Data Sheet and Service Manual

EXAM440.XX – R3 – R5 – RIVELIA

Date: 12.07.2023

RIVELIA

1 Table of Contents

2 TECHNICAL DATA

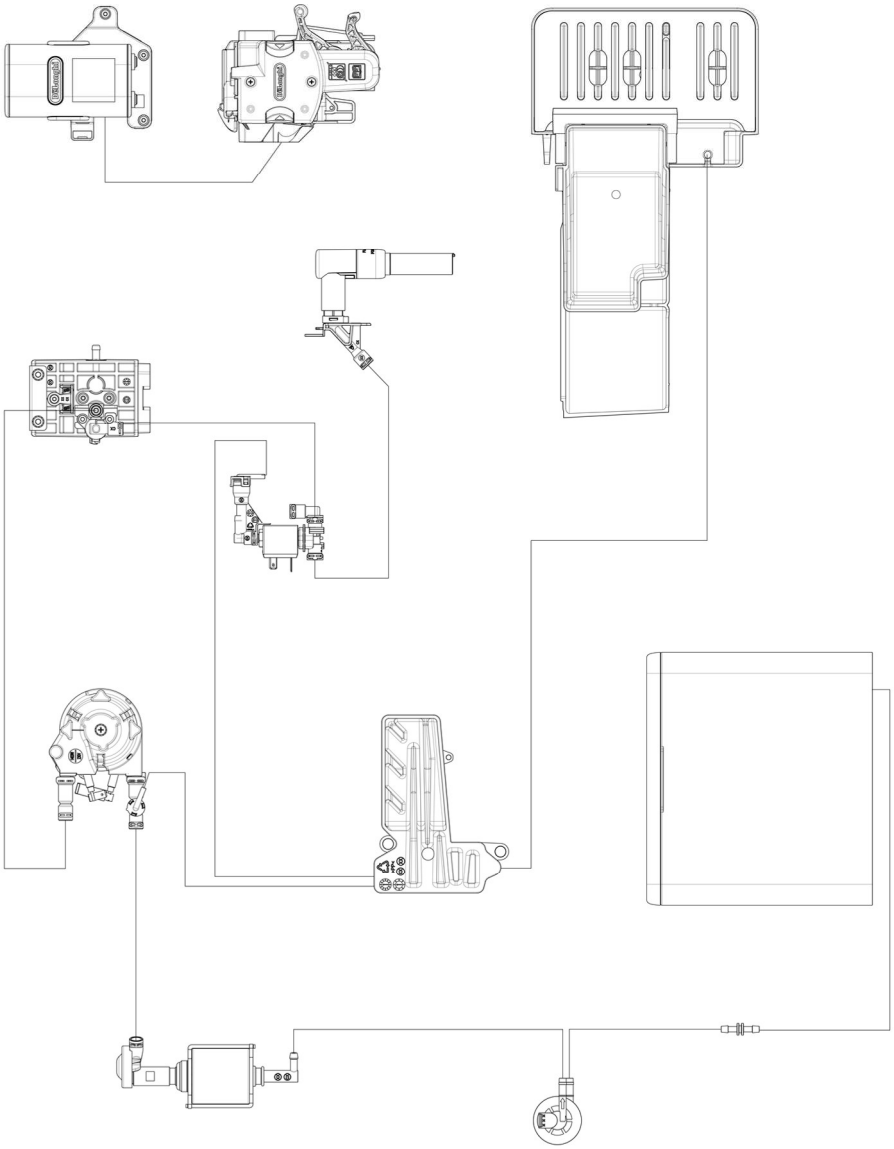
Voltage – Frequency – Input Power	220-240V ÷ 50-60Hz ÷ 1450 W
Power Consumption in Stand-By	0.34 W

COMPONENTS

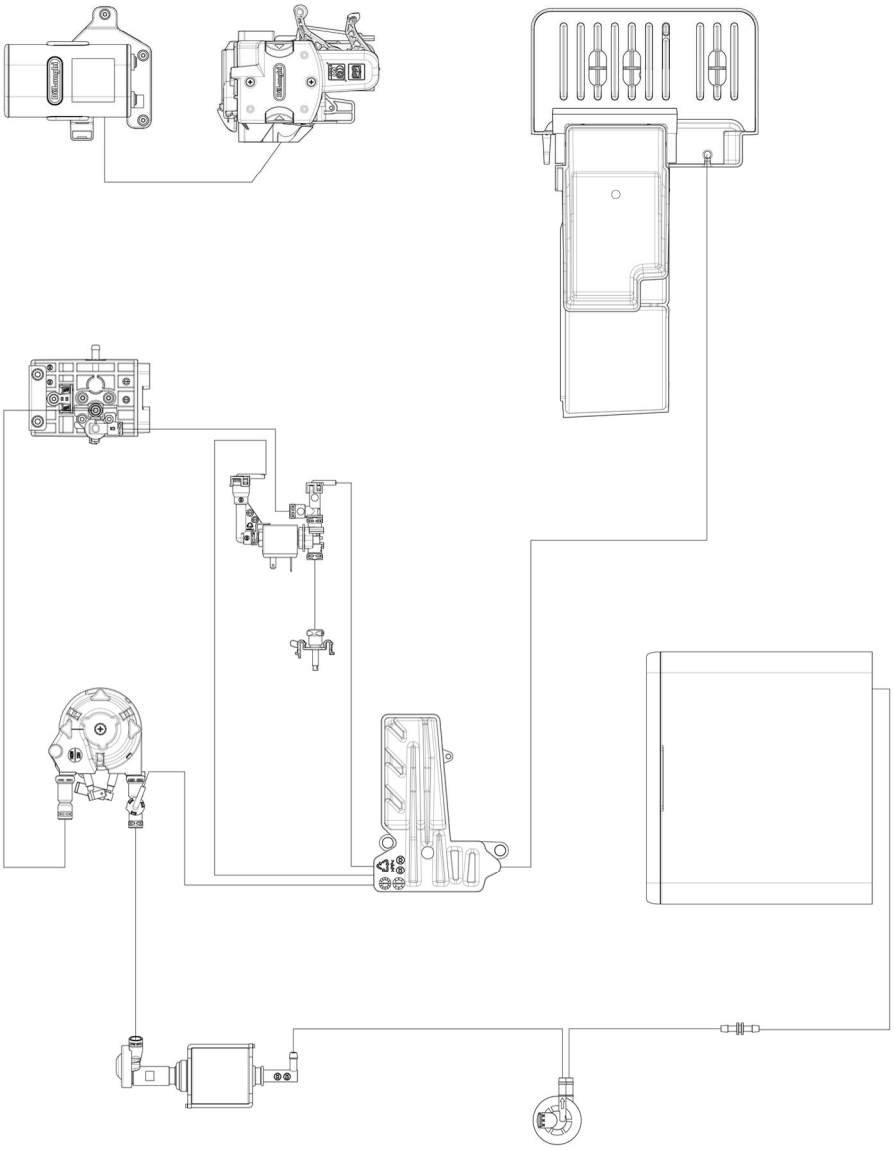
Pump	ARS 220-240V ÷ 50Hz ÷ 70W ÷ 19Bar
Grinder motor	230Vac
Transmission motor	230Vdc with position encoder
Solenoid valve EV2	230Vac
Thermoblock	
- Temperature probe	NTC sensor
- Thermal fuse TCO	192°C ÷ 15A
- Heating element	230 Vac ÷ 1400W

3 HYDRAULIC DIAGRAM

3.1 STEAM WAND VERSION

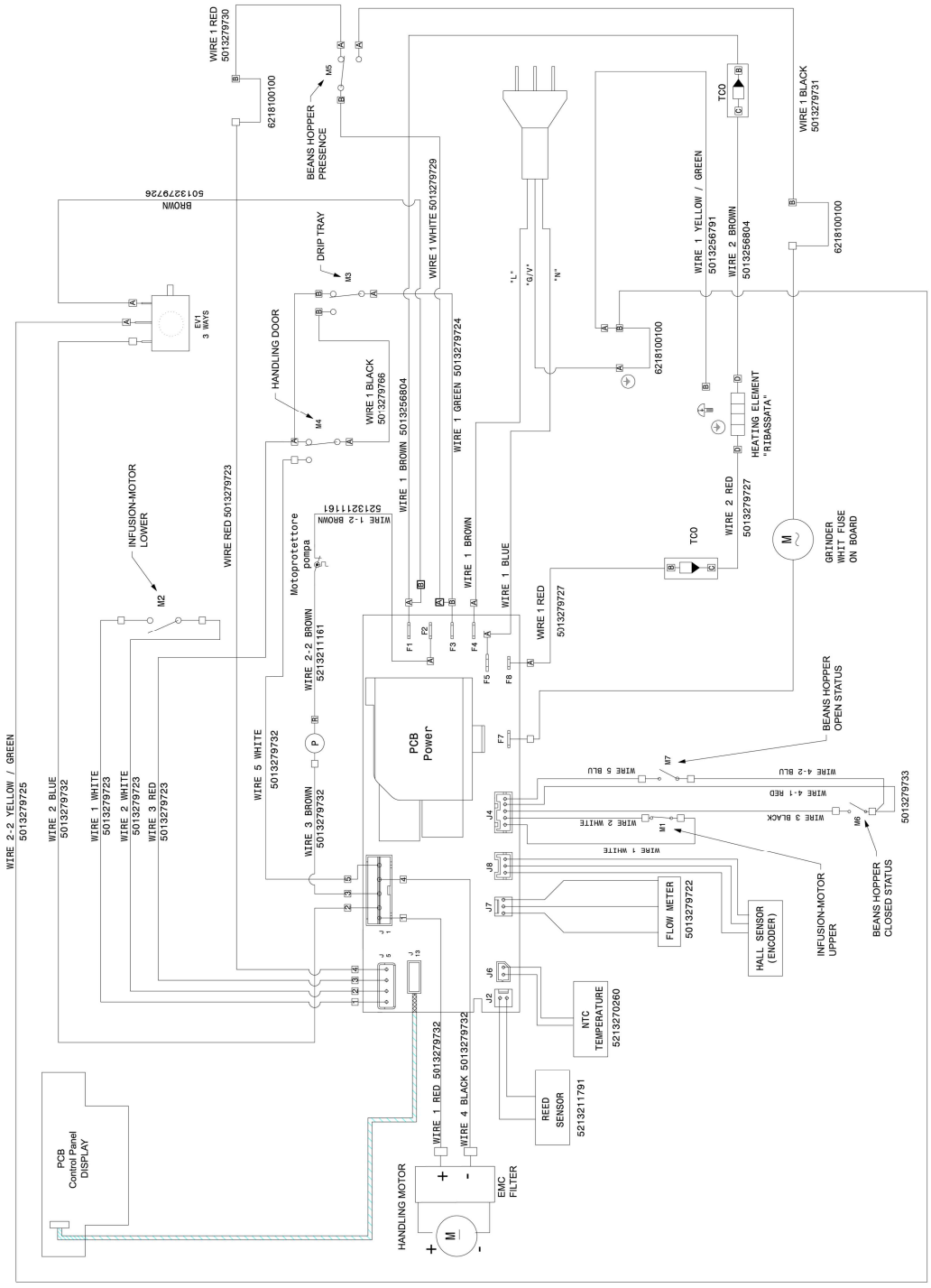


3.2 MILK JUG VERSION

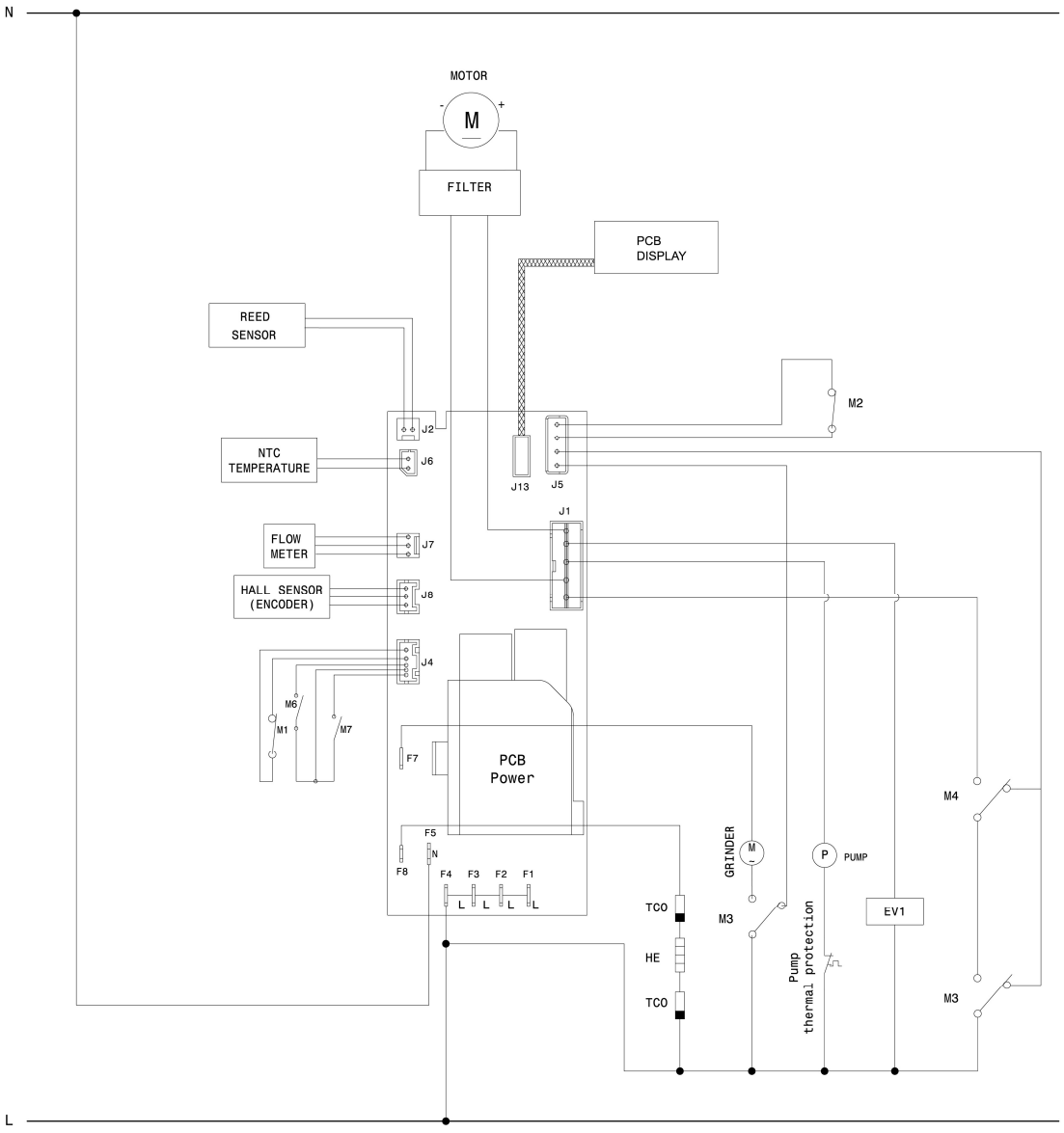


4 WIRING DIAGRAM

4.1 STEAM WAND VERSION: PRACTICAL OUTLINE



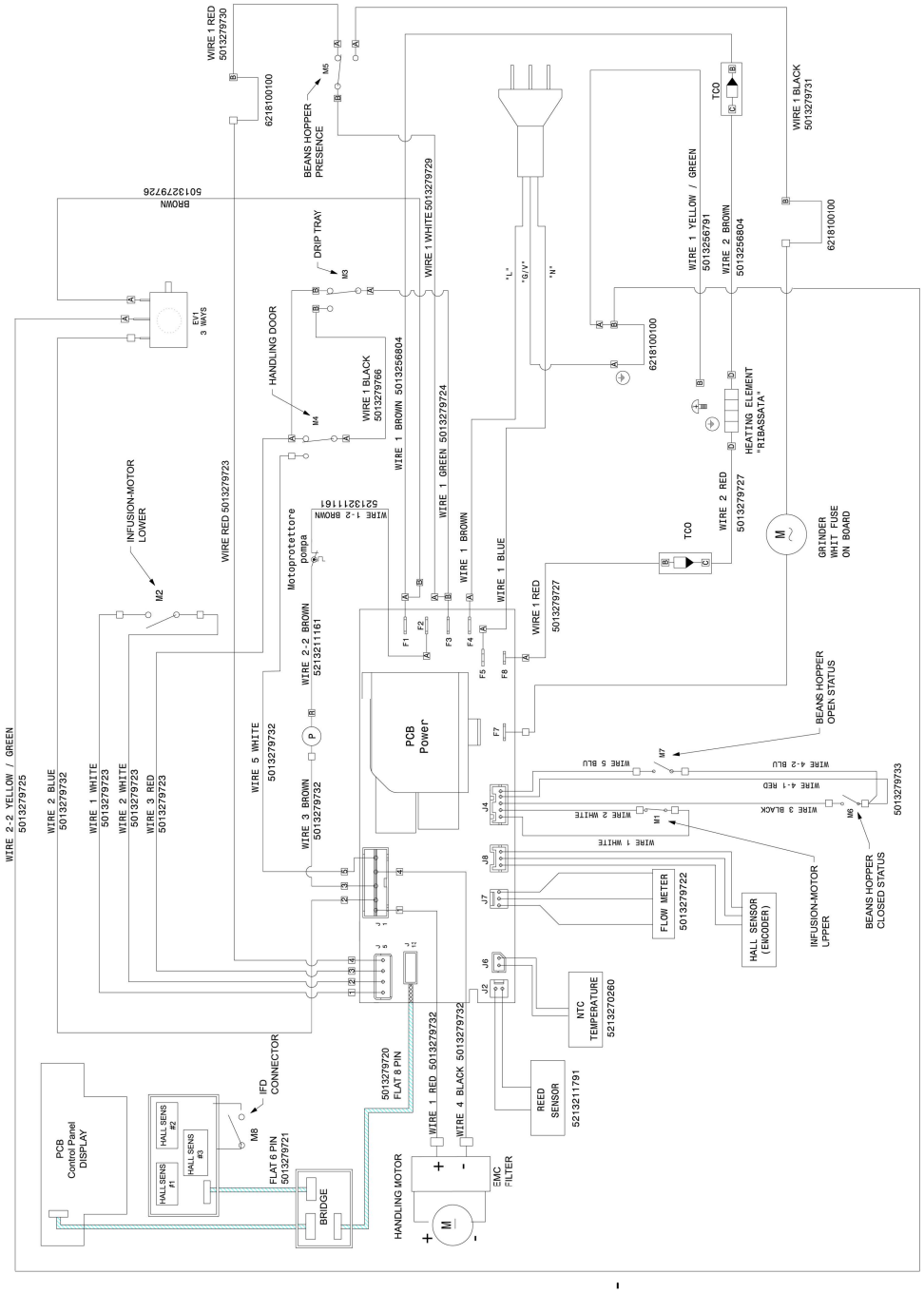
4.2 STEAM WAND VERSION: THEORETICAL OUTLINE



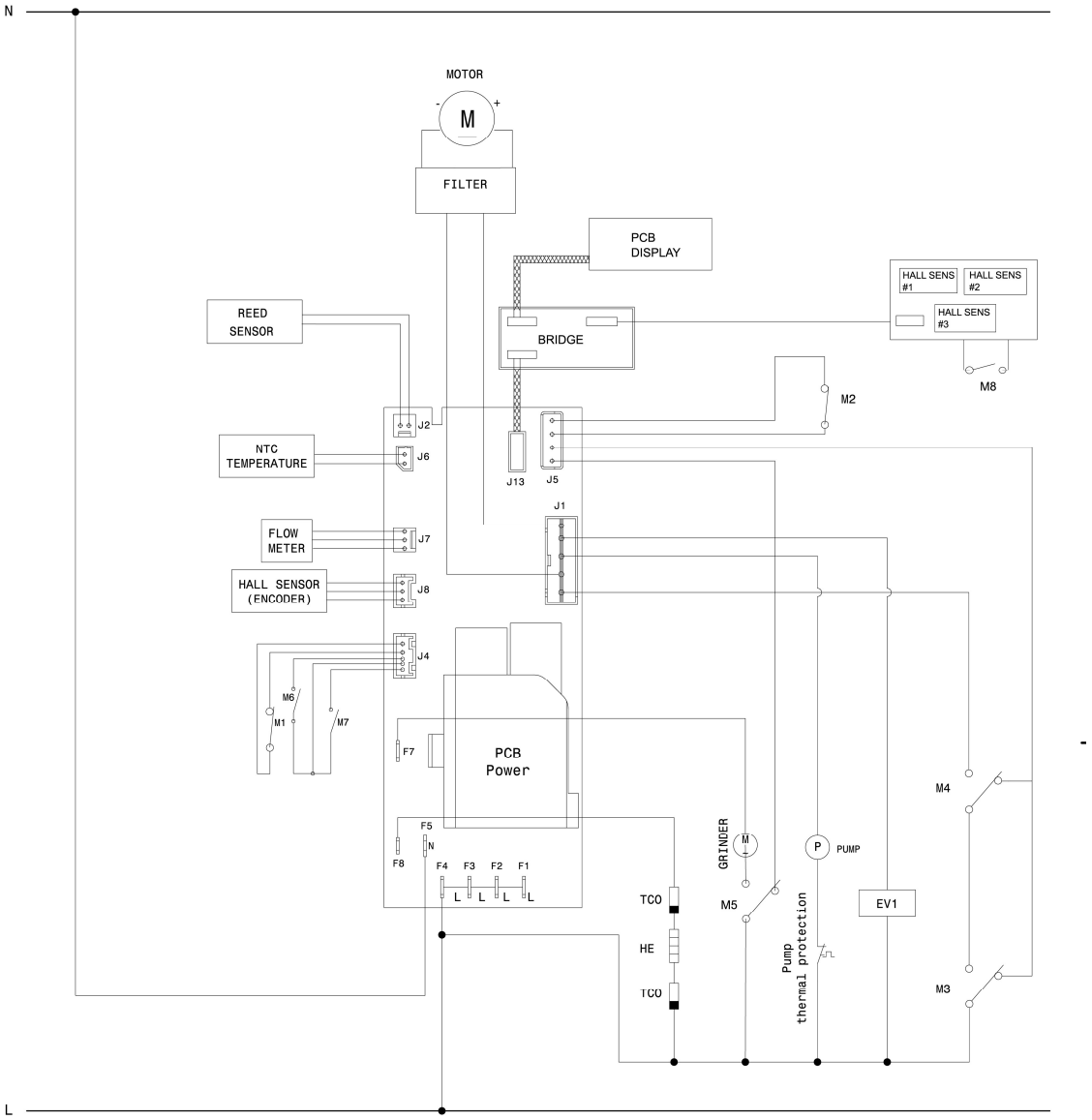
LEGEND:

L : PHASE/LINE
N : NEUTRAL
TCO : THERMAL CUT OFF/THERMAL LINK
HE : HEATING ELEMENT
M1 : MICROSWITCH UPPER (GROUP INFUSION-MOTOR)
M2 : MICROSWITCH LOWER (GROUP INFUSION-MOTOR)
M3 : MICROSWITCH DRAWER
M4 : MICROSWITCH HANDLING DOOR
M5 : MICROSWITCH HOPPER PRESENCE
M6 : MICROSWITCH HOPPER CLOSE
M7: MICROSWITCH HOPPER OPEN

4.3 MILK JUG VERSION: PRACTICAL OUTLINE



4.4 MILK JUG VERSION: THEORETICAL OUTLINE



LEGEND:

L : PHASE/LINE
N : NEUTRAL
TCO : THERMAL CUT OFF/THERMAL LINK
HE : HEATING ELEMENT
M1 : MICROSWITCH UPPER (GROUP INFUSION-MOTOR)
M2 : MICROSWITCH LOWER (GROUP INFUSION-MOTOR)
M3 : MICROSWITCH DRAWER
M4 : MICROSWITCH HANDLING DOOR
M5 : MICROSWITCH HOPPER PRESENCE
M6 : MICROSWITCH HOPPER CLOSE
M7 : MICROSWITCH HOPPER OPEN
M8 : MICROSWITCH IFD CONNECTOR (MILK JUG)

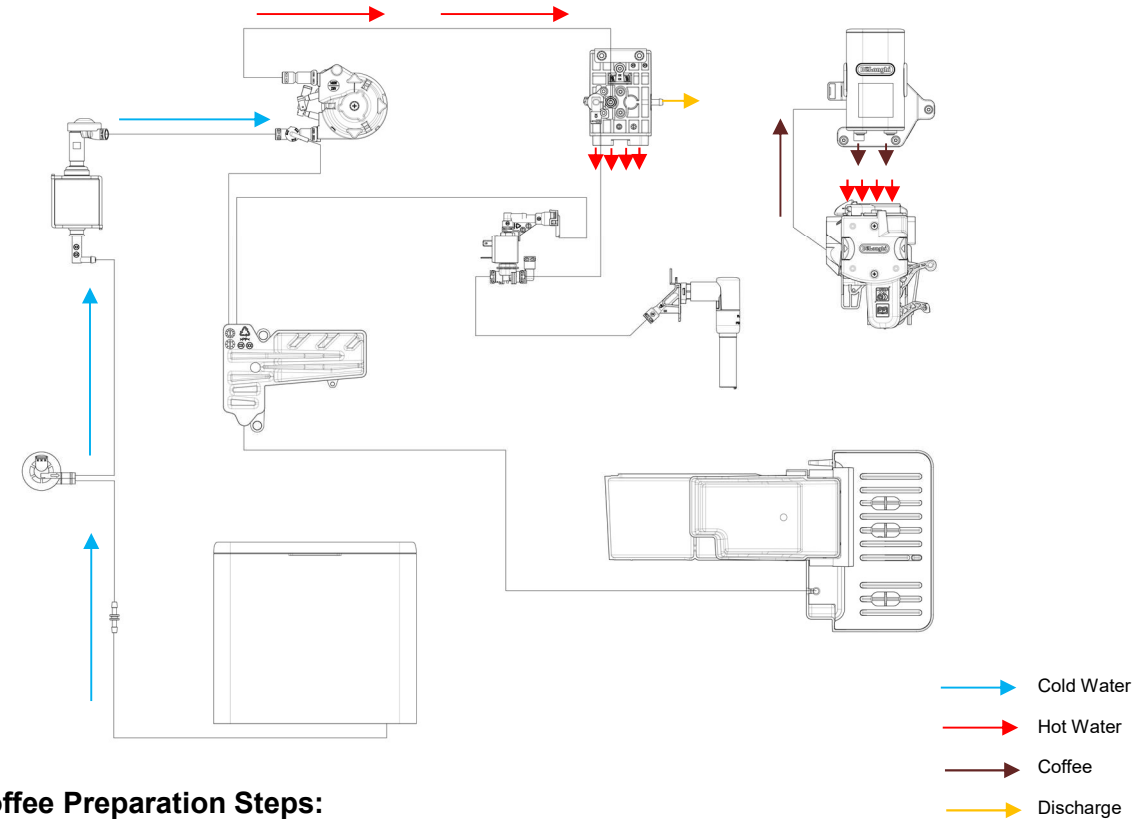
5 WORKING PRINCIPLE

5.1 MICROSWITCHES, SENSORS AND SOLENOID VALVE

MICROSWITCHES	Function	Logic
M1 = UPPER MICROSWITCH	Detects when the infuser is on top position	"NC", it opens when the infuser is in top position
M2 = LOWER MICROSWITCH	Detects when the infuser is on down position	"NO", it closes when the infuser is in down position
M3 = GROUNDS CONTAINER MICROSWITCH	Detects when the grounds container is in correct position	Change-over micro switch. When the grounds container is inserted: - the contact for the grounds container detection is OPEN; - the contact for the transmission motor power supply is CLOSED.
M4 = SERVICE DOOR MICROSWITCH	Detects when the service door is in correct position	Change-over micro switch. When the service door is closed: - the contact for the service door closure detection is OPEN; - the contact for the transmission motor power supply is CLOSED.
M5 = BEANS CONTAINER PRESENCE MICROSWITCH	Detects when one of the beans container is present on its housing	Change-over micro switch. When the beans container is inserted: - the contact for the beans container detection is OPEN; - the contact for the grinder motor power supply is CLOSED.
M6 = BEANS CONTAINER CLOSURE STATUS MICROSWITCH	Detects when the beans container is closed (no beans delivery allowed)	"NC", it opens when the beans container is being rotated for opening the beans outlet (clockwise rotation)
M7 = BEANS CONTAINER OPENING STATUS MICROSWITCH	Detects when the beans container is open (beans delivery allowed)	"NC", it opens when the beans container is being rotated for closing the beans outlet (anticlockwise rotation)
M8 = ACCESSORY DETECTION MICROSWITCH (**ONLY MILK JUG VERSION**)	Detects when the hot water spout or the milk jug is connected to the nozzle.	"NO", it closes when one of the accessories (hot water spout or milk jug) are attached to the nozzle

SOLENOID VALVE	Function	Logic
EV2 = 3-WAYS SOLENOID VALVE	Manages the hot water/steam delivery and the residual pressure discharge	- It opens when the hot water/steam delivery is in progress to make the flow to come out from the nozzle. - It closes when the delivery finishes and the residual pressure is discharged towards the expansion chamber and drip tray
REED AND ENCODER	**Function**	**Logic**
HALL SENSOR ENCODER	Detects rotations of transmission motor	
REED SENSORS FOR ACCESSORIES DETECTION	Allows the machine to detect which accessory (hot water spout, milk jug) is attached to the machine	

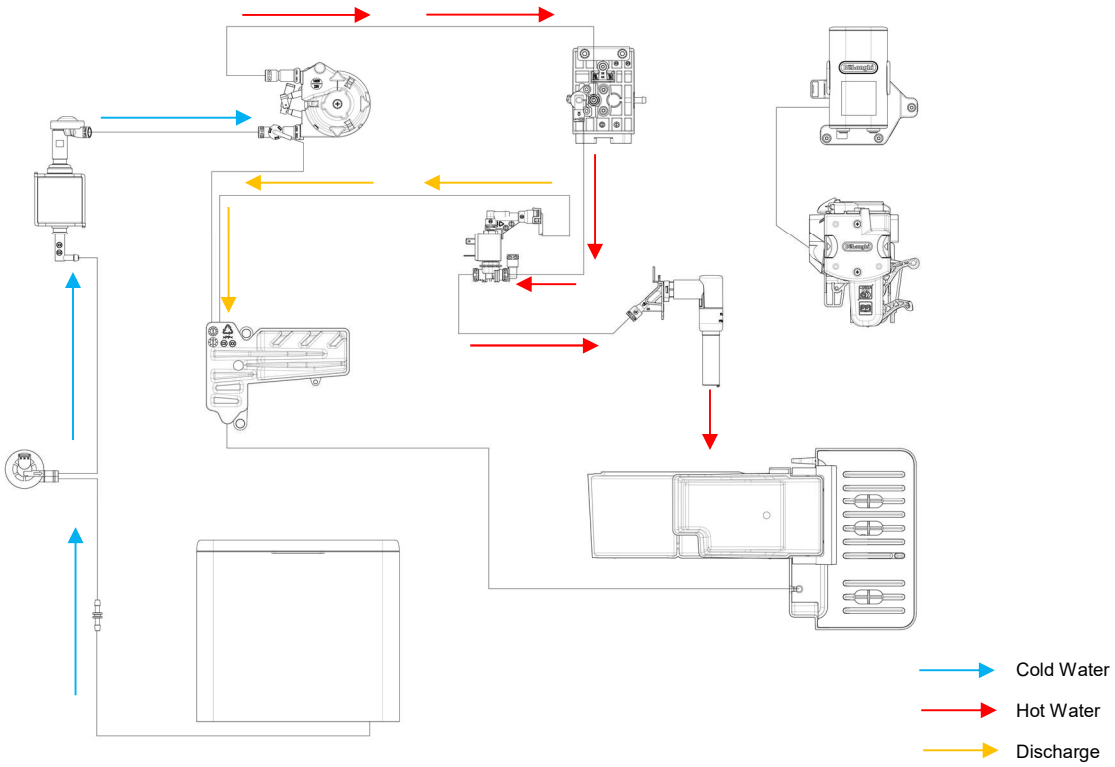
5.2 ESPRESSO COFFEE PREPARATION (STEAM WAND VERSION)



Espresso Coffee Preparation Steps:

1. The Thermoblock is activated.
2. The Grinder is activated for a certain timing (base on the coffee taste selection).
3. The Infuser moves to the mechanical valve
4. The Pump is activated for a couple of seconds for pre-infusion
5. The Pump restarts in continuous mode to deliver the espresso coffee
6. The Pump stops, the Thermoblock turns OFF.
7. The Infuser moves away from the mechanical valve and releases the coffee pod.
8. The Mechanical Valve discharges the excess of water/coffee to the grounds container
9. The Infuser moves back to the “Ready for Coffee” position.

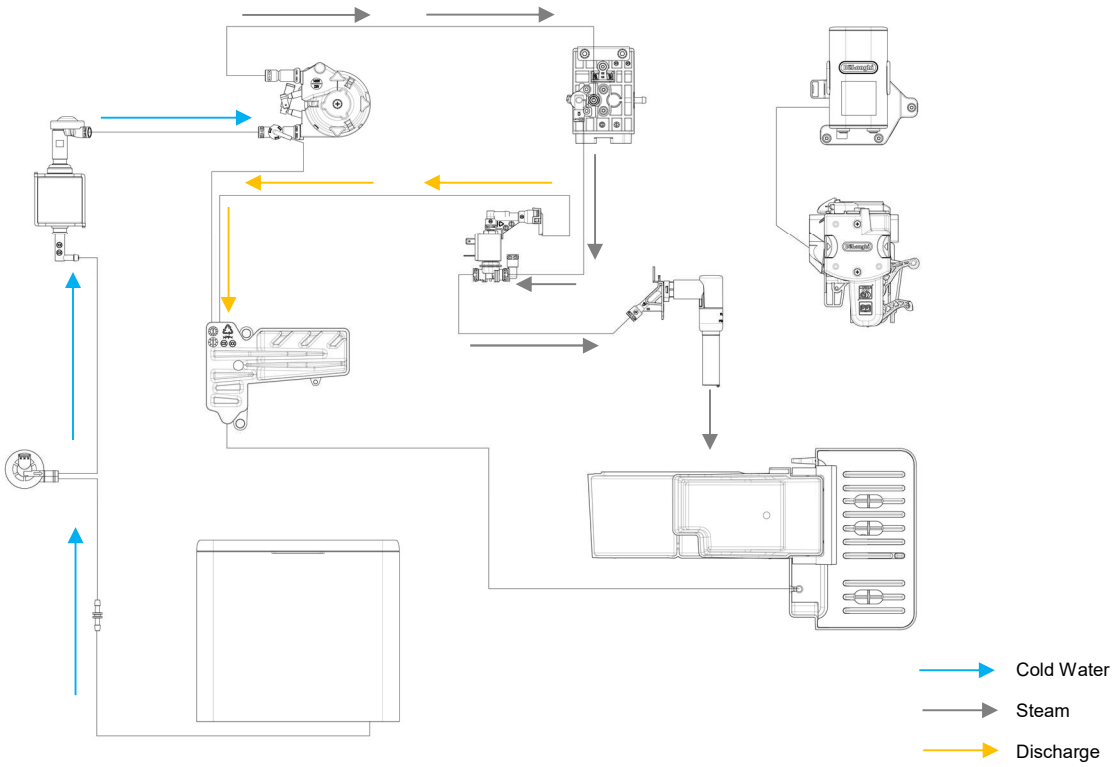
5.3 HOT WATER PREPARATION (STEAM WAND VERSION)



Hot Water Preparation Steps:

1. The EV2 solenoid valve is activated.
2. The Thermoblock is activated.
3. The Pump is activated in fast pulsing mode for a certain timing.
4. The Hot Water is delivered through the steam wand.
5. The Pump stops, the EV2 solenoid valve and the Thermoblock are deactivated.
6. The residual water is discharged by the EV2 solenoid valve into the drip tray.

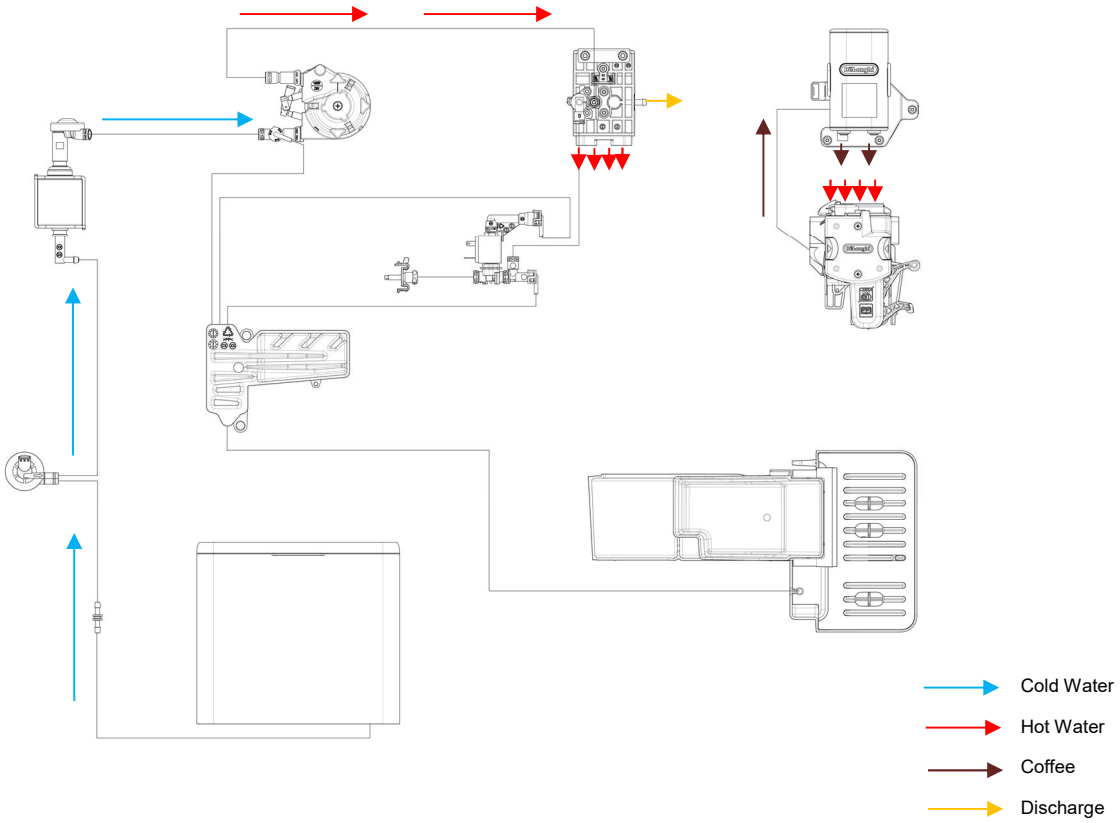
5.4 STEAM PREPARATION (STEAM WAND VERSION)



Steam Preparation Steps:

1. EV2 solenoid valve is activated.
2. The Thermoblock is activated (**temperature set point above 100°C**).
3. The Pump is activated in slow pulsing mode for a certain timing.
4. The Steam is delivered through the steam wand.
5. The Pump stops, the EV2 solenoid valve and the Thermoblock are deactivated.
6. The residual steam and pressure is discharged by the EV2 solenoid valve into the drip tray.

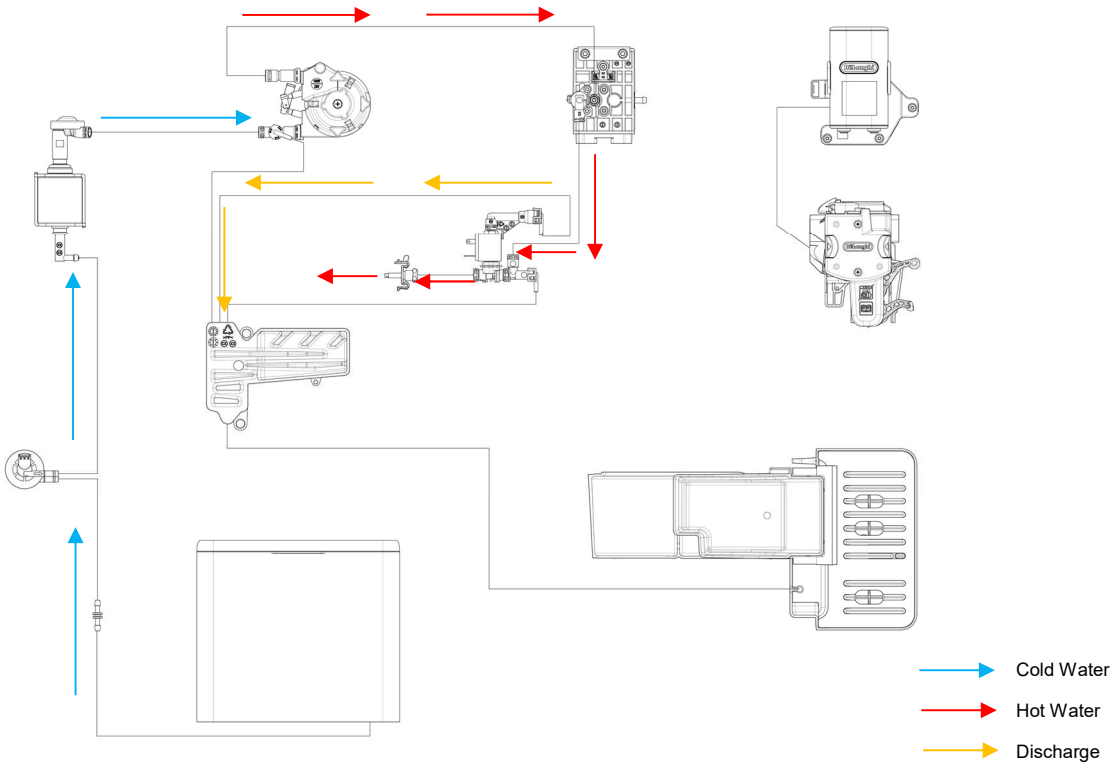
5.5 ESPRESSO COFFEE PREPARATION (MILK JUG VERSION)



Espresso Coffee Preparation Steps:

1. The Thermoblock is activated.
2. The Grinder is activated for a certain timing (base on the coffee taste selection).
3. The Infuser moves to the mechanical valve
4. The Pump is activated for a couple of seconds for pre-infusion
5. The Pump restarts in continuous mode to deliver the espresso coffee
6. The Pump stops, the Thermoblock turns OFF.
7. The Infuser moves away from the mechanical valve and releases the coffee pod.
8. The Mechanical Valve discharges the excess of water/coffee to the grounds container
9. The Infuser moves back to the “Ready for Coffee” position.

5.6 HOT WATER PREPARATION (MILK JUG VERSION)

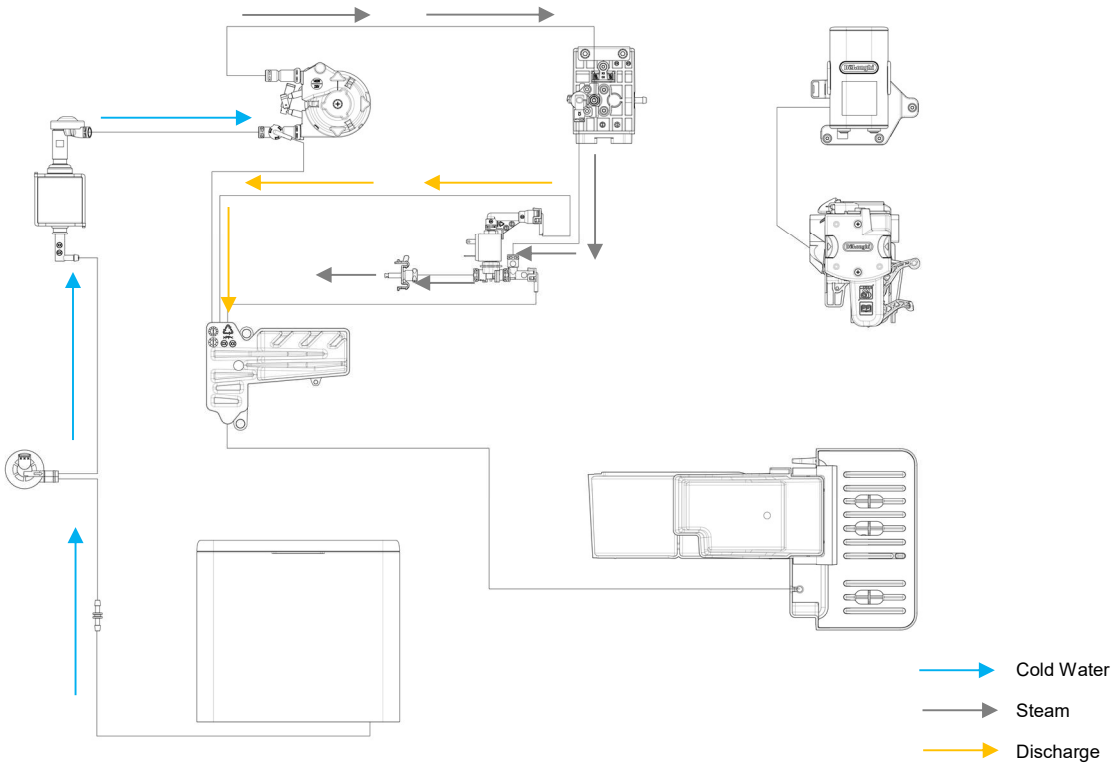


Hot Water Preparation Steps:

1. The EV2 solenoid valve is activated.
2. The Thermoblock is activated.
3. The Pump is activated in fast pulsing mode for a certain timing.
4. The Hot Water is delivered through the hot water accessory attached to the nozzle.
5. The Pump stops, the EV2 solenoid valve and the Thermoblock are deactivated.
6. The residual water is discharged by the EV2 solenoid valve into the drip tray.

IMPORTANT NOTICE: This function can be activated **only if the hot water accessory is attached to the nozzle**.

5.7 MILK FROTH PREPARATION (MILK JUG VERSION)



Milk Froth Preparation Steps (for <u>both</u> LatteCrema Hot and LatteCrema Cold when available):

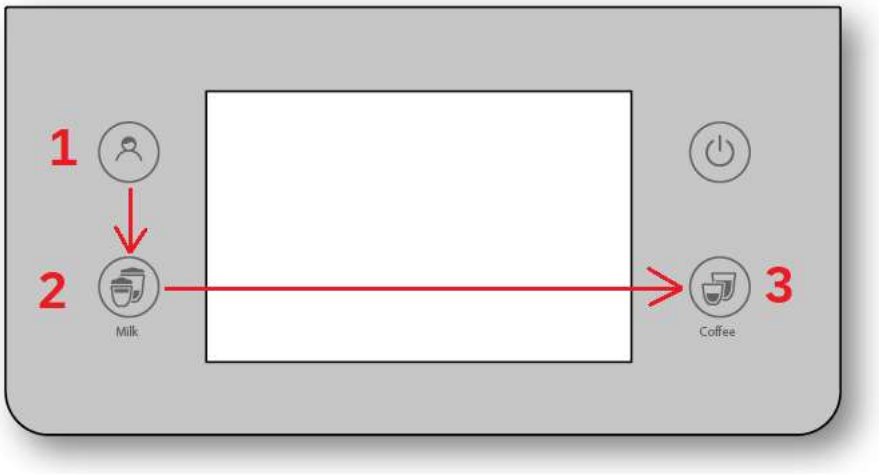
1. EV2 solenoid valve is activated.
2. The Thermoblock is activated (**<u>temperature set point above 100°C</u>**).
3. The Pump is activated in <u>slow pulsing mode</u> for a certain timing.
4. The Steam is injected from the nozzle into the milk jug and mixed with the air (according to the milk froth knob position) to froth the milk.
5. The Pump stops, the EV2 solenoid valve and the Thermoblock are deactivated.
6. The residual steam and pressure is discharged by the EV2 solenoid valve into the drip tray.

<u>IMPORTANT NOTICE</u>: This function can be activated **<u>only if one of the milk jugs (LatteCrema Hot or LatteCrema Cold when available) is attached to the nozzle</u>**.

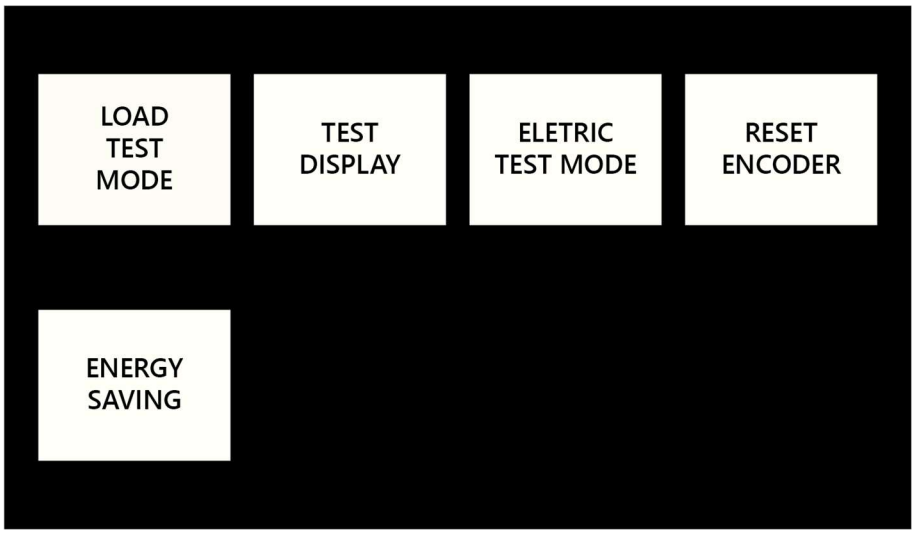
6 TEST MODE

To access the **Test Mode**:

1. The appliance must be connected to the power socket and in stand-by mode.
2. Remove the drip tray and wait until the message “Insert the Drip Tray” will appear on the display.
3. Press in sequence the three buttons as indicated in the below picture:



The below page will be shown on the display:



Within 10 seconds, insert the drip tray and select one of the below functions:

a. **LOAD TEST MODE:** Allows to manually activate the components of the appliance, to check the operation of the NTC sensors and check the correct operation of the reed and micro switches.
b. **TEST DISPLAY:** Allows to test the functioning of all the areas of the soft touch buttons and of the TFT display.

IMPORTANT NOTICE: After the execution of the TEST DISPLAY the appliance will be reset to "first use", i.e. it will reset the water softener filter status, it will ask again to set the language, to set the water hardness and to fill the water circuit.

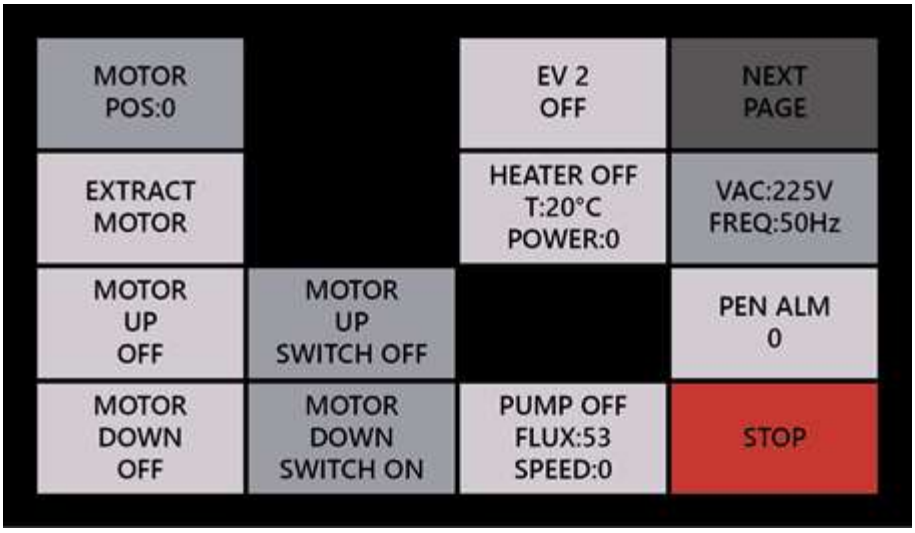
IMPORTANT NOTICE: In case the machine would be reset to "first use" through the TEST DISPLAY or by replacing the main PCB, it is recommended to provide the customer a new Total Hardness Test indicator paper (spare part no. 5532110300), so he/she will be able to properly set the appliance according to the real water hardness in use with the coffee machine:

c. **ELECTRIC TEST MODE:** This feature is used only for tests at the manufacturing plant.

d. **RESET ENCODER:** It resets the value of the maximum position reached by the infuser.

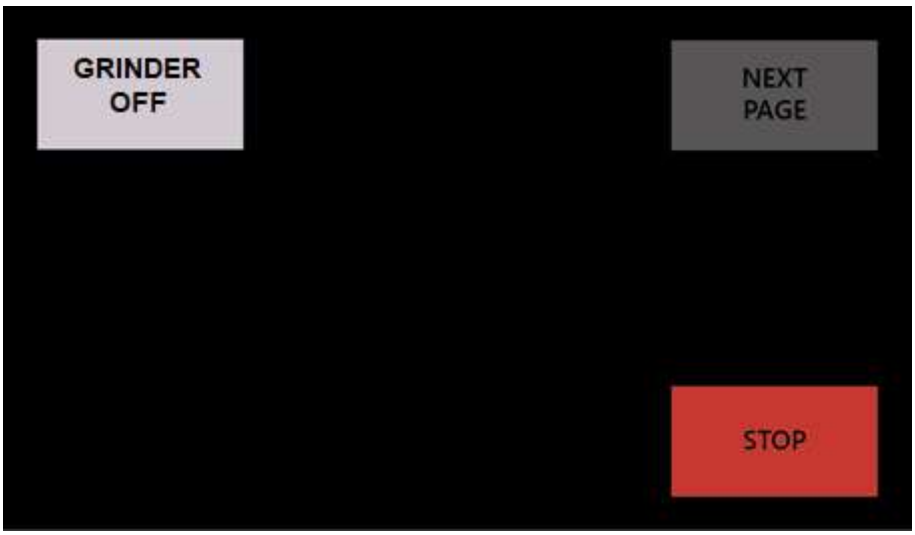
e. **ENERGY SAVING:** It allows to change the default status for the energy saving function of the machine.

6.1 EXPLANATION OF THE LOAD TEST MODE BUTTONS AND FUNCTIONS

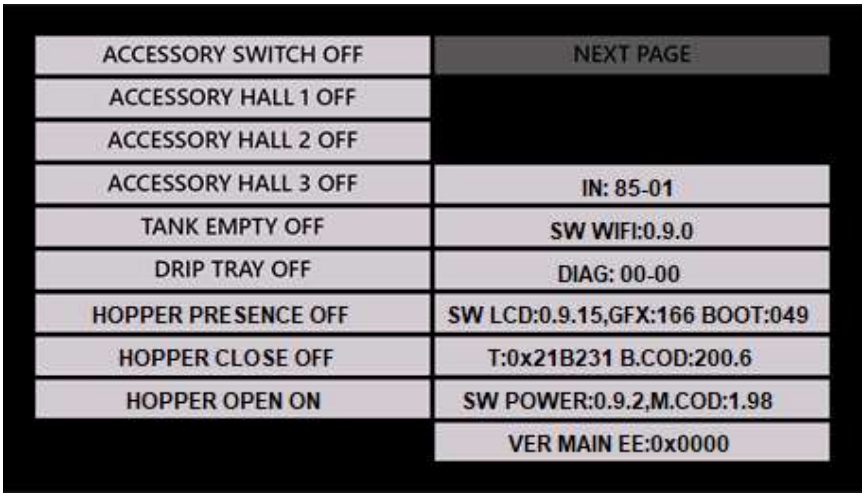


MOTOR: Indicates when the transmission motor is active. **POS:** Encoder value of the Hall sensor.		**EV2:** Activates the solenoid valves. **NOTE:** Some combinations are forced to avoid damages.	**NEXT PAGE:** Moves to next page of menu.
EXTRACT MOTOR: Moves the infuser to the extraction position.		**HEATER:** Blue when the Thermoblock is active. (*) **T:** Temperature of the NTC of Thermoblock. **POWER:** Absorbed power from 0 to 10.	**VAC:** Current voltage.
MOTOR UP: Blue when the motor is moving towards UP position. If pressed, motor starts.	**MOTOR UP SWITCH:** Blue when the infuser is in UP position. **ON:** When pressed (infuser in UP position).		**PEN ALM:** shows the pending alarms (see the chapter **6.3 PEN ALM**).
MOTOR DOWN: Blue when the motor is moving towards DOWN position. If pressed, motor starts.	**MOTOR DOWN SWITCH:** Blue when the infuser is in DOWN position. **OFF:** When pressed (infuser in DOWN position).	**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). **SPEED:** Water flow in cc/s	**STOP:** Interrupts any active load.

(*) By pressing HEATER, the Thermoblock is activated for 5 seconds.



GRINDER: Activates the grinder for 4 seconds.



ACCESSORY SWITCH: status of the accessories micro switch.	**NEXT PAGE:** Moves to next page of menu.
ACCESSORY HALL 1 / 2 / 3: status of the accessories reed sensors.	
TANK EMPTY: status of the empty water tank reed sensor.	
DRIP TRAY: status of the drip tray presence micro switch.	**RELEASE VERSIONS FOR ALL THE SOFTWARE PACKAGES INCLUDED IN THE APPLIANCE**.
HOPPER PRESENCE: status of the beans container presence micro switch.	
HOPPER CLOSE: status of the beans container closure micro switch.	
HOPPER OPEN: status of the beans container opening micro switch.	

6.2 PEN ALM

PEN ALM means **Pending Alarms**. It shows a code for the General Alarm possible causes according to the below table:

Load	Code	Issue
Motor	5	The limit micro switches are not pressed but the motor does not move
	6	With the motor activated, the DOWN limit micro switch is not released and the speed is 0
	8	The grounds container micro switch is interrupted. No motor activation
	11	The UP limit micro switch is interrupted while the DOWN limit micro switch is pushed.
	12	The encoder does not detect the position (disconnected) an the infuser stops on the DOWN limit micro switch
Heater	41	Broken Thermoblock NTC (open circuit or short circuit) Temporary overheating of the Thermoblock
	42	Broken TCO (deduced due to missed Thermoblock heating). Triggered after a few seconds
Hopper	131	Only micro switch M7 pressed: machine detects the hopper open (bean delivery), but not the bean hopper presence (M5 micro switch)
	132	Both micro switches M6 and M7 pressed simultaneously, but M5 micro switch not pressed
	133	All the three micro switches M5, M6 and M7 pressed simultaneously

7 TROUBLESHOOTING

7.1 POSSIBLE TESTS WHICH CAN BE EXECUTED FROM THE LOAD TEST MODE

7.1.1 COFFEE CIRCUIT FLOW ACTIVATION

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

The water will pass through the flow meter, the Thermoblock, the mechanical valve, the infuser and will come out from the coffee spouts.

7.1.2 HOT WATER AND STEAM FLOW ACTIVATION

- The infuser must not be in the upper position.
- Activate the EV2 solenoid valve.
- Activate the pump.

The water will pass through the flow meter, the Thermoblock, the mechanical valve's by-bass and the EV2 solenoid valve. Finally, the hot water will come out from the hot water spout connected to the IFD nozzle.

IMPORTANT NOTICE: The **hot water spout must be connected** to allow the manual activation of the EV2 solenoid valve.

7.2 ELECTRIC CHECKS DIRECTLY ON THE COMPONENTS

7.2.1 HEATING ELEMENT RESSISTANCE CHECK

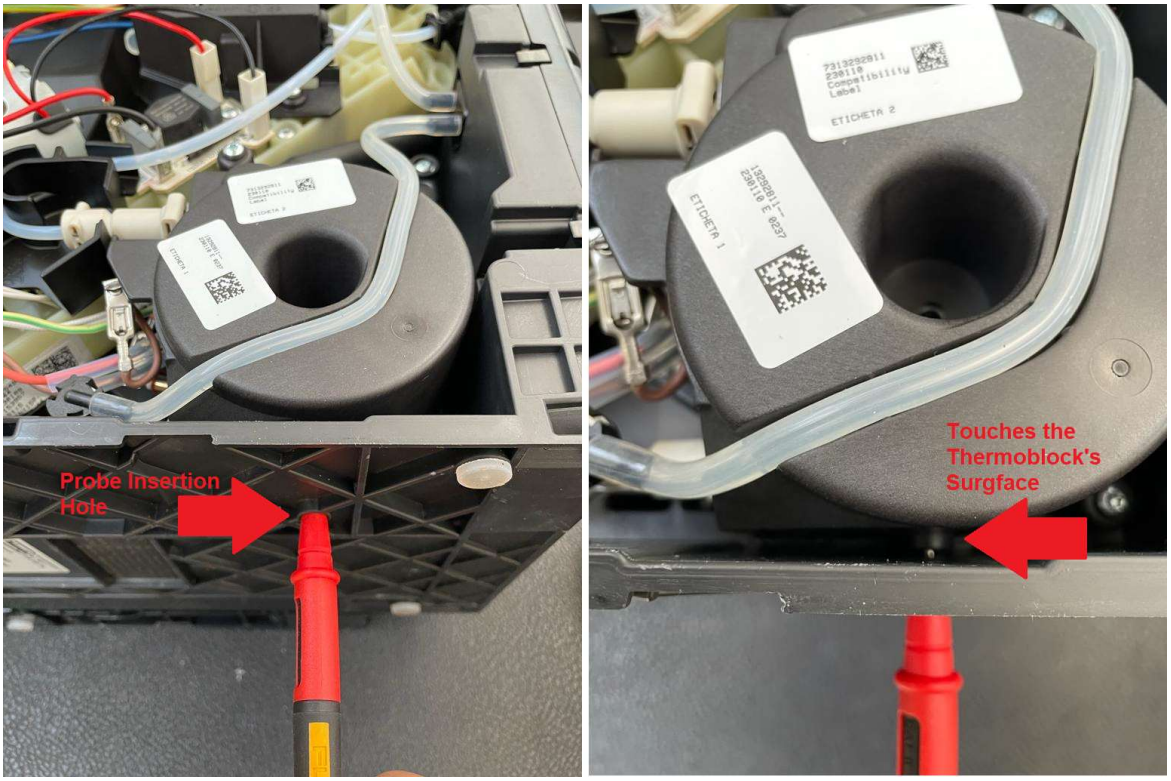
- Thermoblock Resistance Value: **≈ 35 Ohms.**

7.2.2 RESISTANCE/TEMPERATURE CHARACTERISTICS FOR THE NTC SENSOR

TEMP. °C	MINIMUM kΩ	NOMINAL kΩ	MAXIMUM kΩ	Temp. Accy °C	Resi.Accy %
0.0	310.0	328.9	348.8	± 1.17	± 6.05
20.0	118.6	124.6	130.9	± 1.10	± 5.00
40.0	50.75	52.85	55.02	± 1.01	± 4.10
60.0	23.82	24.61	25.43	± 0.92	± 3.31
80.0	12.09	12.41	12.73	± 0.81	± 2.62
100.0	6.557	6.691	6.825	± 0.60	± 2.00
120.0	3.664	3.759	3.855	± 0.94	± 2.55
140.0	2.161	2.228	2.296	± 1.22	± 3.06
160.0	1.327	1.375	1.423	± 1.51	± 3.51
180.0	0.8445	0.8781	0.9126	± 1.82	± 3.93
200.0	0.5541	0.5783	0.6033	± 2.14	± 4.32

7.2.3 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 under the basement of the appliance on the Thermoblock's side until it will touch the Thermoblock's metal surface, as displayed in the below picture:



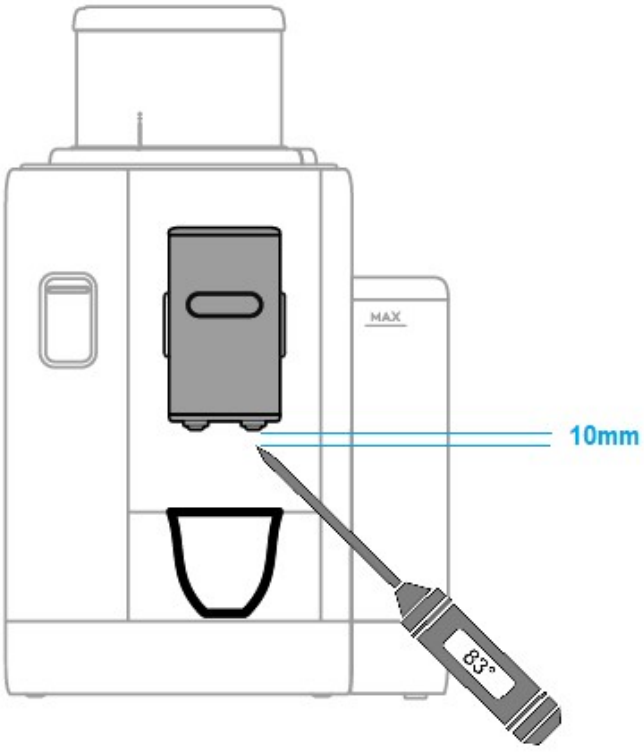
7.3 COFFEE TEMPERATURE TEST

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:

1. Turn the appliance ON.
2. Set the temperature to the MAX level from the settings of the appliance.
3. Run a rinse cycle to warm up the hydraulic circuit.
4. Select to prepare an **XL SIZE ESPRESSO COFFEE** (refer to the user manual for more details).
5. Start the coffee preparation.
6. Wait until at least 20ml of coffee have been delivered into the cup.
7. Measure the coffee flow temperature at about 2÷10mm from the coffee spout, as shown in the below picture:



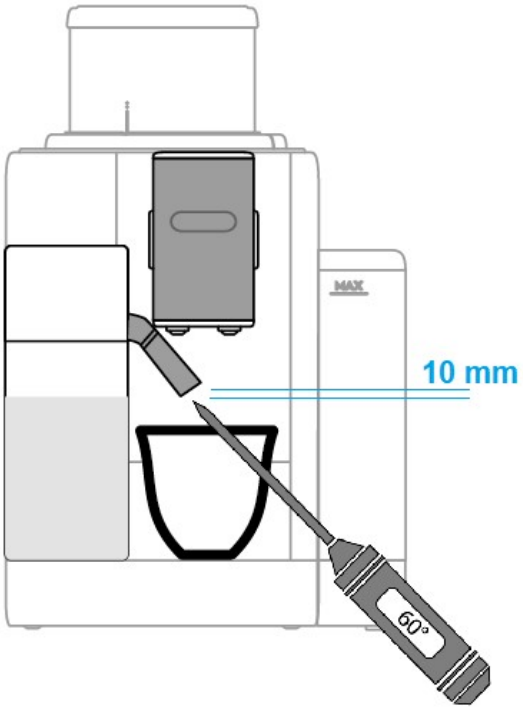
The **optimal indicative temperature measurement** for coffee should be **83°C±3°C**.

7.4 FROTHED HOT MILK CONSISTENCY AND TEMPERATURE TEST

A frothed hot 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 hot milk beverages.

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

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



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

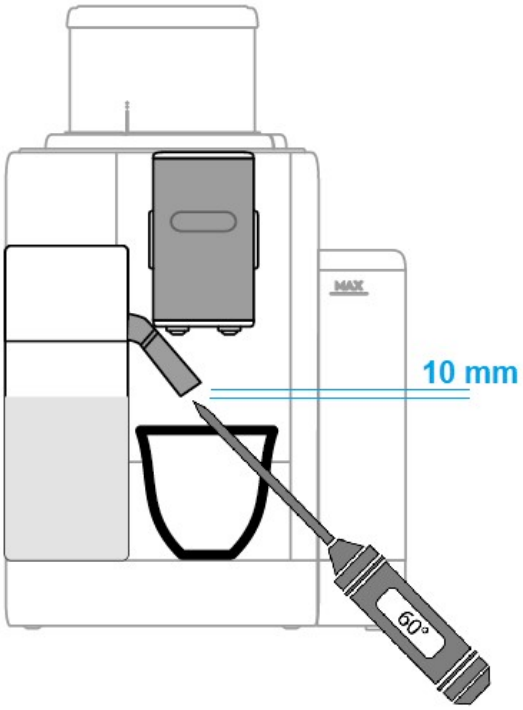
- **Froth appearance: small bubbles without splashes.**
- **Milk temperature: 65°C±5°C.**
- **Froth amount: 50% milk and 50% froth.**

7.5 FROTHED COLD MILK CONSISTENCY AND TEMPERATURE TEST (*)

A frothed cold 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 cold milk beverages.

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

1. Turn the appliance ON.
2. Fill the milk jug with 200ml of **skimmed** milk at a temperature of 5°C±2°C.
3. Insert the lid to the jug and connect it to the appliance.
4. Set the maximum level of froth by rotating the frothing adjustment knob on the jug lid accordingly.
5. Place a 250ml PIREX graduated container under the milk spout.
6. Select COLD MILK beverage and wait until at least 80ml of frothed milk have been delivered into the container.
7. 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:

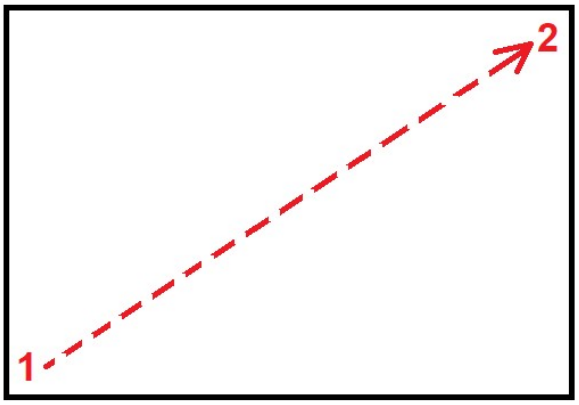
- **Froth appearance: small bubbles without splashes.**
- **Milk temperature: 24,5°C±2,5°C.**
- **Froth amount: 50% milk and 50% froth.**

(*) When the LatteCrema Cool System is available.

8 DEMO MODE ACTIVATION

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

1. The appliance must be plugged-in and in stand-by mode.
2. Remove the drip tray.
3. When the request to insert the drip tray prompts on the display, touch 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 unplugged from the socket.