COMBOMAX ULTRA

Electric boiler with integrated instantaneous water heater

Power capacity: 4.5 kW to 29 kW
120V- 208/240V (single phase)

INSTALLATION, USE AND CARE MANUAL

Your COMBOMAX ULTRA electric boiler has been carefully assembled and factory tested to provide years of trouble-free service. This manual contains instructions for the safe and proper installation, operation and maintenance of the boiler, in order to ensure your full satisfaction. It is imperative that all persons who are expected to install, operate or adjust this boiler read the instructions carefully.
Any questions regarding the operation, maintenance, service or warranty of this water heater should be directed to the dealer or distributor you purchased it from. When all installation steps have been completed, replace this installation manual in its original envelope, and keep in a safe place near the heater for future reference.

THERMO 2000 INC. Revision: December 2021
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Section 1 : TECHNICAL SPECIFICATIONS

Table 1 : Boiler specifications 208V/240V/1ph.[1]

Model COMBOMAX ULTRA	Power (kW)		Heating Elements	Amperage[2]		Suggested electrical cable at 240V[3]		Suggested Breaker/Fuse at 240V
	208 V	240V		208 V	240V	cu	al	
4.5	3.4	4.5	1 x 4,5 kW	16.3	18.9	10	10	30
7.5	5.6	7.5	1 x 4.5 kW + 1 x 3 kW	27.2	31.2	8	6	40
9	6.8	9	2 x 4,5 kW	32.6	37.5	8	6	50
12	9	12	2 x 6 kW	43.5	50	6	4	70
15	11.2	15	2 x 3 kW + 2 x 4,5 kW	54.3	62.5	6	4	80
18	13.5	18	4 x 4,5 kW	65.2	75	4	2	100
20	15	20	4 x 5 kW	72.5	83.3	3	2	110
24	18	24	4 x 6 kW	87	100	2	0	125
27[4]	20.3	27	6 x 4,5 kW	97.9	112.5	1	00	150
29[4]	21.8	29	2 x 4,5 kW + 4 x 5 kW	104	120	1	00	175

[1]Electrical supply: 120/240V or 120/208V single-phase (L1 – N – L2) with three 90°C conductors, or two conductors L1 – L2 if the boiler does not require power to a 120 VAC pump or accessories.
[2]Add the amperage of the circulating pump and other external accessories if they are connected to the boiler (max. 5A).
[3]A higher cable size could be required. In all cases the local electrical code has priority. The electrician has the responsibility to select the appropriate size.
[4]These models are only available on the Combomax Ultra 70.

Maximum operating pressure on the tank: 207 kPa / 30 psi
Tank temperature range: 10°C to 88°C (50°F to 190°F)
Maximum pressure domestic water: 861 kpa (125 psi)
Maximum domestic hot water temperature: 82°C ± 1.7°C (180°F ± 5°F)

1 kW = 3412 BTU/h

Table 2 : Dimensions

	COMBOMAX ULTRA 50	COMBOMAX ULTRA 70
Height	60''	70-1/2''
Diameter	22''	24''
Depth (with door)	25-1/2''	28''
Supply DCW	3/4'' NPTF	3/4'' NPTF
Supply DHW	3/4'' NPTF	3/4'' NPTF
Expansion tank	1/2'' NPTM	1/2'' NPTM
Heating supply	1'' NPTM	1-1/4'' NPTM
Heating return	1'' NPTM	1-1/4'' NPTM

General Safety Precautions

Be sure to read and understand the entire Manual before attempting to install or operate this unit. Pay particular attention to the following General Safety Precautions. Failure to follow these warnings could cause property damage, bodily injury or death. Should you have any problems understanding the instructions in this manual, STOP, and get help from a qualified installer or technician.

Section 2 : INTRODUCTION

WARNING

The important safeguards and instructions appearing in this manual are not meant to cover all possible conditions and situations that may occur. It should be understood that common sense, caution and care are factors which cannot be built into every product. These factors must be supplied by the person(s) caring for and operating the unit.

2.1 LOCAL INSTALLATION REGULATIONS

This COMBOMAX ULTRA electric boiler must be installed in accordance with these instructions and must conform to local regulation, or in the absence of local codes, with the current edition of the National Plumbing Code and the National Electric Code. In any case where instructions in this manual differ from local or national codes, the local or national codes take precedence.

2.2 CORROSIVE ATMOSPHERE

The electric boiler should not be located near an air supply containing halogenated hydrocarbons or high humidity. The limited warranty is voided when failure of the water heater is due to a corrosive atmosphere.

2.3 SHIPMENT INSPECTION

Inspect the electric boiler for possible shipping damage. The manufacturer's responsibility ceases upon delivery of goods to the carrier in good condition. Consignee must file any claims for damage, shortage in shipments, or non-delivery immediately against carrier.

2.4 TO VERIFY

Please check the boiler identification plate to ensure you have the right model.

The following items are factory installed and shipped with the unit:

- **207 kPa (30 psi) tank pressure relief valve.**
- **862 kPa (125 psi) domestic hot water pressure relief valve.**
- **Tank and domestic hot water heat exchanger drain cocks.**
- **Thermo manometer (heat and pressure indicator).**
- **Automatic air vent.**
- **83 kPa (12 psi) Tank pressure regulator.**
- **Check valve with vacuum breaker.**
- **Thermostatic mixing valve on DHW**
- **Electric heating elements**
- **ULTRA SMART™ control.**

Expansion tank is not included. This component must be sized according to the heating system.

WARNING

The COMBOMAX ULTRA electric boiler should not be located in an area where leakage from the tank or water connections will result in damage to the adjacent area or to lower floors of the structure. When such areas cannot be avoided, a suitable drain pan or non-flammable catch pan, adequately drained, must be installed under the boiler. The pan must be connected to a drain.

Section 3 : INSTALLATION

WARNING

The manufacturer's warranty does not cover any damage or defect caused by installation or attachment or use of any special attachment other than those authorized by the manufacturer into, onto, or in conjunction with the water heater. The use of such unauthorized devices may shorten the life of the water heater and may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices.

3.1 SAFETY MEASURES

All domestic and commercial installations will include a pressure relief valve limiting the operating pressure to 207 kPa (30 psi).

This COMBOMAX ULTRA electric boiler is designed for a maximum operating temperature of 88°C (190°F). It is designed for hot water heating system only. When allowed by local regulation a 50% water and propylene-glycol blend may be used on installation with fresh water supply pressure above 240 kPa (35 psi). A particular check valve avoiding back flow to potable water may be required by local authorities.

3.2 LOCATION

The COMBOMAX ULTRA boiler should be installed in a clean, dry location. Long hot water lines should be insulated to conserve water and energy. The boiler and piping should be protected from exposure to freezing.

The COMBOMAX ULTRA boiler must be installed levelled and vertically. Adjustable legs allow for levelling and stability.

The COMBOMAX ULTRA boiler must be located or protected so as not to be subject to physical damage, for example, by moving vehicles, area flooding, etc.

All models can be installed on combustible floors and in alcoves. If the boiler is to be installed in a restaurant or other location where the floor is frequently cleaned, it must be elevated to provide at least 150 mm (6") clearance from the floor as per NSF International recommendations.
The room temperature must be maintained between 10°C (50°F) and 32°C (90°F).

3.3 CLEARANCES

The minimal clearances required for proper inspection and servicing are as follows. Supplementary clearances could be required for piping installation.

Table 3: Minimum clearances required

Left side	0 mm/ 0 ''
Right side	0 mm/ 0 ''
Top	127 mm / 5''
Front*	75 mm / 3''
Back	0 mm/ 0 ''

*If the installation is inside a closet with an access door, ventilation openings could be required to maintain the ambient temperature below 32°C (90°F).

3.4 PIPING INSTALLATION

Make sure that the installation complies with one of the configuration shown below and that the water circulation is done in the right way.

Figure 1: Possible installation configurations

3.5 BOILER COMPONENTS

Figures 2 and 3 show various components of the COMBOMAX ULTRA electric boiler. Figures 4, 5 and 6 shows some installation drawings of the boiler.

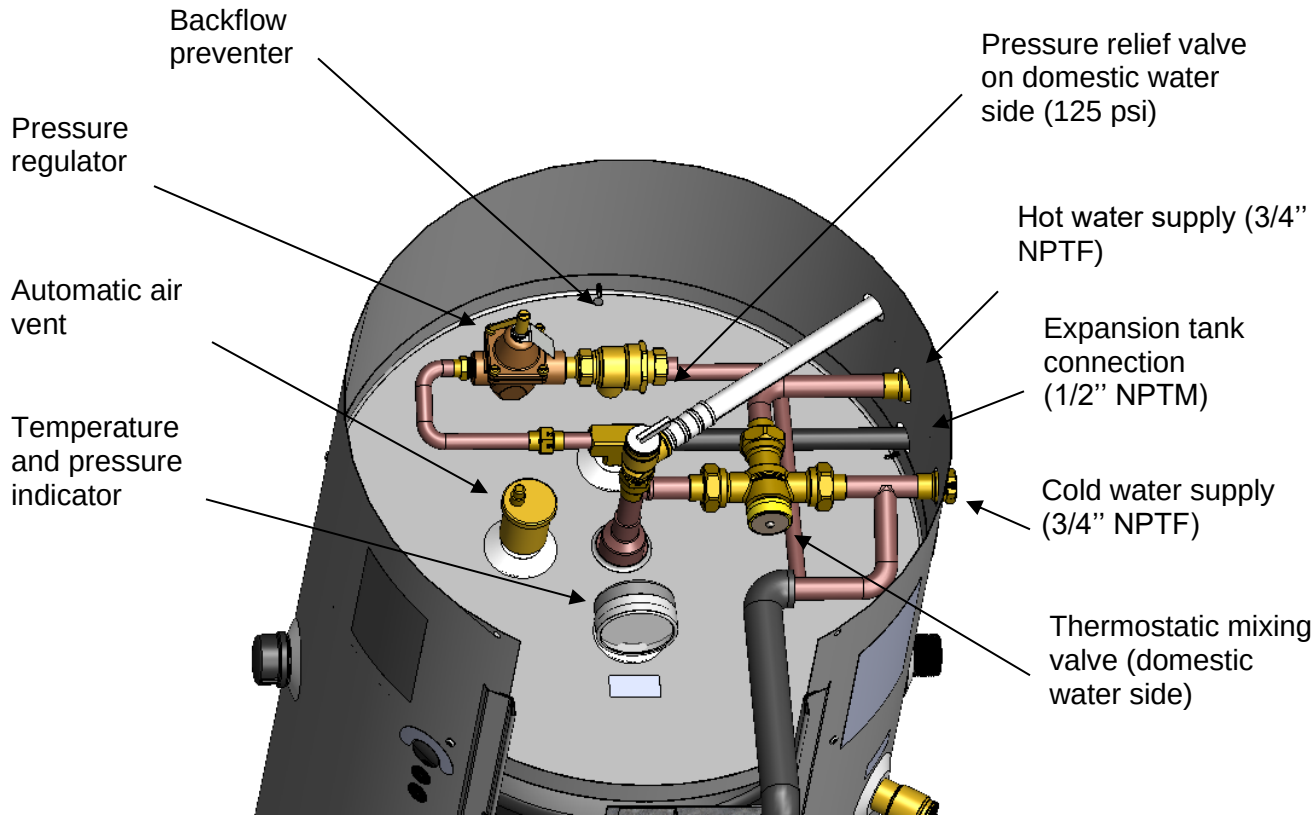


Figure 2: Components identification and location (Upper Compartment)

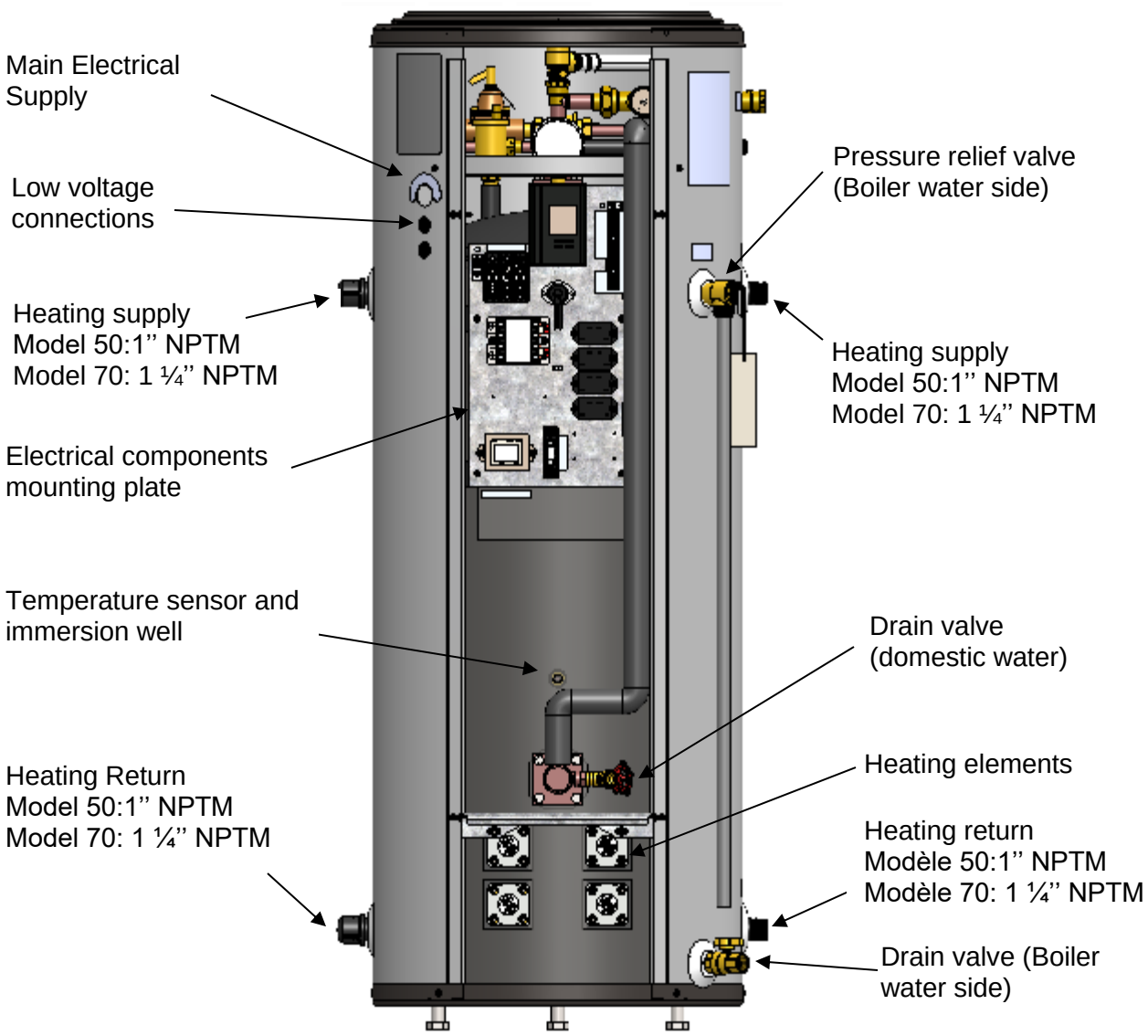


Figure 3: Components identification and location (Front Compartment)

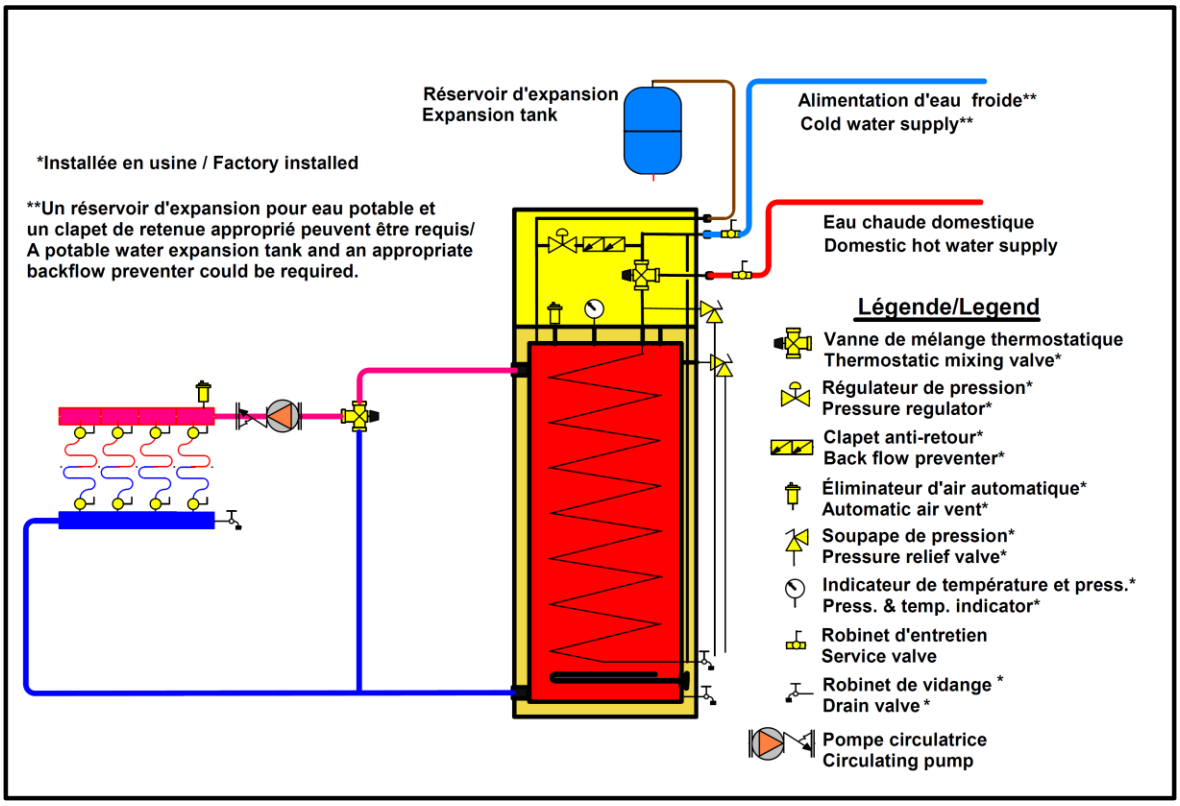


Figure 4: Installation drawing for radiant floor.

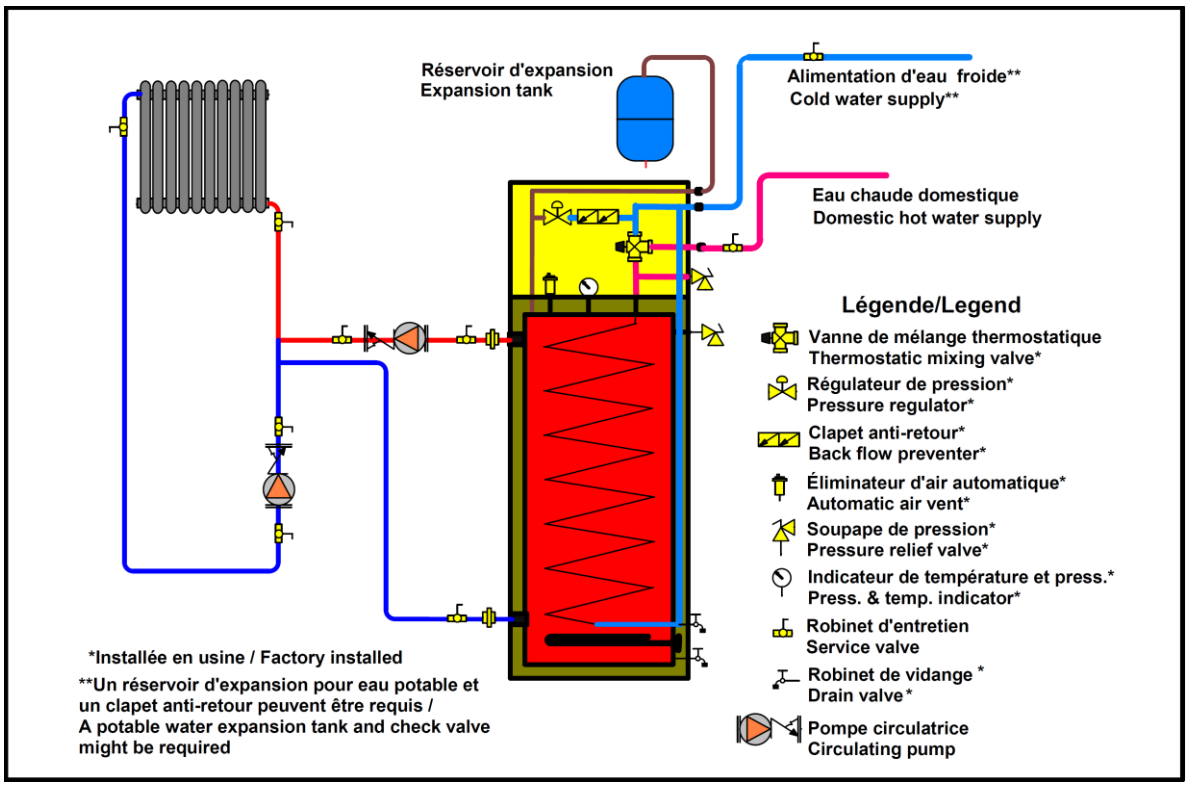


Figure 5: Installation drawing for radiators.

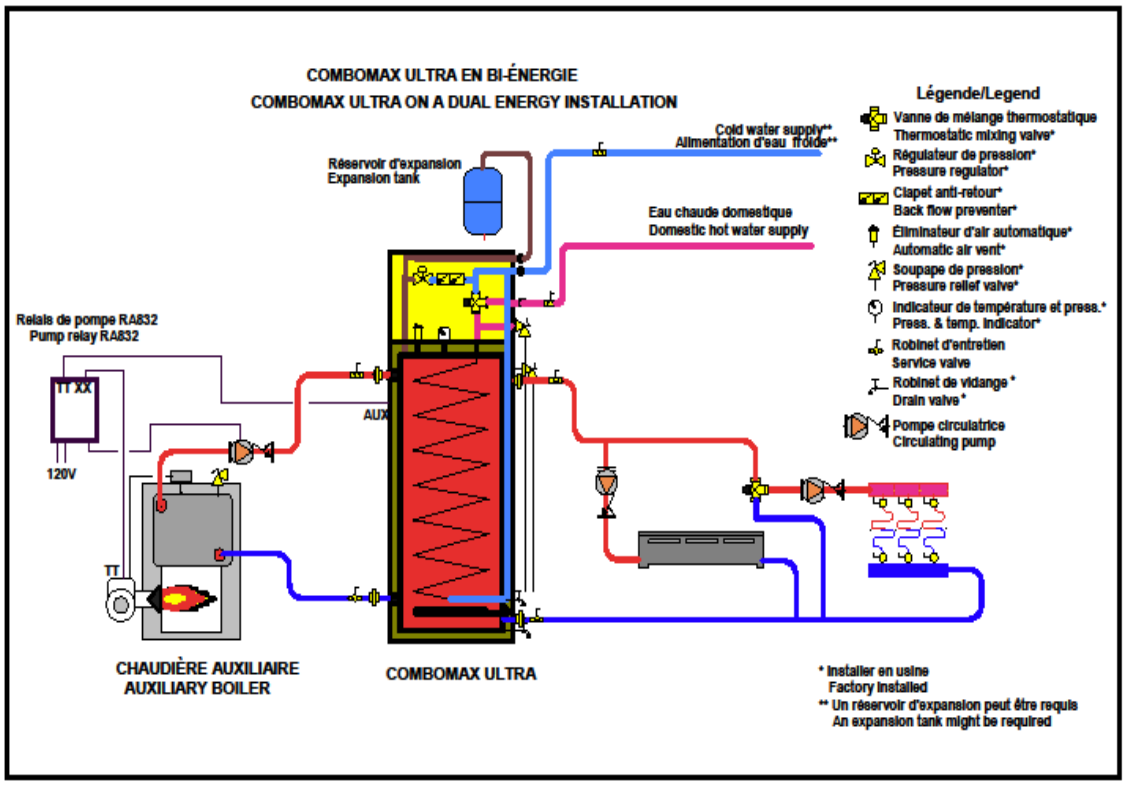


Figure 6: Installation drawing in dual-energy

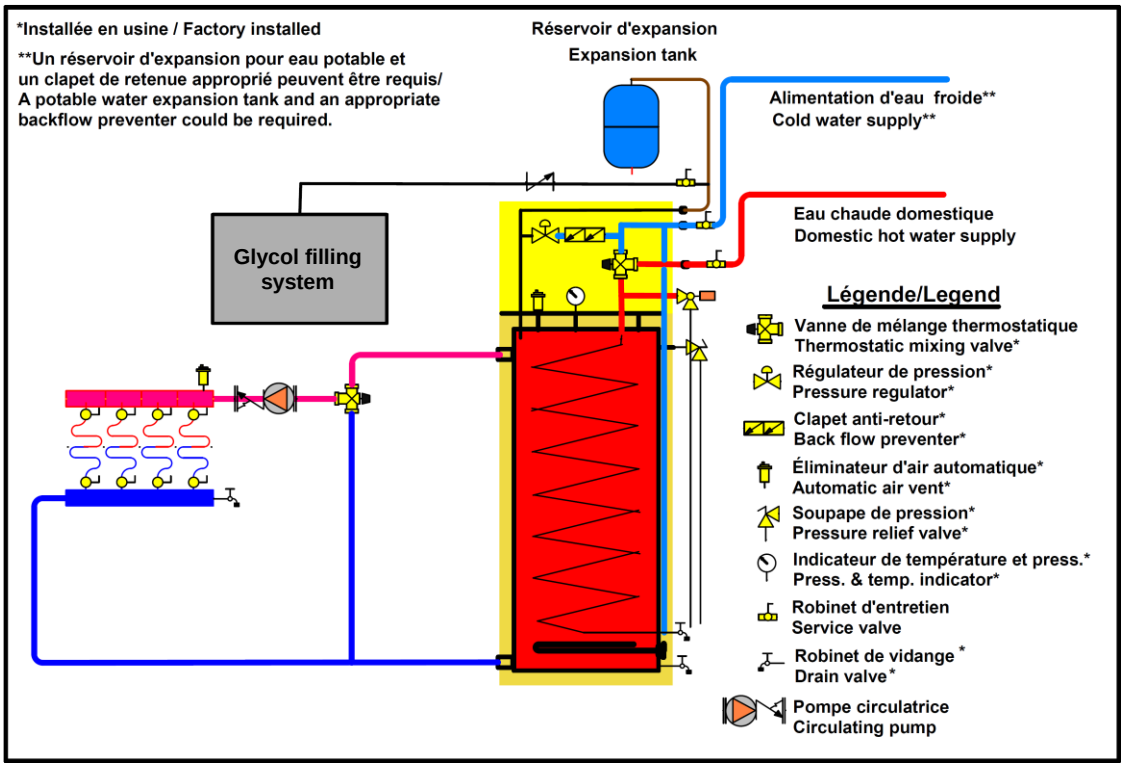


Figure 7: Installation drawing for radian floor with glycol filling system

3.6 SYSTEM SETUP

Figures 2 to 6 indentify and show location of the different components. They also provide typical heating system installation. External components location may vary in order to accommodate specific installation and local codes and regulation.

3.7 HEATING WATER CIRCUIT

3.7.1 Connecting the heating water piping

The boiler heating supply and return connections are located on the left or right side and are 1" NPTM for Model 50 and 1-¼'' NPTM for model 70. The connections at the left or right can be used. The important thing is that the fluid circulation must be made from the bottom to the top (see fig.1)

Unions are recommended on the inlet and outlet pipes to disconnect the water heater easily for servicing if necessary.

Dielectric (insulating) unions should be used if copper-steel connections are made.

Insulate all pipes containing hot water, especially in unheated areas.

Never plug the pressure relief valve to avoid creating a hazardous situation.

3.7.2 Flow-check valve

If the heating system uses a single or multiple circulator without motorized zone valves, **a flow-check valve must be installed** to avoid all possibility of gravity flow and heat loss during non-draw periods. Modern circulators are typically provided with spring loaded check valve that will provide adequate protection.

If the heating system uses motorized zone valves, these will provide adequate protection.

3.7.3 Pressure relief valve

The boiler is delivered with a factory installed tank pressure relief valve set at 207 kPa (30 psi).

NEVER replace the pressure relief valve by a higher set pressure one.

Connect the outlet of the relief valve downward toward a safe location.

Relief valve outlet pipe diameter must not be of smaller diameter than the relief valve outlet. The oulet pipe end must be visible in order to observe any relief incident and be protected from freezing.

NEVER cap or plug a pressure relief valve outlet.

The pressure relief valve is a safety apparatus and preventing its proper operation may cause death, injury or property damage.

3.7.4 Operating pressure control & expansion tank

The boiler is equipped with a factory installed, pressure regulating make-up water equipped with a flow check valve. This make-up water allows filling of the boiler tank and the heating system. It will also maintain a minimal operating pressure cold pressure of 83 kPa (12 psi). When operating the COMBOMAX ULTRA and the heating system, pressure will vary between 83 kPa and 193 kPa (12 psi to 28 psi). The operating pressure is affected by the type of heating system and the size of the expansion tank installed.

The expansion tank is used to absorb the increase of water volume from the boiler and the system when it is working.

The model selection should be based on the maximum working temperature and the water volume of all the system. For example, a system with radiators contains much more volume than a baseboards system. Likewise, the Combomax Ultra also contains an important volume of water that has to be added:

Combomax Ultra 50 : 48 usgal
Combomax Ultra 70 : 71 usgal

With this information, the installator or distributor should be able to make an appropriate selection.

Here are some minimal recommendations for different types of heating systems.

Combomax Ultra	Baseboards	Radiant floor	Cast-iron radiators
Combomax Ultra 50	#30	#30	#60
Combomax Ultra 70	#60	#60	#90

The expansion tank is generally installed on the wall or ceiling and directly connected on the ½ NPTM nipple provided on the boiler. It also has to be well supported.

3.7.4.1 Installation with glycol filling system

If a glycol filling system is added, as shown on figure 7. The filling pressure shall be set over 83 kPa (12 psi) in order to prevent glycol dilution.

The expansion tank selection shall also be reviewed upwards as the base pressure in the tank will be higher than with regular water (83 kPa (12 psi) normal base pressure).

3.7.5 Automatic Air Vent

The COMBOMAX ULTRA has a factory installed tank automatic air vent. This air vent function is to vent any air present in the tank.
For proper operation, do not cap or block the air bleeder outlet.
For proper operation of the heating system, it may be necessary to add air bleeders to the heating system circuits.

3.7.6 Heating pump

A circulating pump not included, is required for the heating system to deliver heating fluid to the different heating zones. Sizing of the pump is base on the heating system configuration and is done by the installator (heating technician, plumber).

3.7.7 Low temperature heating (Radiant floor)

A thermostatic mixing valve or a similar device, offering the same function, must be installed on a heating system operating at less than 65°C (150°F) like radiant floor system. The thermostatic mixing valve limit the heating fluid supplied to the system at a preset appropriated temperature, by mixing hot heating fluid supplied by the COMBOMAX ULTRA to the relatively cold heating system fluid coming back from the radiant floor (see figure 6).

3.8 DOMESTIC HOT WATER CIRCUIT

Please refer to figure 1 and 2 for components identification and location of the domestic water circuit.

3.8.1 Connecting the domestic hot water piping

The COMBOMAX ULTRA boiler HOT WATER OUTLET and the COLD-WATER INLET connections are clearly marked. They are located on the right side (when facing the boiler) and are of ¾" NPTF type.
Use only clean copper or approved plastic pipe for water connections. Local codes or regulations should govern the exact type of material to be used.
Insulate all pipes containing hot water, especially in unheated areas.
To facilitate the mixing valve ajustment, it is recommended to install a thermometer on the domestic hot water supply of the COMBOMAX ULTRA.

3.8.2 Expansion tank on the cold-water supply line

Check if there is a device with a backflow preventer on the cold-water supply line before the tank.
Such items may create a closed system and prevents the water as it is being heated from expanding back into the cold-water supply line. Unless there is a device to absorb this volume increase, the resulting pressure increase could cause the relief valve operate during a heating cycle. In the long run, this operation could cause premature failure of the relief valve and possibly of the water heater itself.
If plumbing devices on which the Combomax Ultra is installed don't prevent water hammer on the network, it could cause the relief valve to open on the domestic hot water side.
Replacing the relief valve will not correct the problem. One method of preventing pressure build-up is to install a domestic water expansion tank on the cold-water supply line before the Combomax Ultra boiler unit. Contact your installing contractor, supplier or local plumbing inspector.

3.8.3 Domestic hot water pressure relief valve

The COMBOMAX ULTRA boiler is factory equipped with a pressure relief valve installed on the domestic hot water outlet. This pressure relief valve is set at 860 kPa (125 psi). Connect both the domestic hot water (862 kPa / 125 psi) and the tank heating system (207 kPa / 30 psi) pressure relief valves downward toward safe location.
Relief valve outlet pipe diameter must not be of smaller diameter than the relief valve outlet. The oulet pipe end must be visible in order to observe any relief incident and be protected from freezing.

3.8.4 Thermostatically controlled mixing valve (included)

The COMBOMAX ULTRA boiler is factory equipped with a thermostatically controlled mixing valve that reduce the risk of scald injury by lowering the domestic hot water temperature at the heat exchanger outlet, by mixing cold fresh water to the hot water coming out of the heat exchanger.
In order to adjust the mixing valve, hot water must be consumed. (See section 5.6)

3.9 BOILER WIRING:

3.9.1 Main power supply

The electrical wiring and grounding must conform to local codes or, in their absence, to the National Electrical Code. Local codes have authority for wiring and electric breaker sizing. It is the electrical technician responsibility to ensure that the installation meets the applicable codes requirements.

On installation where a 120 Vac power is required for a heating pump and other outboard components, main power supply to the COMBOMAX ULTRA must be a 120/240 Vac, single phase, 60 Hz using 3 conductors (L1 – L2 – N) and a ground wire.

On installation where no 120 volts components such a pump need to be powered by the COMBOMAX ULTRA, Power supply could then be supplied with only two conductors L1-L2 with a ground wire.

Electrical current draw for the boiler being installed is indicated on the boiler's name plate. The electrical technician needs this information in order to determine the proper electrical breaker and cable. The cable can be either aluminum or copper, but must be adequate for 75°C operation.

3.9.2 Heating pump wiring

If the building heating system is designed for a single pump operation and the electrical power to the boiler is 120/240 Vac 3 conductors and ground type, the pump (1/6 HP max) can be directly connected to the boiler electric panel "PP" terminals. The boiler control will operate the pump as soon as a heat demand is signalled by the space thermostat. The control would shut the circulating pump off if the tank water temperature is below the minimal set point, giving priority to the domestic hot water over building heat.

If the building heating system is made of multiple circulating pumps a zoning relay may be used.

3.9.3 Domestic hot water priority pump wiring

If the domestic hot water prioritisation function is used, the boiler electrical panel **P_1** and **P_2** 120VAC terminals can be used (5 amps or 1/6 hp) to shut the power to the pump or pumps when domestic hot water priority is needed (When domestic hot water and heating demands occur and the boiler can't keep the temperature setpoint that has been set).

For a one pump system refer to sections 3.9.4 and 3.10

For a multiple pump system with a switching relay box with all zones wired (Relay swtich with ZC and ZR terminals, TACO type for example, see Figure 8):

- Put a jumper between terminals **W** and **R**
- Wire terminal **P_1** to the **ZC** terminal on the relay switch
- If amperage is higher than 5A, an external relay may be used in order to allow more amperage. Wire the **P_1** and **P_2** terminals to a 120VAC coiled relay to get an external 120VAC to the **ZC** terminal on the switching relay (see Figure 9).

For a multiple pump system with a switching relay with free priority zone on the relay (see Figure 10)

- Put a jumper between terminals **W** and **R**
- Wire **P_1** and **P_2** terminals to the coil of a normally closed relay (120VAC coil, 24VAC contact)
- Wire the **R** and **W** terminals of the priority zone to the relay contact.

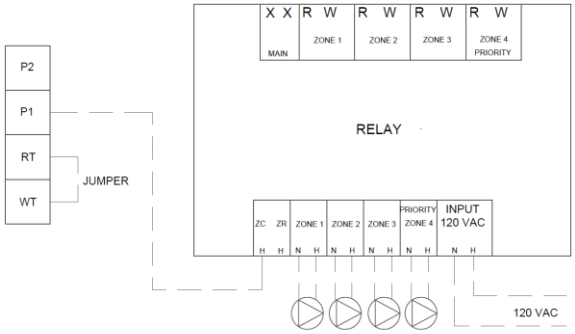


Figure 8 : Multiple pump system with all zones wired and free ZC ZR terminals (total current less than or equal to 5A)

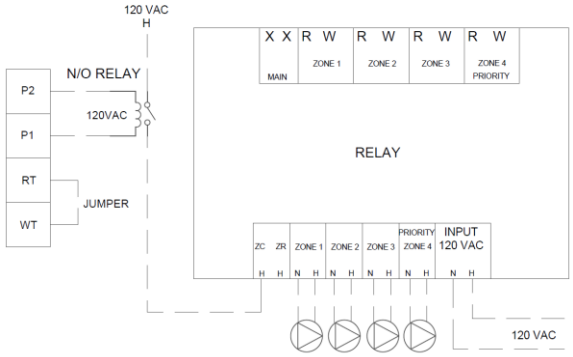


Figure 9 : Multiple pump system with all zones wired and free ZC ZR terminals (total current over 5A)

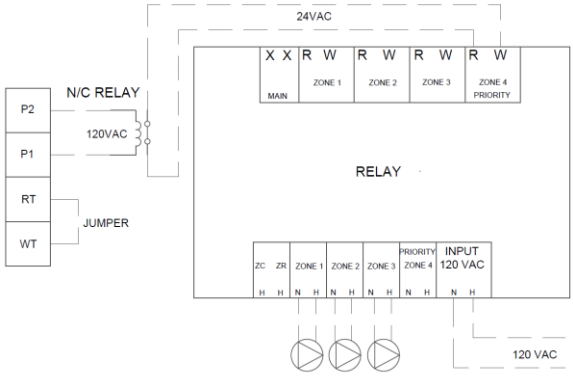


Figure 10 : Multiple pump wiring with free priority zone on switching relay

3.9.4 Room thermostat wiring

3.9.4.1 Single heating zone

Using a two (2) wires central thermostat, connect the low-voltage thermostat dry contact to the **W** and **R** terminals on the COMBOMAX ULTRA electrical panel.

Using a three (3) wires central thermostat, connect the **C**, **W** and **R** terminals to the boiler electric panel corresponding terminals.

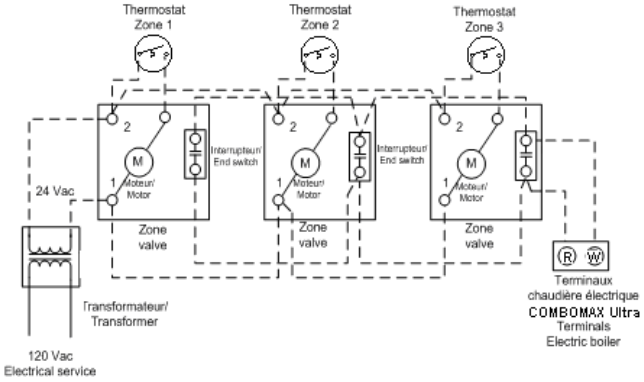
DO NOT apply external current to these terminals.

3.9.4.2 Zone valve zoning

Connect the low-voltage thermostat to the zone valve motor. The components must wired such as, upon a heating demand from a thermostat, only the corresponding zone valve will be actuated and will activate the *COMBOMAX ULTRA.* Connect the zone valve dry end switch contact to the **W** and **R** boiler electrical panel terminals

If the zone valves are 24Vac supplied from boiler terminals R&C, the total maximum external load shall not exceed 20Va.

N.B.: The 24Vac supply of the boiler must not be mixed with another 24Vac external supply



The 24 Vac power supply transformer used must be powerful enough to supply simultaneously all zone valves.

N.B.: If the voltage is supplied from R&C boiler terminals, the total load shall not exceed 20Va.

3.9.5 Dual-Energy wiring with an auxiliary boiler

The COMBOMAX ULTRA boiler is designed to enable the installation on Dual-energy applications without the need to install an interface controller between the boilers and the electricity supplier authorization signal. Upon the reception of that signal (dry contact), the COMBOMAX ULTRA will select the appropriate heating mode and will activate the required boiler. If the heating distribution system is equipped with a single pump connected to the **P_1 P_2** terminals of the boiler, it will be activated on heat calls from the thermostat, whichever heating mode selected.

To allow the operation in dual-energy:

- Open the front access panel to the boiler electric compartment. Remove the screw at the bottom of the controller, raise the upper section of the controller. You will see a switch at the back of the controller having two positions “ELECT” and “Bi-Energ”. Position the switch at “Bi-Energ” (see fig.7)
- Install a 2 wire 18ga cable between the contact (N/F close contact to allow the operation in electricity) of the external device making the selection of the operating mode and terminals **E_1 E_2** (**For Quebec**: Red **R** wire and green **V** wire of Hydro-Quebec)
- Install a pump relay (such as Honeywell RA832 or TACO SR501-4) near the auxiliary boiler. (see fig.8)
  - The relay can be supplied by an external 120V source or directly from the boiler fuse and P2 neutral.
  - Install a 2 wire 18 ga cable between the “**AUX**” of the COMBOMAX ULTRA and “**TT**” of the relay RA832 (or R and W of relay TACO 501-4)
  - Connect the auxiliary pump wires on the relay terminals.
  - Connect the “**TT**” of the auxiliary boiler on the “**XX**” relay RA832 terminals (see fig.5) or 6-5 of the relay TACO 501-4 (see fig.8)
  - The auxiliary boiler will be controlled by his its own operation and limiting controller.

  Do not connect the main electrical supply of the auxiliary boiler to AUX terminals.

Figure 11: Back of the Controller

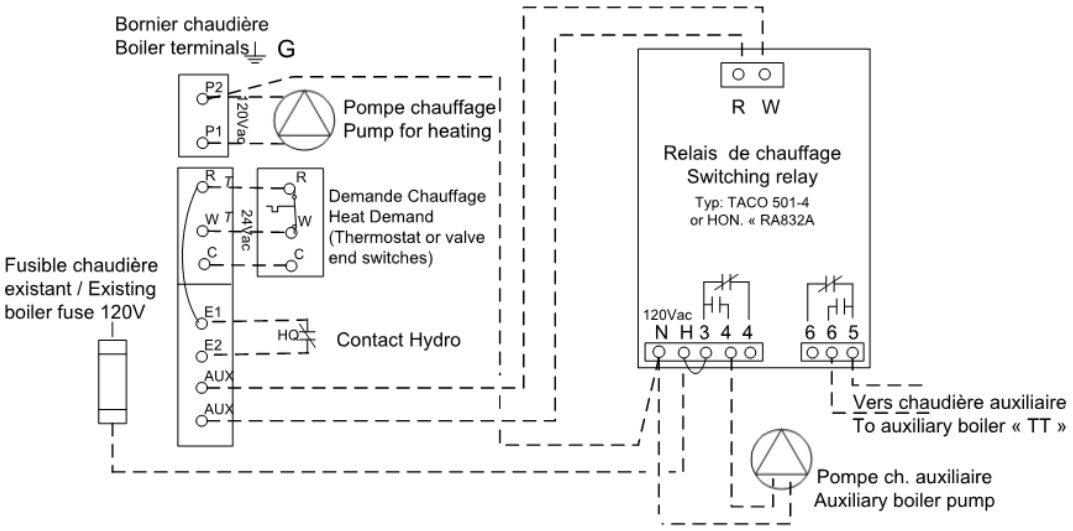
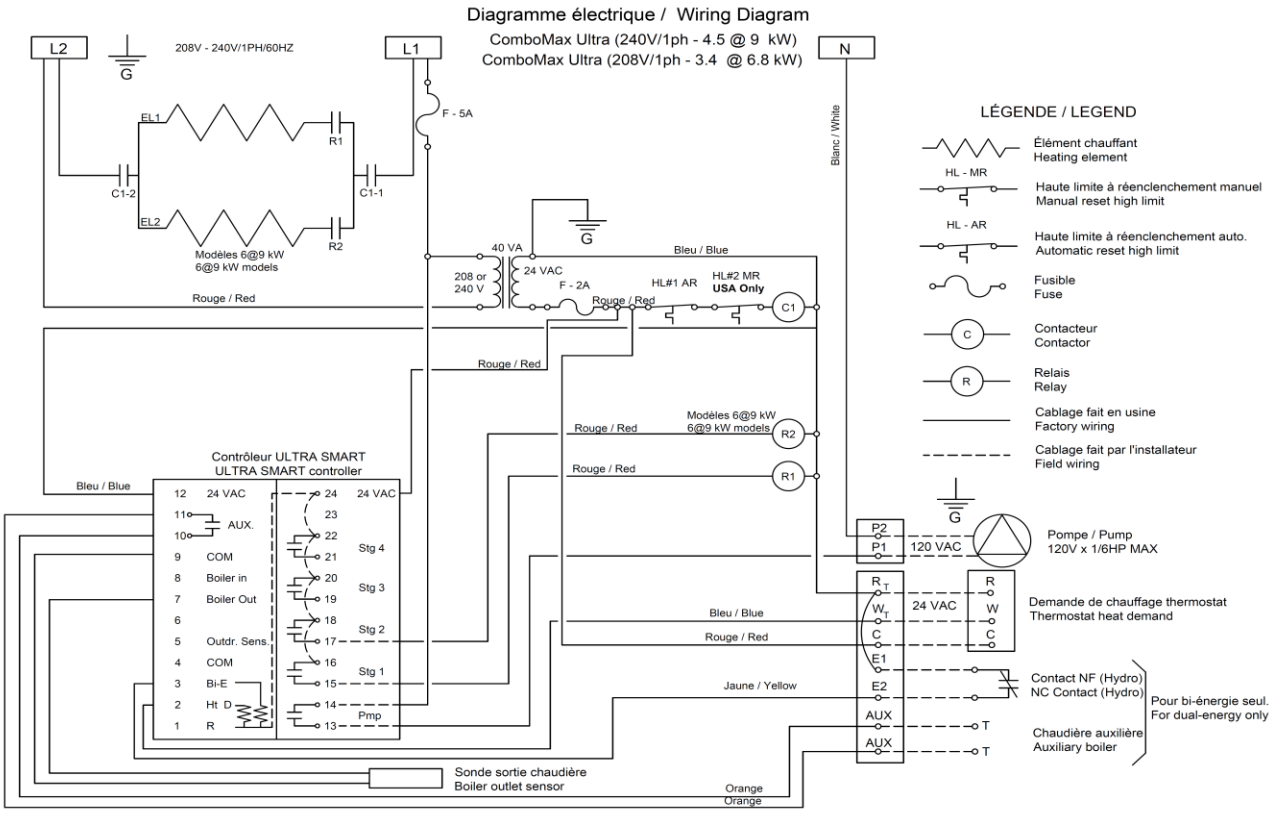
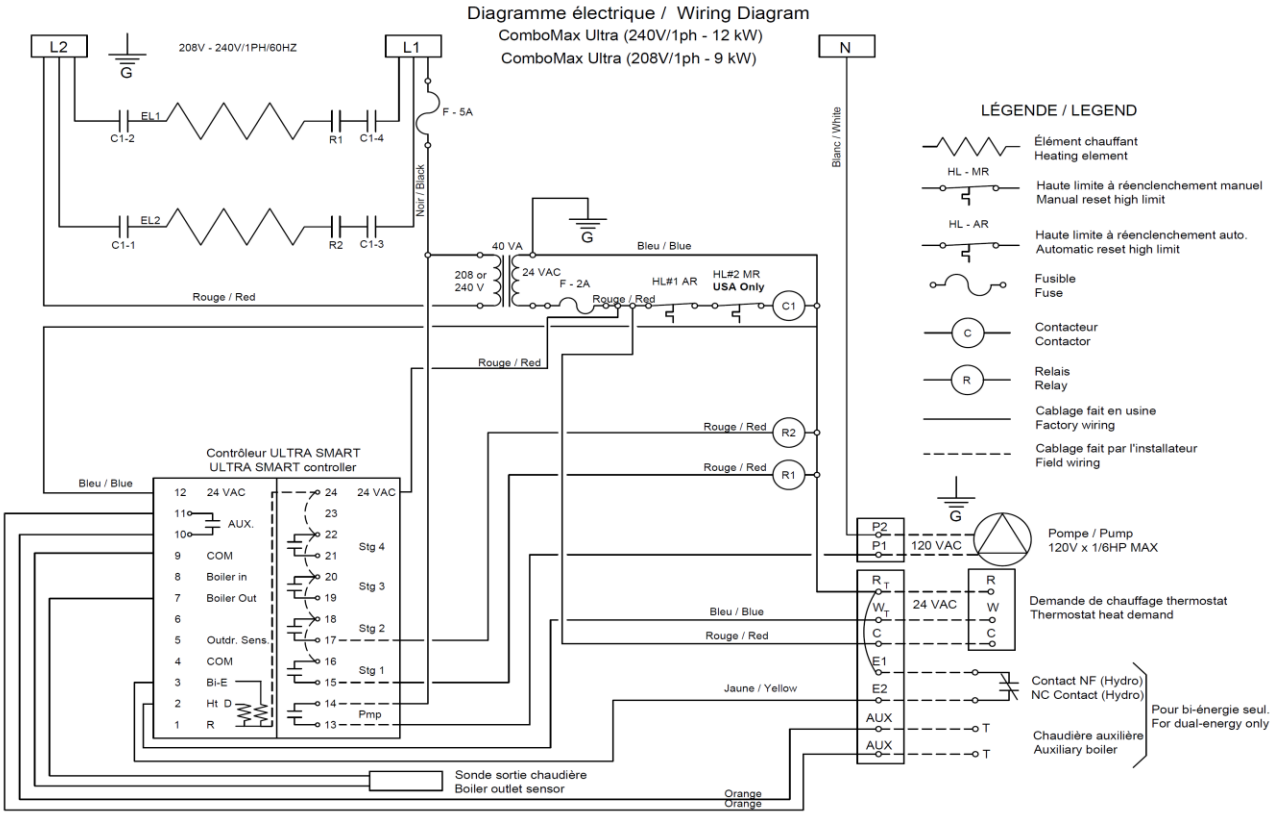


Figure 12: Wiring diagram in Dual-Energy

3.10 WIRING DIAGRAMS





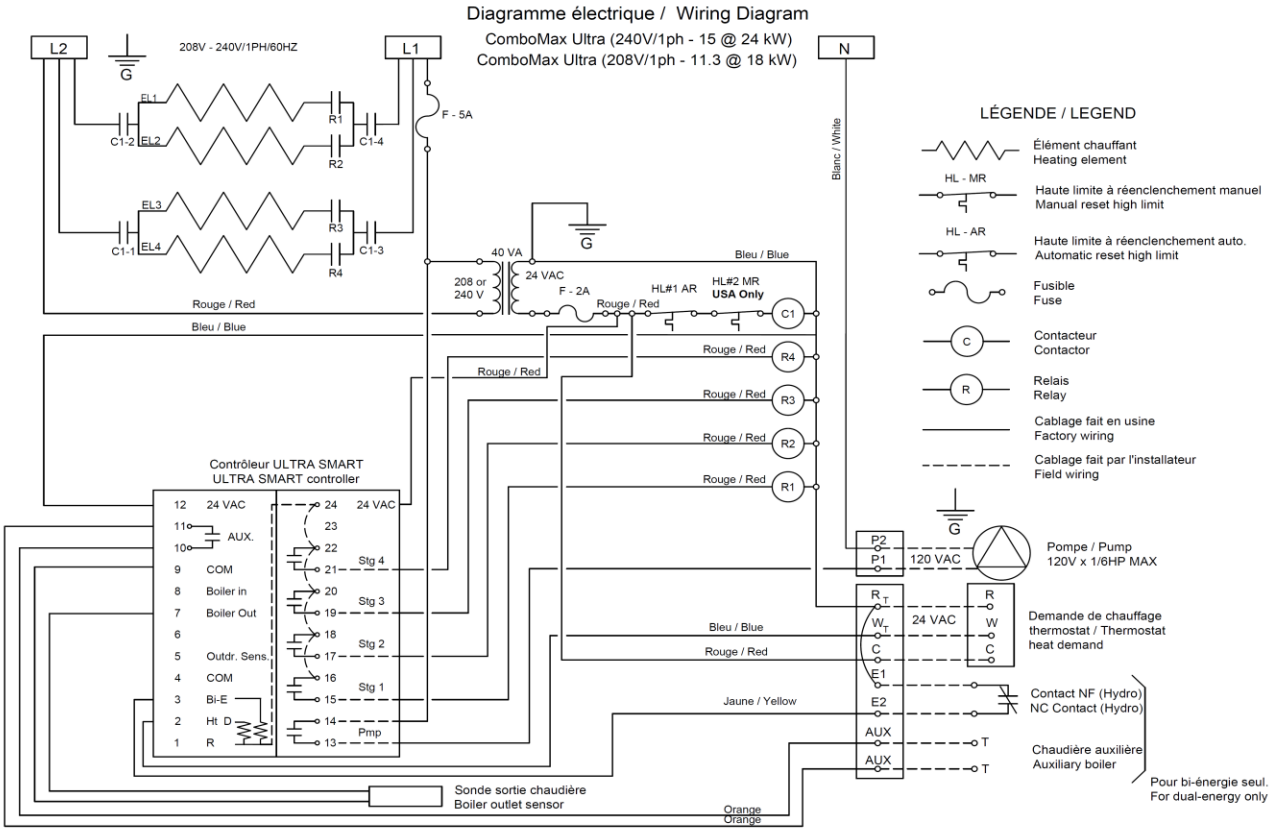


Diagramme électrique / Wiring Diagram
ComboMax Ultra (240V/1ph - 15 @ 24 kW)
ComboMax Ultra (208V/1ph - 11.3 @ 18 kW)
L2
L1
N
208V - 240V/1PH/60HZ
G
EL1
EL2
EL3
EL4
R1
R2
R3
R4
C1-2
C1-4
C1-1
C1-3
F - 5A
40 VA
24 VAC
208 or 240 V
F - 2A
HL#1 AR
HL#2 MR
USA Only
C1
Rouge / Red
Bleu / Blue
Blanc / White
Jaune / Yellow
Orange
Contrôleur ULTRA SMART
ULTRA SMART controller
12 24 VAC
11
10 AUX.
9 COM
8 Boiler in
7 Boiler Out
6
5 Outdr. Sens.
4 COM
3 Bi-E
2 Ht D
1 R
24 24 VAC
23
22
21 Stg 4
20
19 Stg 3
18
17 Stg 2
16
15 Stg 1
14
13 Pmp
Sonde sortie chaudière
Boiler outlet sensor
P2
P1
120 VAC
Pompe / Pump
120V x 1/6HP MAX
R T
W T
C
E1
E2
AUX
AUX
24 VAC
R
W
C
Demande de chauffage
thermostat / Thermostat
heat demand
Contact NF (Hydro)
NC Contact (Hydro)
Chaudière auxilière
Auxiliary boiler
T
Pour bi-énergie seul.
For dual-energy only
LÉGENDE / LEGEND
Élément chauffant
Heating element
HL - MR
Haute limite à réenclenchement manuel
Manual reset high limit
HL - AR
Haute limite à réenclenchement auto.
Automatic reset high limit
Fusible
Fuse
Contacteur
Contactor
Relais
Relay
Cablage fait en usine
Factory wiring
Cablage fait par l'installateur
Field wiring

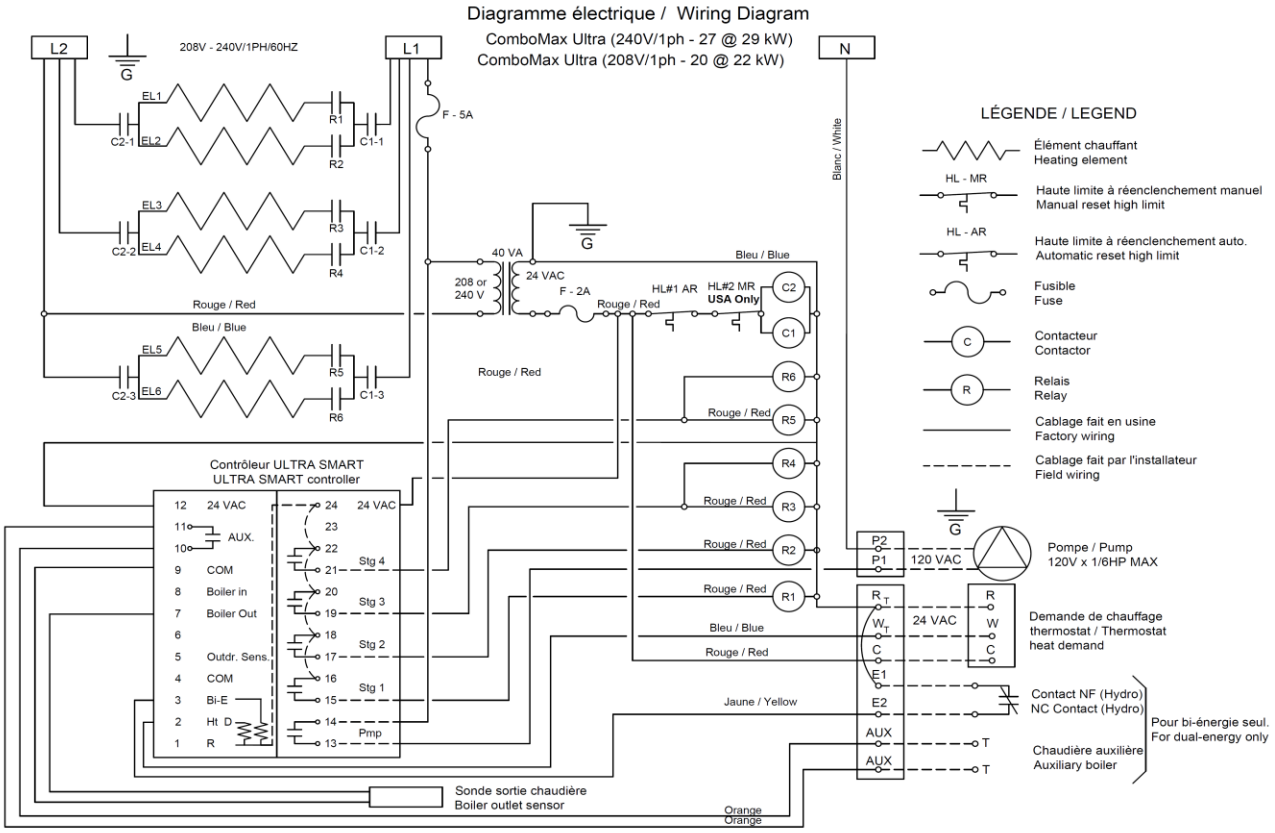


Diagramme électrique / Wiring Diagram
ComboMax Ultra (240V/1ph - 27 @ 29 kW)
ComboMax Ultra (208V/1ph - 20 @ 22 kW)
L2
L1
N
208V - 240V/1PH/60HZ
G
EL1
EL2
EL3
EL4
EL5
EL6
R1
R2
R3
R4
R5
R6
C2-1
C2-2
C2-3
C1-1
C1-2
C1-3
F - 5A
40 VA
24 VAC
208 or 240 V
F - 2A
HL#1 AR
HL#2 MR
USA Only
C2
C1
Rouge / Red
Bleu / Blue
Blanc / White
Jaune / Yellow
Orange
Contrôleur ULTRA SMART
ULTRA SMART controller
12 24 VAC
11
10 AUX.
9 COM
8 Boiler in
7 Boiler Out
6
5 Outdr. Sens.
4 COM
3 Bi-E
2 Ht D
1 R
24 24 VAC
23
22
21 Stg 4
20
19 Stg 3
18
17 Stg 2
16
15 Stg 1
14
13 Pmp
Sonde sortie chaudière
Boiler outlet sensor
P2
P1
120 VAC
Pompe / Pump
120V x 1/6HP MAX
R T
W T
C
E1
E2
AUX
AUX
24 VAC
R
W
C
Demande de chauffage
thermostat / Thermostat
heat demand
Contact NF (Hydro)
NC Contact (Hydro)
Chaudière auxilière
Auxiliary boiler
T
Pour bi-énergie seul.
For dual-energy only
LÉGENDE / LEGEND
Élément chauffant
Heating element
HL - MR
Haute limite à réenclenchement manuel
Manual reset high limit
HL - AR
Haute limite à réenclenchement auto.
Automatic reset high limit
Fusible
Fuse
Contacteur
Contactor
Relais
Relay
Cablage fait en usine
Factory wiring
Cablage fait par l'installateur
Field wiring

Section 4 : CONTROL SET UP

4.1 INTRODUCTION

The COMBOMAX ULTRA boiler is designed to be used in hydronic heating application where the heating fluid passes through the boiler before being supplied to the heating system (parallel system). It is also designed to provide domestic hot water needs to the building.

The COMBOMAX ULTRA ULTRA SMART™ control's main function is to maintain the boiler water temperature between preset values by operating the heating element(s). It is also capable of directly managing one heating system circulating pump.

4.2 LIQUID CRYSTAL DISPLAY (LCD) INFORMATION

The Ultra Smart™ control LCD shows operating functions and values and allows you to adjust them.

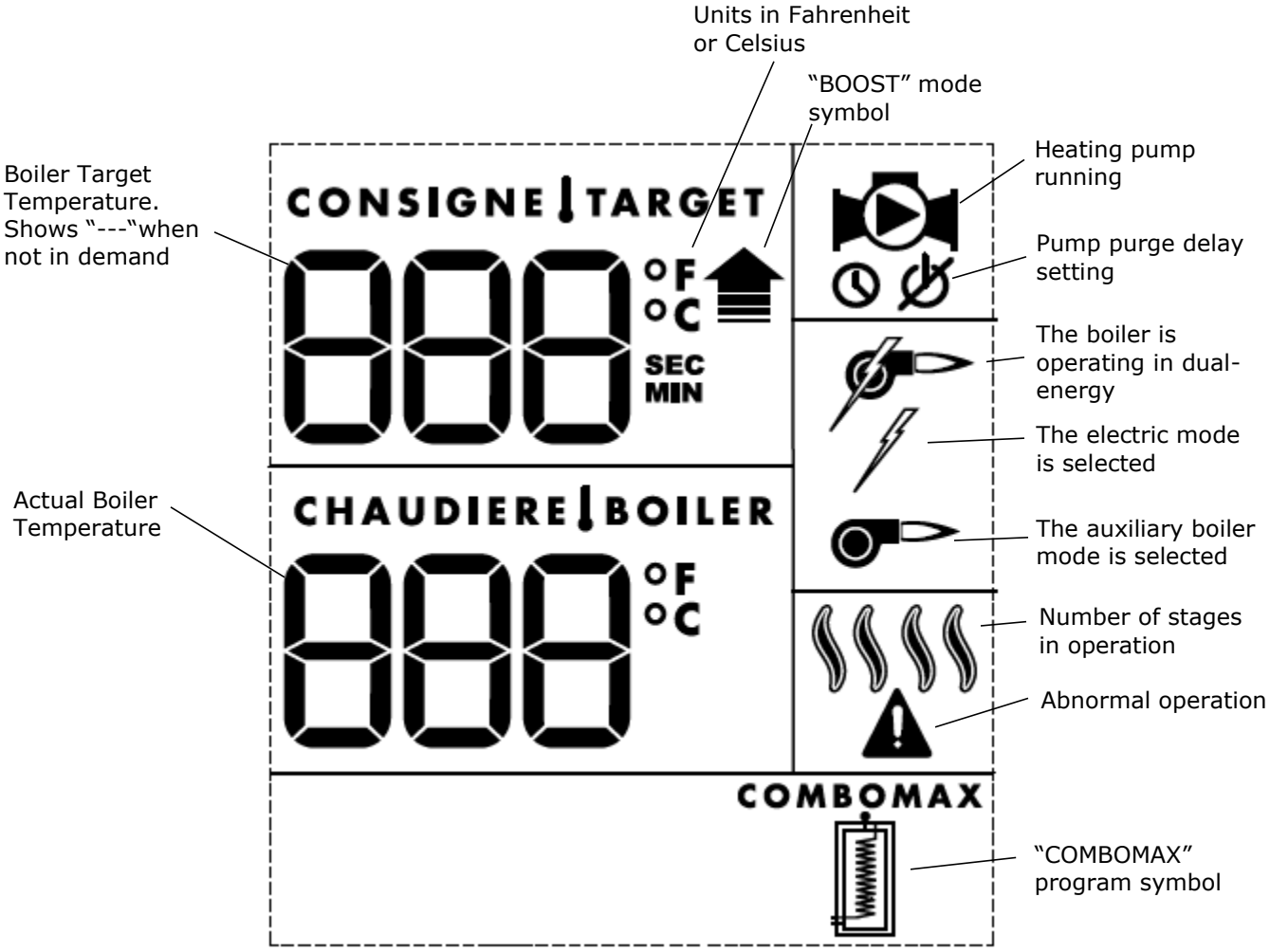


Figure 13: UltraSmart Controller Display

4.3 INTERFACE OPERATION

The Ultra Smart™ control access is through four (4) keys.

Key provides access to the configuration menu and is also used as an « ENTER key » to confirm the selection. The two (2) rocking keys - + allow items selection or value change.

The key light-up the LCD back screen. The screen will remain lighted until the key is depressed again. Depressing any other keys will light-up the LCD for a default value of 10 sec. Depressing the key will turn the LCD lighting OFF.

Figure 14: UltraSmart Controller

4.4 COMBOMAX MODE OPERATION

The Ultra Smart™ control manages both the heating element(s) and circulation pump. It tries to maintain the boiler tank temperature around the target temperature shown on the display. When the tank temperature decrease under the target temperature, the heating element(s) is turned ON and modulate trying to maintain the target temperature. On units equipped with more than one heating element, the heating elements will be used in sequence in order to insure equal aging.Heating stages are indicated on the LCD by the darkening of the icon.

On a heat demand, the control will turn the circulating pump ON if the tank water temperature is high enough to satisfy the domestic hot water demands. The following symbol will appear on the upper right of the display. (see section on domestic hot water prioritisation). The controller will stop the circulating pump once the space heat demand is satisfied or if the boiler temperature drops too much (see section 4.5)

4.5 DOMESTIC HOT WATER DEMAND PRIORITISATION.

The Ultra Smart™ control can manage both heat and domestic hot water demand. It's programmed to prioritize domestic hot water production over building heating in case of low tank water temperature. The control accomplish this operation by turning the heating circuit circulation pump OFF until the tank water temperature return to normal.

The value of the tank temperature decrease under the established target temperature shown on the display is adjustable on the configuration menu of the control.

This function has minimal impact on the building temperature since typically domestic hot water demands are of short enough duration that the building temperature will not be affected.

4.6 CONTROL SET-UP

Since every application presents different heating and domestic hot water needs, it is important to properly set-up the COMBOMAX ULTRA for the application in order to maximise its performance.

In order to set-up the COMBOMAX ULTRA control, the installation technician has to access the Ultra Smart™ control configuration menu in pressing on the for 2 sec. until the first menu is displayed. Selecting the function or the value to adjust is by using the rocking keys - +. Pressing the key confirm your selection an brings you to the next menu.

Table 4 below shows the menus that will appear. If keys are not pressed for more than 15 sec. the controller will save the last changes and return to normal operation display. Scrolling to the end of the menus will also return to normal operation display.

In case of power failure, function set-up are saved and restored with when electrical power is returned.

4.7 OPERATION IN DUAL-ENERGY.

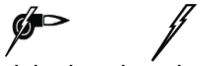
In Dual-energy mode, the display will indicate that this mode is active in showing the icon

If it is not shown, check the position of the switch located at the back of the controller. It must be set to "Bi-Energ" position (fig.7).

NOTE: The controller will have to be reset to save the new mode of operation. Just turn the power OFF and back ON to the unit.

Operation in Dual-energy with Electric

When the authorisation signal to operate in electricity is received, (close contact between E1&E2), the following icons will be shown.



The circulating pump and the heating elements will be activated according to the operating parameters established earlier.

Operation in Dual-energy with the auxiliary boiler

When the authorisation signal will be absent (open contact between E1&E2), the following icons will be shown.

Upon reception of a heat demand on terminals **R W** of COMBOMAX ULTRA boiler, terminals **P_1&P_2** will be energized at 120volts and the pump will be activated. At the same time, the contact will close on the "**AUX**" terminals to activate the auxiliary boiler. This boiler will be activated when there will be a heat demand to the **R W** terminals and/or when its temperature will be lower than the settings of its own temperature controls.

If a three way valve is used on the piping as shown in fig.6, it will change position when the contact will close on AUX terminals and it will be the end switch of the valve that will give the signal to the auxiliary boiler to come on. The water flow will then circulate only in the auxiliary boiler.

Manual selection for the electricity or auxiliary boiler mode.

If the user wishes to manually select the electricity or auxiliary boiler operation, it can be done in following the sequence below:

- Push on the  button for 6 sec. and the following icons will appear

  The selection of the dual-energy or electric only or auxiliary boiler only is made with the button. Once the selection has been made it will be registered by pressing the  or by waiting for 5 sec.

  If the electricity only or auxiliary boiler only has been selected, the corresponding icon and the  icons will blink to advise the user that an unusual heating mode has been selected.

Table 4 : Controller configuration

ITEM	DESCRIPTION	CHOIX	DEFAULT
°F °C	Select user preferred units.	°F or °C	°F
CONSIGNE TARGET 175 °F	If required, change the preset target temperature of the controller to the value required to adequately heat the building and supply all the domestic hot water needs of the user. The water temperature target set point is factory set at 80°C (175°F). Increasing the tank water temperature will increase the amount of energy available for supplying heating and domestic hot water demand.	50°F to 190°F	175°F
	Select the tank temperature drop required to stop the space heating pump during domestic hot water demands. Once the tank temperature will have dropped by the selected value, the circulating pump will be turn OFF momentarily until the tank water temperature is return to normal.	0FF or 5°F to 40°F	10°F

NOTE : Once operating values have been set, the controller will save them and return to normal operation display. The user can change the tank water temperature set point without accessing the configuration menu (see section 4.8)

4.8 USER ADJUSTED TANK TEMPERATURE SET POINT

The tank temperature set point can be adjusted without accessing the configuration menu or changing the installer original set-up.

By using the rocking keys - ▬▬ + .

Pressing one of the keys will cause a flashing “0” to be displayed. This zero indicates that the “user” differential value is zero. By using the - ▬▬ + keys, the user can input a temperature differential between the installer set point and the actual operation set point. The maximum user differential is ± 5°C (10°F).

The new user differential value will be display, flashing for 5 sec. before the LCD return to normal operation display.

Once completed, the new user differential value will be display in a flashing mode every time the rocking keys - ▬▬ + are pressed.

Section 5 : OPERATION

SAFETY PRECAUTIONS

Before operating the COMBOMAX ULTRA boiler, be sure to read and follow these instructions, as well as the warnings printed in this manual. Failure to do so can result in unsafe operation of the water heater resulting in property damage, bodily injury, or death. Should you have any problems reading, following or difficulty in understanding the instructions in this manual, STOP, and get help from a qualified person.

5.1 GENERAL SAFETY PRECAUTIONS

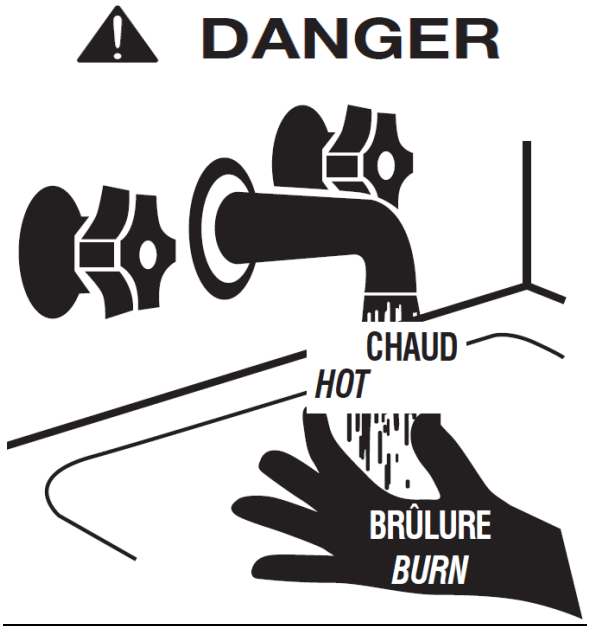
To meet building heating and domestic hot water needs, the controller on this boiler is adjustable up to 88°C (190°F) and regulate the temperature of tank. However, domestic hot water is not controlled by this controller but by the thermostatic mixing valve ajustment located in the upper section of the unit (see fig.2). Domestic hot water temperatures over 52°C (125°F) can cause severe burns instantly or death from scalds. It is recommended to set the control at 50°C (120°F) to start setting the mixing valve for domestic hot water. Then, the temperature may be gradually increased while continuing to adjust the mixing valve until the domestic water have reached the desired temperature.

Safety and energy conservation are factors to be considered when setting the operating temperature of the tank and domestic hot water. The most energy efficient operation will result when the temperature setting is the lowest that satisfies both requirements.

The following chart details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

TIME TO SCALDING VS TEMPERATURE RELATIONSHIP	
Temperature	Time to scalding
50°C (120°F)	Over 5 minutes
52°C (125°F)	1-1/2 to 2 minutes
54°C (130°F)	About 30 seconds
57°C (135°F)	About 10 seconds
60°C (140°F)	Less than 5 seconds
63°C (145°F)	Less than 3 seconds
66°C (150°F)	About 1-1/2 second
68°C (155°F)	About 1 second

With kind permission from the Shriners Burn Institute



There is a hot water scald potential if the thermostatically controlled mixing valve for reducing point-of-use water temperature is damaged, not properly working, removed or by-passed.

Be sure to properly ajust the temperature of the thermostatic mixing valve by putting a thermometer under a faucet and ajusting the valve knob at the desired temperature.

5.2 FILLING THE WATER HEATER TANK

⚠ WARNING

Do not turn ON the boiler unless it is filled with water. Do not turn ON the boiler if cold water supply shut-off valve is closed.

- Make sure the drain valve of the tank is closed.
- Open the cold-water valve supplying the boiler. Bleed the air from the tank by opening the pressure relief valve located on the side of the water heater tank while you are filling the tank. Close the pressure relief valve.
- Tank pressure should stabilise at a value of approximately 83 kPa (12 psi).
- Open the boiler service valve to the heating system. (If the heating system use motorized zone valves, these valves must be manually open. With the motorized valve open, start the circulating pump, check for leaks and repair as required. (If the pump is connected to terminals P1-P2, the domestic hot water demand priorisation has to be temporarily «OFF» on the controller).
- Bleeds air from the tank and from the heating zone(s).

5.3 FILLING THE DOMESTIC WATER HEATER HEAT EXCHAGER

There is a heat exchanger located in the water heater tank that separate the thermal mass fluid and the domestic hot water. This heat exchanger containing potable water must be filled.
Make sure that the heat exchanger drain cock is turned off.
Open the nearest domestic hot water tap as well as any control valve on the water heater outlet (the copper tube at the top of the water heater).
The cold water supply to the boiler shall be Open.
Close the domestic hot water tap as soon as water flows out of it. Fix any leaks
One must open every hot water domestic hot water tap in succession, in order to evacuate air from the distribution system.

5.4 BOILER CONTROLLER SETTING

Safety and energy conservation are factors to be considered when setting the water temperature on the controller. The most energy efficient operation will result when the temperature setting is the lowest that satisfies all requirements.

However, a tank water temperature of 70°C (160°F) as a starting point, is recommended to insure a good supply of domestic hot water.
It may be necessary to rise the tank water temperature up to 88°C (190°F) in order to supply to the domestic hot water demand or when the unit is installed on space heating systems requiring higher operating temperature.

Adjust tank water temperature differential to allow priority on domestic hot water supply. A value ranging from 5°C to 10°C (10°F to 20°F) is generally adequate.

5.5 START UP PROCEDURE

1. Make sure the tank and domestic water heat exchanger are both filled.
2. Make sure the Combomax symbole is displayed on the bottom right corner of the LCD screen as on figure 13. if it is not showing, call technical support.
3. Adjust temperature levels as described in section 5.4
4. Adjust building room thermostat(s) above ambient temperature.
5. Turn ON the boiler main electric supply breaker.
6. The boiler main contactor should close with an audible snap sound, and all elements should turn on in sequence.
7. Tank temperature should gradually increase. Several hours may be required according to the power capacity of the Combomax Ultra and the type of heating system to reach the tank water temperature target.
8. The circulating pump(s) will start once the tank water temperature will reach the tank water target temperature minus the programmed pump differential temperature.
9. If the heating system is of the radiant floor or low temperature type, adjust the heating system temperature lowering device to the proper temperature.
10. Lower the setting of the room thermostat, the heating pump should stop but not the heating elements which will stop only when the boiler temperature will reach the target temperature.
11. As the tank water temperature reaches its target temperature, the heating elements will be turned off in succession.

5.6 THERMOSTATICALLY CONTROLLED MIXING VALVE SETTING

A thermostatically controlled mixing valve automatically regulates the mix of very hot and cold water as required, providing safe domestic hot water under variable conditions.

To adjust the mixing valve setting, carefully open a hot water tap. Protect yourself against scalding. Measure the hot water temperature with a thermometer. Mixing valve adjustment is achieved by turning the mixing valve knob clockwise to reduce the domestic water temperature, contraclockwise to raise the domestic water temperature.

Unless local regulation requires otherwise, a 50°C (120°F) is considered the best temperature to reduce heat loss through the plumbing and prevent scalding for young kid and senior citizen. Generally residential dishwashers are provided with their own water heating element and don't require hotter water.
Raising the domestic hot water outlet temperature will not provide more domestic hot water. In order to provide more domestic hot water, the amount of energy in the water heater tank need to be increase, this is achieved by increasing the water tank temperature (maximum 88°C /190°F).

Section 6 : MAINTENANCE

6.1 INTRODUCTION

Regular water heater maintenance will ensure trouble-free service for many years. It is recommended that you set up and follow a maintenance program. All component may fail eventually. The use of incorrect replacement parts or disregarding safety procedures and warnings during repairs may reduce the boiler safety level and shorten its useful life.

The owner should set up the following maintenance program.

6.2 AT ALL TIMES

The boiler should be immediately inspected in case of:

- ❑ Overheating or burn plastic odours are detected.
- ❑ Water leak from the boiler or the space heating system is found.

If the hot water is leaking from the boiler pressure relief valve, it may indicate a problem with some components of the space heating system or the domestic hot water system. Immediate attention and repair by a qualified technician are required. NEVER CLOSE OR PLUG A PRESSURE RELIEF VALVE.

6.3 EVERY 6 MONTHS

- ❑ Check automatic air vent proper operation.
- ❑ Using hand operated air vent installed on the heating system radiators or in other location, bleed air from the heating system.

6.4 YEARLY INSPECTION

DANGER

Make sure that the power supply to the water heater has been turn off at the circuit breaker before attempting any work on the water heater.

- ❑ Visual inspection of the water heater electrical cabinet. Check for leaks at the heating elements, sign of overheating of electrical components and wiring. At the beginning of the heating season, check for proper operation of the boiler controller, circulating pump(s), mixing valve for low temperature heating system, room thermostat(s) and other heating system components for proper operation.
- ❑ Check the domestic hot water thermostatic mixing valve proper operation by measuring domestic water temperature at a domestic hot water tap with a thermometer.
- ❑ Check for proper operation of the automatic air vent, located on top of the water heater, by removing its cap and by pressing on the knob, releasing air until water began to be expelled.
- ❑ Do not open the tank drain tap unless repair to the water heater is required. Opening the drain tap will eventually force fresh water into the tank. This water introduce oxygen diluted in the fresh water. This oxygen will cause corrosion of the tank internal surfaces, damage the reservoir and void the warranty.
- ❑ If repair is required, it should be accomplish as soon as possible, by a qualified technician and using genuine replacement parts.

WARNING

The manufacturer's warranty DOES NOT cover problems caused by improper installation or maintenance. If the safety valve opens periodically, it may be due to the expansion tank. Immediately call a qualified technician to appraise and repair the problem.

6.5 SPARE PARTS

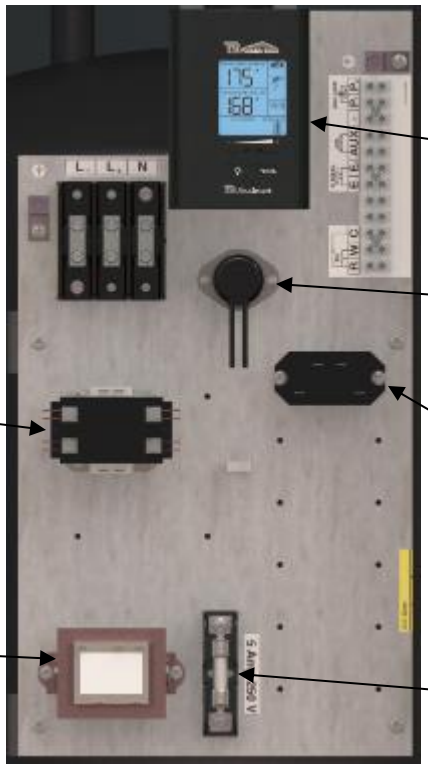


Figure 15: Electrical panel - Combomax Ultra 4,5 kW

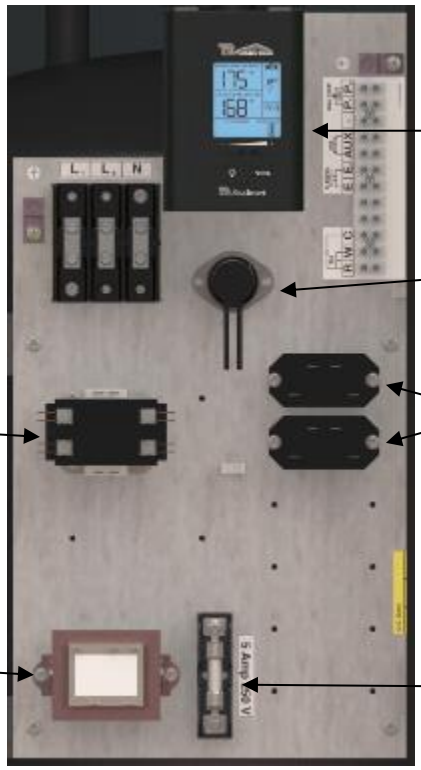


Figure 16: Electrical panel - Combomax Ultra 7,5 & 9 kW

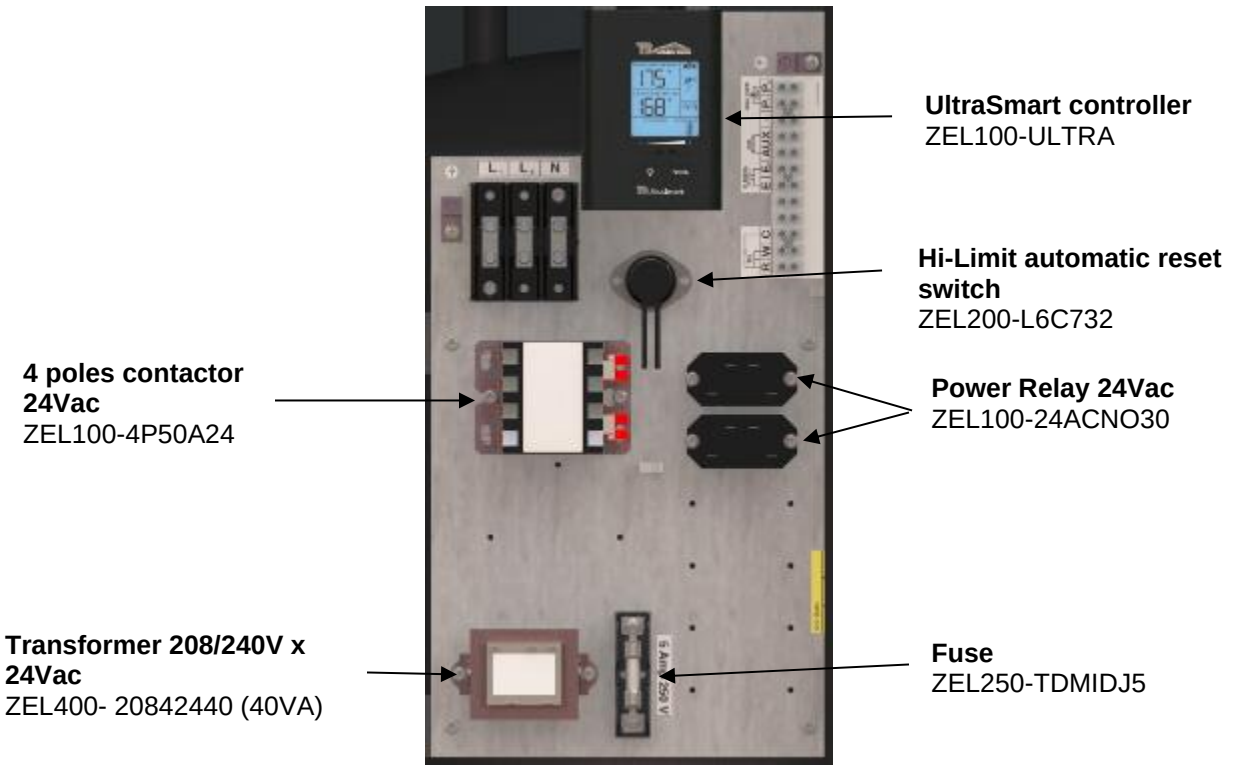


Figure 17: Electrical panel - Combomax Ultra 12 kW

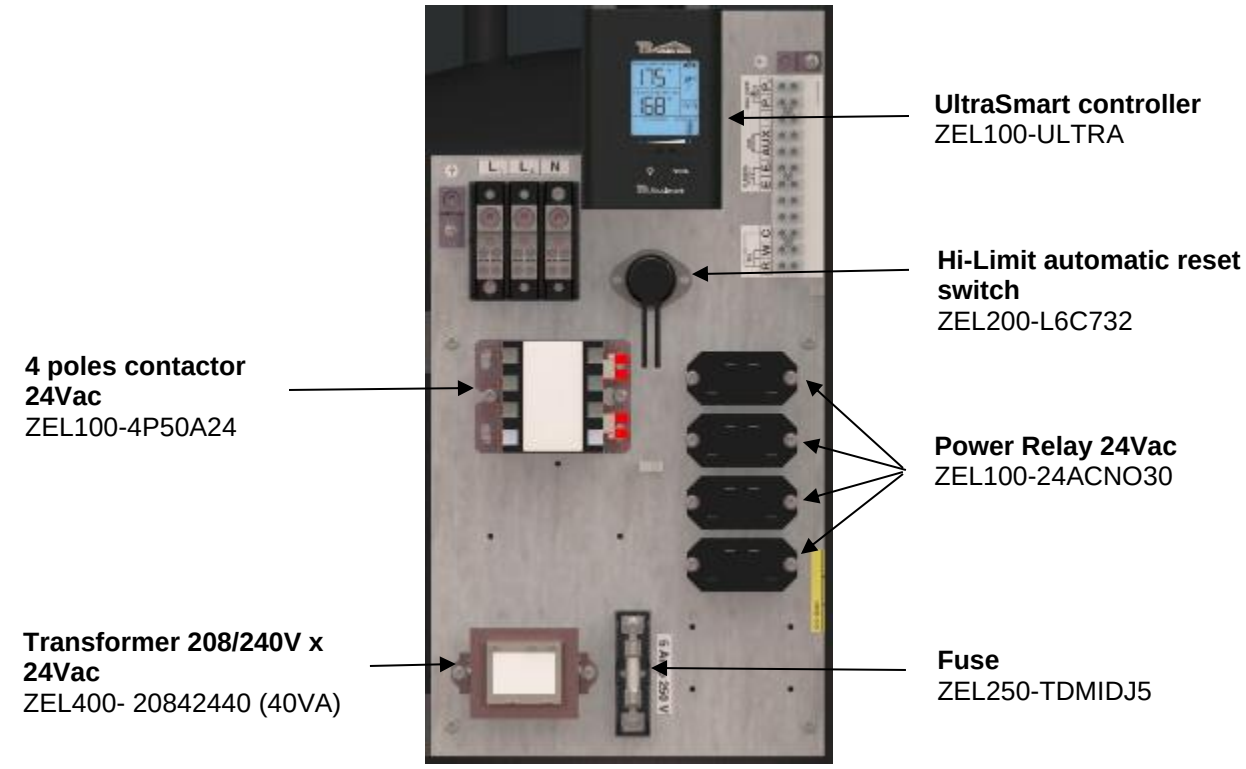


Figure 18: Electrical panel - Combomax Ultra 15 to 24 kW

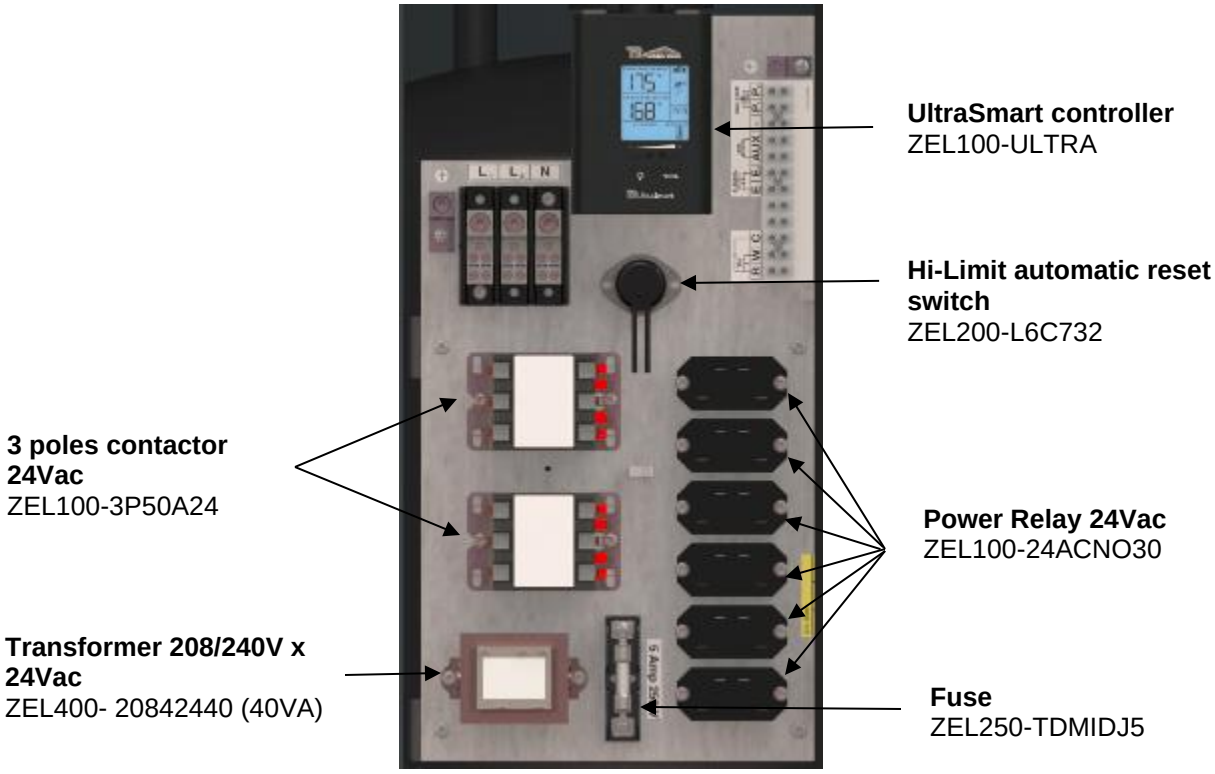


Figure 19: Electrical panel - Combomax Ultra 27 & 29 kW

Section 7 :Troubleshooting

7.1 Trobleshooting table

PROBLEM	CAUSES	SOLUTION
The display shows **---** in "TARGET TEMP"	-The switch located on the back of the controller is set to "Bi-Energ" and the icon  is shown.	-Temporarily increase the value of this setting on the controller configuration. -Set the switch to "Elect"
The display shows "**Er2**" and blinks	The controller is not detecting the presence of the boiler temperature sensor.	-Check the state of the sensor located in the immersion well located at the top of the elect. element compartment. -Check the resistance value (ohms) of the sensor. It should correspond to the value shown on the table below otherwise it should be replaced.
Stage 2 is ON but not Stage 1	There is no problem. A rotation of the stages is provided to allow an equal time of operation of the stages	
When stage 3 or 4 comes ON, stage 1 or 2 comes OFF	This sequence is normal on boilers from 27 to 33kW since stage 2 and 3 activate two elements. Stage 1 or 2 is disactivated to obtain an equal increase of capacity of the boiler.	
The controller shows that the heating stages are ON but the heating elements do not heat.	The main contactor inside the unit is not activated. There is no 24Vac at his coil.	The contact of the hi limit temp. control (automatic reset or manual reset in some models) is open. Reset the control and check for proper operation.
The boiler water temperature at the outlet of the unit "BOILER T^0"does not get to the "BOILER TARGET T^0"	-Some heating elements are defective -The total capacity of the boiler is expelled to the heating distribution system at this temperature.	-Replace defective elements -If a higher boiler water temperature is required to satisfy the heat demands of the thermostats, a boiler having a larger capacity is required.
An overheated plastic odor is released from the boiler	Turn the power OFF to the boiler. Open the front and left side panel of the boiler. Check the components and electric wires for indications of overheating.	Replace overheated components and check supply voltage to the boiler.
Boiler safety valve is leaking	-Pressure reading at the indicator shows a pressure above 28psi -Pressure is below 28psi	-The pressure regulator on the distribution system is defective or the expansion tank is too small or defective. -Replace the safety valve
Boiler will not start	-24V 2A or 3A fuse is blown	-Change the fuse

Table 5 - Resistance value of the temperature sensor vs temperature

Temperature		Resistance	Temperature		Resistance	Temperature		Resistance	Temperature		Resistance
°F	°C	Ω	°F	°C	Ω	°F	°C	Ω	°F	°C	Ω
-50	-46	490,813	20	-7	46,218	90	32	7,334	160	71	1,689
-45	-43	405,71	25	-4	39,913	95	35	6,532	165	74	1,538
-40	-40	336,606	30	-1	34,558	100	38	5,826	170	77	1,403
-35	-37	280,279	35	2	29,996	105	41	5,21	175	79	1,281
-30	-34	234,196	40	4	26,099	110	43	4,665	180	82	1,172
-25	-32	196,358	45	7	22,763	115	46	4,184	185	85	1,073
-20	-29	165,18	50	10	19,9	120	49	3,76	190	88	983
-15	-26	139,402	55	13	17,436	125	52	3,383	195	91	903
-10	-23	118,018	60	16	15,311	130	54	3,05	200	93	829
-5	-21	100,221	65	18	13,474	135	57	2,754	205	96	763
0	-18	85,362	70	21	11,883	140	60	2,49	210	99	703
5	-15	72,918	75	24	10,501	145	63	2,255	215	102	648
10	-12	62,465	80	27	9,299	150	66	2,045	220	104	598
15	-9	53,658	85	29	8,25	155	68	1,857	225	107	553

COMBOMAX ULTRA LIMITED WARRANTY

Warranty Coverage for Residential Installation.

Thermo 2000 Inc. hereby warrants to the original residential purchaser that the COMBOMAX ULTRA tank and exchanger installed in a residential setting shall be free of leaks during normal use and service for a period of fifteen (15) years from the date of purchase as long as the original residential purchaser owns the home in which the unit was originally installed. Residential setting shall mean usage in a single-family dwelling in which the consumer resides on a permanent basis. Also, residential setting shall mean use in multiple family dwellings in which one (1) COMBOMAX ULTRA tank and exchanger is to be use in only one (1) dwelling. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original residential purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from manufacturing plant. The replacement unit will be warranted for the remaining portion of the original Warranty.

Warranty Coverage for Commercial Installation.

Thermo 2000 Inc. hereby warrants to the original residential purchaser that the COMBOMAX ULTRA tank and exchanger (coil assembly) installed in a commercial setting shall be free of leaks during normal use and service for a period of ten (10) years from the date of purchase. Commercial setting shall mean use in other than residential setting stated above in the residential setting definition. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The replacement unit will be warranted for the remaining portion of the original Warranty.

Limited two years warranty on all COMBOMAX ULTRA components & parts

All other COMBOMAX ULTRA components & parts are warranted for a period of two (2) years against defects due to defective material or workmanship. The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The components, repaired or replaced are warranted for the residual period of the initial warranty on the unit.

Exclusions

This warranty is void and shall not apply if:

A) Defects or malfunctions resulting from installation, repair, maintenance and/or usage that are not done in conformity with the manufacturer's installation manual; or

B) Defects or malfunctions resulting from installation, maintenance, or repair that are not done in accordance with regulations in force; or

C) Defects or malfunctions resulting from improper installation, maintenance or repair done carelessly or resulting from consumer damage (improper maintenance, misuse, abuse, accident or alteration); or

D) Installation in which a relief valve (pressure) is not installed or if it is not functioning properly, or when it is not connected to a drain to avoid damage to the property; or

E) Installation in which liquid circulating in the tank does not remain in closed circuit or installation in which piping is leaking; or

F) A polybutylene pipe or radiant panel installation without an oxygen absorption barrier is used; or

G) Installation where the acidity of water is not within the normal Environmental Protection Agency (EPA) (between pH 6.5 – 8.5) guidelines or the domestic water contains abnormal levels of particulate matter or water exceeding 10.5 gpg; or

H) Your home contains any type of water softener system and the unit is not installed and maintained in accordance with the manufacturer specifications; or

I) When installed with a low pressure steam boiler, if sludge is allowed to accumulate in the COMBOMAX ULTRA tank and boiler water acidity is lower than pH 6.5 or higher than pH 8.5; or

J) The COMBOMAX ULTRA unit is being subject to non authorized modifications; or

K) Defects or malfunction resulting of storing or handling done elsewhere than Thermo 2000's manufacturing plant; or

L) Units on which the serial number is removed or obliterated.

Limitations.

Thermo 2000 inc. shall not be responsible for any damage, loss, and inconvenience of any nature whatsoever, directly or indirectly, relating to the breakdown or malfunction of the unit. This warranty limits its beneficiary's rights. Nevertheless, the beneficiary may have other rights, which vary from state to state.

This warranty replaces any other expressed or implicit warranty and constitutes the sole obligation of Thermo 2000 towards the consumer. The warranty does not cover cost of removal, reinstallation or shipping to repair or replace the unit, nor administration fees incurred by the original consumer purchaser.

Thermo 2000 reserves its rights to make changes in the details of design, construction, or material, as shall in its judgment constitute an improvement of former practices.

This warranty is valid only for installations made within the territorial limits of Canada and the United States.

Warranty service procedure

Only authorized COMBOMAX ULTRA dealers are permitted to perform warranty obligations. The owner or its contractor must provide Thermo 2000's head office or authorized depot with defect unit together with the following information: COMBOMAX ULTRAmodel and serial number, copy of the original sales receipt and owner's identification certificate.

THERMO 2000 INC.

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