

Data Sheet and Service Manual

ECAM 61X.YY – PRIMADONNA SOUL

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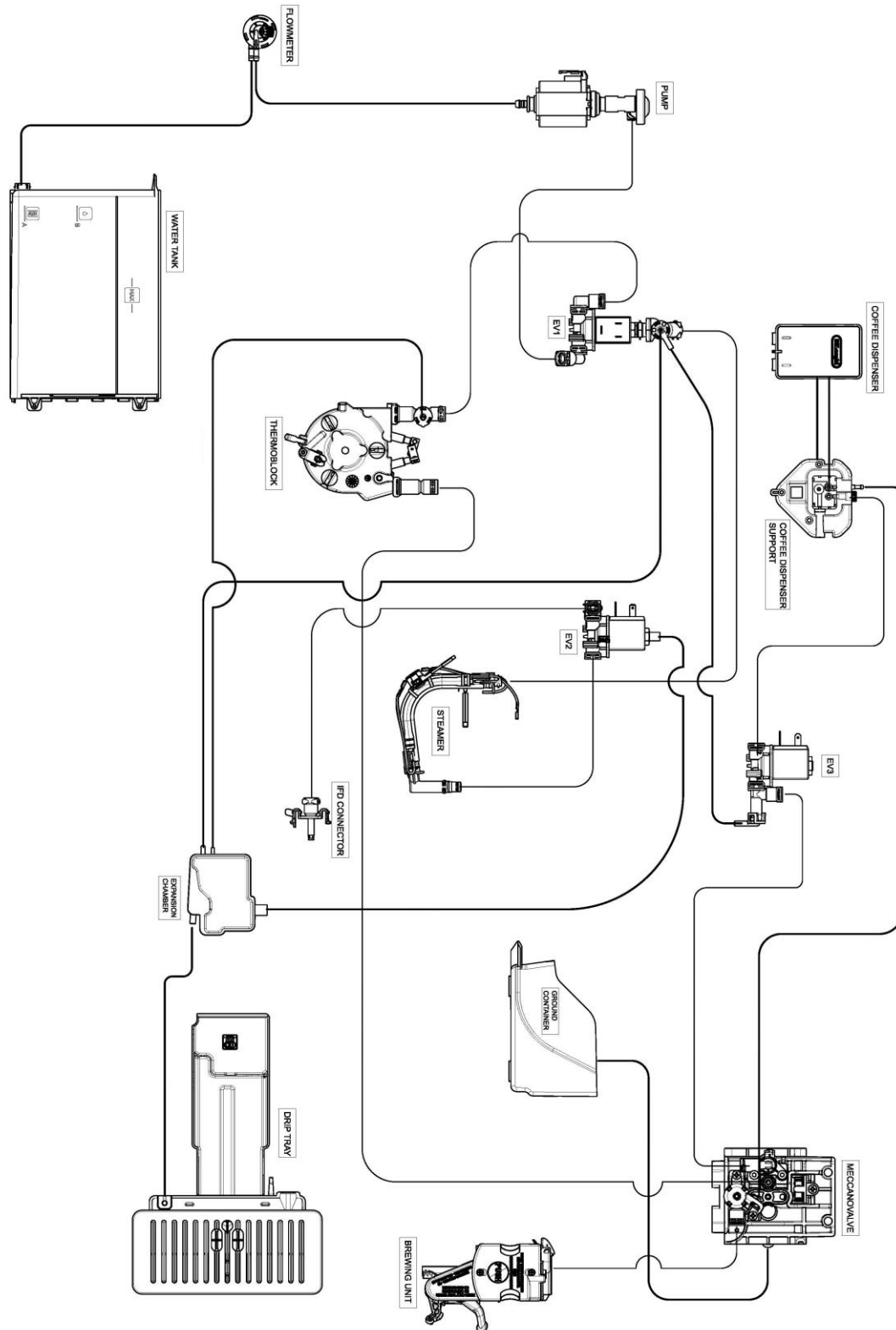
1. TECHNICAL DATA

Voltage	220-240V / 50-60 Hz
MAX. Input power	1450 W
Stand-by Button OFF	0,29W (when the WiFi function is OFF)

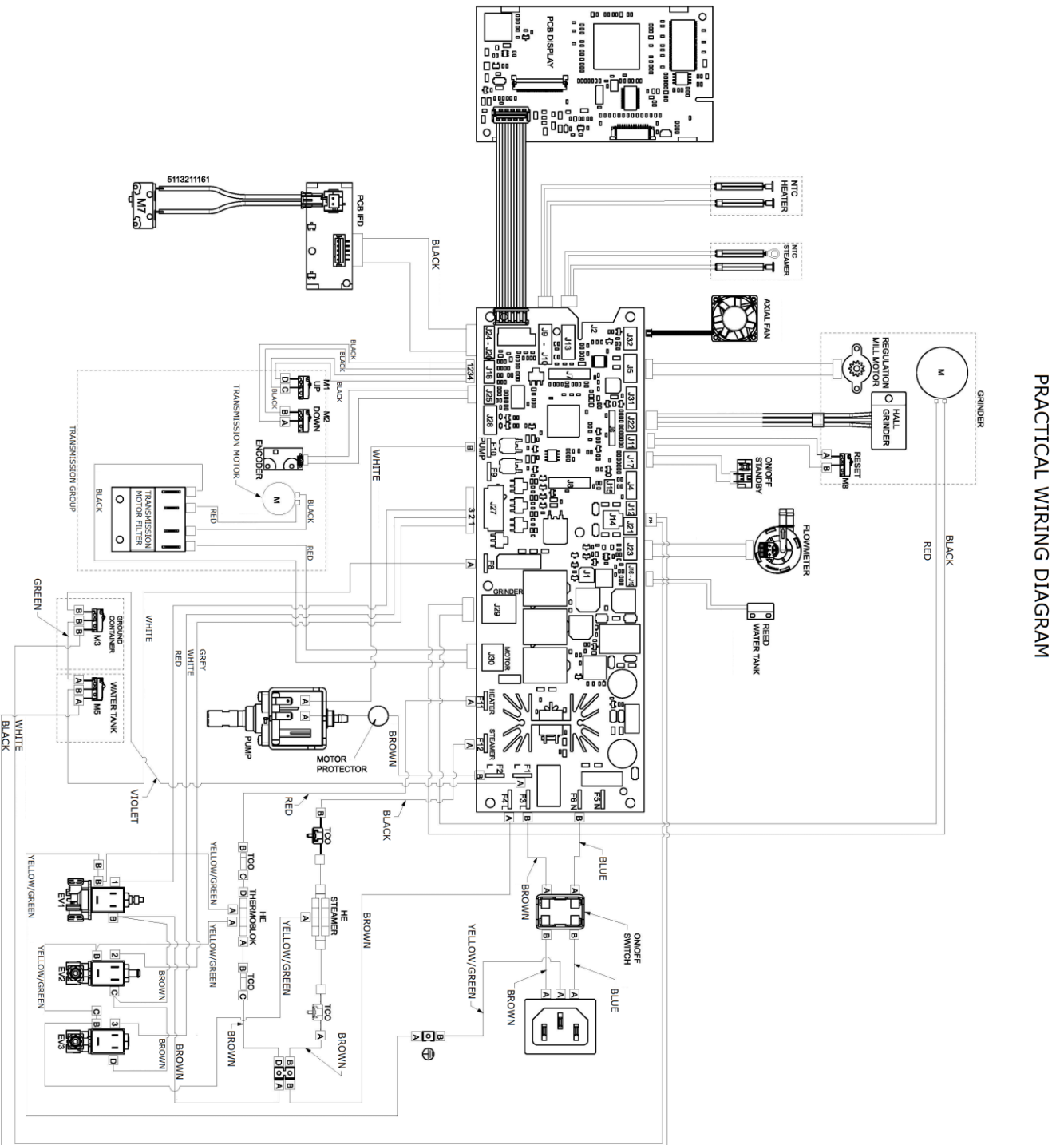
COMPONENTS

Pump	220-240V AC - 70 W – Bar 19
Grinder motor	230V DC with position encoder
Grinder adjustment motor	12V DC step motor with position encoder
Transmission motor	230V DC with position encoder
Solenoid valves EV1 EV2 EV3	230V AC
Fan	12V DC
Coffee thermoblock	
- Temperature probe	Double NTC sensor: set point + hot point
- Thermal fuse TCO	192 °C
- Heating element	230V AC – 1400 W
Steam generator	
- Temperature probe	Double NTC sensor: set point + hot point
- Thermal fuse TCO	318 °C
- Heating element	230V AC – 1070 W

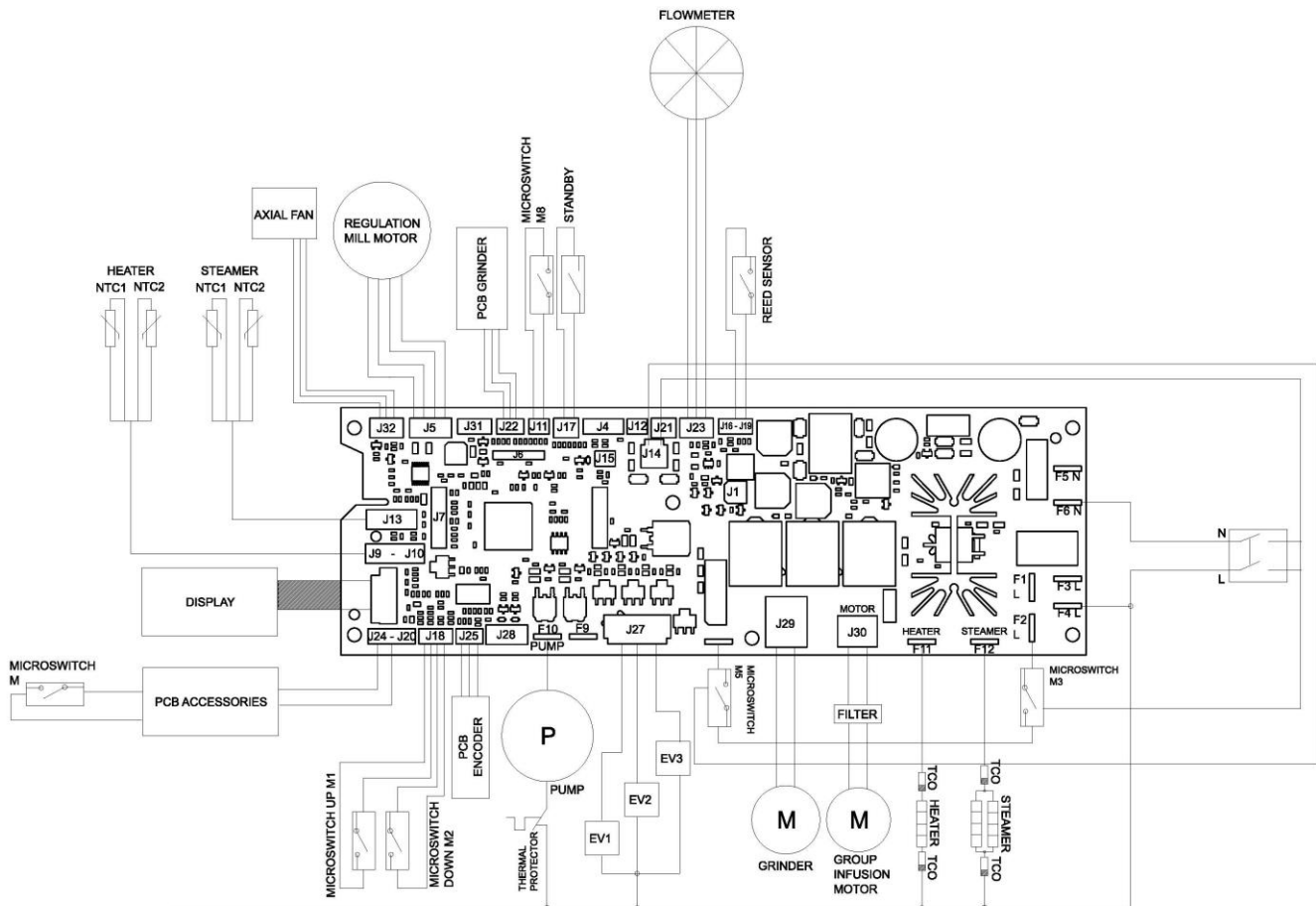
2. HYDRAULIC DIAGRAM



3. WIRING DIAGRAM



THEORETICAL WIRING DIAGRAM



CAPTION

- M1 : UPPER MICROSWITCH (GROUP INFUSION MOTOR)**
- M2 : LOWER MICROSWITCH (GROUP INFUSION MOTOR)**
- M3 : DRAWER MICROSWITCH**
- M5 : WATER TANK MICROSWITCH**
- M7 : IFD MICROSWITCH**
- M8 : GRINDER RESET MICROSWITCH**

- EV1 : 3-WAYS SOLENOID VALVE**
- EV2 : 3-WAYS SOLENOID VALVE**
- EV3 : 2-WAYS SOLENOID VALVE**

- L : LIVE**
- N : NEUTRAL**

- TCO : THERMAL CUT-OFF**
- HE : HEATING ELEMENT**

4. WORKING PRICIPLE

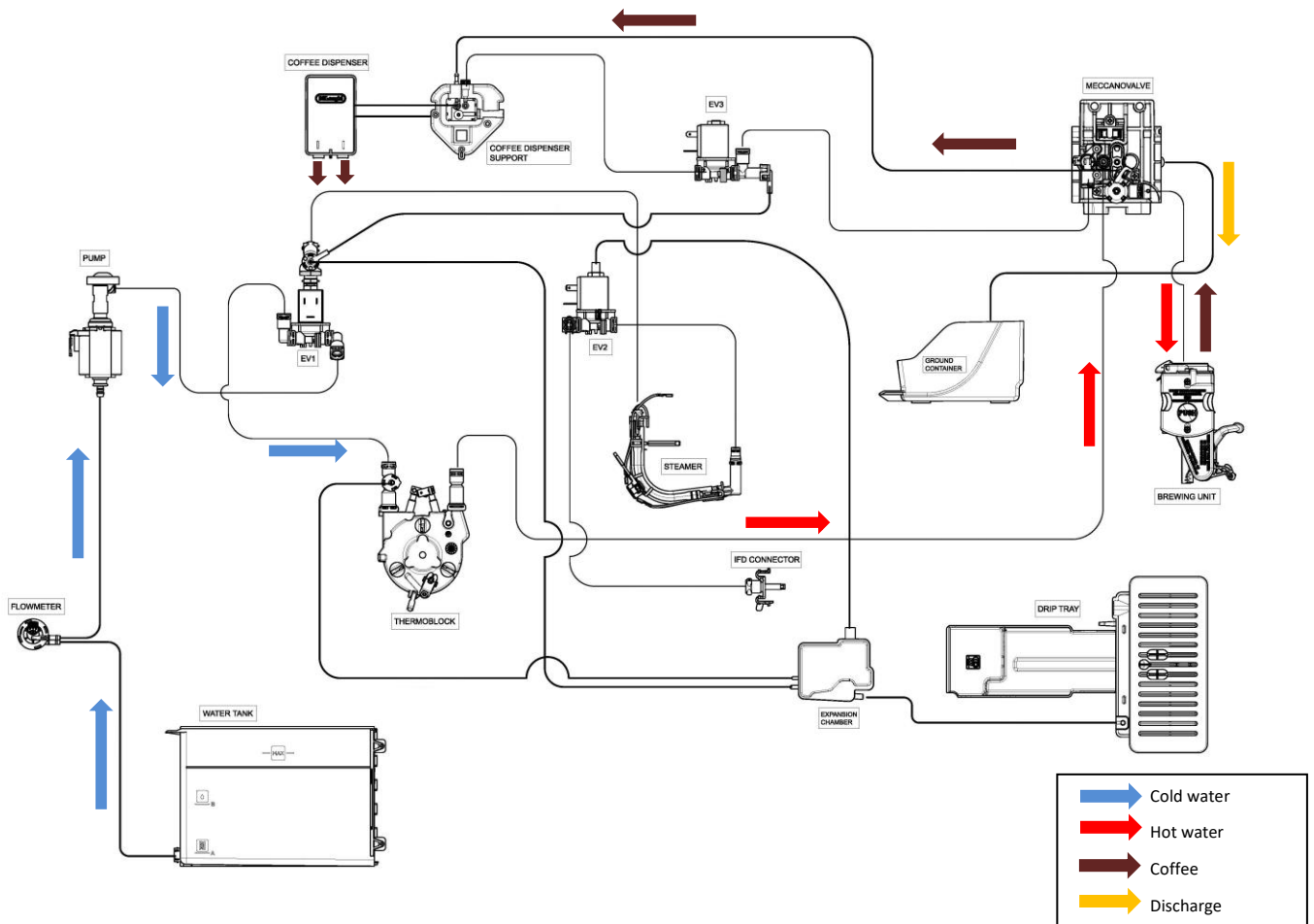
4.1. MICROSWITCHES, SENSORS AND SOLENOID VALVES

MICROSWITCHES	Function	Logic
M1 = UPPER MICROSWITCH	Detects when the infuser is on top position	"NC" when the infuser is in top position
M2 = LOWER MICROSWITCH	Detects when the infuser is on down position	"NC" when the infuser is in down position
M3 = DRAWER MICROSWITCH	Detects when the drip tray is in correct position	3-pin micro switch. When the drip tray is inserted: <ul style="list-style-type: none"> - the contact for the drip tray detection is OPEN; - the contact for the transmission motor power supply is CLOSED.
M5 = WATER TANK MICROSWITCH	Detects the presence of the water tank	3-pin micro switch. When the water tank is inserted: <ul style="list-style-type: none"> - the contact for the water tank detection is OPEN; - the contact for the transmission motor power supply is CLOSED.
M7 = IFD MICROSWITCH	Detects the presence of the descaling spout or milk jug	"NC" when the accessory is present
M8 = GRINDER ADJUSTMENT MICROSWITCH	Used by the appliance for the zero stepper procedure on the grinder	"NC" when pressed by the grinder cam

REED AND ENCODER	Function	Logic
ACCESSORIES SENSOR PCB	Detects which accessory is attached	H1 ON; H2 OFF = descaling spout H1 OFF; H2 ON = milk jug
REED SENSOR LOW WATER TANK	Detects when the water level is at minimum	
HALL SENSOR ENCODER	Detects rotations of transmission motor	
GRINDER ENCODER PCB	Detects the revolutions of the grinder motor	

SOLENOID VALVES	Function	Logic
EV1 = 3 ways COFFEE solenoid valve	Allows the water flow going to the thermoblock	When activated, the water flow goes to the thermoblock
EV2 = 3 ways STEAM solenoid valve	Allows the steam flow from the generator to the external connector	When activated, steam can go from generator to the external connector
EV3 = 2 ways HOT WATER solenoid valve	Allows the hot water coming from the mechanical valve to go to the coffee/hot water dispenser	When activated, the hot water is driven to the corresponding spout of the dispenser

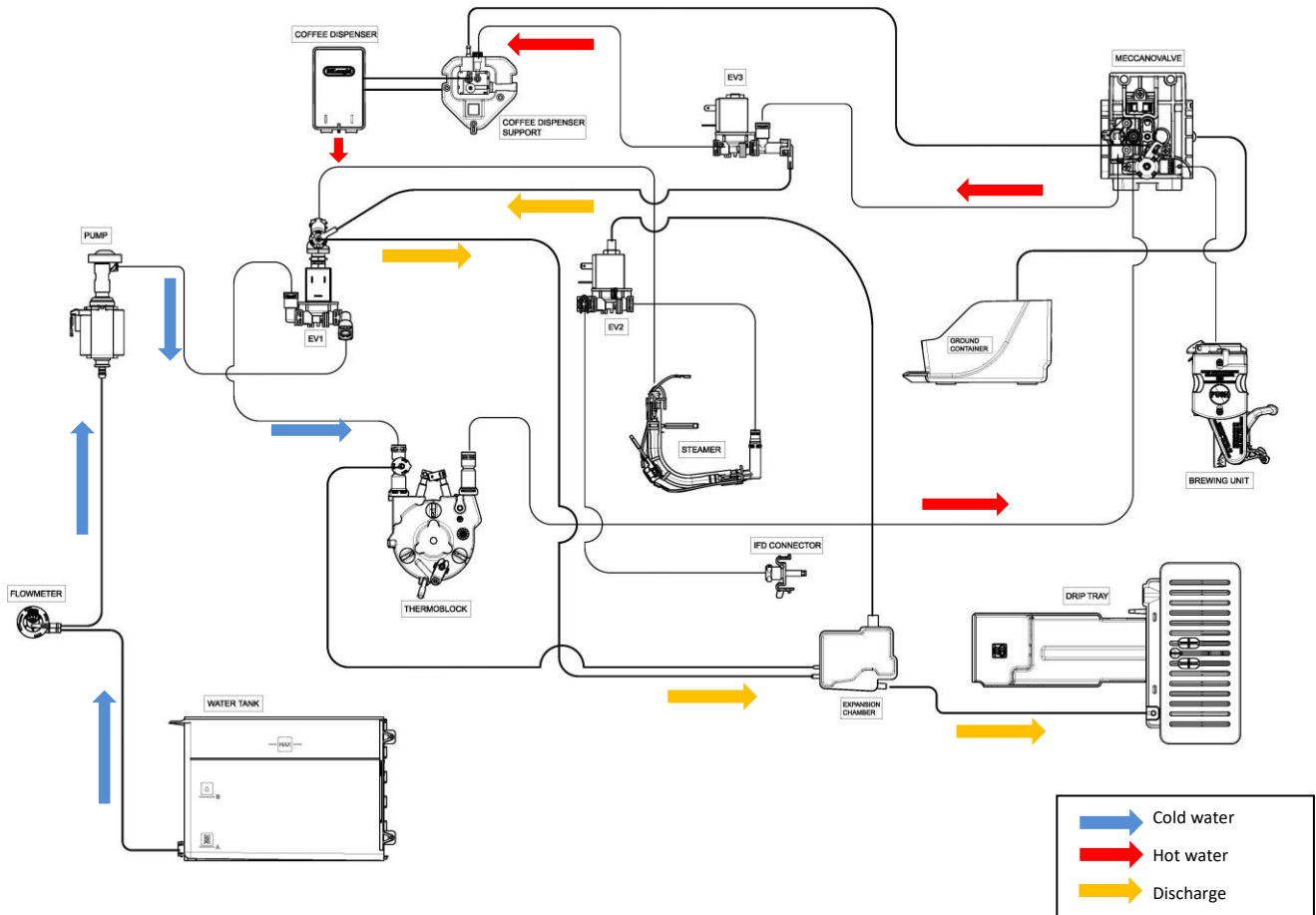
4.2. COFFEE DELIVERY



Espresso delivery steps:

- EV1 is activated
- Thermoblock is activated
- Grinder is activated for a certain timing (based on the coffee taste selection)
- Infuser moves to the mechanical valve
- Pump is activated for a couple of seconds for pre-infusion
- Pump restarts for coffee delivering
- Pump and thermoblock stop, EV1 closes
- Infuser moves away from the mechanical valve and releases the coffee pod
- Mechanical valve discharges excess water/coffee to the ground container
- Infuser is moved back to the "Coffee Ready" position

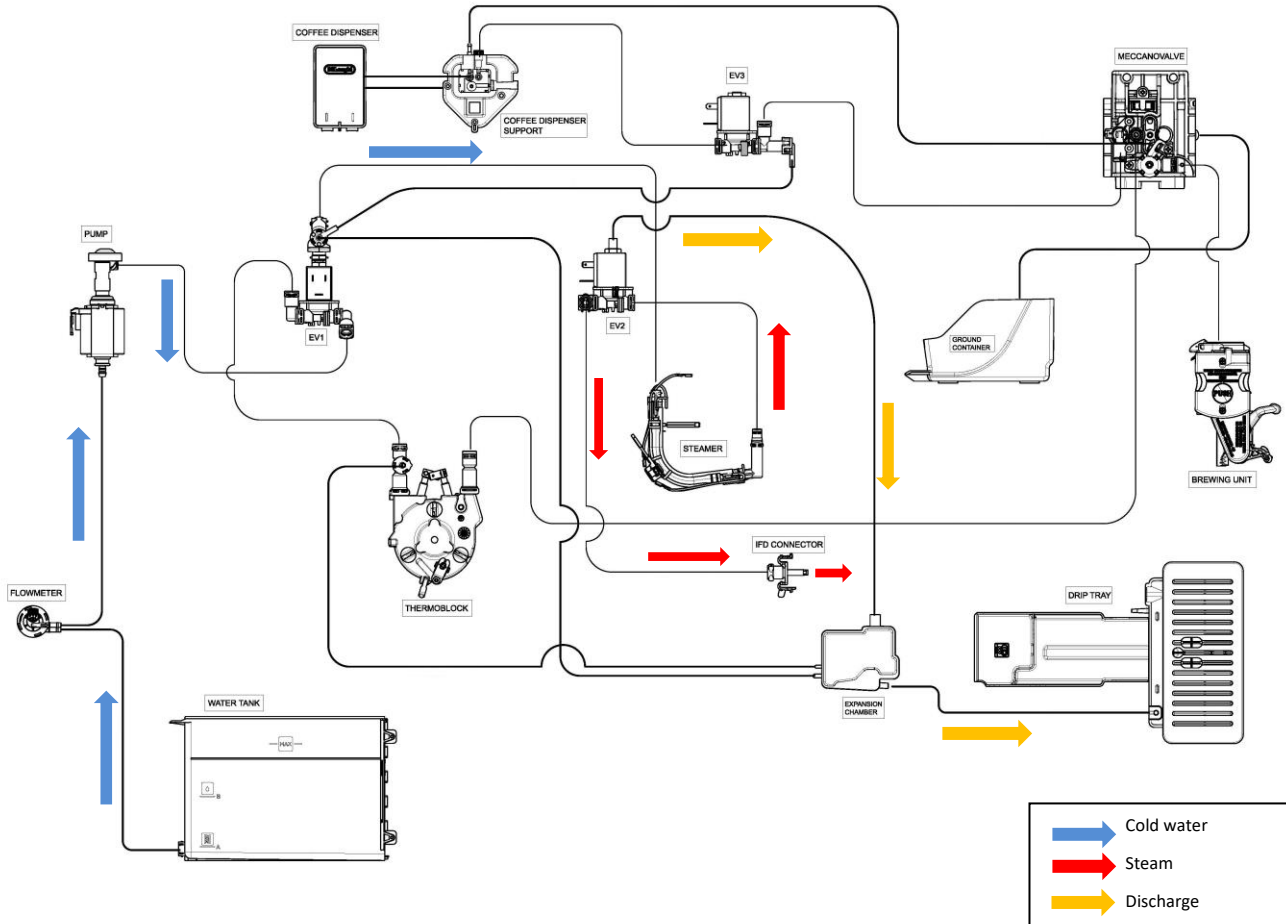
4.3. HOT WATER DELIVERY



Hot water delivery steps:

- EV1 and EV3 are activated
- Thermoblock is activated
- Pump is activated in fast pulsing mode for a certain timing
- Hot water is delivered through the hot water outlet of the dispenser
- Pump stops, EV1 and EV3 are deactivated

4.4. MILK FROTH PREPARATION



Milk foam delivery steps:

- EV2 is activated
- Steamer is activated
- Pump is activated in slow pulsing mode for a certain timing
- The steam is injected from the steam nozzle into the milk jug and mixed with the air (according to the milk froth knob position) to froth the milk
- EV2, steamer and pump are deactivated

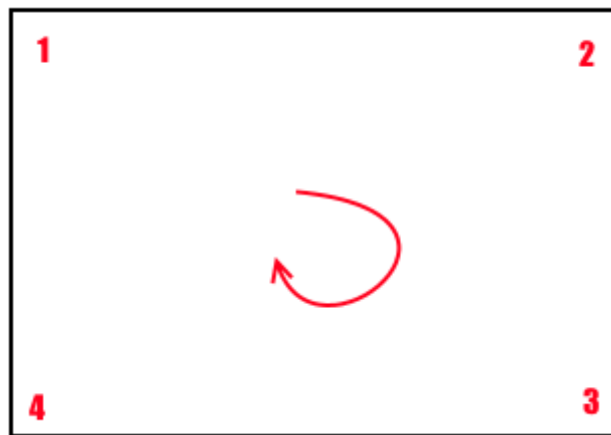
Milk jug cleaning steps:

- EV2 is activated
- Steamer is activated
- Pump is activated in very slow pulsing mode for a certain timing
- Hot water is delivered through the nozzle and air from the milk jug knob in CLEAN position
- EV2, steamer and pump are deactivated

5. TEST MODE

5.1. PROCEDURE TO ACTIVATE TEST MODE, RESET ENCODER, BLUETOOTH AND ECO MODE

- The appliance must be plugged-in and in stand-by mode.
- Remove the water tank.
- Switch ON the machine from the stand-by button.
- When the request to insert the water tank prompts on the display, touch the four corners of the screen in the sequence as shown in the below picture:



- Insert the water tank.
- Select one of the following options:
 - TEST MODE: see next pages.
 - TEST DISPLAY: tests the functioning of all the areas of the touchscreen display (after this procedure machine will reset the language and will ask for initial priming).
 - ELECTRIC TEST MODE: this is used only for tests in the production line.
 - RESET ENCODER: activates the procedure for the encoder reset.
 - ENERGY SAVING: activates or deactivates the energy saving function (this will modify the set-point temperatures).

NOTE: The appliance will stay in test mode for a limited time if no actions are made.

5.2. EXPLANATION OF THE TEST MODE BUTTONS

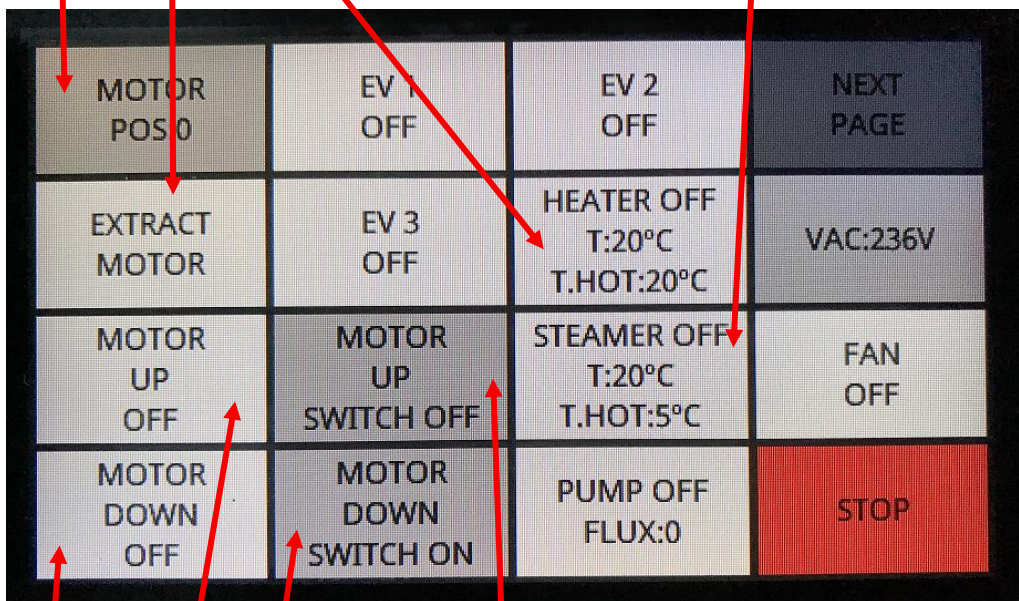
MOTOR: Indicates when the transmission motor is active.
POS: Encoder value of the Hall sensor.

EXTRACT MOTOR: Moves the infuser to the extraction position.

HEATER: Blue when the thermoblock is active.
T: Temperature of the NTC of thermoblock.
T.HOT: Temperature at the hot point of thermoblock.

STEAMER: Blue when the steamer is active.
T: Temperature of the NTC of steamer.
T.HOT: Temperature at the hot point of steamer.

By pressing **HEATER** or **STEAMER**, the corresponding load is activated for 5 seconds.



MOTOR UP SWITCH: Blue when the infuser is in UP position.
ON: When pressed (infuser in UP position).

MOTOR DOWN SWITCH: Blue when the infuser is in DOWN position.
OFF: When pressed (infuser in DOWN position).

MOTOR UP: Blue when the motor is moving towards UP position. If pressed, motor starts.

MOTOR DOWN: Blue when the motor is moving towards DOWN position. If pressed, motor starts.

PUMP: Activates the pump for 200 flowmeter pulses (about 21 sec).
FLUX: Indicates how many pulses passed (after 1 cycle of PUMP the number will be around 200).

EV1, EV2 and EV3: activate the solenoid valves.
NOTE: Some combinations are forced to avoid damages.

NEXT PAGE: Moves to next page of menu.

VAC: Current voltage.

MOTOR POS:0	EV 1 OFF	EV 2 OFF	NEXT PAGE
EXTRACT MOTOR	EV 3 OFF	HEATER OFF T:20°C T.HOT:20°C	VAC:236V
MOTOR UP OFF	MOTOR UP SWITCH OFF	STEAMER OFF T:20°C T.HOT:5°C	FAN OFF
MOTOR DOWN OFF	MOTOR DOWN SWITCH ON	PUMP OFF FLUX:0	STOP

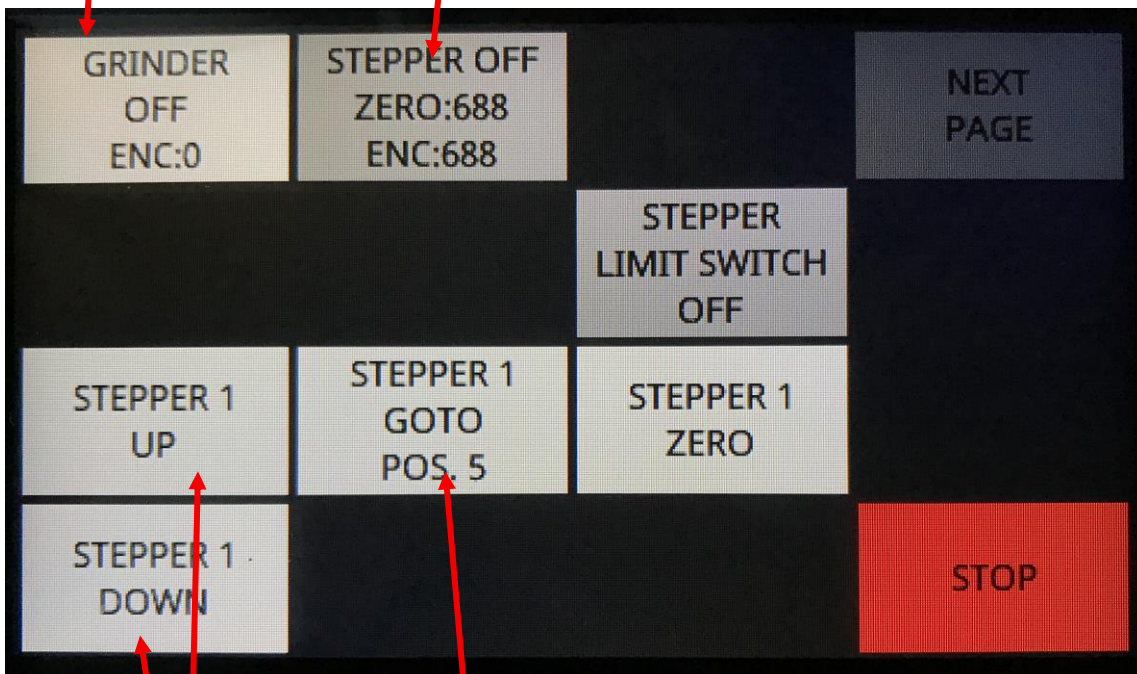
STOP: Interrupts any active load.

FAN: Activates the cooling fan.

GRINDER: Blue when the grinder motor is active.
ENC: Encoder value of the grinder Hall sensor.

STEPPER: Blue when the stepper motor is active.
ZERO: Set value for position 5 (pulses from zero position).
ENC: Current position value.

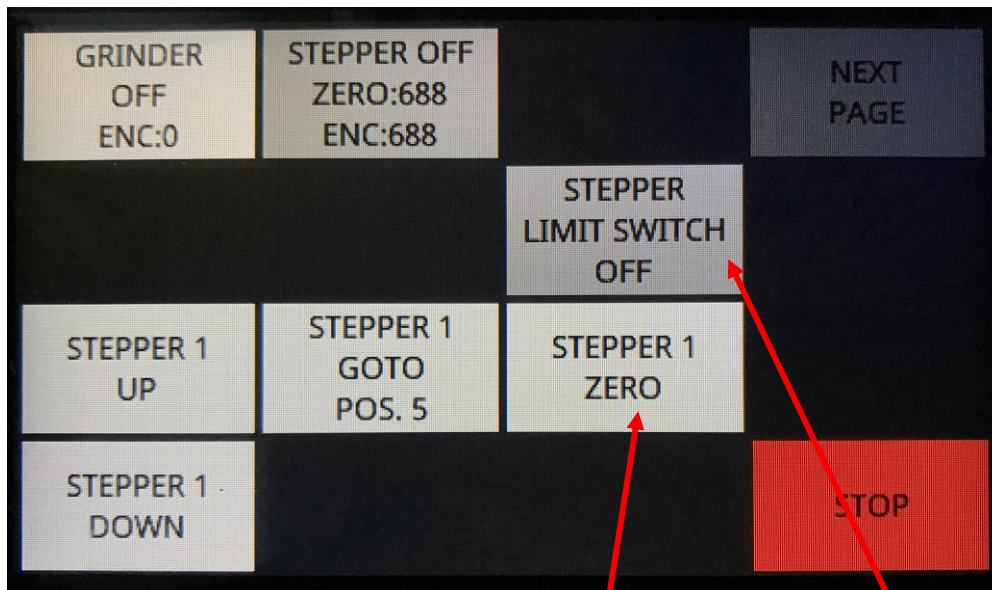
NOTE: Stepper motor is responsible for mill adjustment.
If $ENC < ZERO$, the grinder setting is higher than 5.



STEPPER 1 GOTO POS. 5: Stepper motor will move to ZERO position first and then to position 5. The final ENC value will be equal to ZERO value.

STEPPER 1 UP, STEPPER 1 DOWN: Increases the current position of the grinder stepper 60 pulses. When pressed also the grinder motor will be activated in order to avoid damages to the millstones or to the mechanism.

WARNING: The activation of this function could negatively affect the functioning of the appliance. In case, use the STEPPER GOTO 5 function to restore the default grinder settings.



STEPPER 1 ZERO: Activates the procedure for the grinder ZERO STEPPER (see below).

STEPPER 1 LIMIT SWITCH: Detects when the stepper moves to the ZERO position.

5.3. ZERO STEPPER PROCEDURE

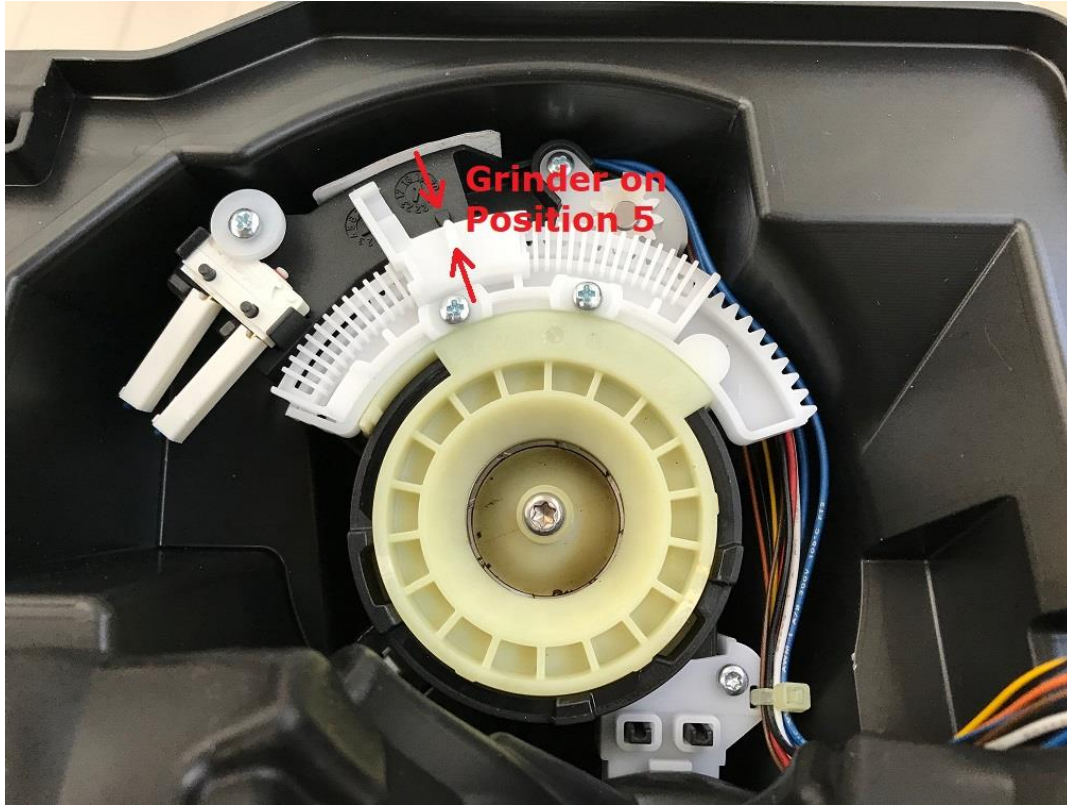
The ZERO STEPPER procedure must be performed in the following situations:

- all the time a new grinder will need to be installed in the appliance;
- all the time a new main PCB will need to be installed in the appliance;
- all the time the ZERO value of the STEPPER is equal to zero.

In order to execute the ZERO STEPPER procedure, the following steps must be performed:

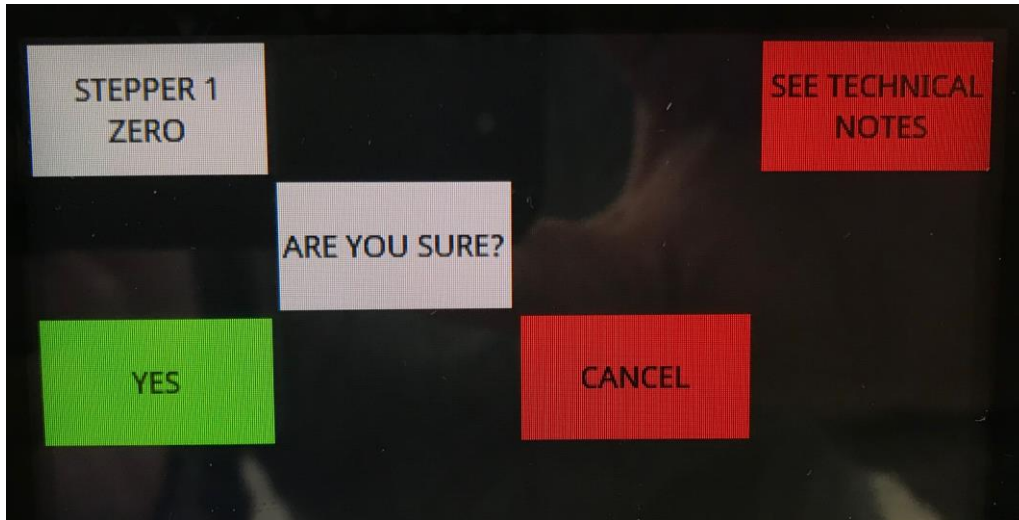
1. In case of used/refurbished grinder, make sure the grinder is perfectly clean from any residual of coffee beans (it must be cleaned perfectly by means of a vacuum cleaner).
2. Make sure the grinder will be in position 5; if not, it must be set to position 5 from the user settings menu of the appliance. Please note that all the brand new grinders will be dispatched by the production line already at position 5.

The grinder is in position 5 when the marker on the white gear of the grinder is matching with the arrow marker on the black plastic part:



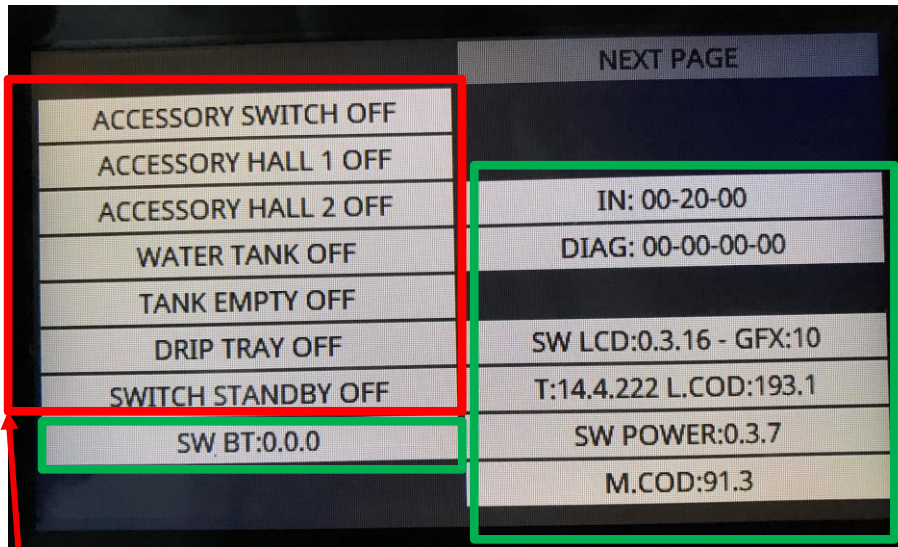
If the grinder is not in position 5 (i.e. the two markers are not aligned, see the right grinder on the above picture), the factory position can be restored by using the **STEPPER UP** or the **STEPPER DOWN** functions available in the load test mode.

3. Access the appliance TEST MODE and launch the ZERO STEPPER procedure by pressing the corresponding button. The appliance will display the following message:



Press the **YES** button to confirm the execution of the ZERO STEPPER procedure.

4. The appliance will start the main grinder motor (beans grinding).
5. The stepper motor will close the grinder gear since it will press the ZERO stepper micro switch. At the same time, the appliance counts how many steps there are between the starting POS 5 position and the POS 0 position (i.e., the one at which the micro switch is pressed). This value is recorded in the ZERO parameter of the STEPPER parameter of the TEST MODE.
6. Finally, the appliance restore the grinder to position 5.



STATUS OF MICRO SWITCHES AND REED SENSORS: See paragraph 4.1 for a detailed description.

RELEASE VERSIONS FOR ALL THE SOFTWARE PACKAGES INCLUDED IN THE APPLIANCE.

6. TROUBLESHOOTING

6.1. POSSIBLE TESTS WHICH CAN BE EXECUTED FROM THE TEST MODE

A. COFFEE BRANCH FLOW ACTIVATION

- Move the infuser to the UP position (MOTOR UP).
- Activate the EV1 solenoid valve.
- Activate the pump.

The water will pass through the flow meter, the EV1 solenoid valve, the thermoblock, the mechanical valve, the infuser and will come out from the coffee spout.

B. HOT WATER BRANCH FLOW ACTIVATION

- The infuser does not have to be in upper position.
- Activate the EV1 and EV3 solenoid valves.
- Activate the pump.

The water will pass through the flow meter, the EV1 solenoid valve, the thermoblock, the mechanical valve the EV3 solenoid valve. Finally it will come out from the hot water outlet which is integrated to the coffee dispenser.

C. STEAM BRANCH FLOW ACTIVATION

- The infuser does not have to be in upper position.
- Activate the EV2 solenoid valve only.
- Activate the pump.

The water will pass through the flow meter, the third way of the EV1 solenoid valve, the steamer, the EV2 solenoid valve. Finally, water will come out from the IFD connector.

6.2. ELECTRIC CHECKS DIRECTLY ON THE COMPONENTS

A. HEATING ELEMENTS RESISTANCE CHECK

- Thermoblock resistance value: ≈ 35 Ohms.
- Steamer resistance value: ≈ 50 Ohms.

B. RESISTANCE/TEMPERATURE CHARACTERISTICS FOR NTCs SENSORS

- Resistance/temperature characteristics for the thermoblock NTCs:

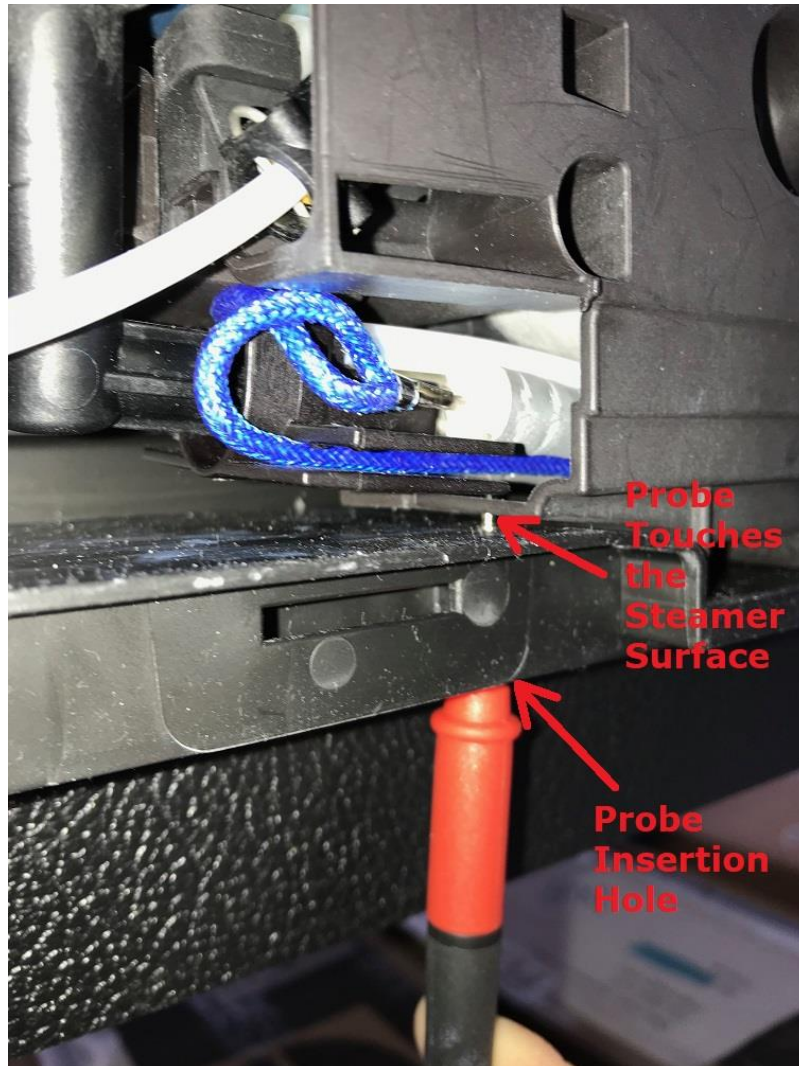
RESISTANCE - TEMPERATURE CHARACTERISTICS					
TEMP. °C	MINIMUM kΩ	NOMINAL kΩ	MAXIMUM kΩ	Temp. Accy ±°C	Resi. Accy ±%
0	310	328,9	348,8	± 1.17	6,05
20	118,6	124,6	130,9	± 1.10	5
40	50,75	52,85	55,02	± 1.01	4,1
60	23,82	24,61	25,43	± 0.92	3,31
80	12,09	12,41	12,73	± 0.81	2,62
100	6,557	6,691	6,825	± 0.60	2
120	3,664	3,759	3,855	± 0.94	2,55
140	2,161	2,228	2,296	± 1,22	3,06
160	1,327	1,375	1,423	± 1,51	3,51
180	0,8445	0,8781	0,9126	± 1.82	3,93
200	0,5541	0,5783	0,6033	± 2,14	4,32

- Resistance/temperature characteristics for the steamer NTCs:

RESISTANCE - TEMPERATURE CHARACTERISTICS				
TEMP. °C	MINIMUM kΩ	NOMINAL kΩ	MAXIMUM kΩ	Temp. Accy °C
0	310	328,9	348,8	± 1.17
20	118,6	124,6	130,9	± 1.10
40	50,75	52,85	55,02	± 1.01
60	23,82	24,61	25,43	± 0.92
80	12,09	12,41	12,73	± 0.81
100	6,557	6,691	6,825	± 0.68
120	3,726	3,823	3,921	± 0.96
140	2,228	2,297	2,425	± 1.26
160	1,392	1,441	1,492	± 1.58
180	0,904	0,94	0,977	± 1.92

C. GROUND CHECK POINT FOR THE APPLIANCE

In order to check the main ground connection of the appliance insert the ground tester probe from the round hole located on the basement of the appliance on the thermoblock and steamer side until it will touch the steamer metal surface, as displayed in the below picture:



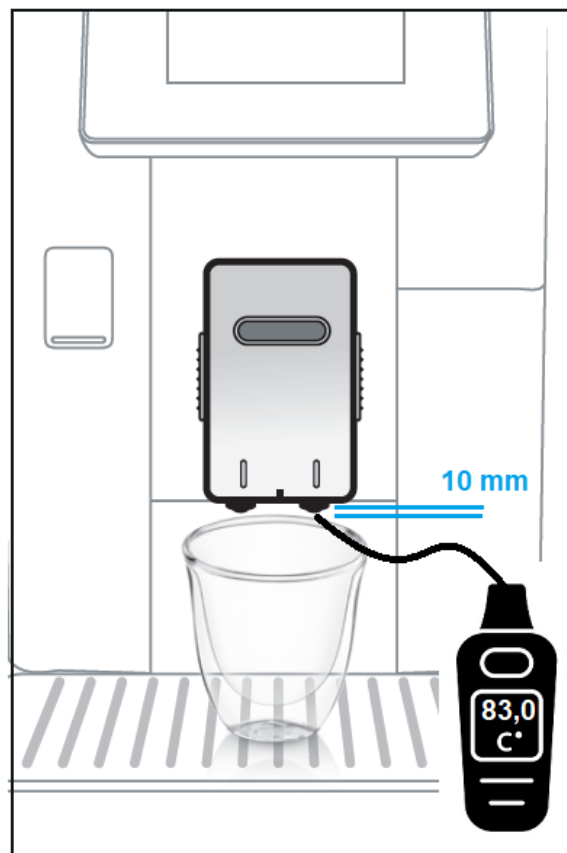
6.3. COFFEE TEMPERATURE TEST

Complaints from end users about coffee temperature are quite frequent. They are mainly due to incorrect appliance adjustments or to an incorrect expectation by the customer.

A **coffee temperature measurement** is required all the times any of these complaints are encountered.

To perform the coffee temperature test, follow in sequence the below steps:

- Turn the appliance ON.
- Run a rinse cycle, to warm up the hydraulic circuit.
- Set the temperature to the maximum level.
- Select to prepare an **EXTRA-LONG ESPRESSO COFFEE** (refer to the user manual for more details).
- Start the coffee preparation.
- Wait until at least 20ml of coffee have been delivered into the cup.
- Measure the coffee flow temperature at about 2±10mm from the coffee spout, as shown in the below picture:



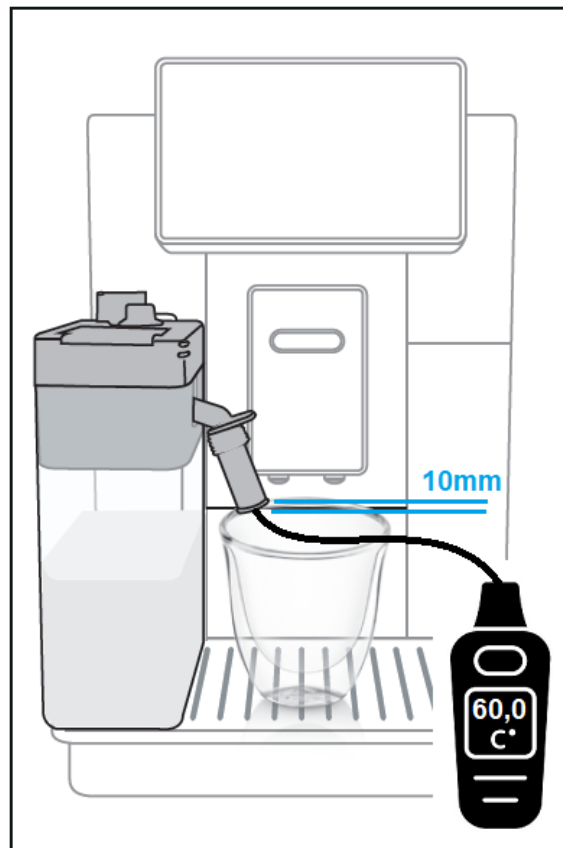
The **optimal indicative temperature measurement** for coffee should be $83^{\circ}\text{C}\pm 3^{\circ}\text{C}$.

6.4. FROTHED MILK CONSISTENCY AND TEMPERATURE TEST

A frothed milk consistency and temperature test can be required whenever the Serviceman is getting complaints from the end user about the quality or the temperature of the milk beverages.

To perform the frothed milk consistency and temperature test, follow in sequence the below steps:

- Turn the appliance ON.
- Fill the milk jug with 200ml of semi-skimmed milk at a temperature of $5^{\circ}\text{C}\pm 2^{\circ}\text{C}$. Insert the lid to the jug and connect it to the appliance.
- Set the maximum level of froth by rotating the frothing adjustment knob on the jug lid accordingly.
- Place a 250ml PIREX graduated container under the milk spout.
- Select the HOT MILK beverage and wait until at least 80ml of frothed milk have been delivered into the container.
- Measure the milk flow temperature during the delivery at about 2÷10mm from the spout, as shown in the below picture:



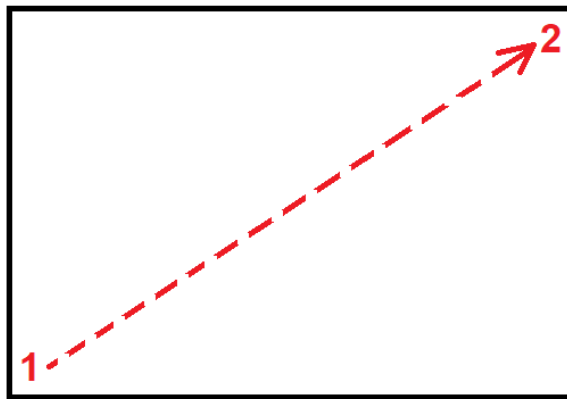
The optimal conditions for the frothed milk (without coffee) should be as resumed below:

- **Froth appearance: small bubbles without splashes.**
- **Milk temperature: $60^{\circ}\text{C}\pm 5^{\circ}\text{C}$.**
- **Froth amount: finally the container must have 50% milk and 50%froth.**

7. DEMO MODE ACTIVATION ON PRIMADONNA SOUL

The below procedure explains how to start the continuous displaying of the demonstration video on the PrimaDonna Soul screen, for instance in case the appliance would be exhibited on the shelf of a shop.

- The appliance must be plugged-in and in stand-by mode.
- Remove the drip tray.
- Switch ON the machine from the stand-by button.
- When the request to insert the drip tray prompts on the display, touch the first the bottom-left corner and then the top right corner of the touch screen:



Insert the drip tray. The demonstration video (DEMO MODE) will start being displayed continuously on the screen until the appliance will be powered OFF.