



Data Sheet and Service Manual

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Product Information

Brand De'Longhi

Models Rivelia START EXAM420

Versions INT



Manufacturer

De'Longhi Appliances s.r.l.
Via L. Seitz, 47
31100 Treviso (TV)
Italy
Phone: +39 0422 4131

Customer Care Technical Support

email: techservice.dls@delonghigroup.com

Document

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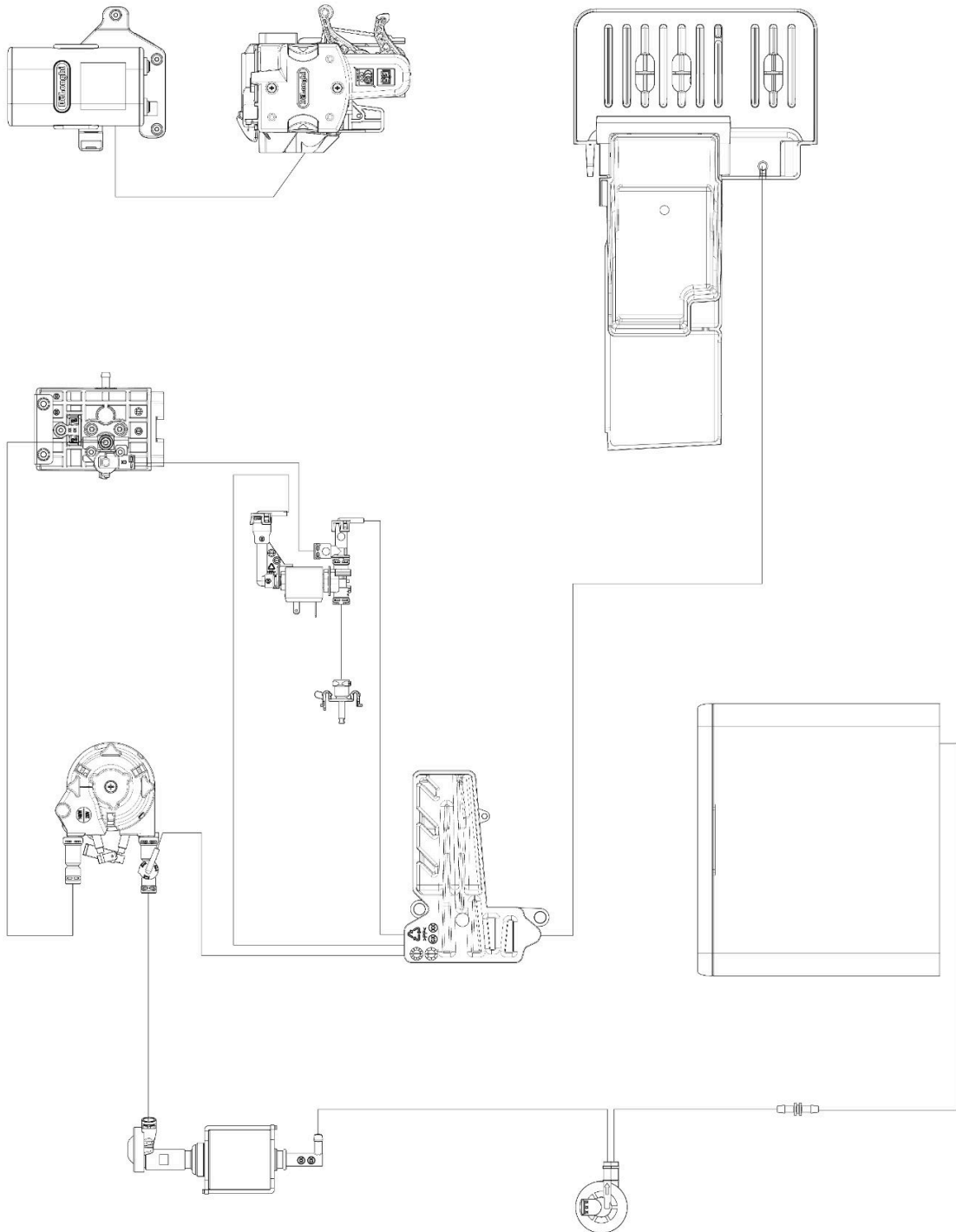
Table of Contents

- Table of Contents..... 3**
- Technical Data.....4**
- Hydraulic Diagram.....5**
- Wiring Diagrams..... 6**
 - Practical Outline (INT Version)..... 6
 - Theoretical Outline (INT Version)..... 7
- Working Principle.....8**
 - Micro-Switches, Sensors and Solenoid Valves..... 8
 - Hot Coffee Preparation..... 10
 - Cold Coffee Preparation..... 11
 - Hot Water Preparation..... 12
 - Milk Froth Preparation (for both LatteCrema Hot and LatteCrema Cool)..... 13
- Test Mode..... 14**
 - Access to the Test Modes..... 14
 - Load Test Mode..... 15
 - Display Test Mode..... 16
 - Reset Encoder..... 17
 - Statistics Mode..... 18
- Appliance Diagnostics..... 20**
 - Tests Executions from the Load Test Mode..... 20
 - Coffee Circuit Flow Activation..... 20
 - Hot Water and Steam Flow Activation..... 20
 - Electrical Checks Directly on the Components..... 20
 - Heating Element Resistance Check..... 20
 - Resistance/Temperature Characteristics for the NTC Sensor..... 20
 - Ground Check Point for the Appliance..... 21
 - Hot Coffee Temperature Test..... 22
 - Cold Brew Coffee Temperature Test..... 23
 - Hot Frothed Milk Consistency and Temperature Test..... 25
 - Cold Frothed Milk Consistency and Temperature Test..... 26

Technical Data

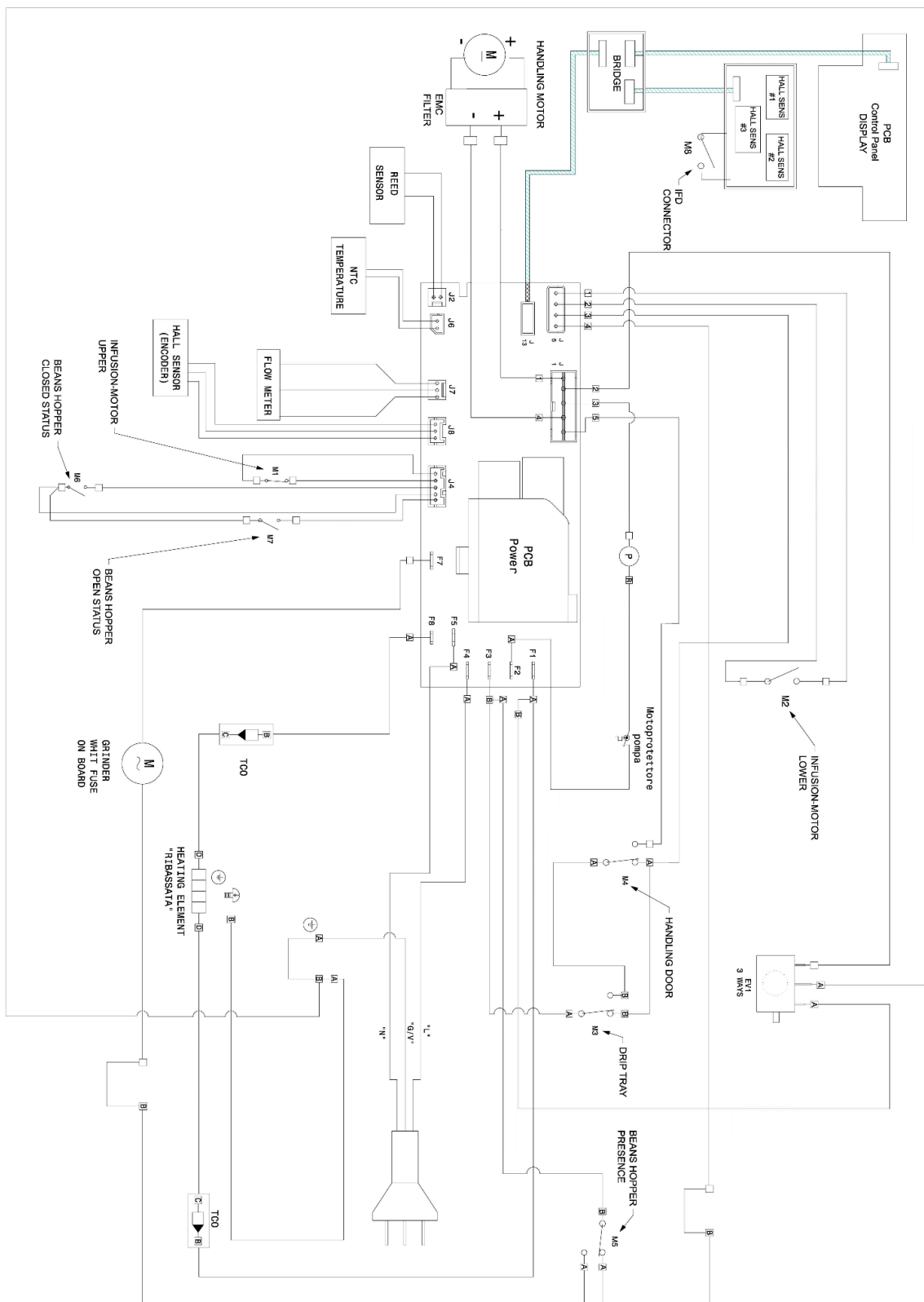
GENERAL INFORMATION	
Voltage - Frequency - Input Power	220-240V ÷ 50-60Hz ÷ 1450W
Stand-by Button OFF	≈ 0.25Wh
COMPONENTS	
Pump	230Vac ÷ 48W ÷ 15Bar
Solenoid Valve (EV1)	230Vac
Grinder Motor	230Vac
Transmission Motor	230Vdc with position encoder
THERMOBLOCK	
Temperature probe	NTC sensor
Thermal Fuse TCO	192°C
Heating Element	230Vac ÷ 1400W

Hydraulic Diagram

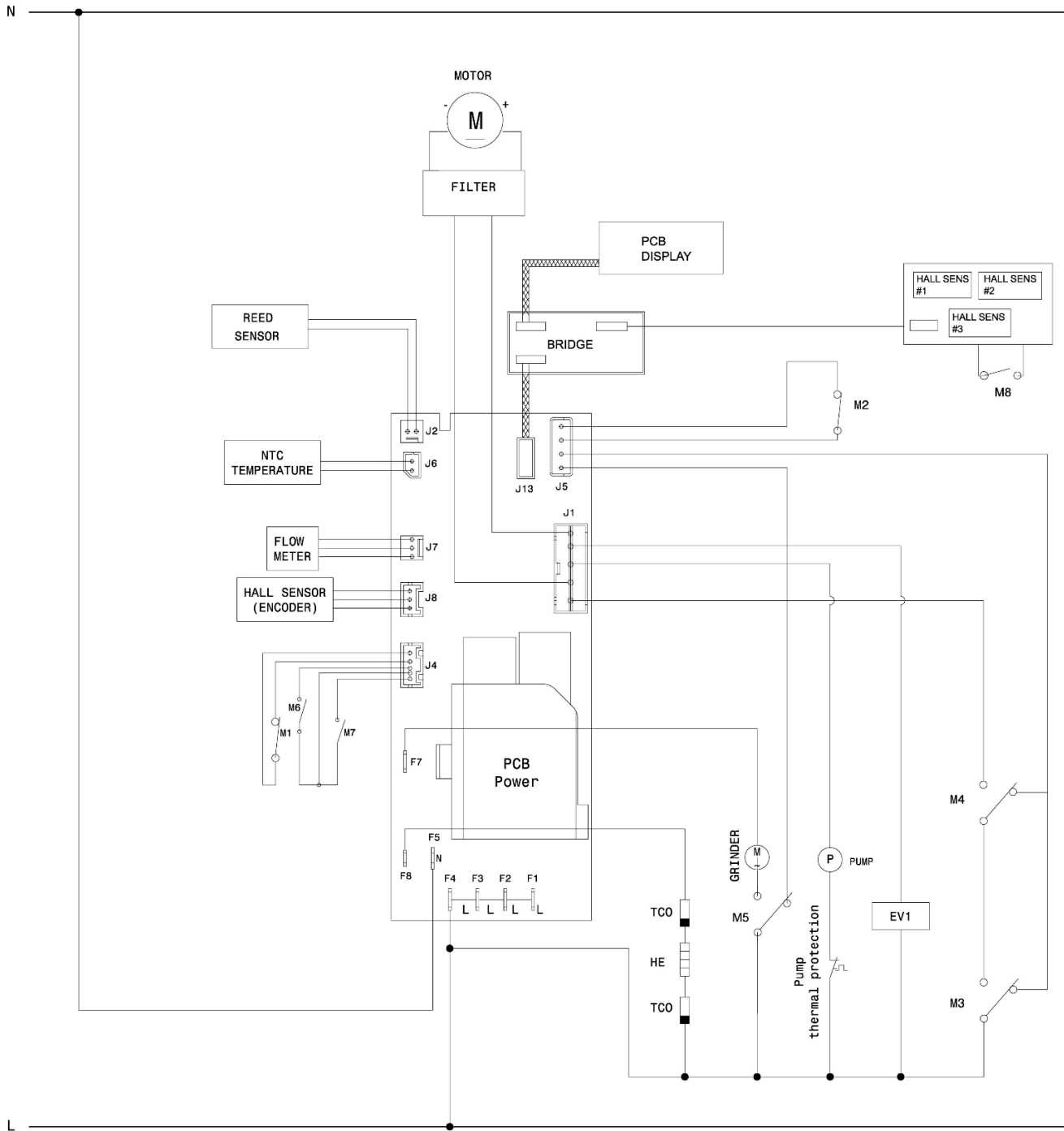


Wiring Diagrams

Practical Outline (INT Version)



Theoretical Outline (INT Version)



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)

Working Principle

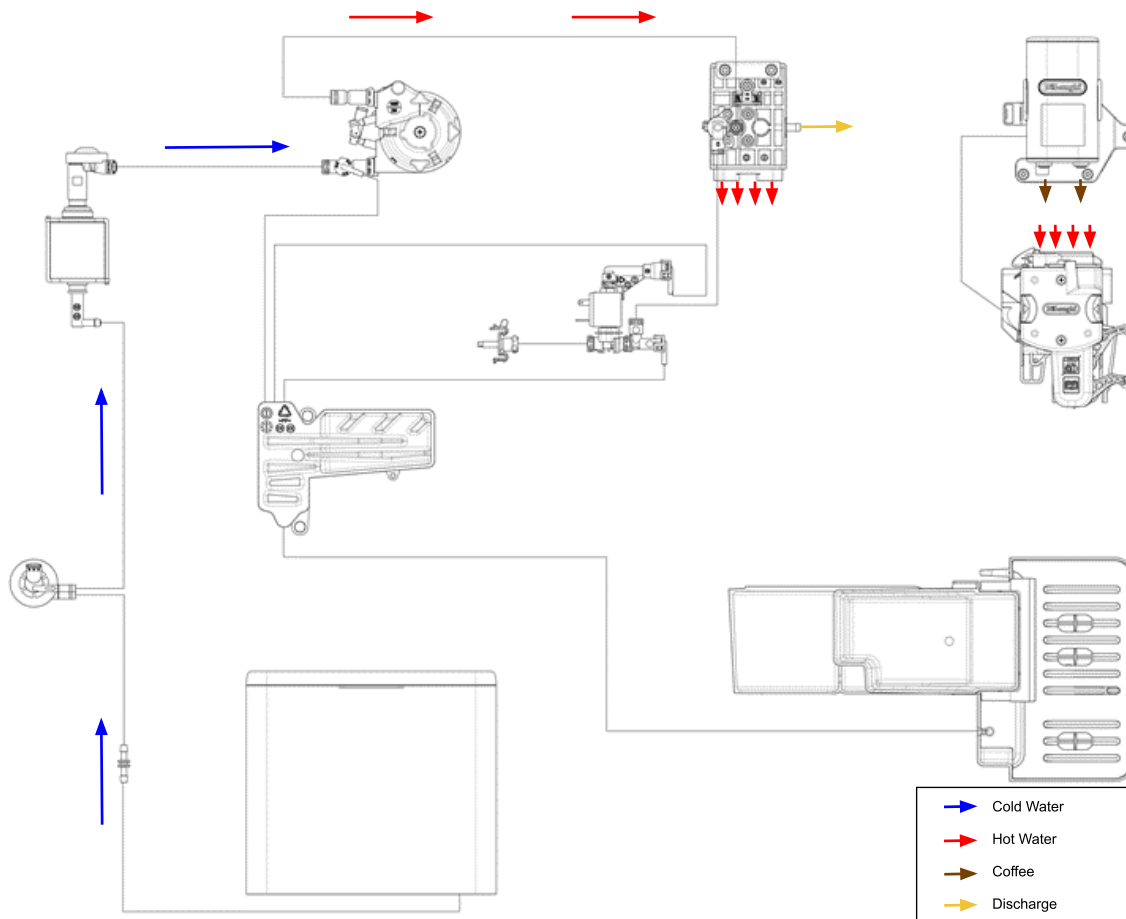
Micro-Switches, Sensors and Solenoid Valves

Micro Switches	Function	Logic
M1 = Upper Micro Switch	Detects when the brewing unit is on top position.	“NC”, it opens when the brewing unit is in top position.
M2 = Lower Micro Switch	Detects when the brewing unit is on down position.	“NO”, it closes when the brewing unit is in down position.
M3 = Drawer Micro Switch	Detects when the drip tray is in the correct position.	Change-over micro switch. When the drip tray is inserted: • The contact for the drip tray detection is OPEN; • The contact for the transmission motor power supply is CLOSED.
M4 = Service Door Micro Switch	Detects when the service door is in the 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 Micro Switch	Detects when one of the beans containers is present in 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 Micro Switch	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 Micro Switch	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 Micro Switch	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) is attached to the nozzle.

Solenoid Valve	Function	Logic
EV1 = 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 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
Reed Sensors for accessories detection	Allows the machine to detect which accessory (hot water spout, milk jug) is attached to the machine.	
Hall Sensor Encoder	Detects the rotations of the transmission motor.	

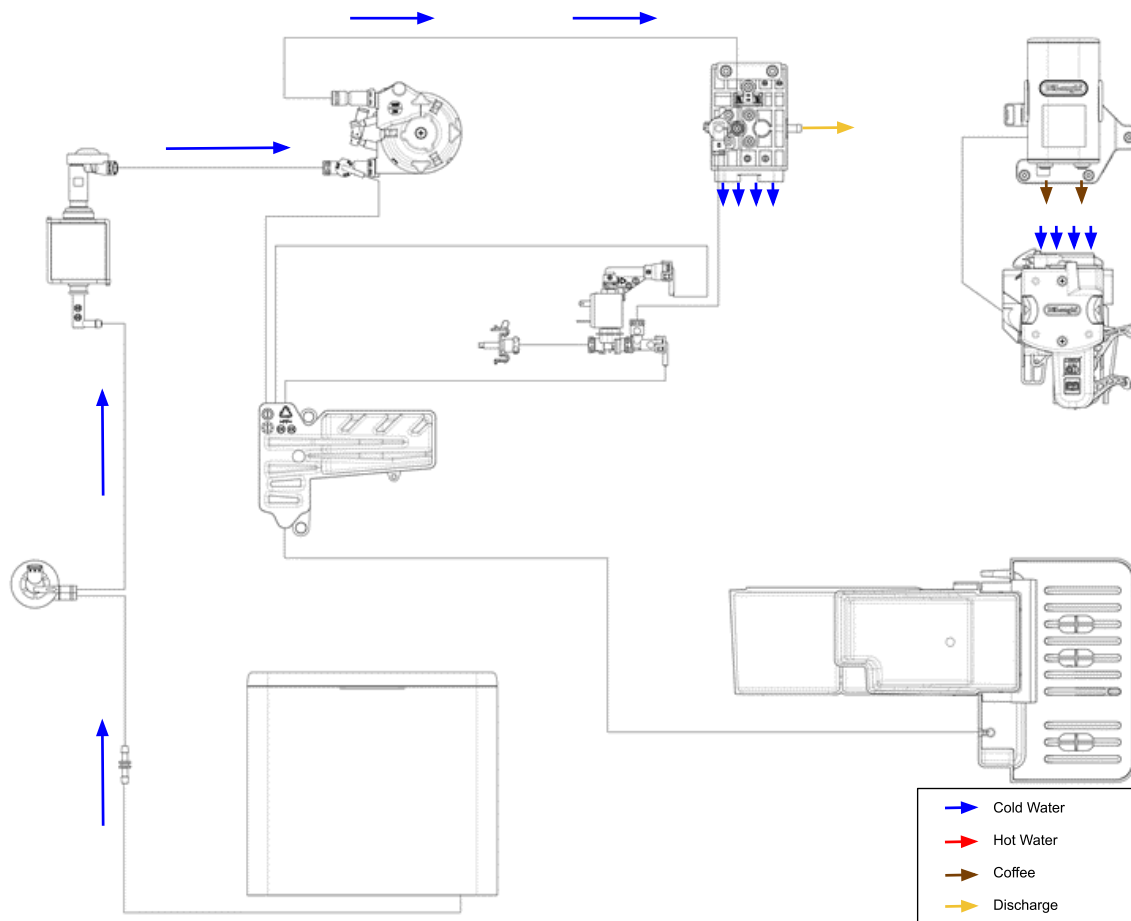
Hot Coffee Preparation



Hot Coffee Preparation Steps:

1. The Thermoblock is **activated**.
2. The Grinder is activated for a certain amount of time (based on the coffee taste selection).
3. The Brewing Unit moves to the mechanical valve.
4. The Pump is activated for a couple of seconds for pre-infusion.
5. The Pump is activated in continuous mode to deliver hot coffee.
6. The Pump stops, the Thermoblock turns OFF.
7. The Brewing Unit 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 Brewing Unit moves back to the "Ready to Use" position.

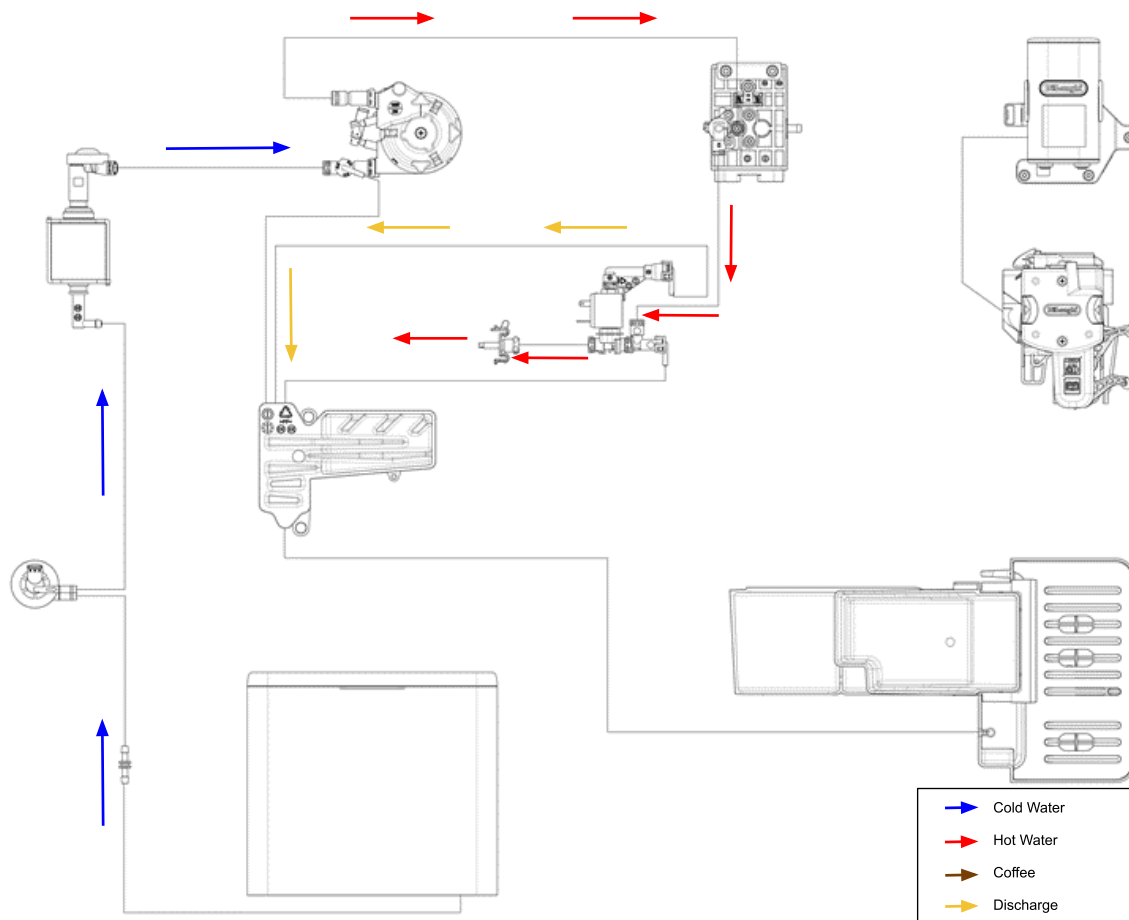
Cold Coffee Preparation



Cold Coffee Preparation Steps:

1. The Grinder is activated for a certain period of time (based on the coffee taste selection).
2. The Brewing Unit moves to the mechanical valve.
3. The Pump is activated in very slow pulsing mode for a certain period of time to brew the coffee. During this phase the Thermoblock is OFF.
4. The Brewing Unit moves away from the mechanical valve and releases the coffee pod.
5. The Mechanical Valve discharges the excess of water/coffee to the grounds container.
6. The Brewing Unit moves back to the "Ready to Use" position.

Hot Water Preparation

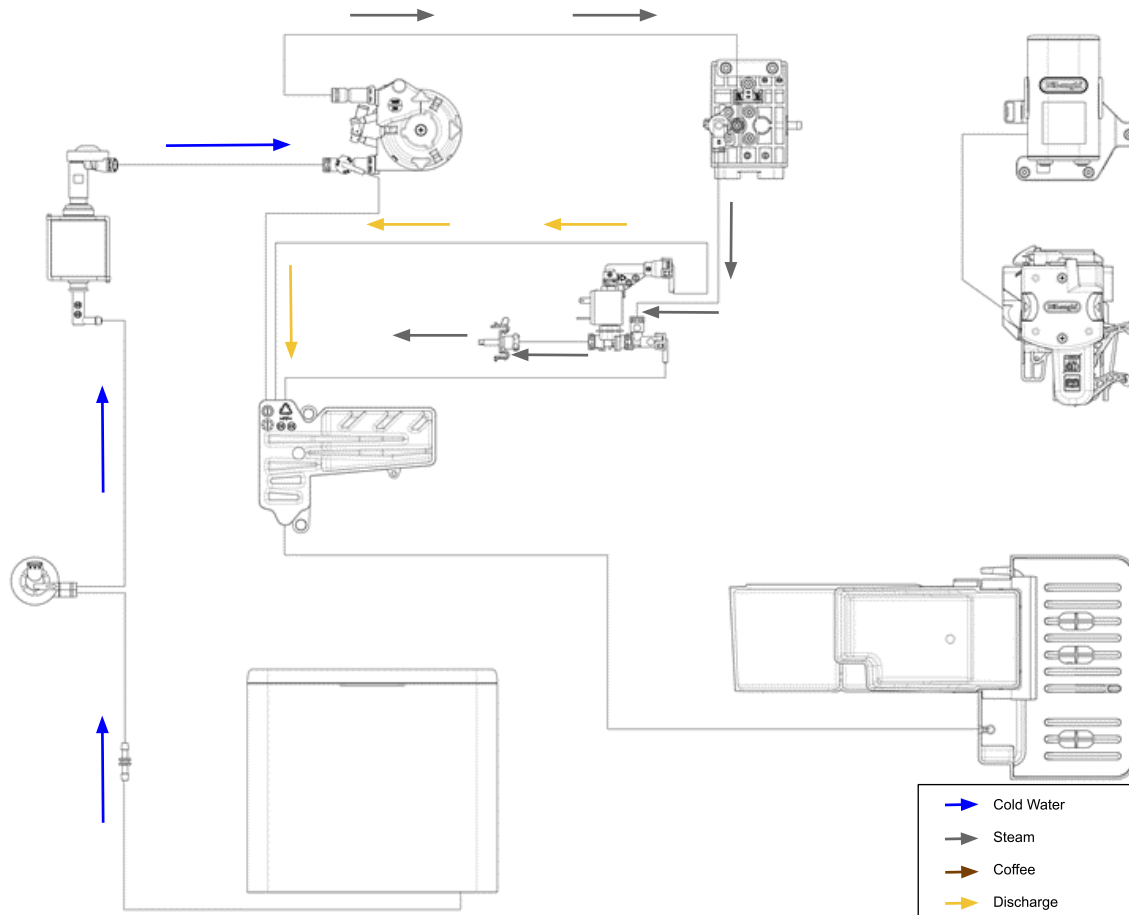


Hot Water Preparation Steps:

1. The EV1 Solenoid Valve is activated.
2. The Thermoblock is activated.
3. The Pump is activated in fast pulsing mode for a certain amount of time.
4. The hot water is delivered through the Hot Water Spout attached to the nozzle.
5. The Pump stops, the EV1 Solenoid Valve and the Thermoblock are deactivated.
6. The residual water is discharged by the EV1 Solenoid Valve into the drip tray.

IMPORTANT NOTICE: This function can be activated only if the Hot Water Spout is attached to the nozzle.

Milk Froth Preparation (for both LatteCrema Hot and LatteCrema Cool)



Milk Froth Preparation Steps:

1. The EV1 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 amount of time.
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 EV1 Solenoid Valve and the Thermoblock are deactivated.
6. The residual steam and pressure are discharged by the EV1 Solenoid Valve into the drip tray.

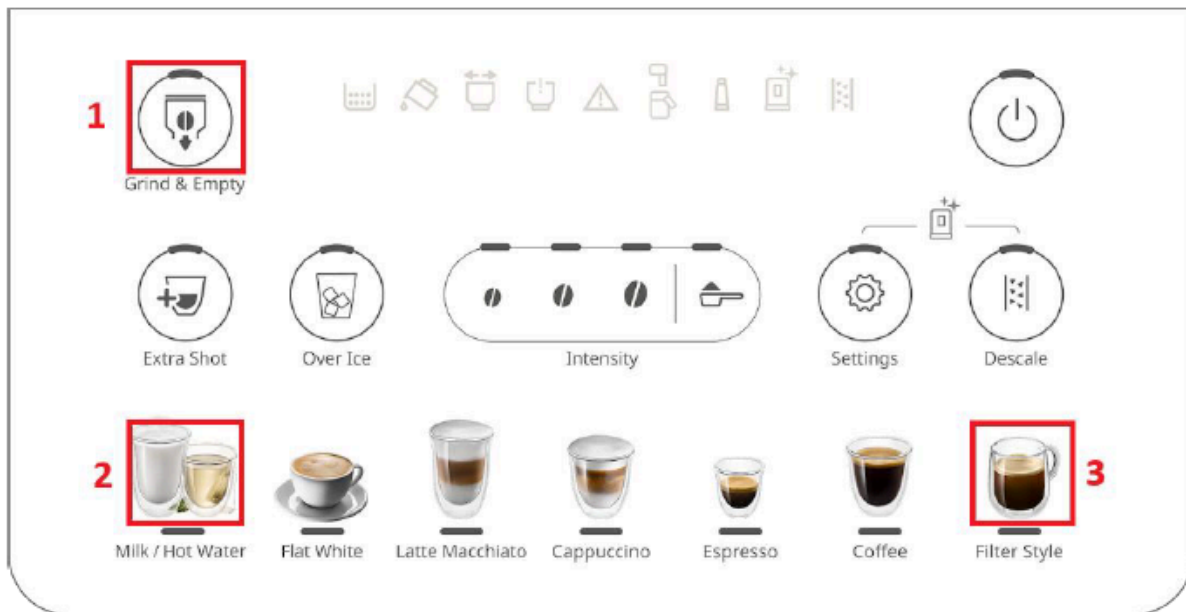
IMPORTANT NOTICE: This function can be activated only if one of the Milk Jugs (LatteCrema Hot or LatteCrema Cool) is attached to the nozzle.

Test Mode

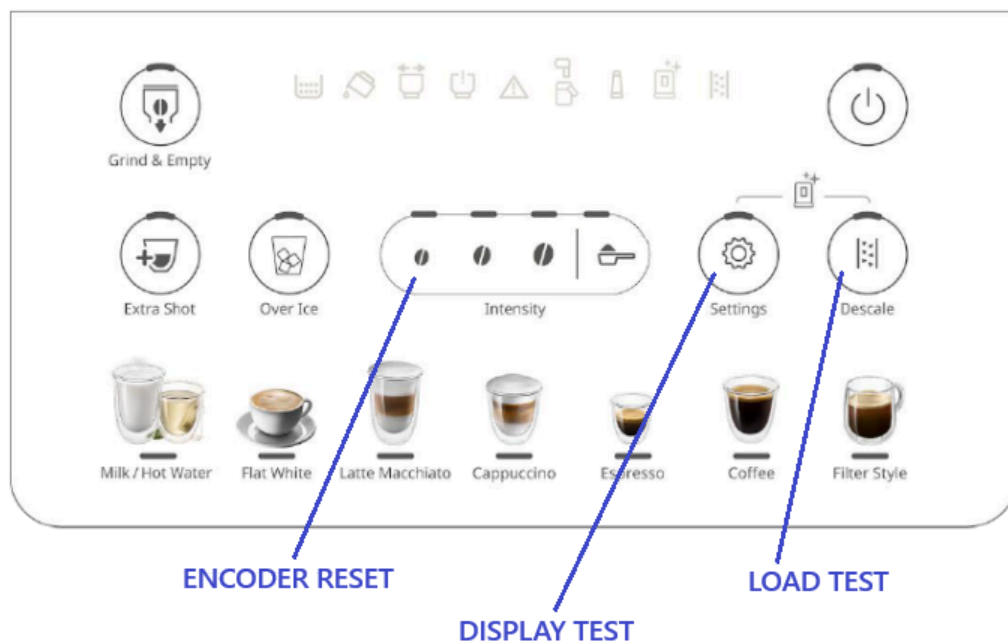
Access to the Test Modes

To activate the **Test Modes**, proceed as follows:

1. The appliance must be plugged in and in stand-by mode.
2. Extract the **drip tray**. The drip tray alarm will light up.
3. Press in sequence the buttons shown in the image below:

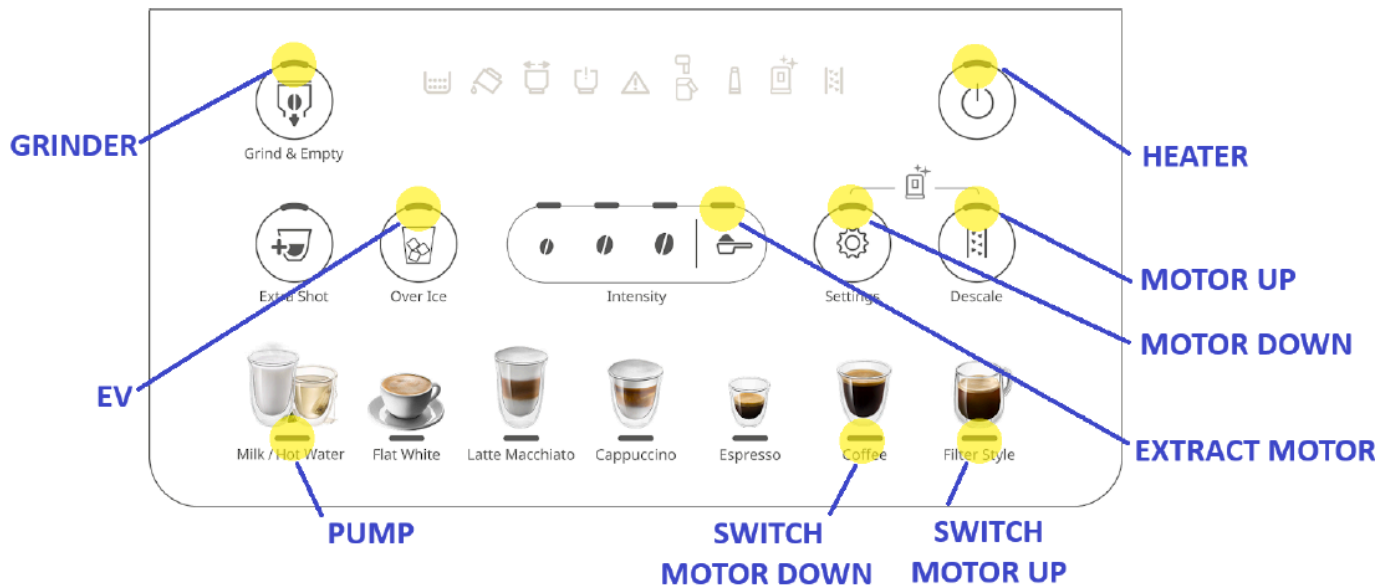


4. Insert the **drip tray**.
5. Select the desired test mode:



Load Test Mode

After having accessed the test modes as previously explained, select the **LOAD TEST** (Descaler button) option to access the **Load Test Mode**. Press one of the icons as shown in the next image to activate the relative load:



LED legend:

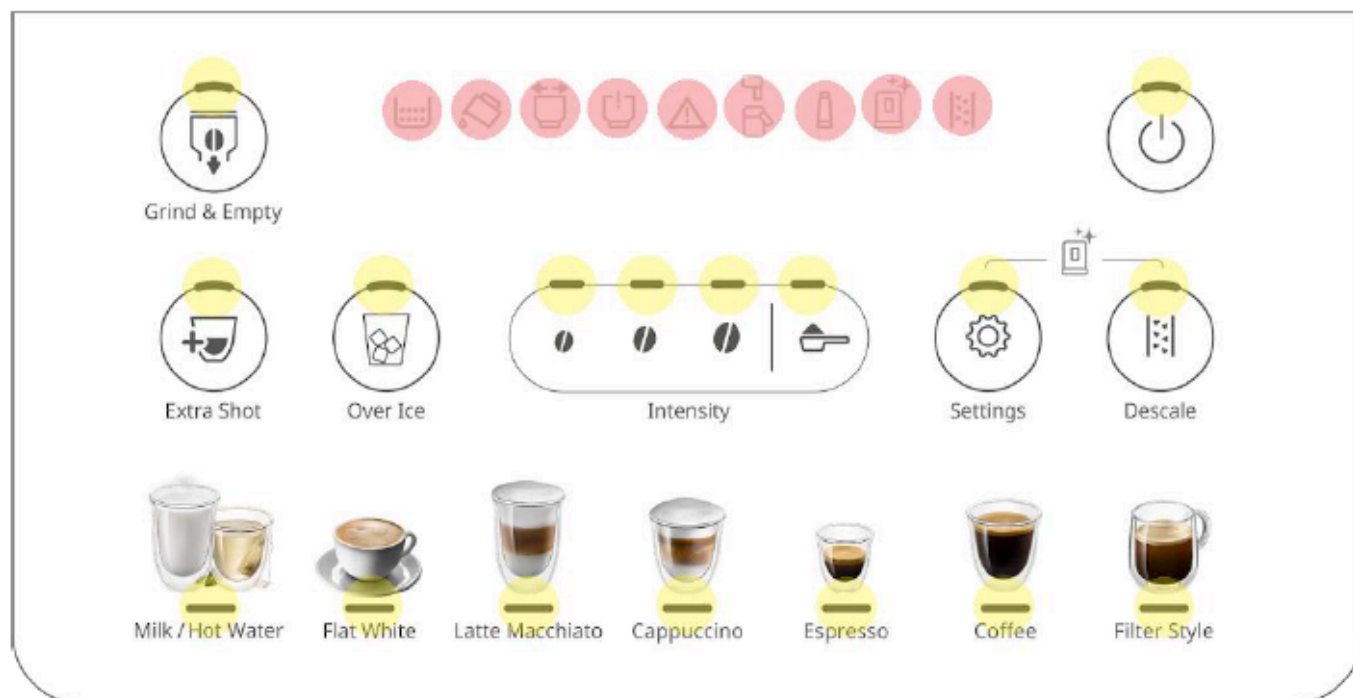
- Steady ON: available functions.
- Slow blinking: active load.

Please Note:

- In case the **drip tray** is not inserted, no loads will be activated.
- In case the **water tank** is not present, the pump won't be activated.

Display Test Mode

After having accessed the test modes as previously explained, select the **DISPLAY TEST** (Settings button) option to access the **Display Test Mode**:



During the **Display Test Mode**, all the LEDs are ON. When a button is pushed, a beep is emitted to confirm that the input has been received.

IMPORTANT NOTICE: Once the **Display Test Mode** has been performed in the appliance, the machine is set back to “**first usage**”, therefore it will ask again for:

- the first hydraulic circuit filling.
- the water softener filter installation.

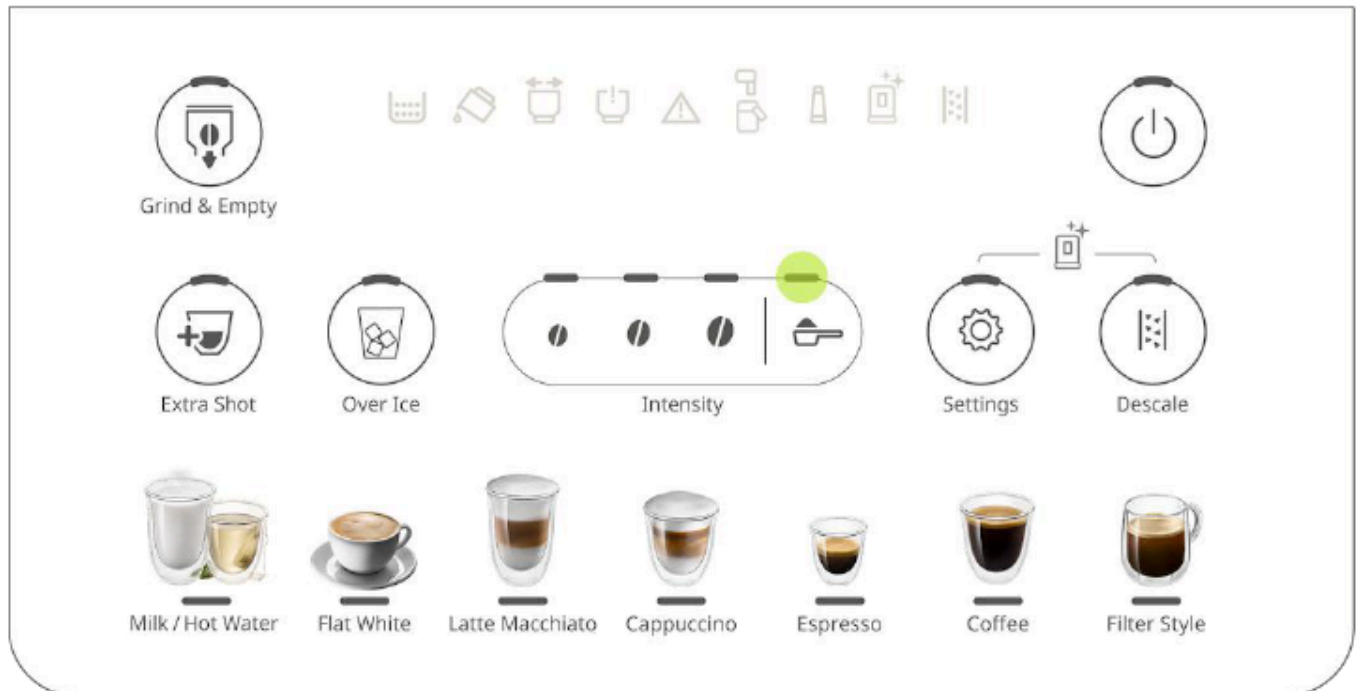
IMPORTANT NOTICE: In case the machine is reset to “**first usage**” through the **Display Test Mode** or by replacing the main power PCB, it is recommended to provide the user with a new **Total Hardness Test Indicator Paper** (P/N **5532110300**):



Thanks to this item, the customer has the opportunity to properly set the appliance according to the real water hardness in use with the coffee machine.

Reset Encoder

After having accessed the test modes as previously explained, select the **RESET ENCODER** (First Intensity button) option to access the **Encoder Reset** function:



LED legend:

- Slow blinking: Reset in progress.
- Steady ON: Reset performed.

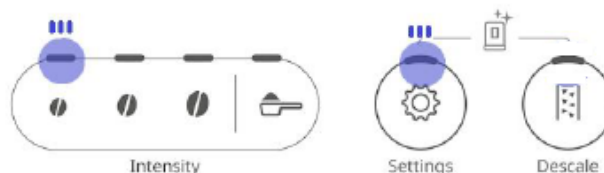
Statistics Mode

The appliance allows the reading of the statistics data to understand exactly how the machine operated along the time. To access the **STATISTICS MODE**:

- Make sure the appliance is ready to use (i.e. in ready-for-coffee mode).

- Hold   pressed for at least 5 seconds.

The LEDs blink slow to confirm the STATISTICS MODE:



Press the desired button to display the corresponding statistic data, according to the table:

Statistics	Selection Button
Number of descales	Descale
Litres of water used	Milk/Water (1° beverage)
Number of filters installed	Flat White (2° beverage)
Number of milk carafe cleaning cycles	Latte Macchiato (3° beverage)
Number of milk based beverages	Cappuccino (4° beverage)
Number of coffee beverages	Espresso (5° beverage)
Number of other beverages	Filter / Cold Brew (7° beverage)

After having pressed the desired button, the appliance will display the corresponding statistic value with the sequential blinking of the below lights:



IMPORTANT NOTICE: Icon **lits ON** at the beginning and turns **OFF n-times** to display the corresponding statistic value. If the value is 0, only a short beep is emitted for that digit.

Example: To display a total amount of **104** coffee beverages, the appliance will display:

1. Icons  **lit ON** (in red) to advise which icons will be involved on the count.
2. Icon  blinks once.
3. The machine emits a long beep to advise that the second value is 0 (icon  stays **lit OFF**).
4. Icon  blinks 4 times.

To exit the statistics mode, press the SETTINGS button again or wait for 120 seconds without operating on the machine. The appliance will come back to the ready to use mode.

Appliance Diagnostics

Tests Executions from the Load Test Mode

Coffee Circuit Flow Activation

To check the operation of the coffee circuit, proceed as follows:

1. Move the brewing unit to the top limit position (i.e. to the mechanical valve).
2. Activate the pump.

The water flows through the flowmeter, the Thermoblock, the mechanical valve, the brewing unit and comes out from the coffee spouts.

Hot Water and Steam Flow Activation

To check the operation of the hot water and steam circuit, proceed as follows:

1. The brewing unit must not be in the top limit position (i.e. to the mechanical valve).
2. Activate the solenoid valve.
3. Activate the pump.

The water flows through the flowmeter, the Thermoblock, the mechanical valve's by-pass and the solenoid valve. Finally, the hot water comes out from the Hot Water Spout connected to the IFD nozzle.

IMPORTANT NOTICE: The **Hot Water Spout** accessory must be connected to the coffee machine to allow the manual activation of the solenoid valve.

Electrical Checks Directly on the Components

Heating Element Resistance Check

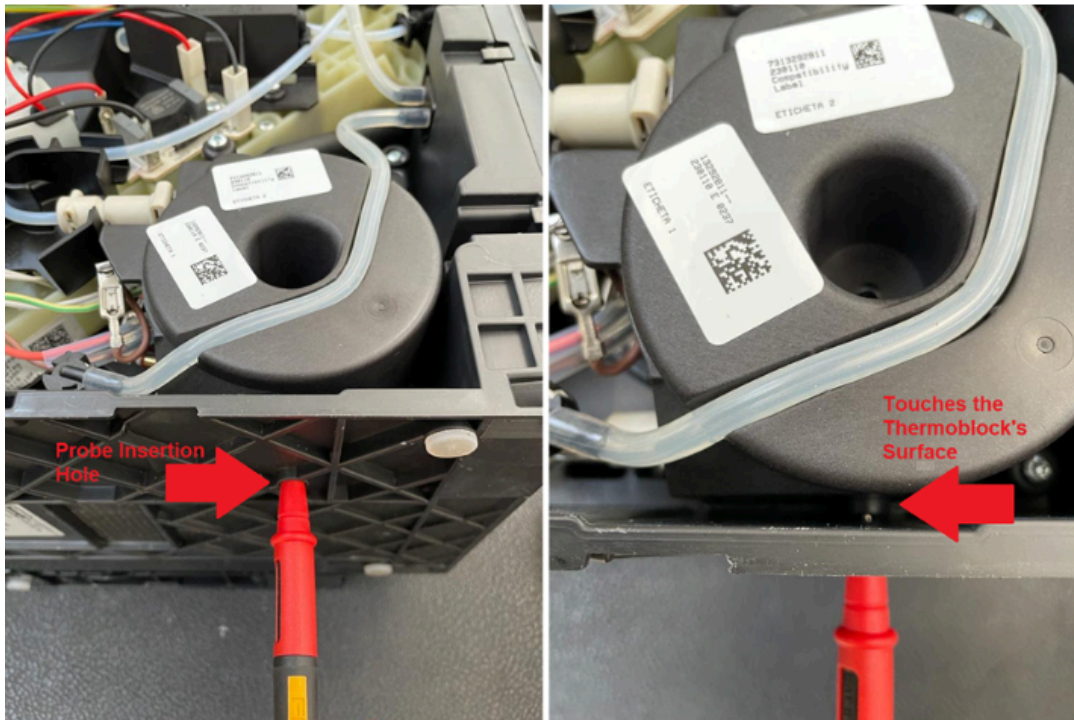
- **Thermoblock resistance value:** $\approx 38 \Omega$

Resistance/Temperature Characteristics for the NTC Sensor

TEMP. °C	MINIMUM k Ω	NOMINAL k Ω	MAXIMUM k Ω	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

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 picture below:



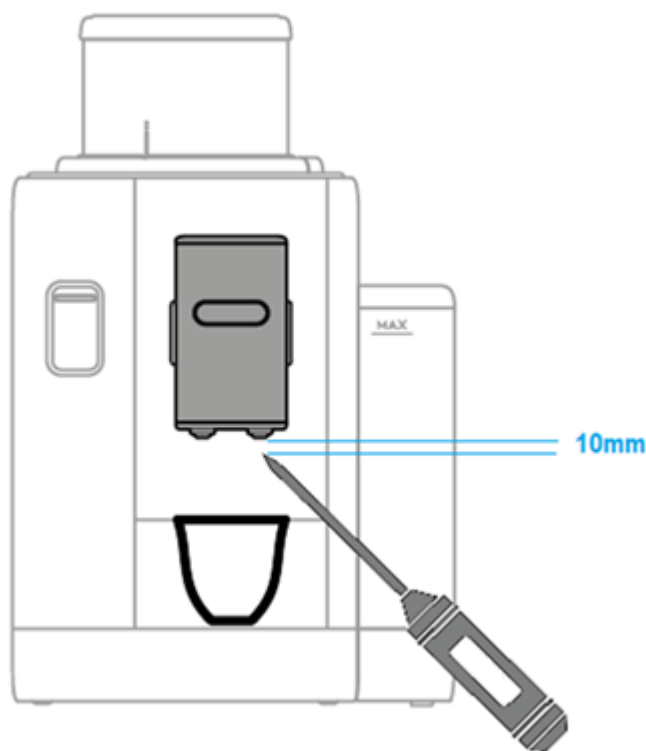
Hot Coffee Temperature Test

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

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

1. Turn the appliance ON.
2. Set the **medium temperature** profile, as explained in the user manual.
3. Run 1-2 rinse cycles to warm up the hydraulic circuit.
4. Select to prepare an **ESPRESSO COFFEE**, setting the coffee size in the cup to the maximum possible amount. (refer to the user manual for more details)(*).
5. Start the coffee preparation.
6. Wait until at least 20 ml of coffee has been delivered into the cup.
7. Measure the coffee flow temperature at about $2 \div 10$ mm from the coffee spout, as shown in the picture below:



The **optimal indicative temperature measurement** should be $83^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for the **medium temperature profile** set in the machine.

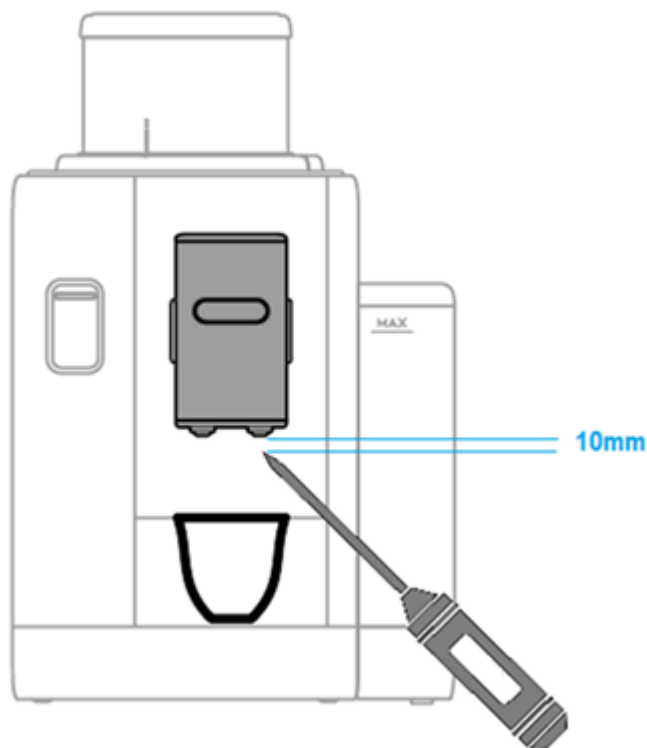
(*)**IMPORTANT NOTICE**: At the end of the test, make sure to restore the cup size originally set by the customer.

Cold Brew Coffee Temperature Test

As the machine is using the same circuit for both the hot and the cold coffee drinks preparations, the Cold Brew coffee is not delivered with ambient temperature water, but **by keeping the Thermoblock OFF starting from an initial set point of at least 75°C**, which makes the coffee brewed to be warm. The “Cold Brew” effect is then achieved when the coffee gets in touch with the ice cubes that must be added to the cup before the preparation.

To make sure that the cold brew preparation is satisfying the temperature specifications, proceed with the test described in the steps below:

1. Turn the appliance ON.
2. Set the medium temperature profile, as explained in the user manual.
3. Select to prepare a **COLD BREW DRINK** (refer to the user manual for more details).
4. Add **6 ice cubes** (prepared with the ice cube tray with spare part number **5313281401**) to the glass in which the cold brew drink is being delivered.
5. Start the coffee preparation.
6. Wait until at least 20 ml of coffee has been delivered into the cup.
7. Measure the coffee flow temperature at about $2 \div 10$ mm from the coffee spout, as shown in the picture below:



The **optimal indicative temperature measurement** is about $60^{\circ}\text{C} \pm 5^{\circ}\text{C}$ at the beginning of the brewing process, and then it slowly decreases up to $45^{\circ}\text{C} \pm 3^{\circ}\text{C}$ as the Thermoblock is OFF during the brewing process.

At the end of the cold brew drink preparation, measure the temperature in the glass:



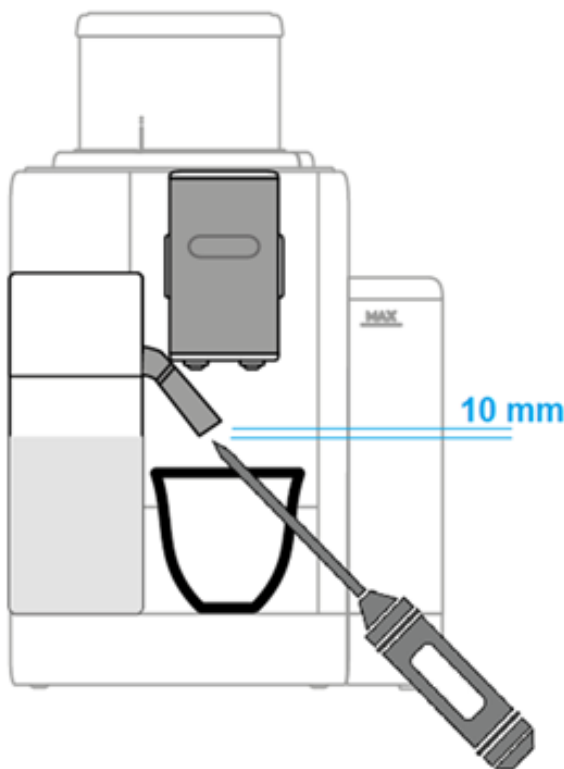
The **optimal indicative temperature measurement in the glass (with 6 ice cubes)** after about 10 seconds should be **$12^{\circ}\text{C} \pm 3^{\circ}\text{C}$** .

Hot Frothed Milk Consistency and Temperature Test

A hot frothed milk consistency and temperature test can be required when the Service Engineer is receiving complaints from the end user about the quality or the temperature of the hot milk drinks.

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

1. Turn the appliance ON.
2. Fill the milk jug with 200ml of semi-skimmed milk at a temperature of $5^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
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 the **HOT MILK DRINK** and wait until at least 80ml of frothed milk has been delivered into the container.
7. Measure the milk flow temperature during the delivery at about $2 \div 10$ mm from the spout, as shown in the picture below:



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

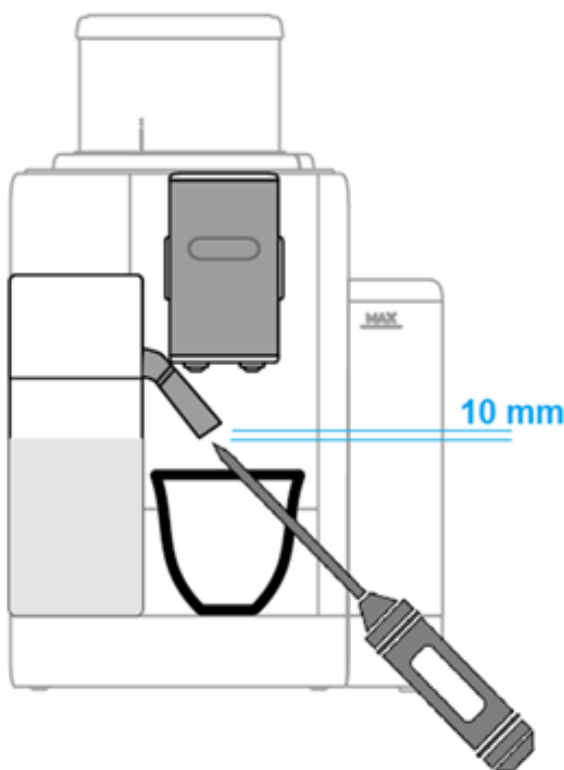
- **Frothed Appearance:** small bubbles without splashes.
- **Milk Temperature:** $64^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
- **Froth Amount:** 50% milk and 50% froth.

Cold Frothed Milk Consistency and Temperature Test

A cold frothed milk consistency and temperature test can be required when the Service Engineer is receiving complaints from the end user about the quality or the temperature of the cold milk drinks.

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

1. Turn the appliance ON.
2. Fill the milk jug with 200ml of skimmed milk at a temperature of $5^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
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 the **COLD MILK DRINK** and wait until at least 80ml of frothed milk has been delivered into the container.
7. Measure the milk flow temperature during the delivery at about $2 \div 10$ mm from the spout, as shown in the picture below:



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

- **Frothed Appearance:** small bubbles without splashes.
- **Milk Temperature:** $23,5^{\circ}\text{C} \pm 2,5^{\circ}\text{C}$.
- **Froth Amount:** 50% milk and 50% froth.