USER MANUAL

MBT

[MBT-165] 30.165.000 - [MBT-350] 30.350.000

THERMOBILE

EN | English

TABLE OF CONTENTS

1 INTRODUCTION

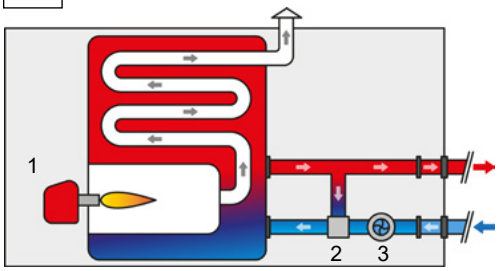
This MBC-500 manual is intended for professional end users such as installers and rental companies who manage the installation, maintenance and transport themselves.

The MBC-500 is a hot water installation with a maximum power of 500 kW.

Applications:
Temporary replacement in case of failure of the existing installation. Temporary heating of new construction and renovation projects and process heating. Heating for events, heating of sports fields during winter periods.

A supply temperature is set on the boiler for the heating circuit. The oil burner first heats up the boiler. An internal/external circulation pump pumps water through the boiler to transport the produced heat to the required location. A three-way valve controls the water flow to ensure a stable supply temperature in the circuit.

01



1 - Burner
2 - Three-way valve
3 - Pump

Explanation of pictograms in this manual:

CAUTION!
Indicates a risk of equipment damage.

WARNING
Indicates a dangerous situation, which death or serious injury may result.

WARNING
Indicates the possibility of fatal shocks.

HOT
Indicates a hazardous surface temperature.

Suggestions and tips to simplify the performance of the relevant tasks or actions.

2 TECHNICAL SPECIFICATIONS

General specifications		MBT-165	MBT-350
Net capacity	Kw	100-165	200-350
Efficiency	%	>95	>95
Temperature difference between flow and return in the boiler	°C	20	20
Max. outlet temperature	°C	90	90

Boiler specifications	MBT-165	MBT-350
Manufacturer	Riello	Riello
Type	RTS 166 3S	RTS 349 3S

Burner specifications		MBT-165	MBT-350
Manufacturer		Riello	Riello
Burner type		RL 22 BLU	RL 44
Fuel type		Diesel, HVO, GTL	Diesel, HVO, GTL
Pump pressure	Bar	10 - 23	12
Nozzle Danfoss	USG/h/degree	1x 2.25 GPH 60°	2x 3.5 GPH 60°
Fuel tank capacity	l	700	1500
Fuel consumption	l/h	10/16	17/35
Max. gas oil fuel viscosity	cST mm²/s	6	6
Max. outlet temperature	°C	220	220

Emission values			
		Low	High
CO_2	%	12,5	12,5
CO	PPM	<10	<10
O	%	4	4
NOx	mg/kWh	<120	<120

Hydraulic specifications		MBT-165	MBT-350
Liquid flow	m³/h	7	15
System volume (excl. expansion vessel)	l	340	510
Expansion vessel volume	l	140	200
Max. system pressure	Bar	5	
Fluid		non-corrosive	
Pressure loss @25 m³/hr - w. clean filter	kPa	45	

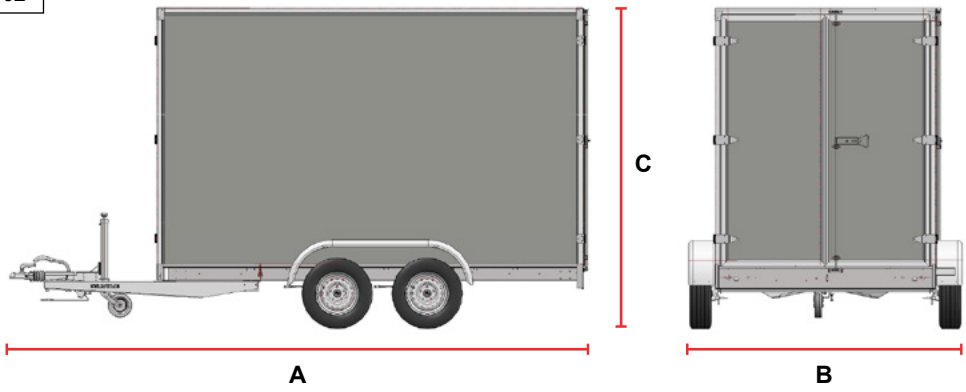
Electrical specifications		MBT-165	MBT-350
Supply voltage	V	230 1ph	230 1ph
Frequency	Hz	50	50
Amperage	A	5	6
Voltampère	kVA	2	2
Electrical connection	Cee-form	16A 1P N PE	16A 1P N PE

Noise specifications		MBT-165	MBT-350
Sound pressure level @5m	dBA		

Physical specifications		MBT-165	MBT-350
Overall length [A]	mm	4350	4850
Overall width [B]	mm	2280	2280
Overall height [C]	mm	2660	2680
Total weight	kg	max. 2700	max. 3500
Fluid connection (cam lock)	Inch	2	2
Chimney connection	mm	250	300
Fuel connection	Quick connect	0,5"	0,5"
Stackable		Not possible	Not possible

3 DIMENSIONS

02



4 PRECAUTIONS AND SAFETY INSTRUCTIONS

4.1 General rules

This document contains important information for the safe and confident installation, use and dismantling of the boiler.

The activities described in this manual are intended to be performed by authorised and trained staff only. The MBC-500 is intended for professional use. Unqualified staff are not permitted to operate or maintain this device. The warranty is only valid if original components are used for repairs.

4.2 Use

The Thermobile MBC-500 can be used to supply closed systems with warm or hot water.

4.3 Installer information

Only use the device for the purpose described in this manual. The manufacturer shall not be held liable for the consequences of incorrect or illogical use. Incorrect use may cause damage to the device and/or create hazardous situations.

The installation and packaging materials may be hazardous, so keep them away from children.

Never modify the device or any part of it without a certificate of approval from the manufacturer, otherwise you and others may be seriously injured. Significant property damage may result.
All repairs must be performed using original components.

Ensure that work is always performed according to the regulations of the local authorities.

CAUTION
Do not lift or hoist the boiler, this may damage the boiler system.

4.4 User information

Inform the user about the operation of the device. A manual must always be available near the boiler.

The user must check the system pressure of the device regularly.

Never change the burner settings without the use of a flue gas meter.

Pay close attention to the warnings in this manual.

5 DESCRIPTION OF THE PRODUCT

5.1 General

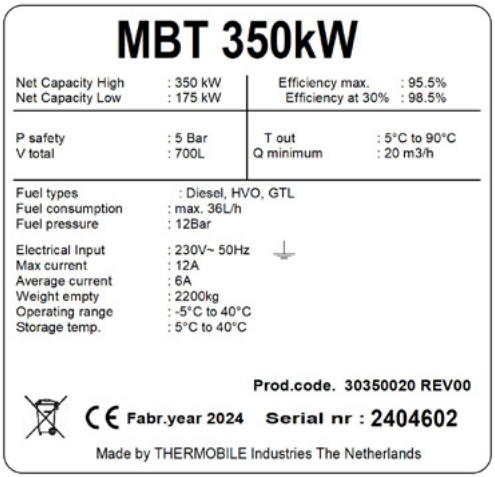
The Thermobile MBT is a water heater with a low and high stage. This boiler must be filled with water or a max 30%water/propylene glycol mixture.The circuit consists of a Riello boiler and stainless steel piping. By means of a three-way valve, the correct temperature is obtained.

The boiler circuit is an open circuit with 2' camlock connections and a water filter. The three-way valve in the primary circuit is controlled based on the outgoing temperature of the circuit. This control uses PI&D.

The temperature can be set using an interface located in the boiler. Here, the boiler can also be switched on or off.

The system is protected with a pressure relief valve, pressure switches, maximum temperature sensor and a fire valve in the fuel supply.

5.2 Identification



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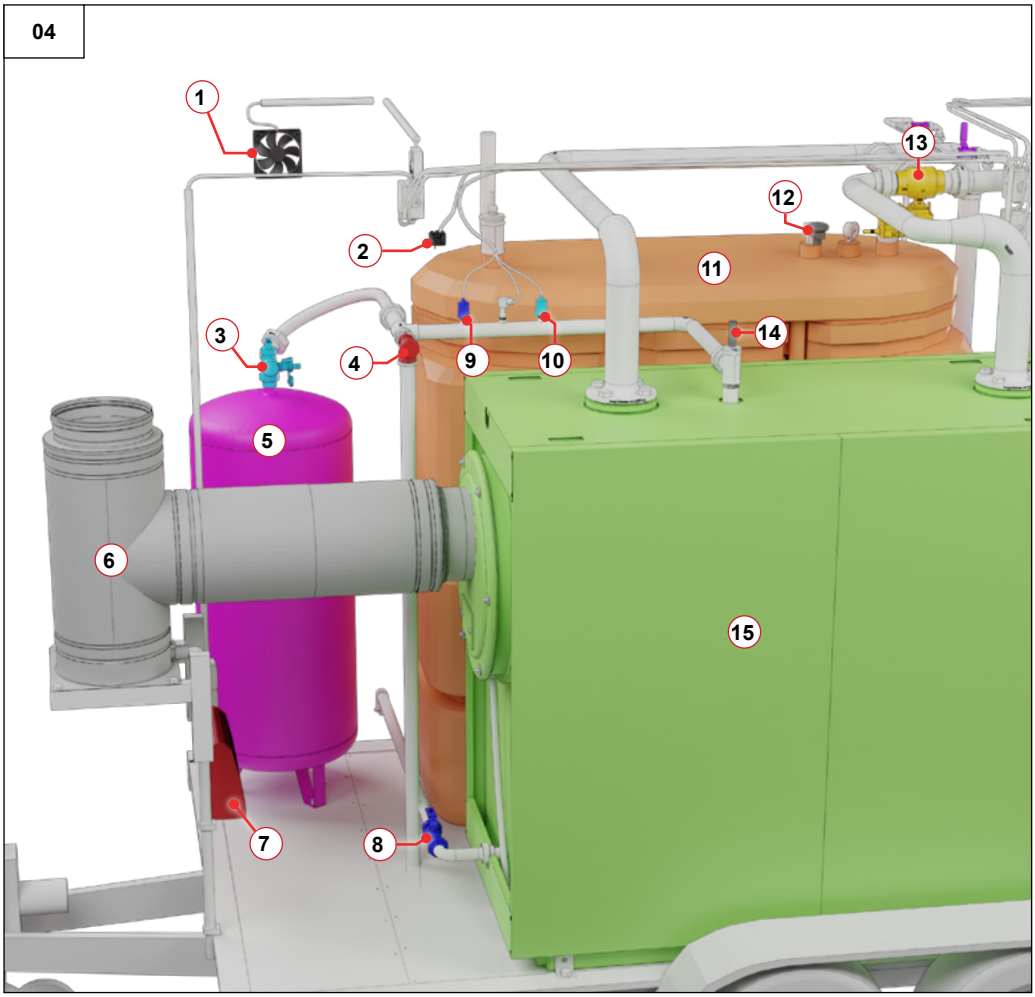
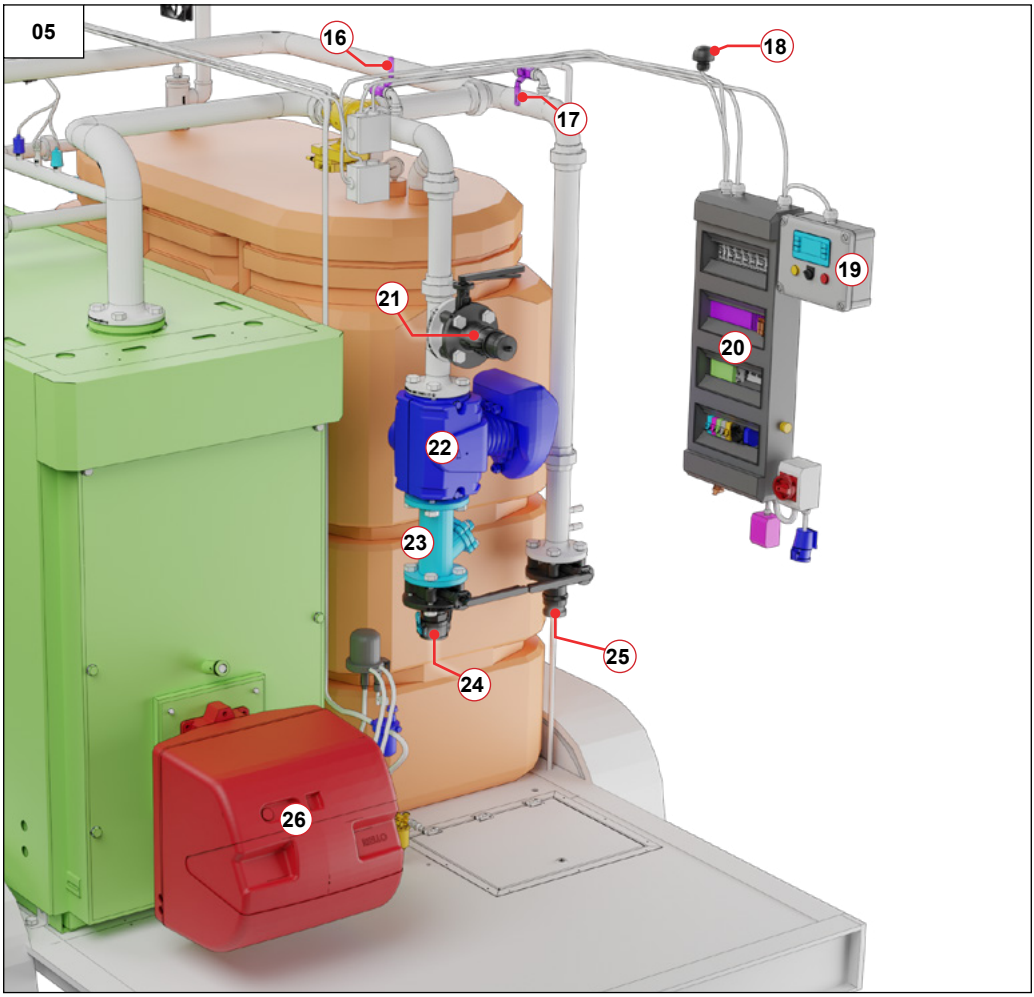


5.3 Main components

1. Cabin fan
2. Maximum thermostat
3. Connection group expansion vessel
4. Pressure relief valve
5. Expansion vessel
6. Flue gas outlet
7. Convector heater / Frost protection
8. Fill / drain boiler
9. Min. pressure protection
10. Max. pressure protection
11. Fuel tank
12. Anti siphon valve
13. Three-way valve
14. Automatic air vent
15. Boiler



16. Venting ball valve
17. Venting ball valve
18. Antenna
19. Control panel AHW boiler
20. Switch box AHW boiler
21. Butterfly valve return connection external
22. Water pump
23. Water filter
24. Butterfly valve return connection
25. Butterfly valve supply connection
26. Burner

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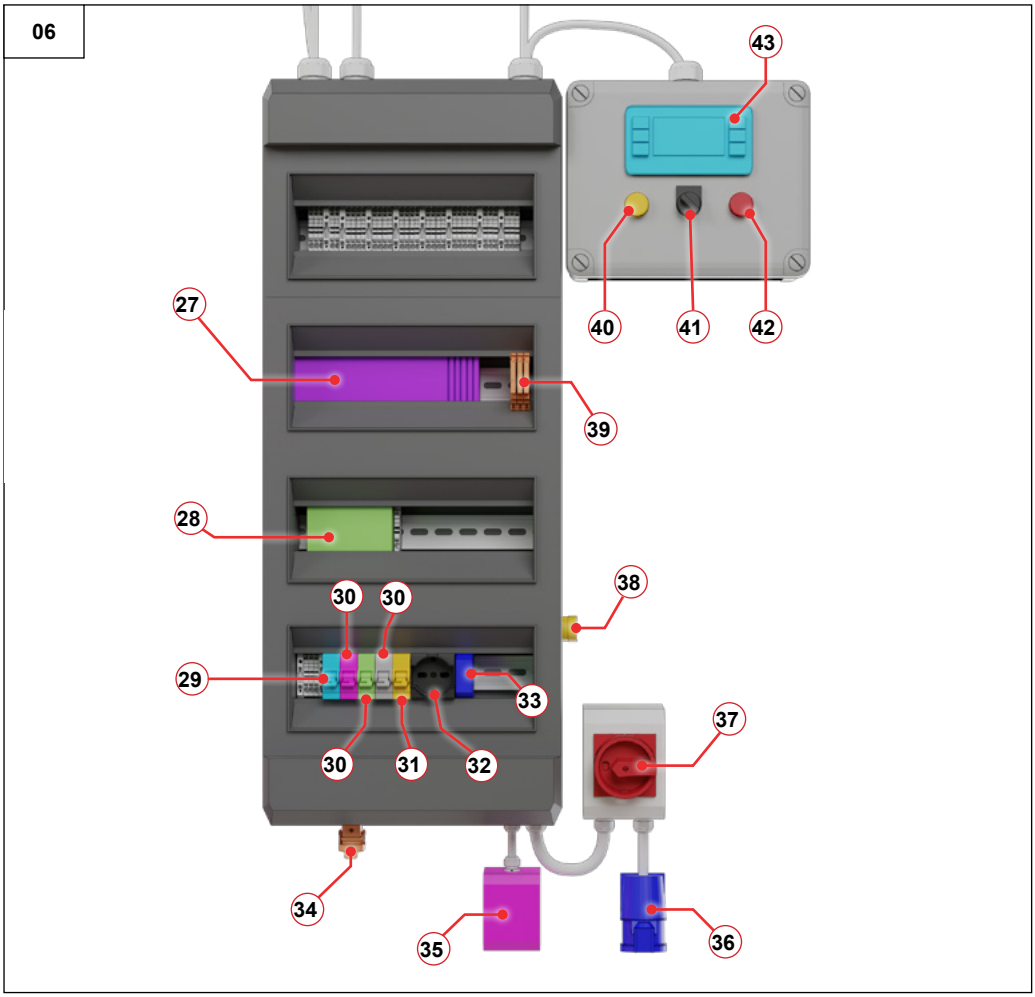
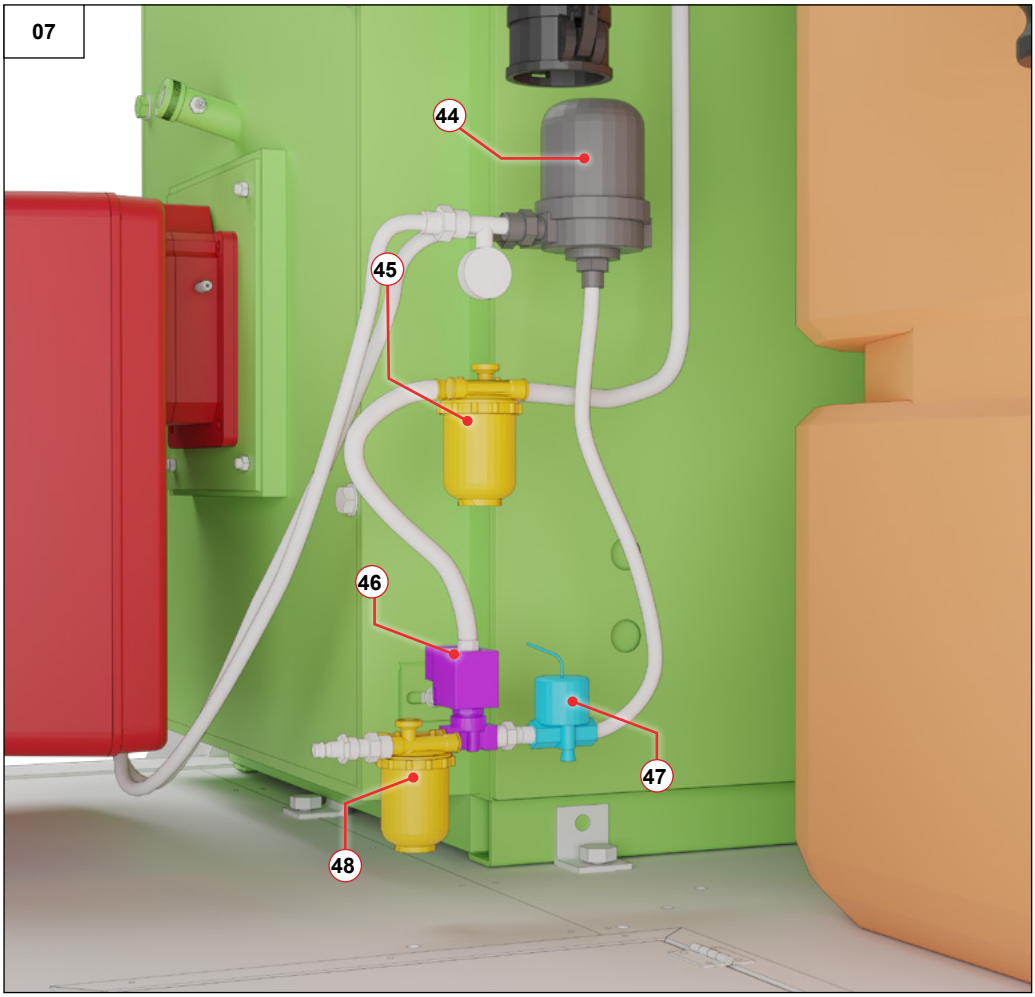


27. Siemens S400 controller
28. Calculus C06
29. Earth leakage circuit breaker B16 30mA
30. Circuit breaker 6A B
31. Circuit breaker 6A C
32. WCD 230V
33. 24V power supply
34. Thermostat connection
35. Light switch
36. 230V plug
37. Main switch
38. USB connection ext.
39. IO Relay 230V
40. Lamp (Yellow)
41. Switch
42. Lamp (Red)
43. Siemens display



44. Tigerloop
45. Oil filter internal
46. Oil three-way valve
47. Fire valve
48. Oil filter external

6 TRANSPORT AND INSTALLATION

6.1 General

The MBT is built into a closed trailer and can be moved using a vehicle with a towbar or truck. This unit is fully assembled, tested and ready to use. Shocks must be avoided at all times during transport. Heavy shocks or excessive tilting of the unit can cause damage or a hazardous situation. Always place the boiler on a firm and stable surface that is suitable for the boiler when it's in operation. Always place the boiler on a horizontal plane. Ensure that there is always a gap of 1 metre free of obstacles around the boiler.

6.2 Truck

Ensure that the boiler is correctly secured to the truck or trailer according to the applicable regulations.

6.3 Trailer

When transporting a trailer, it is essential to follow the applicable rules and guidelines applicable to this type of equipment. Ensure that transport is safe and compliant. For additional information and specific instructions, please refer to the manufacturer's manual.

WARNING
This device must not be lifted or hoisted. Only use the appropriate means of transport.

Do not drive the trailer if the fuel tank contains more than 200 litres of fuel. Otherwise, the permitted total weight of the trailer will be exceeded. Pump off excess fuel before transporting the trailer.

CAUTION
When transporting the system, make sure the support wheel is turned upwards!

Also make sure there is no water left in the heating system. Check this before transport and drain the water if necessary.

- Make sure the support wheel is fully screwed in and jacked up before driving. Otherwise the nose wheel may break off, become loose or block the brake system block.

- Attach the safety cable around the coupling of the towing vehicle.

- Close the double wing door or access door securely before driving.

- Comply with the applicable legislation of the respective country for driving with a trailer combination.

- Remove ice, snow and water from the roof of the trailer, regardless of whether the trailer is in is in use. Ice, snow and water accumulations can cause damage to the roof and cause danger in traffic.

7 INSTALLATION & FUEL SUPPLY

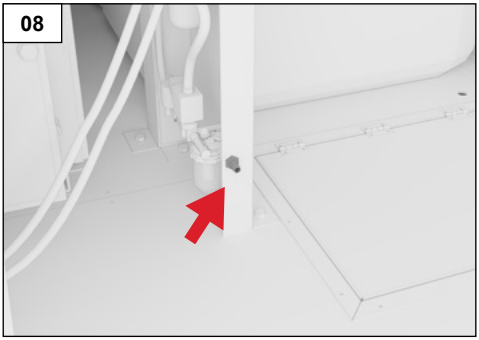
7.1 Installation

CAUTION
The installation and commissioning may only be performed by qualified staff.

1. Place the container horizontally/level on a solid and flat surface.
Ensure that the exhaust gases escaping from the chimney don't cause any hazards or nuisance. Observe the local regulations. Ensure unimpeded access to the system.

2. When using an external fuel tank, connect it to the hydraulic quick coupler with a suitable pipe. See fig. 08

08



3. Open the fuel tap on the filter.
See fig. 9. 1: Internal tank, 2: External tank.

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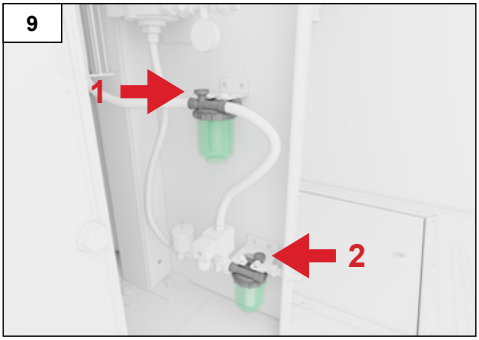

4. Close the circuit by connecting hoses to the supply and return or use the secondary return connection with an external pump.
Always ensure that the pump is connected as close as possible to the boiler return inlet.
See fig. 10. 1: External pump, 2: Internal pump.

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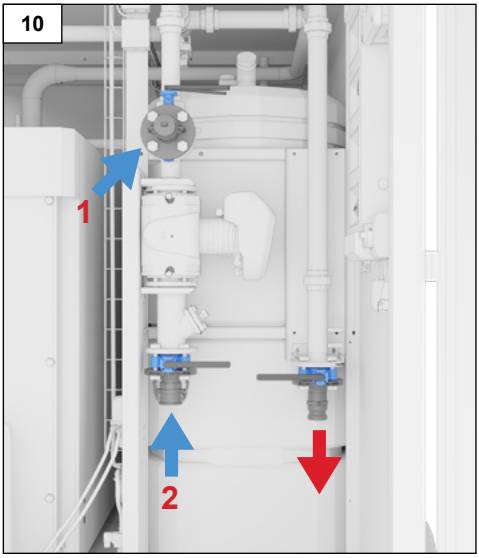

5. Check that the circuit is pressurised. If the pressure is not sufficient, top it up first. See 14.1 for more information.

6. Finally, connect the mains power supply.

7.2 Fuel tank

The boiler is equipped with an internal fuel tank with anti-siphon valve and a built-in level sensor.
For situations where a larger fuel capacity is required, an external fuel tank can be connected to the available quick connector, see 7.1 (2).

Depending on the type of valve, the changeover to the external fuel tank must be performed manually or via the controller. For an automatic valve, the switchover is set via the controller. For a manual valve, the switchover should be performed manually.

CAUTION
While using an external fuel tank, close the filter of the internal fuel tank to prevent possible leakage.

8 COMMISSIONING

CAUTION
For correct operation, ensure that the circuit is correctly filled with water.

1. Energise the system by turning on the main switch.
2. Control takes place automatically with a PLC. The PLC is switched on by turning the black switch button under the display to ‘ I ’. This will heat the boiler to a minimum internal temperature and switch on the internal pump.

CAUTION
The internal pump remains on until the boiler power supply is cut off.

Detailed operation and settings of the system follow in the following chapters (9, 10 and 11).

9 GENERAL OPERATION

The main controller consists of physical buttons, switches and lights. (main power, start/stop, general alarm and controller with display)

10 MAIN CONTROLS

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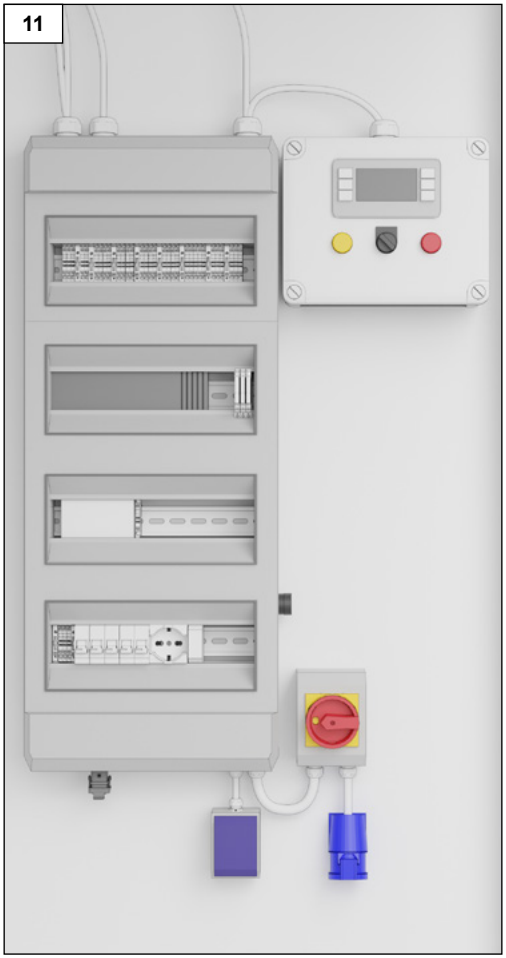

The physical controls of the boiler consist of two switches, two lights and a controller with a display. For each control component, the text below describes what it is for.

Digital controller (Screen)
The digital control of the boiler, for more information see chapter 11 ‘HMI CONTROL PANEL’.

Start/Stop: (Black switch)
When the switch is set to ‘ I ’, the boiler will start operating. At the first start, after the machine is energised, the internal circulation pump will start running. The burner will turn on to reach the desired temperature. First, the burner will evaporate any condensate present, after which the control valve of the primary circuit will operate. The control valve regulates the outgoing temperature of the circuit. When the switch is set to ‘ 0 ’, the burner will turn off and the control valve will be fully open for the set lag time. During this lag time, the boiler will be optimally cooled. The circulation pump of the primary circuit remains in operation as long as voltage remains on the machine.

Power ON: (Yellow)
The ‘Power on’ lamp lights yellow when there is power on the machine. This means that the controller's power supply is working properly and the power plug is connected correctly.

Alarm: (Red)
The ‘Alarm’ lamp comes on when the boiler goes on malfunction. With this alarm, the cause of the malfunction must be checked carefully.
The maximum thermostat must be manually reset at the back of the boiler, see 13.2. An alarm is automatically reset when the cause is remedied.

Main Power:
De “Main Power” schakelaar onderbreekt de stroomtoevoer. In stand “O” wordt de stroom onderbroken en is het lampje “Power on” uit. De machine is spanningsvrij vanaf de schakelaar en er kan dus veilig aan worden gewerkt.

11 HMI CONTROL PANEL

11.1 Layout of the HMI

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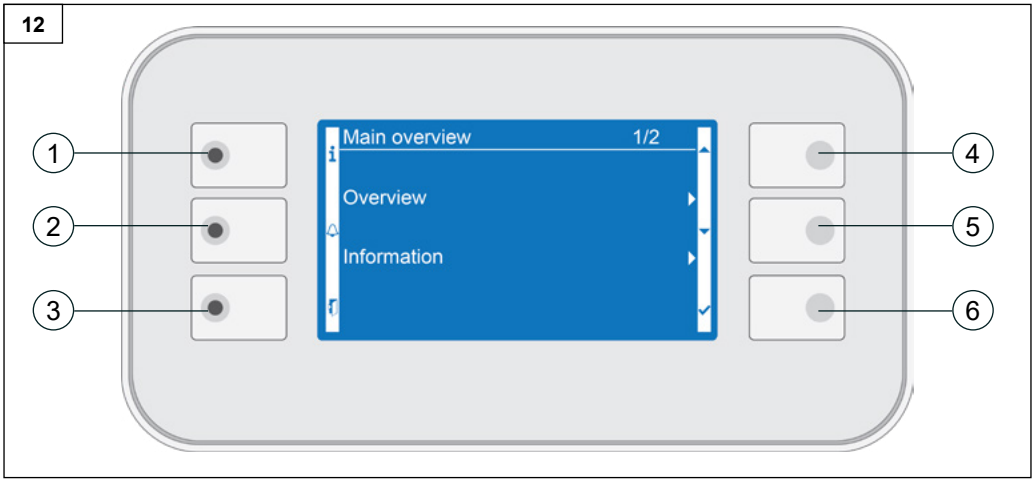
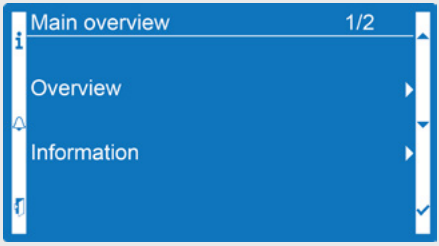


1. Home button: Use this button to return to the main overview or Service menu.
   The LED of this button lights up green when the boiler is switched on
2. Alarm button: used to display an alarm or manually reset an alarm.
   Red LED illuminates when an alarm is detected
3. Escape key: return to the previous page.
   This LED flashes green when the pump is switched on.
4. Up arrow: Used to move from line to line in the currently displayed screen and to change the setting of a parameter.
5. Down arrow: Enables management of the currently displayed screen and setting values of parameters.
6. Enter button: Used to confirm choice like, menu selection, confirm parameter or log in. Logging in can be done by pressing this button for 3 seconds.

11.2 Menu structure

11.3.1 - Main overview before login

de Main overview heeft verschillende niveaus, standaard krijgt een gebruiker het basis menu te zien



Overview
Navigate to the Overview Page to view system status and temperature settings.

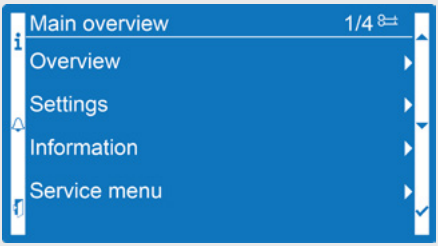
Information
Navigate to the Information Page to access operational data and statistics.

11.2.2 - Login

Login by pressing enter for 3 seconds. See login screen. Enter the 6-digit code here, change the first number of the code with the arrow keys and move to the next one with the enter key.

11.2.3 - Main overview after login

The Main Menu serves as the central navigation hub for accessing various parameters and settings of the boiler system. From this page, users can navigate to different sections to monitor, configure, and manage system operations.



Overview
Navigate to the Overview Page to view system status and temperature settings.

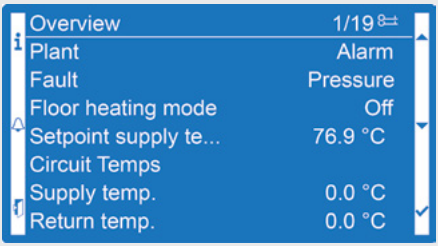
Settings
Navigate to the Settings Page to configure system parameters for heating control.

Information
Navigate to the Information Page to access operational data and statistics.

Service menu
Navigate to the Service Menu Page for advanced system settings and configurations.

11.2.4 - Main overview - Overview

The Overview Page provides a comprehensive display of critical system information, including operational status, temperature settings, and sensor readings for both primary and secondary circuits.



Plant status
Displays the current operation mode of the system.

Fault
Indicates current system faults (e.g., burner or pump issues).

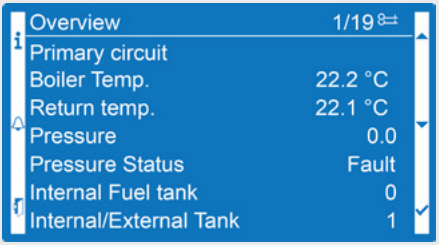
Floor heating mode
Enables floor heating protection mode with a maximum supply temperature limit.

Setpoint suply temp
Sets the target supply temperature for the system.

Circuit Temps
Displays parameters related to the circuit.

Supply temp.
Sensor reading for the secondary system supply temperature.

Return temp.
Sensor reading for the secondary system return temperature.



Primary circuit

Displays parameters related to the primary circuit.

Boiler Temp.

Sensor reading for the primary system supply temperature.

Return Temp.

Sensor reading for the primary system return temperature.

Pressure

Digital pressure reading of the system.

Pressure Status

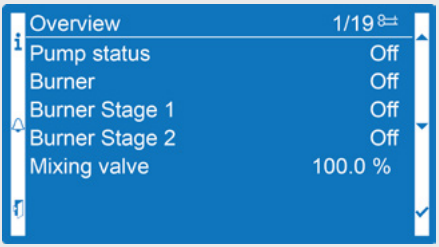
Status of the min/max pressure switches.

Internal Fuel tank

Displays the current level of the internal fuel tank.

Internal/External Tank (Option)

Valve status for switching to external fuel supply (ON = external tank).



Pump Status

Indicates the current command status of the pump (On/Off).

Burner

Indicates the current status of the burner (On/Off).

Burner Stage 1

Indicates the status of burner stage 1 (low stage).

Burner Stage 2

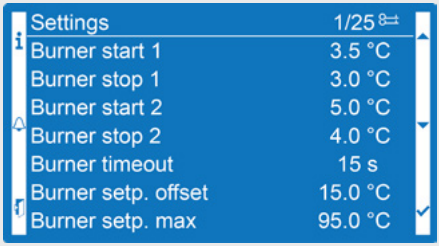
Indicates the status of burner stage 2 (high stage).

Mixing Valve

Displays the current position command of the mixing valve.

11.2.5 - Main Overview - Settings

The Settings Page allows users to configure system parameters for controlling the heating process, including burner operation, temperature limits, and pump delays.



Burner start 1

Temperature difference to start the low-stage burner.

Burner stop 1

Temperature difference to stop the low-stage burner.

Burner start 2

Temperature difference to start the high-stage burner.

Burner stop 2

Temperature difference to stop the high-stage burner.

Buner timeout

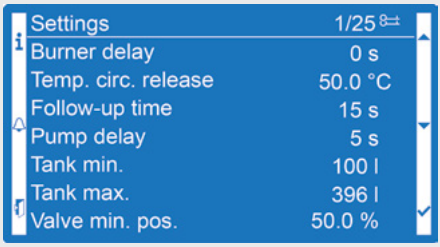
Minimum stop time before the burner can restart.

Burner setp. offset

Offset temperature for the boiler.

Burner setp. max

Maximum boiler temperature limit.



Buner delay

Delay time for switching the burner relay after a heat request.

Temp. circ. release

Release temperature for the circuit.

Follow-up time

Duration the three-way valve remains open during system shutdown.

Pump delay

Delay time for switching on the pump relay.

Tank min.

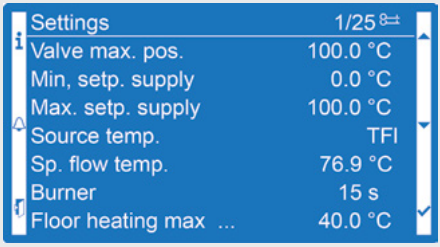
Volume setting to switch from internal to external tank.

Tank max.

Volume setting to switch from external to internal tank.

Valve min. pos.

Minimum valve position.



Valve max. pos.

Maximum valve position.

Min. setp. supply

Minimum limit for the supply temperature setpoint.

Max. setp. supply

Maximum limit for the supply temperature setpoint.

Source temp.

Temperature probe used for the PID controller.

Sp. flow temp.

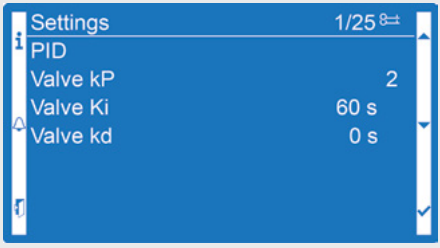
Setpoint supply temperature.

Burner Cooldown

Delay time for restarting the burner after a shutdown.

Floor heating max. temp.

Maximum temperature during floor heating mode.



PID

Adjust proportional, integral, and derivative control settings.

Valve kP

Proportional gain for PID control.

Valve Ki

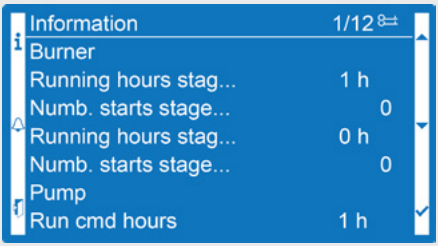
Integral time for PID control.

Valve kd

Derivative time for PID control.

11.2.6 - Main Overview - Information

The Information Page displays operational data and statistics, including burner runtime, pump status, and fuel tank levels.



Burner

Displays burner-related information.

Running hours stage 1

Hour counter for burner stage 1 (low stage).

Numb. starts stage 1

Number of starts counter for burner stage 1 (low stage).

Running hours stage 2

Hour counter for burner stage 2 (high stage).

Numb. starts stagee 2

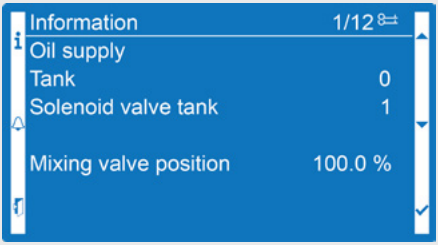
Number of starts counter for burner stage 2 (high stage).

Pump

Displays pump-related information.

Run cmd hours

Pump command run hours.



Oil supply

Displays fuel tank and valve status.

Tank

Current internal tank level (if tank sensor is connected).

Solenoid valve tank

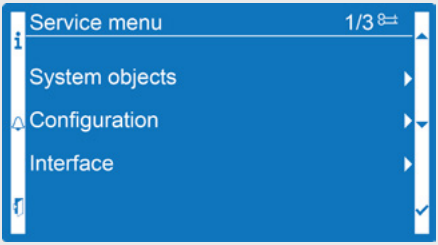
Solenoid valve status for internal/external tank switching.

Mixing valve position

Mixing valve position command (0-100% = 0-90°).

11.3.7 - Main Overview - Service menu

The Service Menu Page provides access to advanced system settings and configurations, including PLC information, system configuration, and interface settings.



System objects

Navigate to the System Objects Page for PLC information and settings.

Configuration

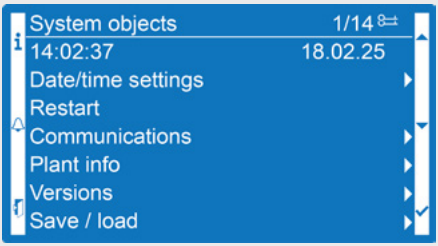
Navigate to the Configuration Page to change system configuration.

Interface

Navigate to the Interface Page to modify PLC inputs and outputs.

11.2.8 - Main Overview - Service menu - System objects

The System Objects Page displays system information, including time settings, communication configurations, and diagnostic data.



System clock

Displays the current system time/date.

Date/time settings

Change time settings.

Restart

Restart the system.

Communications

Configure communication settings (e.g., IP address).

Plant info

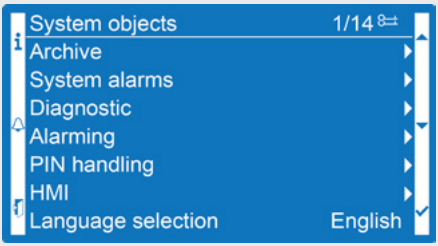
Displays plant information.

Versions

Displays system version information.

Save / load

Options for saving and loading settings and parameters.



Archive

Configure archive settings.

System alarms

Displays system alarm information.

Diagnostic

Access controller diagnostic information.

Alarming

View alarm history and settings.

PIN handling

Change login PIN settings.

HMI

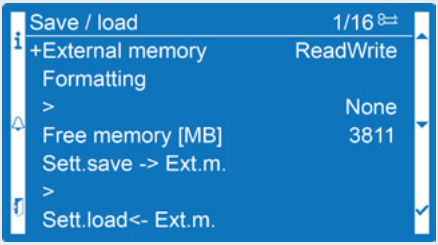
Configure HMI settings.

Language selection

Select the language for the HMI interface.

11.2.9 - Main Overview - Service menu - System objects - Save / Load

The Save/Load Page allows users to save and load system settings and parameters, including alarm history and firmware updates.



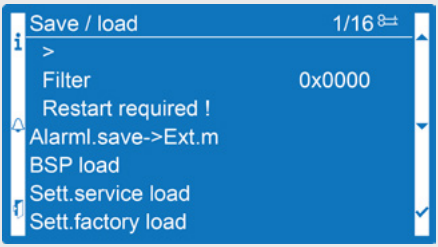
+External memory
Displays the status of external memory.

Formatting
Format USB drive (all data will be deleted).

Free memory [MB]
Displays the amount of free memory on the USB drive.

Sett.save -> Ext.m.
Save system settings and parameters to the USB drive.

Sett.load<- Ext.m.
Load system settings and parameters from the USB drive.



Filter
Filter for partial save/load settings.

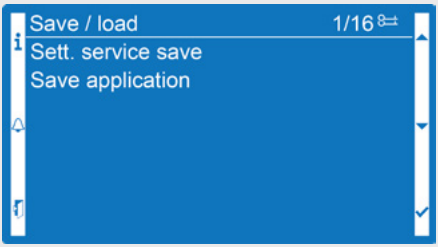
Restart required !
Restart the controller after loading new settings/parameters.

Alarml.save->Ext.m
Save alarm history to a TXT file on the USB drive.

BSP load
Load new BSP firmware file to the controller.

Sett.service load
Load service settings.

Sett.factory load
Load factory settings.



Sett. service save
Save current settings as service settings.

Save application
Save application to internal memory.

12 FUNCTIONALITY OF SAFETY COMPONENTS

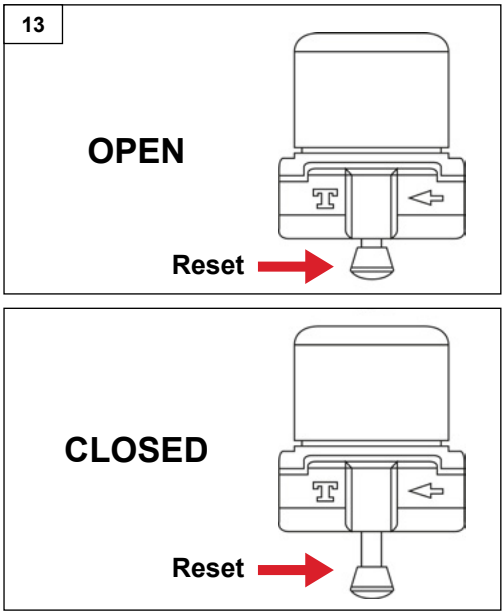
12.1 Fire valve

The fire valve is located in the fuel supply line. The fire valve has a temperature sensor mounted on the ceiling of the boiler. When the temperature rises to 90°C, the fuel supply to the burner is cut off. This prevents possible uncontrollable leakage due to an excessively high temperature inside the device.

If the fire valve is triggered, the reset button must be operated manually. Fig. 13 shows the open and closed position of the fire valve

CAUTION
Once the fire valve has been triggered, the heat source and its cause must first be investigated before resetting the fire valve.

13

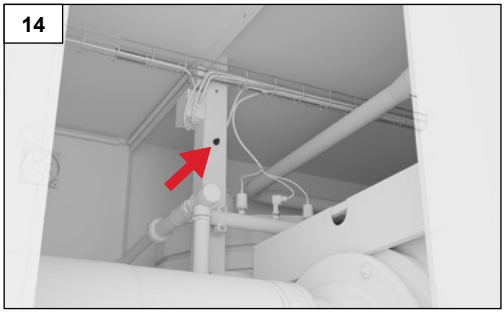


12.2 Maximum thermostat

The boiler is protected internally against overheating. Overheating is very hazardous in a boiler because high pressure can arise in the boiler and the connected pipes.

The maximum thermostat is located at the back of the boiler and can be accessed through the side door. After the boiler has been secured and cooled down, the maximum thermostat can be reset by removing the protective cover of the thermostat and pressing the green button with a pointed object. The reset procedure is successful when a clicking sound is heard.

14

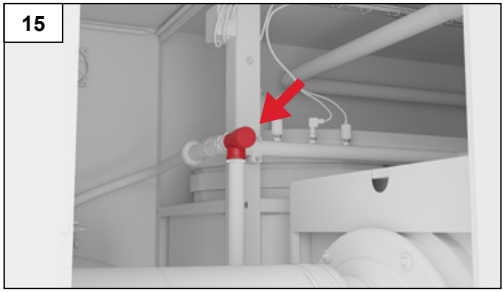


CAUTION
If the temperature sensor in the boiler has not cooled down sufficiently, resetting the maximum thermostat is not possible.

12.3 Pressure relief valve (5Bar)

There is a pressure relief valve in the circuit. If the pressure rises above 5 Bar in the circuit, the valve will open and discharge the excess water.

15



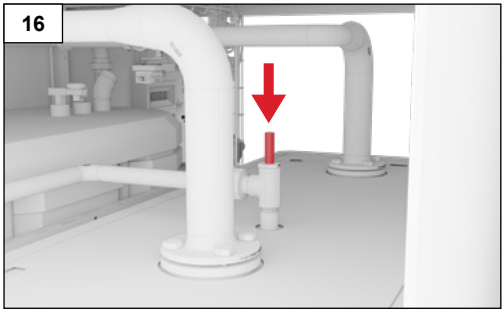
WARNING!
Hot water and steam will often be released during an overpressure. Never work in the boiler when it's hot. Always ensure that you keep an eye on the pressure gauge in the expansion vessel and stop working in the boiler at a pressure above 3 bar.

12.4 Automatic de-aerator

In the boiler's complex piping system during filling, air bubbles can accumulate. Over time, the air bubbles will move to the top of the boiler.

Air in the primary circuit can cause irregular flow and pressure. It's important to ensure that as little air as possible is inside the boiler and the primary circuit. To remove these air bubbles from the system, an automatic de-aerator is located on top of the boiler. (fig. 16)

16



12.5 Upper and lower pressure switches

There is both an upper and a lower pressure switch on the circuit. These can be found side by side on the top of the circuit. (fig. 17)

17

The upper or lower pressure switches switch when the primary pressure falls outside the range of 0.5 to 4.5 Bar.
In case of activation, the switches automatically reset when the problem is corrected.

13 MAINTENANCE AND MAINTENANCE SCHEDULE

WARNING!
Before performing maintenance or repairs, always disconnect the boiler from the power supply

WARNING!
During and after operation, the opening of the chimney and the camlock connections for the circuit are hot.

13.1 Boiler pressure refill

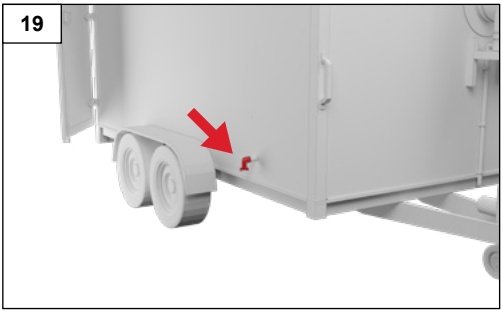
It is important that the circuit has a pressure above 0.5 Bar at all times. Thermobile maintains a filling pressure of 1.5 Bar at 20°C. There is a pressure gauge on the expansion vessel to read the system pressure.

18

CAUTION
When using the boiler in larger installations, the integrated expansion vessel may not provide sufficient capacity. Check whether an additional expansion vessel is necessary and, if necessary, consult an installer or specialist for advice.

If the pressure is too low, it can be topped up via the connection (filler tap) at the bottom of the boiler. The connection is located on the right-hand side of the trailer. See ‘Fig. 19’.

19



Use a sturdy hose to refill the boiler.
Allow the hose to fill with water as much as possible before connecting it. Remove the cap from the filling valve. Then connect the hose to the filling valve.

Turn on the water supply of the hose gently, then open the filling valve in small increments until the pressure starts to rise on the pressure gauge. Once the desired pressure has been reached, the filling valve must first be closed, then the water supply must be cut off.

CAUTION
Always refill the boiler with clean tap water. It is preferable to supplement the boiler with demineralised water. This improves the life of the boiler.

13.2 Cleaning the oil filter

Many oil tanks are heavily contaminated. Especially if the tank is almost empty or if it is refilled during operation of the boiler, a lot of dirt from the burner can get into the fuel circuit filter. it.

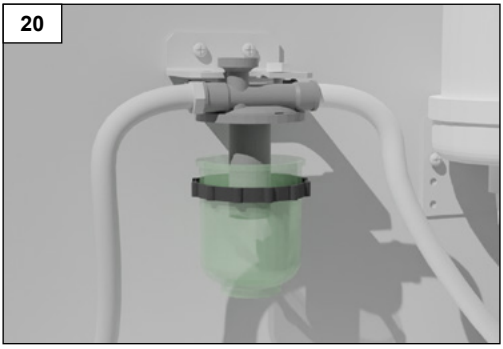
If the filter is too dirty or appears to be dirty, clean it as follows:

1. Place a cloth or tray under the filter to catch any oil leaks.

2. Close the filter using the rotary knob on top of the filter.

3. Loosen the retaining ring of the filter cup and carefully remove the filter cup with the filter from the base.

20



4. Empty the filter cup into a suitable container for the fuel residue.

CAUTION
If you do not have a stainless steel filter, you cannot clean this filter and you need to replace it.

5. When the filter and filter cup are clean they can be refitted.

6. Open the filter using the rotary knob on the filter.

7. After fitting, check that there is no leakage by briefly running the boiler until the filter cup is refilled with fuel.

TIP
Place a scraper filter on the fuel tank to avoid frequent cleaning of the oil filter. A scraper filter is many times easier to clean and can be used for several boilers.

WARNING!
Always wear gloves suitable for working with fuel while cleaning the oil filter.

13.3 Cleaning the water filter

The boiler is equipped with a water dirt filter to protect the system from contamination.

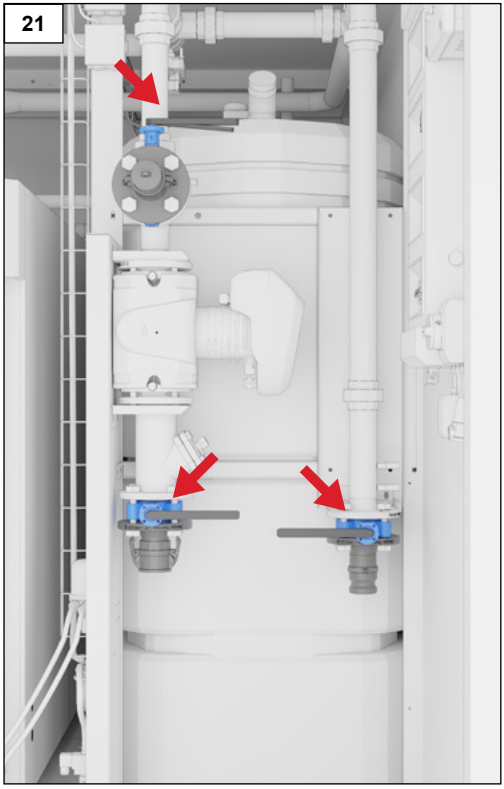
The frequency of cleaning the filter depends on the water quality and the duration of the heating project. Check the filter regularly during use and clean or replace it if necessary to ensure optimal operation.

If in doubt about the cleaning frequency, we recommend inspecting the filter weekly, especially in environments with potentially contaminated water.

Clean the filter using the following steps:

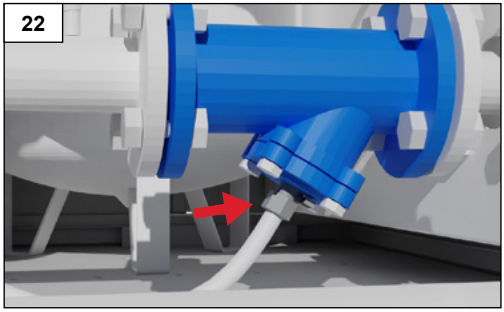
1. Close the circuit with the two butterfly valves at the circuit connections.

21



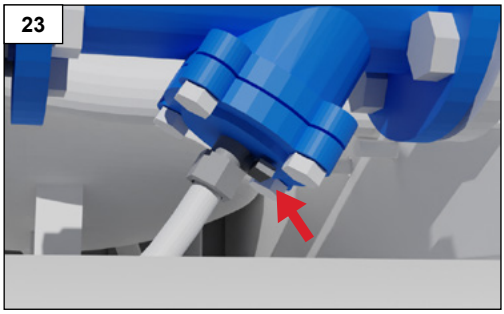
2. Connect a hose to the bottom of the filter, then place the end of this hose in a suitable drain.

22



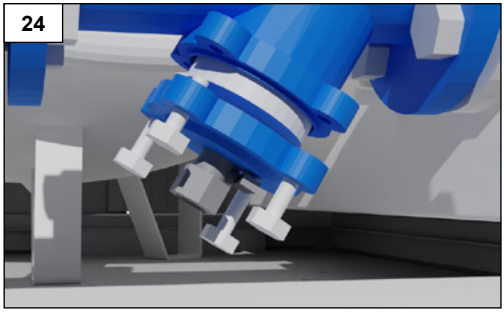
3. Open the tap on the filter to drain it .

23



4. When the system is completely empty, the filter can be can be removed by unscrewing the 4 bolts under the filter.

24



5. Take the filter gauze with jacket to a cleaning station and rinse the filter until no more dirt is present.

6. Replace the filter and fit the cover again with the 4 bolts.

CAUTION
Don't forget to install the cover gasket and replace it if necessary to prevent leakage.

13.4 Maintenance components

The components to be ordered for general maintenance are as follows:

MBT-165

Component	Number	Interval
Nozzles 2.25 gph 60gr S	40504705	Replace annually.
Oil filter	41520027	Clean as soon as soiled.
Flange Gasket DN 50	30500190	Replace as soon as flange is removed or damaged
Flange Gasket DN 65	30500191	Replace as soon as flange is removed or damaged
Camlock Gasket	30500194	Replace when disassembled is or annual.

Component	Interval
Burner chamber	Clean annually.

MBT-350

Component	Number	Interval
Nozzles 3.50 60gr A	30350102	Replace annually.
Oil filter	41520027	Clean as soon as soiled.
Flange Gasket DN 50	30500190	Replace as soon as flange is removed or damaged
Flange Gasket DN 65	30500191	Replace as soon as flange is removed or damaged
Camlock Gasket	30500194	Replace when disassembled is or annual.

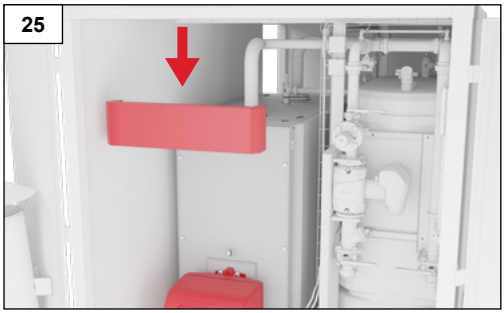
Component	Interval
Burner chamber	Clean annually.

13.5 Opening and cleaning the boiler

At least annually, the boiler must be cleaned and carbon residues removed. This is essential to extend the life of the boiler.

1. Remove the red cap from the boiler.

25

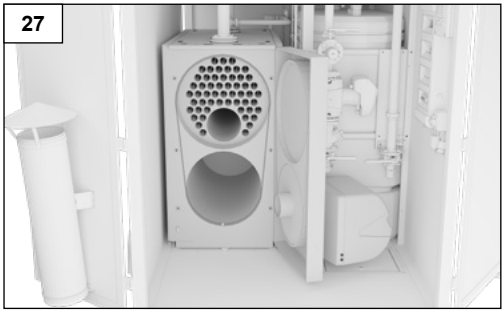


2. Unscrew the 6 bolts on the door.

26

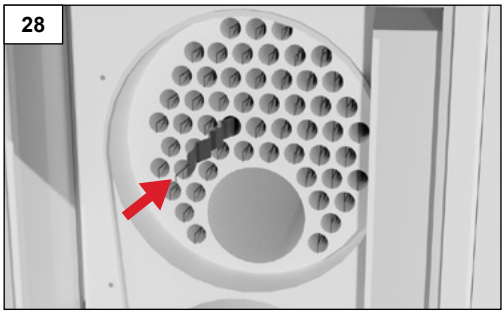
4. Open the door.

27



5. Remove the flue gas inhibitors.

28



6. Clean the inside with a squeegee brush or other suitable tool.

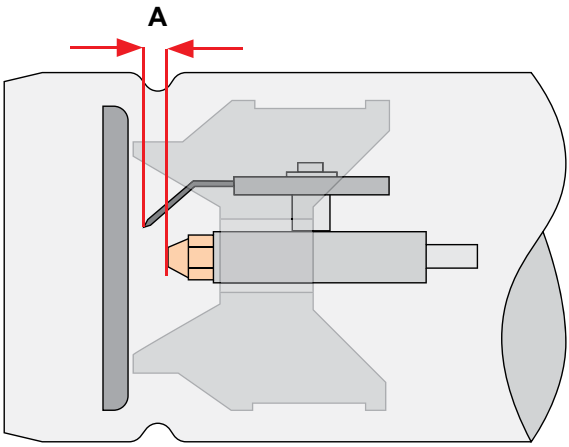
15 BURNER MAINTENANCE

Extensive explanations and details of the installed burner can be found in the manual supplied by the manufacturer.

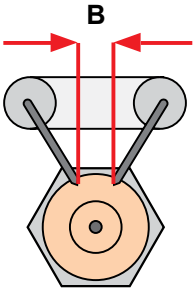
CAUTION
Adjusting the air supply must always be done in combination with a CO_2 measurement. It must always be between 12 - 12.5%.

14.1 Burner settings

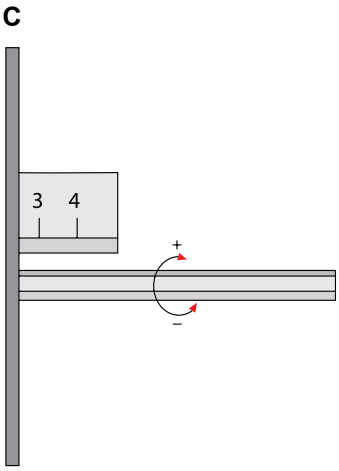
29



30



31



	MBT-165	MBT-350
A	2 mm	2 mm
B	3.5-4 mm	3.5-4 mm
C	5	3

Nozzle	
MBT-165	1x 2.25 gph 60gr S
MBT-350	2x 3.50/60A

Pump pressure	
MBT-165	10 Bar
MBT-350	24 Bar

14.2 Nozzle

Don't clean the nozzle opening. Never open the nozzle. The nozzle filter may be cleaned or replaced if necessary. Replace a nozzle every year or after 1,000 burning hours.

14.3 Fuel pump

The pump pressure should not deviate more than 0.5 Bar. Unusual noises from the pump indicate wear and tear. See 14.1 Burner settings for pump pressure.

If the pump pressure is unstable or the pump is too noisy, remove the flexible supply pipe from the oil filter. Use a local fuel supply to test if the problem lies in the pump or the supply oil filter.

If the problem lies in the pump, clean the oil filter of the pump. If the problem seems to be in the supply line, ensure that it's completely clean and that no air is being sucked in.

14.4 Fan

Check that no excess dust has accumulated in the fan or on the fan blades. If there's a lot of dust, the fan must be cleaned. Too much dust on the fan or in the fan housing can reduce the airflow, which can cause inefficient burning.

14.5 Photocell

Clean the glass housing of the photocell. Remove the photocell (1) to pull it out from the clamped position.

32

14.6 Fuel supply

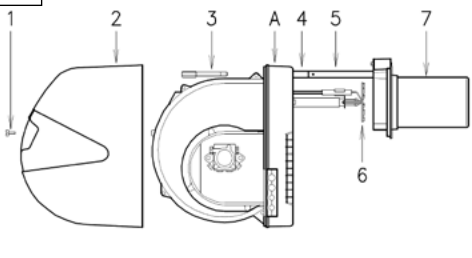
Check regularly that the fuel supply to the burner is sufficiently clean. If there's a lot of water or dirt in the tank or pipes, they must be cleaned. Use an external pump to suck water and other impurities out of the tank.

Clean the tank every 5 years or when necessary.

14.7 Opening the burner

Open the burner and remove the burner chamber by following the steps below; the numbers correspond to the indications on the image.

33



1. Switch off the power to the boiler.
2. Remove the screw (1) with the protective cap (2) from the burner.
3. Remove the bolt (3) to slide the burner out of the burner pipe.
4. Place the extension sliding guides (4), if supplied, on the existing guides.
5. Pull part A back, taking care to keep the burner straight to prevent damage to the baffle plate (6)

14.8 Burner control unit diagnostics and reset

During startup, the signal lamp on the burner control unit lights up as follows:

Status	Colour code
Pre-purification	●○●○●○●○●
Ignition phase	●○●○●○●○●
Operation, flame OK	□□□□□□□□□
Working with weak flame signal	□○□○□○□○□
Power supply less than ~170V	●▲●▲●▲●▲●
Lock	▲▲▲▲▲▲▲▲▲
Extremely light	▲□▲□▲□▲□▲

○ Off ● Yellow □ Green ▲ Red

The burner control unit has a diagnostic mode for easy identification of the causes of burner faults (Indicator: RED LED).

To use this function, wait minimum 10 seconds after the start of the safety condition (Lock-out).
Then press down the reset button for more than 3 seconds.
The burner control unit generates a sequence of pulses (1 second apart) that are repeated at an interval of 3 seconds.
After identifying the fault through the pulses, the system must be reset by pressing down the button for between 1 and 3 seconds.

RED LED lights up wait min. 10s	Lock	Press min. 3s reset	Pulsating	Interval 3s	Pulsating
			● ● ● ● ●		● ● ● ● ●

The codes with associated faults are shown in the table in chapter 17.2 Burner faults.

15 DECOMMISSIONING

15.1 Switching off the boiler

Always switch off the Boiler by using the 'Start/Stop' switch. When the switch is set to stop, the unit starts post-cooling. The set post-cooling time determines the time the three-way valve is fully opened to allow the unit to cool down as quickly as possible. During this process, let the circuit run to dissipate the heat.

CAUTION
Always leave the unit to cool down below 50°C before taking any other actions. After the "Stop" of the boiler, the internal circulation pump will always continue to run as long as the boiler is under voltage. Running the pump ensures good mixing of the liquid and prevents the liquid from freezing during the winter period.

CAUTION
If the boiler has been de-energised by power failure, or manually turning off the main switch, the pump will not start running again until the 'Start/stop' switch is turned on.

15.2 Turning off the power

To make the boiler completely de-energized, the main switch must be turned to 0. This switch must be blocked with a lock during maintenance on the device.
To be able to work completely without voltage in the switch box, the mains plug must be disconnected.

After performing these actions, it's safe to work on the boiler.

15.3 Emptying the system

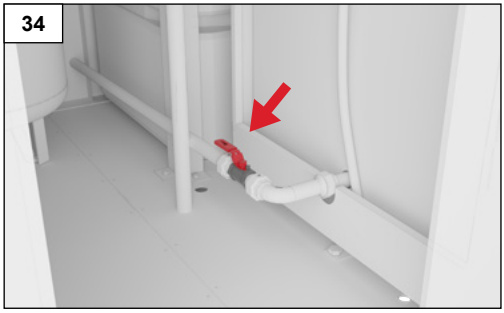
To make changes or repairs to the circuit, it must be emptied.

CAUTION
Always ensure that the boiler has cooled down completely before emptying or disconnecting the system.

WARNING!
The primary circuit has an expansion vessel and the circuit is pressurized under normal conditions. In the event of leakage or disconnection of the pipes, high-pressure liquid can be released.

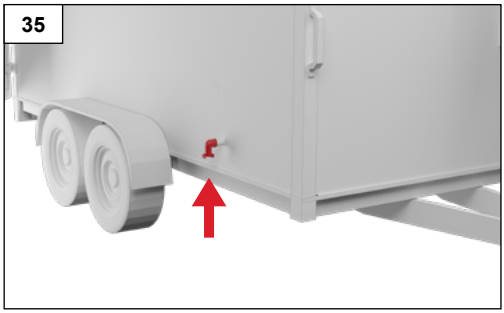
On the right side is the circuit filling point. Connect a hose to the filling point and place the other end of the hose in a suitable drain or drain tank.

34



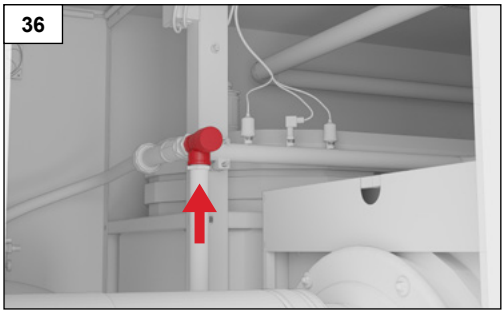
Gently open the tap until liquid comes out of the hose.

35



Fluid flow will decrease as the pressure of the circuit decreases.
When the pressure has decreased and the liquid flow is minimal, the ball valve on top of the boiler can be opened to allow the liquid to flow better.

36



To empty the system more quickly, you can also use a suitable pump and hose.

CAUTION
Dispose of the water/glycol mixture according to the regulations of the local authorities.

16 FAULTS AND REPAIRS

Faults can occur in different components of the boiler.
There are only 2 components on the boiler that can visually indicate malfunctions. The display and burner inform the user through image and light signals that a malfunction is present during operation.

16.1 PLC faults

Description	Cause	Solution
Burner failure	Burner transmits error signal to PLC. The burner may have various faults.	Reset can be done with the button on the burner, detection of the fault is described in chapter 17.2 Burner faults and table.
Maximum boiler temperature reached	Maximum thermostat is enabled by an internal temperature of >110°C	Trace the cause of the excessive temperature. Reset the maximum thermostat inside the switch box.
Boiler temperature sensor broken P.TFl	Temperature is out of the usual range.	Check the connections. Replace the sensor.
Boiler temperature sensor broken P.TRl	Temperature is out of the usual range.	Check the connections. Replace the sensor.
Boiler temperature sensor broken S.TFl	Temperature is out of the usual range.	Check the connections. Replace the sensor.
Boiler temperature sensor broken S.TRt	Temperature is out of the usual range.	Check the connections. Replace the sensor.

16.2 Burner faults

SIGNAL	PROBLEM
None	The burner does not start.
POSSIBLE CAUSE	**ADVICE**
1 - No power supply.....	Close all the switches. Check the plugs.
2 - A limit or safety check has been opened.....	Adjust or replace them.
3 - Locking of the control box.....	Reset the switch box (not earlier than 10s after locking).
4 - Pump is stuck.....	Replace.
5 - Incorrect electrical connections.....	Check connections.
6 - Defective switch box.....	Replace.
7 - Defective electric motor.....	Replace.

SIGNAL	PROBLEM
2x flashing ● ●	After the pre-rinsing and safety time, the burner becomes locked.
POSSIBLE CAUSE	**ADVICE**
9 - No fuel in tank; water on bottom of tank.....	Fill with fuel or suction up water.
10 - Incorrect adjustment of head and air valve.....	Adjust.
11 - Solenoid valves don't open..... (1st stage or safety)	Check connections; replace coil.
12 - 1st nozzle clogged, dirty or deformed.....	Replace.
13 - Dirty or poorly adjusted burner electrodes.....	Adjust or clean.
14 - Earthed electrode due to defective insulation....	Replace.
15 - High-voltage cable defective or earthed.....	Replace.
16 - High-voltage cable deformed due to high..... temperature.	Replace and protect.
17 - Ignition transformer defective.....	Replace.
18 - Incorrect electrical connections of valves..... or transformer.	Check.
19 - Control box defective.....	Replace.
20 - Pump not primed.....	Fill the pump and see: "Pump unprimes".
21 - Pump/motor coupling defective.....	Replace.
22 - Suction line pump connected to return line.....	Correct the connection.
23 - Valves upstream of pump closed.....	Open it.
24 - Dirty filters: pipe - pump - nozzle.....	Clean.
25 - Defective photocell or switch box.....	Replace photocell or switch box.
26 - Dirty photocell.....	Clean.
27 - 1st stage of cylinder is defective.....	Replace the cylinder.
28 - Motor protection triggered.....	Reset the thermal protection.
29 - Defective motor control.....	Replace.
30 - Missing phase. Thermal protection is switched..	Reset the thermal protection when the third phase is reconnected.
31 - Wrong direction of rotation of the motor.....	Change the motor's electrical connections.

SIGNAL	PROBLEM
4x flashing ● ● ● ●	The burner starts and then becomes locked.
POSSIBLE CAUSE	**ADVICE**
32 - Photocell short-circuit.....	Replace photocell
33 - Light goes inside or flame is simulated.....	Eliminate light or replace control box

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Flame detachment
POSSIBLE CAUSE	**ADVICE**
34 - Badly adjusted head.....	Adjust.
35 - Badly adjusted or dirty..... ignition electrodes.	Adjust.
36 - Badly adjusted fan air gate: ..... too much air.	Adjust
37 - 1st nozzle too large (pulsation).....	Reduce 1st nozzle
38 - 1st nozzle too small (flame loss).....	Increase 1st nozzle
39 - 1st nozzle dirty or deformed.....	Replace
40 - Unsuitable pump pressure.....	Adjust to between 10 and 14 bar.
41 - 1st stage nozzle unsuitable for burner or..... boiler.	Reduce 1st stage
42 - Defective nozzle 1st stage.....	Replace

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	The burner does not switch to the 2nd stage
POSSIBLE CAUSE	**ADVICE**
43 - Control device TR does not close.....	Adjust or replace
44 - Defective switch box.....	Replace
45 - Sol. valve spool 2nd stage defective.....	Replace
46 - Piston jammed in valve unit.	Replace entire unit

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	The fuel goes to the second stage, but the air remains in the first stage.
POSSIBLE CAUSE	**ADVICE**
47 - Low pump pressure.....	Increase
48 - 2nd stage operation of cylinder is defective.....	Replace the cylinder

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Burner stops in transition between 1st and 2nd phases. Burner repeats the start cycle.
POSSIBLE CAUSE	**ADVICE**
49 - Nozzle dirty..... 50 - Photocell dirty..... 51 - Excessive air.....	Replace the nozzle Clean Reduce

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Uneven fuel supply
POSSIBLE CAUSE	**ADVICE**
52 - Check whether the cause is in the pump or the fuel supply system.	Burner power supply from tank near burner.

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Internally corroded pump
POSSIBLE CAUSE	**ADVICE**
53 - Water in tank pump	Suction water from bottom of tank with a separate pump.

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Noisy pump, unstable pressure
POSSIBLE CAUSE	**ADVICE**
54 - Air has entered the suction line..... - Pressure value too high (above 35 cm Hg): 55 - Tank/burner height difference too great..... 56 - Pipe diameter too small..... 57 - Suction filters clogged..... 58 - Suction valves closed..... 59 - Fuel solidified by low temperature.....	Tighten the connectors. Feed burner with loop circuit. Increase. Clean. Open. Add additive to the fuel.

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Pump cuts out after a prolonged pause.
POSSIBLE CAUSE	**ADVICE**
60 - Return pipe not immersed in fuel..... 61 - Air enters suction line.....	Move it to the same height as the suction pipe Tighten the couplings.

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Pump is leaking fuel.
POSSIBLE CAUSE	**ADVICE**
62 - Leakage of sealing member	Replace pump.

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Smoke in flames - Dark Bacharach
POSSIBLE CAUSE	**ADVICE**
63 - Not enough air.....	Adjust head and fan gate.
64 - Nozzle worn or dirty.....	Replace
65 - Nozzle filter clogged.....	Clean or replace
66 - Incorrect pump pressure.....	Adjust to 10 - 14 bar
67 - Flame stability coil dirty, loose or deformed.....	Clean, tighten or replace
68 - Insufficient air openings in the boiler space.....	Increase
69 - Excessive air.....	Adjust head and fan gate.

SIGNAL	PROBLEM
7x flashing ● ● ● ● ● ● ●	Dirty burner head
POSSIBLE CAUSE	**ADVICE**
70 - Nozzle or filter dirty.....	Replace.
71 - Unsuitable nozzle or angle.....	See recommended nozzles.
72 - Loose nozzle.....	Tighten.
73 - Impurities on flame stability coil.....	Clean.
74 - Incorrect head adjustment or not enough air.....	Adjust. Open valve.
75 - Length of nozzle not adapted to boiler.....	Contact the boiler manufacturer.

SIGNAL	PROBLEM
10x flashing ● ● ● ● ● ● ● ● ● ●	The burner becomes locked.
POSSIBLE CAUSE	**ADVICE**
76 - Connection or internal fault.....	
77 - Presence of electromagnetic interference.....	Use the radio interference protection kit.

16.3 Other faults

Description	Cause	Solution
Poor flow through the secondary circuit	Dirty water filter	Clean the water filter in the secondary circuit.
Regular overheating of the boiler >110°C	Poor flow in the primary circuit	Check circulation pump for blockage; replace circulation pump if necessary.
Scraping or squealing noises in oil pump	Excessive resistance in the diesel supply circuit. Excessive dirt in filters or closed tap on oil supply.	Check the pipes for blockages. Clean the oil filter and clean the pump filter. Clean the fuel tank if heavily soiled.
Fluctuating secondary circuit supply temperature	PID control disrupted.	Adjust PID control or activate an auto tune.
Black smoke from flue gas discharge	Bad combustion with too little oxygen and too high a CO2 value	Open the air slide on the burner until the black smoke disappears. Use a flue gas meter to analyze the flue gases and re-adjust the burner to a CO2 value of 12.5%
White smoke from flue gas exhaust	Poor combustion due to excessive air in the fuel.	Check the oil supply for leaks.
White vapor from flue gas discharge	Cold flue gases during startup or boiler temperature set too low.	Increase boiler temperature to minimum 45°C. Wait 15 minutes for boiler to heat up.

17 ENVIRONMENT

17.1 Antifreeze (Propylene Glycol)

As an option, use can be made of Propylene glycol (maximum 30%) as antifreeze in the boiler circuit.
Propylene glycol has lower toxicity than other anti-freezes and is more environmentally friendly.
However, liquid from the boiler must always be disposed of according to local regulations.
See the supplied safety sheet “Propylene glycol”.

18 DISMANTLING AND DISPOSAL

All materials released during the dismantling of this machine must be disposed of according to local government regulations.

19 EC DECLARATION OF CONFORMITY

The EC Declaration of Conformity can be found at www.thermobile.com.

Datum Date Datum Date	Omschrijving: Onderhoud of Storing Description: Maintenance or Failure Beschreibung: Wartung oder Fehler Description: Entretien ou Erreur	Actie door Action by Aktion durch Action par

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