TEACHING MANUAL
STAT PROJECT – THERMOSTAT BOILER

Family: Wall-Mounted Boilers
Group: CANTIERE
Models: STAT

Edition 1 dated 1st September 1998

PROFESSIONAL TEAM

MT1998CAL005001001

CONTENTS

1. THE RANGE OF BOILERS

1.1 IDENTIFYING THE RANGE OF BOILERS.

The boiler model names are formed by a series of alphanumeric codes and are interpreted as follows:

LEGEND:	
23	Refers to the maximum operating power in KW
R	Central heating boiler
M	Combination boiler
FF o TURBO o CS	Indicate the use of a sealed combustion chamber with the products of combustion discharged by means of a fan.

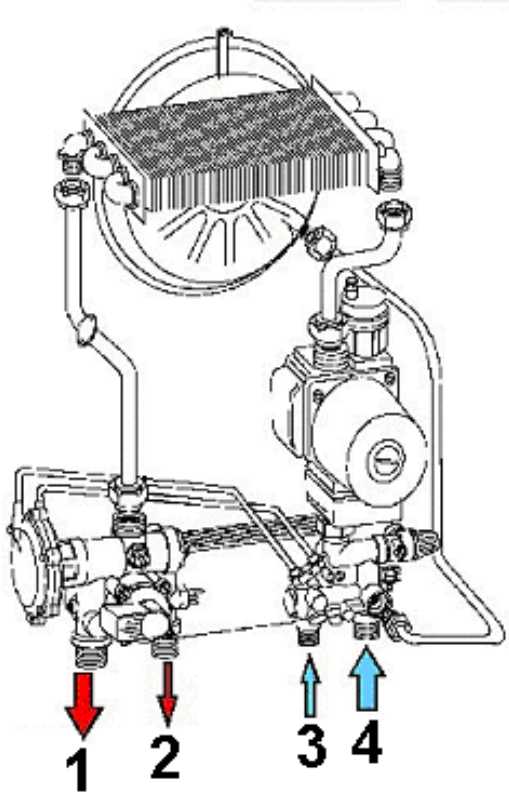
1.2 BOILER DIMENSIONS AND CONNECTION POSITIONS

The dimensions of all the boilers (either open chamber or sealed chamber) are the same therefore installation errors are avoided.

1.3 CONNECTION TEMPLATE

The template makes it possible to position the water connections without installing the boiler in that the same is supplied with a complete kit containing the tap, pipe fittings and relevant fixing bracket.

2. THE WATER SYSTEM



1. central heating flow
2. domestic hot water flow
3. domestic cold water
4. central heating return

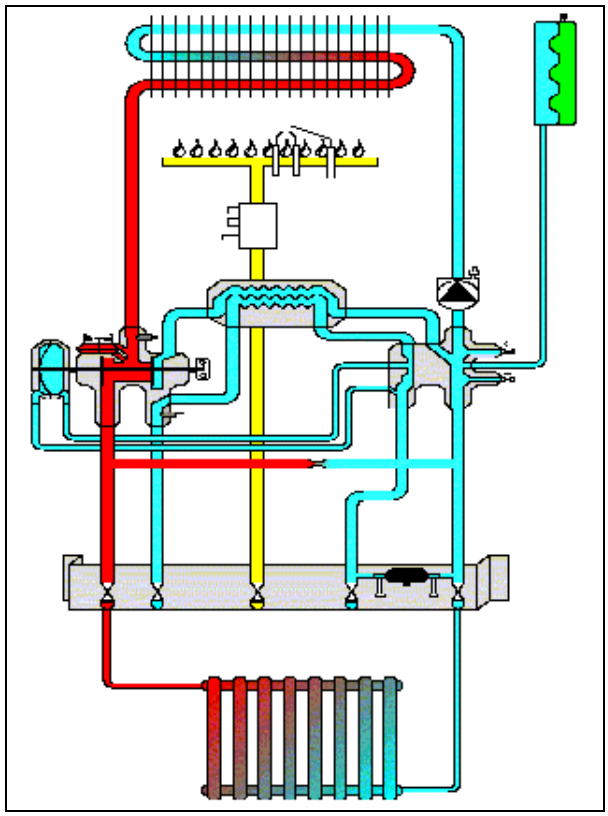
Degree of protection of the boiler: IPX4D

X= no protection against the infiltration of solid matter
4= water protection coefficient
D= iron O 1 mm not in contact with live parts.

2.1 CENTRAL HEATING MODE

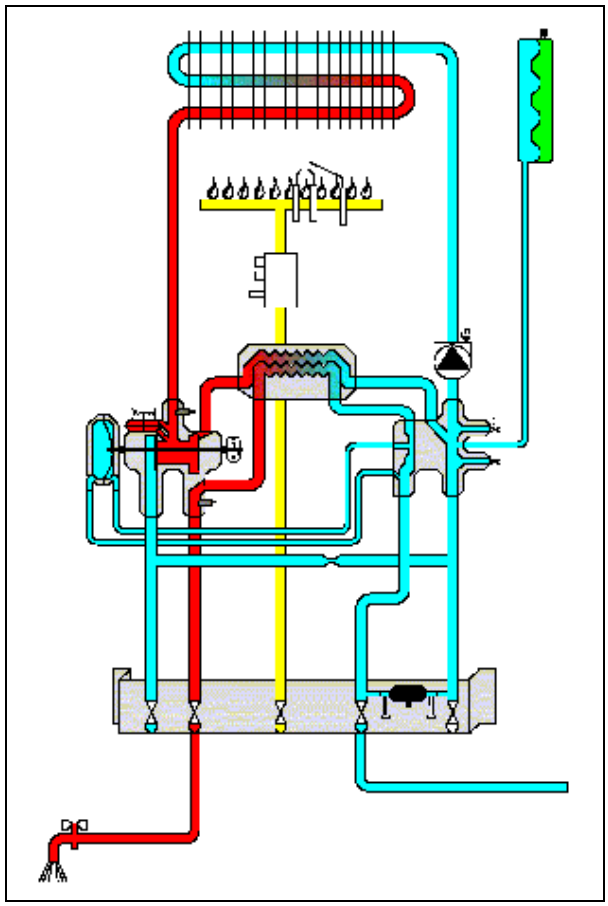
In central heating mode, the circulation pump forces the water in the primary circuit through the main heat exchanger, which heats the water.
The heating probe detects the water temperature at the inlet of the three-way valve.
The main flow switch checks the efficiency of the circulation pump.
The 3-way valve remains in central heating mode and water flows directly to the radiators.
If there is insufficient circulation within the radiators, the automatic by-pass opens to allow a flow of at least 350 l/h.

N.B.: To simplify the diagram, the by-pass and differential flow switch are not shown in installation configuration.

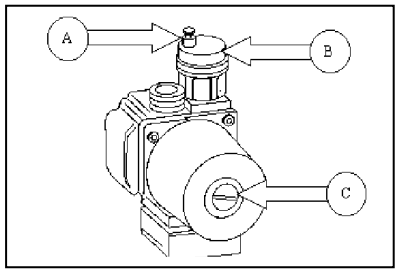


2.2 DOMESTIC HOT WATER MODE

In Domestic Hot Water mode, the water flow switches the position of the 3-way valve closing the central heating circuit and opening the circuit to the domestic hot water heat exchanger to activate the domestic hot water micro-switch.
The water in the main circuit passes through the heat exchanger heating the domestic hot water.
The temperature of the domestic hot water is read at the outlet of the heat exchanger on the 3-way valve.



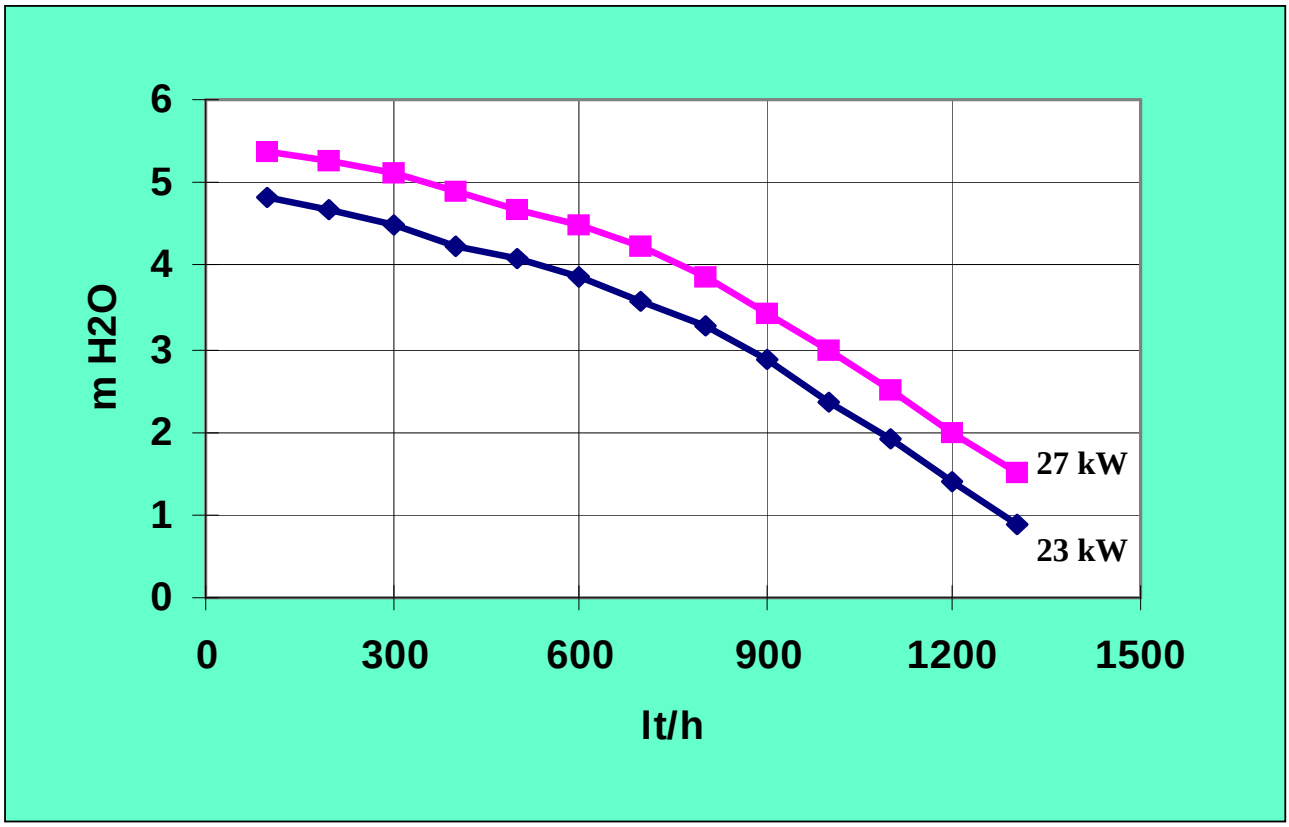
2.3 THE CIRCULATION PUMP



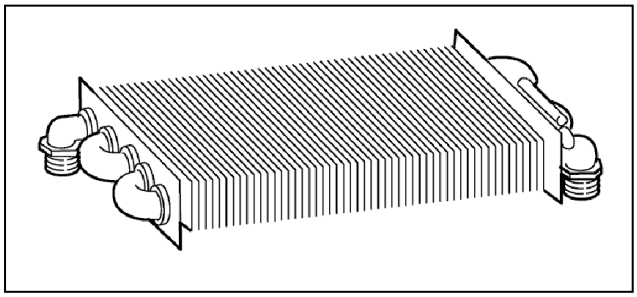
The pump is equipped with an automatic air release valve that separates the air in the area of major turbulence of the water.

A: Air vent
B: Automatic air release valve
C: Screws for access to the circulation pump shaft to release the same

- 230V 50 Hz Single phase motor
- Ceramic shaft and plastic rotor
- Cast iron air release valve body reduces noise and vibrations
- MTS circulation pump for the wall-mounted boiler equipped with 23 kW: 95 W thermostats
- SALMSON 50-15 circulation pump for the wall-mounted boiler equipped with 27 kW: 114 W thermostats



2.4 THE MAIN HEAT EXCHANGER



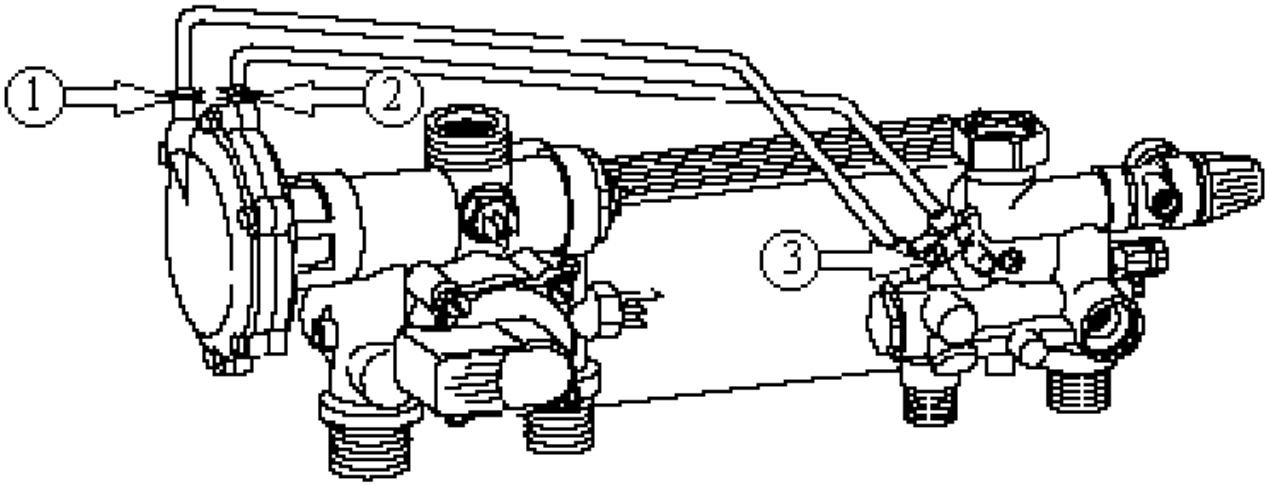
The body of the exchanger is made of copper treated with silicone to prevent corrosion.
The exchanger transmits the heat from the combustion products to the water circulating in the radiators and in the domestic hot water exchanger.

The heat exchangers of the 23 and 27kW boilers have different fins (number and thickness)

2.5 THE HYDRAULIC GROUP

This is an easy to dismount multi-function group fitted with:

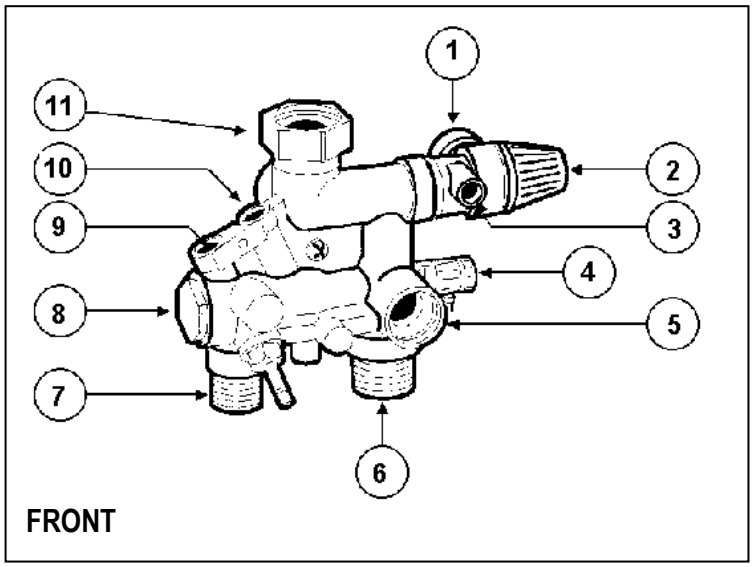
- Safety flow switch on the primary.
- Automatic by-pass
- System filling point.
- System draining point.
- Filter for reducing the Domestic Hot Water flow.
- 3-way switch valve.
- Primary circuit safety valve (3 bar).



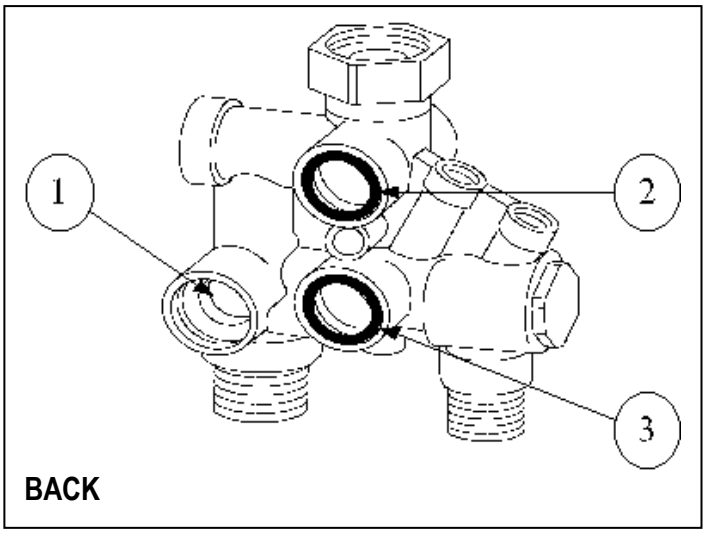
2.6 THE HYDRAULIC DISTRIBUTION GROUP

The distribution group ensures connection of the expansion vessel, the safety valve, the drain tap, the central heating return and the heat exchanger, in a single piece. Moreover, the magnetic flow switch/filter switches to domestic hot water mode when domestic hot water is drawn.

1. Overpressure discharge pipe.
2. Safety valve rated at 3 bar.
3. Gauge pressure tube.
4. Drain tap.
5. Connection of the expansion vessel.
6. Central heating return.
7. Domestic cold water inlet.
8. Domestic hot water magnetic flow switch/filter group.
9. Positive sign pressure tube of the domestic hot water.
10. Negative sign pressure tube of the domestic hot water.
11. Circulation pump connection.



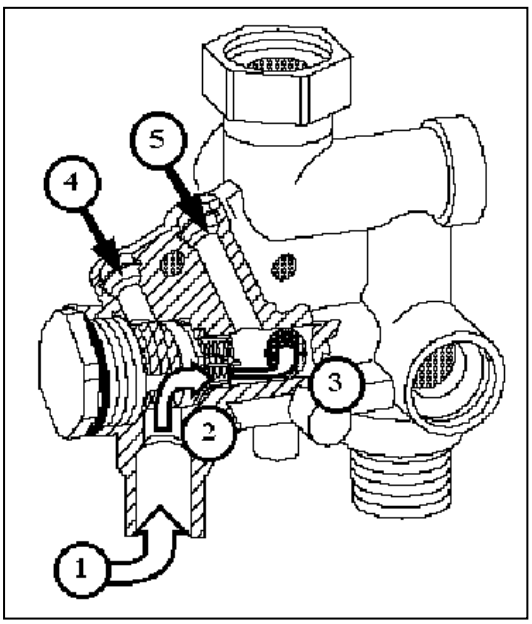
FRONT



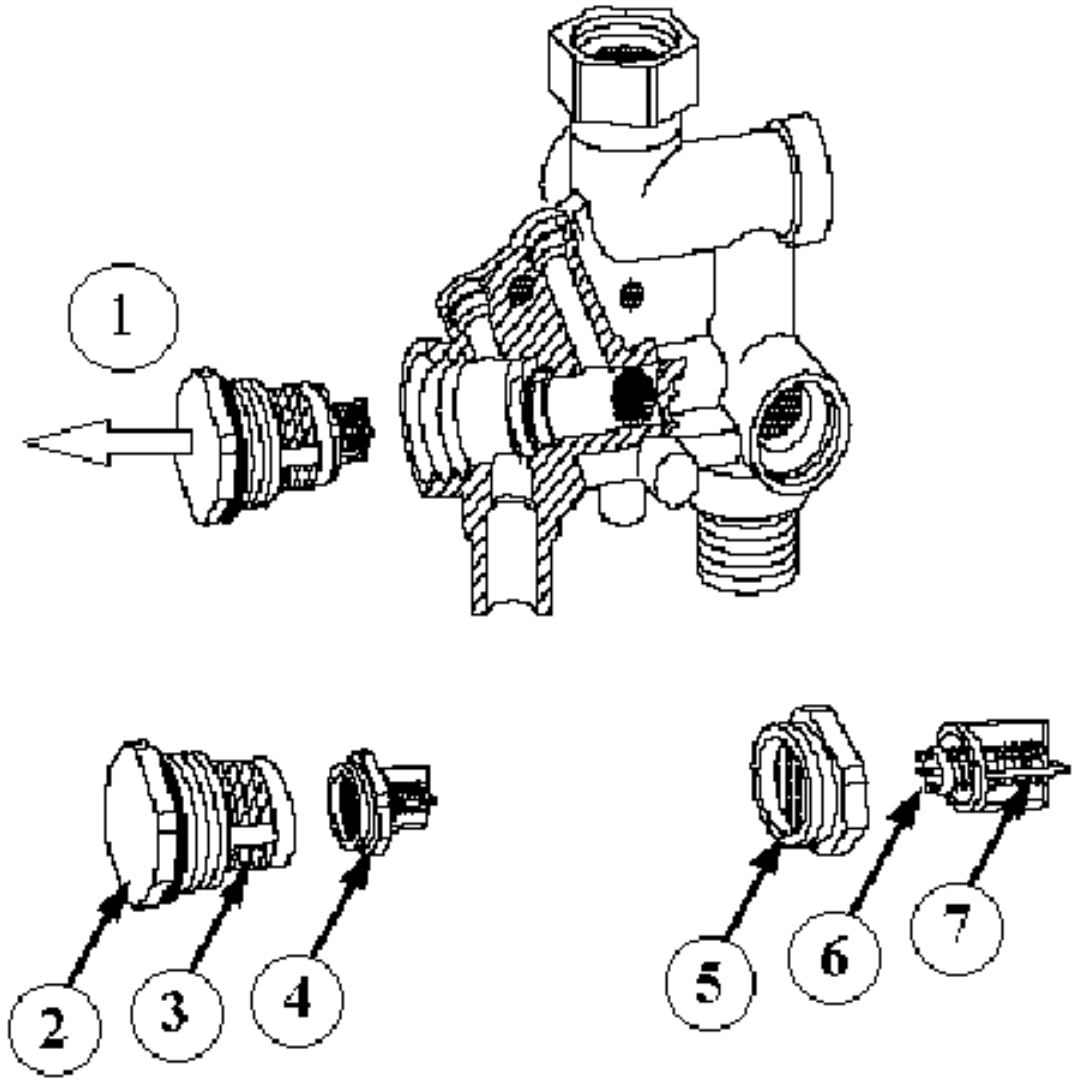
BACK

1. By-pass return.
2. Primary circuit return of the plate heat exchanger.
3. Domestic cold water flow to the plate heat exchanger.

The cold water enters the distribution hydraulic group (1).
The water flows through the magnetic flow switch/filter group in (2) and its pressure drops.
The cold water flows to the heat exchanger through opening (3).
Pressure (4) is positive upstream from the magnetic flow switch and negative (5) downstream from the magnetic flow switch. This pressure difference controls the hydraulic 3-way valve.

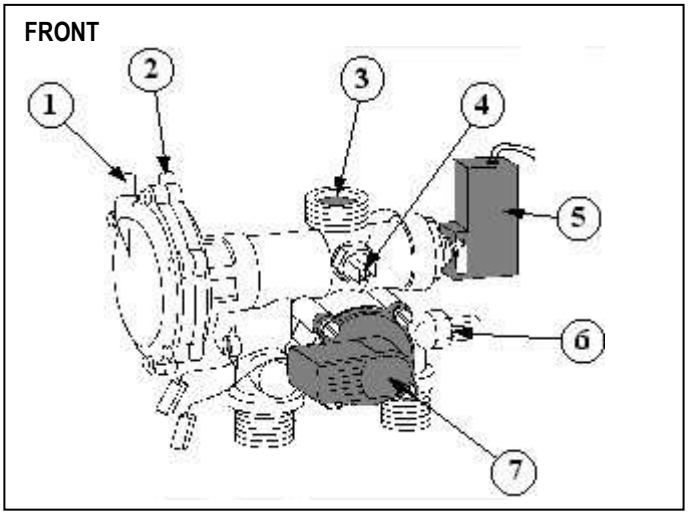


Disassembling the hydraulic distribution group:

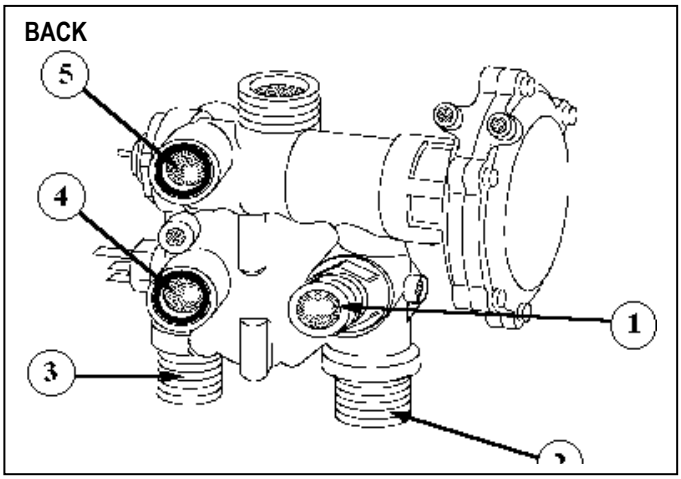


The domestic hot water filter/magnetic flow switch group (1) can be unscrewed from the distribution group.
Cap (2) contains the filter (3).
The magnetic flow switch (4) is screwed onto the cap.
The magnetic flow switch consists of a diaphragm (5) on which a valve (6) supported by a spring (7), is mounted. This system creates the pressure difference required to operate the hydraulic 3-way valve.

2.7 THE HYDRAULIC 3-WAY VALVE



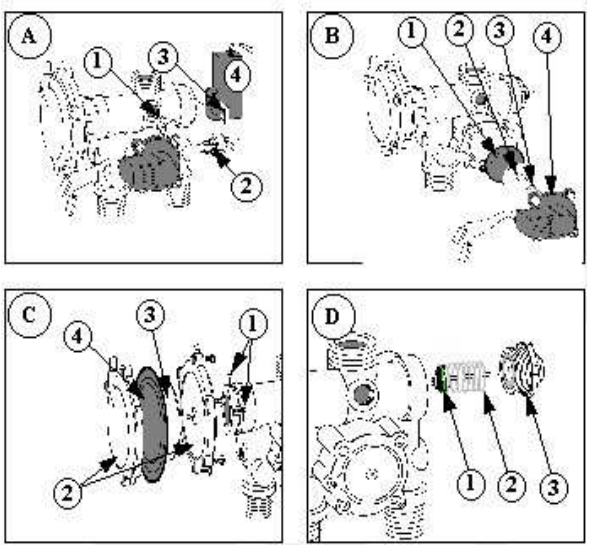
1. Positive pressure tube
2. Negative pressure tube
3. Primary heat exchanger water inlet
4. Central heating probe
5. Domestic hot water micro
6. Domestic hot water probe
7. Circulation pump differential detection flow switch



1. Central Heating By-Pass
2. Central heating flow
3. Domestic hot water outlet to user
4. Outlet for hot water from the domestic hot water heat exchanger
5. Primary outlet to domestic hot water heat exchanger

In combined boilers, the 3-way valve acts as hydraulic “exchange” to divert the water of the primary circuit to the domestic hot water heat exchanger when domestic hot water flows through. The differential flow switch and the heat exchanger are connected on the 3-way valve.
The 3-way valve is controlled by a pressure difference due to the flow of domestic hot water. This pressure difference is applied in (1) and (2) for a minimum domestic hot water flow of 2.6 L/mn and a minimum pressure of 0,3m H_2O.
The water from the primary heat exchanger (3) to the central heating outlet is diverted to the domestic hot water heat exchanger.
The domestic hot water micro (5) is closed.
In both domestic hot water and central heating modes, the flow switch (7) controls the operation of the circulation pump and allows gas to flow to the burner.

Disassembling the hydraulic 3-way valve.



A) Unscrew the central heating probe (1).
- Unscrew the domestic hot water probe (2).
- Remove the clips (3).
- Remove the domestic hot water micro (4).

B) Remove the 4 screws and then the upper cover (4).
- Remove diaphragm (1), piston (2) and spring (3).

C) Remove the 2 screws (1), then remove it from the hydraulic group.
- Remove the 6 screws to separate the two covers (2).
- Remove plate (3) and diaphragm (4).

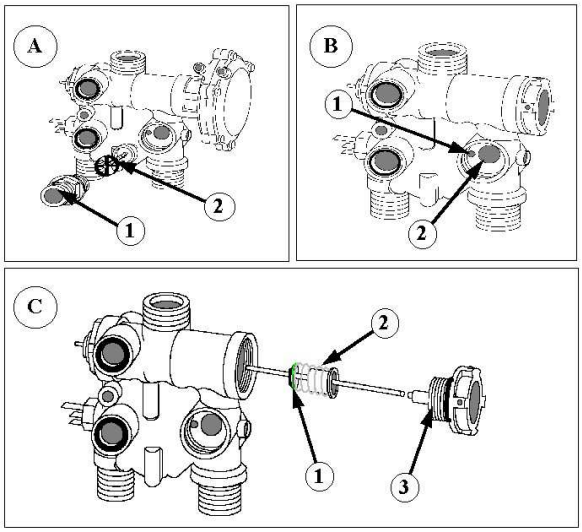
D) Unscrew head pipe fitting (3).
- Extract shutter (1) and spring (2).

A) Unscrew pipe fitting (1), remove the automatic by-pass (2), having maximum flow capacity of 350 L/H.

B) If a serious load loss occurs in the central heating circuit, the water of the primary circuit flows through opening (2). Opening (1) is the negative pressure of the flow switch. In view of its position with respect to the By-Pass, it has the same pressure as it would have if it were installed under the circulation pump.

C) Unscrew head pipe fitting (3).

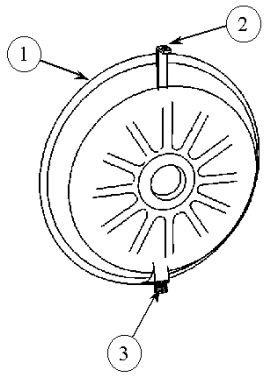
D) Remove shutter (1) and corresponding spring (2).



2.8 THE FLOW SWITCH

The main circuit flow switch operates on the principle of pressure differences.
When the circulation pump runs, the flow switch shuts the electrical circuit and gives the consent for operation creating depression in the upper chamber and pressure in the lower chamber; the diaphragm moves upwards moving the plate that in turn lifts a rod which excites the micro-switch.
When the pump stops the pressure in the chambers is the same but the spring pushes the plate and deactivates he micro-switch.
If the circulation pump does not run or does not create a sufficient pressure to close the contact of the main circuit flow switch, the boiler will not start.

2.9 THE CENTRAL HEATING EXPANSION VESSEL



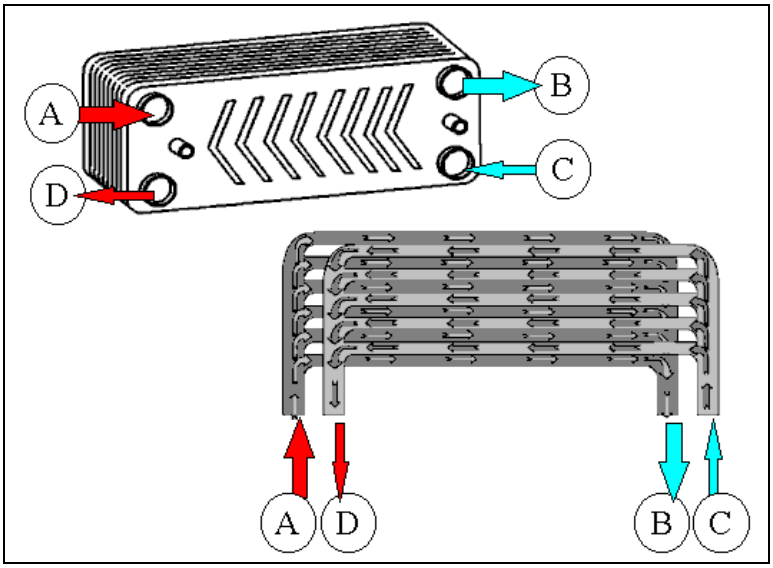
1) inflation valve
2) fixing bracket
3) coupling

Technical data:

- Capacity: 7 litres
- Nitrogen pressure: 1 bar

The expansion vessel absorbs the expansion of the water in the primary circuit whenever the temperature of the boiler rises.
It consists of two sections separated by a rubber diaphragm. Nitrogen is in one section and the water of the primary circuit in the other section
The nitrogen chamber (that may be compressed) absorbs the additional volume of water due to the rise in temperature.
The expansion vessel is designed for a central heating system of approx. 150 litres.

2.10 The domestic hot water exchanger



 Stainless steel exchanger
Power 23 kW or 27 kW according to the boiler power.
The exchanger is fitted with an off-axis stop to prevent incorrect positioning.
The water from the heating body flows in through (A) and flows out through (B); in order to heat the domestic cold water that flows in (C) and flows out hot through (D).

3. 5. THE ELECTRICAL AND ELECTRONIC SYSTEM

3.1 ELECTRIC POWER SUPPLY

Via power supply configuration and thermostat control.
- The minimum power supply voltage must be at least 185 Vac, under this value problems will occur on the spark generator (weak spark), on the fan (rpm decreases significantly and consequently the signal to the air pressure switch) and the gas valve does not ensure perfect opening of the operators
- It is not necessary to respect the polarisation (neutral phase).
- In the case of live/live power supply, there should be no problems; if flame detection is insufficient, a correct power factor kit is available which restores the potential of the detection electrode.
- One 2 Amp fuse for short-circuit protection of the high voltage components.
- 230 V lamp indicates a power supply (if the fuses have blown, the lamp will not light up).
- VDR for voltage fluctuations (lightning proof) of up to 260 VCA, when it intervenes the live/neutral short-circuits and the fuse blows, the state continues until the VDR is eliminated from the printed circuit and the fuse is replaced
- Current rectifier on the ET-M P.C.B.;
- Housing for the connection of this appliance to the ET-MI/FFI (for valve replacement).

3.2 OPERATING LOGIC AND SAFETY FEATURES

3.2.1 RESET/SAFETY SHUTDOWN (versions MI –FFI)

These safety features are controlled by the CBAT P.C.B.
At the beginning of each spark generation stage, the P.C.B. carries out a number of internal and actuator checks; if a failure occurs, the boiler shuts down until the failure has been eliminated (safety shutdown).
Some of the checks remain activate even during the other system operation phases.

3.2.2 FUME FLOW SWITCH CONTROL (version FFI)

The fume flow switch (PF) commutes to carry out the fan control.
During the reset stage, the PF must be in the rest position (NC); before the fan starts running, the PF switches to NO and the burner ignition stage will start. During operation, there will be a safety shutdown if the PF returns to the NC position (gust of wind).

3.2.3 FUME DISCHARGE SAFETY FEATURE (versions M – MI)

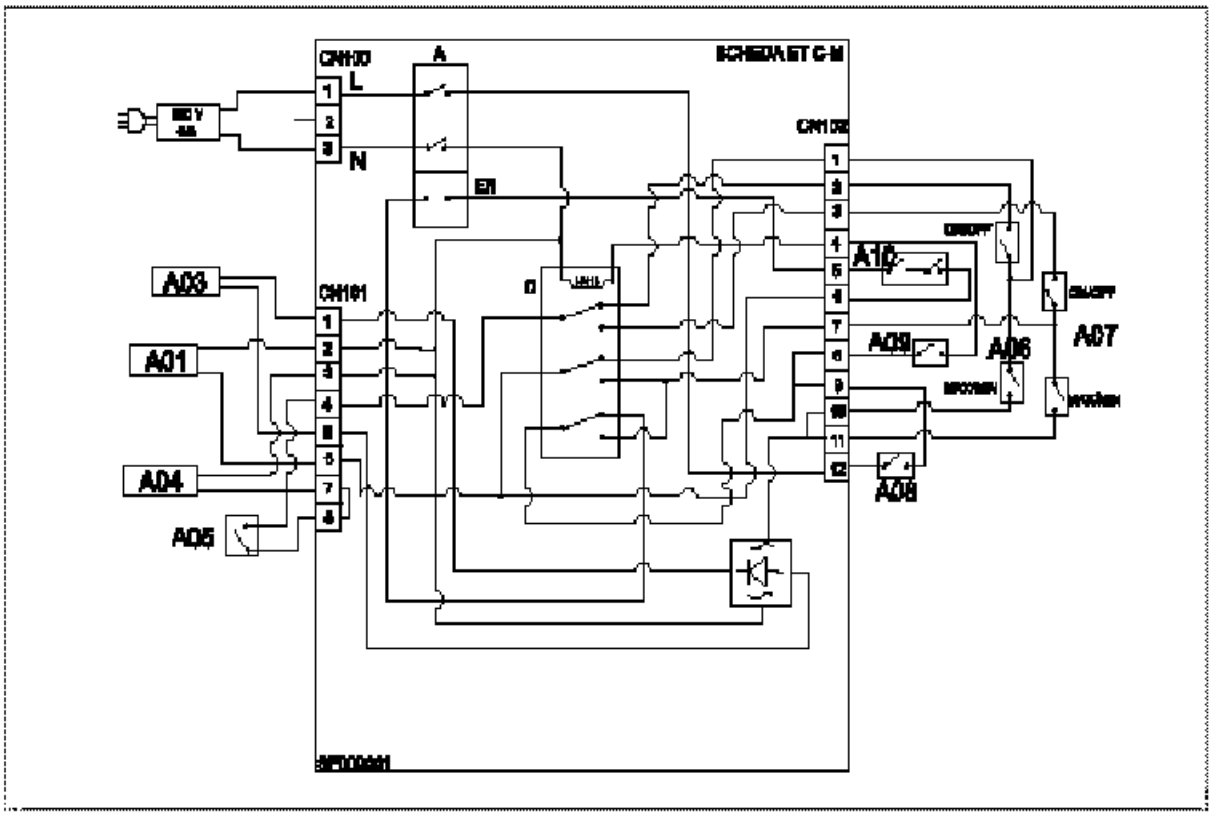
Version M features a manual reset bulb thermostat control by means of a pushbutton on the front boiler panel. Intervention of the thermostat is not visualised.
Version MI is equipped a manual reset contact thermostat (on the fume hood). Intervention of this thermostat is not visualised.

3.2.4 FLAME SENSOR CONTROL (versions FFI - MI)

The flame is detected by controlling the ionisation current by means of a special spark plug.
A short-circuit on the detection spark plug to earth will trigger a safety shutdown.

3.3 ELECTRIC DIAGRAMS

STAT 23 M

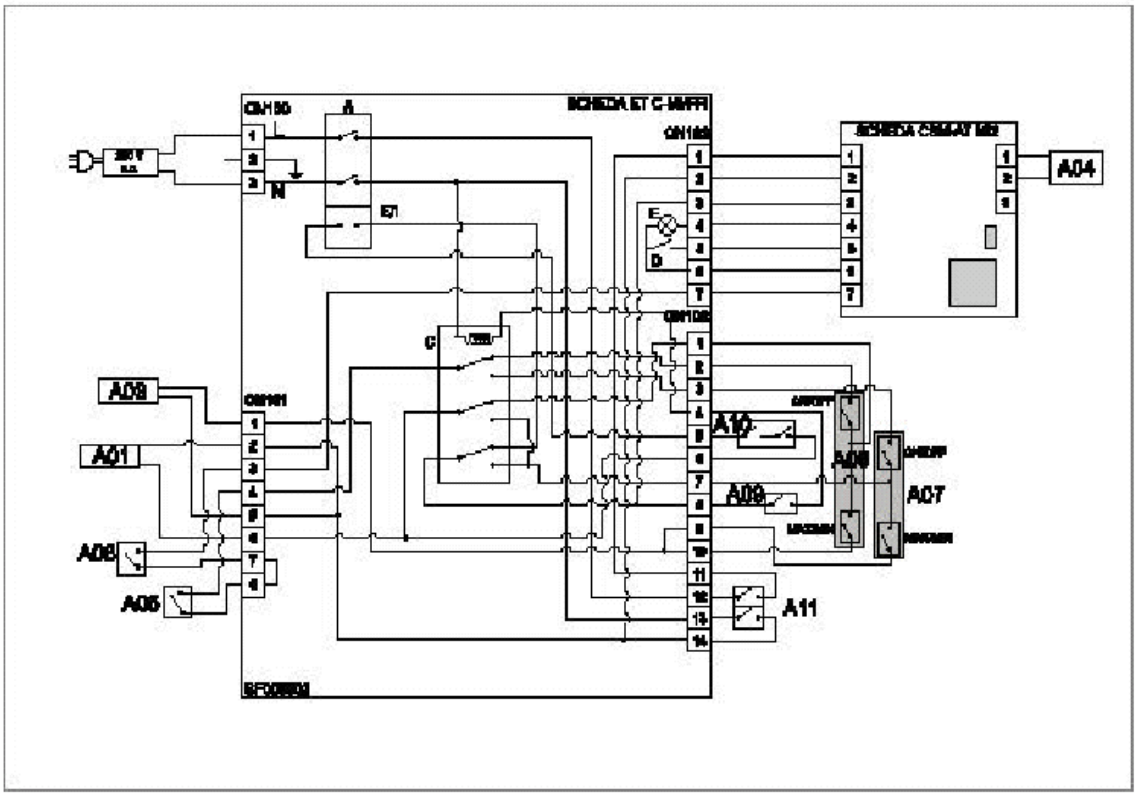


Legend:

A. Operating mode selector
B. ON/OFF L.E.D.
C. Relay
D. Ignition failure reset push button (mod.MI-MFFI)
E. Ignition failure L.E.D. (mod. MI-MFFI)

A01. Circulation pump
A02. Earth terminal
A03. Gas valve modulator
A04. Gas valve operator
A05. Circulation pump activation pressure switch
A06. Central heating thermostat
A07. Domestic hot water thermostat
A08. Fume thermostat
A09. Switch valve
A10. Clock room thermostat
A11. Overheat fan
A12. Electric fan
A13. Fume pressure switch

STAT 23 MI



STAT 23 M FFI