



WOOD BOILER

ASPIRO

SY 400 LCD 2022

Installation
Use
Maintenance

ARCA

www.arcacaldaie.com

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1. GENERAL WARNINGS

- This instruction booklet is an integral part of the product and must be provided to the user. Carefully read the warnings contained in this booklet, as these provide important safety instructions for the installation, use and maintenance of the product. This booklet should be carefully kept for future reference.
- Installation must be carried out by professionally qualified personnel or by an authorised service centre (in compliance with Law 46/90) following the instructions provided by the manufacturer. The manufacturer is not liable for any damage caused to people, animals or things due to incorrect installation.
- Make sure the product is intact. If in doubt do not use the product and contact the supplier. The parts of the packaging must not be disposed of into the environment or left within the reach of children.
- Before performing any settings, maintenance or cleaning operations on the system, disconnect the appliance from the mains power supply using the system switch or the corresponding on-off devices.
- In the event of faults or malfunctioning of the appliance or of the boiler, it should be deactivated. Do not attempt to repair it. Contact professionally qualified personnel only. Any repairs must only be carried out by a manufacturer's authorised service centre, exclusively using original spare parts.
- Read this manual carefully before carrying out any work on the boiler.
- This booklet should be carefully kept for future reference.
- Connect the boiler to a 230V - 50Hz standard voltage power socket.
- Connect the boiler to the heating system; under no circumstances may the boiler be used without a hydraulic connection and water charge.
- Check that the electrical system and sockets have the capacity to withstand the maximum power consumption of the appliance stated in the manual.
- Some parts of the boiler, in particular the door, exhaust pipe, reach very high temperatures during operation; avoid contact with such parts without suitable protection.
- Do not use flammable liquids or substances to ignite the boiler or rekindle the flame.
- The boiler must only be fired with fuels with the characteristics described in the manual.
- Ensure that the room where the boiler is to be installed is suitable and has minimum ventilation slots in accordance with the regulations in force.
- Any unauthorised tampering, replacement and/or modification of boiler parts may cause harm to the user and releases the manufacturer from any liability.
- Any tampering with, replacement or modification of the electronic part other than as described in the manual will void the warranty.
- It is forbidden to modify safety or regulation devices.
- Do not use the boiler in any other way than intended.



IMPORTANT: the manufacture declines all liability, whether contractual or otherwise, for damage due to improper installation or use and in any case failure to observe the instructions shown in this manual.



IMPORTANT: failure to heed the above warning may affect the effectiveness of the system or its individual components, causing potential harm to the user. The manufacturer accepts no liability whatsoever in such circumstances.

CAUTION: THE FIRST IGNITION AND TESTING OF THE BOILER MUST BE CARRIED OUT BY AN AUTHORISED SERVICE CENTRE.



1.1. Packaging and transport

The boiler is delivered complete with all its electrical and mechanical components and factory tested.

Open the packaging and ensure that the boiler is complete and undamaged; if in doubt, contact the seller.

The installer is responsible for fitting the casing (see section 5.2.)

Disposal or recycling of the packaging is the responsibility of the end user.

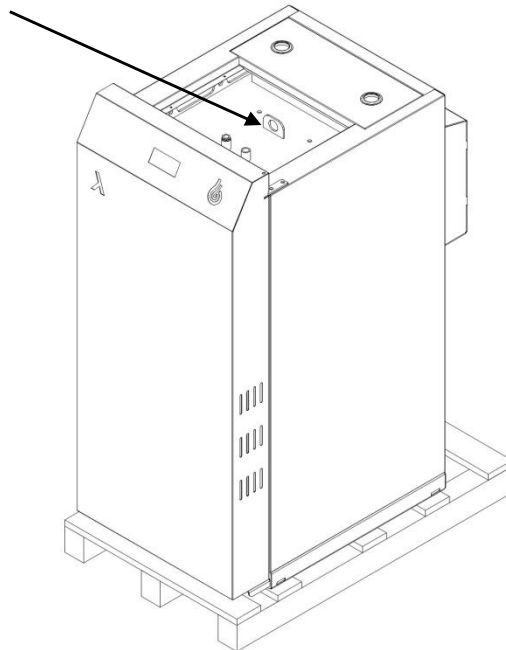
The document envelope contains:

- boiler rating plate
- test certificate
- warranty
- user and installation manual

The boiler must always be moved in an upright position by means of manual or mechanical trolleys, which can lift the pallet on which it is packed or directly the boiler itself.

The boiler is equipped with a lifting hook as shown in the figure.

HOOK



1.2. Warranty conditions

The manufacturer guarantees the appliance, with the exception of the wear parts listed in section 1.3, for **24 months** on all electrical and mechanical components, **3 years** on the steel boiler body only, **10 years** on the stainless steel boiler body only.

The warranty is only valid if tested by an authorised **ARCA** service centre and the accompanying warranty certificate is filled out.

1.3. Warranty limitations

The warranty **does NOT** cover any parts that are damaged or defective due to incorrect use, negligence or careless maintenance, incorrect installation or failure to comply with this manual.

The manufacturer accepts no liability for any damage that may occur to persons, property or animals as a result of non-compliance with the rules and instructions written in this manual regarding installation, use and maintenance.

The warranty does not cover:

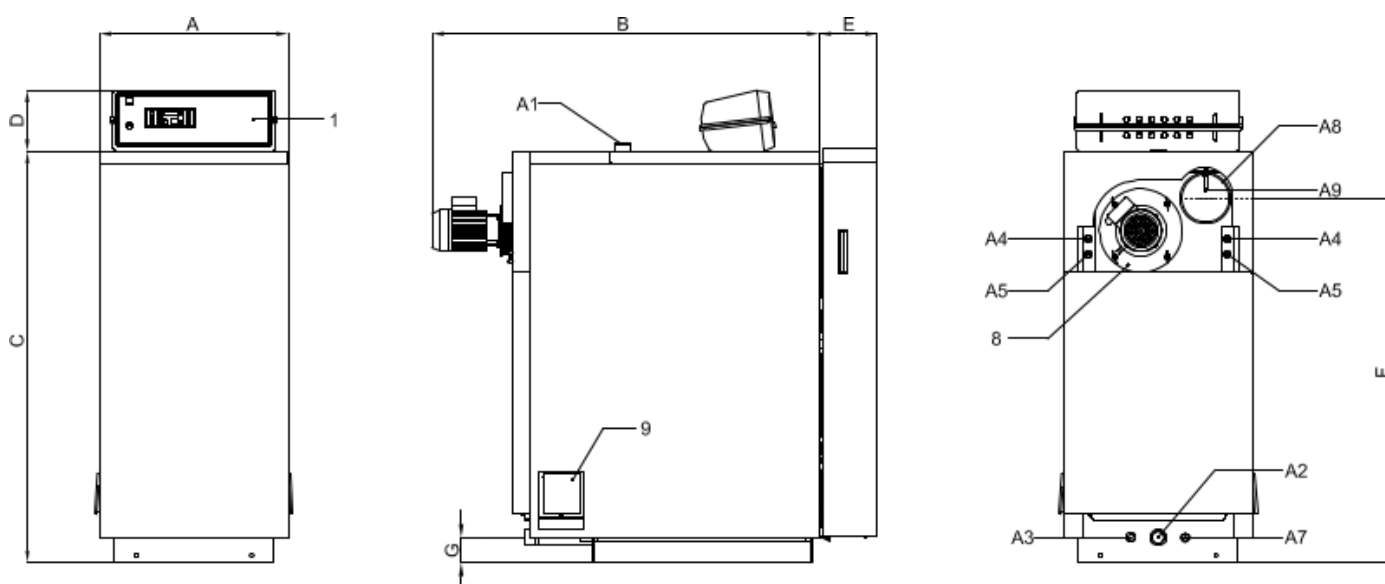
- damage caused by the transport of the product;
- damage resulting from chemical, electro-chemical, atmospheric agents, fire, lightning, floods, glaciation, earthquakes, natural disasters, defective electrical installations;
- damage to masonry;
- damage from the use of fuels that do not comply with what is described in the manual;
- damage caused by normal corrosion phenomena;
- damage to the electrical system, plumbing, or flue if the instructions in this manual are not followed;
- damage to the boiler body if no anti-condensation circuit is installed;
- damage caused by modifications or tampering with the electrical, hydraulic, mechanical part of the boiler and/or other causes not resulting from the manufacture of the product;
- damage caused by the use of non-original spare parts.
- all routine cleaning and maintenance work, nor any activities to access the product such as removal of casings or otherwise.

Furthermore, the warranty does not cover:

- parts subject to wear such as: refractory top (main stone), cement catalyst, bars.
- all parts subject to colour variations, coloured details, covers, handles and electrical cables.

2. TECHNICAL SPECIFICATIONS AND SIZES

2.1. Technical features and dimensions A25CTCA – A35CTCA - A50CTCA



Key:

- | | | | |
|----|--------------------|----|---|
| 1 | Electronic panel | A4 | Safety heat exchanger connections |
| 8 | 2-speed fan motor | A5 | Domestic hot water exchanger connections (only ver. SA) |
| 9 | Blast door | A6 | Boiler probe thermowell connections (S4) |
| A1 | System flow outlet | A7 | Boiler probe thermowell connection (S5) |

A2 System return inlet
A3 Boiler drain

A8 Chimney connection
A9 Flue gas probe thermowell connection

SIZE

Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	A1 ø	A2 ø	A3 ø	A4 ø	A5 ø	A6 ø	A7 ø	A8 ø
Aspiro 25 CTCA	550	1,050	1,200	190	150	1,080	80	1" ¼	½"	½"	½"	½"	½"	½"	150
Aspiro 35 CTCA	650	1,050	1,300	190	150	1,150	80	1"½	½"	½"	½"	½"	½"	½"	180
Aspiro 50 CTCA	650	1,230	1,300	190	150	1,150	80	1"½	½"	½"	½"	½"	½"	½"	180

TECHNICAL DATA

	u.m.	Aspiro 25 CTCA	Aspiro 35 CTCA	Aspiro 50 CTCA
Nominal heat output (Qn)	kW	24.08	31.30	41.14
Maximum firebox output	kW	26.53	34.68	45.96
Minimum rated thermal output (Qmin)	kW	16.86	21.91	28.80
Burning period (Tb)	Hours	3.5	3.5	3
Flue gas temperature at rated power	°C	140	140	140
Exhaust gas flow at rated power	kg/s	0.0186	0.0222	0.0272
Minimum flue draught	mbar	0.20	0.20	0.20
Boiler flue gas outlet diameter	mm	150	180	180
Maximum operating pressure	bar	4	4	4
Boiler body water content	L	95	115	135
Mains voltage	V	230	230	230
Frequency	Hz	50	50	50
Electrical consumption at rated power	W	122	122	182
Boiler weight	kg	380	470	555
Class ref. UNI EN 303-5:2012		5	5	5
Efficiency at rated power	%	90.78	90.24	89.51
Environmental classification	stars	★★★★	★★★★	★★★★

3. MAIN PARTS OF THE BOILER

3.1. Wood storage chamber

It is the *tank* of the wood boiler. In this compartment, which is located in the upper part of the boiler, wood logs are loaded after ignition and the production of embers.

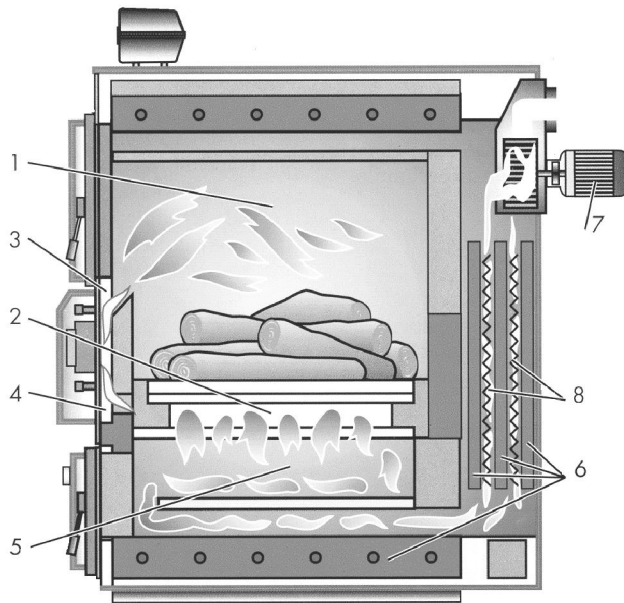
3.2. Main stone and bars

In the central part of the boiler between the wood storage chamber and the lower exchange area, the main refractory concrete stone is positioned, which has a longitudinal slit in the centre with a recess to house the grid plate. The latter is composed of elements called bars, made of refractory cement, whose function is to support the embers and, through the central slits, to allow the passage of combustible gas.

3.3. Exchange zone and catalyst

The wood gas, as it passes through the bars, produces a flame that, developing downwards, grazes a refractory concrete conveyor, known as the lower firebox.

The flame, passing through a high-temperature zone, promotes the elimination of the remaining unburnt carbon particles. As the combustion gases pass through the vertical rear exchange zone, they release heat to the water.



Key:

- 1 Wood storage chamber
- 2 Burner grid plate
- 3 Primary air inlet
- 4 Secondary air inlet
- 5 Combustion zone
- 6 Exchange zone
- 7 Fan motor
- 8 Mobile turbulators

3.4. Smokebox and fan

The combustion gas, after having given up energy to the water, accumulates inside the smokebox located at the rear of the boiler. The smokebox houses the two-speed fan, fitted horizontally and consisting of an electric motor and impeller. The fan allows easy maintenance, being secured in place using wing nuts.

3.5. Air distribution unit

At the front of the boiler, between the upper and lower door, is the combustion air intake. The inlet duct is equipped with an internal, gravity-driven clapet valve that closes when the fan stops.

The air entering the unit is divided into primary and secondary. The primary air goes to the wood storage chamber and, mixing with the distilled gas, creates the combustible mixture, which burns through the grid plate. Secondary air, on the other hand, passes through the two cavities of the main stone and the bars, providing an injection of oxygen directly into the flame formation zone, thereby optimising combustion. The secondary air is then regulated by the front servomotor, which takes its movement signal via the oxygen percentage reading from the lambda sensor located in the smoke box.

3.6. DHW exchanger (SA versions only)

The Aspiro CTCA boiler can be equipped with an internal instantaneous heat exchanger for the production of domestic hot water (SA models only). The heat exchanger consists of a copper tube immersed in the water jacket, around the body of the wood boiler, with the inlet and outlet plumbing connections at the rear of the boiler.

3.7. Safety heat exchanger

The boiler is equipped as standard with a safety heat exchanger for the wood-fired part. Its function is to cool the boiler in the event of overtemperature by means of a thermal exhaust valve hydraulically connected to the heat exchanger inlet (see section 5.6). It consists of a steel coil with an inlet and outlet at the rear of the wood boiler (A4 connections). The sensing element of the thermal exhaust valve is positioned in connection A6.

3.8. Water temperature probe thermowells

At the top of the boiler are two identical thermowells (A6) both with a ½" coupling, and with the following functions:

- housing for the copper sheath that holds the probes connected to the electronic control panel;

- ❑ free housing for a second copper sheath or temperature measuring device (thermal relief valve)

3.9. Recirculating pump (anti-condensation)

To minimise the possibility of condensate forming in the wood-fired boiler, a recirculating pump needs to be installed. The pump is connected between the outlet (A1) and return (A2) fittings, with the direction of flow from top down. ARCA supplies a recirculating pump kit as an accessory, including pump, connection piping and fittings.



IMPORTANT: For correct generator operation the recirculating pump must be installed.



THE WARRANTY WILL BE VOID IF THE RECIRCULATING PUMP IS NOT INSTALLED.

3.10. Insulation

The Aspiro CTCA boiler is insulated by a 60 mm thick layer of mineral wool placed in contact with the boiler body, in turn protected by the outer casing, made from epoxy powder coated steel panels.

3.11. Supply water

For correct operation and safety of the central heating system information must be available on the chemical-physical characteristics of the system and top-up water. The main problem caused by using very hard water is fouling of the heat exchange surfaces. It is well-known that high concentrations of calcium and magnesium carbonates (lime scale) precipitate when heating, forming scale. These lime deposits have low thermal conductivity and consequently prevent heat exchange, creating localised overheating that weakens the metal structures, leading to breakage. It is therefore recommended to adopt water treatment in the following cases:

- ❑ very hard top-up water (over 20°f)
- ❑ high capacity (large) systems
- ❑ frequent topping up due to leaks
- ❑ frequent filling due to maintenance on the system.



IMPORTANT: if the boiler is used as a replacement in an existing system, this should be washed chemically beforehand using basic dispersants.

4. TYPE OF OPERATION

The Aspiro CTCA boiler is a biomass boiler running on wood, using the traditional method of wood gasification with a reversed flame.

4.1. Gasification technology

The Aspiro CTCA boiler bases its operation on the principle of gasification (or distillation) of wood. The solid fuel, placed in the upper compartment of the boiler (wood storage chamber), in contact with the embers produced on the grid plate develops gases that combine with the combustion air (primary air) to create a combustible mixture. This mixture is drawn through the grid plate slits into the lower area of the firebox (exchange zone) where it will give rise to the characteristic '*upturned flame*'.

Gasification, by not burning wood directly, but using the gases contained in it, allows total exploitation of the solid fuel, meaning high combustion efficiency and a very low environmental impact due to the absence of unburnt and harmful substances in the fumes.

The Aspiro CTCA boiler is designed to minimise the negative effects of acid condensation. The firebox is 8 mm thick in the steel version and 5 mm thick in the stainless steel version, and is seamless in the upper area of the wood storage chamber.

5. INSTALLATION

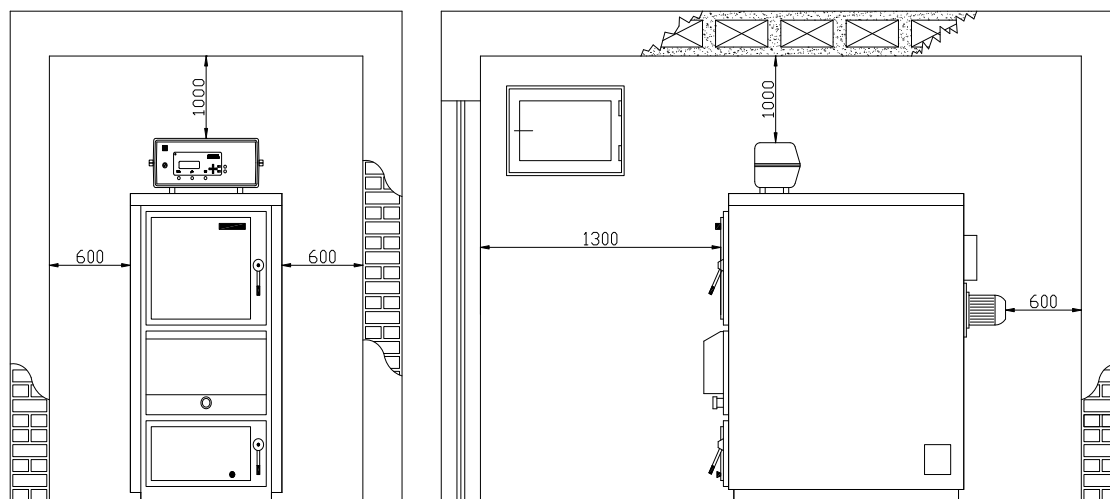
The Aspiro CTCA boiler is no different from a normal solid fuel boiler; therefore, there are no specific installation instructions beyond the safety requirements of the relevant standards in force. The room must be well-ventilated; ventilation openings must have a minimum total surface area no less than 0.5 m^2 . To simplify cleaning of the flue gas circuit, a free space no less than the length of the boiler should be left at the front, making sure that the door can open 90° without being obstructed.

The boiler can rest directly on the floor, as it comes with a self-supporting frame. Nonetheless, in very damp boiler rooms, a concrete base is recommended. Once installation is complete, the boiler must be perfectly horizontal and stable so as to reduce any vibrations and noise.

5.1. Positioning in the boiler room

Aspiro CTCA Generators must be installed in the boiler room in compliance with the relevant legislation in force (for further details contact your local fire station).

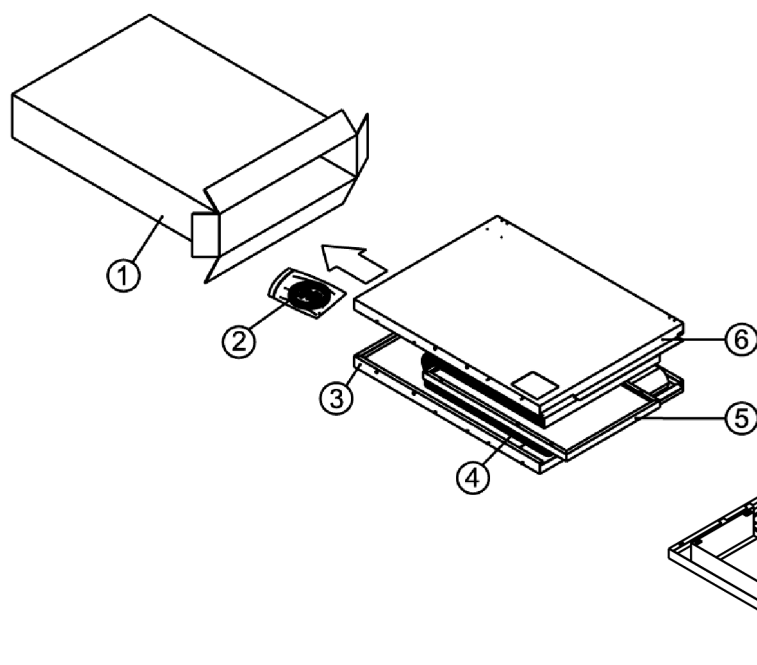
The distances for positioning the boiler in the boiler room are illustrated below.



5.2. Casing packaging

The Aspiro Monomatic boiler is delivered dismantled: the casing and the casing accessory kit are packed separately in cardboard boxes.

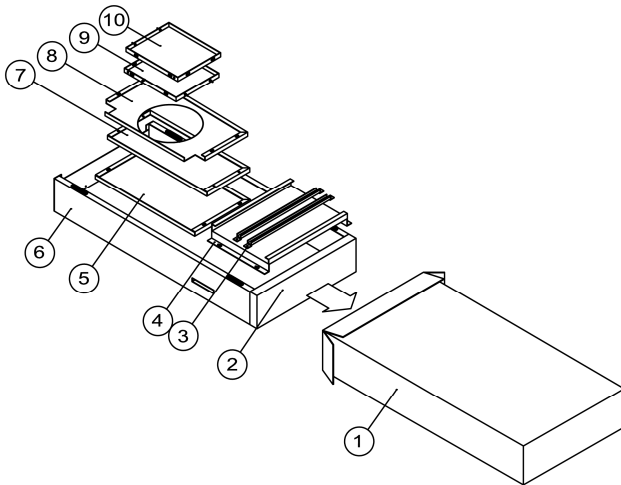
CASING PACKAGING:



Key:

- 1 Packaging cardboard
- 2 Accessory bag
- 3 Right side panel
- 4 Boiler body insulation
- 5 Lid
- 6 Left side panel
- 7 Front centre cover plate
- 8 Lower back
- 9 Lower front door cover
- 10 Upper front door cover
- 11 Upper back

CASING KIT PACKAGING:

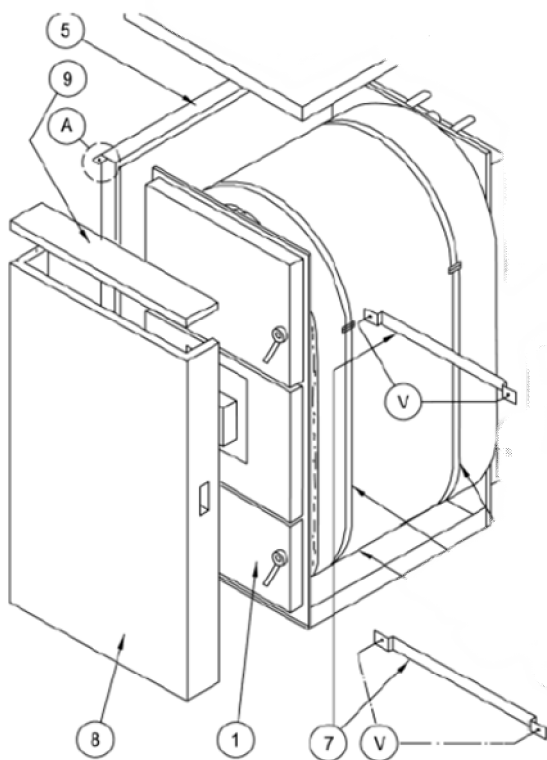
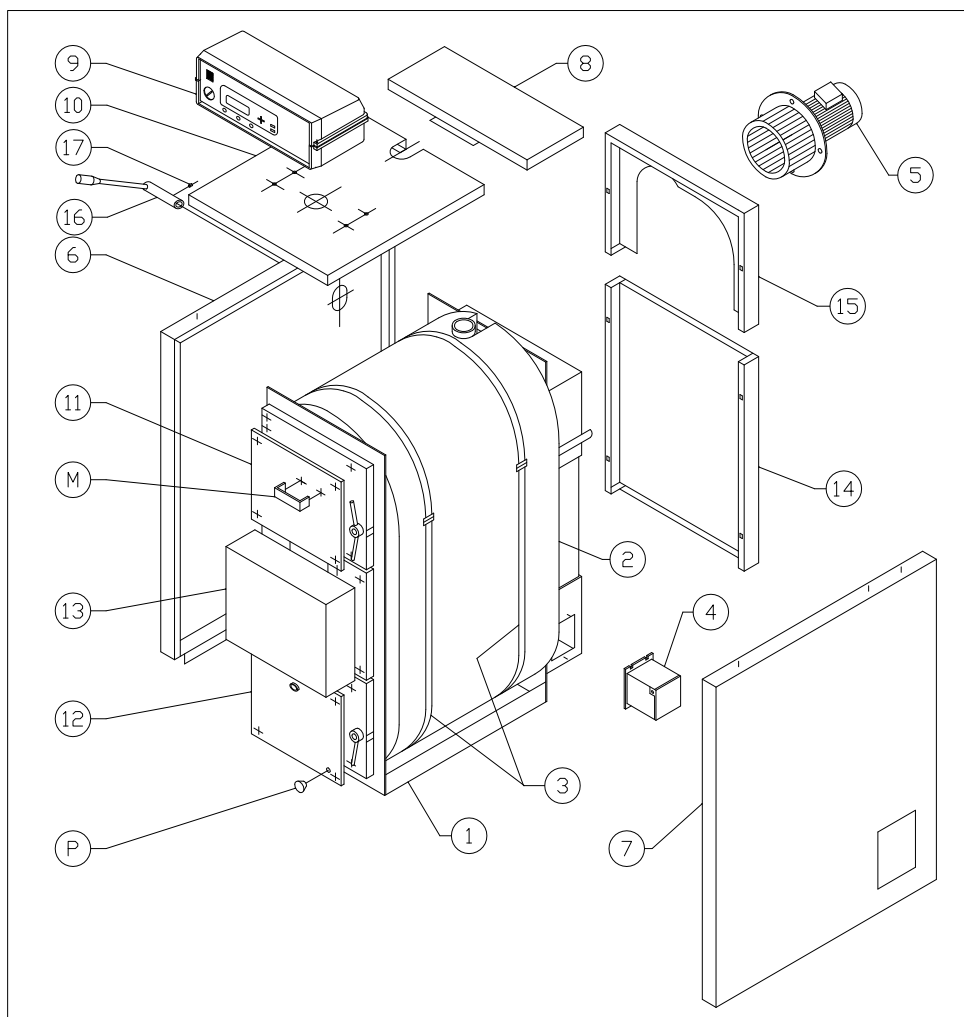


Key:

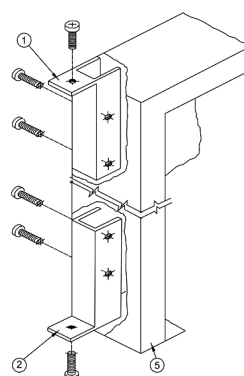
- 1 Packaging cardboard
- 2 Upper door cover
- 3 Spacers
- 4 Upper back
- 5 Lower back
- 6 Front door
- 7 Lower horizontal back
- 8 Upper horizontal back
- 9 Right rear side panel
- 10 Left rear side panel

5.3. Casing assembly

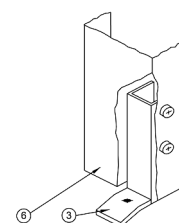
- ☐ Position generator 1 in the boiler room and make the hydraulic connections.
- ☐ Wrap the boiler body with the rockwool insulation mat 2 and secure it with the clamps 3.
- ☐ Screw the blast doors to the base of the smoke chamber 4.
- ☐ Install the fan 5 in the smoke box housing.
- ☐ Position the casing sides 6 and 7, taking care to insert the upper fold into the slots on the top of the plates, and the lower fold into the base angle of the boiler.
- ☐ Place the cover 8 on the side panels 6 and 7, taking care to match the pins on the side panels to the clip holes in the cover itself, and fit them by applying light pressure
- ☐ Attach control panel 9 to cover 10, unwind the thermostat capillaries and pass them under the cover through the hole provided. When unwinding the capillaries, care must be taken to ensure that they are not bent in such a way that they present very sharp curves, which would prevent the normal expansion/reduction of the heat-sensitive substance inside them; always try to unwind the capillaries in such a way that they present slight curves.
- ☐ Place cover 10 on side panels 6 and 7, taking care to match the pins on the side panels to the holes provided with clips on the cover itself, and fit them with light pressure.
- ☐ Fasten the protective panel 11 to the wood storage chamber door, not before screwing in the handle M.
- ☐ Attach protective panel 12 to the lower door, not before screwing in knob P.
- ☐ Mount the rear panels 14 and 15 by fixing them to the pins on the side panels 6 and 7
- ☐ Insert lever 16 for cleaning the mobile turbulators on the pin on the side of the smoke box, securing it with the hexagon screw provided.
- ☐ Mount the door as shown:
 - Insert door 8 into the screw that serves as the pin of bracket B.
 - Bring door 8 closer to bracket A and fasten the screw that should centre hole X symmetrical to the hole centred in the previous step.
 - Check that the door 8 rotates properly and secure the cover 9 by inserting the pegs into the springs with light pressure.



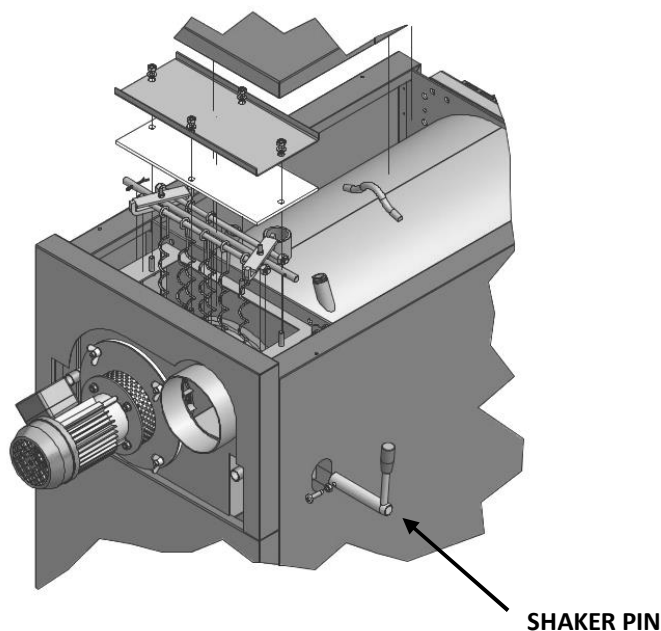
Particolare A



Particolare B



5.4. Shaker lever assembly



On the side of the casing there is a hole where you can insert the lever for cleaning the mobile turbulators to be mounted on the pin on the side of the smoke box, securing it with the appropriate hexagon screw.

The shaker pin can be mounted on either the right or left side.

5.5. Flue

The chimney plays a fundamental role in ensuring good boiler operation: the chimney must be impermeable and well-insulated. Old or new chimneys not built in compliance with the above specifications can be used, but with special modifications. A metal flue needs to be inserted inside the existing chimney, and the space between the metal flue and the chimney has to be filled with special insulation. Chimneys made from prefabricated blocks must have perfectly sealed joints to prevent condensate in the flue gas from fouling the walls due to absorption.

We strongly recommend the use of a flue pipe that complies with current standards, and in particular with EN 1806, which require resistance to a flue gas temperature of up to 1000°C. The user is liable for damage caused by the use of unsuitable rods.

In any case, the chimney must feature good draught, equal to at least 15 Pa of negative pressure at the base. Chimneys with insufficient draught will cause the wood boiler to shut down when the system is not operating, with tar and condensate forming along the air inlet. Vice-versa, a chimney with excessive natural draught will cause problems of thermal inertia as well as high wood consumption.

A draught regulator should always be installed so as to maintain constant negative pressure in the chimney. This will avoid any unwanted increases in heat output.



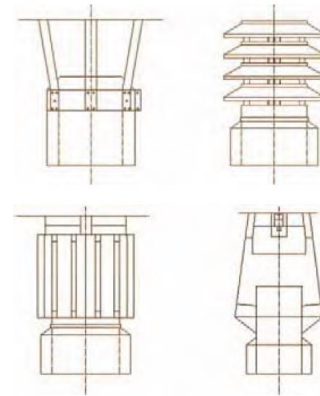
WARNINGS

- the flue must have a pipe diameter no smaller than that of the boiler outlet connection.
- the flue must be as vertical as possible.
- the flue must be perfectly sealed to prevent it from cooling down.
- the flue must have a constant, free, independent internal cross-section, free of bottlenecks.
- flue pipes must not pass through rooms in which the installation of combustion appliances is prohibited.
- hoses are not permitted.
- a 'T' pipe must be installed immediately after the boiler outlet so that residues can be cleaned out periodically.
- a collective flue cannot be used.
- only exhaust ducts suitable for the type of fuel used must be used.
- avoid the construction of completely horizontal sections.
- The room in which the boiler is to be installed must not have an extraction hood.
- direct wall exhaust is not permitted.
- install an inspection valve to allow any condensate that may have formed to drain away.
- use a rainproof and windproof terminal.

5.5.1. Chimney pot

The chimney pot must meet the following requirements:

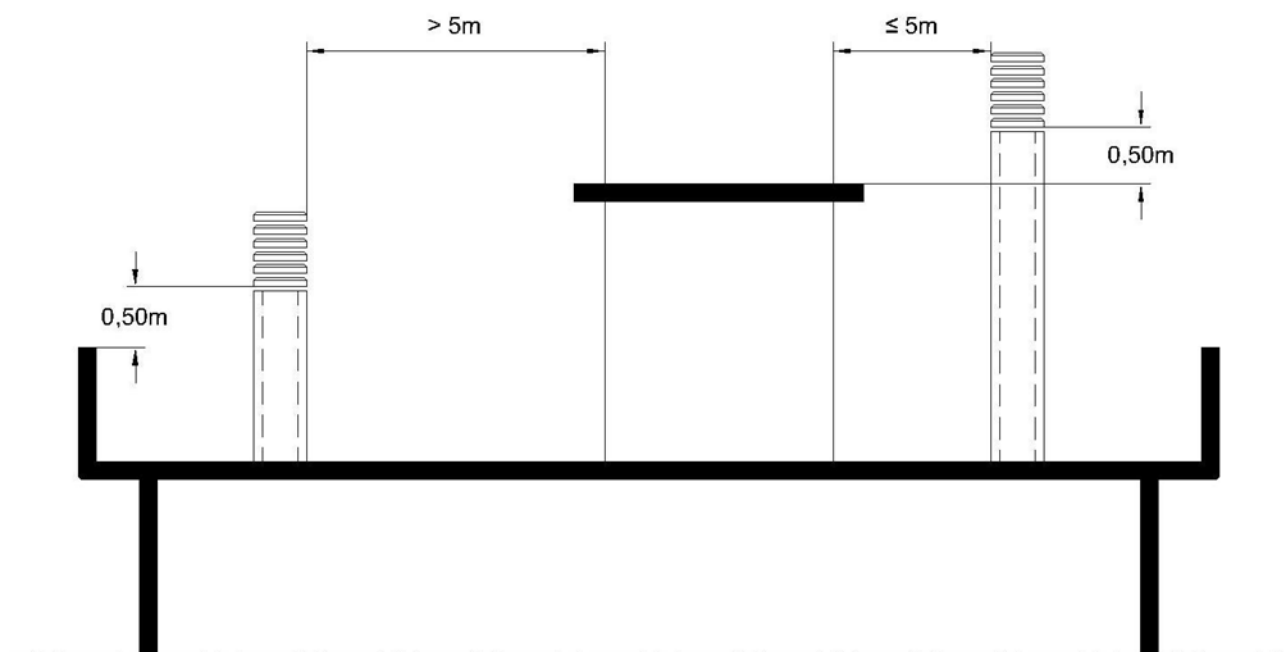
- have a cross-section and internal shape equivalent to that of the flue;
- have a useful outlet cross-section not less than twice that of the flue;
- be constructed in such a way as to prevent the penetration of rain, snow and foreign bodies and, in the event of winds, ensure the normal flow of smoke;
- be positioned so as to ensure adequate dispersion and dilution of combustion products and in any case outside the reflux zone.



5.5.2. Chimney height

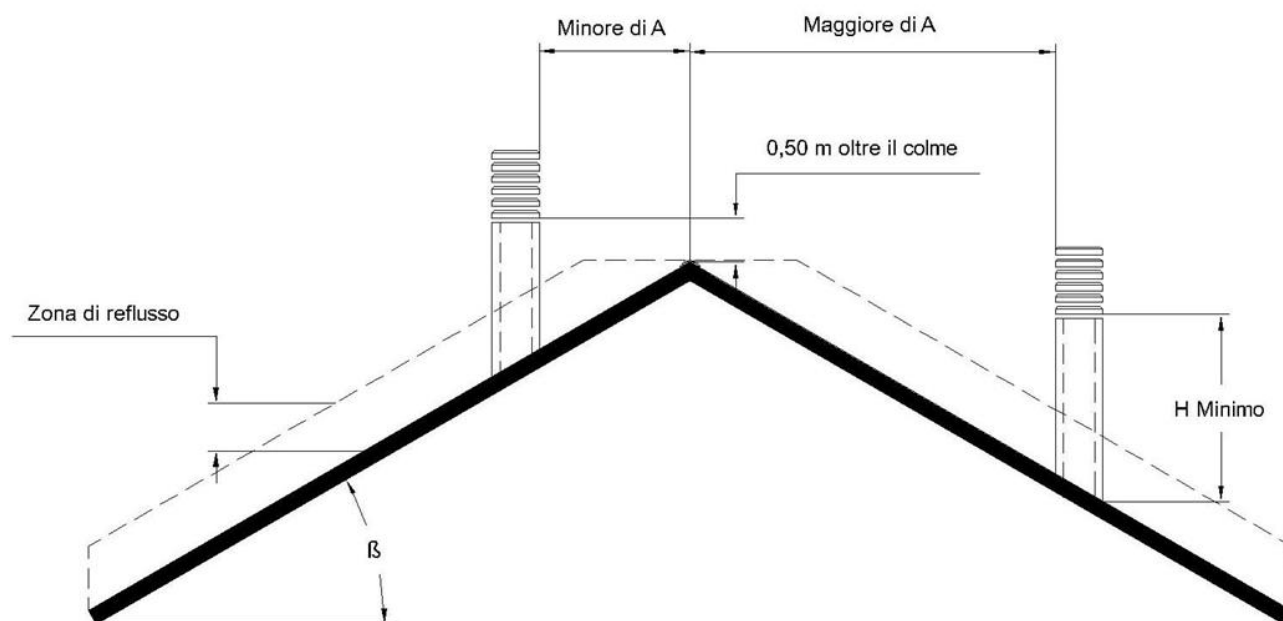
The height of the part of the chimney projecting from the roof depends on the type of roof, its slope and its position.

FLAT ROOF



SLOPING ROOF

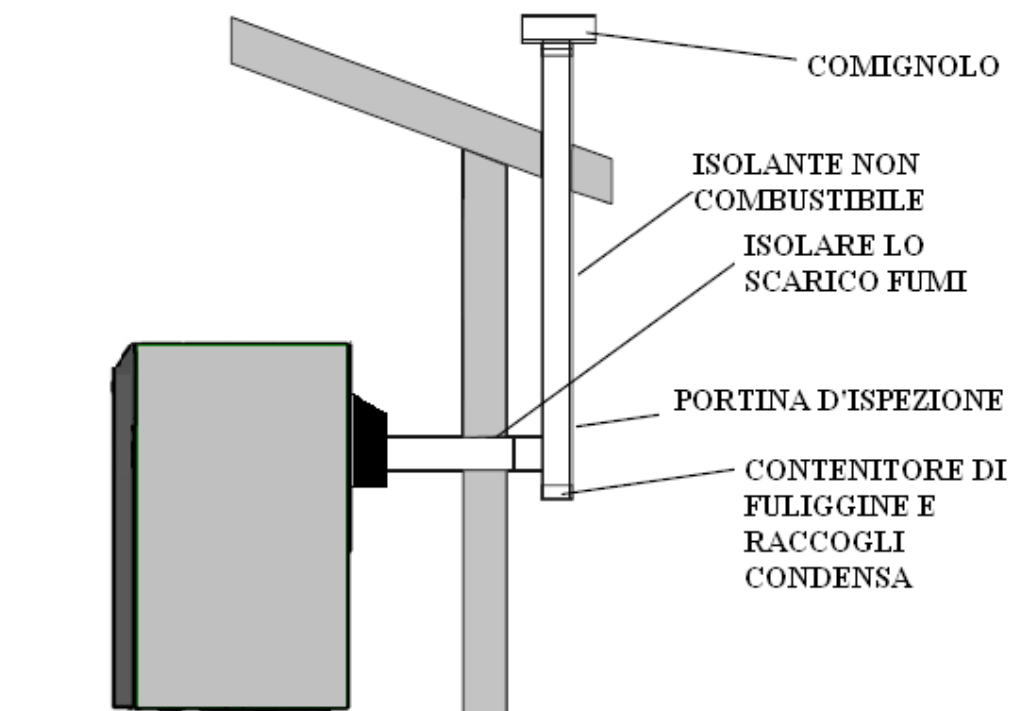
ROOF PITCH	REFLUX ZONE	DISTANCE BETWEEN RIDGE AND CHIMNEY	MINIMUM CHIMNEY HEIGHT
β	m	A	H
15°	0.50m	$\leq 1.85\text{m}$	0.50m over the ridge
		$> 1.85\text{m}$	1.00 m from the roof
30°	0.80m	$\leq 1.30\text{m}$	0.50m over the ridge
		$> 1.30\text{m}$	1.20m from the roof
45°	1.50m	$\leq 1.50\text{m}$	0.50m over the ridge
		$> 1.50\text{m}$	2.00m from the roof
60°	2.10m	$\leq 1.20\text{m}$	0.50m over the ridge
		$> 1.20\text{m}$	2.60m from the roof



5.5.3. Roof drain with steel flue

When installing the flue, always ensure an inspection valve for periodic soot cleaning and evacuation of any condensate.

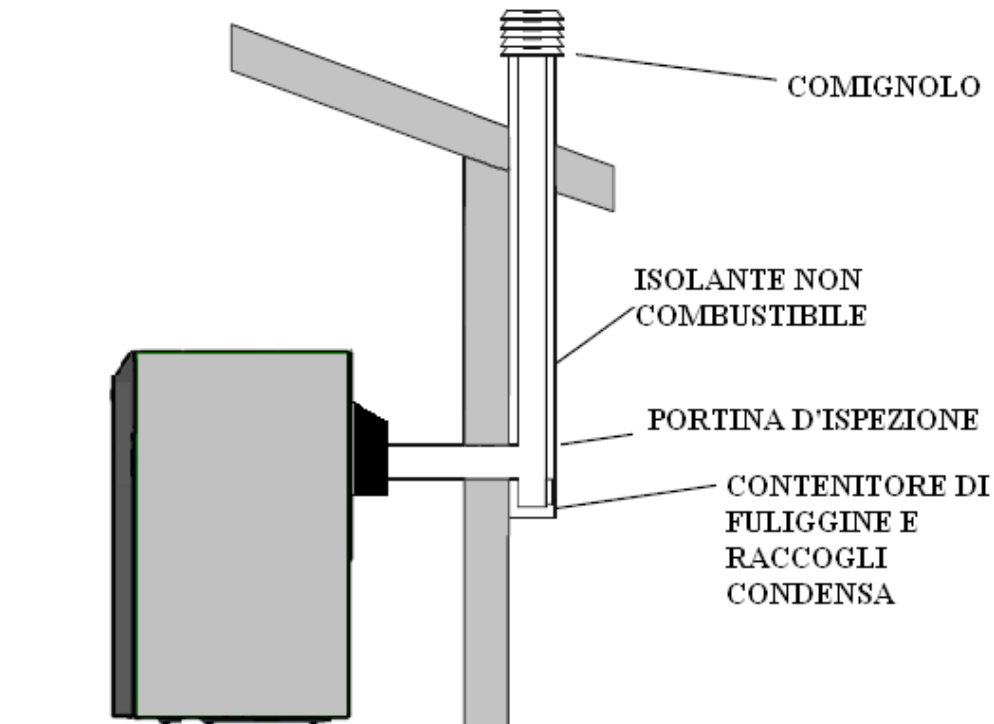
If the flue gas duct is to be installed completely outdoors, it should be made completely of double-walled stainless steel to ensure better weather resistance and adequate flue gas discharge temperature.



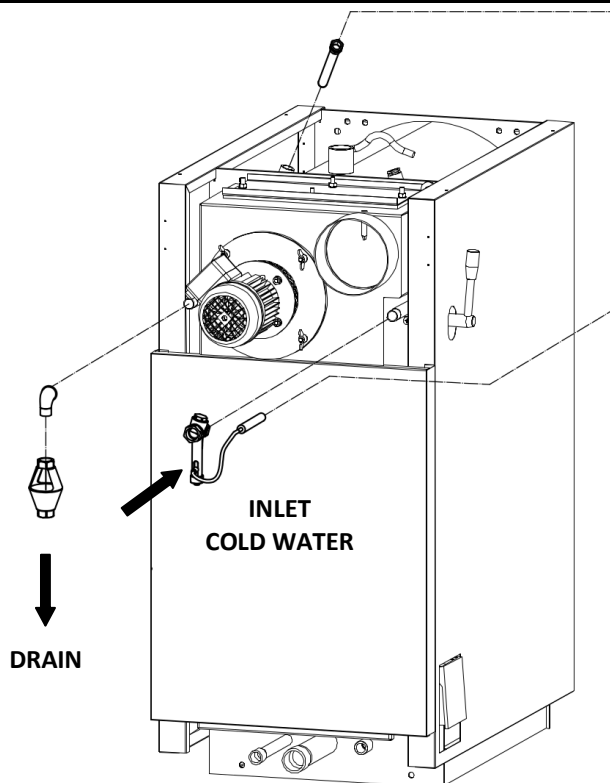
5.5.4. Roof drain with traditional flue

Combustion gases can also be evacuated using an existing traditional flue as long as it is built to standard. It must comply with the following rules:

- must be provided with adequate insulation in the exposed outer section;
- the internal section must be constant;
- must be made of material that is resistant to high temperatures, the action of combustion products and any condensation that may form;
- predominantly vertical course with deviation from the axis not exceeding 45°;
- must be equipped with a soot and condensate collection chamber that can be inspected through a door.



5.6. Thermal exhaust valve connection

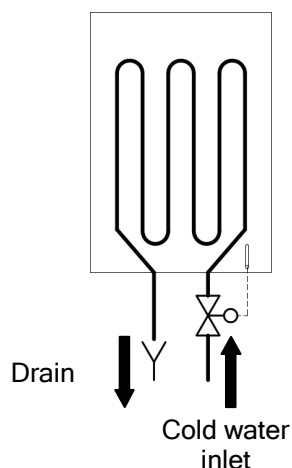


IMPORTANT: it is recommended to install a thermal relief valve in the coil input and a drain pipe near the heat exchanger outlet.

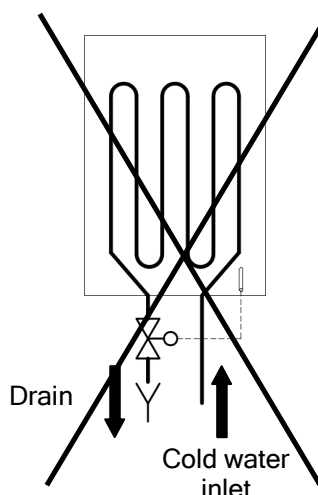


Note: the thermal relief valve could also be placed on the used hot water outlet, but this would not be beneficial from a safety point of view and you would run the risk that the sediments in the heat exchanger interfere with correct operation of the valve itself.

**CORRECT
INSTALLATION**



**WRONG
INSTALLATION**



5.6.1. Operation of the thermal exhaust valve

The valve, regardless of pressure, opens when the temperature of the primary circuit reaches approximately 95°C. Opening the valve results in a constant discharge of water, which prevents the temperature from reaching 110°C.

Note: it is recommended to test the safety valve once installed by bringing the boiler to the valve opening temperature.

It is absolutely forbidden to produce domestic hot water by means of the safety heat exchanger. The heat exchanger must be permanently connected to a thermal safety valve and must be able to intervene with maximum efficiency to cool the boiler in an emergency.



5.7. Correct sizing of the buffer tank

The boiler installation always includes the connection to the system of a buffer tank (thermal flywheel), consisting of a storage tank, with thermal insulation, in which the water heated by the boiler circulates.

This allows rapid temperature increases or decreases to be absorbed, increasing the system's operating range.

In the **Aspiro 25/35/50 CTCA** wood boiler, the fuel cannot be metered as in a pellet, gas or oil boiler, so once loaded it must be consumed in one go. In modulation steady state operation, the minimum power output is 30% higher than the nominal heat output, therefore, it is necessary to install a correctly dimensioned buffer tank according to **EN 303-5:2012** (paragraph 4.4.6) which provides the following calculation formula:

$$V_{sp} = 15 T_B Q_N (1 - 0,3 Q_H / Q_{min}) \text{ (in litres)}$$

Where:

- V_{sp} is the volume of the storage tank in litres;
- Q_N is the rated output of the boiler in kilowatts;
- T_B is the burning period in hours;
- Q_H is the heat demand of the installation site in kilowatts (a value that depends on the building's dispersion and must be assessed by the heating engineer);
- Q_{min} is the minimum boiler output in kilowatts.

	Aspiro 25 CTCA	Aspiro 35 CTCA	Aspiro 50 CTCA
Q_N - Boiler nominal output	24.08 kW	31.3 kW	41.14 kW
T_B - Burning period	3.5 h	3.5 h	3 h
Q_{min} - Minimum boiler output	16.8 kW	21.9 kW	28.8 kW

The volume of the storage tank therefore depends on both the boiler characteristics (table above) and the 'thermal' characteristics of the building (Q_H) served by the boiler. The table below shows the minimum storage volumes to be provided depending on the value of the building's energy demand in the cases of 100%; 80% and 50% Q_N :

Buffer tank sizing for Aspiro 25, 35 and 50 CTCA according to EN 303-5:2012						
Boiler model	V with $Q_H=Q_N$	Litres/kW	V with $Q_H=80\%Q_N$	Litres/kW	V with $Q_H=50\%Q_N$	Litres/kW
Aspiro 25 CTCA	722	30	831	35	993	41
Aspiro 35 CTCA	939	30	1080	35	1291	41
Aspiro 50 CTCA	1058	26	1217	30	1455	35

The closer the boiler output is to the building's energy demand, the smaller the volume of the storage tank will be. It is therefore advisable that the designer does not tend to oversize the generator because this would result in having to install large tanks with a consequent increase in system costs.



Caution: in order to obtain Conto Termico 2.0. incentives, the storage tank must comply with EN 303-5:2012 and must be dimensioned as above.

6. ELECTRONIC PANEL SY400 LCD (cod.PEL0100LCDLAM)

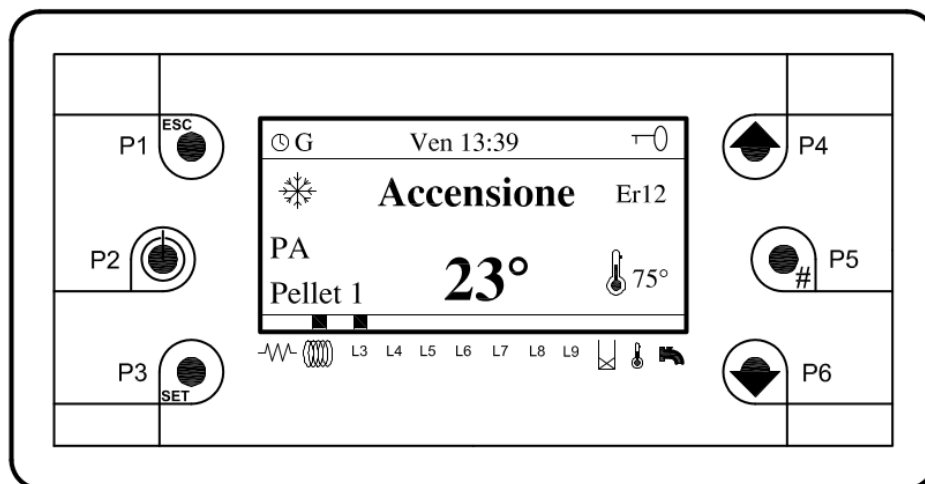


Key:

- 1 Main switch
- 2 Safety thermostat
- 3 Display keypad

6.1. LCD keypad

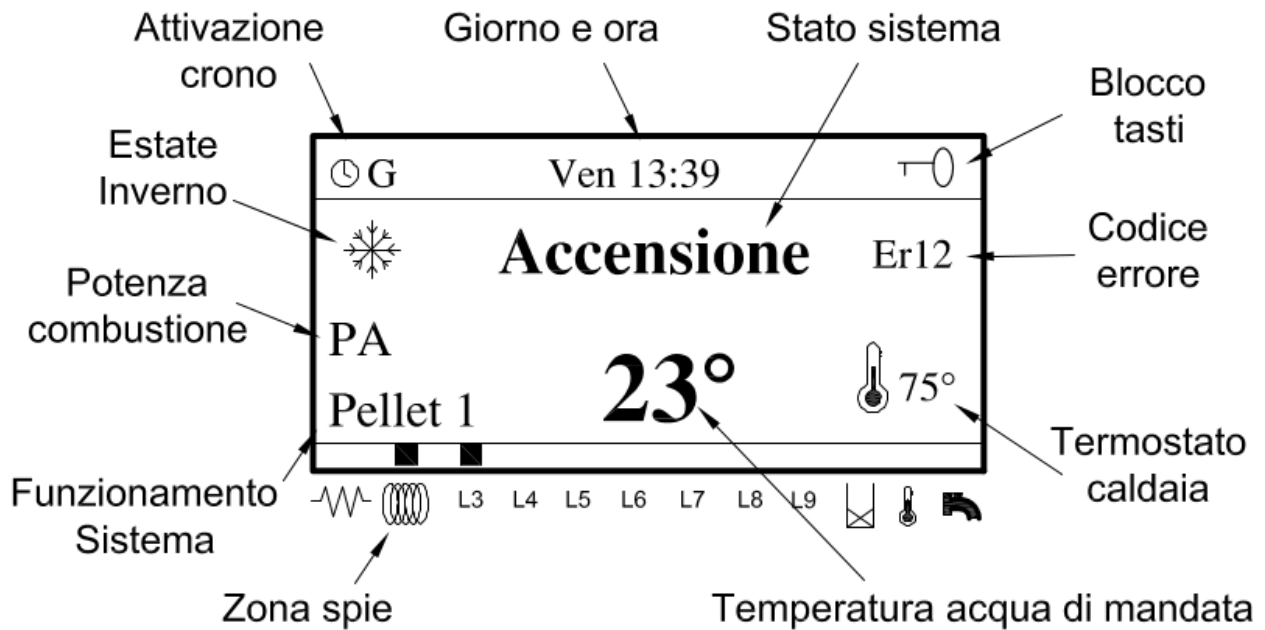
The figure below shows the LCD control panel with the key to the functions of each component:



Key:

P1	Used to exit from a menu or sub-menu
P2	<ul style="list-style-type: none"> - Ignition and shutdown when pressed for 3 seconds, until you hear the acoustic signal - System alarms reset when pressed for 3 seconds, until you hear the acoustic signal
P3	<ul style="list-style-type: none"> - Enter a menu or sub-menu - Enter to edit a menu - Save data in the menu
P4 – P6	<ul style="list-style-type: none"> - In the menu, they are used to scroll up and down in the lists of parameters and sub-menus - In menu editing mode, they increase or decrease the parameters
P5	Locks/unlocks the keys when pressed for 3 seconds, until you hear the acoustic signal (with keypad locked the symbol of a key appears at top right)

6.2. LCD display



Key:



Resistor symbol (NOT USED)



Auger symbol (NOT USED)

L3

System pump LED

L4

Recirculating pump (anti-condensation) LED

L5

DHW storage cylinder pump - buffer tank LED

L6

Solar panels pump LED

L7

Brazier cleanout solenoid valve LED

L8

Auxiliary generator output LED

L9

NOT USED



NOT USED



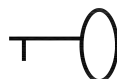
Room thermostat triggered symbol



NOT USED

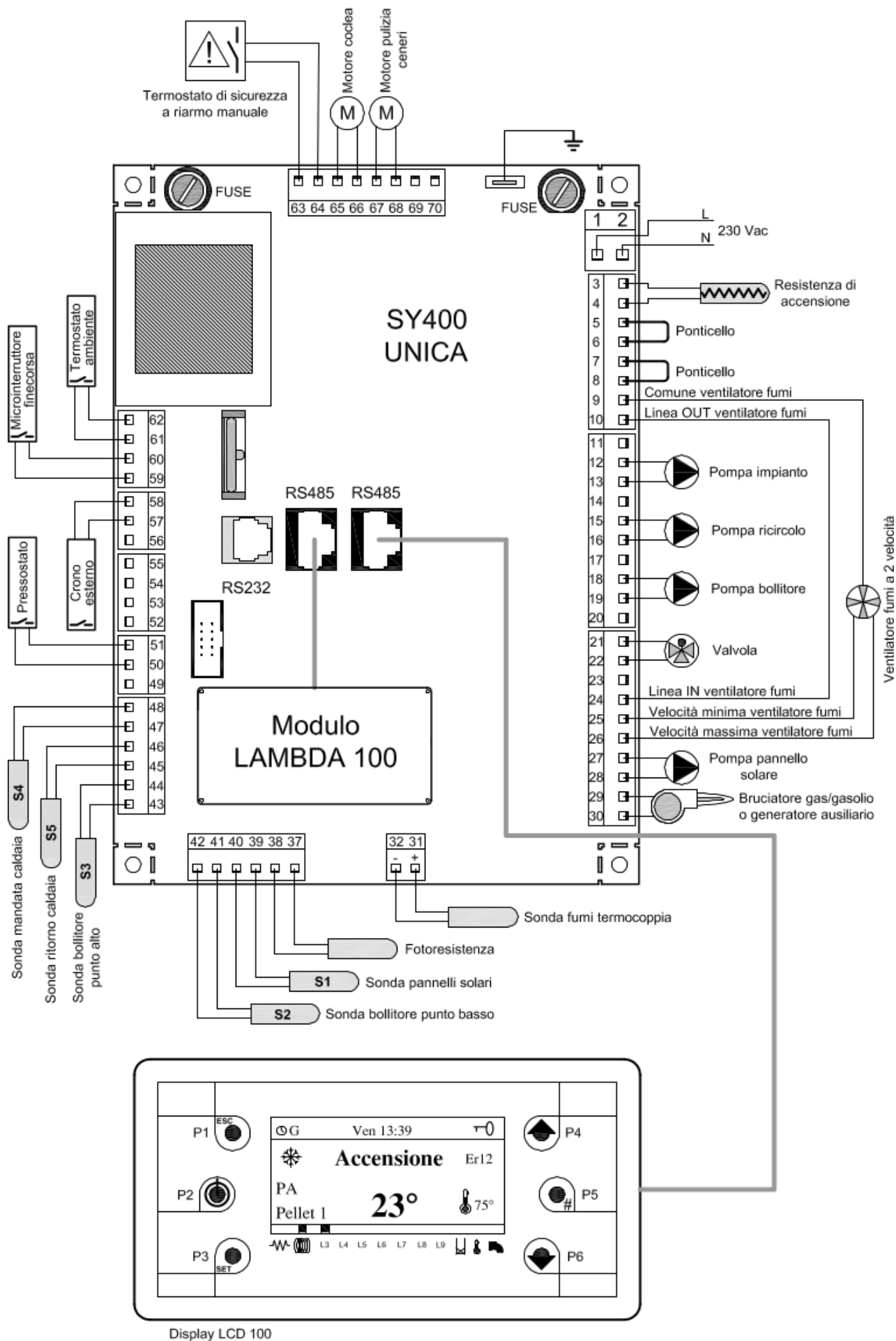


Timer thermostat enabled (NOT USED)



Keypad lock

6.3. SY400 electronic board (inside the panel)

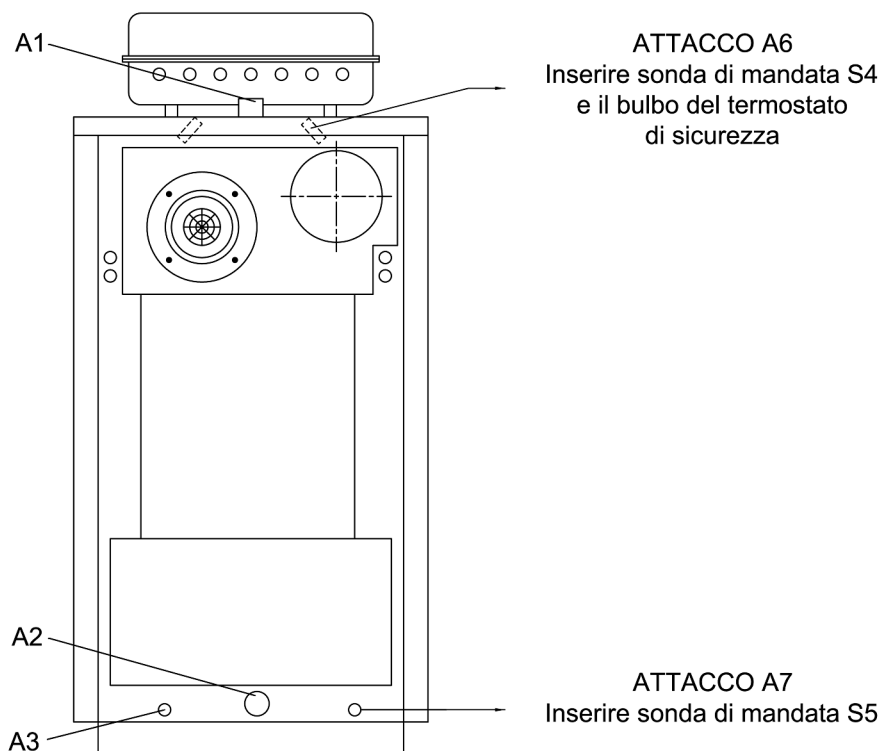


6.4 Probe connections

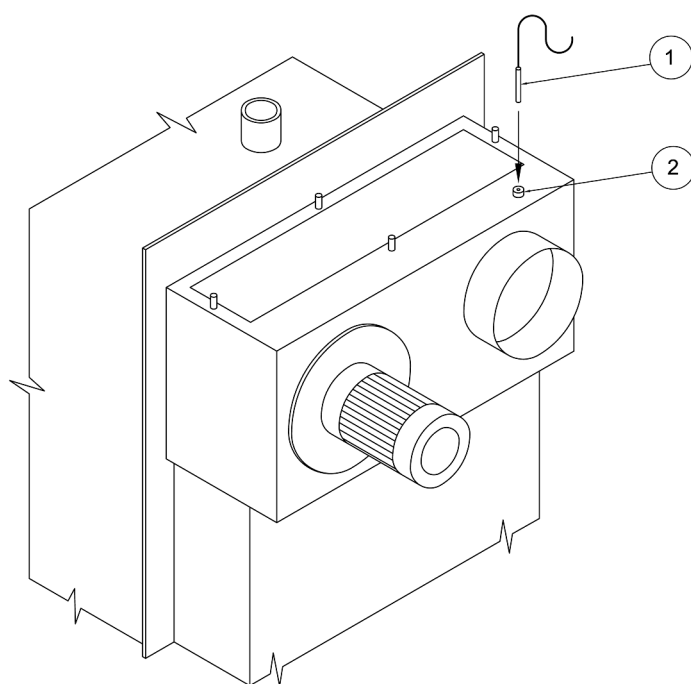
For correct boiler operation, the water temperature probes and safety thermostat sensor must be positioned correctly.

The control unit comes pre-wired with the outlet probe S4 - 3 m of cable (pins 47, 48 page 17), the return probe S5 - 3 m of cable (pins 45, 46 page 17) and the safety thermostat (pins 63, 64 page 17).

These must be positioned as shown in the following figure:



6.5. Flue gas probe connection



Key:

- 1 Flue gas probe
- 2 Flue gas probe thermowell



IMPORTANT!

The flue gas probe is already wired on the electronic board to pins 31 - 32, as shown in the figure on page 15.

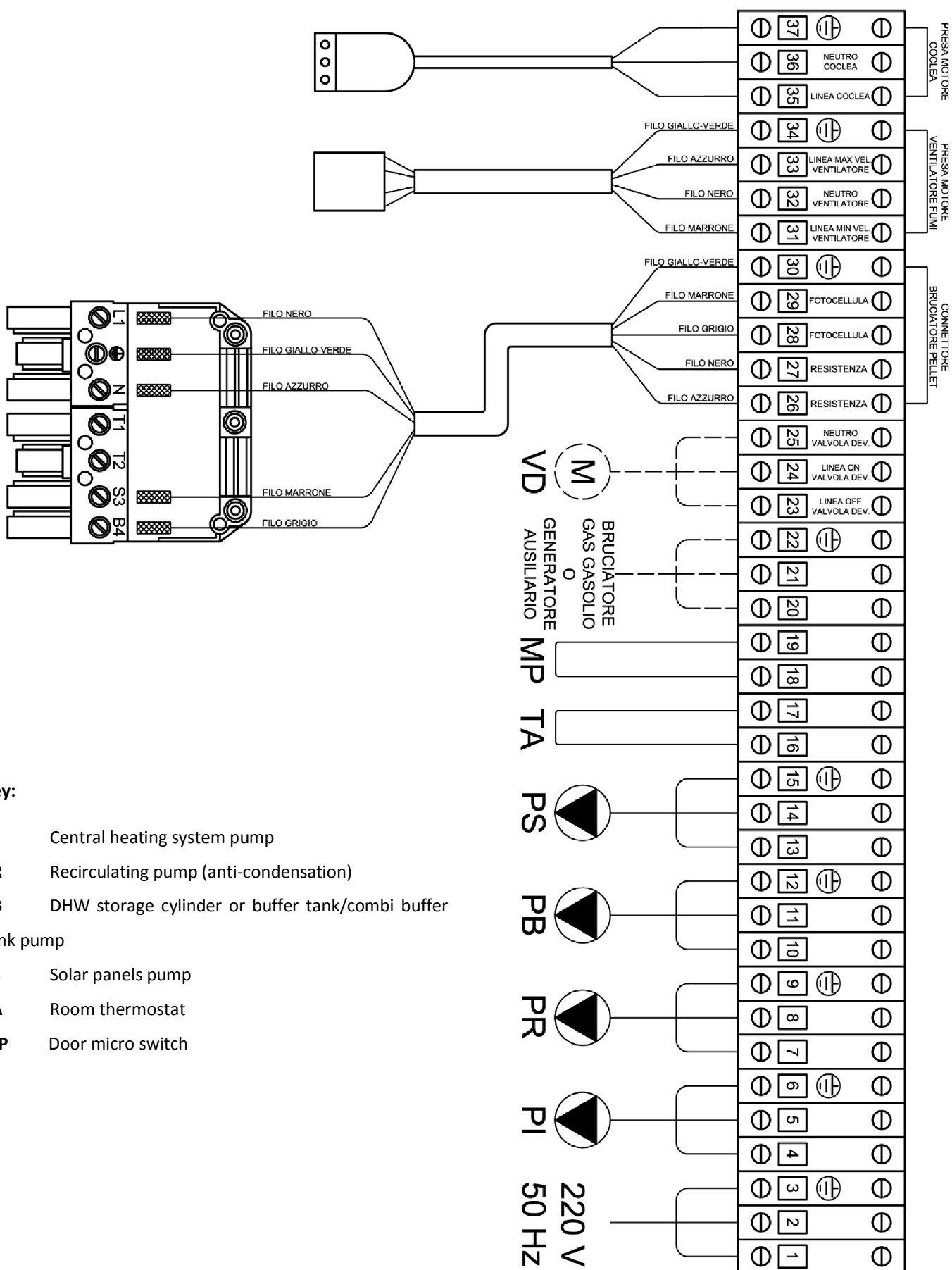
This must be fitted at the rear of the boiler: near the chimney connection there is a thermowell for inserting the probe.



CAUTION!

Clean the flue gas probe thermowell at least once every season to ensure that the correct temperature is read.

6.6. Terminal block wiring connections



Key:

- PI** Central heating system pump
- PR** Recirculating pump (anti-condensation)
- PB** DHW storage cylinder or buffer tank/combi buffer tank pump
- PS** Solar panels pump
- TA** Room thermostat
- MP** Door micro switch



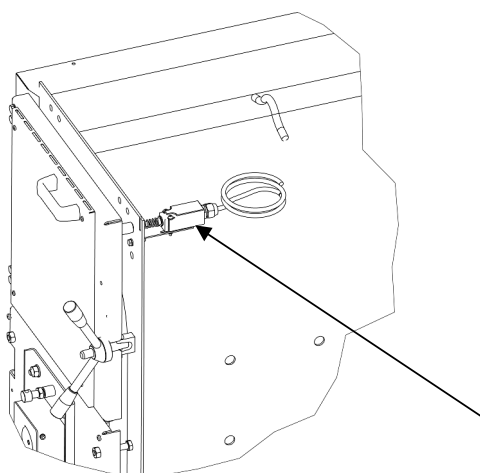
NOTE: contacts 16 and 17 (TA) are jumpered to allow continuous operation of the system pump if the room thermostat is not connected.

The 'pellet burner' connector and the 'auger motor' socket are supplied as optional extras if the pellet burner is installed on the top door.



CAUTION: if a room thermostat is connected, remove the jumper and make sure the two connectors are attached to the device. Failure of the system pump could be due to incorrect connection of the wires to the device or the device itself being defective. Make sure the room thermostat connection has a voltage-free contact.

The door micro switch is already fitted on its support; simply connect the two wires to pins 18 and 19.



DOOR MICROSWITCH

7. DISPLAY

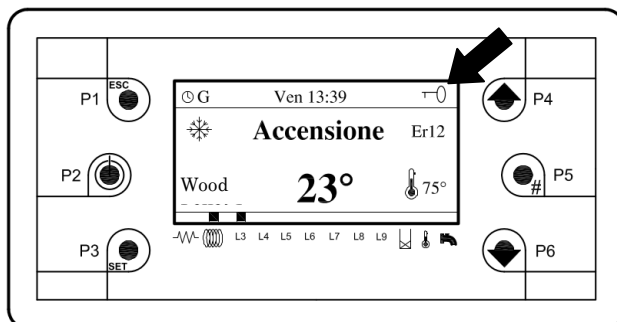
The LCD display has a menu showing the readings of all enabled probes. The value can be seen next to the name of the parameter. Press P4 or P6 to enter this menu.

Flue Gas T. [°C]	120
Boiler T. [°C]	62
Boiler Return T. [°C]	59
High Buffer Tank T. [°C]	61
Low Buffer Tank T. [°C]	59
Solar T. [°C]	78
Oxygen [%]	12.00
Frequency [Hz]	50
Recipe	1

- Flue gas temperature
- Boiler outlet temperature
- Boiler return temperature
- High point boiler/buffer tank temperature (if enabled)
- Low point boiler/buffer tank temperature (if enabled)
- Solar panel temperature (if enabled)
- Oxygen % reading (if enabled)
- Mains frequency
- Fuel recipe set
- Basic board firmware version
- Keypad firmware version

7.1. Keypad lock

The keypad can be locked. Press and hold P5 to do so. A key symbol will appear at top right to show the keypad is locked. Press and hold P5 again to unlock the keypad. The key symbol should disappear.



8. COMMISSIONING AND OPERATION

Before starting the boiler, check that:

- a) the system is full of water and well-vented
- b) any on-off devices are open and the pumps are not blocked

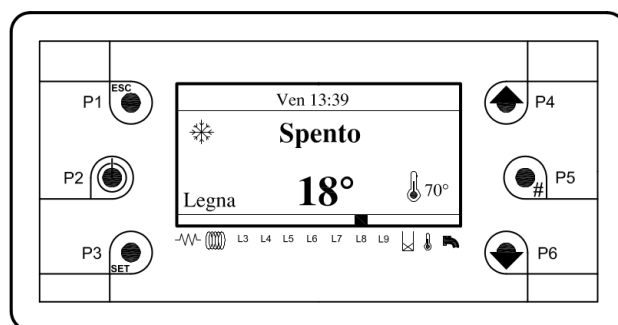
moreover:

- Before performing any maintenance always disconnect power to the boiler and wait for the appliance to reach room temperature.
- Never drain the water from the system unless absolutely unavoidable.
- Periodically check that the device and/or flue gas exhaust duct are intact.
- Do not use flammable substances (petrol, alcohol, solvents, etc.) to clean the boiler

8.1. Boiler off

When the boiler is “Off”, the fan is also off.

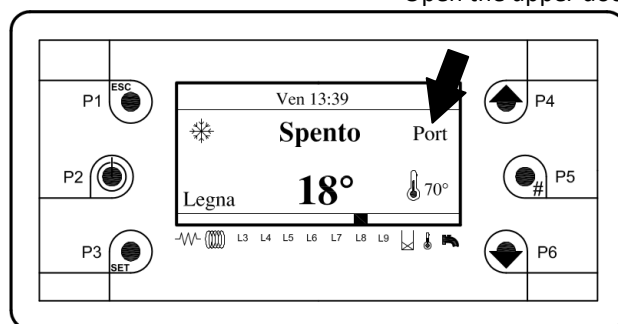
The bottom centre of the display always shows the outlet temperature whilst the bottom right side shows the set temperature. LED L8 is lit since with the boiler in standby, the burner or auxiliary generator output is active.



8.2. Boiler ignition

When the wood storage chamber door is open, 'Port' appears on the display; when closing it, make sure that the inscription disappears.

Open the upper door.



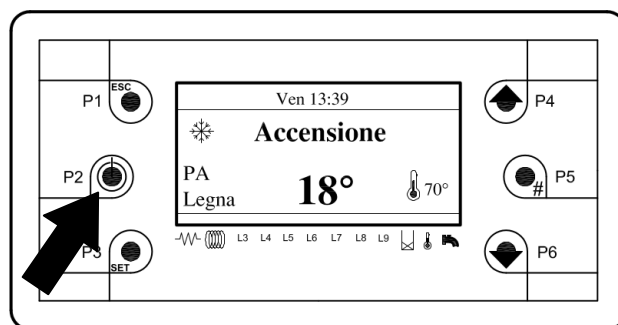
Place some fine dry wood, arranged in a criss-cross pattern, in the centre of the stone above the cast-iron grid plate. Put easily flammable material on the wood, avoid large, square-shaped pieces. Using thin sheets of paper (newspapers or similar) light the wood. Immediately close the wood storage chamber door and press button P2 to start the flue gas fan.



CAUTION: make sure that the door is securely closed and that the word 'Port' on the display disappears.

If this is not the case, even if the P2 button is pressed, the flue gas fan will not start.

Press P2 for about 5 seconds to start the ignition cycle.

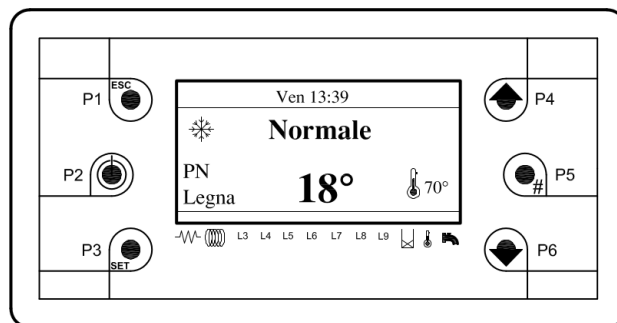


As soon as the operating cycle is started, 'Ignition' appears on the upper display, indicating the boiler start-up phase. This message will remain on the display until the flue gas temperature exceeds the *minimum flue gas ignition*

temperature (set at 70°) within the time set by the *ignition phase time* parameter (set at 30 minutes); in this state the fan runs at maximum speed.

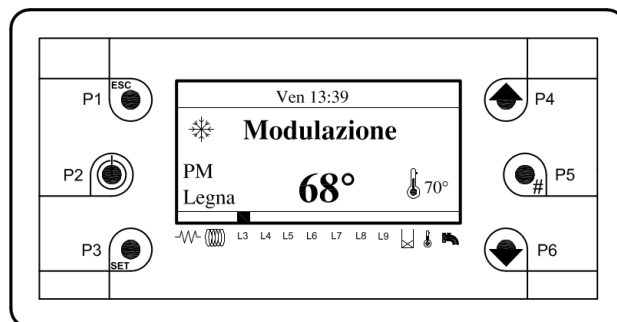
8.3. Normal operation

When the *minimum flue gas ignition temperature* is exceeded, the word " Normal " will appear on the upper display, indicating the normal boiler power status; in this status the fan runs at maximum speed.



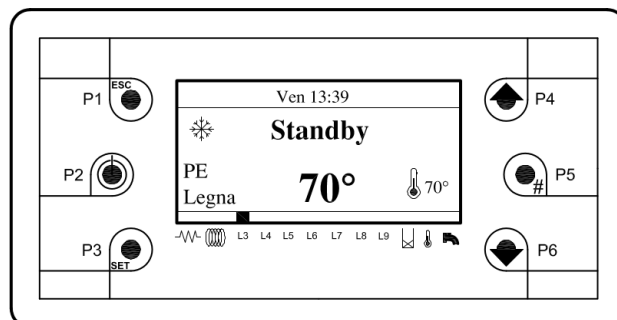
8.4. Modulation

On reaching the set temperature and more precisely 2°C below the operating temperature, the top display will show "**Modulazione**" [Modulation] indicating modulating operation; in this stage the fan operates at minimum speed. This message may also be shown when the boiler starts modulating operation due to excessive flue gas temperature (maximum setting 190°C).



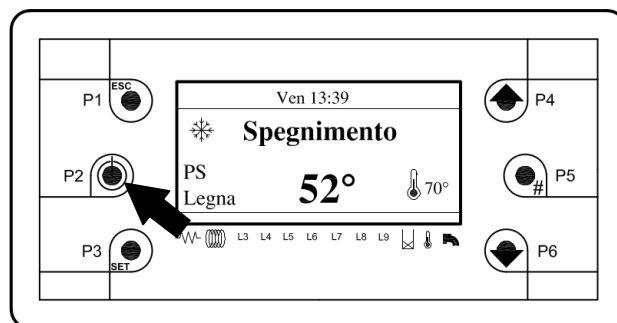
8.5. Standby

Once the set temperature has been reached, '**Standby**' will appear on the upper display, indicating the temperature maintenance status; in this status the fan is switched off. Once the boiler temperature drops 5° C below the set temperature, the fan starts automatically.



8.6. Total shutdown

The boiler can be shut down at any time by pressing and holding P2 for 3 seconds. In this way, even if the temperature drops, the fan remains switched off.



CAUTION: only use button P2 to switch the boiler off, never power the appliance down using the green main switch on the electronic panel.

8.7. Tips for proper functioning

8.7.1. Loading the wood



Once the bed of embers is formed, the wood can be loaded. Slowly open the door of the wood storage chamber, to allow the fan to draw in the flue gas accumulated in the wood storage chamber. Using the supplied poker, slowly open the smoke door and distribute the embers evenly over the main stone. You can then proceed to load the wood, which must be done with logs of the same length as the firebox.

Note: this indication must be strictly followed. Since for good combustion it is indispensable that there is an even downward flow of wood, it is necessary to ensure that the length of the pieces introduced, their shape and the way they are loaded do not prevent the fuel from descending regularly. The pieces must be arranged longitudinally, no pieces must be tilted or placed crosswise.



Before loading more wood, consume as much of the previous one as possible. More wood can be loaded when the bed of embers in the wood storage chamber has been reduced to a thickness of about 5 cm. Arrange the new load of wood as indicated above.

Useful tips:

- ❑ Pieces that are too long do not fall regularly, causing 'bridges'.
- ❑ Open the door of the wood storage chamber slowly to avoid puffing and smoke formation.
- ❑ It is absolutely forbidden to open the lower door of the wood boiler during operation.
- ❑ **Avoid (especially in the off-season) excessive wood loads** so that the boiler does not remain idle for long with the storage chamber full of wood. Under such conditions, the wood in the storage chamber is dried by the high temperature present, but the water vapour and acetic acid that are formed, instead of being expelled from the chimney by combustion, stagnate in the wood storage chamber itself. These acidic vapours in contact with the cooler side wall tend to condense, amplifying corrosion phenomena in the materials. **For this reason, it is not recommended to fill the storage chamber with wood during the warmer period or the summer period for domestic hot water production, while wood should not be left in the storage chamber for more than a day without being burnt.**

8.7.2. Usable fuels

Aspiro CTCA boilers can only be used with wood logs.

The wood used must be of good quality with the following minimum requirements:

- Moisture content between 12% and 20%.
- Maximum length 500 mm (Aspiro 25 and 35), 700 (Aspiro 50)
- Size 20-100 mm.
- Calorific value ≥ 4.0 kWh/kg.



It is important to use dry wood with a seasoning of at least two years.

The recommended woods are: beech, oak, acacia, turkey oak, larch, birch.

Do not use whole round logs because whole round logs obstruct the air flow inside.

8.7.3. Warnings and fuel advice



CAUTION: Italian law prohibits the burning of any waste in domestic biomass plants

It is strictly forbidden to burn:

- contaminated wood from packaging, crates, pallets.
- painted wood or chipboard.
- old wood from furniture, windows or floors.
- scrap wood from construction sites.
- sawdust or pruned branches.
- paper, cardboard, newspapers, magazines.
- tetra pak, packaging or similar.
- plastics of all kinds.
- waste.

Using the boiler for waste disposal causes the emission of aggressive fumes that result in corrosion of the appliance, damage to the flue and pollution of the air and environment.

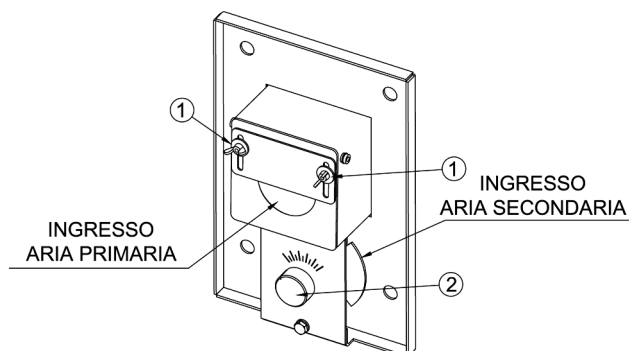
Damage causes high maintenance and repair costs, which are considerably higher than the costs of regular waste disposal.

8.7.4. The correct storage of wood

- storage is of the utmost importance for maintaining the quality of firewood.
- wood should already be stored in the size of use.
- wood should be stored in a minimum of two years.
- store woodpiles in places protected from rain.
- create a dry bottom for storage and keep separated from the ground to allow airing at least 20cm (e.g. stack on top of long beams).
- store in wind-exposed locations facing SOUTH.
- when stacking near constructions keep a space of at least 5-10cm between the stack and the wall.



8.7.5. Combustion air regulation



The combustion air for the wood boiler flows through the intake duct. The injected flow is then channelled to two separate ducts called 'primary air' and 'secondary air'.

The primary air determines the output of the boiler and thus the amount of wood that is burned: more air, more output, more consumption. To adjust the primary air, turn the primary air screw located above the air inlet duct; screwing closes, unscrewing opens. The amount of primary air required for combustion, however, depends on the quality of the wood being burned: well-seasoned wood in small sizes, which is very flammable, requires little primary

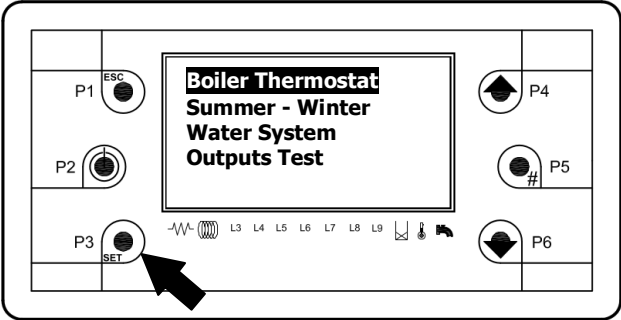
air; whereas moist wood of large size requires more primary air. Secondary air is used to complete combustion by completely oxidising the flame; to adjust it, turn the secondary air screw located under the air inlet duct. There should be only a few unburnt embers in the ash deposited on the catalysts. If the primary air is in excess there will be embers and small pieces of coal in the ash, the flame will be fast, dry, cold-coloured and noisy. Decrease the primary air setting. If the primary air is missing, the flame will be slow, small, will not graze the upper catalyst, and the output will be insufficient. If the flame is dark orange the secondary air is insufficient; if it is small and blue the secondary air is too much.

The flue gas temperature should be between 150 and 180°C by adjusting the primary air appropriately. Lower temperatures could create condensation problems in the chimney. Higher temperatures, in addition to lowering efficiency, would lead to overheating of the motor, vibration and noise phenomena in the motor, and premature wear of the fan bearing. Adjustment by SAT (Technical Assistance Service).

9.

USER MENU

This can be accessed by pressing **SET** (P3) on the front panel.



Press **P4** and **P6** to highlight the desired menu item.
Press **P3** to access the highlighted sub-menu showing the list of sub-menus or the setting of the selected parameter (Boiler Thermostat).

Boiler Thermostat	_____	Parameter name
A03	_____	
Max: 80	_____	Maximum settable value
Set: 70	_____	Set value
Min: 65	_____	Minimum settable value

The settings menu consists of the parameter name (first and second rows), minimum, maximum and actual value (“Set”).
Press **P3** again to enter the editing mode (the “Set” field flashes); press **P4** and **P6** to increase or decrease the value:
Press **P3** to save the set value, press **P1** to cancel the operation and restore the previous value. The new parameter is then transmitted to the heater: if transmission fails (interference in the transmission cable) a message is shown:



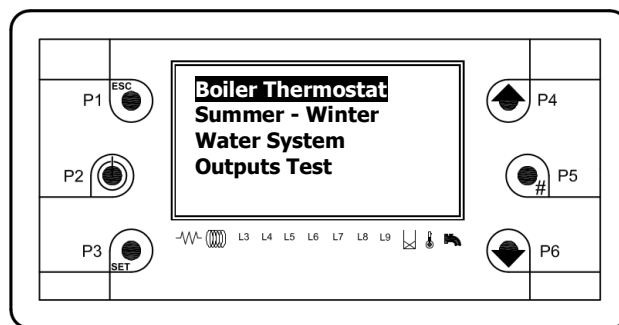
In this case try again to edit the parameter.

List of user menus and submenus:

ITEM N°	USER MENU	DESCRIPTION
1	Boiler Thermostat Summer - Winter Water System Outputs Test	Menu to edit the maximum set temperature of the boiler.
2	Boiler Thermostat Summer - Winter Water System Outputs Test	Menu for selecting summer operation (system pump disabled and DHW storage cylinder pump enabled) or winter operation (system pump and DHW storage cylinder pump enabled).
3	Boiler Thermostat Summer - Winter Water System Outputs Test	Menu for selecting the type of water system.
4	Ash cleanout Summer - Winter Water System Outputs Test	Menu for testing all 220V outputs.

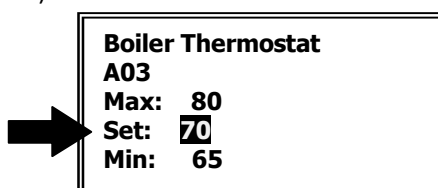
9.1. Boiler thermostat menu

Menu to edit the maximum set temperature of the boiler.



PROCEED AS FOLLOWS

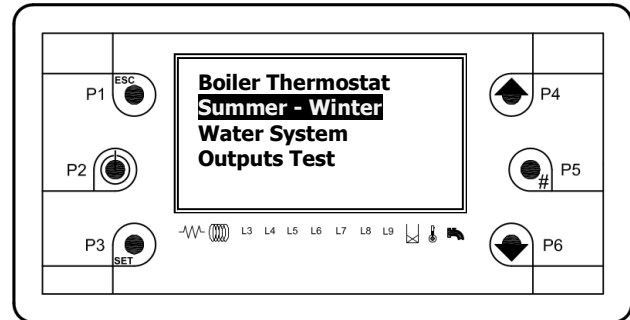
- ☐ Press **P3** (SET).
- ☐ Press **P4** and **P6** to highlight the item on the “Boiler Thermostat” menu.
- ☐ Press **P3** to access the highlighted sub-menu showing the list of sub-menus or the setting of the selected parameter (Boiler Thermostat).



- ☐ The “Set” field flashes, press **P4** and **P6** to increase or decrease the value.
- ☐ Press **P3** to save the set value and exit the menu, press **P1** to cancel the operation and restore the previous value.
- ☐

9.2. Summer - winter menu

Menu for selecting summer operation (system pump disabled and DHW storage cylinder pump enabled) or winter operation (system pump and DHW storage cylinder pump enabled).



PROCEED AS FOLLOWS

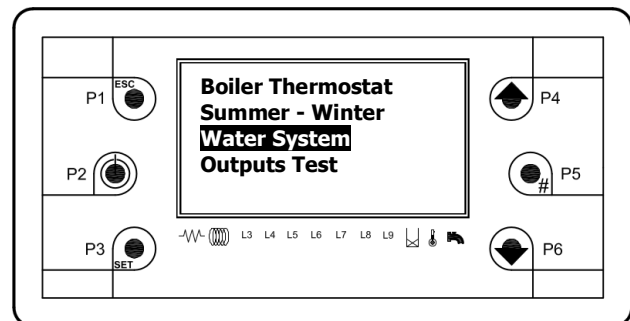
- ☐ Press **P3** (SET).
- ☐ Press **P4** and **P6** to highlight the item on the “Summer - Winter” menu.
- ☐ Press **P3** to enter the highlighted sub-menu showing the list of sub-menus or the setting of the selected parameter (Summer - Winter).



- ☐ The highlighted field flashes, press **P4** and **P6** to edit the selection.
- ☐ Press **P3** to save the set value and exit the menu, press **P1** to cancel the operation and restore the previous value.

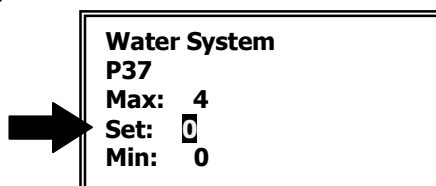
9.3. Water circuit menu (enable probes)

Depending on the type of water circuit connected to the boiler, the temperature probes need to be enabled for managing the pump electrical signals.



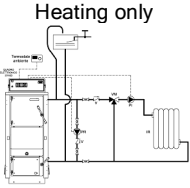
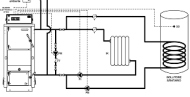
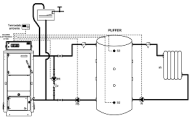
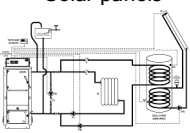
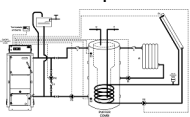
PROCEED AS FOLLOWS

- ☐ Press **P3** (SET).
- ☐ Press **P4** and **P6** to highlight the item on the “Water System” menu.
- ☐ Press **P3** to enter the highlighted sub-menu showing the list of sub-menus or the setting of the selected parameter (Water System).



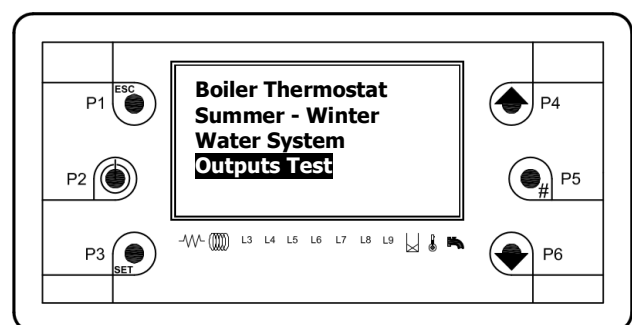
- ☐ The highlighted field flashes, press **P4** and **P6** to edit the selection.
- ☐ Press **P3** to save the set value and exit the menu, press **P1** to cancel the operation and restore the previous value.

The following table indicates the values for enabling the probes based on the type of water circuit used:

System configuration[P37]	Description	Water probes enabled	Pumps enabled
Set: 0	Heating only 	Boiler outlet probe S4 Boiler return probe S5	System pump (PI) Anti-condensation pump (PR)
Set: 1	Heating + DHW storage cylinder 	Boiler outlet probe S4 Boiler return probe S5 Boiler DHW storage cylinder top probe S3	System pump (PI) Anti-condensation pump (PR) Boiler DHW pump (PB)
Set: 2	Heating + Buffer tank - Combi buffer tank 	Boiler outlet probe S4 Boiler return probe S5 Buffer tank top probe S3 Buffer tank bottom probe S2	System pump (PI) Anti-condensation pump (PR) Buffer tank pump (PB)
Set: 3	Heating + DHW storage cylinder + Solar panels 	Boiler outlet probe S4 Boiler return probe S5 Boiler DHW storage cylinder top probe S3 Boiler DHW storage cylinder bottom probe S2 Solar panel probe S1	System pump (PI) Anti-condensation pump (PR) Boiler DHW pump (PB) Solar panel pump (PS)
Set: 4	Heating + Buffer tank + Solar panels 	Boiler outlet probe S4 Boiler return probe S5 Buffer tank top probe S3 Buffer tank bottom probe S2 Solar panel probe S1	System pump (PI) Anti-condensation pump (PR) Buffer tank pump (PB) Solar panel pump (PS)

9.4. Outputs test menu

This menu is used to test the individual outputs on the board (and consequently the connected loads) when the boiler is **OFF**.



PROCEED AS FOLLOWS

- ☐ Press **P3** (SET).
- ☐ Press **P4** and **P6** to highlight the item on the “Outputs Test” menu.
- ☐ Press **P3** to enter the highlighted sub-menu showing the list of sub-menus.

Fuel Fan
Secondary Fan/Ash
Cleanout
Screw
Ignition heater

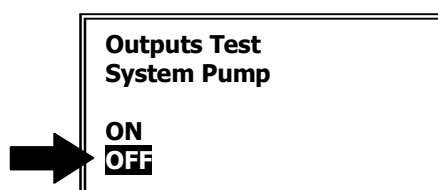
Recirculating Pump
Buffer Tank Pump
Solar Pump
Valve
Burner

Secondary Air Valve

Key:

TEST	DESCRIPTION
Fuel Fan	Boiler flue gas fan
Secondary Fan/Ash Cleanout	Ash compartment cleaning motor (NOT USED)
Screw	Pellet tank auger motor (NOT USED)
Ignition heater	Burner ignition heater (NOT USED)
System Pump	Heating system pump
Recirculating Pump	Anti-condensation pump
Buffer Tank Pump	DHW storage cylinder or buffer tank / combi buffer tank fill pump
Solar Pump	Solar panels pump
Valve	Brazier cleanout air valve
Burner	Gas-diesel burner or auxiliary generator output (220V)
Secondary Air Valve	Secondary air servomotor

- ❑ Press **P4** and **P6** to highlight the item on the sub-menu.
- ❑ Press **P3** (SET).



- ❑ The highlighted field flashes, press **P4** to select **ON**.
- ❑ Press **P3** (SET) to start the test (e.g. Screw).
- ❑ To switch the motor off select **OFF** with **P6**.
- ❑ Press **P3** (SET) to finish the test (e.g. System Pump).
- ❑ Press **P1** (ESC) to exit the sub-menu.



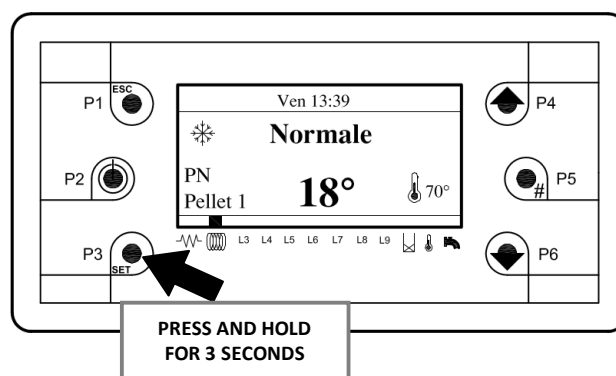
CAUTION: for boiler flue gas fan tests, the speed can be set. For the remaining tests use ON/OFF.



CAUTION: the output tests can be run only with the boiler OFF, under no alarm condition and with the pumps stopped.

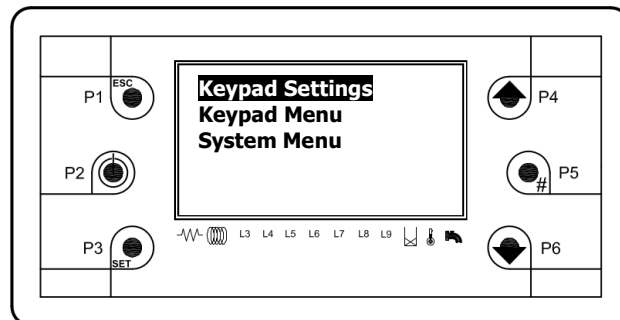
10. CUSTOMISATIONS MENU

The control unit has a customisations menu; to access this menu press and hold **P3** for 3 seconds. The menu can be accessed during any operating status.



10.1. Customisation - Keypad Settings

Adjust the date and time on the “Keypad Settings”; the control panel language can also be selected.



PROCEED AS FOLLOWS

- ❑ Press and hold **P3** (SET) for 3 seconds.
- ❑ Press **P4** and **P6** to highlight the item on the “Keypad Settings” menu.
- ❑ Press **P3** to enter the highlighted sub-menu showing the list of sub-menus.

Date and Time
Language

To edit the date and time

- ❑ Press **P4** and **P6** to highlight the item on the “Date and Time” menu.
- ❑ Press **P3** (SET).

Date and Time
15 : 48
Thursday
14/05/2015

- ❑ Press **P4** and **P6** to highlight the item to be edited.
- ❑ Press **P3** (SET) (the value flashes).
- ❑ Press **P4** and **P6** to edit the value.
- ❑ Press **P3** (SET) to confirm the change (the value stops flashing).
- ❑ Press **P4** and **P6** to highlight other items to be edited or press **P1** (ESC) to exit.

To edit the language

- ❑ Press **P4** and **P6** to highlight the item on the “Language” menu.

Date and Time
Language

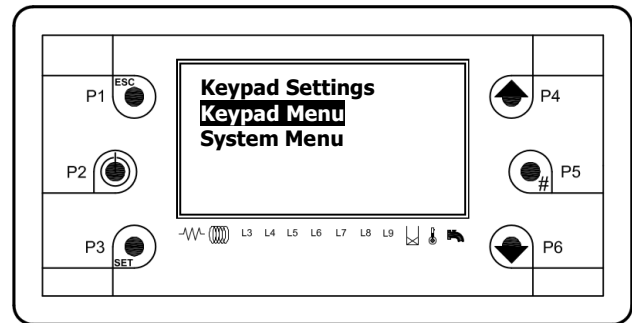
- ❑ Press **P3** (SET).

Español
Français
Deutsch
English
Italiano

- ☐ Press **P4** and **P6** to highlight the language to be set.
- ☐ Press **P3** (SET) to confirm the change.
- ☐ Press **P1** (ESC) to exit.

10.2. Customisation - Keypad Menu

Adjust the display view on the “Keypad Menu”.



PROCEED AS FOLLOWS

- ☐ Press and hold **P3** (SET) for 3 seconds.
- ☐ Press **P4** and **P6** to highlight the item on the “Keypad Menu”.
- ☐ Press **P3** to enter the highlighted sub-menu showing the list of sub-menus.

Adjust Contrast
Adjust Minimum Light
Keypad Address
Nodes List
Acoustic Alarm

To edit “Adjust Contrast”

- ☐ Press **P4** and **P6** to highlight the item on the “Adjust Contrast” menu.
- ☐ Press **P3** (SET).

Adjust Contrast

+
 0 15
 -

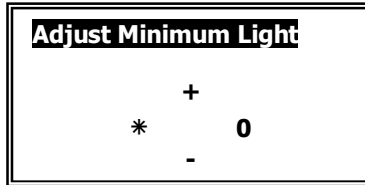
- ☐ Press **P4** and **P6** to edit the contrast value.
- ☐ Press **P3** (SET) to confirm the change.
- ☐ Press **P1** (ESC) to exit.

To edit “Adjust Minimum Light”

- ☐ Press **P4** and **P6** to highlight the item on the “Adjust Minimum Light” menu.

Adjust Contrast
Adjust Minimum Light
Keypad Address
Nodes List
Acoustic Alarm

- ☐ Press **P3** (SET).



- ☐ Press **P4** and **P6** to edit the minimum light value when the controls are not being used.
- ☐ Press **P3** (SET) to confirm the change.
- ☐ Press **P1** (ESC) to exit.

To edit "Keypad Address and Nodes List"



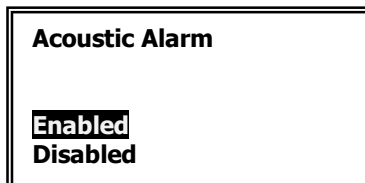
CAUTION: the "Keypad Address" and "Nodes List" menus are reserved for the technical support and therefore cannot be edited from the user menu.

To edit "Acoustic Alarm"

- ☐ Press **P4** and **P6** to highlight the item on the "Acoustic Alarm" menu.



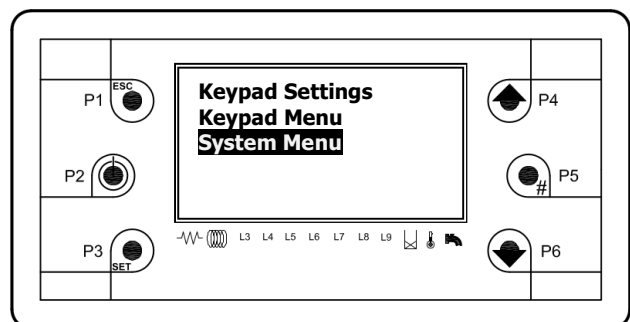
- ☐ Press **P3** (SET).



- ☐ Press **P4** and **P6** to enable or disable the acoustic alarm.
- ☐ Press **P3** (SET) to confirm the change.
- ☐ Press **P1** (ESC) to exit.

10.3. Customisation - System Menu

The "System Menu" can only be accessed with a password. Access is reserved for specialised personnel or the technical support service.



11. WATER CIRCUIT DIAGRAMS

All the water circuit diagrams shown in this booklet are purely indicative, and must be approved by a heating system designer. ARCA s.r.l. is not liable for any damage to things, people or animals due to incorrect system design. For any diagram not explicitly indicated in this booklet, please contact the ARCA S.r.l. technical office. The warranty will not cover any systems that are not commissioned in compliance with specifications or without authorisation.



IMPORTANT: For correct generator operation the recirculating pump must be installed.



THE WARRANTY WILL BE VOID IF THE RECIRCULATING PUMP IS NOT INSTALLED.

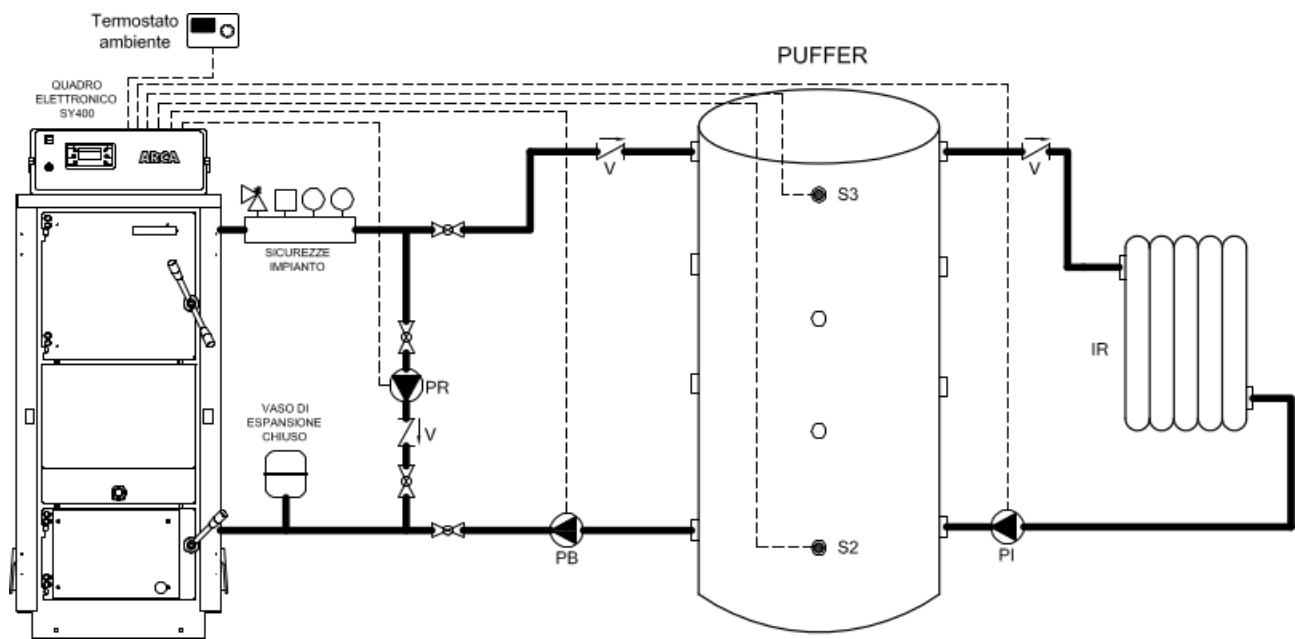
11.1. Indicative diagrams for closed vessel heating system with buffer tank or buffer tank combi

The heating system with buffer tank or combi buffer tank consists of the following parts:

1. **Boiler outlet probe (S4):** this is located in the thermowell near the boiler outlet (connection A6) and its reading is used to change operating mode and enable operation of the pumps.
2. **Boiler return probe (S5):** this is located in the thermowell near the boiler return (connection A7) and is used for operation of the recirculating or anti-condensation pump (PR).
3. **Buffer tank top probe (S3):** this is located in the thermowell at the top of the buffer tank and is used for management of the buffer tank pump (PB) and the system pump (PI).
4. **Buffer tank bottom probe (S2):** this is located in the thermowell at the bottom of the buffer tank and is used for management of the buffer tank pump (PB) and the solar panel pump (PS).
5. **Solar panel probe (S1):** this is located on the outlet of the solar panel manifold and is used for management of the solar panel pump (PS).
6. **System pump (PI):** this is enabled for operation above the value of **TH-BUFFER-SYSTEM-PUMP[A34]**, however, it is effectively activated based on the signal from the room thermostat. This always operates, i.e. ignores the room thermostat, in the event of a frost alarm (outlet water temperature less than the value of **TH-BOILER-ICE[A00]**) or anti-inertia operation (outlet water temperature greater than the value of **TH-BOILER-SAFE[A04]**).
7. **Recirculating or anti-condensation pump (PR):** this is enabled for operation above the value of **TH-RECIRC-PUMP[A14]**, however, it is only activated when the outlet water temperature exceeds the return temperature by a delta equal to the value of parameter **RECIRCULATION DIFFERENTIAL[d00]** in the protected menu. This always operates in the event of a frost alarm (outlet water temperature less than the value of **TH-BOILER-ICE[A00]**) or anti-inertia operation (outlet water temperature greater than the value of **TH-BOILER-SAFE[A04]**).
8. **Buffer tank pump (PB):** this is enabled for operation above the value of **TH-BOILER-PUMP[A15]**, however, it is only activated when the temperature at the top of the buffer tank is below the value of **TH-BUFFERTANK-ON[A33]**. It stops when the water temperature at the bottom of the buffer tank reaches the value of **TH-BUFFERTANK-OFF[A48]**. This always operates, i.e. ignores the room thermostat, in the event of a frost alarm (outlet water temperature less than the value of **TH-BOILER-ICE[A00]**) or anti-inertia operation (outlet water temperature greater than the value of **TH-BOILER-SAFE[A04]**).
9. **Solar panels pump (PS):** this is activated if the water temperature in the solar panel manifold exceeds the temperature at the bottom of the cylinder by a delta equal to the value of parameter **SOLAR DIFFERENTIAL[d16]** in the protected menu. If the water temperature at the top of the cylinder reaches the value of thermostat **TH-BOILER-SAFE[A35]**, the pump will stop for safety reasons. In the event of a solar panel frost alarm (panel water

temperature less than the value of thermostat **TH-SOLAR-ICE[A48]**) the pump will be activated intermittently with off times equal to the value of parameter **TIME SOLAR ICE OFF[t37]** and on times equal to **TIME SOLAR ICE ON[t36]**.

11.1.1. Indicative diagram for closed vessel heating with buffer storage tank



Key:

PI	System pump	V	Check valve
PR	Recirculating pump	S3	Buffer tank top probe (optional)
PB	Buffer tank fill pump	S2	Buffer tank bottom probe (optional)
IR	Central heating system		



WATER SYSTEM CONFIGURATION: “Water System” user menu - set value 2.

- ELECTRICAL CONNECTIONS:

- ☐ System pump **PI** electrically connected to pins 4 – 5 – 6 on the terminal block.
- ☐ Recirculating pump **PR** electrically connected to pins 7 – 8 – 9 on the terminal block.
- ☐ Buffer tank pump **PB** electrically connected to pins 10 – 11 - 12 on the terminal block.
- ☐ Buffer tank top probe **S3** electrically connected to pins 43 – 44 on the electronic board.
- ☐ Buffer tank bottom probe **S2** electrically connected to pins 41 - 42 on the electronic board
- ☐ Room thermostat **TA** electrically connected to pins 16 – 17 on the terminal block.

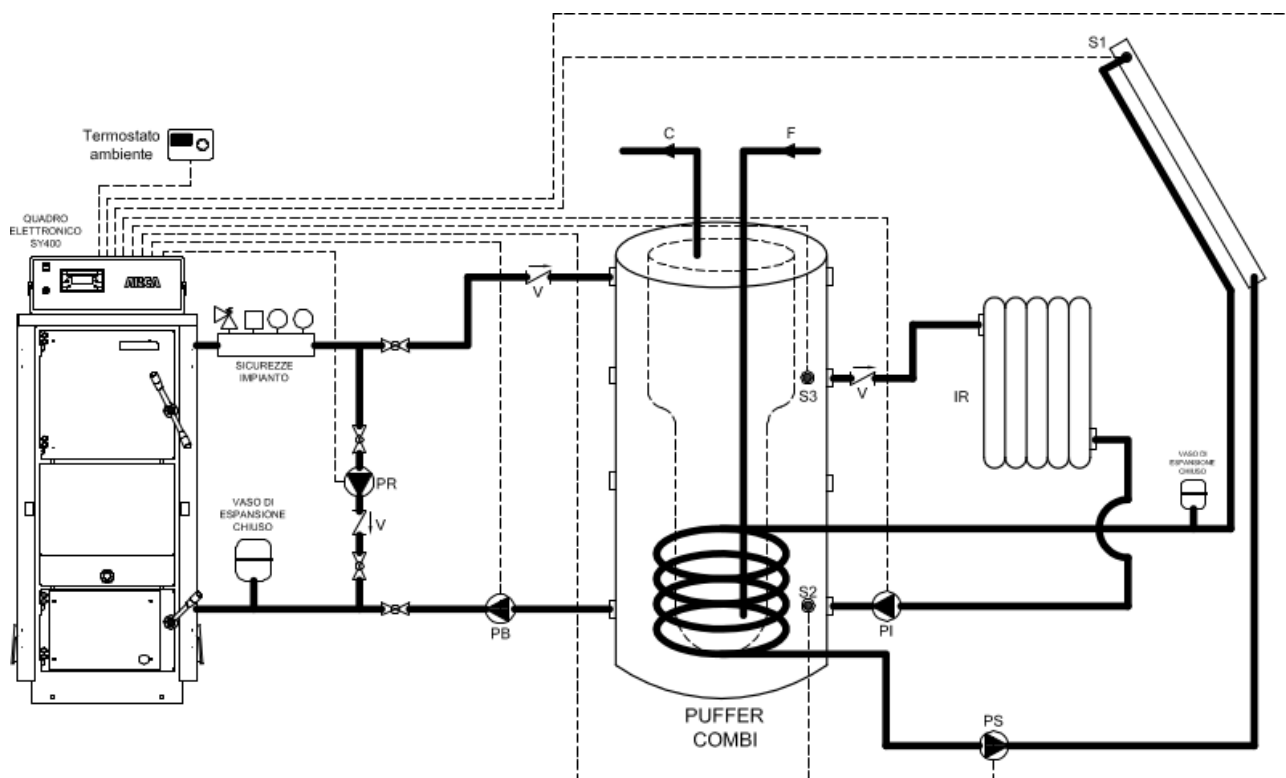


CAUTION: it is mandatory to install the thermal exhaust valve on the safety coil of the boiler (connections A4 page 13).



NOTES: the diagram envisages installation of a buffer tank between the boiler and the central heating system.
The buffer tank fill pump **PB** operates by reading the temperatures between probes **S3** and **S2**.
The system pump **PI** operates by reading the temperature of **S3** and the room thermostat connected to the boiler's SY400 control unit.

11.1.2. Indicative diagram for closed vessel heating with combi buffer tank + solar panels



Key:

PI	System pump	S1	Solar panel probe (optional)
PR	Recirculating pump	S2	Buffer tank bottom probe (optional)
PB	Buffer tank fill pump	S3	Buffer tank top probe (optional)
PS	Solar panel pump	V	Check valve
IR	Central heating system		



WATER SYSTEM CONFIGURATION: “Water System” user menu - set value 4.

- ELECTRICAL CONNECTIONS:

- ☐ System pump **PI** electrically connected to pins 4 – 5 – 6 on the terminal block.
- ☐ Recirculating pump **PR** electrically connected to pins 7 – 8 – 9 on the terminal block.
- ☐ DHW storage cylinder pump **PB** electrically connected to pins 10 – 11 - 12 on the terminal block.
- ☐ Solar panel pump **PS** electrically connected to pins 13 – 14 - 15 on the terminal block.
- ☐ Buffer tank top probe **S3** electrically connected to pins 43 – 44 on the electronic board.
- ☐ Buffer tank bottom probe **S2** electrically connected to pins 41 - 42 on the electronic board.
- ☐ Solar panel probe **S1** electrically connected to pins 39 - 40 on the electronic board.
- ☐ Room thermostat **TA** electrically connected to pins 16 – 17 on the terminal block.



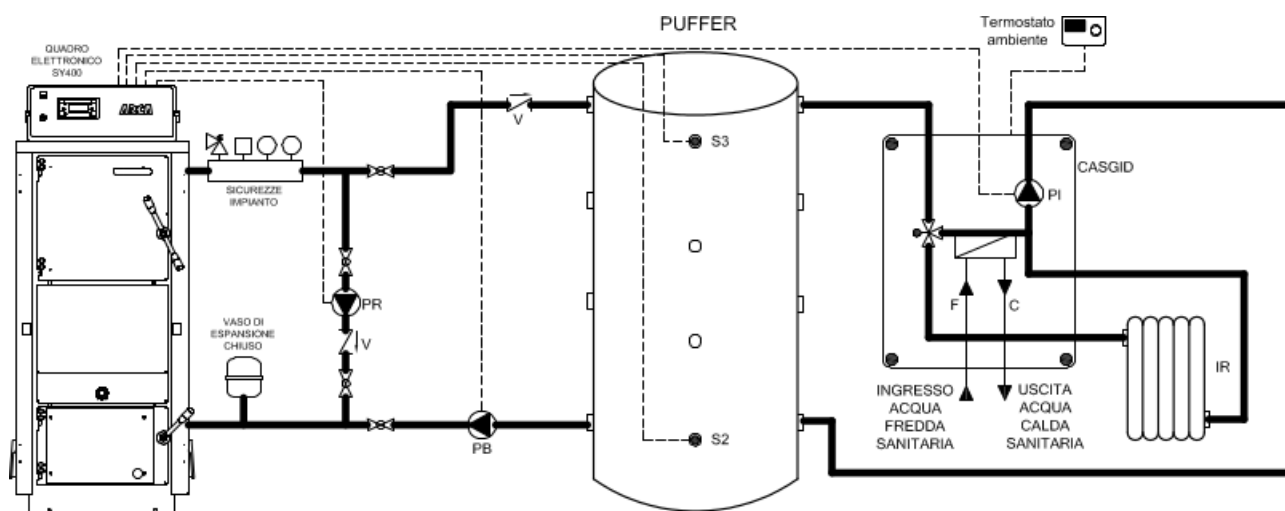
NOTES: the diagram envisages installation of a combi buffer tank between the boiler and the central heating system with integration of a solar panel.

The pump **PS** (solar panels) is controlled directly by the boiler's SY400 control unit by the differential between probe **S1** and probe **S2**. In winter there is a frost function.

The buffer tank fill pump **PB** operates by reading the temperatures between probes **S3** and **S2**.

The system pump **PI** operates by reading the temperature of **S3** and the room thermostat connected to the boiler's SY400 control unit.

11.1.3. Indicative diagram for closed-vessel heating with buffer tank and hydraulic box for instant domestic hot water production (code GASGID)



Key:

PI	System pump	V	Check valve
PR	Recirculating pump	S2	Storage cylinder bottom probe (optional)
PB	DHW storage cylinder pump	S3	Storage cylinder top probe (optional)
IR	Central heating system		



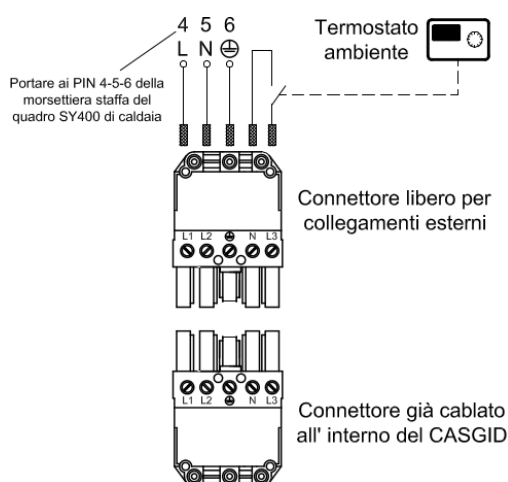
WATER SYSTEM CONFIGURATION: "Water System" user menu - set value 2.

- ELECTRICAL CONNECTIONS:

- ☐ System pump **PI** electrically connected to pins 4 – 5 – 6 on the terminal block.
- ☐ Recirculating pump **PR** electrically connected to pins 7 – 8 – 9 on the terminal block.
- ☐ Buffer tank pump **PB** electrically connected to pins 10 – 11 - 12 on the terminal block.
- ☐ Buffer tank top probe **S3** electrically connected to pins 43 – 44 on the electronic board.
- ☐ Buffer tank bottom probe **S2** electrically connected to pins 41 - 42 on the electronic board

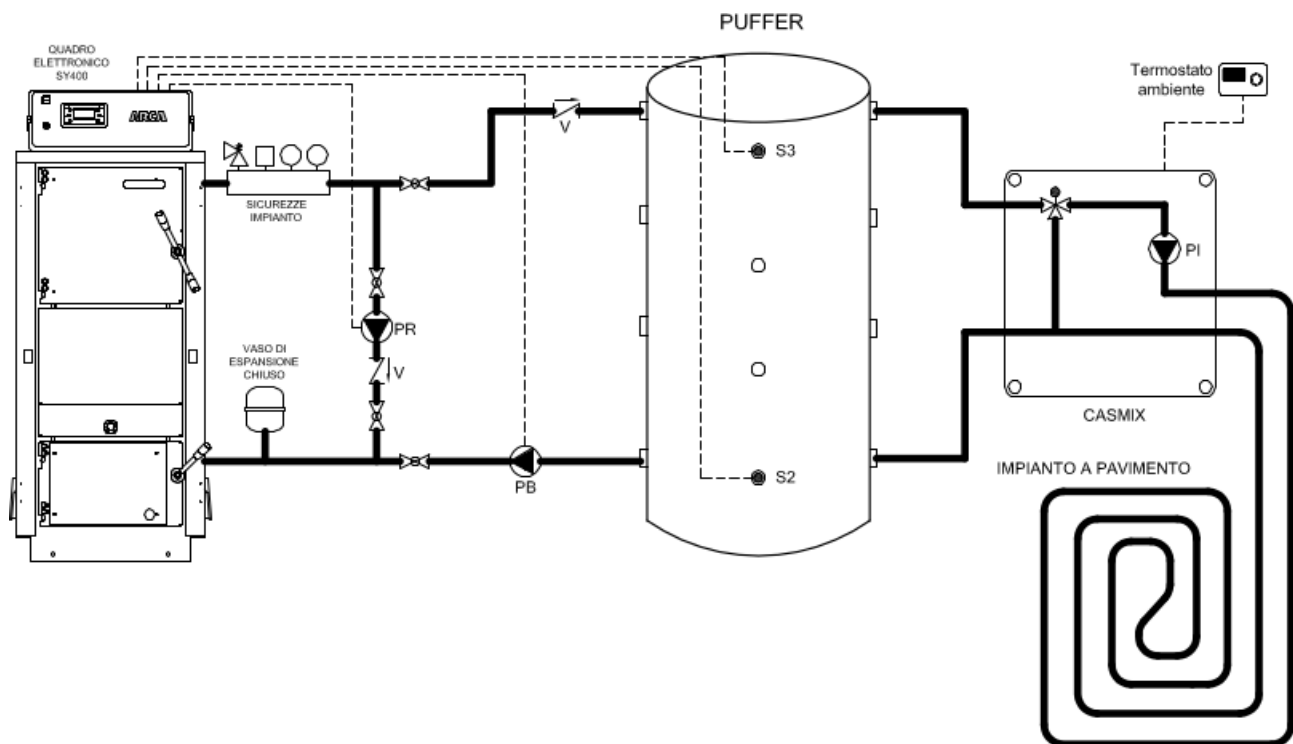


CAUTION: it is mandatory to install the thermal exhaust valve on the safety coil of the boiler (paragraph 5.5 page 17).



NOTES: The diagram envisages installation of a buffer tank and hydraulic box, code **CASGID** for the production of instantaneous domestic hot water prior to the heating system. The box pump will draw its power from the **PI** output (PIN 4-5-6) of the SY400 panel. The **TA** contact (PIN 16-17) of the SY 400 panel must remain jumpered. The room thermostat will be connected directly in the box (see diagram opposite). We recommend lowering the system pump start parameter **PI A34** to 40°.

11.1.4. Indicative diagram of closed-vessel heating with buffer tank and hydraulic box with mixing for radiant panel systems (code CASMIX)



Key:

PI	System pump	V	Check valve
PR	Recirculating pump	S2	Storage cylinder bottom probe (optional)
PB	DHW storage cylinder pump	S3	Storage cylinder top probe (optional)



WATER SYSTEM CONFIGURATION: “Water System” user menu - set value 2.

- ELECTRICAL CONNECTIONS:

- ☐ System pump **PI** electrically connected to pins 4 – 5 – 6 on the terminal block.
- ☐ Recirculating pump **PR** electrically connected to pins 7 – 8 – 9 on the terminal block.
- ☐ Buffer tank pump **PB** electrically connected to pins 10 – 11 - 12 on the terminal block.
- ☐ Buffer tank top probe **S3** electrically connected to pins 43 – 44 on the electronic board.
- ☐ Buffer tank bottom probe **S2** electrically connected to pins 41 - 42 on the electronic board

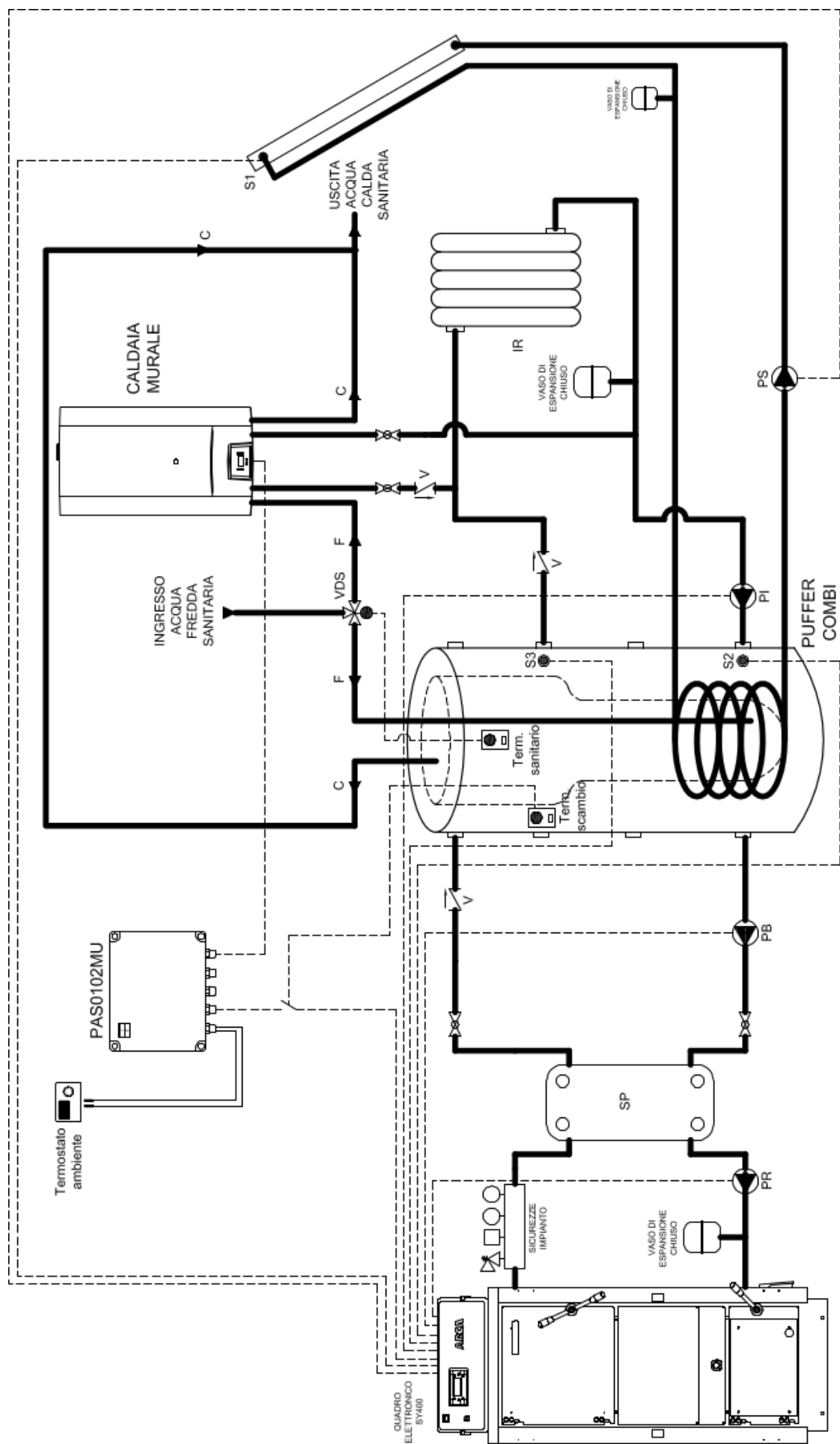


CAUTION: it is mandatory to install the thermal exhaust valve on the safety coil of the boiler (paragraph 5.5 page 17).



NOTES: The diagram envisages installation of a buffer tank and mixing hydraulic box, code **CASMIX**. The power supply of the box and the room thermostat will be drawn externally from the SY400 boiler panel.

11.1.5. Indicative diagram of closed vessel heating with combi buffer tank, solar panels and gas boiler



Key:

PI	System pump	V	Check valve
PR	Recirculating pump	S1	Solar panel probe (optional)
PB	DHW storage cylinder pump	S2	Storage cylinder bottom probe (optional)
PS	Solar panel pump	S3	Storage cylinder top probe (optional)
IR	Central heating system		



WATER SYSTEM CONFIGURATION: "Water System" user menu - set value 4.

- ELECTRICAL CONNECTIONS:

- ☐ System pump **PI** electrically connected to pins 4 – 5 – 6 on the terminal block.
- ☐ Recirculating pump **PR** electrically connected to pins 7 – 8 – 9 on the terminal block.
- ☐ DHW storage cylinder pump **PB** electrically connected to pins 10 – 11 - 12 on the terminal block.
- ☐ Solar panel pump **PS** electrically connected to pins 13 – 14 - 15 on the terminal block.
- ☐ Buffer tank top probe **S3** electrically connected to pins 43 – 44 on the electronic board.
- ☐ Buffer tank bottom probe **S2** electrically connected to pins 41 - 42 on the electronic board.
- ☐ Solar panel probe **S1** electrically connected to pins 39 - 40 on the electronic board.
- ☐ The 'Exchange' thermostat commands the **PAS010MU** control panel to switch on the wall-mounted boiler.
- ☐ The 'DHW' thermostat controls the **VDS** diverter valve.



CAUTION: it is mandatory to install the thermal exhaust valve on the boiler safety coil (paragraph 5.5 page 17).

For the system to work properly, the pumps, probes and PAS0102MU panel must be electrically connected to the SY400 control panel of the boiler. The room thermostat will be connected to the PAS0102MU.



NOTES: the diagram envisages installation of a combi buffer tank between the boiler and the central heating system with integration of a solar panel.

The pump **PS** (solar panels) is controlled directly by the boiler's SY400 control unit by the differential between probe **S1** and probe **S2**. In winter there is a frost function.

The summer/winter function can be chosen on the wood-fired boiler's SY400 control unit.

The PAS0102MU electric panel restores priority to the wood boiler by allowing 30 minutes to reach the minimum flue gas temperature when recharging or lighting the wood (by tripping the door microswitch), **ensuring that the two generators operate alternately and never simultaneously.**

Each time the upper door is opened (thanks to the microswitch), priority is restored to the wood boiler if the "combined" function type has been set in the "COMBUSTION MANAGEMENT" menu.

The 'COMBUSTION MANAGEMENT' menu also allows you to choose wood-only or gas-only operation.

Domestic hot water is produced with the storage tank when the wood boiler is in operation and can be produced with a wall-mounted gas boiler in the summer when the solar panel is not in operation.

It is recommended to choose a wall-mounted boiler with instantaneous domestic hot water production to avoid heating the storage tank in the summertime if the wood boiler is switched off and the solar panel cannot provide the required amount of heat for domestic hot water production.

11.2. Indicative diagrams for closed vessel heating system with DHW storage cylinder and buffer tank

The heating system with domestic hot water storage cylinder and buffer tank consists of the following parts:

1. **Boiler outlet probe (S4):** this is located in the thermowell near the boiler outlet (connection A6) and its reading is used to change operating mode and enable operation of the pumps.
2. **Boiler return probe (S5):** this is located in the thermowell near the boiler return (connection A7) and is used for operation of the recirculating or anti-condensation pump (PR).
3. **DHW storage cylinder top probe (S3):** this is located in the thermowell at the top of the domestic hot water storage cylinder and is used for management of the storage cylinder pump (PB).
4. **DHW storage cylinder bottom probe (S2):** this is located in the thermowell at the bottom of the domestic hot water storage cylinder and is used for management of the solar panel pump (PS).
5. **Solar panel probe (S1):** this is located on the outlet of the solar panel manifold and is used for management of the solar panel pump (PS).
6. **Buffer tank pump (PI):** this is enabled for operation above the value of **TH-SYSTEM-PUMP[A01]** thermostat with the boiler pump off. This always operates in the event of a frost alarm (outlet water temperature less than the value of **TH-BOILER-ICE[A00]**) or anti-inertia operation (outlet water temperature greater than the value of **TH-BOILER-SAFE[A04]**). In this type of water system the buffer tank fill pump
7. **Recirculating or anti-condensation pump (PR):** this is enabled for operation above the value of **TH-RECIRC-PUMP[A14]**, however, it is only activated when the outlet water temperature exceeds the return temperature by a delta equal to the value of parameter **RECIRCULATION DIFFERENTIAL[d00]** in the protected menu. This always operates in the event of a frost alarm (outlet water temperature less than the value of **TH-BOILER-ICE[A00]**) or anti-inertia operation (outlet water temperature greater than the value of **TH-BOILER-SAFE[A04]**).
8. **Storage cylinder pump (PB):** this is enabled for operation above the value of **TH-BOILER-PUMP[A15]**, however, it is effectively activated only when the temperature at the top of the cylinder is below the value of **TH-DHW-BOILER[A32]**. It stops when the water temperature at the top of the cylinder reaches the above thermostat value. This always operates in the event of a frost alarm (outlet water temperature less than the value of **TH-BOILER-ICE[A00]**) or anti-inertia operation (outlet water temperature greater than the value of **TH-BOILER-SAFE[A04]**).
9. **Solar panels pump (PS):** this is activated if the water temperature in the solar panel manifold exceeds the temperature at the bottom of the cylinder by a delta equal to the value of parameter **SOLAR DIFFERENTIAL[d16]** in the protected menu. If the water temperature at the top of the cylinder reaches the value of thermostat **TH-BOILER-SAFE[A35]**, the pump will stop for safety reasons. In the event of a solar panel frost alarm (panel water temperature less than the value of thermostat **TH-SOLAR-ICE[A48]**) the pump will be activated intermittently with off times equal to the value of parameter **TIME SOLAR ICE OFF[t37]** and on times equal to **TIME SOLAR ICE ON[t36]**.

11.2.1. Indicative diagram for closed vessel heating with buffer tank + two-coil DHW storage cylinder and solar panels

PR	Recirculating pump	S2	DHW storage cylinder bottom probe (optional)
PB	DHW storage cylinder pump	S3	DHW storage cylinder top probe (optional)
PS	Solar panel pump	V	Check valve
IR	Central heating system		



WATER SYSTEM CONFIGURATION: “Water System” user menu - set value 3.

- ELECTRICAL CONNECTIONS:

- ☐ System pump **PI** electrically connected to pins 4 – 5 – 6 on the terminal block.
- ☐ Recirculating pump **PR** electrically connected to pins 7 – 8 – 9 on the terminal block.
- ☐ DHW storage cylinder pump **PB** electrically connected to pins 10 – 11 - 12 on the terminal block.
- ☐ Solar panel pump **PS** electrically connected to pins 13 – 14 - 15 on the terminal block.
- ☐ DHW storage cylinder top probe **S3** electrically connected to pins 43 – 44 on the electronic board.
- ☐ DHW storage cylinder bottom probe **S2** electrically connected to pins 41 - 42 on the electronic board.
- ☐ Solar panel probe **S1** electrically connected to pins 39 - 40 on the electronic board.



CAUTION: it is mandatory to install the thermal exhaust valve on the safety coil of the boiler (connections A4 page 13).



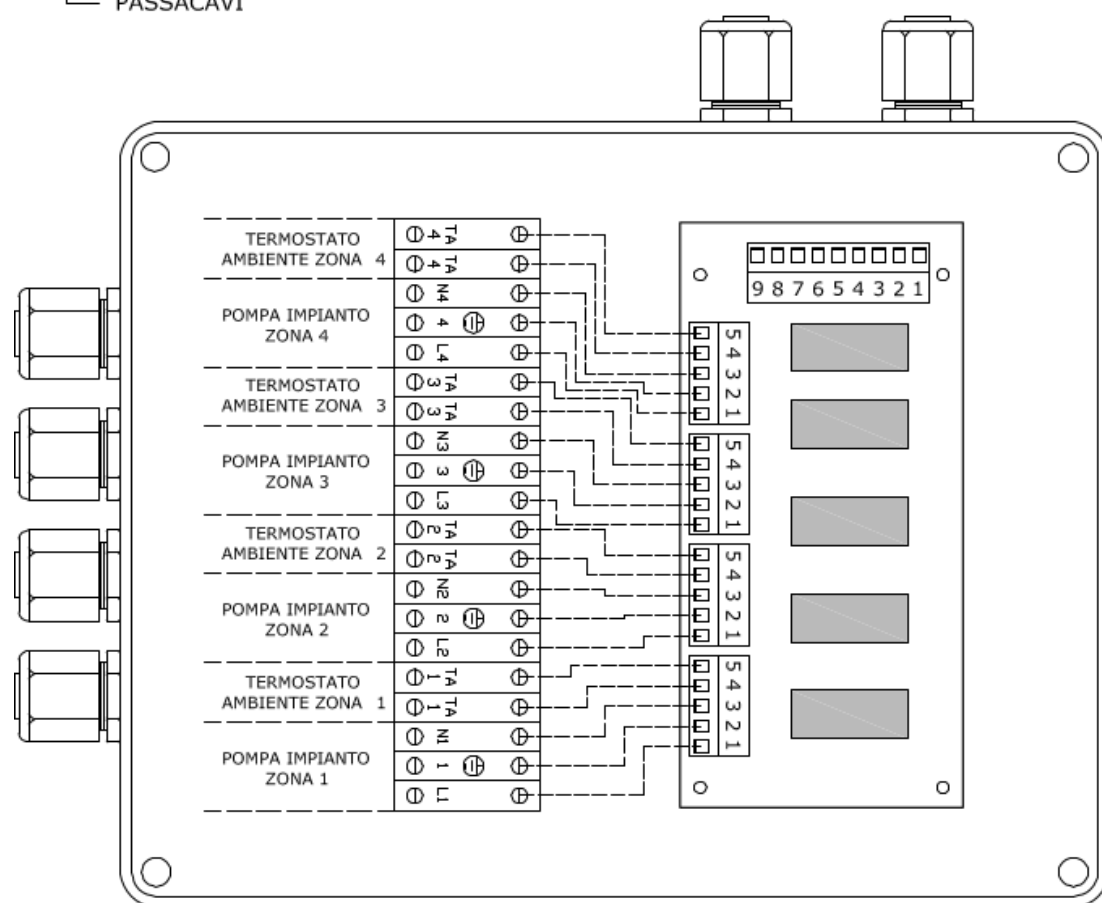
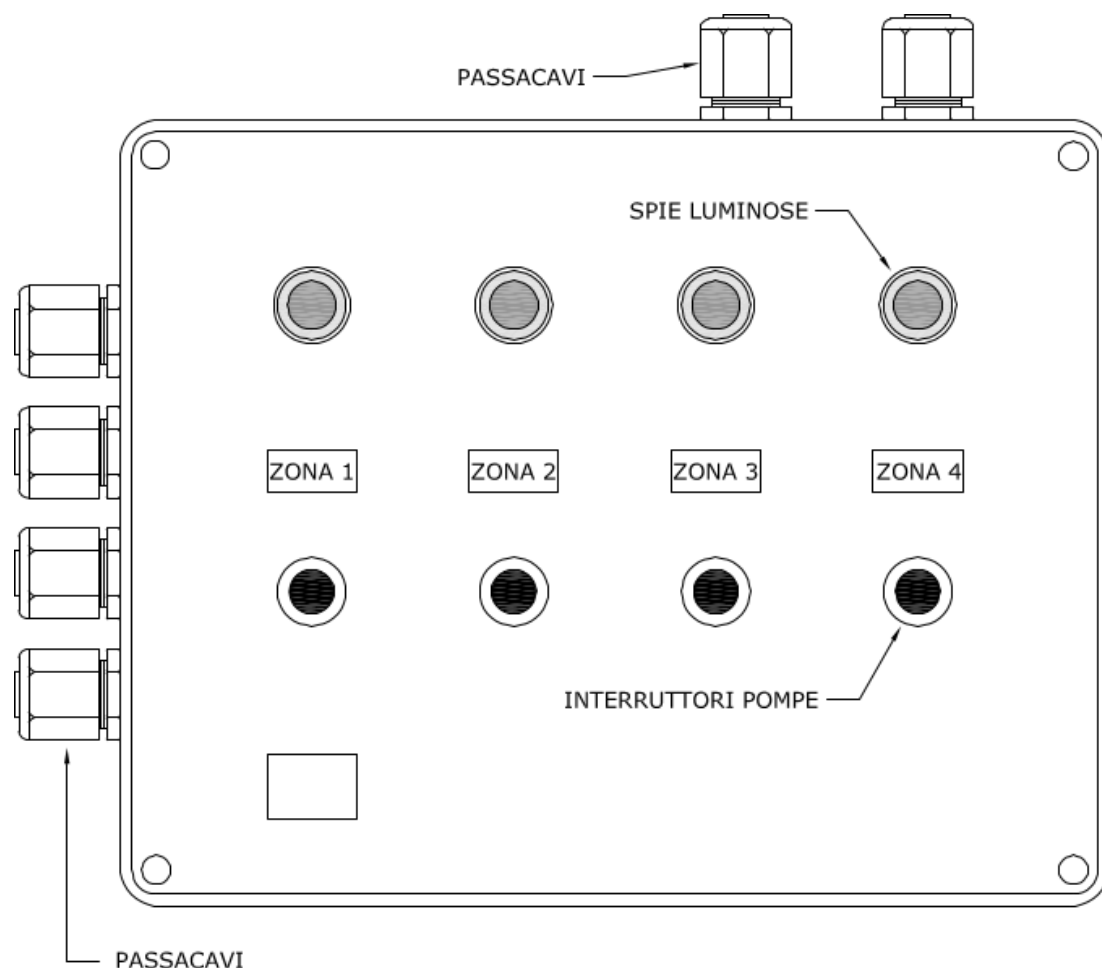
NOTES: This type of system uses the system pump **PI** to fill the buffer tank, while the “System pump” indicated on the diagram is the pump that fills the home's central heating system **IR**. This pump must therefore be controlled from outside the SY400 boiler panel and connected directly to the room thermostat. The contacts of the “**T Max buffer tank Thermostat**” will be connected to the electrical output TA of the SY400 control panel (contacts 16 - 17 of the bracket terminal board) in order to allow the **PI** buffer tank load pump to operate according to the boiler temperature parameters and also to be able to manage the operating temperature of the buffer tank.

A minimum buffer tank temperature thermostat “**T Min Impianto**” (set to 50°/60°C) should be installed at the top of the buffer tank and connected directly to the room thermostat, so as to activate the “**System pump**” only if the buffer tank has reached the temperature set on the thermostat.

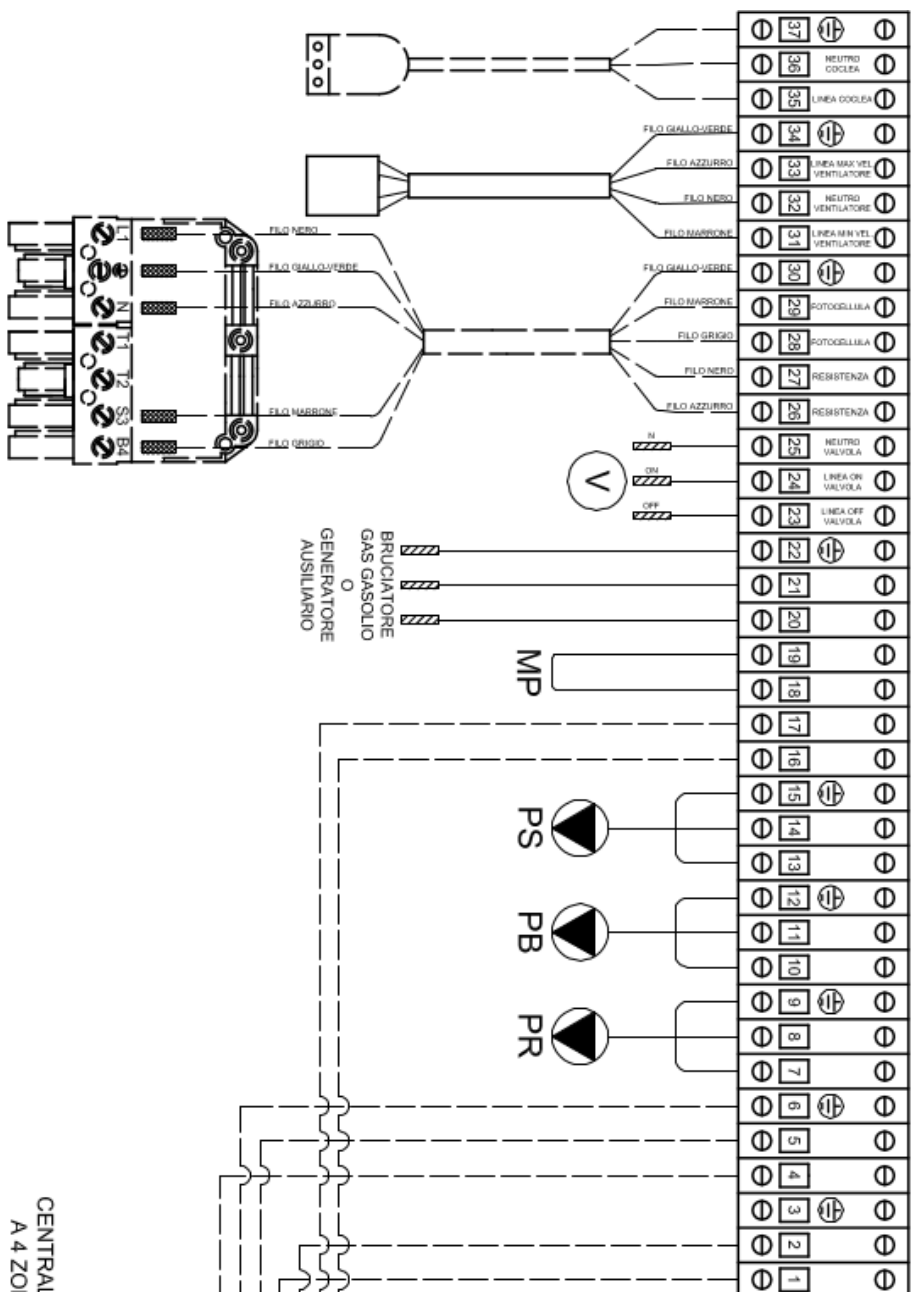
The pump **PS** (solar panels) is controlled directly by the boiler's SY400 control unit by the differential between probe **S1** and probe **S2**. In winter there is a frost function.

12. CENTRAL HEATING SYSTEM CONNECTIONS TO “n” ZONES

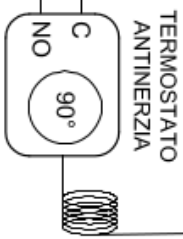
ARCA S.r.l. supplies a control unit for managing 4 zones as an accessory (code SCH 0005C). This is connected to the SY400 boiler panel.



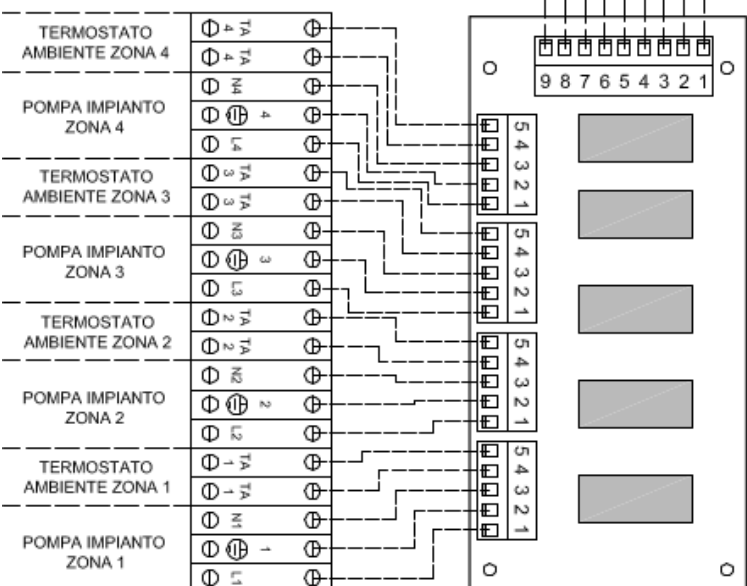
MORSETTIERA QUADRO SY400 CALDAIA



Il bulbo del termostato antinerzia deve essere infilato nell' attacco mandata caldaia A6



CENTRALINA A 4 ZONE



ATTENZIONE !! L' ASSORBIMENTO MASSIMO CONSENTITO NON DEVE SUPERARE 4 AMPERE

13. MAINTENANCE AND CLEANING

- ❑ Before performing any maintenance always disconnect power to the boiler and wait for the appliance to reach room temperature.
- ❑ Never drain the water from the system unless absolutely unavoidable.
- ❑ Periodically check that the device and/or flue gas exhaust duct are intact.
- ❑ Do not use flammable substances (petrol, alcohol, solvents, etc.) to clean the boiler



CAUTION: do not leave containers of flammable materials in the room where the boiler is installed!



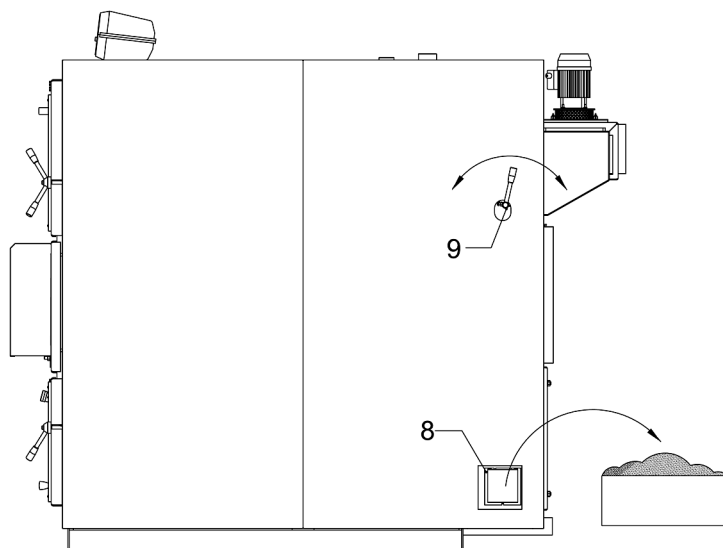
CAUTION: careful maintenance ensures cost savings and safety

13.1. Daily cleaning

- ❑ With the help of the special tool supplied with the boiler, remove the bed of embers so that the ash accumulated in the wood storage chamber falls through the grid plate slots. This will prevent clogging of the grid plate slots and consequent malfunctioning of the boiler; it will also prevent overheating of the grid plate bars and consequent premature wear.
- ❑ Check that there is no accumulation of ash and unburnt matter in the lower firebox and in the smoke passages around its perimeter.

13.2. Weekly cleaning

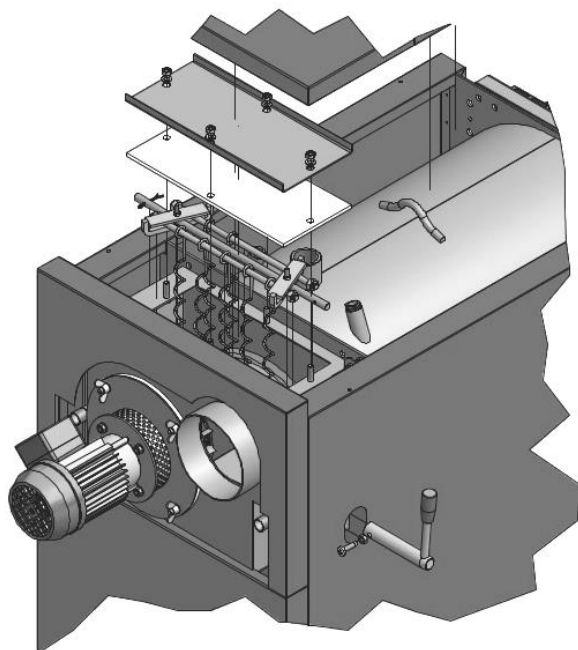
- ❑ Remove any combustion residue from the upper firebox (upper door).
- ❑ Remove the ash from the rear smokebox through the side doors.
- ❑ Check that the grid plate slots are not clogged.
- ❑ If abnormal operation persists even after carrying out the operations described above, the cause may be poor secondary air distribution: remove the air distribution unit and check with a soft brush that the two secondary air ducts are not blocked. Also check the cleanliness of the vertical heat exchanger smoke pipes through the upper inspection door of the smoke box (see next paragraph).
- ❑ Operate the side shaker lever (item 9) to clean the vertical rear heat exchanger. Collect fallen ash from the side doors (item 8).



13.3. Monthly maintenance

- ❑ Clean any deposits from the fan blades. Normally compressed air or a light brush ensure perfect cleaning. For more stubborn deposits, always proceed delicately to avoid unbalancing the fan unit and making it noisier and less efficient.
- ❑ Lubricate the motor's head bearing.

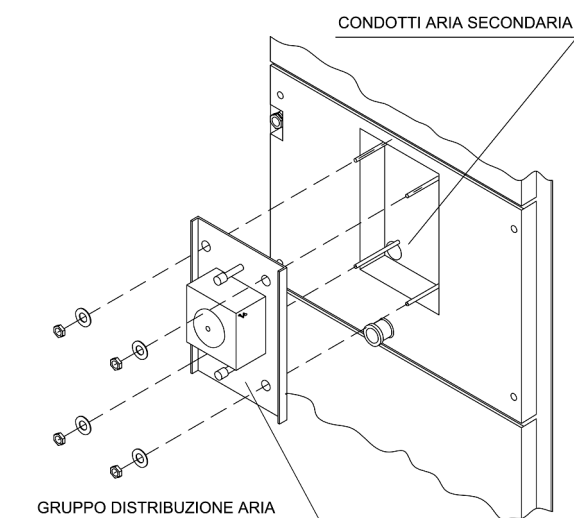
- ❑ Periodically check the condition of flue and the draught.
- ❑ Clean the flue gas probe.
- ❑ Clean the rear heat exchanger (see figure)



- Remove the upper rear part of the boiler casing.
- Remove the smoke chamber cover.
- Insert the pipe brush into the smoke pipes, taking care to insert it all the way in. Vigorously brush each pipe of the heat exchanger several times.

13.4. Annual maintenance (performed by the service centre)

- ❑ At the end of each season perform general cleaning on the boiler, making sure to remove all ash. If the boiler is not used during summer, keep the doors closed.
- ❑ Check the condition of the seals and replace them if necessary.
- ❑ Clean the air distribution unit, its housing and secondary air ducts of wood, tar and dust deposited during winter operation. Thoroughly clean the secondary air ducts with a soft brush.
- ❑ Check the condition of flue and the draught.



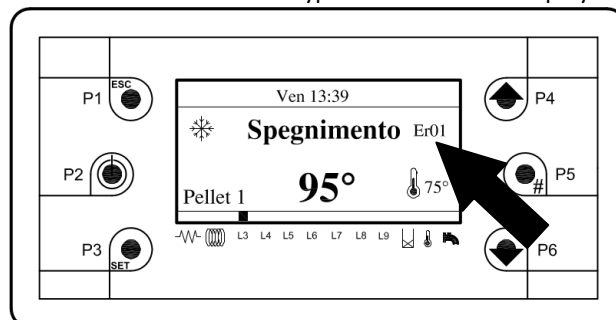
IMPORTANT: annual maintenance operations must be performed by qualified personnel or an authorised service centre. If replacing any faulty material always use original ARCA spare parts.

14. TROUBLESHOOTING

14.1. Electronic control panel troubleshooting

In the event of malfunctions the electronic panel shuts down the boiler and shows the type of error on the display.

The top right display shows "Er" followed by a number.
This number indicates the type of error.
All types of errors are shown as follows:



Error ER01

Boiler outlet temperature has exceeded 95° with activation of the safety thermostat, contact 63 - 64 is opened on the electronic board.

To reset the error, wait for the boiler temperature to fall below 90°, press the safety thermostat button and hold **P3** for 3 seconds.

Error ER02 (contact the service centre)

The electronic board has a "Thermostat reset 2" contact that is not used in any application. There is a jumper that keeps the contact normally closed on contacts 7 - 8 on the board. If the error appears, check the jumper connection and make sure the contact is closed.

To reset the error press and hold **P3** for 3 seconds.

Error ER04

The outlet probe S4 has read a temperature higher than 90°C causing the boiler to safely shut down.

To reset the error, wait for the boiler temperature to fall below 90° and then press and hold **P3** for 3 seconds.

Error ER06 (contact the service centre)

The electronic board has a "Tank thermostat" contact that is not used in any application. There is a jumper that keeps the contact normally closed on contacts 5 - 6 on the board. If the error appears, check the jumper connection and make sure the contact is closed.

To reset the error press and hold **P3** for 3 seconds.

Error ER11 (contact the service centre)

The board has a clock with internal calendar that also works if there is a blackout, thanks to a buffer battery. If the battery is flat or the clock does not work properly, error 11 is shown on the display. In this case, the first step is to contact the service centre to check the battery and replace if necessary.

To reset the error press and hold **P3** for 3 seconds.

Error ER12

Boiler ignition has failed as the flue gas temperature (*parameter F29 – protected menu TERM*) has not reached the minimum value set (70°C) within 30 minutes.

To reset the error press and hold **P3** for 3 seconds.

Error ER13

The boiler has stopped accidentally due to the flue gas temperature (*parameter F28-protected menu TERM*) falling below the minimum value set (50°C). This error occurs, for example, when fuel in the wood storage chamber runs out.

Error ER14 (contact the service centre)

The electronic board has a "Pressure switch" contact with normally closed contact. There is a jumper that keeps the contact closed on contacts 50 - 51 on the board. If the error appears, check the jumper connection and make sure the contact is closed.

To reset the error press and hold **P3** for 3 seconds.

Error ER16 (contact the service centre)

Error 16 is caused by non-communication of the RS 485 port on the electronic board to which the cable running to the LCD display is connected.

To reset the error press and hold **P3** for 3 seconds.

Error EL00 (contact the service centre)

Generic error: switch the board off and on

Error EL01 (contact the service centre)

Heating sensor shorted to earth: switch off the board and check the lambda sensor connections. It may be necessary to replace the lambda sensor.

Error EL02 (contact the service centre)

Open heating sensor: switch off the board and check the lambda sensor connections. It may be necessary to replace the lambda sensor.

Error EL03 (contact the service centre)

Heating sensor short-circuited at +12V: switch off the board and check the lambda sensor connections. It may be necessary to replace the lambda sensor.

Error EL04 (contact the service centre)

Lambda sensor shorted to earth: switch off the board and check the lambda sensor connections. It may be necessary to replace the lambda sensor.

Error EL05 (contact the service centre)

Heating supply voltage too low: disconnect the Lambda module from 230V and check all fuses on the board. Also check that the mains voltage is 230Vac +/- 20%

Error EL06 (contact the service centre)

Lambda sensor supply voltage too low: disconnect Lambda module from 230V and check all fuses on the board. Also check that the mains voltage is 230Vac +/- 20%

Error EL07 (contact the service centre)

Heating sensor failure: check that the sensor is heated.

Error EL08 (contact the service centre)

Lambda sensor overtemperature: the sensor should not be exposed to flames or flue gas with temperatures above 700°C.



CAUTION: for any problem, it is always recommended to contact an authorised service centre.

14.2. Boiler troubleshooting

Problem	Probable causes	Solutions
The boiler has a tendency to go out with the formation of a vault of unburnt wood in the storage chamber. It takes a long time to reignite with difficulty in flame formation.	a) The grid plate is clogged. b) Insufficient primary air	a) Clear the grid plate holes b) Increase primary air
The flame is very fast, noisy, and produces a lot of black and white ash. The boiler consumes a lot.	a) Excess primary air.	a) Decrease primary air.
The flame is short, slow, the output is low, the refractory of the lower door is blackened.	a) Primary air missing.	a) Increase primary air.
The boiler produces a lot of liquid tar in the wood storage chamber.	a) Very humid fuel b) Boiler temperature too low. c) Very long dwell times with a wood storage chamber full of fuel.	a) Load drier wood b) Raise the operating thermostat to a temperature of 75 - 80°C c) Commensurate the amount of wood loaded with actual demand.
The fan never stops, and the boiler does not reach temperature.	a) Clogged boiler. b) Pumps not connected to the panel. c) Fuel not loaded according to instructions. d) Incorrect sizing of the boiler in relation to the system's requirements.	a) Clean the boiler in all areas. b) electrically connect the pumps to the panel. c) load the wood in such a way as to better fill the wood storage chamber, without empty spaces. d) Open and bring the individual zones to temperature progressively one after the other.



CAUTION: for any problem, it is always recommended to contact an authorised service centre.

15. GENERAL TECHNICAL SUGGESTIONS

15.1. Calibration and maximum temperatures

High-power boilers are often used by customers with production processes in the woodworking industry.

Wood processing residues are fed into the boiler as fuel.

Very often, such residues are very dry and, in addition to natural wood, contain resins, paints or other materials that should not be used in boilers. As a result, the calorific value of the fuel is very high, which greatly increases the output of the boiler and the flue gas temperature at the flue gas outlet.



CAUTION: if the flue gas temperature at full boiler power exceeds 200°C, problems may arise with the intake motor (the lubricating grease dries out), with the bars (they may wear out quickly), with the catalysts, etc.

Therefore, it is strongly recommended to check the temperature and, if it is too high, to reduce the boiler output by reducing the air supply and suggesting to the customer to mix very dry wood or wood processing residues with high calorific value with other, less dry fuel with lower calorific value.

For the system to function well, the boiler flue gas temperature must be between 150°C and 180°C.

If it is lower, condensation and corrosion problems may arise.

If it is higher, the fan, the bars and the lower catalyst may deteriorate.

Of course, boiler calibration is necessary due to the considerable differences in calorific values of the solid fuels used.

15.2. First ignition

All boilers, and particularly high-powered boilers, require a very gradual initial ignition to allow uniform drying and heating of the refractory parts.

So it is advisable to put a small amount of wood in the first ignition and let the temperature gradually rise. If, on the other hand, the boiler is used at full power immediately, surface detachments of refractory concrete or isolated deep cracks may occur. In some cases, small explosions may occur if moisture cannot gradually escape from the porosity of the concrete.

15.3. Refractory cements inside the boiler

It is quite common and normal for refractory materials to have cracks and small imperfections.

For these reasons, the thickness of the refractory materials is oversized by a few centimetres; thus, even if phenomena such as described above (paragraph 15.2.) occur, the insulation of the boiler is still guaranteed.

15.4. Boiler autonomy and reload frequency

Under normal conditions of use, the boiler is loaded on average twice a day. Normal operating conditions mean operation in the recommended power range at an intermediate value.

This is achieved if the house to be heated is well insulated and if the outside temperature is about 5°C, etc.

In extreme conditions, fuel charges will be more frequent (even 3 or 4), while in spring one charge per day will suffice.

15.5. Explosions

In conditions of insufficient chimney draught and when using very dry wood, with excessive fuel load, gas could stagnate in the wood storage chamber. When the fan starts up again, the air-gas combination could cause a particularly noisy explosion. The boiler will not suffer any damage as it is equipped with blast proof doors at the rear.

15.6. Consumables

The grid plate bars are made of material that is highly resistant to high temperatures and acid attack by combustion gases. They are therefore suitable for operation for an unspecified number of hours proportional to the working temperature (which depends on the type of wood, the humidity, the calorific value of the wood, the working temperature of the boiler, the more or less frequent stops of the boiler, the acetic acid content of the wood, etc.), the acidity of the flame, the cleanliness and maintenance of the grid plate area, and the proper functioning of the entire boiler.

They are therefore excluded from the general warranty conditions and are to be considered to all intents and purposes as **consumables**. Similar considerations apply to catalysts and the fan.

15.7. Warnings

The use of wood with high humidity (more than 25%) and/or loads that are not commensurate with the demand of the system (resulting in prolonged stops with the storage chamber loaded) causes considerable condensation therein. Check the steel walls of the wood storage chamber once a week. They should be covered with a light layer of dry tar, opaque in colour, with bubbles that tend to pop and peel off. Otherwise, the tar is shiny, runny and if removed with the poker, liquid appears: it is therefore essential to use less moist wood and/or reduce the amount of wood in the load. Condensation inside the wood storage chamber causes corrosion of the plates. Corrosion which is not covered by the warranty as it is due to abnormal use of the boiler (damp wood, excessive loads, etc.).

The flue gases circulating in the boiler are rich in water vapour, as a result of combustion and the use of fuel that is in any case impregnated with water. If the flue gases come into contact with relatively cold surfaces (approx. 60°C), water vapour condenses, which combines with other combustion products to give rise to corrosion of metal surfaces. Frequently check for signs of flue gas condensation (blackish liquid on the floor behind the boiler). In this case, less moist wood should be used; check the operation of the circulation pump, the flue gas temperature, increase the operating temperature (to control the flow temperature, install a mixing valve). Corrosion by flue gas condensation is not covered by warranty as it is due to the moisture in the wood.

16. CHOOSING THE MODEL

16.1. Boiler power

For each type of boiler, there is a minimum output, a useful output (corresponding to wood with a calorific value of 3500 kcal/Kg with a moisture content of 15%) and a maximum output, the latter being indicated for the purposes of dimensioning the safety components: valves, diameter of the safety pipe, etc.

The choice must be confirmed by the system's heating engineer or installer, taking into account the calorific value and moisture content of the wood used.

N.B. :

The calorific value of wood can range between a minimum of 1600 kcal/Kg and a maximum of 3500 kcal/Kg (see catalogues). Wood from dead or shade-grown trees is particularly difficult to burn as, in the former case, the carbon content is reduced due to prolonged failed feeding of the tree and natural combustion of the residue. Natural (flameless) combustion refers to the loss of carbon that wood undergoes through ageing due to the instability of carbon in the slow drying process. In the second case, there was a lack of photosynthesis, and the wood was very low in carbon and rich in cellulose.



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