

# STREBEL



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## TECHNICAL MANUAL

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# BLUNOX

TRIPLE PASS, REVERSE FLAME,  
WET BACK BOILERS

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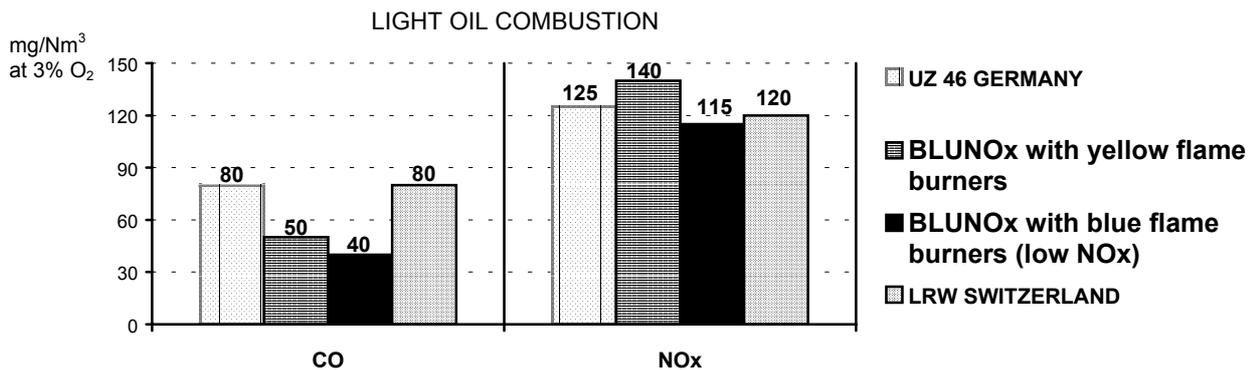
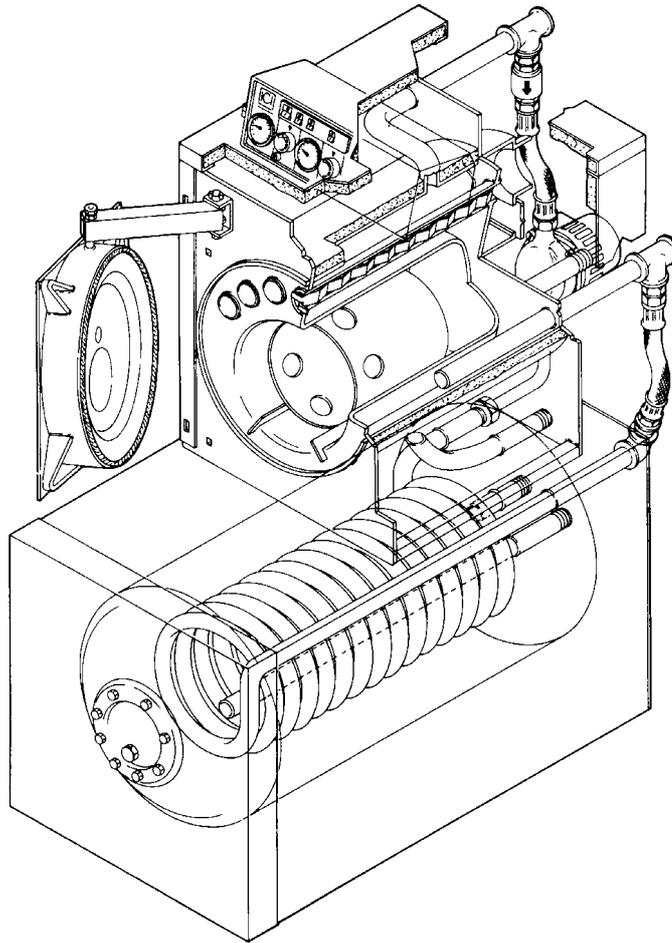
**GENERAL**

The BLUNOX is a pressurised boiler which is highly efficient and has a low level of pollution emission. i.e. low pollution of Nitrogen oxide and Carbon monoxide.

The BLUNOX can be powered by either gas or light oil burners and the oil burner can be blue flame (low Nox) or yellow flame.

Matching sanitary water tanks are available for the production and storage of water between 30°C and 60°C (higher storage temperature available upon request).

The maximum permitted pressure of the primary heating system is 3 bar and of the sanitary water system is 6 bar.



### 1. INTRODUCTION

All ICI CALDAIE generators are provided with a manufacturer's identification plate listing:

- Serial number or identification name;
- Rated thermal output in kcal/h and kW;
- Furnace thermal output in kcal/h and kW;
- Type of fuels that can be used;
- Max operating pressure.

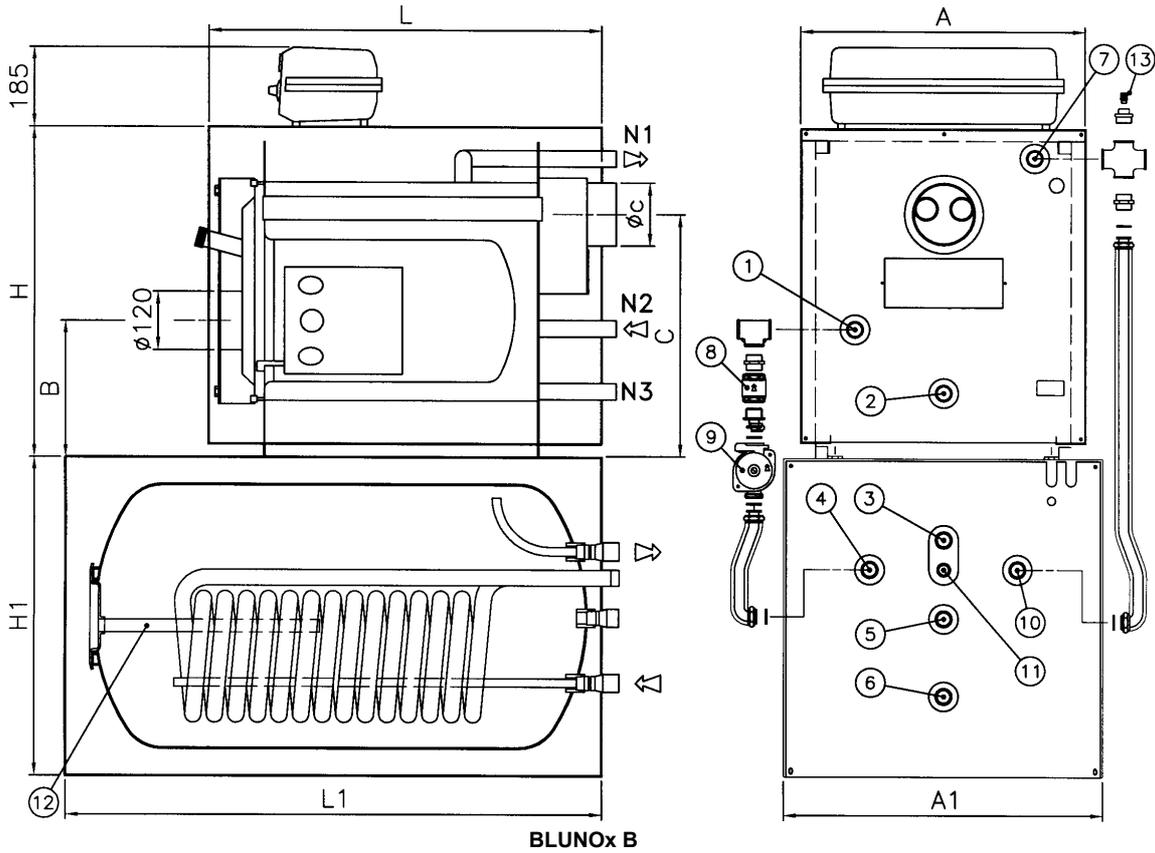
#### CAUTION

The installation must be performed in compliance with the regulations in force by **professionally qualified personnel**.

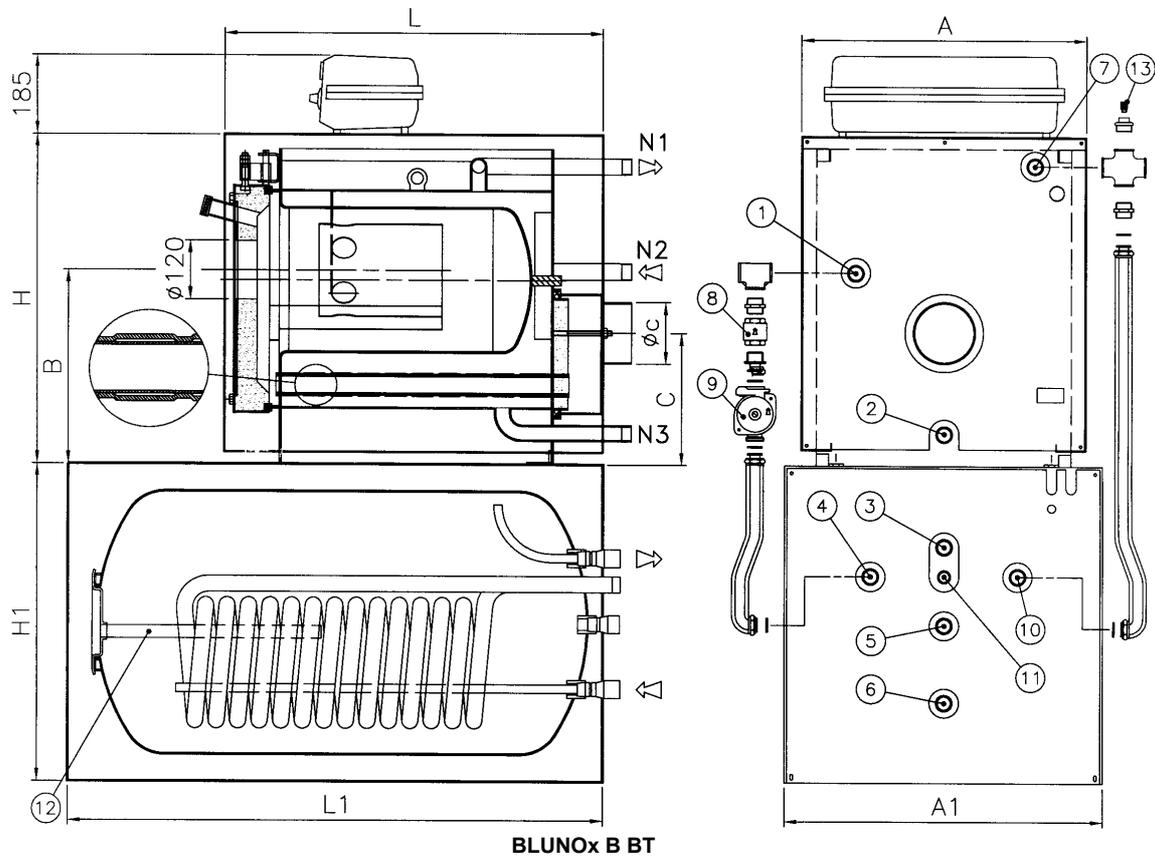
The term "professionally qualified personnel" means persons with specific technical skills in the sector of heating system components.

Incorrect installation may cause damage to persons, animals or objects for which the manufacturer cannot be held responsible.

2. TECHNICAL SPECIFICATIONS



BLUNOX B



BLUNOX B BT

Key

- 1. Boiler N2 return – 2. Boiler N3 drain – 3. 3/4" domestic hot water outlet – 4. 1" coil outlet– 5. 3/4" water heater recirculation – 6. 3/4" domestic hot water inlet– 7. Boiler N1 flow – 8. Non return valve – 9. Hot water tank circulator – 10. 1" coil inlet – 11. Bulb well – 12. Magnesium anode – 13. Air vent.

## TECHNICAL SPECIFICATIONS

BOILER TYPE	HEAT OUTPUT		FURNACE OUTPUT		CAPACITY litres	PRESSURE LOSSES WATER SIDE • mbar	COMBUSTION CHAMBER COUNTERPRES-SURE mbar	WEIGHT kg
	kcal/h	kW	kcal/h	kW				
<b>BLUNOx 19</b>	19.000	22,0	20.730	24,0	33	12	0,2	110
<b>BLUNOx 27</b>	27.000	31,4	29.490	34,3	44	15	0,3	130
<b>BLUNOx 34</b>	34.000	40,0	37.230	43,8	66	15	0,3	160
<b>BLUNOx 43</b>	43.000	50,0	47.130	54,8	66	20	0,4	160
<b>BLUNOx 60</b>	60.000	70,0	65.570	76,5	88	30	0,4	200

<b>BLUNOx BT 27</b>	27.000	31,4	29.490	34,3	44	15	0,3	145
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BOILER TYPE	DIMENSIONS mm								
	A	L	H	B	C	Øc	N1	N2	N3
<b>BLUNOx 19</b>	525	780	620	280	465	127	1"	1"	1"
<b>BLUNOx 27</b>	580	810	670	300	500	127	1"	1"	1"
<b>BLUNOx 34</b>	660	920	760	320	560	178	1"1/4	1"1/4	1"
<b>BLUNOx 43</b>	660	920	760	320	560	178	1"1/4	1"1/4	1"
<b>BLUNOx 60</b>	660	1010	790	320	565	178	1"1/4	1"1/4	1"

<b>BLUNOx BT 27</b>	580	860	670	400	273	130	1"	1"	1"
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DOUBLING BOILER	CAPACITY'	WEIGHT kg	DIMENSIONS mm		
	litres		A1	L1	H1
<b>BL 150</b>	150	100	610	1000	610
<b>BL 200</b>	200	130	660	1125	660
<b>BL 250</b>	250	160	660	1375	660

● Pressure losses referring to a differential temperature of 12°C  
bar

Maximum boiler operating pressure: boiler3 bar-water tank 6

### **3. ASSEMBLY (Fig. 1-2)**

- a) **Siting:** the boiler should be sited to allow 60 cm of free space all around. On request a base can be provided suitable for any size of boiler.

**Complete assembly: (Fig. 2)**

The boiler is fixed to the water heater with two bolts which are screwed between the frame of the boiler itself (at the rear) and the threaded bushes on the casing of the water heater.

- b) The boiler body is covered with an insulating layer of fibreglass inside the casing panels which are fixed to the boiler body by a retaining strap.
- c) **Installing the control panel:** remove the cover and carefully unroll the thermometer and thermostat capillaries. secondly pass them through the holes at the bottom of the control panel then through the hole made in the top panel of the boiler.
- d) Insert the cables through the hole at the bottom of panel (1) and (2); then allowing for which-side the door is hung, connect the wires connecting the control panel to the burner.
- e) **Installing casing:** First of all, fit lateral panels right (1) and left (2), by hooking them to the frame. Secondly, fit the upper panel (3) and place the thermostat bulbs (TR, TS, TLI, TLIB\*) and thermometer (TMC) in the pockets provided.

**Complete assembly: (Fig. 2)**

For boilers with hot water tanks, thread the water heater thermostat bulbs (TB\*) and relative thermometer (TMB\*) through the hole in the back panel of the boiler and then insert them in the pockets.

Finally secure the upper panel to the lateral panels with screws and close the holes with proper plugs (Fig. 1).

- f) Hook the front panel (4) to the lateral panels.
- g) **Before connecting the hydraulic system,** secure the back galvanised sheet with self-threading screws. Finally fit the plastic washers in the flow , return and drain connections.

\* only for boilers with hot water tank.

# ASSEMBLY

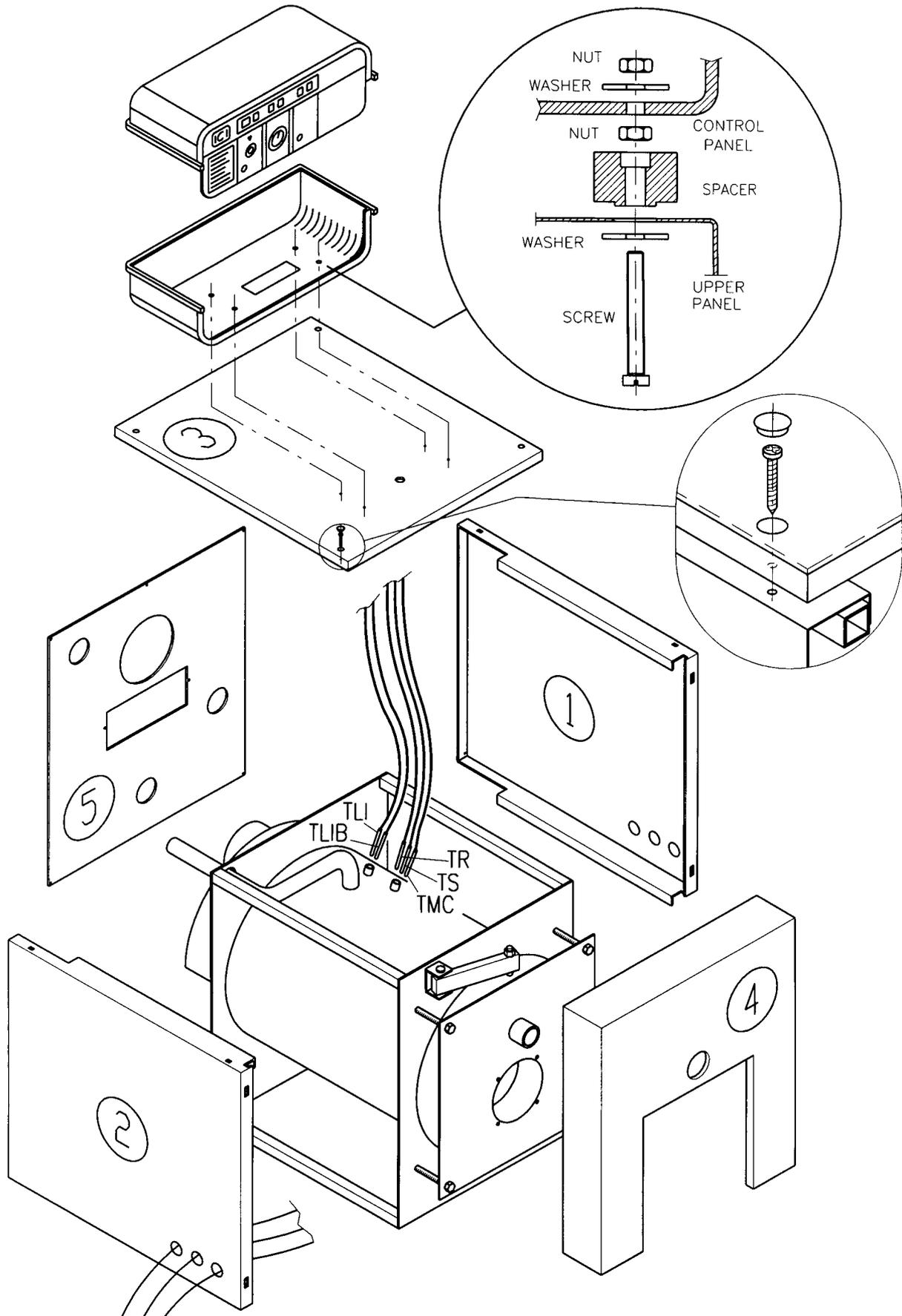
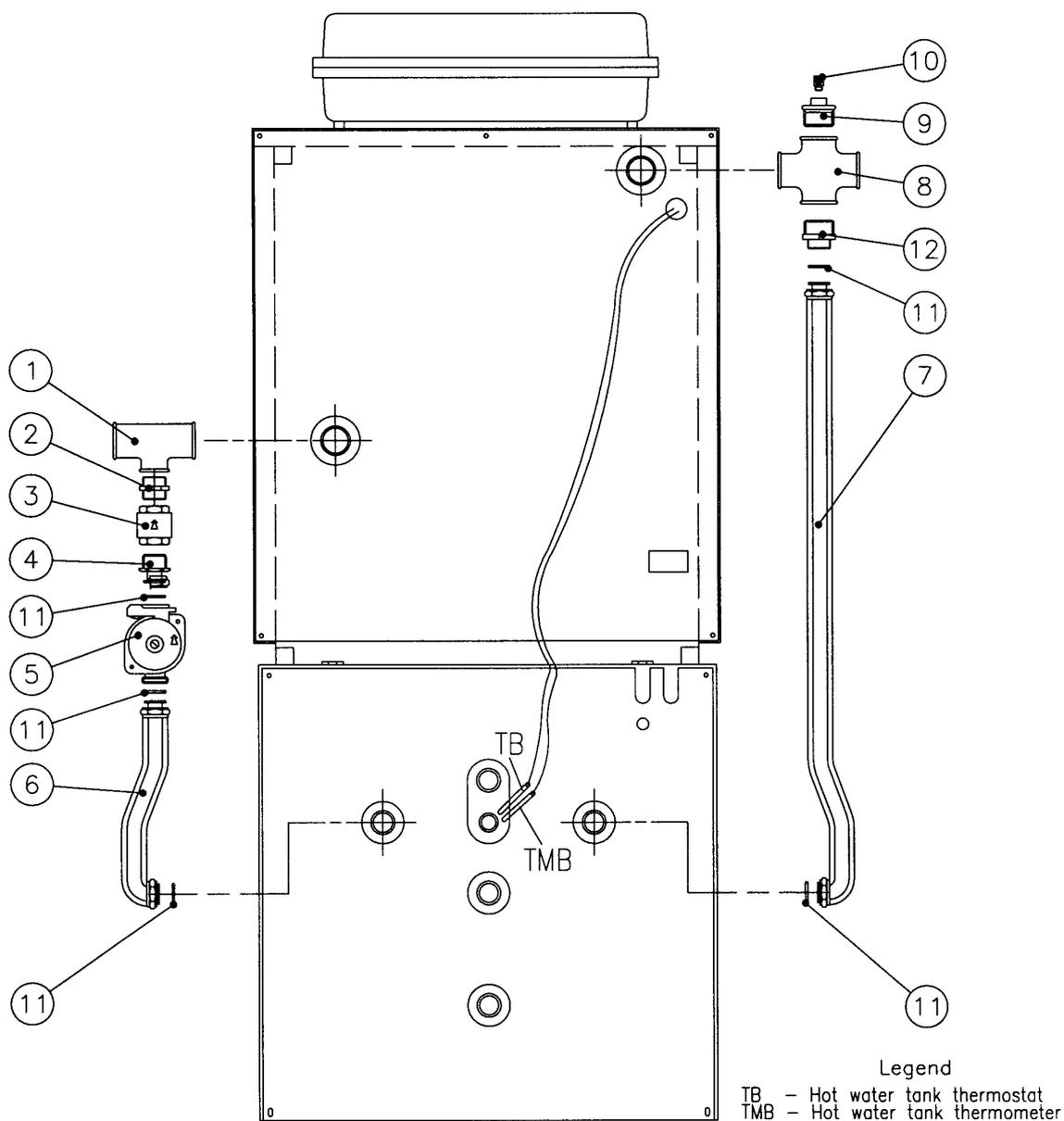


Fig. 1

**Key :** TR Boiler control thermostat – TS High limit thermostat - TLI Pump consent thermostat - TMC Boiler thermometer – TLIB Hot water consent thermostat (only for boilers with hot water tanks).

## ASSEMBLY

### 3.1 ASSEMBLING HOT WATER TANK AND BOILER (Fig. 2)



12	CONNECTOR	1"	1"	1"1/4x1"	1"1/4x1"
11	GASKET	1"	1"	1"	1"
10	MANUAL AIR VENT	1/4"	1/4"	1/4"	1/4"
9	PLUG WITH HOLE	1"x1/4"	1"x1/4"	1"1/4x1/4"	1"1/4x1/4"
8	CROSS CONNECTOR	1"	1"	1"1/4	1"1/4
7	FLOW PIPE	F 1" L=785	F 1" L=780	F 1" L=860	F 1" L=895
6	RETURN PIPE	F 1" L=225	F 1" L=350	F 1" L=275 (RH)	F 1" L=275 (LH)
5	CIRCULATING PUMP + AIR VENT	1"	1"	1"	1"
4	CIRCULATING PUMP CONN. PIPE	M/F 1"	M/F 1"	M/F 1"	M/F 1"
3	NON RETURN VALVE	F 1"	F 1"	F 1"	F 1"
2	CONNECTOR	1"	1"	1"	1"
1	CONNECTOR TEE	1"	1"	1"1/4x1"1/4x1"	1"1/4x1"1/4x1"
POS.	DESCRIPTION	BLUNOX B 19-27	BLUNOX B BT 27	BLUNOX B 34-43	BLUNOX B 60

Fig. 2

## 4. INSTALLATION

Before connecting the boiler, perform the following operations:

- Thoroughly clean all the system pipes in order to remove any foreign matter that could affect correct operation of the boiler;
- Check that the flue has an adequate draught, that there is no narrowing of passages and that it is free from debris; also check that other appliances do not discharge into the flue (unless designed to serve several utilities).

### 4.1. HEATING PLANT

#### 4.1.1. FLUE

The pressurised boiler that now powers your heating system is so-called because it uses a burner provided with fan which introduces into the combustion chamber the exact amount of air necessary in relation to the fuel and maintains an overpressure in the furnace equivalent to all the internal resistances of the flue gas path as far as the boiler exhaust. At this point the fan pressure should have dropped to zero to prevent the flue connection pipe and the lower area of the flue itself being under pressure and combustion gas leaks occurring in the boiler room if the flue gas duct is not sealed.

The connection pipe from the boiler to the base of the flue must slope upwards in the direction of the flue gas flow with recommended gradient of no less than 10 degree. Its path must be as short and straight as possible with the bends and fittings designed in accordance with air duct criteria.

The flues must be insulated in order to prevent temperature losses above 1°C for every metre of length. An appropriately sized solids collection and discharge chamber and a hole for taking flue gas samples must be provided at the base of the flue.

The following graph (Fig. 3) shows the heights of flues with different sections for pressurised boilers according to capacity.

For example:

Boiler having:

- Heat output:..... 27.000 kcal/h

- Flue height: ..... 5 m

**Flue diameter:..... 200 mm**

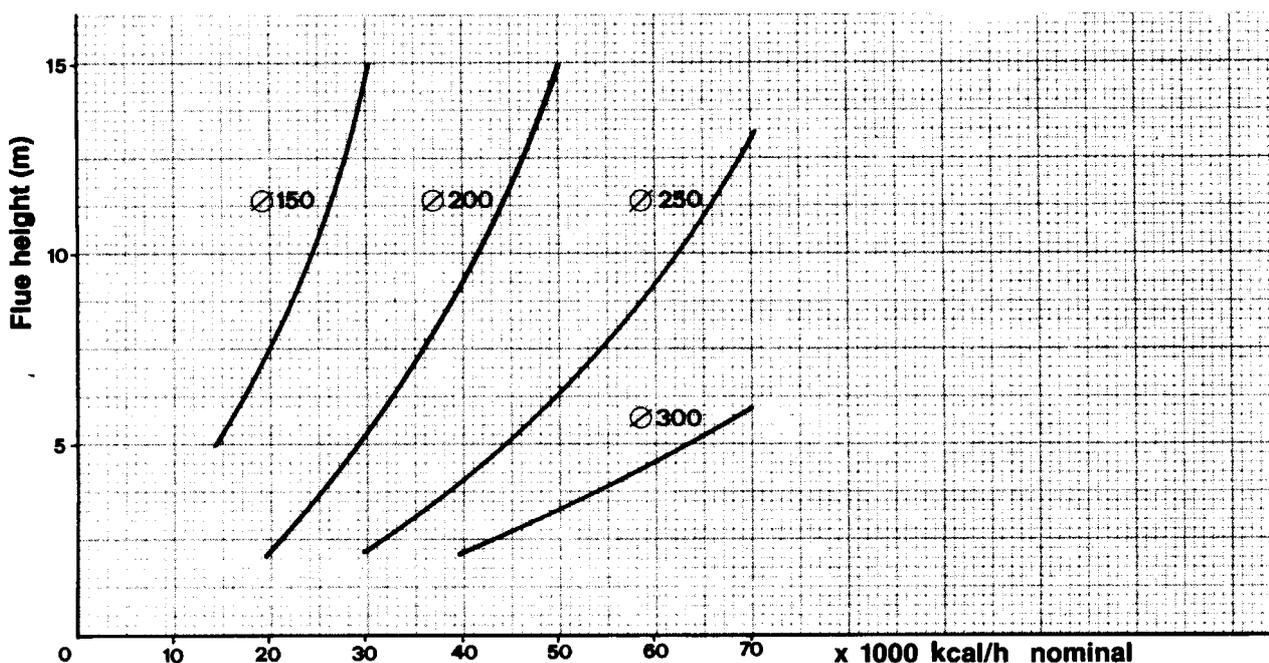


Fig. 3

**4.2. HYDRAULIC CONNECTION (Fig. 4)**

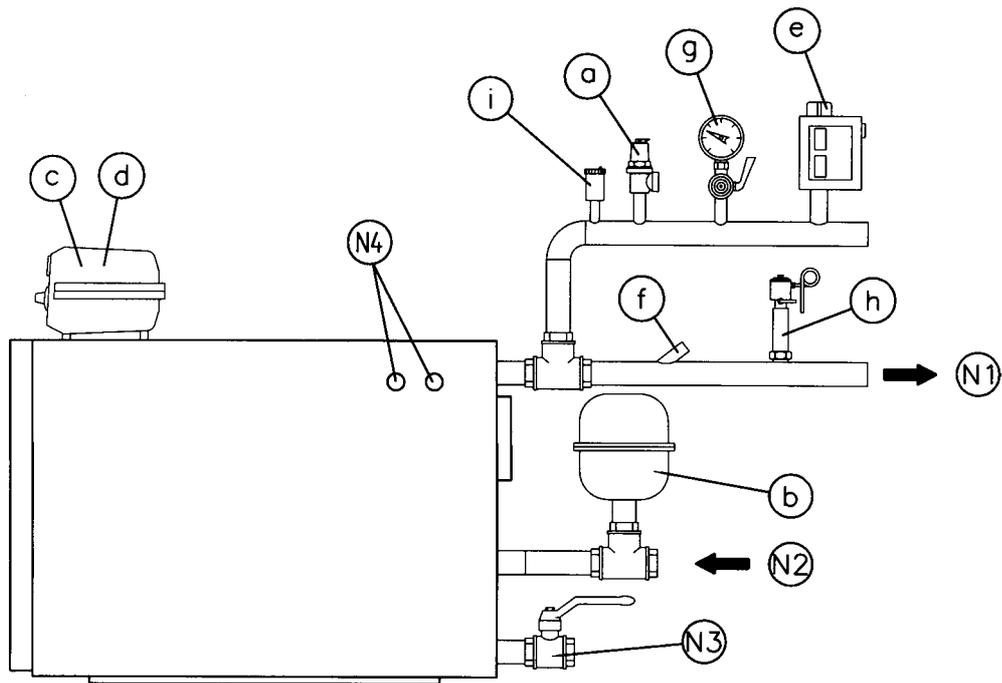


Fig. 4

**Key**

- a - Safety valve
- b - Expansion vessel
- c - Control thermostat
- d - High limit thermostat
- e - Cut-off pressure switch
- f - Pocket for control thermometer
- g - Pressure gauge with flange for control pressure gauge
- h - Heat discharge valve or fuel on-off valve
- i - Air vent

- N1 - Flow
- N2 - Return
- N3 - Filling/drain
- N4 - Bulb well (boiler thermometer, control thermostat, high limit thermostat, pump consent thermostat, water heater consent thermostat (only for boilers with hot water tank).

Ensure that the hydraulic pressure measured after the reduction valve on the supply pipe does not exceed the operating pressure specified on the rating plate of the component (boiler, heater etc.).

- As the water contained in the heating system increases in pressure during operation, ensure that its maximum value does not exceed the maximum hydraulic pressure specified on the component rating plate.
- Ensure that the safety valve outlets of the boiler and hot water tank, if there is one, have been connected to an drain funnel in order to prevent the valves flooding the room if they open.
- Ensure that the pipes of the water and heating system are not used as an earth connection for the electrical system as this can seriously and very rapidly damage the pipes, boiler, heater and radiators.
- Once the heating system has been filled, you are advised to close the supply cock and keep it closed so that any leaks from the system will be identified by a drop in hydraulic pressure indicated on the system pressure gauge.

## INSTALLATION

### 4.3. ELECTRIC CONNECTION

#### 4.3.1 CONTROL PANEL (Fig. 5)

The control panel supplied with the boilers is made of self-extinguishing plastic and houses the control and safety instruments:

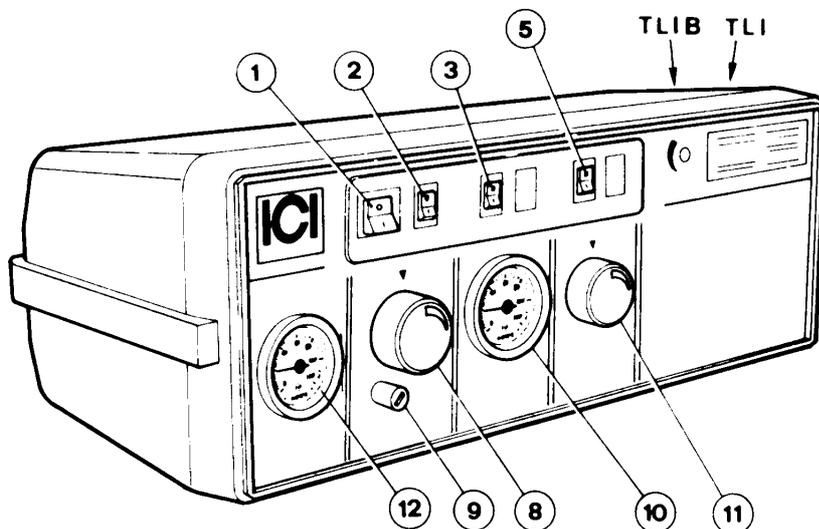


Fig. 5

#### Key

- |                                |  |
|--------------------------------|--|
| 1 - Main switch (IG)           | 8 - Boiler control thermostat (TR)           |
| 2 - Burner switch (IB)         | 9 - High limit thermostat (TS)               |
| 3 - Pump switch (ICI)          | 10* - Hot water tank thermometer (TMB)       |
| 5* - Water heater switch (ICB) | 11* - Hot water tank control thermostat (TB) |
|                                | 12 - Boiler thermometer (TMC)                |

Inside the control panel:

TLI – Pump consent thermostat 55°C (40°C for BT)

TLIB\* – Hot water tank consent thermostat 55°C (40°C for BT)

\* Only for boilers with hot water tank.

The upper part of the control panel can be removed to gain access to the terminal board and uncoil the thermostat and thermometer capillaries. A copy of the wiring diagram is contained inside the control panel cover.

The thermostats for the minimum water temperature in the boiler (TLI e TLIB) do not allow the water heater and the circulating pump to work until the water temperature reaches 55°C. This permits higher boiler temperatures to be maintained thus reducing the risk of condensation.

**The control thermostat (TR)** has an operating range from 60°C to 90°C (from 40°C to 90°C for BT) and it can be adjusted by using the front knob.

**The high limit thermostat (TS)** is set at a fix value (100°C).

**Hot water tank control thermostat (TB\*)** has an operating range from 0°C to 65°C and it can be adjusted by using the front knob.

In order to balance the water temperature in the boiler and have a more uniform temperature, we suggest you install a shunt pump having 1/3 of the capacity of the heating system pump.

For correct installation, refer to the boiler casing assembly instructions.

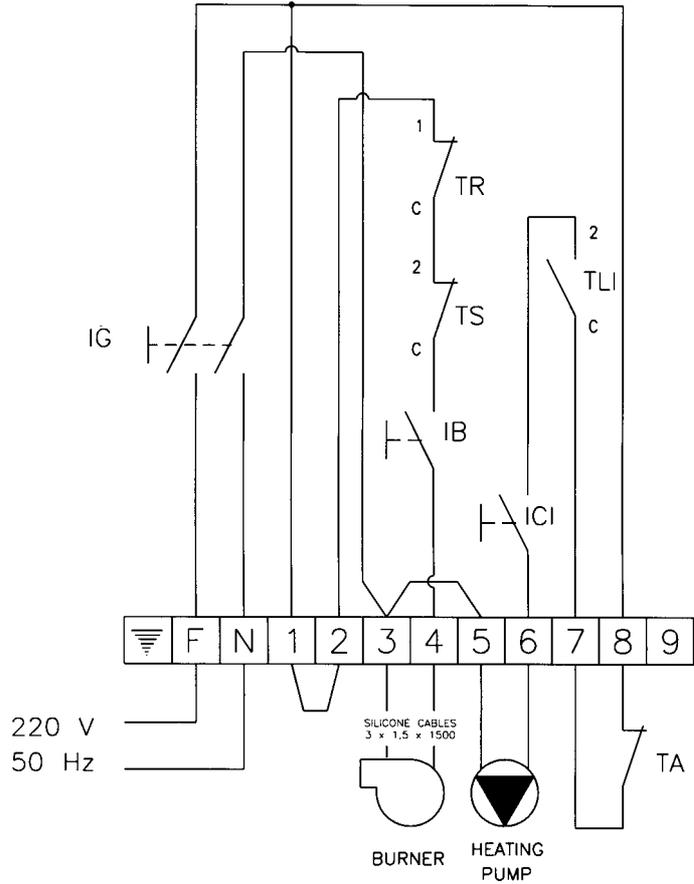
# INSTALLATION

## 4.3.2 WIRING DIAGRAM

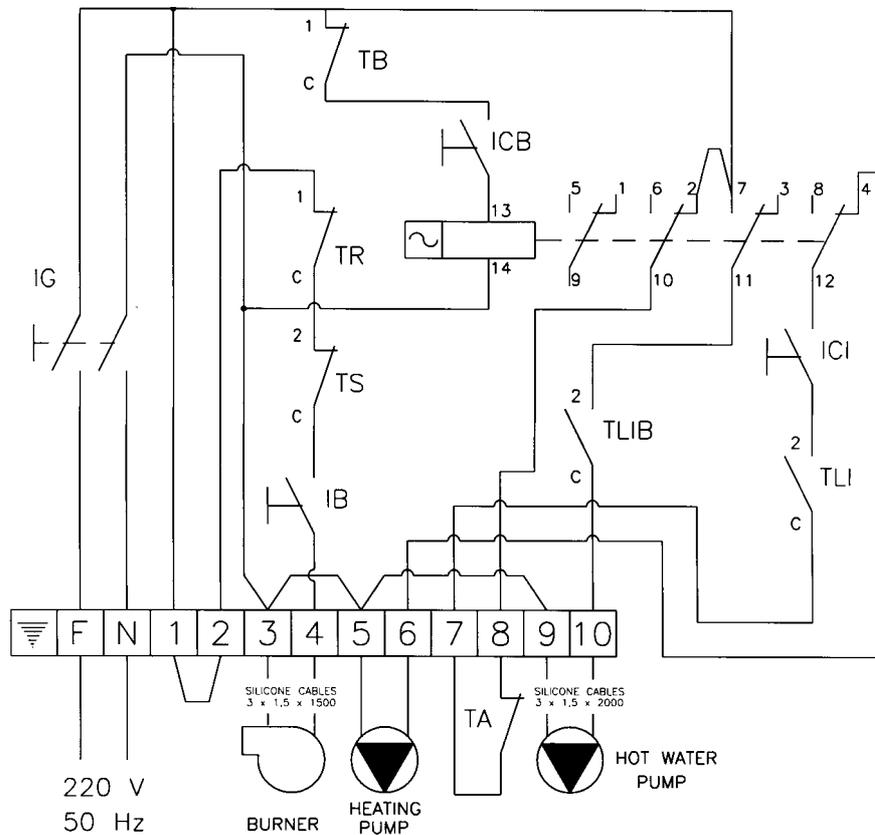
**Key**

- IG** Main switch
- IB** Burner switch
- ICI** System circulator switch (summer-winter)
- ICB** Hot water tank circulator switch
- TLI** Pump consent thermostat  
55°C (40°C for BT); cap. 1500 mm
- TB** Hot water tank control thermostat  
0÷65°C; cap. 2000 mm
- TR** Boiler control thermostat  
60÷90°C (40÷90°C for BT); cap. 2000 mm
- TS** High limit thermostat  
100°C; cap. 2000
- TLIB** Hot water tank consent thermostat  
55°C (40°C per BT); cap. 1500 mm
- TA** Room thermostat

**BOILERS WITHOUT HOT WATER TANK**



**BOILERS WITH HOT WATER TANK**



### 4.4. BURNER CONNECTION

Before installation you are advised to thoroughly clean the inside of all the fuel supply system pipes in order to remove any foreign matter that could affect correct operation of the boiler;

The following checks should also be carried out:

- check the internal and external seal of the fuel supply system;
- regulate the fuel flow according to the power required by the boiler;
- check that the boiler is fired by the correct type of fuel;
- check that the fuel supply pressure is within the values specified on the burner rating plate;
- check that the fuel supply system is sized for the maximum flow rate necessary for the boiler and that it is provided with all control and safety devices provided for by the regulations referred to above.

In particular, when using gas:

- check that all the gas connections are sealed;
- check that the boiler room vents are sized in order to guarantee the air flow established by the regulations referred to above and that they are in any case sufficient to obtain perfect combustion;
- check that the gas pipes are not used as earth connections for electrical appliances.

If the boiler is not going to be used for some time, close the fuel supply cock or cocks.

**IMPORTANT: check that the air spaces between the burner draught tube, minimum length 130 mm (L) and the burner aperture are suitably filled with thermo insulating material (Fig. 6).**

The boiler is supplied with a piece of ceramic cord. Should this not be suitable for your burner, use a cord of different diameter but the same material.

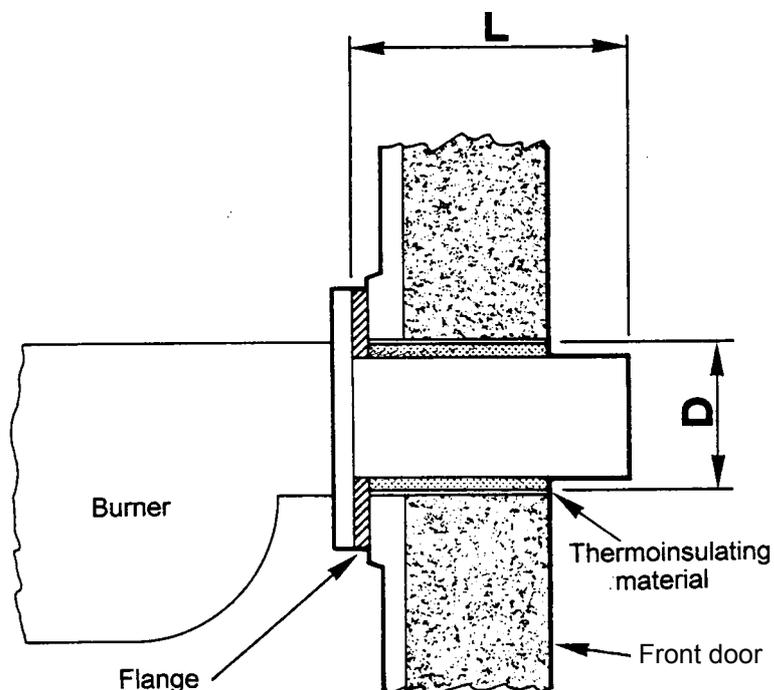


Fig. 6

## 5. START-UP

WARNING: Before starting up, insert turbolators of at least 100 mm in the gas pipes.

### 5.1 PRELIMINARY CHECKS

Before starting the boiler, check that:

- the rating plate specifications and power supply network (electricity, water, gas, fuel oil or other fuel) specifications correspond;
- the burner power range is compatible with the power of the boiler;
- the boiler room also contains the instructions for the burner;
- the pipes from the boiler are covered in thermoinsulating material;
- the flue gas exhaust pipe is operating correctly;
- the combustion air supply is correct;
- the manhole, the smoke box and the burner plate are closed in order to provide a complete flue gas seal;
- the system is full of water and that any air pockets have therefore been eliminated;
- the anti-freeze protected are operative;
- the water circulation pumps are operating correctly.

### 5.2 WATER TREATMENT

The most common phenomena that occur in heating systems are:

- **Scaling (Fig. 7)**

Scale obstructs heat transfer between the combustion gases and the water, causing an abnormal increase in the temperature of the metal and therefore reducing the life of the boiler.

Scale is found mostly at the points where the wall temperature is highest and the best remedy, at construction level, is to eliminate areas that overheat.

Scale creates an insulating layer which reduces the thermal transfer of the generator, affecting system efficiency. This means that the heat produced by burning the fuel is not fully exploited and is lost to the flue.

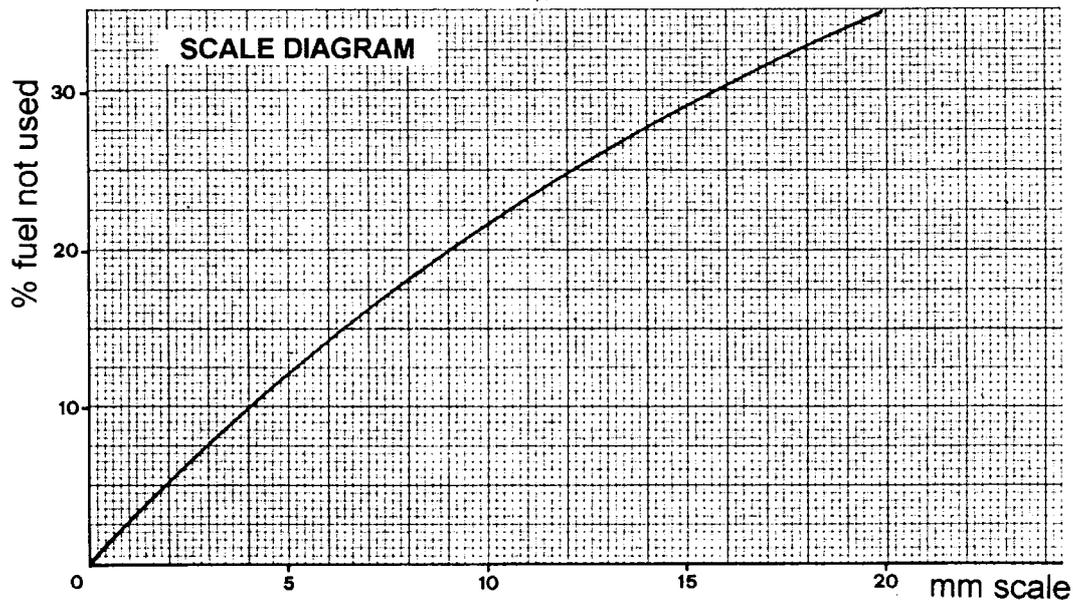


Fig. 7

## START UP

### - Corrosion on the water side

Corrosion of the metal surfaces of the boiler on the water side is due to the passage of dissolved iron. In this process the presence of dissolved gases and in particular of oxygen and carbon dioxide is very important. Corrosion often occurs with softened or demineralised water which has a more aggressive effect on iron: in these cases, although the system is protected from scaling, it is not protected against corrosion and **the water must be treated with corrosion inhibitors**.

Treatment of the water for these systems, must be done with:

- Chemical treatment (see Fig. 8) with inhibitor compatible with the waste water laws.

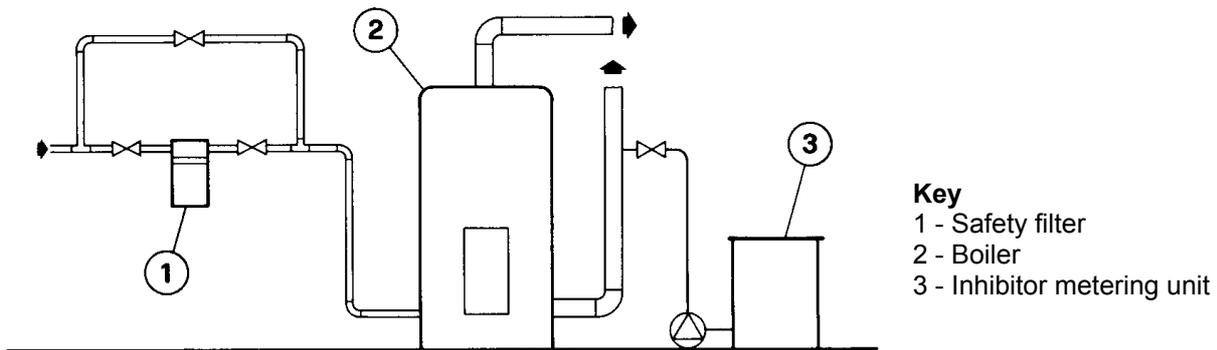


Fig. 8

### 5.3 FILLING THE SYSTEM

The water must enter the system as slowly as possible and in a quantity proportional to the air bleeding capacity of the components involved.

Filling times vary depending on the capacity and characteristics of the system but should never be less than 2 or 3 hours.

In the case of a system with sealed expansion vessel, water must be let in until the pressure gauge indicator reaches the static pressure value pre-set by the vessel.

Heat the water to maximum temperature. During this operation the air contained in the water is released through the automatic air separator or through manual bleed valves.

The water discharged from the system with elimination of the air is made up by the automatic or manual filling valve.

Once the system is working to full capacity, you are advised to close the automatic supply cock.

## 6. OPERATION

### 6.1 OPERATING CHECKS

The heating system must be correctly operated to ensure perfect combustion as far as possible and to avoid hazards and damage resulting from incorrect emission of flue gases into the atmosphere.

During operation, the following values should be obtained when the burner is correctly regulated:

Fuel	%CO <sub>2</sub> in flue	Outgoing flue gases temperature	% CO in flue
<b>NATURAL GAS</b>	9	170/180°C	0,1

Fuel	%CO <sub>2</sub> in flue	Outgoing flue gases temperature	Smoke index (Bacharach)
<b>GASOIL</b>	13	170/190°C	0,5 ÷ 1

- The differential temperature between boiler flow and return must not exceed 15°C in order to prevent thermal shock to the boiler structures.
- The temperature of the return water must be above 55°C in order to protect the boiler from corrosion due to condensation of the flue gases on cold surfaces; for this purpose it is useful to install a 3 or 4-way mixing valve.
- You are advised to avoid switching the burner on and off too often by leaving it on all the time (burner switch on control panel in the ON position).
- If the flue gas seal is poor in the front part of the boiler (manhole and burner plate) or the back part (smoke box), the closing tie rods of the individual parts must be adjusted; if this is not sufficient, the seals must be replaced.

**CAUTION**

**Do not open the manhole and do not remove the smoke box when the burner is working, wait until all the insulating parts cool down.**

### 6.2 CLEANING AND SERVICING

Cleaning can be performed by opening the front manhole only, taking the turbulence activators out with a pair of pliers and cleaning the tubes with a steel brush.

Finally to complete the cleaning process, open the inspection cover of the smoke box chamber and remove any debris found.

#### **About boiler BT (at low temperature)**

The cleaning of the smoke box can be carried out by disconnecting the flue and removing the box by loosening the bolts.

Check that the refractory castings in contact with the flue gases are in perfect condition and if not, replace them.

Periodically check the efficiency of the system control and safety instruments.

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