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## "CE" STATEMENT OF COMPLIANCE

In compliance with the following directives:

European Directive EEC 73/23 and subsequent amendment 93/68

EEC 89/336 and subsequent amendments EEC 93/68

EEC 92/31

EEC 93/97

Thermorossi S.p.A., Via Grumolo 4 - ARSIERO (VI), at its exclusive liability, declares that the boilers belonging to the SIRIO, TERNA S and TERNA B series, have been designed and built in compliance with the safety requirements demanded by the CE mark provisions.

This statement refers to the entire production of the aforementioned series.

ARSIERO, 1 October 1999

**THERMOROSSI S.p.A.**

A handwritten signature in black ink, appearing to read 'Gian Paolo'.

# 1 INTRODUCTION

## 1.1 GENERAL WARNINGS

- This installation, use and maintenance manual constitutes an integral and essential part of the product and must be kept by the user.
- All the indications contained in this handbook should be read carefully prior to proceeding with the installation, use and maintenance of the product.
- This appliance should only be used for the purposes for which it was foreseen. Any other use is considered improper and therefore dangerous; consequently, if the product is used improperly the user must accept total responsibility.
- Installation, maintenance and repairs must be carried out by professionally qualified personnel and in compliance with the standards in force on the subject and according to the indications provided by the manufacturer of the appliance itself.  
Only original spare parts must be used for repairs.
- Incorrect installation or poor maintenance can cause damage to people, animals or things; in this case the manufacturer shall not be held responsible.
- Prior to carrying out cleaning or maintenance operations, disconnect the appliance from the power supply by switching off the plant's general switch or any other interception organ located before the appliance.
- The product should be installed in appropriate fire-proof premises and have all the necessary facilities (mains power and fume exhaust vents) which the appliance requires for its safe and proper functioning.
- Should the appliance be sold or transferred to another user, always ensure that the manual accompanies it.

*Thermorossi S.p.A. retains Copyright of these service instructions.*

*Without the necessary authorisation, the aforementioned indications cannot be copied or imparted to third parties and cannot be used for competitive purposes.*

## 1.2 SAFETY REGULATIONS

### ***Injuries to people***



This safety symbol highlights important messages given throughout the manual. Whenever you come across this symbol always carefully read the message which follows as non-compliance with its contents could cause serious injuries to persons using the boiler.

### ***Damage to things***



This safety symbol highlights messages or instructions on which the boiler and system's proper functioning depends.

If these instructions are not meticulously followed, serious damage could be caused to both the boiler and the heating system.

### ***Information***



This symbol highlights important instructions for the correct functioning of the boiler and system. If not correctly observed, the boiler and system may not function satisfactorily.

### 1.3 STANDARDS AND RECOMMENDATIONS

**Standard references:** national and international standards adhered to in the planning, large scale manufacturing and production of the products referred to in this handbook include:

- European directive EEC 73/23
- European directive EEC 93/68
- European directive EEC 89/336
- standard CEI 61/50
- standard CEI EN 60204
- standard CEI 64-8 (IEC 364)



#### **RECOMMENDATIONS:**

- Prior to using the appliance, carefully read this entire instructions manual, as knowledge of the information and instructions contained in it is fundamental for correct use of the appliance.
- The whole connection operation of the electric panel must be carried out by specialised personnel; no responsibility will be accepted for damage, even to third parties, if these instructions for the installation, use and maintenance of the appliance are not strictly adhered to.
- Modifications to the appliance carried out by the user or on his behalf, must be considered as being the total responsibility of the user.  
All the operations necessary for the installation of the appliance and maintenance necessary for the efficient running of the appliance before and during use are the sole responsibility of the user.



#### **GENERAL WARNINGS**

**Caution:** the appliance must be connected to a system equipped with a PE ground cable (in compliance with the EEC 73/23, EEC 93/98 standards relevant to low voltage tension). Prior to installing the machinery, the efficiency of the power system's ground circuit must be checked.

**Caution:** the power line section must be appropriate to the power of the machinery. The cable section must not be less than 1.5 mm<sup>2</sup>.  
The boiler requires a feed voltage of 230 V and 50 Hz. Voltage variations greater than 10% of the rated value can cause irregular functioning or damage to the electrical equipment. If not already present, a suitable differential switch must be installed before the machinery.

## 1.4 TRANSPORTATION

### ✓ *Packing*

The body of the boiler is wrapped in heat-shrinkable plastic material whereas the electrical panel is packaged in special cardboard placed inside the combustion chamber. The outer casing of the boiler body is protected by cardboard packaging and supplied separately from the boiler body.

### ✓ *Transportation and handling*

The boiler body must always be kept in a vertical position when handled and moved only on a trolley.

Particular attention must be taken with the electrical panel so that it is protected from mechanical bumps which could affect its integrity and correct functioning.

### ✓ *Storage*

The boiler body must be stored in premises free from humidity and must not be exposed to weather conditions; it is inadvisable to place the boiler body directly on the floor.

The electrical panel must be stored in a dry location which is free from dust.

It is inadvisable to store the electrical panel for extended periods of time.

### ✓ *Unpacking*

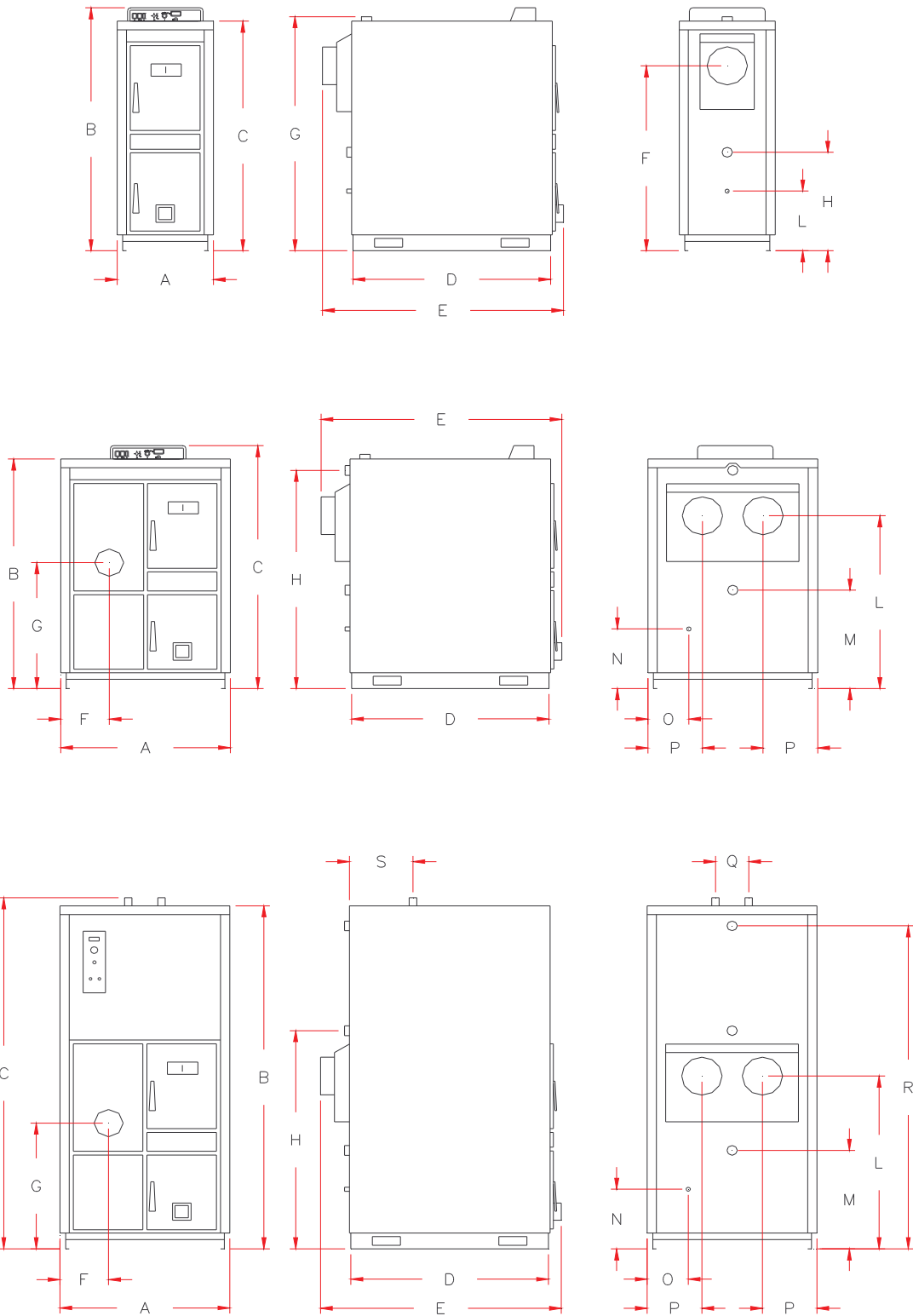
Place the boiler body in its final position before unwrapping it.

Do not unpack the electrical panel and pre-enamelled sheet casing until they are to be installed in order to protect them from bumps, water and any other element that could damage their correct functioning or external appearance.

Do not store the body of the boiler, casing or the electrical panel without their special packing.

## 2. TECHNICAL CHARACTERISTICS

### 2.1 TECHNICAL DATA





TECHNICAL DATA: DIMENSIONS

MODEL	Sizes in mm															Weight kg	Loading door size	Max. length comb.cham.in mm.	Chamber volume	
	A	B	C	D	E	F	G	H	L	M	N	O	P	Q	R					S
SIRIO S 25	500	1210	1110	635	920	865	1160	495	315								215	260 X 380 h	540	65
SIRIO S 36	500	1210	1110	890	1160	865	1160	495	315								275	260 x 380 h	780	106
SIRIO S 42	500	1210	1110	890	1160	865	1160	495	315								310	260 x 380 h	790	135
SIRIO S 58	590	1310	1210	980	1250	900	1260	495	315								450	260 X 380 h	880	250
TERNA S 27	740	1110	1210	720	920	195	655	1050	865	440	315	200	200				345	260 X 380 h	540	65
TERNA S 38	740	1110	1210	720	1160	195	655	1050	865	440	315	200	200				450	260 x 380 h	780	106
TERNA S 45	790	1110	1210	910	1160	220	655	1050	865	450	315	220	220				480	260 x 380 h	790	131
TERNA B 27	740	1790	1830	720	920	195	655	1050	865	440	315	200	200	115	1620	250	400	260 X 380 h	540	65
TERNA B 38	740	1790	1830	910	1160	195	655	1050	865	440	315	200	200	115	1620	300	500	260 x 380 h	780	106
TERNA B 45	790	1790	1830	910	1160	220	655	1050	865	450	315	220	220	115	1620	330	510	260 X 380 h	790	131

TECHNICAL SPECIFICATIONS

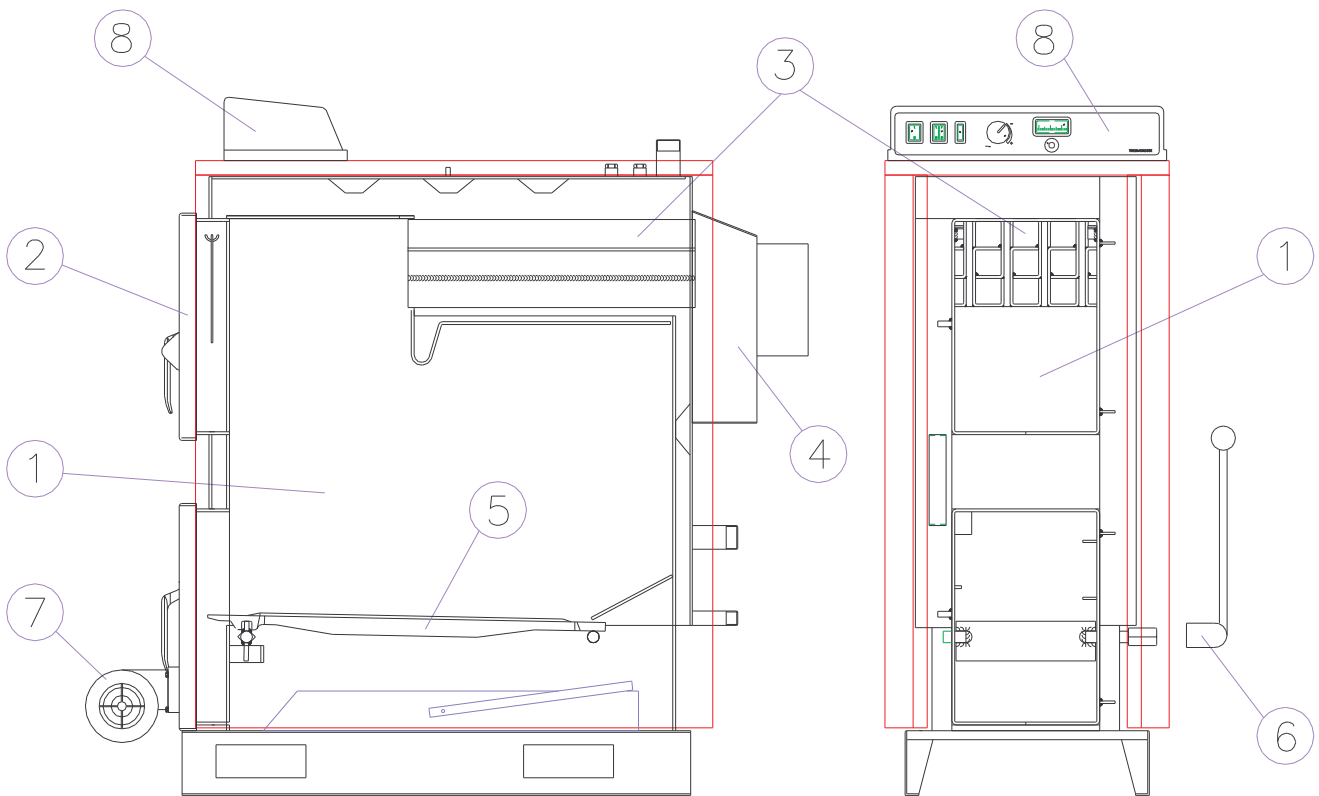
MODEL	Combustion chamber capacity kw (kcal/h)	Coal capacity kw (kcal/h)	Wood capacity kw (kcal/h)	Gas-oil capacity kw (kcal/h)
SIRIO S 25	32 (27.900)	29 (25.000)	28 (24.000)	/
SIRIO S 36	48 (41.800)	42 (36.000)	39 (34.000)	/
SIRIO S 42	58 (50.000)	49 (42.000)	46 (40.000)	/
SIRIO S 58	79 (67.200)	67 (58.000)	63 (54.000)	/
TERNA S 27	35 (29.900)	29 (25.000)	28 (24.000)	31 (27.000)
TERNA S 38	49 (41.800)	42 (36.000)	39 (34.000)	44 (38.000)
TERNA S 45	58 (50.000)	49 (42.000)	46 (40.000)	52 (45.000)
TERNA B 27	35 (29.900)	29 (25.000)	28 (24.000)	31 (27.000)
TERNA B 38	49 (41.800)	42 (36.000)	39 (34.000)	44 (38.000)
TERNA B 45	58 (50.000)	49 (42.000)	46 (40.000)	52 (45.000)

MODEL	Hot water content l.	Working pressure bar	Flue depression Mbar	Heating connections ø	Boiler load	Water tank capacity	Water tank connections ø	Water tank output	Flue connections ø
SIRIO S 25	42	3	-2	1-1/4"	3/4"				200
SIRIO S 36	56	3	-2	1-1/4"	3/4"				200
SIRIO S 42	65	3	-2	1-1/4"	3/4"				200
SIRIO S 58	110	3	-2	1-1/2"	3/4"				250
TERNA S 27	110	3	-2,5	1-1/4"	3/4"				200
TERNA S 38	150	3	-2,5	1-1/4"	3/4"				200
TERNA S 45	115	3	-2,5	1-1/4"	3/4"				200
TERNA B 27	137	3	-2,5	1-1/4"	3/4"	115	1"	550	200
TERNA B 38	177	3	-2,5	1-1/4"	3/4"	115	1"	550	200
TERNA B 45	147	3	-2,5	1-1/4"	3/4"	160	1"	730	200

OPERATING CHARACTERISTICS: BOILER WORKING PRESSURE 3 bar - BOILER TEST PRESSURE 4.5 bar  
 Data and sizes quoted in the above tables are not binding. The company reserves the right to alter them without notice.

### 3. GENERAL DESCRIPTION

#### 3.1 WOOD-FIRED BOILER: SIRIO



- 1 - *Combustion chamber*
- 2 - *Loading door*
- 3 - *Heat exchanger tubes*
- 4 - *Smoke hood*
- 5 - *Riddling grate*
- 6 - *Riddling grate handle*
- 7 - *Fan*
- 8 - *Electrical panel*

The **Sirio** boiler is a direct flame boiler capable of running on solid fuel: wood, coal, compressed sawing briquettes.

*It consists of:*

– **COMBUSTION CHAMBER**

A considerable amount of wood fits into the capacious combustion chamber. The internal walls and top are water jacketed with 5 mm thick sheet steel. This is the main heat exchange surface.

– **LOADING DOOR**

The loading door is also very large which permits large pieces of wood to be inserted. It has a handle locking system and in the upper part there is a draught control flap which lets in the small amount of secondary air necessary for good combustion.

– **HEAT EXCHANGER TUBES**

Located in the upper part of the combustion chamber, the bundle consists of a series of tubes with rectangular section which permits the fumes to flow to the rear part of the boiler where they are sucked up by the smoke hood (no. 4) and conveyed to the flue outlet.

These tubes have a wet outer surface and are consequently a further heat exchange surface. Each tube is divided into three square sections by means of two dry fins which prevent the formation of condensate.

– **RIDDLING GRATE**

In the lower part of the combustion chamber there is a riddling grate (5) where the firewood is placed.

The grate consists of a series of closely aligned cast iron bars which permit the comburent air pushed from below by the fan to pass through.

By acting on the special riddling handle (6) these bars slide longitudinally but in opposite directions which lets the ash fall below: otherwise the ash tends to accumulate thereby obstructing the comburent air flow.

Both the riddling grate and the ash pan below can be checked by means of the ash pan door; the fan is fixed to the outside of this door.

– **CASING**

The outer insulation of the boiler body consists of a pre-enamelled sheet casing in 4 pieces. A thick layer of fibreglass is attached to the inside of each of these pieces and this creates excellent insulation which reduces heat dispersion.

The electrical panel, which controls the operation of the boiler, is attached to the outer casing.

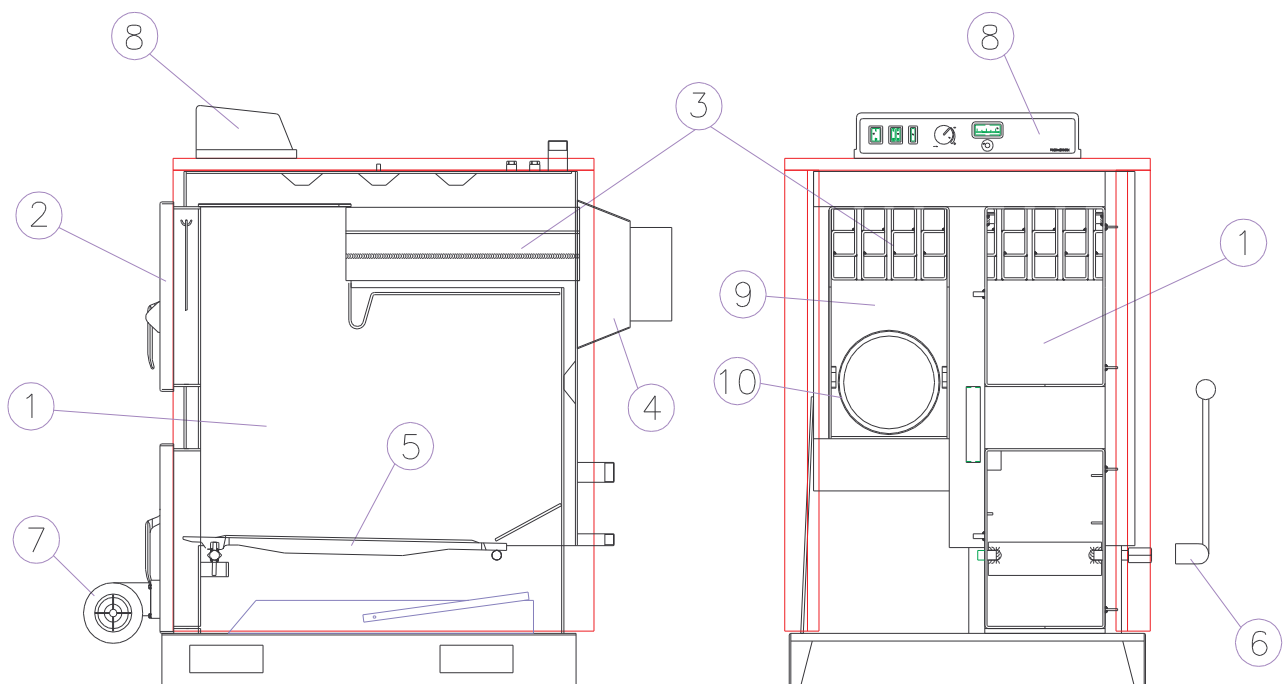
### 3.2 WOOD-FIRED BOILER: TERNA S

**TERNA S** is a multifuel boiler which has the exact same combustion chamber for solid fuel as the **Sirio** boiler; consequently, refer to the previous description.

Next to the solid fuel combustion chamber there is another one which is specifically for liquid and gas fuels.

The two combustion chambers are completely independent of each other but have one thing in common: the water used for heat absorption.

In the liquid and gas combustion chamber there is an open cylinder made of refractory steel which acts as a dry chamber while in the upper part there is a horizontal tube bundle, similar to the solid fuel one, which pipes the fumes to the rear hood and thereby absorbing further heat.



- 1 - Combustion chamber
- 2 - Loading door
- 3 - Heat exchanger tubes
- 4 - Smoke hood
- 5 - Riddling grate

- 6 - Riddling grate handle
- 7 - Fan
- 8 - Electrical panel
- 9 - Liquid fuel chamber
- 10 - Stainless steel cylinder

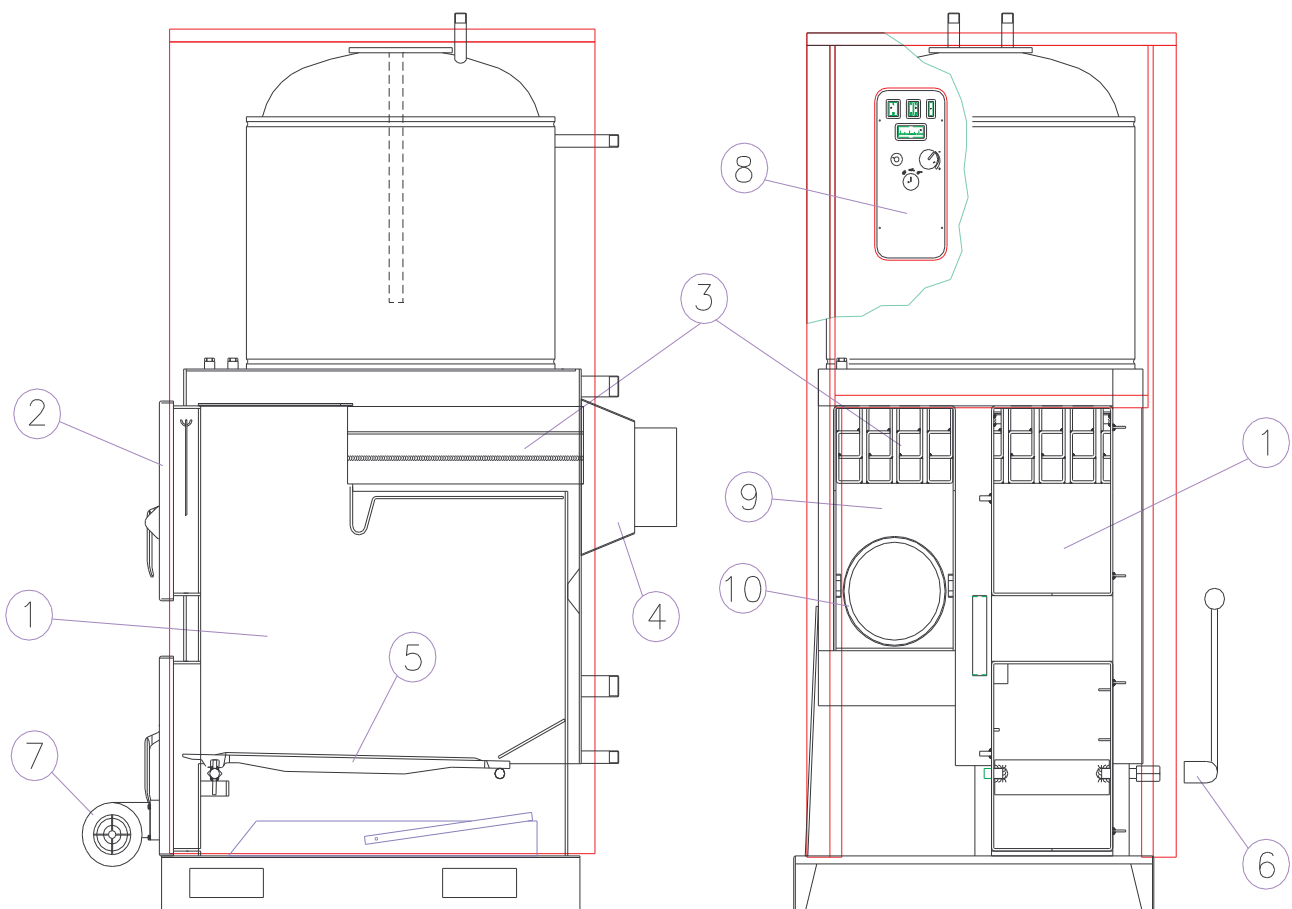
### 3.3 WOOD-FIRED BOILER: TERNA B

**TERNA B** has the exact same combustion chamber as the **TERNA S**. However, on the upper part, a double jacketted vitrified water tank which is externally heated by the boiler water has been mounted.

This water tank can provide both storage of a large quantity of hot water for domestic use and a fair instant hot water production .

On the upper part of the water tank there is an oval handhole with a magnesium anode attachment to prevent corrosion and 2 x 3/4" tubes for cold water inlet and hot domestic water outlet.

At the rear highest part of the boiler there is a 3/4" stub pipe which is used as an exhaust pipe to bleed the air from the boiler and as a connection to the open expansion tank.



- 1 - Combustion chamber
- 2 - Loading door
- 3 - Heat exchanger tubes
- 4 - Smoke hood
- 5 - Riddling grate

- 6 - Riddling grate handle
- 7 - Fan
- 8 - Electrical panel
- 9 - Liquid fuel chamber
- 10 - Stainless steel cylinder

## 4 INSTALLATION



### **INTRODUCTION**

Assembly and electrical and hydraulic connections must be carried out by a qualified technician. The company will not be held responsible in any way whatsoever for incorrect installation and connections.

### **4.1 FLUE OUTLET AND DRAUGHT**

The flue outlet and the depression created inside it are very important for a correct evacuation of the fumes and consequently good functioning of the boiler.

The flue outlet must be well-insulated with suitable materials that are resistant to the fumes temperature and corrosion. Optimal depression (draught) must be between 1 and 1.5 mm in the water column (measured with a vacuumeter). Lower values can result in carbon deposits and smoke escaping from the boiler itself.

The branch pipe between the boiler and the flue mouthpiece is important. It must be kept as straight as possible and, if possible, inclined at 45° and free from narrowings and horizontal segments.

To determine the working section of the flue outlet (internal section) use either the calculation or the thermotechnics tables below. The flue must be at least 500 mm higher than the top of the building and the outlet section must be at least double the size of the flue's section.

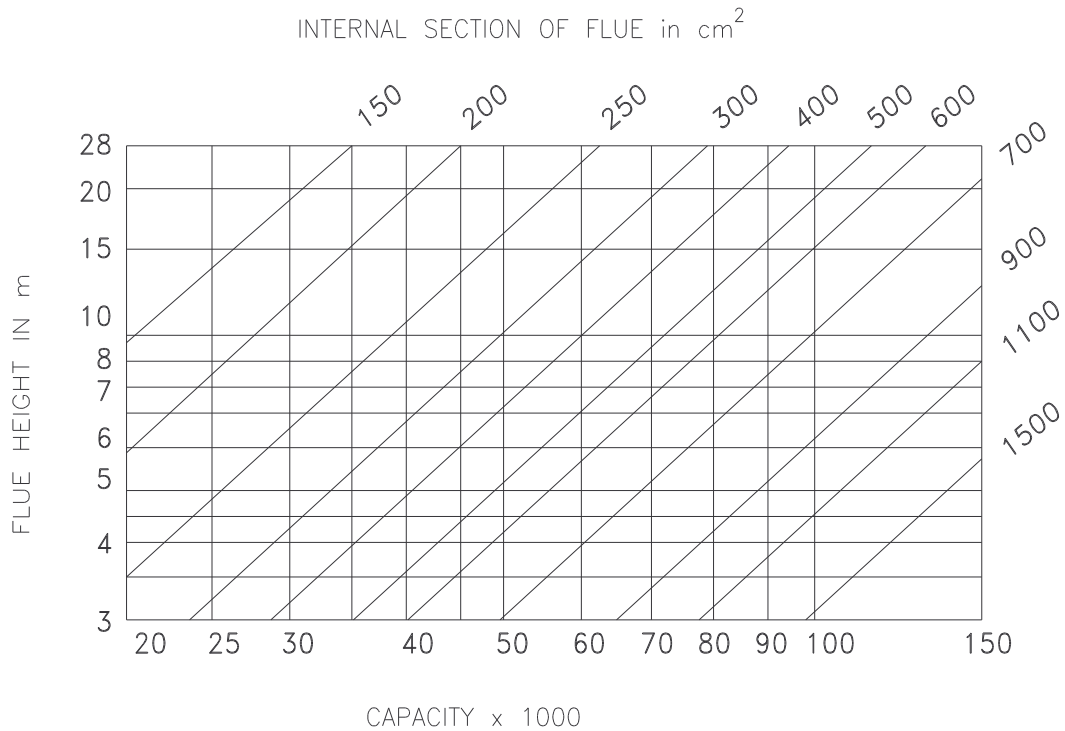
### **HOW TO CALCULATE THE WORKING SECTION OF THE FLUE OUTLET**

$$S = \frac{K \times P}{\sqrt{H}}$$

- S** = flue outlet section measured in cm<sup>2</sup>
- P** = combustion chamber capacity in kcal/h
- H** = flue height measured in metres between the flame level and the flue outlet
- K** = coefficient (equal to 0.03 for solid fuel)

The result obtained from this calculation is multiplied by 1.5 if wood or lignite is used.

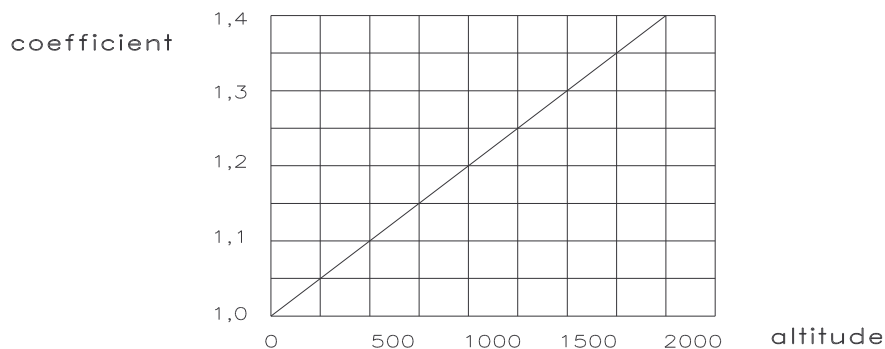
## GRAPHS FOR CALCULATING THE WORKING SECTION OF THE FLUE OUTLET



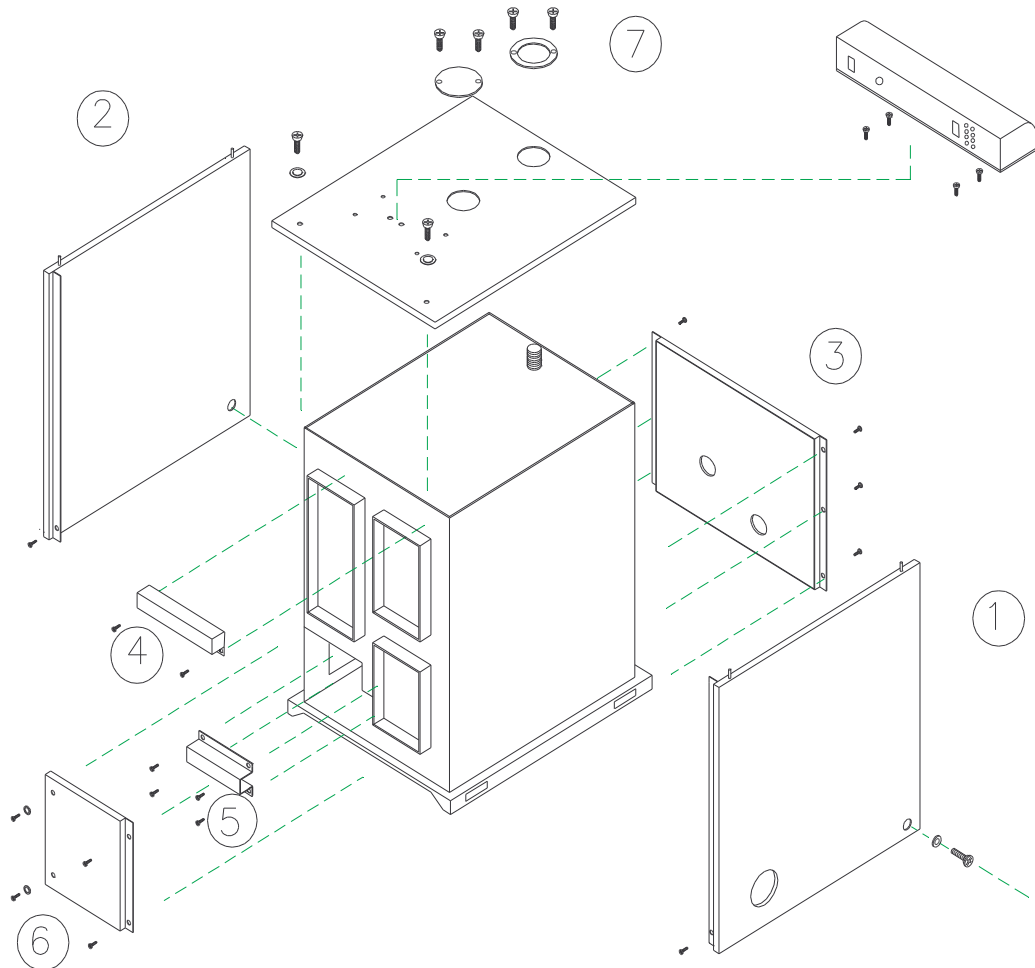
**Basic data for the calculation:**

Barometric pressure	760 mm Hg
Fume temperature	200 °C
Fume specific weight at 200 °C	0.746 Kg/cu.m
Air specific weight at 200 °C	0.746 Kg/cu.m

If installed at heights which are different to the ones used for the calculation, the flue section must be multiplied by the correction factor obtained from the following graph:



**4.2 OUTER CASING ASSEMBLY : TERNA S BOILER**



To assemble the casing panels, proceed as follows:

- A) First of all prepare a drill with a 3.5 diam. bit and a medium box wrench.
- B) Assemble the 2 side panels (1-2), drill and secure with screws.
- C) Assemble the cover(7)
- D) Assemble the rear panel (3), drill and secure with screws.
- E) Assemble the upper front panel (4), drill and secure the screws on the front panel and the cover.
- F) Assemble the mid front panel (5), drill and secure with screws.
- G) Assemble the lower front panel (6), drill and secure with screws.
- H) Assemble the two upper hole-covering washers.

NB: Long screws are used for the washer.

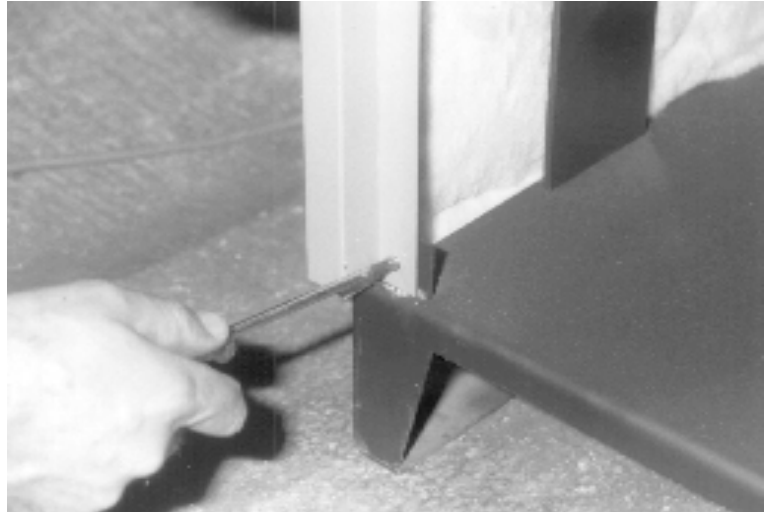


Open the package and take out the various panels that make up the casing.

Take an electric drill with a 3.5 mm drill bit and a medium screwdriver. Place panel no. 1 from the drawing on the right side of the boiler so that the plate welded onto the side of the base serves as a point of reference and support for the panel itself.

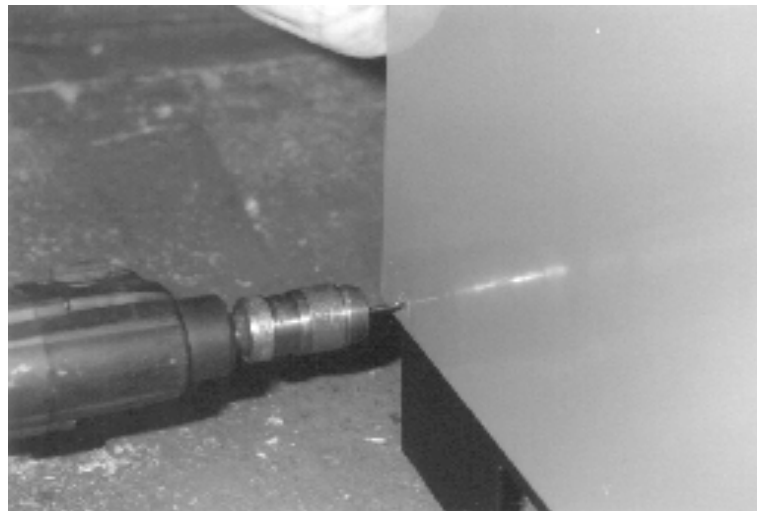
Drill a hole into the plate using the hole in the casing as reference see photo n° 1.

Use one of the short screws to fasten the panel .



*Photo no. 1*

Make the second hole in the lower rear part of the right side and fasten the panel by means of a long screw. (see photo no. 2).



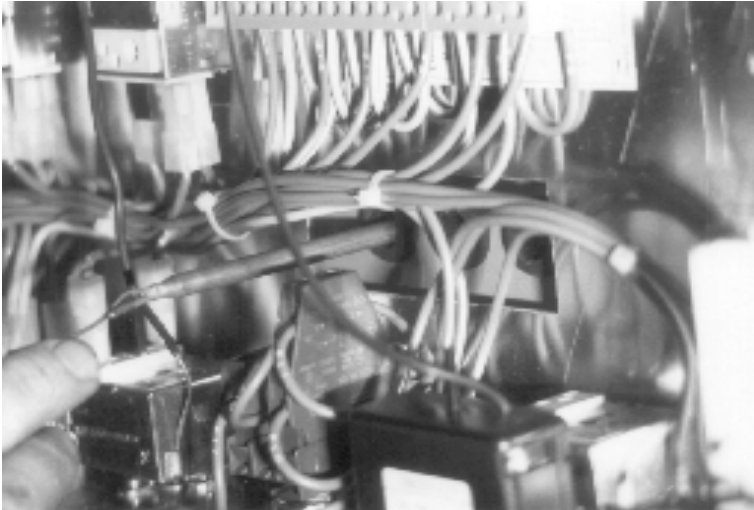
*Photo no. 2*

Repeat this procedure to mount the left panel.

Remove the electrical panel from the box (it is packed inside the wood combustion chamber) and slide off the plastic cover.

Fix the panel to the upper cover of the outer casing by means of the screws and spacers provided.

Unwind the wire bundles without getting any kinks in them.



*Photo no. 3*

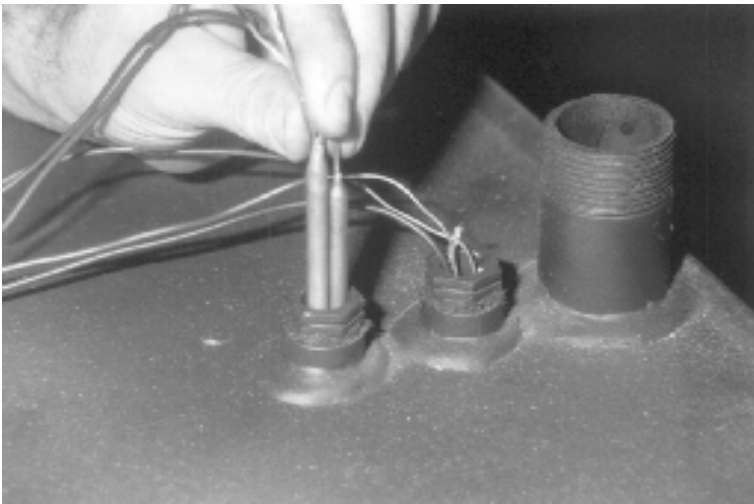
Thread them through the holes one by one (see photo no. 3).

Insert the capillary bulbs into the two sumps located near the boiler delivery pipe (see photo no. 4).

Pour some oil into the sumps in order to improve the heat exchange.

Thread the fan feed cable end through to the inside of the electrical panel.

Fix the outer casing cover no. 7 to the top of the side panels by means of the snap pins.



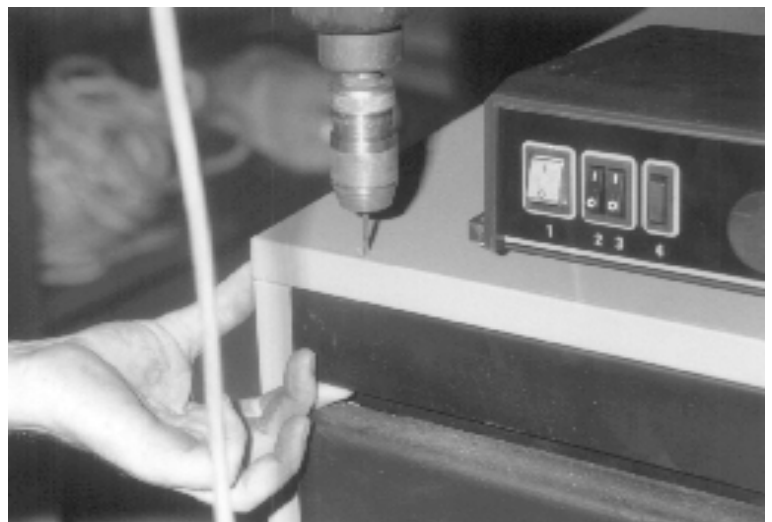
*Photo no. 4*

Mount the sheet profile no. 4 above the doors, drill the holes and secure it by means of the special long screws (see photo no. 5).

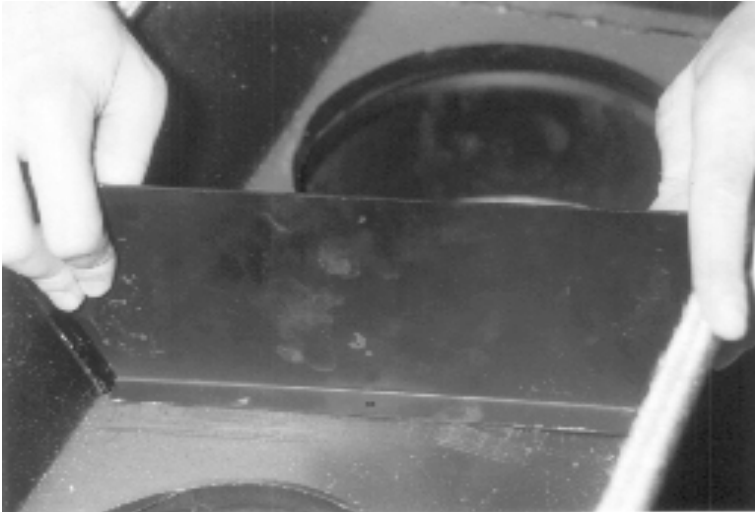
Fasten the other panels 5 and 6 by means of the special screws to complete the assembly of the casing.

Place the rear panel into position (after having cut out the fibreglass around the holes for the stub pipes) and use the special screws to secure it.

Position the rear smoke hood according to the type of use.



*Photo no. 5*



*Photo no. 6*

Fumes can be released separately by mounting a divider inside the hood (see photo no. 6) and removing the plug that closes off one of the two outlets.



*Photo no. 7*

Mount the riddling handle on the special square shaft located on the lower right side panel of the boiler (see photo no. 7)

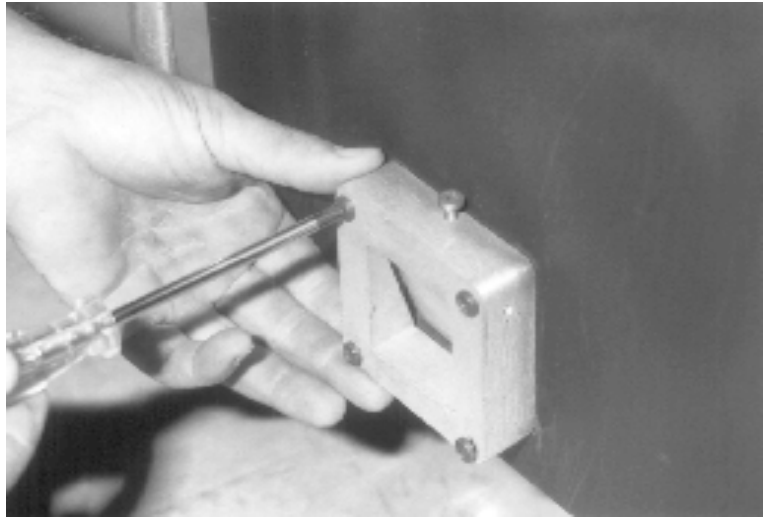
After completing the hydraulic connections, mount the upper disk and the hole cover.

### **4.3 OUTER CASING ASSEMBLY: SIRIO BOILER**

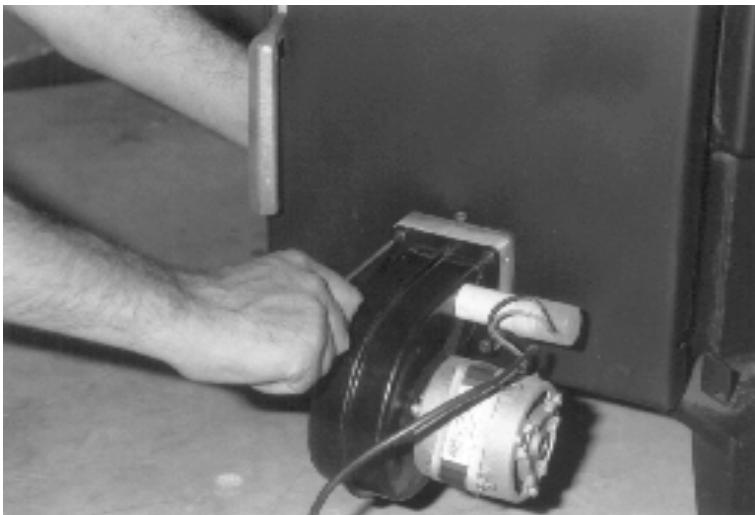
The procedure is practically the same as for the casing assembly on **Terna S** therefore refer to the instructions at point **4.2**.

#### 4.4 FAN ASSEMBLY ON SIRIO – TERNA S – TERNA B BOILERS

- 1) Remove the screws that secure the aluminium block (see photo no. 8) to the ash pan door and disassemble it .



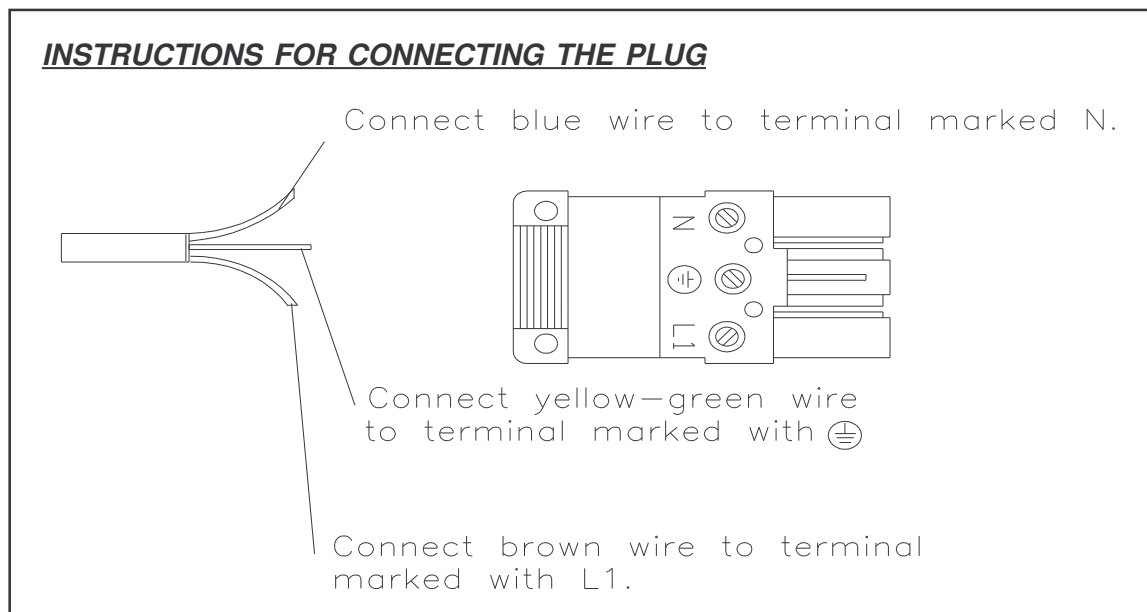
*Photo no. 8*



- 2) Mount the fan on the aluminium block and insert the special screws through the ash pan door and secure them on the inside of the door with the special nuts (see photo no. 9).

*Photo no. 9*

- 3) Assemble the plug on the fan cable terminals as shown in the figure below.
- 4) Insert the plug into the outlet located on the lower right side panel of the casing.



#### 4.5 BURNER ASSEMBLY: TERNA S AND TERNA B BOILERS

The **TERNA B** and **TERNA S** boilers are equipped with a double combustion chamber, consequently they can be fitted with a fan assisted burner that runs on various types of liquid fuel, oil, methane, LPG, etc.

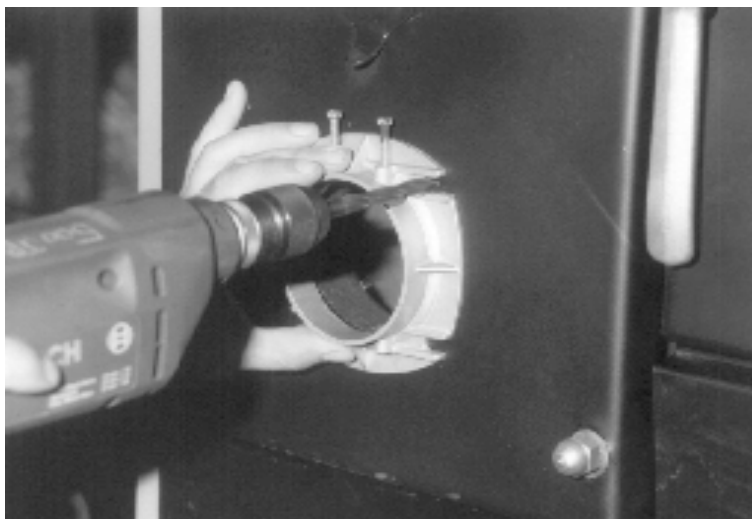
Because of the special shape of the combustion chamber any type of burner can be mounted provided it functions at 2,800 rpm and is fed by 230 Volt single phase current .

The burner is installed in the special door equipped with a burner hole.  
The burner opening must be short and the flame must not exceed the 45° opening so that it does not directly touch the side walls.

The fuel capacity load must not exceed the capacity specified on the plate.  
All the connections must be carried out in compliance with the burner manufacturer's instructions and the electrical connections must comply with the electrical drawing supplied with this manual.

To install the burner proceed as follows:

- Take the connection flange of the selected burner.
- Place it on the hole in the gas / gas-oil combustion chamber door.
- Drill the holes required for the particular type of flange used (see photo no.10).
- Secure the flange with appropriate packing.
- Install the burner by inserting the mouth into the previously assembled flange.



*Photo no. 10*

#### 4.6 RECOMMENDATIONS FOR CARRYING OUT HYDRAULIC CONNECTION : SIRIO - TERNA S - TERNA B BOILERS



Safety regulations in Italy specify that solid fuel boilers can only be installed in open expansion tank type systems.

They must be equipped with :

- a) open expansion tank
- b) safety tube of suitable section
- c) delivery tube for topping up the water in the boiler
- d) thermal safety blowdown valve

The safety tube referred to in b) above must be connected to the boiler delivery and there must be no interceptive devices at all.

Its path, from the boiler to the open expansion tank, must be the shortest possible and there must be no descending sections or air-traps.

The sensitive bulb of the capillary feeler type thermal blowdown valve must be inserted in the special 1/2" sheath located under the boiler delivery .

The thermal blowdown valve discharges the excess heat in the event of an excessive rise in the boiler water temperature.

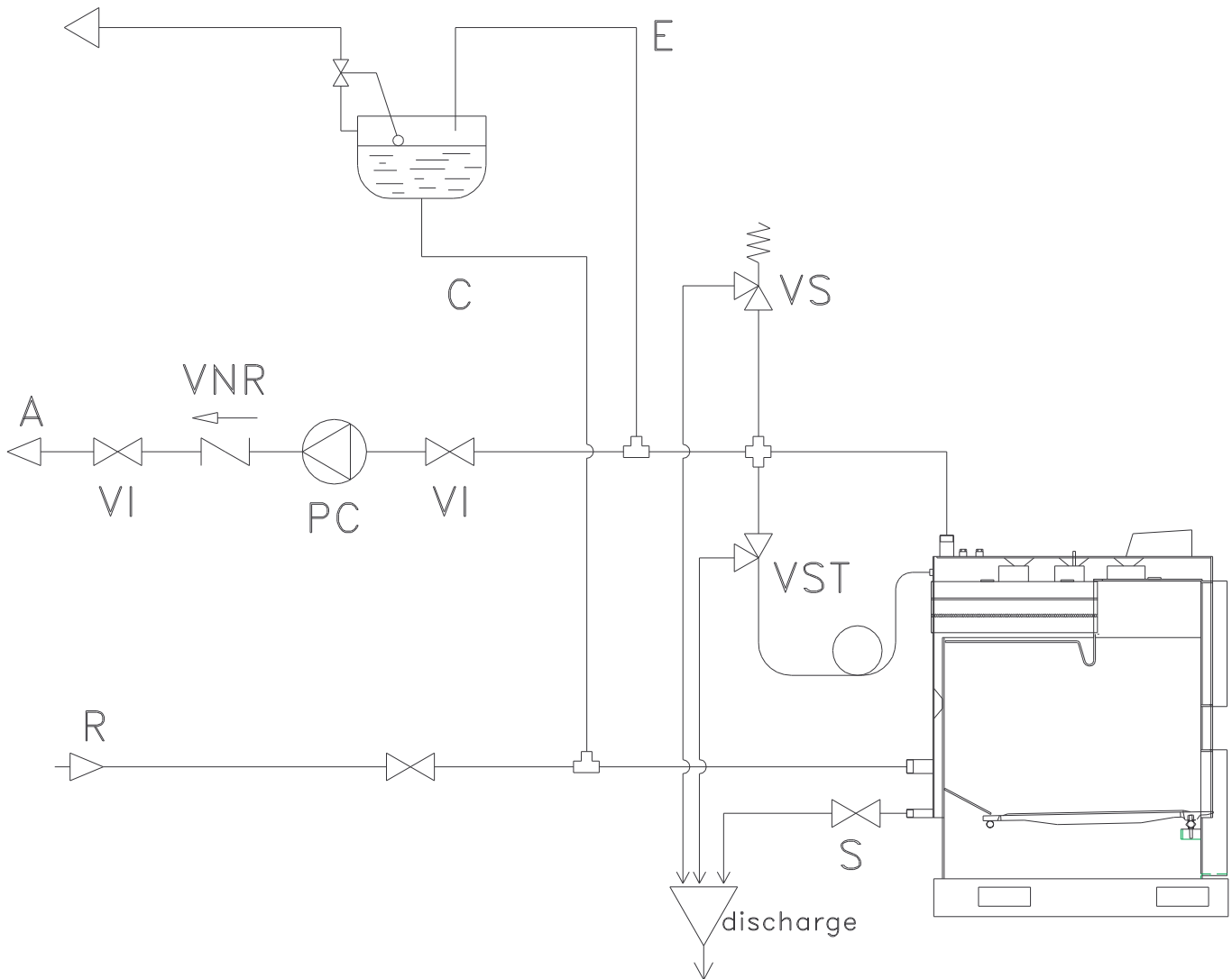
There must be absolutely no gravity circulation in the system because while the water temperature is less than 55-60°C, condensate is caused by the humidity of the fumes on the inside of the boiler.

The condensate produced is acidic and therefore it is particularly corrosive for the boiler's steel walls.

**Therefore a non-return valve must be installed after each circulating pump on any systems with gravity circulation.**

### 4.7 HYDRAULIC HOOKUP: SIRIO AND TERNA S BOILERS

The following drawing illustrates the connections to be carried out:

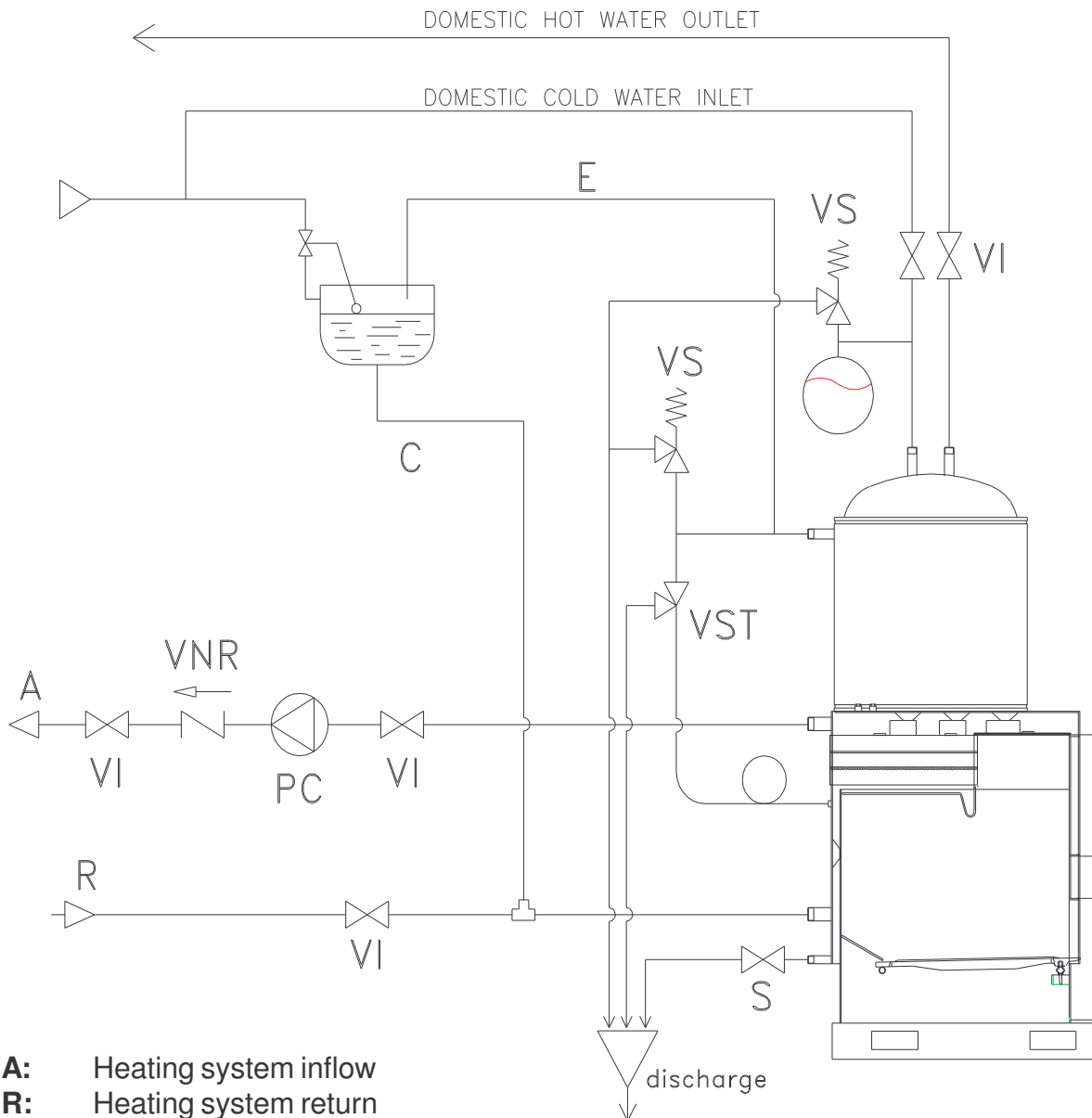


- A:** Heating system inflow
- R:** Heating system return
- E:** Safety tube connecting boiler to open expansion tank
- S:** Boiler discharge
- C:** Delivery tube for topping up system water reserve
- PC:** System circulation pump
- VI:** On-off valve
- VNR:** Non-return valve
- VST:** Thermal blowdown valve
- VS:** Safety valve



### 4.8 HYDRAULIC HOOKUP: TERNA B BOILER

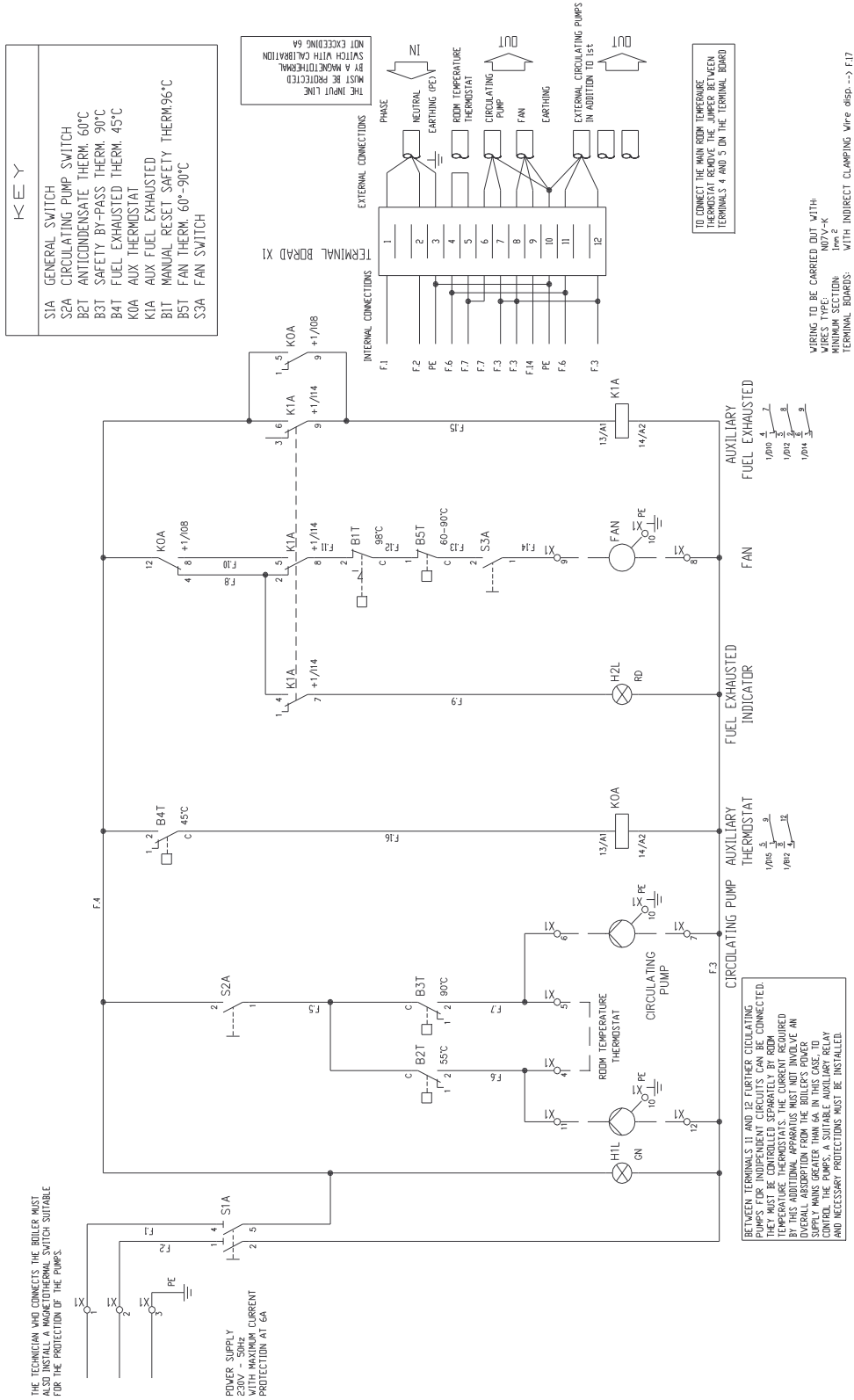
The following drawing illustrates the connections to be carried out:



- A:** Heating system inflow
- R:** Heating system return
- E:** Safety tube which connects the two boilers to the open expansion tank
- S:** Boiler discharge

- PC:** System circulation pump
- VI:** On-off valve
- VS:** Safety valve
- VNR:** Non-return valve
- VST:** Thermal blowdown valve

4.9 ELECTRICAL WIRING: SIRIO BOILER



#### 4.10 ELECTRIC PANEL: SIRIO BOILER

**The control panel consists of the following components:**

- 1 – General and cycle start switch (light)
- 2 – Control switch for boiler fan unit
- 3 – Control switch for heating system circulating pump
- 4 – Warning light to indicate wood cycle start and fuel exhausted.  
It lights up when the fuel exhausted thermostat indicates a drop in the boiler water temperature due to fuel exhaustion.  
The thermostat is inside the electric board and is calibrated at 45 °C.  
When the fuel is exhausted the indicator lights up and the fan stops.

**Operation is as follows:**

When the load of wood is almost all consumed, the boiler water temperature tends to drop thereby activating the anticondensate thermostat which stops the pumps.

The fan continues to rotate, however rather than producing further heat it cools the boiler body.

When, as a result of this cooling down the temperature drops to approximately 45°C, the fuel exhausted thermostat trips.

When this thermostat is activated it stops the fan.

In the initial cold start phase of the boiler the fuel exhausted device could be activated even if the boiler is started up correctly with a good load of wood.

**This could occur when :**

- a) The circulating pumps are not connected to the electrical panel; they are connected by means of collar-type external thermostats. These thermostats are not very sensitive, therefore they permit the pumps to operate until the water temperature in the boiler drops to below 45°C thereby tripping the fuel exhausted thermostat.
- b) The overall capacity of the connected pumps is so high that when they start up at 60° for the first time, the water exchange is so quick that the anticondensate thermostat doesn't succeed in signalling the cold water return from the system in time; therefore the temperature drops to below 45°C, which in this case as well, trips the fuel exhausted thermostat.  
To remedy this problem simply reduce the pump speed, or else restrict its capacity.

- 6 – Boiler water temperature adjustment thermostat (from 70 to 90 °C).  
It is advisable to keep the boiler water temperature on high values (75/80 °C) in order to avoid possible condensate formation.
- 8 – Thermometer
- 5 – Manual reset safety thermostat (100 °C)

#### **4.11 RECOMMENDATIONS FOR CARRYING OUT ELECTRICAL CONNECTIONS: SIRIO BOILER**



As already mentioned on page 6 of the chapter entitled “Recommendations”, the electrical connections must be carried out by specialised personnel.

Also, it is imperative that these connections be carried out in accordance with the drawing on page 26 and attached to the electric panel.

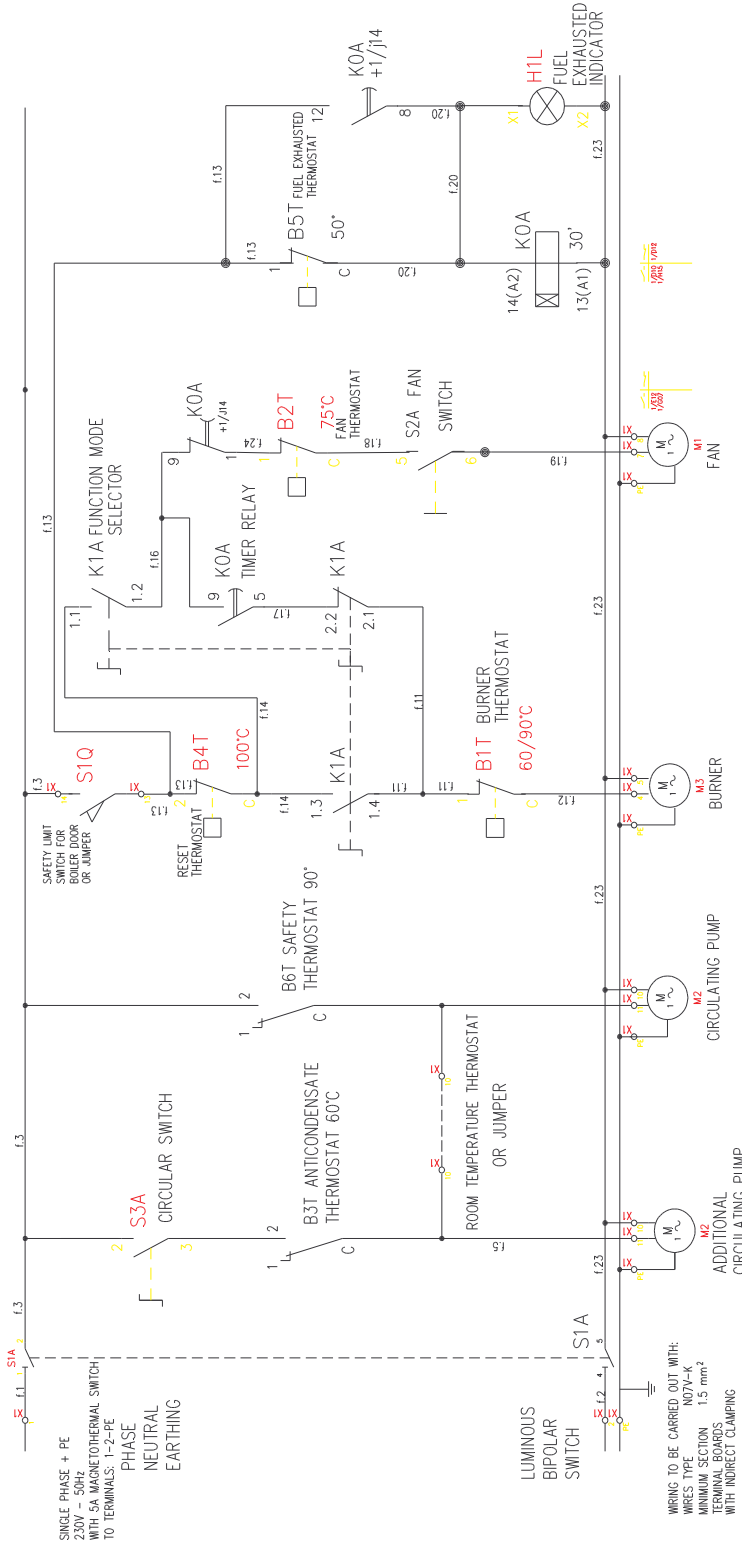
Connections which differ from those indicated and arbitrary changes to the thermostats will automatically annul the guarantee.

If the system consists of only one circulating pump and one room temperature thermostat then the former must be connected to terminals 6 and 7 and the latter to terminals 4 and 5.

If, on the other hand, the system consists of several areas fed by several circulating pumps then an area with its respective circulating pump and room temperature thermostat is selected to perform the function of thermal safety cut-off. These must be connected as previously described with respect to terminals 6 – 7 and 4 – 5.

All the other circulating pumps must be directly connected to terminals 11 and 12, if the overall load does not exceed 5 Amperes, or by means of relays if the load exceeds this value. The relevant room temperature thermostats are series connected on the respective feed lines. This type of connection ensures that the circulating pumps will function as anticondensers and consequently will not operate with the boiler water temperature below 60 °C.

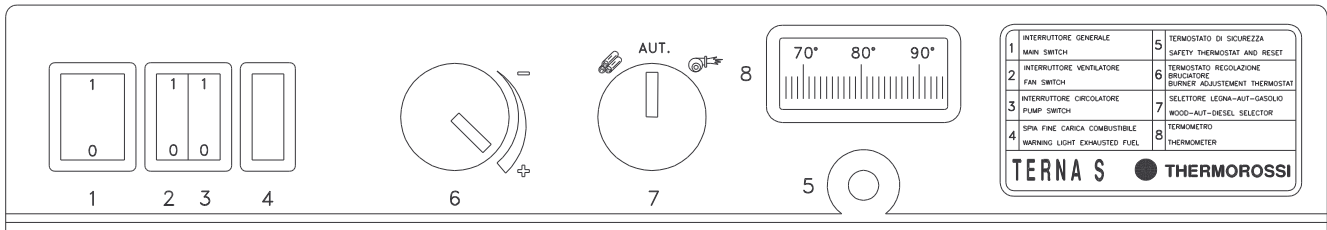
4.12 ELECTRICAL WIRING: TERNA S AND TERNA B BOILERS



EXTERNAL CONNECTION SIDE	INTERNAL CONNECTION SIDE
JUMPER OR LIMIT SWITCH	18
DOOR SAFETY	17
JUMPER OR ROOM TEMP.THERM.	16
EXT. CIRCULATING PUMP	15
EXT. CIRCULATING PUMP	14
EXT. CIRCULATING PUMP	13
EARTHING	12
CIRCULATING PUMP	11
CIRCULATING PUMP	10
EARTHING	9
FAN	8
FAN	7
EARTHING	6
BURNER	5
BURNER	4
EARTHING	3
POWER SUPPLY 220 V - 50 Hz	2
NEUTRAL	2
PHASE	1

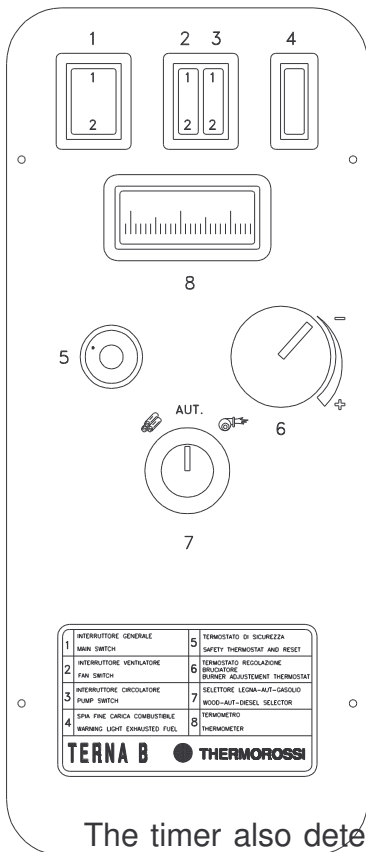


4.13 ELECTRIC PANEL: TERNA S AND TERNA B BOILERS



At first sight these panels may appear different, however they are identical in terms of functions and composition.

*They consist of :*



- 1- Green light bipolar general switch
- 2- Fan switch
- 3- Circulating pump switch (it is switched off during the summer months if the boiler is only used to heat water for domestic purposes).
- 4- Fuel exhausted indicator: it lights up when the fuel exhausted thermostat (calibrated at 50 °C) trips. When the load of wood is almost all consumed the boiler water temperature tends to drop thereby activating the anticondensate thermostat which stops the pumps. The fan continues to rotate, however rather than producing further heat it cools the boiler body. When, as a result of this cooling down the temperature drops to approximately 50 °C the fuel exhausted thermostat trips. However its intervention is delayed by approximately 30 minutes by means of a timer in order to avoid false alarms.

The timer also determines the maximum time available for the boiler, during the starting phase, to reach a temperature greater than 50 °C which is the fuel exhausted limit. If within this time the boiler cannot exceed this temperature value, the fan turns off and, if necessary, the burner starts.

This problem could arise for various reasons:

- a) If there is gravity circulation in the system, there is insufficient time to heat the water in the boiler, in the tubing and in the radiators from room temperature to 50 °C. In this case a non-return valve must be installed after the system circulating pump.
- b) The same problem occurs if the pumps or any one of the pumps connected to the system operate without being controlled by the anticondensate thermostat and therefore below 50 °C.
- c) If a substantial amount of domestic hot water is drawn off from the water tank during the initial heating phase, the 30 minutes available might not be sufficient and as a result the above-mentioned problem could occur.

**5 – Manual reset safety thermostat.**

This thermostat intervenes when the water temperature rises, for whatever reason, to approximately 100 °C.

This can occur for example due to a fault with the fan or burner adjustment thermostat which does not stop either of them at the preset temperature.

In this situation when the safety thermostat intervenes at approximately 100 °C it cuts off the electric power thereby deactivating them.

To reset the operation wait until the temperature drops below 65-70 °C and press the push button located under the black cap screwed on to the front of the panel after having checked the cause for the irregularity.

**6 – Burner adjustment thermostat.**

This thermostat regulates the water temperature within a range of 60 to 90 °C when the burner is running on gas - oil.

It is advisable never to set working temperatures below 65 °C.

When the preset temperature has been reached, the burner stops.

The burner restarts when the water temperature drops by about 4 or 5 degrees below the preset temperature.

**7 – Function mode selector.**

It can be set on three positions:

**LEGNA (WOOD), AUT. and  
BRUCIATORE (BURNER)**

- a) When it is set on **LEGNA (WOOD)**, the fan is activated (when switch no. 2 is on).

The adjustment temperature is set at 75 °C by an internal thermostat.

When the wood is all consumed the fuel exhausted device stops the fan and the red warning indicator no.4 lights up.

To start the boiler and to restart the fan, carry out a cycle reset procedure by turning the general switch off then back on again.

- b) When it is set on **AUT.** the boiler starts on wood and at fuel exhausted, the fan is turned off and the burner is immediately turned on.
- c) When it is set on **BRUCIATORE (BURNER)** it can only function if the burner is controlled, as previously explained, by thermostat no. 6.

**8 – Rectangular thermometer.**

This device measures the water temperature when operating either on wood or with the burner.

**4.14 RECOMMENDATIONS FOR CARRYING OUT ELECTRICAL CONNECTIONS: TERNA S AND TERNA B BOILERS**

As already mentioned on page 6 of the chapter entitled "Recommendations", the electrical connections must be carried out by specialised personnel.

Also, it is imperative that these connections be carried out in accordance with the diagram in the booklet and attached to the electric panel.

Connections which differ from those indicated and arbitrary changes to the thermostats will automatically annul the guarantee.

If the system consists of only one circulating pump and one room temperature thermostat these must be connected respectively to terminals 10 and 11 and with the jumper removed, to terminals 15 and 16.

If, on the other hand, the system consists of several areas fed by several circulating pumps and respective room temperature thermostats, it is advisable to select an area where the thermal safety function is to take place.

The circulating pump with respective room temperature thermostat relevant to that area must be connected, in this case as well, to terminals 10-11 and 15-16.

All the other circulating pumps must be directly connected to terminals 17 and 18 (if the overall load does not exceed 5 Amps), or by means of relays if the load exceeds this value.

Each circulating pump is equipped with an autonomous room temperature thermostat inserted along the feed line.

This connection ensures that the anticondenser functions.

**4.15 CONNECTING TERNA S AND TERNA B BOILERS TO THE FLUE OUTLET**

Each of the two combustion chambers must discharge its fumes through its own flue outlet.

For this reason, the two outlets in the hood must be separated by a sheet divider suitably installed (see fig. 6 on page 19).

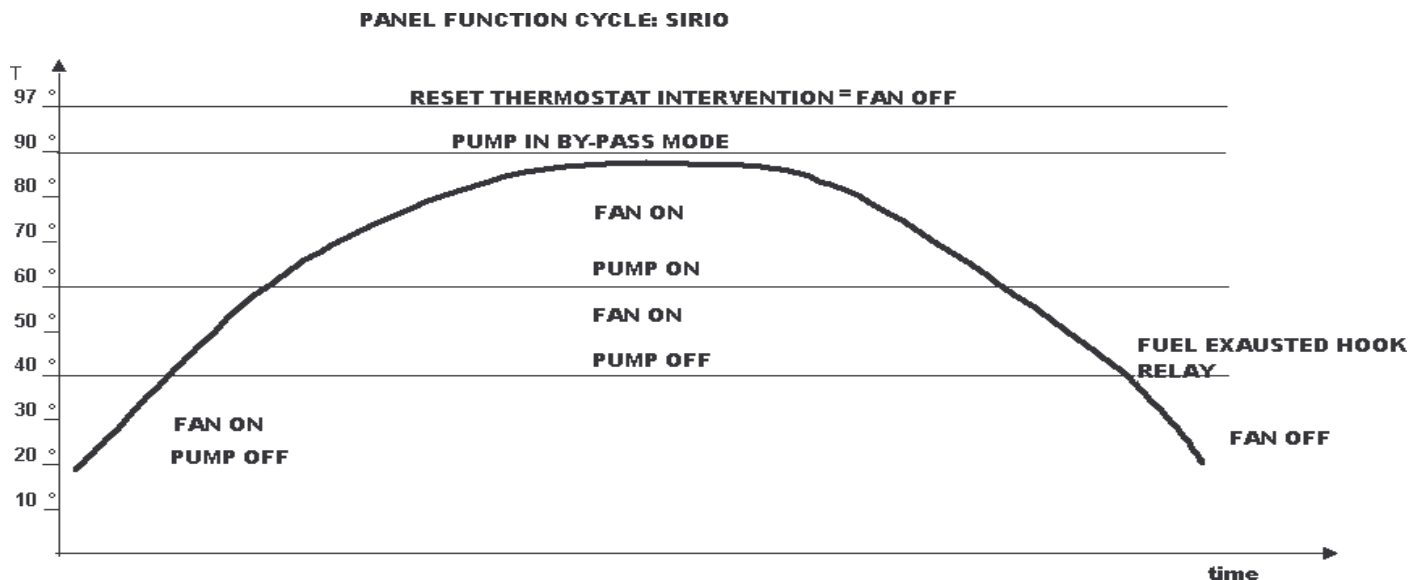


## 5. BOILER USE

### 5.1 STARTING THE SIRIO BOILER

To start the boiler the general switch no.1 must be on and the fan switch no.2 off.

- Open the combustion chamber and ash pan doors.
- Place quite a large amount of newspaper or a firelighter cube on the grate at the bottom of the combustion chamber.
- Place thin and very dry sticks of wood on top of the paper, then some thicker sticks on top of them.
- Light the newspaper or the firelighter.
- Close the combustion chamber door to prevent the smoke from escaping and leave the ash pan door open to allow the comburant air to circulate.
- After a few minutes, when the fire is well-lit, stoke up the fire with larger pieces of wood, then turn on the fan (switch no.2) and close the ash pan door.  
From this point on the fire grows steadily until it reaches the boiler's maximum capacity.



## **5.2 RELOADING WOOD: SIRIO BOILER**

To stoke up the boiler, first of all turn off the fan.

- Open the combustion chamber door.
- Use the poker to spread out the remaining wood and embers uniformly.
- Load the firewood so that each piece slightly crosses over the one below in order to allow a passage for the comburant air.
- Close the door and turn on the fan.

At this point it is advisable to move the riddling handle backwards and forwards several times in order to discharge part of the ash that has accumulated in the combustion chamber thereby improving the comburant air passage.

## **5.3 ADJUSTMENT OF THE DRAUGHT CONTROL FLAP ON THE SIRIO BOILER**

To obtain good combustion and boiler efficiency the right amount of air needed for combustion must be supplied.

This is strictly related to the quantity and size of the firewood loaded.

If using very large billets (with diameters > 10-15 cm), combustion will be rather slow so the quantity of inflowing air must be limited in order to avoid losses to the flue due to excessive air.

On the other hand if the firewood is very thin, the air flow has to be limited in order to avoid a too-fast combustion which produces heat in excess of the boiler's absorption capacity. In this case the flame can be seen entering directly into the smoke tubes and also escaping from the rear hood creating extremely high temperature fumes.

Slightly turn the adjustment screw to limit the air flow and consequently the rate of combustion and fume temperature.

When using normal size firewood where the billets have a diameter ranging from 5 to 10 cm, the initial adjustment does not need to be altered.

## 5.4 FUEL: WOOD

Any type of wood can be burnt in the boiler; however, it is important to be aware of the fact that efficient running of the boiler depends significantly on the type of wood used and on its degree of seasoning.

- Wood seasoned for 1 year still contains 40% humidity and only generates 2.300 kcal/kg.
- Wood seasoned for 2 years contains approx. 25% humidity and generates approx. 3.000 kcal/kg.
- Wood seasoned for 3 years contains approx 15% humidity and generates approx. 3.500 kcal/kg.

It is obvious, therefore, that the quantity and degree of desiccation of the wood greatly influences the boiler's thermal output.

It is important to note also that by burning poor quality wood containing a high percentage of humidity the boiler will be fouled more than normal.

It is advisable to store double the amount of wood needed for one winter in order to season the wood for at least 2 years.

For wood that is sufficiently dry even some large pieces with a 15/20 cm diameter can be used. However, note that these pieces burn slower than those with smaller diameters and therefore are not capable of generating the boiler's maximum capacity.

Therefore, if during the coldest periods the system requires the boiler's maximum capacity, then it is advisable to use smaller pieces and keep the larger pieces for between seasons.

*Following are some recommendations regarding the most commonly used wood:*

excellent:	ash, beech, maple, hornbeam, oak
good:	birch, alder, acacia
fair:	linden, poplar, willow, chestnut.

Resinous timber is considered unsuitable.

Sawings and shavings must not be used as the boiler has been designed and constructed to burn normal size firewood, and it must not be used as an incinerator.

## 5.5 FUEL: COAL

The recommendations are as follows:

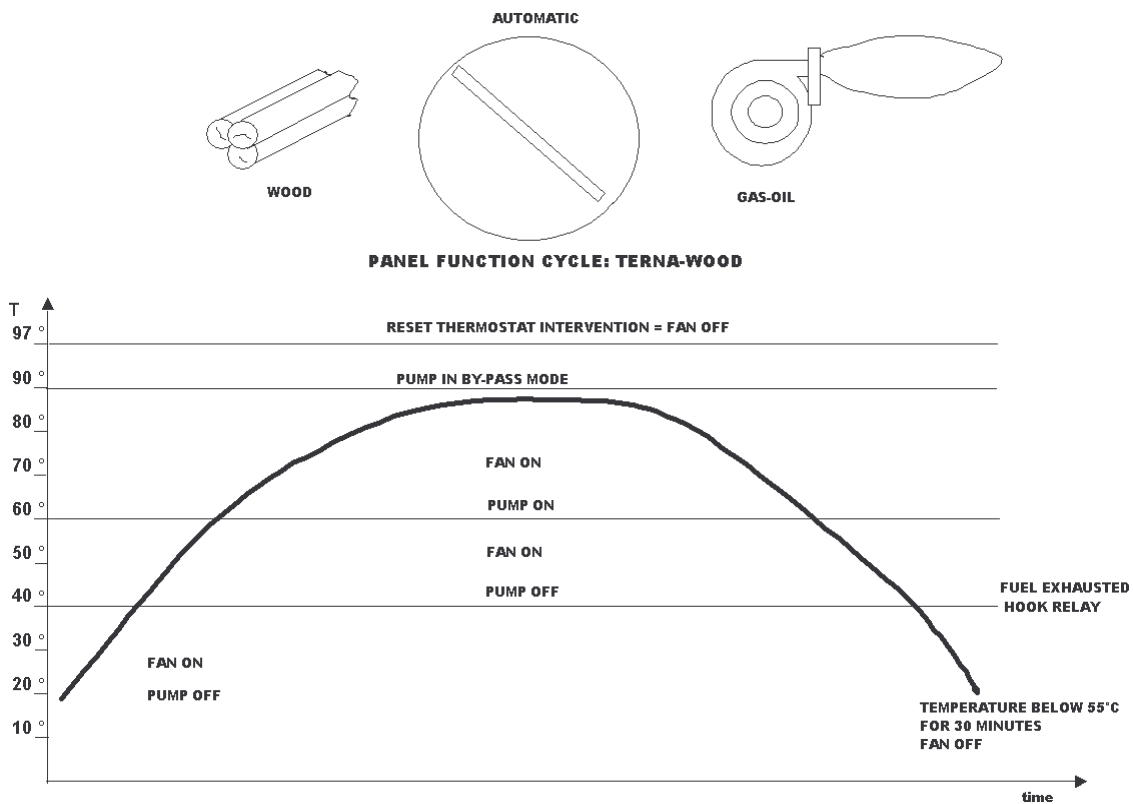
it is important to distribute the coal uniformly on the grate in order to avoid creating heaps and to regularly clean the ash pan and grate: in fact coal produces much more ash than wood.

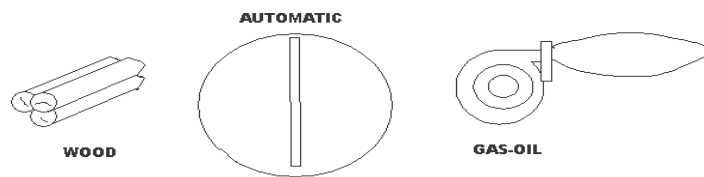
An overfull ash pan or a clogged grate prevent the normal passage of comburant air.

The types of coal that are most recommended for heating are in order : metallurgical coke, gas coke, anthracite, hard coals, semi-rich coals.

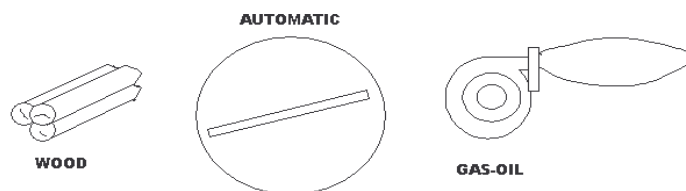
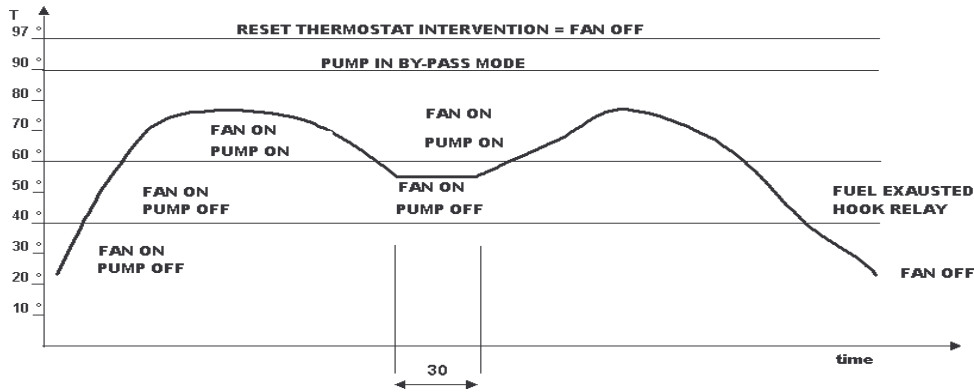
## 5.6 STARTING: TERNA S AND TERNA B BOILERS

For all that concerns running the boiler on wood, see points 5.1 and 5.5 above regarding the SIRIO boilers; the information is also relevant to these boilers as their wood sections are identical to those of the SIRIO boilers.

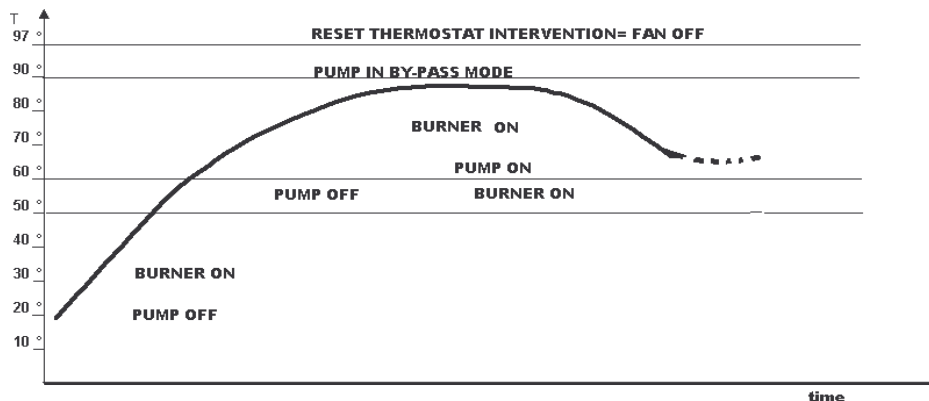




**PANEL FUNCTION CYCLE :AUTOMATIC**



**PANEL FUNCTION CYCLE TERNA : GAS-OIL**



## 5.7 RUNNING ON GAS - OIL: TERNA S AND TERNA B BOILERS

For the Terna S and Terna B boilers to function only with the gas – oil burner, position the function mode selector (no. 7 page 30) on **BRUCIATORE (BURNER)** and turn on the general switch.

At this point, if the boiler is not already at its working temperature, the burner begins the reset operation with the modes relevant to the type of burner, then it starts up and continues to function until it reaches the temperature set on the adjustment thermostat.

Check that the flame does not directly touch the side walls and bottom of the combustion chamber.

## 6. TROUBLESHOOTING

### 6.1 PROBLEMS, CAUSES AND REMEDIES: SIRIO BOILER

PROBLEM	POSSIBLE CAUSE	REMEDY
<b>During the wood starting phase the fan stops and the fuel exhausted indicator lights up</b>	Most probably the pump or pumps renew the water in the boiler too quickly causing the temperature to drop below 40°C (fuel exhausted temperature) in a space of time which is too brief to allow the fuel exhausted thermostat to be able to stop them.	Check that the draught rate is 1.5 mm for mod. SIRIO 25 and 2 mm for all the rest. Reduce the pump speed or throttle the delivery pipe in order to reduce the flow.
	The fuel exhausted thermostat is not calibrated.	Check the calibration and if necessary replace it.
	Poor sensitivity of the anticondensate thermostat.	Check that there is sufficient oil in the thermostat sump.
<b>When the fan is off (above 75°C), the boiler tends to come to the boil</b>	The flue has an excessive draught.	Install a draught regulator or leave the flue inspection door slightly open
	The draught control flap through which the fan forced air passes, does not close properly.	Remove the element causing the door to jam.
<b>Water leaking from solid fuel chamber</b>	Probable formation of condensate caused by gravity circulation or by pumps operating even at a low temperature	Eliminate gravity circulation by installing a non-return valve and connect the pumps to the anticondensate thermostat.
<b>Fume temperature excessive and overheating of flue</b>	The draught control flap through which the fan forced air passes lets too much air through resulting in excessive combustion.	Restrict the flap opening by tightening the adjustment screw located on the fan housing.
<b>Fume temperature too high</b>	The boiler needs cleaning: the exchange surfaces cannot absorb the amount of heat generated	Clean the exchange surfaces properly.

## 6.2 PROBLEMS, CAUSES AND REMEDIES: TERNA S AND TERNA B BOILERS

PROBLEM	POSSIBLE CAUSE	REMEDY
<b>The boiler does not commute to Diesel oil when wood is exhausted</b>	The fuel exhausted thermostat is not calibrated	Check the calibration which should be 50-55°C
<b>During the wood starting phase the fan stops and the fuel exhausted indicator lights up</b>	There is natural circulation in the system and the 30' available are not sufficient to reach 55°C	Eliminate the natural circulation by installing a non-return valve
	30' are not sufficient to heat the water in the boiler and the water tank	Set the timer at 40 - 45'
<b>When the fan is off (above 75°C), the boiler tends to come to the boil</b>	The flue has an excessive draught	Install a draught regulator or leave the inspection door slightly open
<b>Water leaking from the water tank</b>	There is no expansion tank in the system	Check the situation and install all that is required
	The system's expansion tank is empty	Check the situation and install all that is required
	There is no safety valve in the system	Check the situation and install all that is required
<b>Water leaking from solid fuel chamber</b>	Probable formation of condensate caused by gravity circulation or by pumps operating even at a low temperature	Eliminate natural air supply by installing a non-return valve and connect the pumps to the anticondensate thermostat.
<b>Fume temperature excessive and overheating of flue</b>	The draught control flap through which the fan forced air passes lets too much air through resulting in excessive combustion.	Restrict the flap opening by tightening the adjustment screw located on the fan housing.
<b>Fume temperature too high</b>	The boiler needs cleaning: the exchange surfaces cannot absorb the amount of heat generated	Clean the exchange surfaces properly.

## 7. CLEANING AND MAINTENANCE

### 7.1 CLEANING AND MAINTENANCE: SIRIO BOILER



For the boiler to be perfectly efficient the grate must be shaken 2 or 3 times every time wood is loaded so that the accumulated ash drops below thereby freeing the comburant air passage.

It is advisable to regularly empty out the ash pan (see photo11).

To complete this procedure:

- a) Open the ash pan door.
- b) Use the special handle to pull the pan out.  
We suggest using protective gloves to avoid burns when carrying out this operation.
- c) Empty the ash pan, return it to its original position and close the door.



*Photo no. 11*

Every 5-10 days, depending on the type of firewood used, the smoke tubes must be thoroughly cleaned to remove the scaling which considerably reduces heat exchange and consequently boiler output.

In order to carry out this procedure the boiler must come to a standstill, then open the loading door and remove the baffle plate.

Insert the special brush into the first tube and by moving it forwards and backwards 2 of the 4 internal sides are scraped. (see photo 12)



*Photo no. 12*



Remove the brush and reinsert it in such a way as to scrape the remaining two sides.

Repeat this procedure to scale all the other tubes.

Use a normal painters' scraper to scale the internal walls of the boiler.

When all these procedures are completed, part of the scaled soot and tar end up in the smoke hood and consequently have to be removed through the hole located at the lower part of the hood itself.

The hole is closed off by a metal sheet and secured by two threaded wing nuts.

## 7.2 CLEANING AND MAINTENANCE: TERNA S AND TERNA B BOILERS

Refer to point 7.1 above regarding the SIRIO boilers for information on cleaning and maintenance procedures for the wood and coal combustion chamber.

However as far as the gas – oil combustion chamber is concerned, every year the chamber itself, the smoke tubes and burner must be thoroughly cleaned.



### Caution:

before commencing this procedure disconnect the electric power supply to the boiler by turning the magnetothermal switch to "**OFF**".

It is absolutely necessary to close the gas or oil on-off valve that feeds the burner in order to prevent possible leaks. At this point the burner can be disassembled: simply loosen the fasteners and open the door that supports it by unscrewing the two cap nuts M19 that keep it shut.

Use the special brush provided to clean the smoke tubes.

It is advisable to remove the stainless steel cylinder from the combustion chamber in order to remove any scaling that reduces heat exchange.

At the rear of the boiler remove the two wing nuts which secure the galvanized cover on the smoke hood; remove the cover and suction out the scaling residues previously removed by the scraping procedure through the hole.

With regards to the cleaning of the burner, the user must be aware that it is a very delicate procedure and is best left to the manufacturers' after-sales assistance service.

If the user prefers to carry out the maintenance personally, then he must scrupulously follow all the instructions provided by the manufacturer of the burner.

Once the cleaning procedure has been completed, reassemble all the components in the inverse order with respect to the disassembly.

When all the parts have been reassembled it is advisable to check that the boiler functions correctly to eliminate the possibility of errors.

### 7.3 TERNA B WATER TANK

The water tank installed on the Terna B boiler is protected against corrosion by the process of vitrification obtained through the Therglass system.

A further degree of protection is achieved through the application of a magnesium anode fixed to the inside of the handhole cover.

This anode gradually wears out and consequently has to be replaced every two years.

***To replace the anode follow this procedure:***

- 1) Close the supply on-off valve to the boiler.
- 2) Open a hot water tap to release the pressurised water that has accumulated in the expansion tank of the water tank; if possible, this tap should be positioned lower than the water tank.
- 3) Remove the sheet cover located in the centre of the upper panel of the casing by loosening the self-tapping screws which secure it.
- 4) Cut away the fibreglass layer covering the handhole flange.
- 5) Completely unscrew the nut M14 which blocks the handhole flange bracket.
- 6) Remove the bracket and then the handhole flange.
- 7) Check the wear condition of the magnesium anode (the original dimensions are Ø 22 mm., length 500 mm.)
- 8) If necessary replace it with a new one by unscrewing the nut M8 that secures it to the handhole flange.
- 9) Check the condition of the calcareous deposits on the inside of the water tank. If the scaling is thicker than 2-3 mm it is advisable to scale it either by using the special liquid available in plumbing supplies shops or by scraping with a wooden scraper (or similar soft material that will not damage the vitrification).
- 10) After having removed the calcareous residues and repeatedly washed the inside of the water tank (if the descaling liquid was used) all the parts can be reassembled, taking special care to position the rubber packing correctly between the handhole flange and its seat on the water tank.