch (item 7 in Figure 11) to the **OFF** position.
- Connect LPG cylinder and start as normal.

2 Introduction

Thank you for purchasing the Foamstream M600!

IT IS IMPORTANT THAT ALL OPERATORS READ AND UNDERSTAND THESE INSTRUCTIONS BEFORE USING THE MACHINE

Having read these instructions, the operator will:

- Understand how the M600 works
- Identify key components in the M600
- Know how to carry out pre-start and start-up procedures
- Observe safe operating practices
- Be able to effectively operate the M600
- Be able to shut down and clean the M600
- Be able to perform basic maintenance and troubleshooting tasks

PLEASE KEEP THESE INSTRUCTIONS IN A SAFE PLACE FOR FUTURE REFERENCE

3 Important information

The following PPE (Personal Protective Equipment) are recommended when operating the M600:

- Eye protection is required when handling Foamstream® concentrate
- Gloves are required as the lance assembly will get hot
- Safety Footwear suitable for working in the areas concerned is recommended
- No specific protective clothing is required, although use of overalls and a HI-Viz vest is suggested as best practice.

IT IS THE RESPONSIBILITY OF THE OPERATOR TO WEAR APPROPRIATE PPE

Never operate the machine without checking that there are adequate supplies of clean diesel, clean water, and clean Foamstream® concentrate in the appropriate tanks.

The M600 produces **VERY HOT** water. This can cause serious burns and injury if used incorrectly.

Never point the lance at people or animals as this machine operates at high temperature and low pressure.

All personnel operating a M600 machine must be deemed competent to do so and must be adequately trained. A copy of the training record is available on demand.

Always check the M600 for any damage before use. Damaged cables, hoses or connections must be reported immediately, and the machine taken out of use until repairs have been completed.

Use only genuine Weedingtech spare parts and Foamstream® consumables. This will ensure the best performance of your machine and maintain the warranty of the unit.

The M600 must never be modified, safety interlocks bypassed, or settings adjusted (unless specified in these guidance notes) without Weedingtech's written consent.

Ensure that the M600 is placed in an area where there is adequate ventilation when in use.

Ensure that the consumable liquid (foam concentrate) is not subject to temperatures below 5 degrees centigrade at any time.

Ensure that both the M600 and its water tank are securely attached to the transport vehicle. It is the responsibility of the vehicle driver to ensure that any load is secure and that any payload restrictions are observed. You can refer to section 14 for more information on transport.

NEVER OPERATE THE M600 WITHOUT FOAMSTREAM® CONCENTRATE

4 Product description

The M600 weed control unit consists of:

- Foamstream®
- Water tank (270 litres)
- Hose reel (30 metres)
- Lance

The M600 houses a diesel-powered boiler, an LPG-powered generator, a logic controller (PLC), a piston pump, a 35 litres diesel tank, and a 15 litres Foamstream® concentrate tank.

When the water reaches 95 degrees centigrade, a valve opens allowing water to flow from the lance (7 lpm @ 12 bar) and a venturi mixer opens to allow Foamstream® concentrate to be injected at a ratio of 99.5 parts water to 0.5 parts concentrate. Air is added to the water and Foamstream® mix as it exits the lance to create the foam.

Figure 1 - M600 (operator and vehicle not included)

When the machine is switched on and operational, water is pumped at 7 litres per minute and passes through the boiler to be heated up to a minimum of 95 degrees centigrade.

The M600 has been designed to require no manual input or adjustment. The PLC monitors the system pressure, temperature and flow rate to ensure optimum performance of the unit.

A pressure relief valve and over-temperature sensor ensure that internal pressure and temperature will not exceed 35 bar or 120 degrees centigrade in the event of a system fault.

Operation of the M600 is via the user interface at the front of the unit (see section 7 for details).

Filters are fitted to the diesel, water and foam systems to ensure supplies are kept clean and free from debris. These needs to be checked daily (see section 6).

The top cover and front doors can be opened with a key to allow access to all internal components. The generator is on a slider and can be removed for improved access. The side panels can be easily opened by removing the three 1/4-turn screws on each side for maintenance purposes. Access to the electronics is via a door on the front of the M600 which can be opened by a key.

The standard water tank (270 litres) can be either wrap around the unit or be separate. There are two hydraulic connections (water supply, water return) and one electrical connection (water sensor).

An automatic hose reel is located inside the unit to allow the 30 metres hose to be stowed safely when the M600 is not in use. The hose comes off the right side of the reel and is connected to the lance via a threaded collar.

M600	
HEIGHT (mm)	1200
WIDTH (mm)	1000 or 1260 (with tank)
DEPTH (mm)	800 or 1110 (with tank)
WEIGHT (kg)	240 EMPTY, 270 FULL
WATER	270 LITRES
FUEL	DIESEL – 35 LITRES
FOAMSTREAM	FOAMSTREAM – 15 LITRES
GENERATOR OIL	0.6 LITRES SAE 5W40
PUMP OIL	0.3 LITRES SAE 5W40
FLOW RATE	7 LITRES PER MINUTE
OPERATING PRESSURE	30 BAR ON HEAT UP, 12 BAR TRIGGER OPEN
OPERATING TEMPERATURE	95 – 110 °C
PRESSURE RELIEF VALVE	35 BAR
OVER TEMPERATURE CUT-OUT	125 °C
GENERATOR	3.2 kVA – LPG POWERED
BOILER	48 kWh – DIESEL POWERED

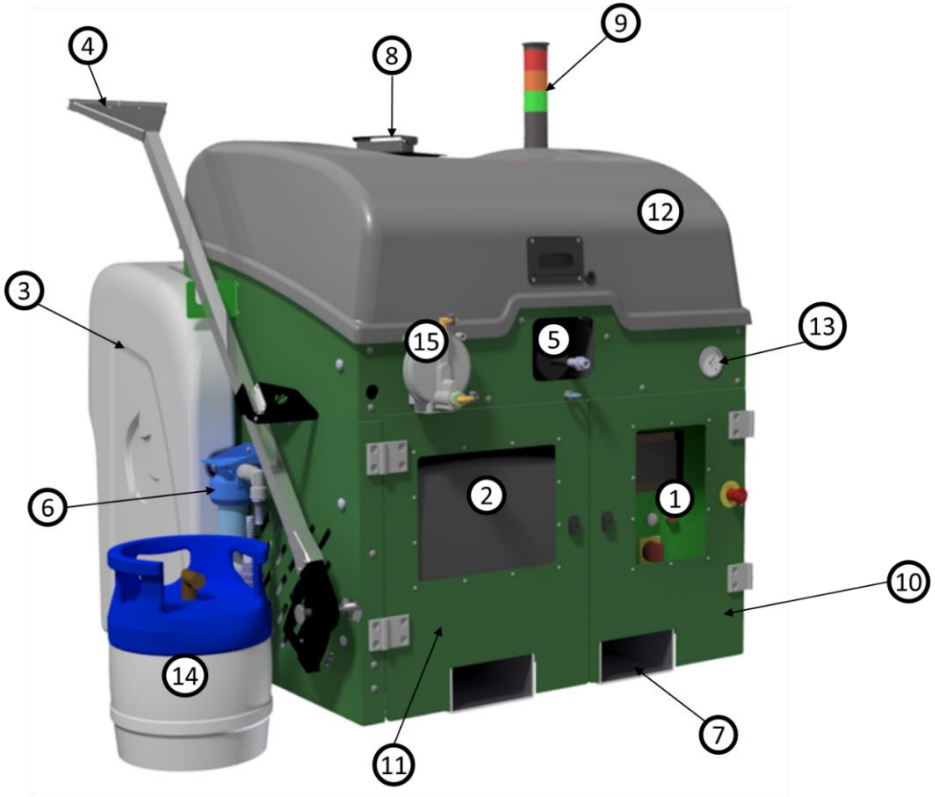


Figure 2 – Perspective view of the M600

Num.	Description
1	Control Panel
2	Generator
3	Water tank
4	Lance
5	Hose reel orifice
6	Water Filter
7	Forks entrance
8	Boiler exhaust flap
9	Warning light
10	Control panel access door
11	Generator access door
12	Top cover
13	Hydraulic pressure gauge
14	LPG cylinder
15	LPG regulator

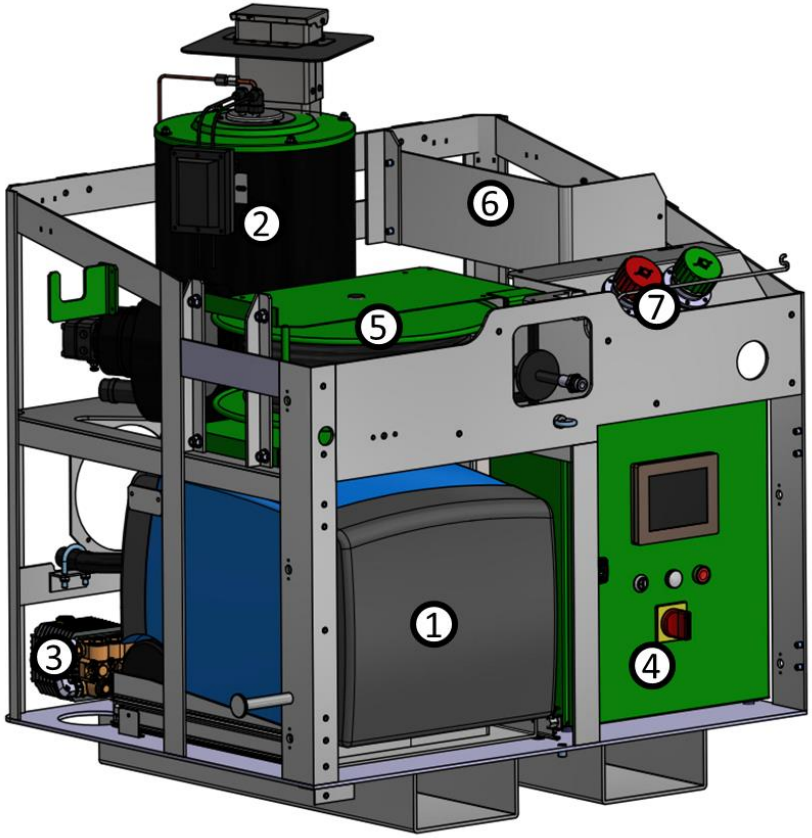


Figure 3 - Internal components of the M600 (panels removed)

Num.	Description
1	LPG generator
2	Diesel boiler (CAUTION HOT)
3	Water pump
4	Control box
5	Automatic hose reel
6	Hydraulic plate (hydraulic components not represented)
7	Diesel & Foamstream® filling points

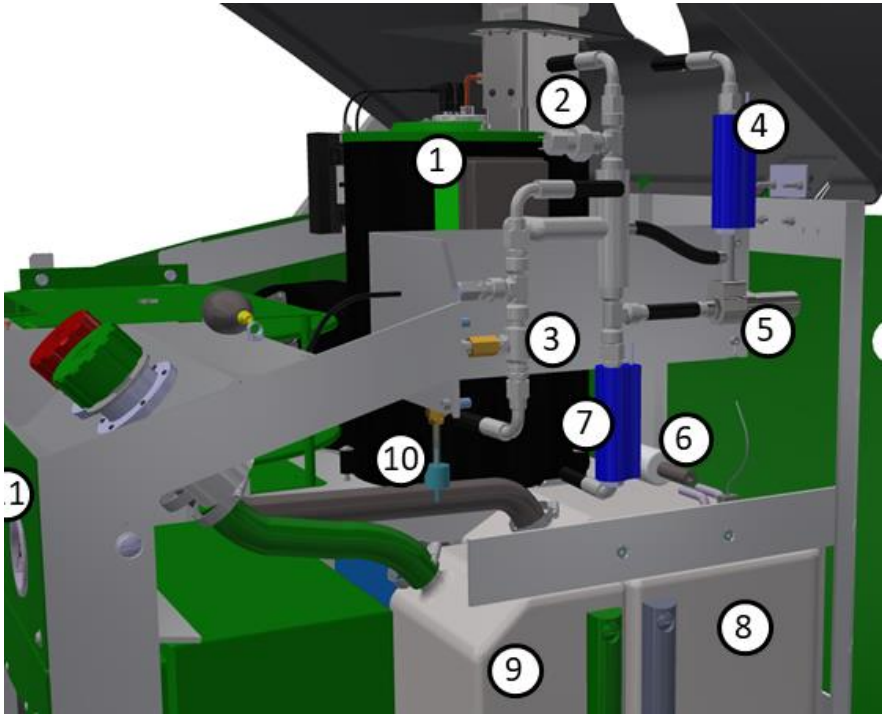


Figure 4 - View of the M600 hydraulic panel (some parts hidden for clarity)

Num.	Description
1	Lance solenoid valve
2	Lance pressure switch
3	Venturi
4	Return to tank flow switch
5	Pressure relief valve (PRV)
6	Diesel filter
7	Main flow switch
8	Diesel tank
9	Foam tank
10	Foam filter
11	Pressure gauge

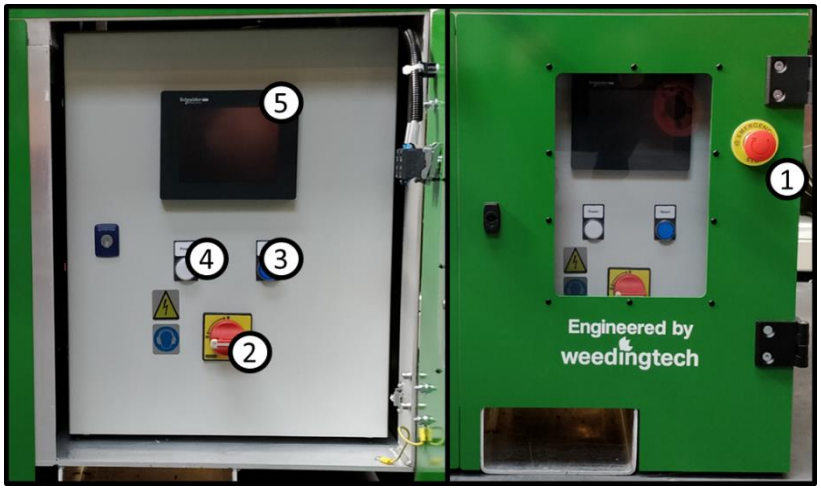


Figure 5 - Closed control box (left) open (right)

Num.	Description
1	Emergency stop
2	Main contact switch
3	Boiler reset button
4	Power light
5	PLC screen (touch screen)

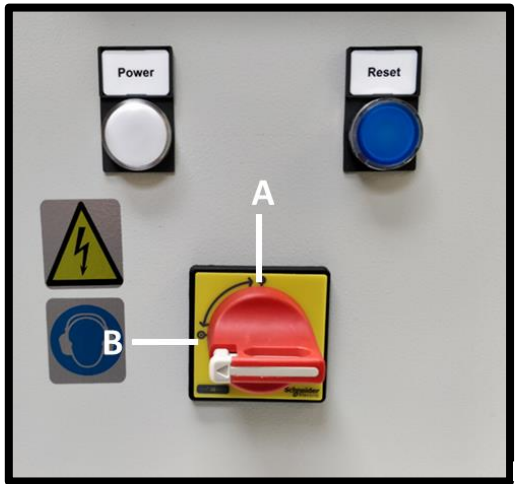


Figure 6 – Detail of the switches on the front panel

5 FOAMSTREAM®

5.1 How FOAMSTREAM® kills weeds

Foamstream® uses heat to kill weeds. Water is heated to near boiling point and then mixed with the Foamstream® concentrate to produce foam before being applied. The foam blanket ensures that the heat is held on the plant so that the weeds experience hot, killing temperatures for a few seconds. Figure 10 below explains and compares the process to hot water and steam.

5.2 Indicators

The lances can apply large volumes of water and foam and can be used to kill larger weeds. Foam cover, and hence heat retention on weeds, is easier to achieve on prostrate plants that are near the ground. Tall plants should be trodden down either by foot or by using the lance outlet, to aid foam cover and heat retention.

Figure 7 - Foamstream during treatment

Immediately after treatment, weeds will go dark green and limp. This indicates that the machine is operating properly. The weeds will die; this becomes more obvious within the next one to seven days (depending on species and weather). If weeds fail to go limp, temperatures may be too low or forward speed to high.

Figure 8 - Weed immediately after treatment with Foamstream

Figure 9 - Weed 24 hours after treatment with Foamstream

If weeds go brown immediately after treatment, this could indicate that forward speed is too slow and excessive heat is being applied.

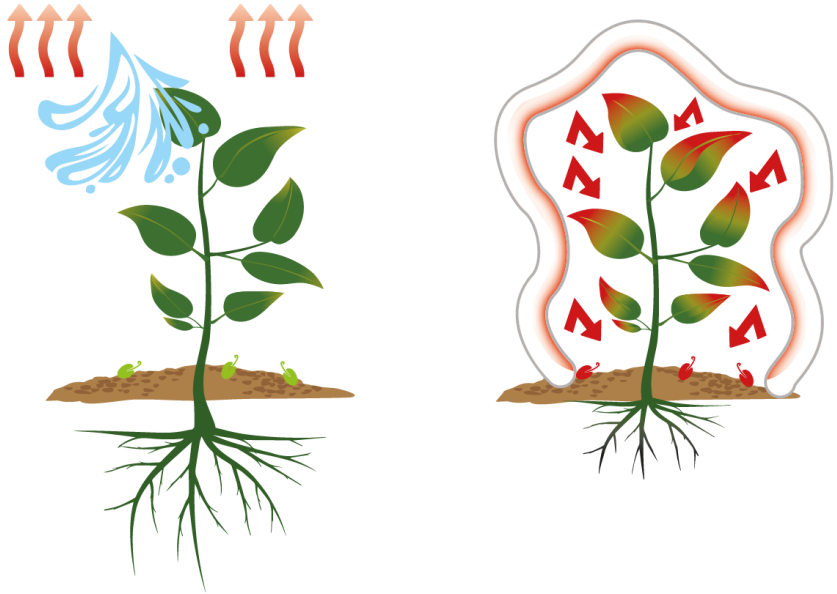


Figure 10 - Foamstream's triple action

Steam / Hot Water	Foamstream
Kills the leaves	Kills weeds
No effects on seeds	Sterilises seeds
Very weak effect on roots	Damages the root

In general, annual weeds are easier to kill than biennial or perennial ones. Weed species that originate from desert or semi-arid regions are more heat tolerant and will need a slightly prolonged treatment period compared to other species.

Biennial or perennial weeds usually have parts protected against heat (especially regenerative parts under the soil, the Rhizome). Foamstream is a contact application, it will kill foliage, but many perennial and biennial plants will regenerate. The number of repeat treatments required to completely kill weeds depends on the species and their size.

5.3 Caution – poisonous weeds

Some poisonous weeds, such as common ragweed (*Senecio jacobaea)* may still be attractive to animals after treatment with Foamstream. When treating any area where animals are likely to graze after treatment with Foamstream, check for the presence of such potentially toxic weeds and remove them or keep out of reach of animals that are at risk.

The effect of the system on plants

The M600 has been designed to operate in an urban environment and control weed growth on both hard surfaces and cultivated land. These weeds may be in, at, or around kerbs and channels, footpath edges, driveways, boundaries, obstacles etc.

Within these environments there are various plant species that need to be controlled. These species may vary in type and growth patterns depending on the specific geographic location.

The system, through its unique operation, delivers a plant kill based on thermal activity penetrating and breaking down the cell structure of the plant.

With varying plants in the target area, it is important for the operator have some knowledge of the weed types, sizes and

ages that they are treating, as this impacts on the speed of operation to deliver an effective kill.

For maximum efficacy, it is important that all weeds in the target area are in contact with the hot foam. Either flatten tall weeds i.e. by treading or use of the lance or ensure that the stems are 'ring barked' (completely surrounded by a blanket of foam). The density of the plants and foliage is a very important aspect for the operator to be aware of, as this also impacts on the speed of operation. It should be noted:

- As the height and/or density of the target plants increases, the speed of operation will be slower.
- In a situation where regular treatment of the area is part of a maintenance programme the weeds will generally be easier to treat as regrowth should be reduced.
- Regular treatment also allows increased speed of operation, as the volume of target plants to kill will be minimised on each maintenance cycle.

6 Pre-start checks

THESE CHECKS MUST BE COMPLETED BEFORE EACH START OF THE M600. ANY FAULTS MUST BE RECTIFIED BEFORE THE M600 IS SWITCHED ON.

6.1 Checklist

- ✓ The M600 is in good condition and securely attached to the transport vehicle
- ✓ The M600 water tank is securely attached to the transport vehicle
- ✓ The LPG cylinder is full, secured, and in good condition
- ✓ Water tank is full of clean water
- ✓ Water filter is clean and free from debris
- ✓ Air intakes are clear of debris
- ✓ The lance, hose reel and hose are securely connected and free from damage
- ✓ Lance wear pads are not excessively worn
- ✓ The water return pipe and water level sensor are connected
- ✓ Pipe/hose routes are clear of sharp edges and hot surfaces
- ✓ There are no signs of leaks from any pipe or connection
- ✓ Fuel tank is full of clean diesel fuel
- ✓ Boiler fuel filter is clean and free from debris
- ✓ The Foamstream® concentrate has not been subject to temperatures below 5°C and frozen or separated
- ✓ Foamstream® concentrate tank is full of clean Foamstream® concentrate
- ✓ Foamstream® filter is clean and free from debris
- ✓ Vent screw on Foamstream® tank filler cap is open
- ✓ Generator engine oil level is correct
- ✓ Pump oil level is correct
- ✓ Generator and boiler exhaust are secure and clear of debris and obstruction
- ✓ Fuel switch on generator is in the **OFF** position when using LPG
- ✓ Generator is switched to normal mode
- ✓ Water feed valve is connected and in the ON (inline) position
- ✓ Air has been bled from water system
- ✓ The LPG cylinder valve is connected, open, and leak free.

CLOSE LPG CYLINDER VALVE WHEN MACHINE IS NOT IN OPERATION

NEVER RUN THE GENERATOR WITH LPG WHILE PETROL REMAINS IN THE GENERATOR'S PETROL TANK

7 Start procedure

- ✓ Complete pre-start checks (see section 6)
- ✓ Press and hold priming button on regulator
- ✓ Start the generator by either:
  - Turning the key to position **E** and release to position **D** when engine starts (see
  - Figure 11) or
  - Turn the key to position **D** and double press and hold **ON** on the remote
- ✓ Turn the isolator switch to position **A** (see
- ✓ Figure 11), the PLC screen should illuminate (see Figure 12)

Figure 11 - Details of the switches of the front panel

- ✓ The reset indicator (blue light) lights up and **FAULT** will appear on the top right hand corner of the PLC screen
- ✓ Press the **RESET** button (blue button on the front panel, see Figure 5), the **FAULT** indicator goes out and you should see the screen represented in Figure 12
- ✓ Wait a few seconds before requesting air bleed: buttons **1** or **2** in Figure 12

If you have disconnected the water tank or are starting for the first time of the day, please use "**Air bleed Total**"

If you just took a break or want to perform an additional air bleed, please select "**Air bleed Partial**"
When bleeding the machine, the **trigger must be pushed** to allow water to flow out of the lance. Failure to do so will cause the machine to display a fault message.

- ✓ Once button **1** or **2** is pressed the bleed screen represented in Figure 13 will appear.
- ✓ Wait until the purge is completed. A new screen will appear, represented in Figure 14.
- ✓ Press **START**, the button turns green and the screen represented on Figure 15 will appear.
- ✓ The amber **HEATER** light will illuminate and the red **FAULT** button should go out. This indicates that the boiler has switched on and is heating the water
- ✓ The green **READY** light will illuminate when the M600 has reached operating temperature and the system is ready for use (2 – 4 minutes).

AFTER A COLD NIGHT (BELOW 0 DEGREES CELSIUS), LET THE GENERATOR RUN FOR 15 MINUTES TO WARM UP THE MACHINE BEFORE STARTING THE PUMP OR BLEEDING THE UNIT

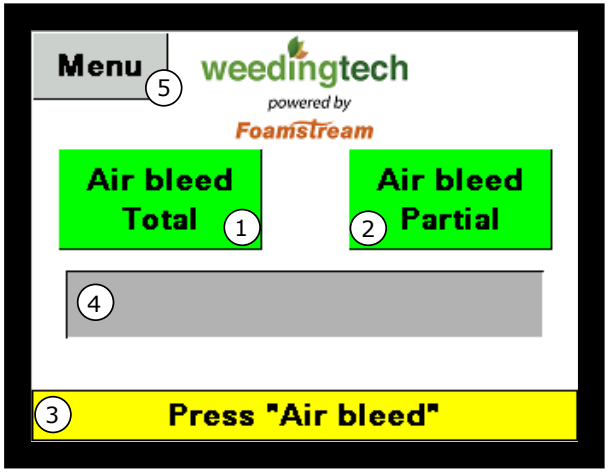


Figure 12 - Start-up screen of the PLC

Num.	Description
1	Press this button to purge the M600 for 30 seconds.
2	Press this button to purge the M600 for 10 seconds.
3	Indication message.
4	Air bleed status indicator.
5	Menu access

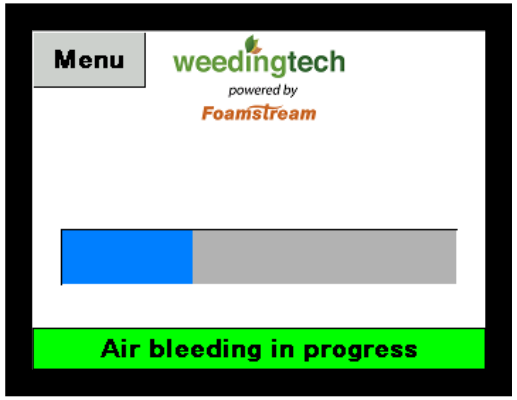


Figure 13 - Bleed screen of the PLC

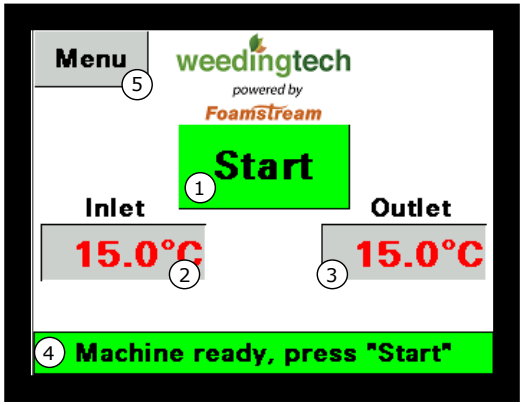


Figure 14 - Start screen of the PLC

Num.	Description
1	Start button
2	Boiler water input temperature
3	Boiler water output temperature
4	Indication message
5	Menu access

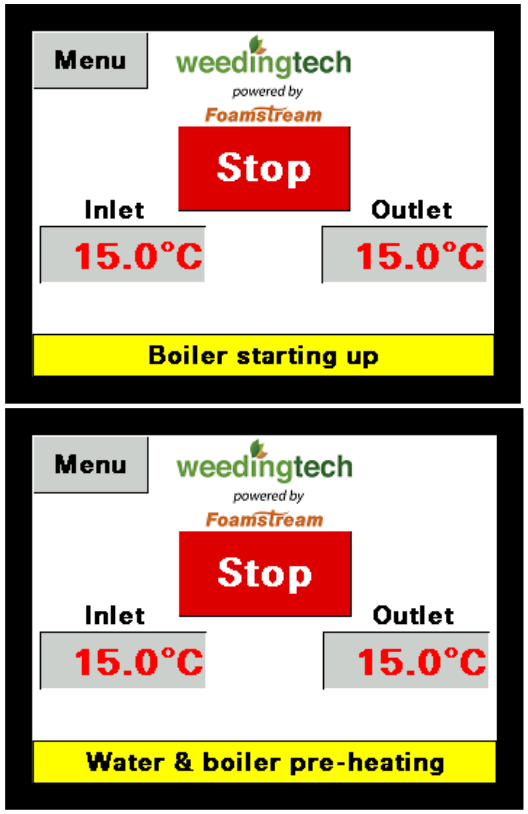
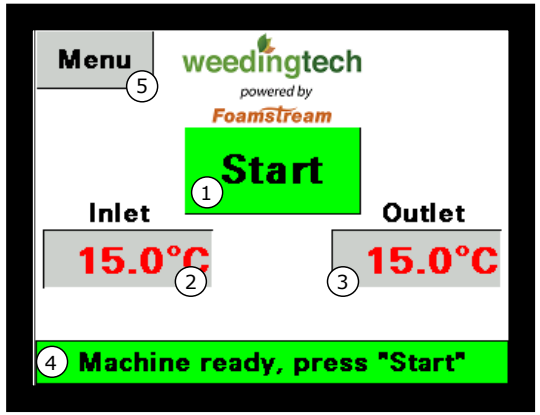


Figure 15 - Running screen of the PLC

8 Screen and PLC navigation

When the M600 is ready to start, the screen below will appear (same as Figure 14)



To access the menu, click on the "Menu" button on the top left-hand side of the screen. The screen in will appear.

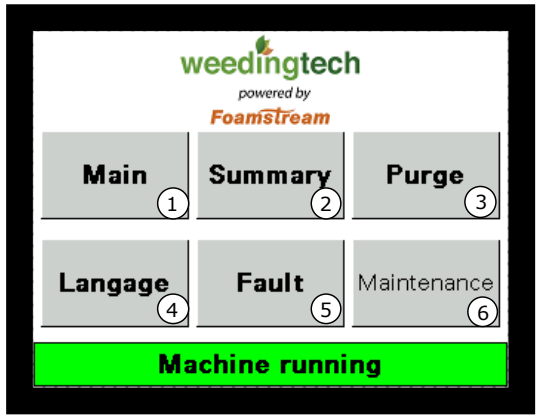
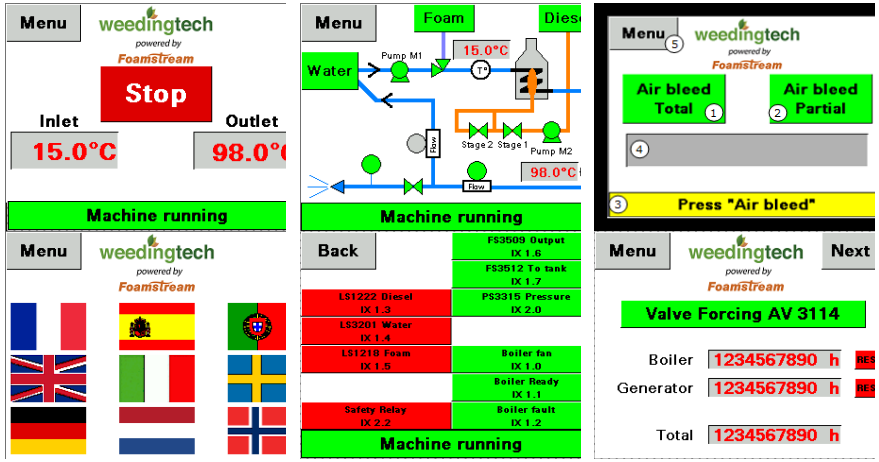


Figure 16 - Menu screen

Num.	Description
1	Return to main page
2	Go to summary screen
3	Purge
4	Language and units selection
5	Fault summary panel
6	Maintenance mode

Users have no need to access pages **5** and **6**. Page **6** is restricted by a password. The screens are summarized in the table below (in the same order as is Figure 16)



9 Using the M600

The M600 control panel gives important feedback on the status of the M600:

Status	Red	Orange	Green
Ready		Fixed	Fixed
Stand-by		Fixed	Flashing
Boiler active		Fixed	
Boiler fault	Fixed		
Water tank too hot		Flashing	
Level sensor low	Flashing		
Boiler overtemp.	Fixed	Flashing	

POWER *LIGHT - WHITE*
When the generator is on, this light should be illuminated. If the generator does not start, then the generator plug should be checked. If the generator breaker position is correct and the generator does not start the M600 should be checked by a competent service engineer.

AMBER ***HEATER*** *LIGHT*
If the amber light is illuminated the water is below 96 degrees centigrade and is being heated. If the amber light does not illuminate, and the red fault light stays on, there may be a system fault (see below)

GREEN ***READY*** *LIGHT*
When this light is illuminated the M600 is ready for use. If the green light is not illuminated the water may need heating (amber light will be on) or there is a system fault (red fault light will be on, see below).

FLASHING ORANGE LIGHT
If the amber light is flashing the water in the water tank is too hot. If water in the water tank exceeds 45°C the boiler will shut down. The water tank will need to be drained and refilled with cold water, or the level topped up with cold water.

BLUE ***RESET*** *LIGHT*
The blue reset light should switch off when the reset button is pressed during start up. If the light stays on there is an electrical fault which needs rectification. The M600 should be switched off until the fault has been corrected.

FLASHING BLUE ***RESET*** *LIGHT*
A flashing blue reset light indicates a boiler fault. The M600 must be switched off and checked by a competent service engineer.

RED ***FAULT*** *LIGHT*
The red fault light will illuminate at start up until the green button is pressed and the amber light illuminates. If the red light stays on, and the amber light fails to illuminate, the system may need to be bled to remove air (see section 7). If the red light fails to switch off after bleeding there is a system fault. The M600 should be switched off until the fault has been corrected by a competent service engineer.

*RED **FAULT** AND FLASHING AMBER LIGHT*

An illuminated red fault light and flashing amber light indicates the boiler is too hot. The M600 should be switched off and checked by a competent service engineer.

*GREEN AND AMBER WITH FLASHING RED **FAULT** LIGHT*

A flashing red fault light with illuminated green and amber lights indicates one of the fluid levels is low (water, Foamstream® or diesel). The levels should be checked and filled up accordingly.

THE M600 SHOULD BE SWITCHED OFF AND CHECKED BY A COMPETENT SERVICE ENGINEER IF IT DOES NOT OPERATE AS EXPECTED, OR THE LIGHTS ILLUMINATE IN A DIFFERENT WAY THAN EXPLAINED.

10 Foamstream® application (killing weeds)

To effectively control vegetation with the herbicide-free Foamstream® system, you must co-ordinate all the different elements that give a successful result. If one element is not functioning properly, the desired result will not be achieved.

For effective results the Foamstream® system requires the:

- Correct volume
- Correct temperature
- Correct method
- Correct quantity of foam agent

This section looks at the speed and method of application.

10.1 Hose reel

The M600 unit is fitted with an automatic hose reel which contains 30 m of hose as standard. The hose comes off the top of the reel and is connected to the lance by a swivelling connection covered by an insulating sleeve.

Only remove as much hose as is required.

Once finished, rewind the hose onto the reel neatly.

10.2 Speed

Operators will average approximately 2 - 4 kilometres per hour, when proficient at applying the Foamstream® with the M600. Foamstream® and the M600 are unaffected by weather, thus ensuring overall productivity each week is similar.

DO NOT HURRY!

If the operator moves too quickly over the vegetation, the required volume of hot water and foam may not have penetrated or been applied correctly. Total vegetation control will not have been achieved.

10.3 Use of the lance

To kill weeds effectively, the lance head must be no more than 25 mm above the ground at all times. If possible, keep the lance head in contact with the ground. While every element of the treatment is important, the most critical aspect is to ensure the lance head is not lifted from the targeted area.

Control of vegetation for up to 90 days will only be achieved if the temperature measured at the lance head does not fall below 96°C. If the lance head is more than 30mm above the ground, a less than acceptable result may be achieved due to the rapid temperature loss.

It is recommended the operator keeps the trigger open if possible. This maintains constant flow of hot water and foam and ensures that they are leaving the lance at the correct temperature.

If the trigger is released for more than 30 seconds, the operator will have to wait until the water and foam mixture is replaced, this normally takes up to 45 seconds.
When moving the lance head from one treatment zone to another, turn off trigger and ensure the hot water and foam is not applied to sensitive plant areas.

If there is a reduction in foam produced from the lance head, you will not achieve the desired kill. You can check this by lifting the lance and observing the water flow.

10.4 Treatment of thick weeds

The Foamstream system works by penetration of heat into plant cells. In cases of dense growth and dense swards of grass (especially species such as kikuyu) progress will be slower as a greater volume of liquid (thermal energy) is required to ensure a result.

The Foamstream system is designed to control vegetation up to 200 mm high in optimum conditions.

10.5 Treatment

The 'treatment zone' will be stated in the job specification. The operator must kill the total area of the plant in the treatment zone including any parts that hang over onto the sealed area.

10.6 Confirmation of treatment

With practice, operators will become familiar with determining whether weeds have been treated correctly.

Broad leaf weeds will go floppy and wilt (similar to boiled cabbage). In most cases these will go darker in colour.

Grasses: usually, grasses immediately lighten in colour and flatten to the ground. This can be difficult to observe when using hot foam.

Moss will go bright green.

In all cases, a distinctive smell (similar to cooking spinach) also assists to confirm a result.

VISUAL CONFIRMATION THAT THE TREATMENT HAS BEEN SUCCESSFUL IS ESSENTIAL.

10.7 Correct posture

When using the equipment for several hours per day it is important that operators adopt the correct posture and technique.

Remember it is the heat that controls the vegetation.

When treating straight stretches of roads or parks, use just the trigger hand to guide the lance. This keeps your back upright and not twisted and you are not encouraged to push down with the other hand.

Only use the other hand when changing direction or raising the lance.

When walking, swap trigger hands every so often to rest the muscles.

11 Shut-down procedure

Upon completion of work, or when taking a break, the unit must be shut down correctly:

- Press the red stop button pictured on Figure 17. All lights will extinguish apart from the 'power' light (white) and the red fault light. The red fault light will remain on until the water temperature in the M600 drops to a safe level and the pump stops.
- Wait until the red fault light switches off
- Turn the isolator switch to **B** (Figure 11).
- Turn the generator key switch to **C** (Figure 11) or press **OFF** on the remote.
- Close the LPG cylinder valve

AT THE END OF THE DAY OR BEFORE AN EXTENDED BREAK SHUT OFF THE GENERATOR BY TURNING OFF THE GAS (LPG) SUPPLY. USING THE KEY OR REMOTE WILL NOT STOP THE SUPPLY OF GAS AND THIS ***MUST*** BE DONE MANUALLY FOR SAFETY REASONS, TO STOP UNBURNED GAS REMAINING IN THE SYSTEM.

The emergency stop shuts off the boiler and the pump in the event of an **emergency**. Example scenarios below but not limited to:

- Water temperature exceeds 120 degrees centigrade
- Steam emits from the lance
- A significant leak occurs

The emergency stop button is not to be used in place of the red stop button (Figure 17). Doing so can damage the hydraulic system by holding hot water inside. The shutdown procedure includes flushing the system with cooler water to bring down the internal temperature to safe storage levels prior to stopping the M600.

Once per week or after 40 hours use, whichever comes first, it is recommended to test the emergency stop to ensure it functions as intended.

IF THE EMERGENCY STOP HAS BEEN USED IN AN EMERGENCY OR IF IN THE PERIODIC TEST IT DOES NOT FUNCTION PROPERLY THE M600 SHOULD BE CHECKED BY A COMPETENT SERVICE ENGINEER, AND ANY FAULTS RECTIFIED BEFORE THE M600 IS SWITCHED BACK ON AGAIN.

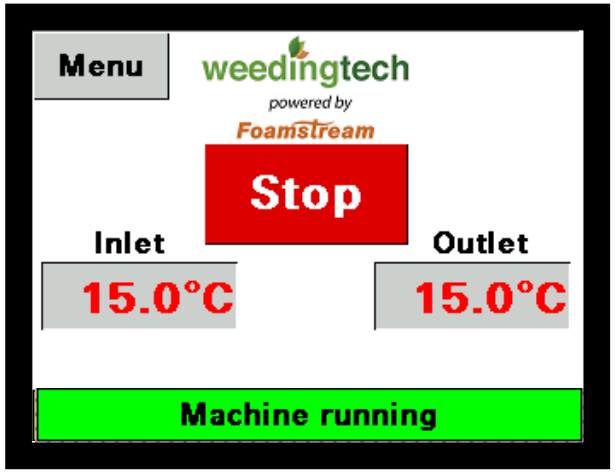


Figure 17 – Stop button showing on the PLC

12 Basic fault finding

The PLC of the M600 is designed to help the user in case something goes wrong.

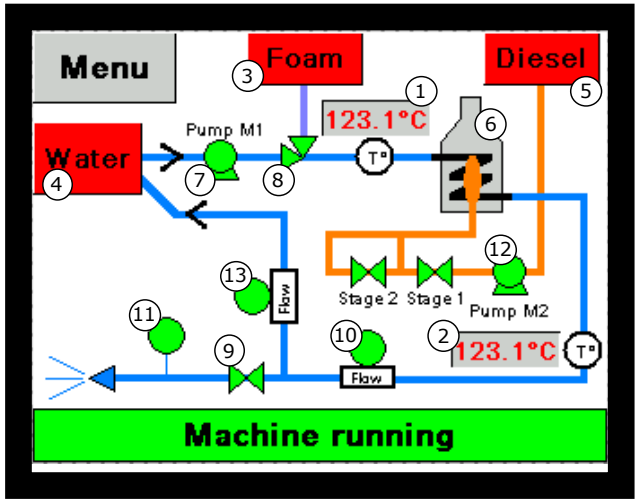


Figure 18 – Summary screen of the PLC

Num.	Description
1	Boiler incoming water temperature
2	Boiler outgoing water temperature
3	Foamstream tank level sensor
4	Water tank level sensor
5	Diesel level sensor
6	Boiler controller
7	Water pump
8	Venturi
9	Lance solenoid valve
10	Lance flow switch
11	Lance pressure switch
12	Boiler diesel pump
13	Return to tank flow switch

Green colour indicates that the sensor is seeing a signal and grey or red that it doesn't. Red colour does not necessarily mean that there is an issue with the sensor. Normal sensor states during start-up/shut-down and normal operation are described in the table below.

Num.	Start-up	Running
1	Not applicable	
2	Not applicable	
3	Green	Green
4	Green	Green
5	Green	Green
6	Should be visible	
7	Green	Green
8	Grey	Green
9	Grey	Green
10	Green	Green
11	Grey	Green
12	Green	Green
13	Green	Grey

When a fault occurs, a fault message will be displayed in the box n°4 of Figure 14. Below are the faults that can appear in that screen and what they mean.

Sentence	Colour	Explanation
Machine running	Green	Machine is running and producing foam
Clear fault	Red	Press the red button on front panel to clear the fault
Outlet temp. too high	Red	The temperature at boiler outlet is too high. Clean the water filter and check for leaks. If the problem persists, please contact your WTL distributor
Inlet temp. too high	Red	The temperature in the main water tank is too high (more than 45C) and the machine has stopped. Let the water cool down in the tank or top it up with cooler water.
Low level in foam tank	Yellow	The fluid level is low, the machine will keep running 2 minutes and will then stop. Please top up.
Low level in water tank	Yellow	Same as above
Low level in diesel tank	Yellow	Same as above
Outlet pressure too low	Red	The lance valve is open and the flow is ok but there is no signal from the pressure switch. Please control the pressure on the pressure gauge of the side panel. If the pressure is below 5 bars this means you have no lance or a large leak before the lance. If the pressure is above 5 bars you might have an issue with the pressure switch and need to change it
Boiler fault, press "Reset"	Red	Press "Reset". If the boiler does not start, stop the machine and restart it. If the problem persists, please call a Weedingtech distributor.
Boiler could not start	Red	20s after the start-up signal is given, the boiler is not started. Press "Reset" and try again. If the boiler does not start, stop the machine and restart it. Check on the summary screen that “stage 1” and “stage 2” are in green, if not check that the plugs have not fallen out of the boiler. If that is not the case and the problem persists, please call a Weedingtech distributor.

Boiler not ready	Red	The boiler fan is running but the boiler is not running as the 'ready' signal from controller was not received. Push on the 'reset' button for 5 seconds and try again. If the problem persists, please call your Weedingtech distributor.
Emergency stop activated	Red	The emergency stop button is activated, release it and press "reset".
No flow at outlet	Red	The pump is running but no flow is detected. Please check the hydraulic panel for leaks. If no leaks are found, the flow switch might be faulty.
No flow at bypass	Red	The pump is running and the water heating up but no flow is detected in the return to tank line. Please check the hydraulic panel for leaks. If no leaks are found, the flow switch might be faulty.
Press "Air bleed"	Green	Press "Air bleed"
Machine ready, press "Start"	Green	Press "Start"
Boiler starting up	Yellow	Nothing
Water & Boiler pre-heating	Yellow	The boiler is warming up the water to reach 95° and will then open the lance valve. You have nothing to do.
Air bleeding in progress	Green	Wait until the bleeding is complete
Pressure sensor fault	Red	The pump is not running but the pressure sensor sends a signal. The pressure sensor is faulty and needs to be changed
Outlet flow sensor fault	Red	The pump is not running but the flow sensor sends a signal. The flow switch needs to be changed
Inlet flow sensor fault	Red	The pump is not running but the flow sensor sends a signal. The flow switch needs to be changed
Boiler controller fault	Red	The boiler is not running but ready signal from controller is received. Please contact a Weedingtech distributor
Water pump speed inverter fault	Red	Fault signal from speed inverter. Please stop and start the machine. If the problem persists you will need to contact a Weedingtech distributor to open the electrical box and reset the inverter.
Release trigger	Yellow	Release the trigger.

Manual bleeding required	Red	You need to bleed the air from the unit manually by unscrewing the brass tap on top of the water filter to let air go out.

The table below explains what to do to solve an issue when the sentence above appears on the screen.

The table below lists other basic faults which can be diagnosed and rectified by a competent M600 operator. Please refer to the training documentation provided during training.

BEFORE BEGINNING ANY WORK ENSURE THE WEEDINGTECH M600 HAS BEEN SWITCHED OFF, AND THE ELECTRICAL SUPPLY FROM THE GENERATOR IS DISCONNECTED. WARNING: WATER IN THE M600 MAY BE HOT.

THE M600 SHOULD BE SWITCHED OFF AND CHECKED BY A COMPETENT SERVICE ENGINEER IF THE OPERATOR IS UNABLE TO DIAGNOSE AND RECTIFY A FAULT USING THE TABLE BELOW, OR IF A FAULT PERSISTS.

SYMPTOM	CAUSE	REMEDY
Generator will not start (no lights)	Battery is flat	Charge battery
	No fuel in LPG tank	Refill tank and bleed fuel system
	Air in the fuel pipe	Prime fuel using the in-line hand pump
The PLC will not illuminate	Generator is not started	Start generator
	Main switch is still on 'OFF' position	Turn main switch on 'ON' position
Boiler will not fire up. (pump runs, red fault light on)	Air in water feed line	Stop the machine and bleed water once again
	Water filter blocked	Clean and replace filter
	Hot water in tank	Drain tank and refill with cold water
	Boiler control box safety switch activated	Press reset button on boiler control box
	Boiler switched off at boiler control box	Turn switch on boiler control box to 'on'
	Flow too low	Check water filter is clean
No water flows from lance	Water temperature too low	Wait until water temperature reaches correct level
	No water in the water tank	Refill water tank
Intermittent Flow (amber light on,	Water temperature too low	Wait until water temperature reaches correct level

intermittent green light)		
Steam coming from lance	Temperature control system faulty	Switch off M600 and call competent service engineer
Red light flashing	Water and/or Foam and/or Diesel level too low	Check water and/or Foamstream® and/or diesel levels and refill as needed.
Blue reset light on	Electrical fault	Press reset button on control panel
No foam coming out of the lance	No foam in the tank	Fill up tank with foam
	Breathing screw of the foam tank too tight (air not getting through)	Loosen the breathing screw on top of the cap of the foam tank
	Foam filters clogged	Clean foam filters using hot water or replace them
	Dosage plate blocked	Clean dosage plate using warm water
	Pressure too high (more than 18 bars)	Untighten pressure relief valve to reach 12 to 15 bars operating pressure
	Foam is too cold and has separated	Drain foam from tank, clean pipes, filter and dosage
		plate holder, re-mix foam and refill tank.
	Air coming in the foam system	Check the foam pipe for air contamination. Then tighten the faulty connection

13 Service checks and intervals

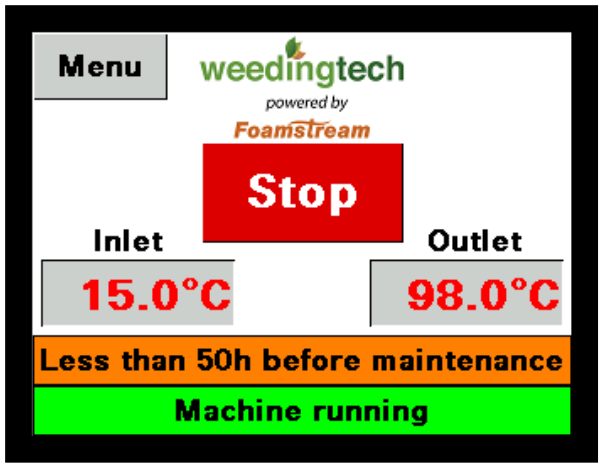


Figure 19 – 50 hours before maintenance

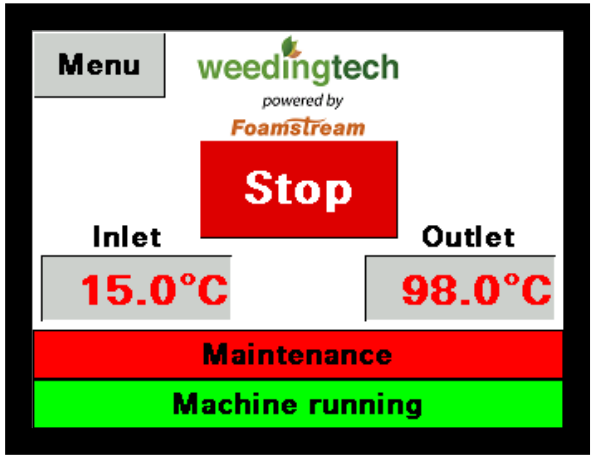


Figure 20 – Maintenance due

The PLC screen will let you know 50 hours before the first major maintenance of the unit, as depicted on Figure 19. Once the maintenance is due, Figure 20 will show.

BEFORE BEGINNING ANY WORK ENSURE THE WEEDINGTECH M600 HAS BEEN SWITCHED OFF, AND THE ELECTRICAL SUPPLY FROM THE GENERATOR IS DISCONNECTED.

EVERY 50 HOURS (1 MONTH MAXIMUM)

- Change generator oil

EVERY 250 HOURS (6 MONTHS MAXIMUM)

- Check boiler flue gas for CO content, adjust air flap setting if required
- Check and de-scale coil (if necessary)
- Change particulates filter cartridge (if applicable)
- Clean generator air filter
- Check and/or adjust generator spark plug

EVERY 500 HOURS (12 MONTHS MAXIMUM)

- Change generator oil filter
- Change generator air filter
- Change fuel filter.
- Check and clean boiler mixing device. Replace electrodes and nozzles if necessary
- Check and adjust boiler burner pressure regulator setting
- Check and clean boiler burner chamber
- Check electrical control panel for moisture damage
- Check and adjust boiler pump oil pressure and level
- Change particulates filter cartridge (if applicable)

EVERY 750 HOURS (OR 18 MONTHS MAXIMUM)

- Change pump oil and filter cartridge (if applicable)

14 Loading and handling

Before lifting the M600 you should make sure that the water tank is not full of water.

THE M600 SHOULD NOT BE LIFTED WITH A FULL TANK OF WATER

Before driving, the user should make sure that the unit and the water tank are appropriately strapped or bolted to the vehicle.

Figure 21 - Strapping of the M600 to the vehicle

15 Schematics

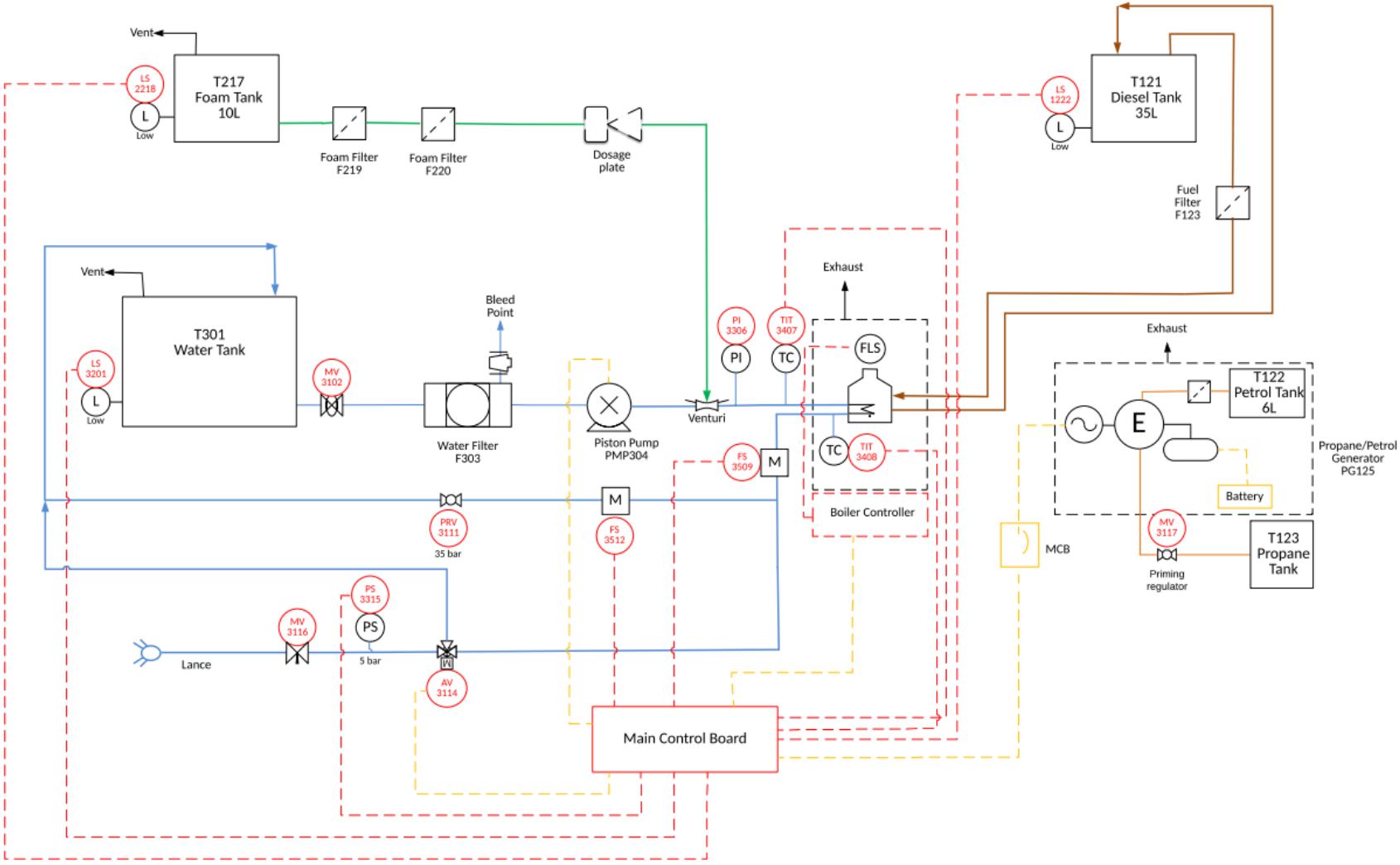
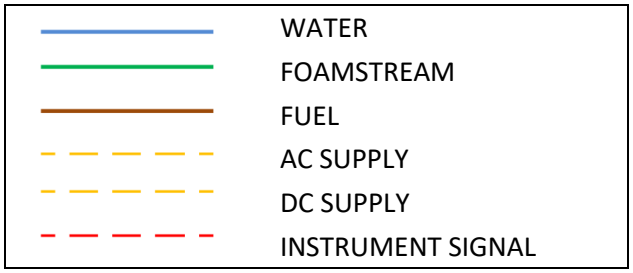


Figure 22 - M600 P&ID



AV	Actuated Valve
MV	Manual Valve
PI	Pressure Gauge
PS	Pressure Switch
FS	Flow Switch
PRV	Pressure Relief Valve
TC	Thermocouple
FLS	Flame Sensor
L	Level Switch

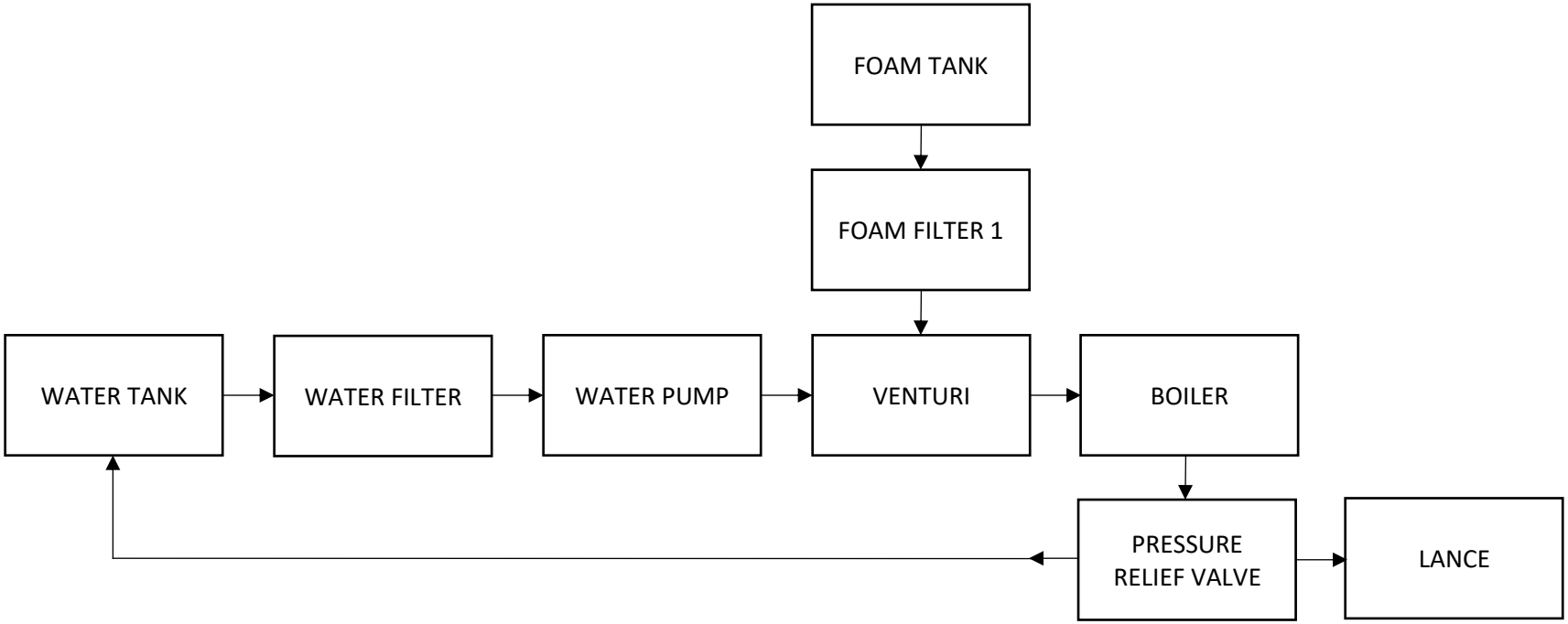


Figure 23 – Foam and water schematics

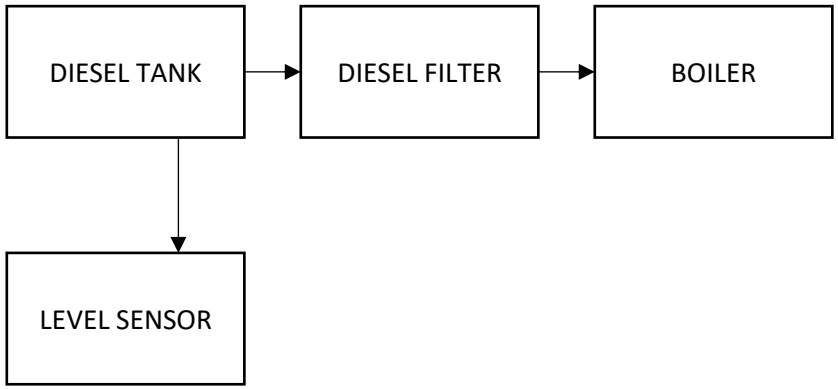


Figure 24 – Fuel schematics

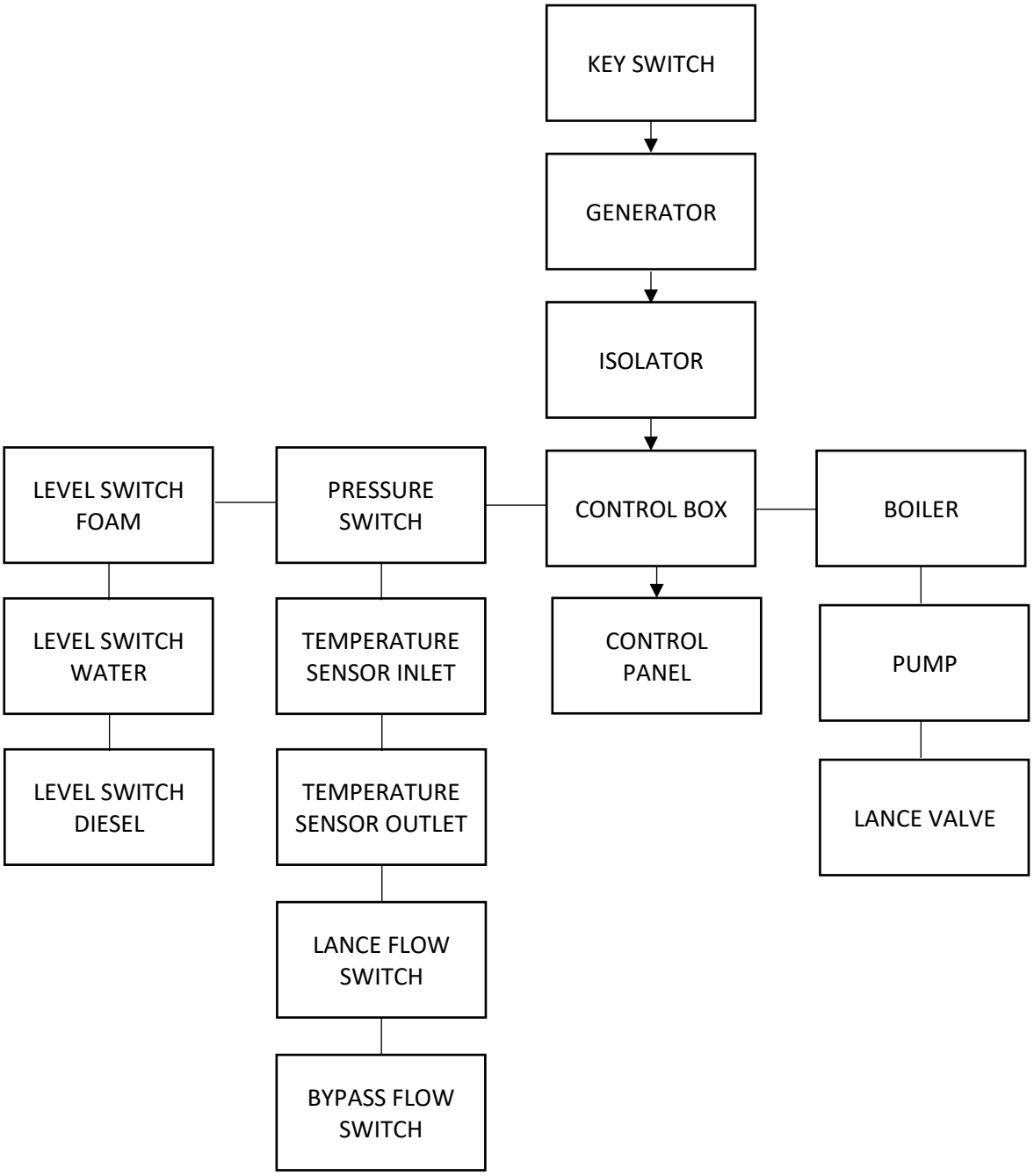


Figure 25 – Electrics schematics

16 Warranty

(a) The following is an inexhaustive summary of relevant aspects of the standard terms and conditions of Weeding Technologies Ltd ("WTL") and is subject to those terms and conditions and to any special terms and conditions agreed between the parties. Where this summary and WTL's standard terms and conditions conflict, those terms and conditions take precedence (and any special terms and conditions take precedence both over WTL's standard terms and conditions and over this document). You are advised to read the full terms and conditions including so as to take note of further exclusions of liability.

(b) In no case (without express written agreement, and save as required by law) does WTL accept any liability towards any person other than the person ("you") who originally made the purchase from WTL or in respect of any alleged defect not notified by you to WTL within 12 months from delivery.

You are notified that the standard warranty period given by the manufacturer is 12 months from delivery.

(c) You must inspect all goods thoroughly with 7 days of delivery. Subject to the rules set out in section 3 below, any claim must be notified to WTL within 7 days of delivery or (subject to clause (b) above) in the case of any defect which is not reasonably apparent on inspection then within seven days of the defect coming to your attention (or of the date when the defect reasonably should have been apparent to you, if earlier).

(d) Subject to section 3 below, WTL will have no liability if you do not comply with the above.

(e) WTL's options, in cases where it is liable, include repairing or replacing defective goods and allowing you credit for them. If WTL exercises such an option it has no further liability. In any event, the liability of WTL is limited to parts, freight and a limited amount of labour as set out in WTL's standard terms and conditions. Labour in excess of such limits will be at your cost in any event.

(f) You must, if so requested in writing by WTL, at your risk promptly return any goods the subject of any claim and any packing materials securely packed and carriage paid to WTL for examination. (If the claim is substantiated, WTL will normally reimburse these costs)

(g) If any repairs, modifications, or adjustments are carried out upon goods other than by WTL or personnel that hold a valid training certificate or are an authorised sub-contractor then WTL will have no liability in respect of those goods.

(h) WTL does not accept any liability to you for any loss or damage of any nature except as expressly stated in the standard terms and conditions (or in such terms and conditions as may be specially agreed between you and WTL). This means among other things that WTL has no liability for consequential losses, property damage, penalties, liquidated, exemplary or aggravated damages, downtime, loss of goodwill, capital costs or any pure economic loss.

(i) Subject to section 3 below, WTL does not accept any liability for defects resulting from wear and tear, accident, improper use or use except in accordance with the

instructions or advice of WTL or authorised dealer or neglect or from any instructions or materials provided by you. Please note that this means WTL cannot accept liability in the event of use of unauthorised foam concentrate or alteration in factory foam additive dosage settings. Please note that it is not to be inferred or implied from the fact that WTL may supply you with any technical means of altering the settings for the use of the goods that you have any contractual or other legal protection in the event that you do so - any alterations to the settings for the use of the Units if not made in accordance with WTL's or the manufacturer's express written instructions are made at your own risk.

17 Product certification

M600 is CE certified. Certification is available upon request.

Sound Pressure Level: 69dB(A)

Guaranteed Sound Power Level: 77dB(A)

Measurement Uncertainty K: ±0.4dB(A)

Some specific versions of M600 are CSA and UL certified. Documents and specification are available upon request.

Foamstream

M600

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