

AFTER-SALES SERVICE



**PRESSURE BOILER
(ESPRESSO)**



**OPEN-TOP BOILER
(INSTANT)**

SERVICE MANUAL

BOILER UNITS FOR THE “KORO”

PRESSURE BOILER UNIT (KORO)

INTRODUCTION

In the **KORO** vending machine, according to the model, two different types of boilers are used:

- 1) **Pressure** boiler, for espresso models in all versions
- 2) **Open-top** boiler, with operating pressure equivalent to the atmospheric pressure, for instant and fresh brewer models

PRESSURE BOILER

The boiler is made of special brass alloy certified as food-grade. It is composed of two half-shells made of special brass alloy with cylindrical shape and hot forged to obtain high mechanical resistance, joined together with four screws and special "O-ring" seals (see exploded view at page 4) and with a capacity of 600 cc. Water is kept at a temperature of approximately 95° (adjustable between 90° and 100°C via software) by means of a 1400 W heating element; the internal temperature is kept at 12 bar by means of a check valve and a special bypass located on the vibration pump. The internal temperature is controlled by an NTC probe that has an internal resistance of 12 Kohm at 20°C temperature. Su resistance gets smaller with heating, and at 100°C is 900 ohm. Such change is controlled by the software, and according to an algorithm the heating element is activated or deactivated until reaching the set temperature.

Upon reaching the correct temperature, the software activates the heating element for short pulses to ensure uniformity of the set temperature; the activation cycles are conceived to avoid electromagnetic interference to the power supply line, in compliance with EC directives.

Starting from a room temperature of 20°C it takes approximately 4 min to bring the water to a temperature of 95°C.

Different heating cycles have been optimised, according to the current status of the vending machine: START – MAINTENANCE – TEMPERATURE RECOVERY AFTER THE SELECTION – SPECIAL SELECTIONS.

The boiler is fitted with all safety systems in compliance with relevant regulations:

PROTECTION AGAINST OVERHEATING

The boiler is fitted with a manual-reset bipolar thermostat set to 125°C. In the event of failure to the control or activation systems, upon reaching a temperature of 125°C the thermostat is triggered and the heating element is deactivated. The thermostat is reset by pressing the red button (FIG 2), after checking and solving the cause of the malfunction (see paragraph regarding trouble-shooting).

PROTECTION AGAINST EXCESSIVE PRESSURE

In the event of uncontrolled increase of the internal pressure, there is a controlled failure of the pump by-pass (set to 12 bar) and the controlled failure of the solenoid valves (set to 17 bar). The boiler was tested with a pressure of 25 bar without having any other failures or reduction in safety, therefore with ample safety margin.

On the upper side the boiler is fitted with a solenoid valve block, different according to the model.

FIG 2 shows a boiler with three 2-way solenoid valves and one 3-way solenoid valve.

The 3-way solenoid valve is specific for espresso coffee selections, as the third way is used for purging the coffee selection.

The 2-way solenoid valves are used for instant product selections, where there is no need of purging.

The solenoid valves run under 230 V AC 50 Hz, with an operating intermittence at 100%.

There are also models running under 240 V 50 HZ and 110 V 60 Hz for specific markets.

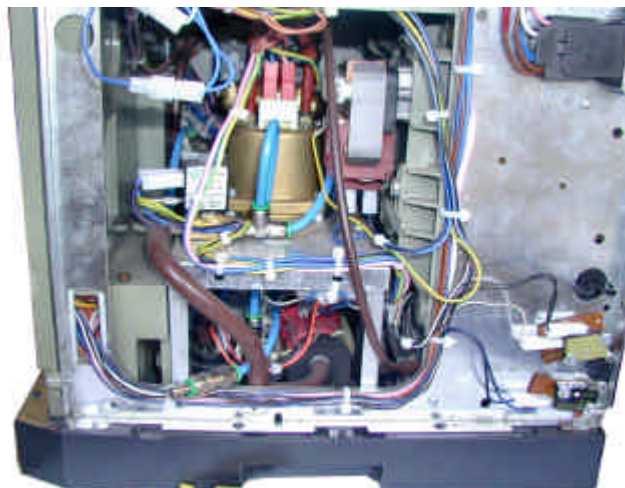


FIG. 1

VIEW FROM THE RIGHT WITHOUT CASING
POSITION OF ESPRESSO BOILER ASSEMBLY



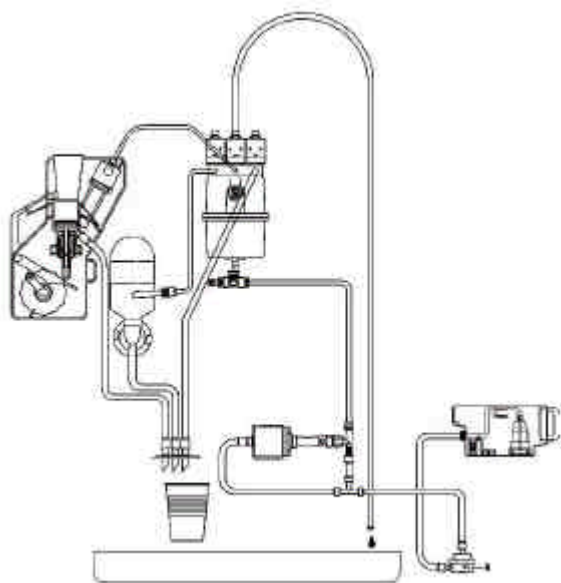
FIG. 2

ESPRESSO BOILER UNIT
COMPLETE WITH SOLENOID VALVES AND
SAFETY THERMOSTAT

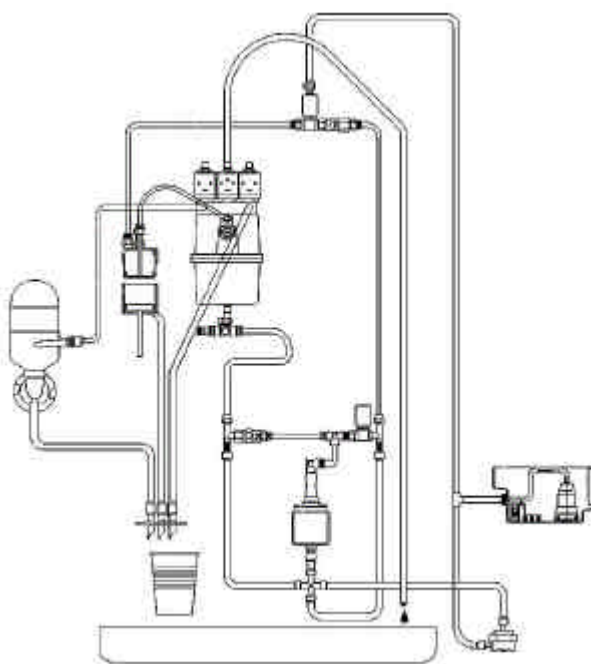
The pressure boiler is filled by the vibration pump (see FIG 1) which draws water for the selection from the water supply pan (FIG 4).

In the near future there will be also a version that will draw water directly from the mains, controlled through the air-break. When a selection is made, the pump starts and draws the amount of water (metered by the volumetric counter) set for the selection, delivering it to the boiler which at the same time has one of the solenoid valves open (according to the selection) and thus delivering the same amount of water to the brewer unit or to the mixer for preparing the requested drink (see hydraulic diagram).

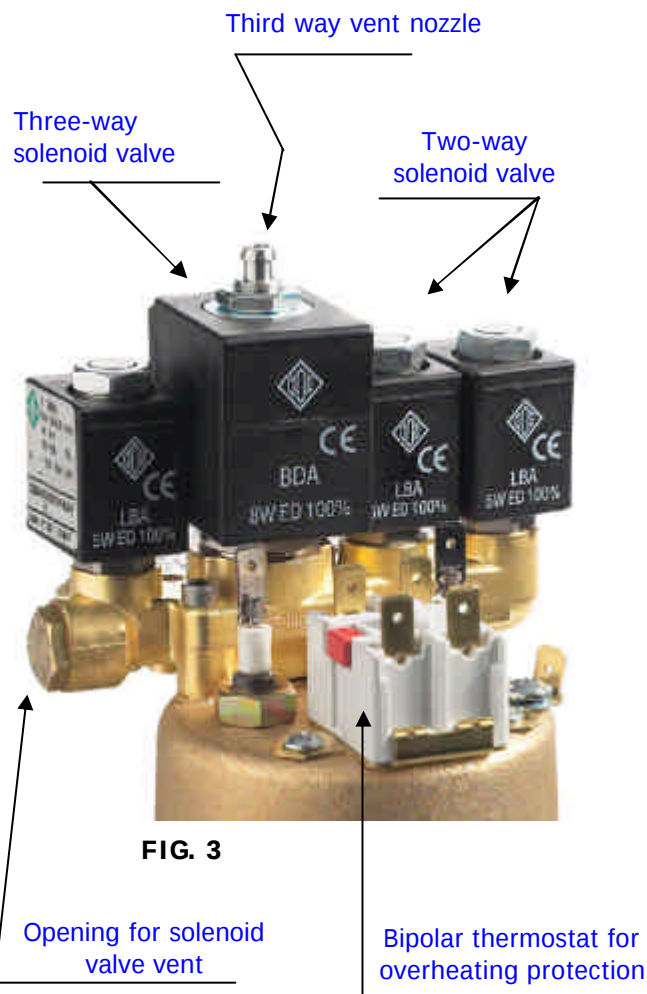
To be noted that the **Koro** machine can be fitted on request with also the variable chamber brewer unit, therefore with two different hydraulic circuits (see below).



ESPRESSO HYDRAULIC CIRCUIT

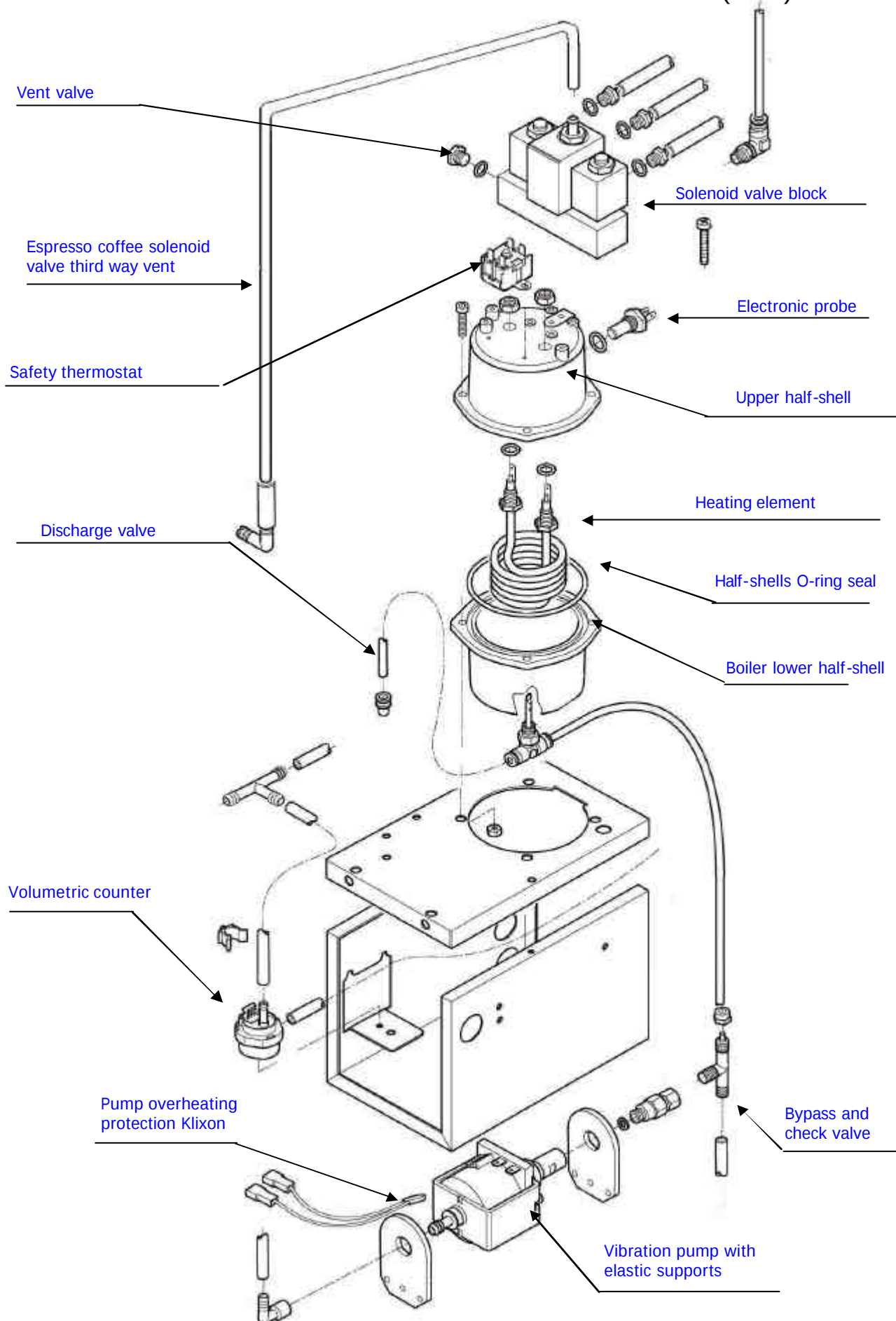


**ESPRESSO HYDRAULIC CIRCUIT
WITH VARIABLE CHAMBER**



**WATER SUPPLY TANK WITH
SOFTENER FILTER**

EXPLODED VIEW OF PRESSURE BOILER ASSEMBLY (Koro)



N&W GLOBAL VENDING SPA – SERVICE MANUAL – FUNCTIONAL UNITS H&C

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OPEN-TOP BOILER UNIT (KORO)

An “open-top boiler” is used for instant products based drinks and filtered coffee.

Open-top boiler means a boiler with internal pressure equivalent to the atmospheric pressure, and this is accomplished by having an air port of at least 20 mm².

The open-top boilers can be controlled by an air-break connected with the principle of communicating vessels, or having the air-break incorporated.

The boiler fitted in the Koro has the air-break incorporated.

The boiler is located on the right-hand side of the machine and can be accessed easily for normal maintenance simply by removing the right-hand panel, undoing only one screw (**FIG 1**).

In order to remove the boiler from the machine, the front panel must be removed, operating from the front compartment with the door open, then the electrical and hydraulic connections must be disconnected, and the boiler can then be pulled out (**FIG 2**).

FIG 3 shows the boiler completely removed.

It can be seen that the solenoid valves (**FIG 1**) do not come out with the boiler, but remain fixed to the frame.

Boiler construction

The boiler is made of special thermoplastic food-safe material, constructed by means of injection molding into two parts. Body and lid are closed together by means of snap-on fasteners, the boiler is externally covered with foam insulation material to limit heat dispersion and reduce power consumption.

Boiler operation

The lower compartment is practically a water container that is filled by the pump, which is connected to the water supply tank (in the near future there will be also a version with water supply directly from the mains).

The boiler is fitted with a float that when the set level is reached will send a signal to the board to stop the pump.

All heating components are located in the upper lid, temperature control and pump for delivering hot water to the dispensing systems or to the brewer. (**FIG. 3 - 4 - 5 - 6**)

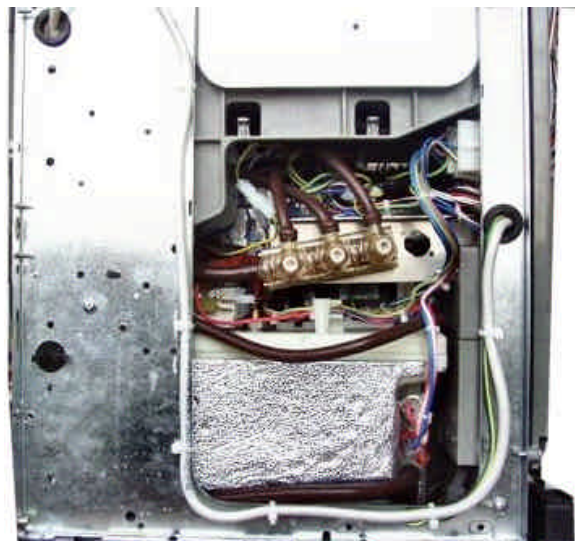


FIG. 1



FIG. 2

INSTANT & FB HYDRAULIC CIRCUIT

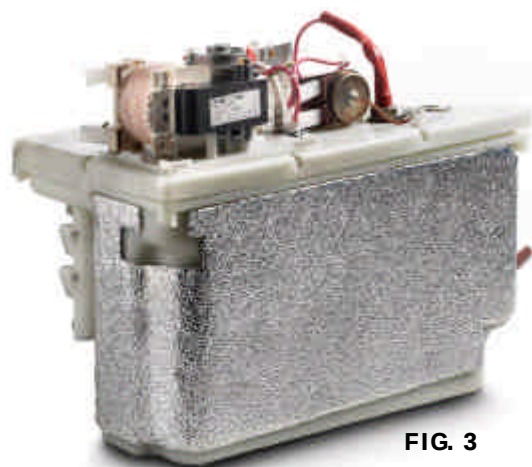
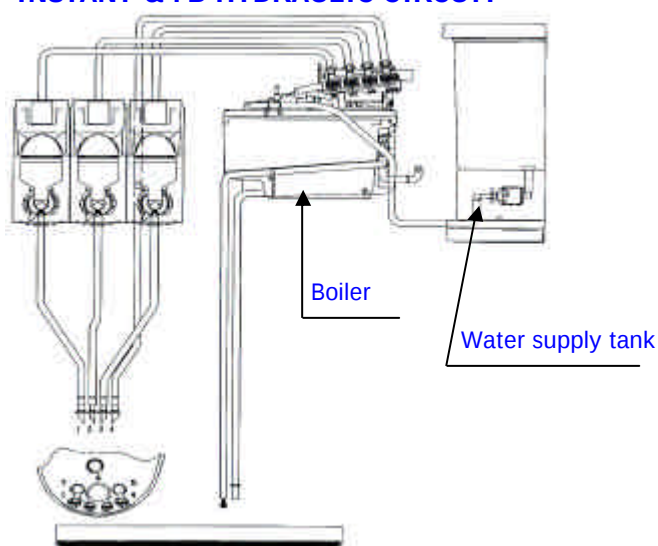


FIG. 3

Electrical and overheating safety devices of the boiler.

The heating temperature is controlled by means of a heating element submersed into the water (**FIG 5**). The temperature is monitored by means of a submersed **NTC** probe that controls the changes in temperature through changes in its own internal resistance, such changes are read by the software and interpreted as temperature; when the set value is reached the heating element is deactivated.

In the event of software error or failure to the actuation systems, or with a dry boiler, upon an uncontrolled increase in temperature a bulb thermostat located on the heating element (**FIG 4 – 5**) is triggered, this can signal an anomalous increase in temperature and deactivate the heating element that is connected to the thermostat in series and therefore not affected by any malfunctions of the board.

In the event of over-boiling, the steam travels through a forced path and the generated heat triggers two thermostats connected in series and located on the boiler, serving also the purpose of monitoring the overflow (**FIG 7**).

In the event of failure to the level control the hot water triggers the thermostats when flowing through the tube (FIG 7), thus stopping the water supply pump or deactivating the water inlet solenoid valve, if fitted.

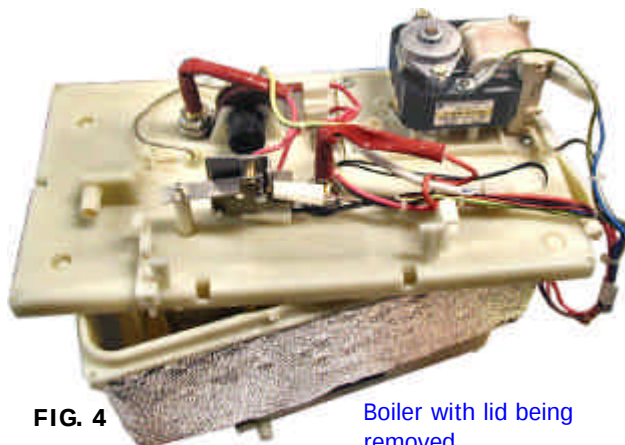


FIG. 4

Boiler with lid being removed

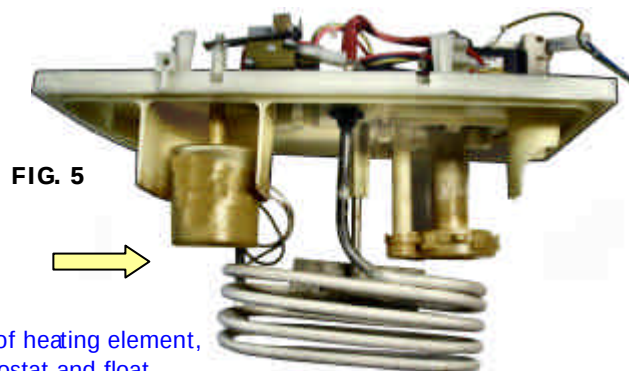


FIG. 5

View of heating element, thermostat and float



FIG. 8

Water supply tank

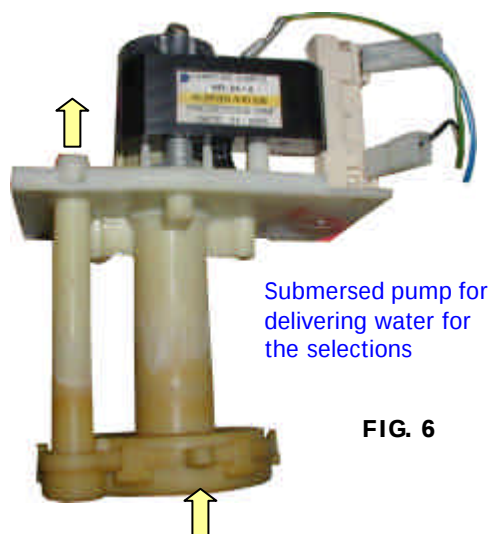


FIG. 6

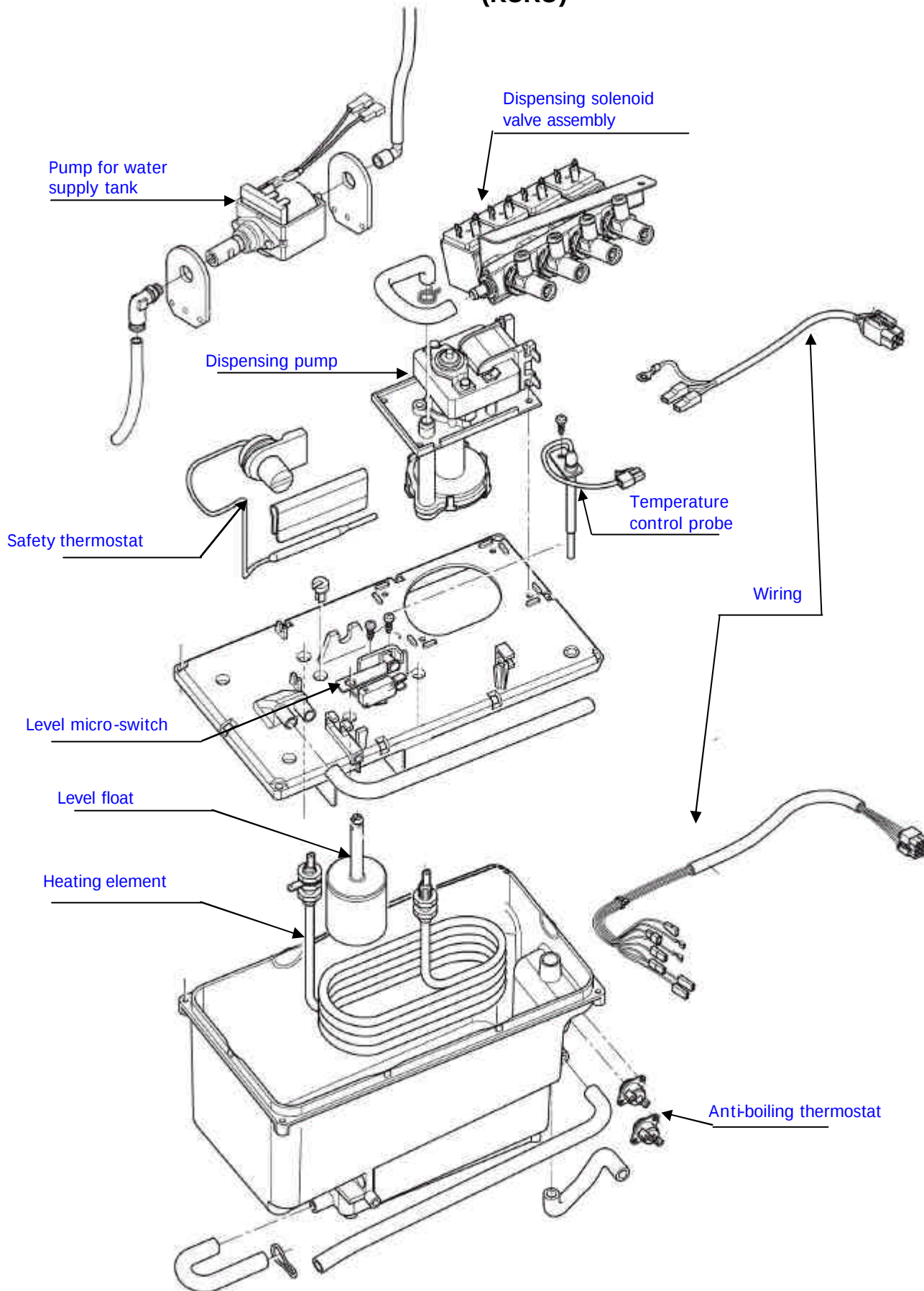
Submersed pump for delivering water for the selections



FIG. 7

Manual-reset thermostat for anti-boiling

EXPLODED VIEW OF INSTANT BOILER ASSEMBLY WITH WATER SUPPLY TANK (KORO)



TROUBLE-SHOOTING – PERIODIC MAINTENANCE AND CONTROL PROCEDURES

When using water with a low level of hardness, or using and replacing periodically a softener filter, the boilers do not have any particular operating problems for a long time.

By not replacing the filter when necessary or using hard water, the boiler will be subject to encrustations until its operation is impaired, resulting in reduced flow rate; at this point it will be necessary to do a complete descaling of the boiler, with the usual and known methods.

In any case, should the following malfunctions occur, the indicated controls must be carried out.

1) Lack of water in the tank, but this is not indicated on the display (see FIG 1 -2-3)

Check the correct functioning of the magnetic float, ensuring that it slides freely without forcing

2) The boiler does not heat (FIG 4 -5)

Check that the safety devices were not triggered, and if they were triggered verify the cause

3) In the instant, although there is water in the tank, there is no water flow for the selections (FIG 1 -5)

Check the perfect functioning of the centrifuge pump submersed in the boiler and for any presence of calcium deposits in the blades

4) In spite of all above checks gave positive results, the boiler does not heat or overheats until triggering the safety thermostats.

Check the perfect functioning of the electronic probe, verifying with a digital tester the correspondence of the values indicated in the table at the different temperatures.

FIG. 1

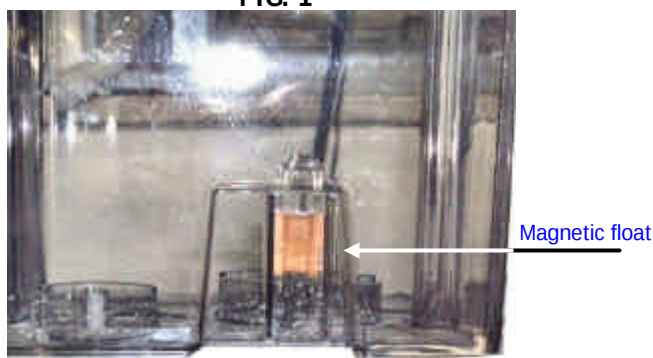


FIG. 2



Water supply tank with softener filter (Espresso)

FIG. 3



Water supply tank with softener filter (Instant)

Temp. C°	Internal resistance Ω	Tolerance Ω
0	35875	+ / - 7
25	12000	+ / - 4
50	2900	+ / - 4
70	2313	+ / - 3
85	1475	+ / - 3
90	1260	+ / - 4
100	963	+ / - 4

FIG. 4



Manual-reset bipolar thermostat



Submersed centrifuge pump

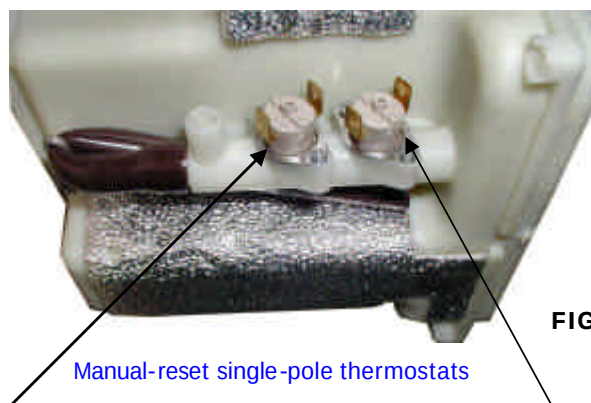


FIG. 5

Manual-reset single-pole thermostats