Data Sheet and Service Manual

CAM 510YY – TRUE BREW™

Date: 07.03.2023

1 Table of Contents

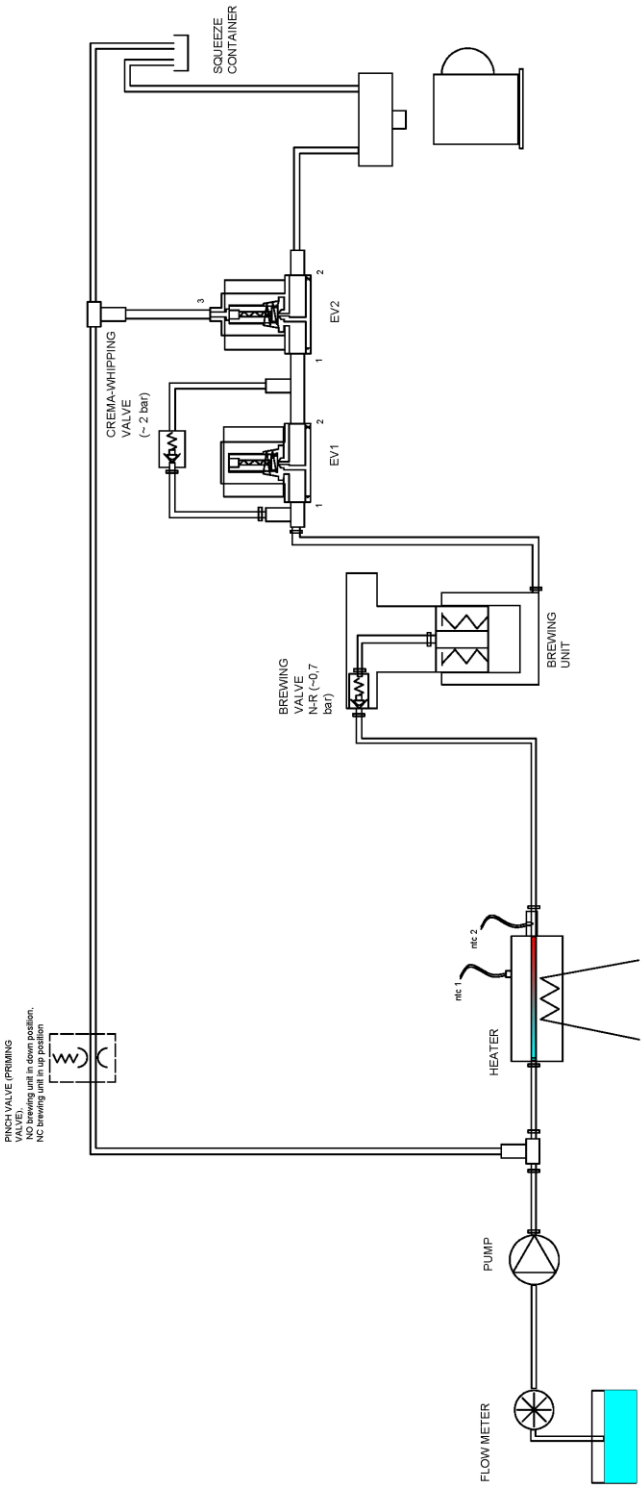
2 TECHNICAL DATA

Voltage – Frequency – Input Power	120V – 60Hz – 1500 W

COMPONENTS

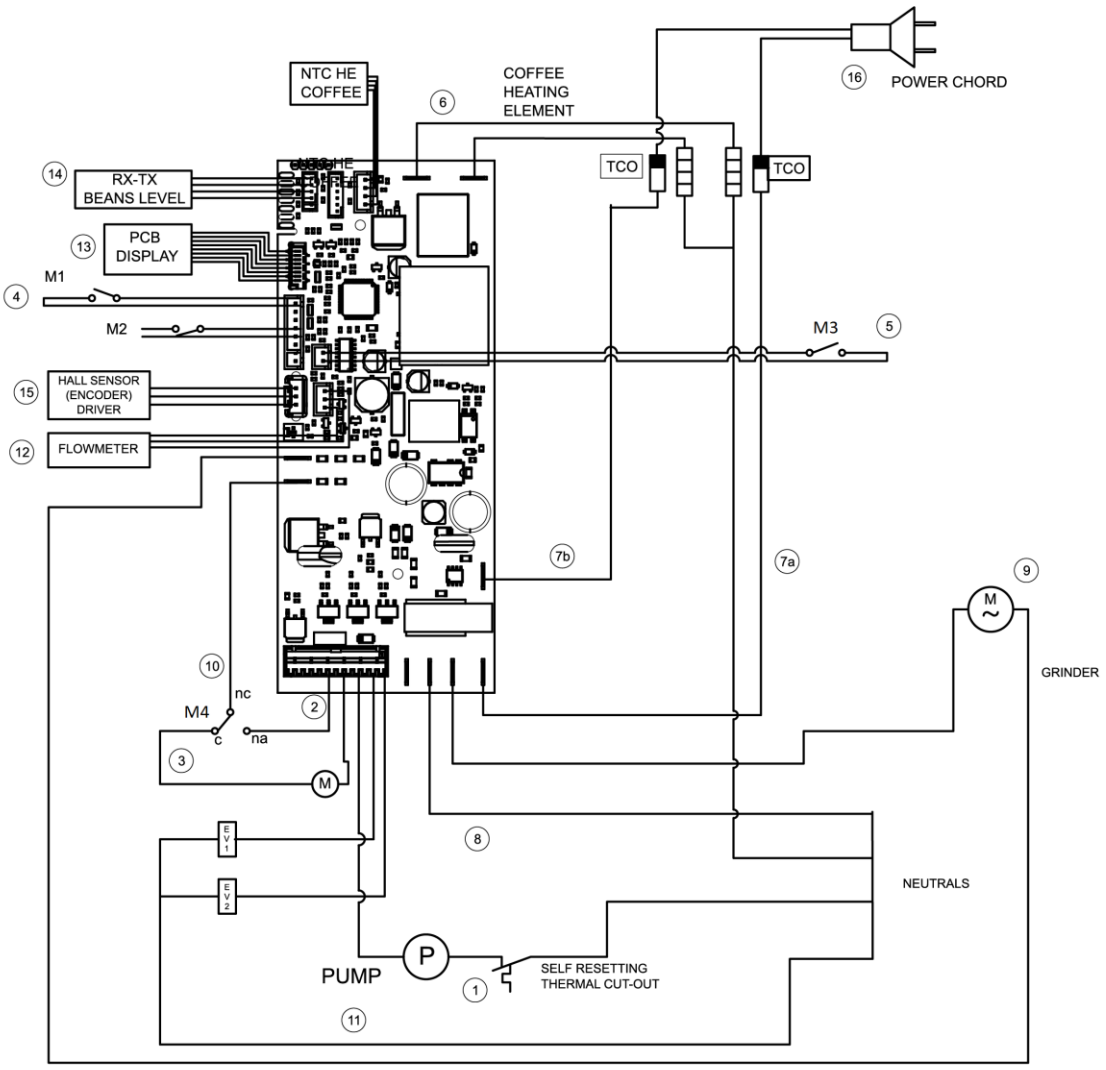
Pump	ARS 110/120V – 60Hz – 25W – 5Bar
Grinder motor	120VAC
Transmission motor	120VDC with position encoder
Solenoid valves EV1, EV2	120VAC
Coffee Thermoblock	
- Temperature probe	Double NTC sensor: set point + hot point
- Thermal fuse TCO	229°C – 15A
- Heating element	120 VAC – 1460W (730W + 730W)

3 HYDRAULIC DIAGRAM

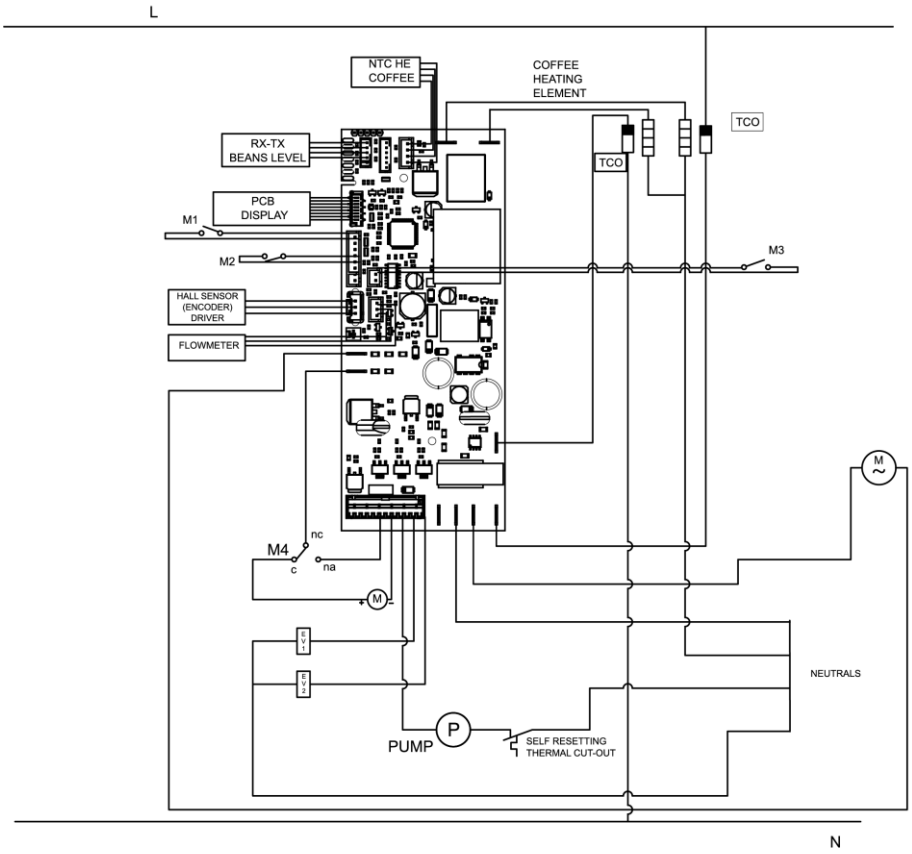


4 WIRING DIAGRAM

4.1 PRACTICAL OUTLINE



4.2 THEORETICAL OUTLINE



LEGENDA / LEGEND
M1 = GRUPPO ALTO - MICROSWITCH UPPER (GROUP INFUSION MOTOR)
M2 = GRUPPO BASSO - MICROSWITCH LOWER (GROUP INFUSION MOTOR)
M3 = SEGNALE CASSETTO FONDI - DRIP TRAY SENSOR
M4 = CASSETTO SQUEEZE SICUREZZA - SQUEEZE CONTAINER
EV1 = ELETTROVALVOLA A 2 VIE - 2 WAY SOLENOID VALVE
EV2 = ELETTROVALVOLA A 3 VIE - 3 WAY SOLENOID VALVE
L = FASE - PHASE/LIVE
N = NEUTRO - NEUTRAL
TCO = TERMOFUSIBILE - THERMAL CUT OFF
H.E. ELEMENTO RISCALDANTE - HEATING ELEMENT

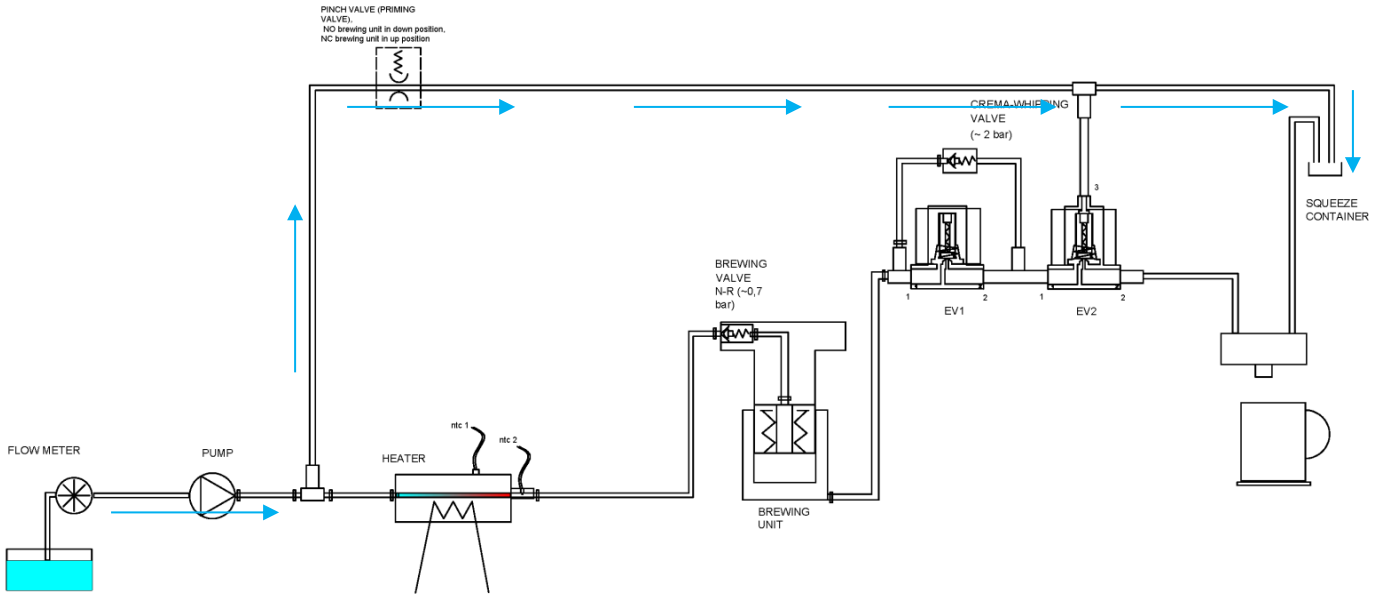
5 WORKING PRINCIPLE

5.1 MICROSWITCHES, SENSORS, SOLENOID VALVES AND MECHANICAL COMPONENTS

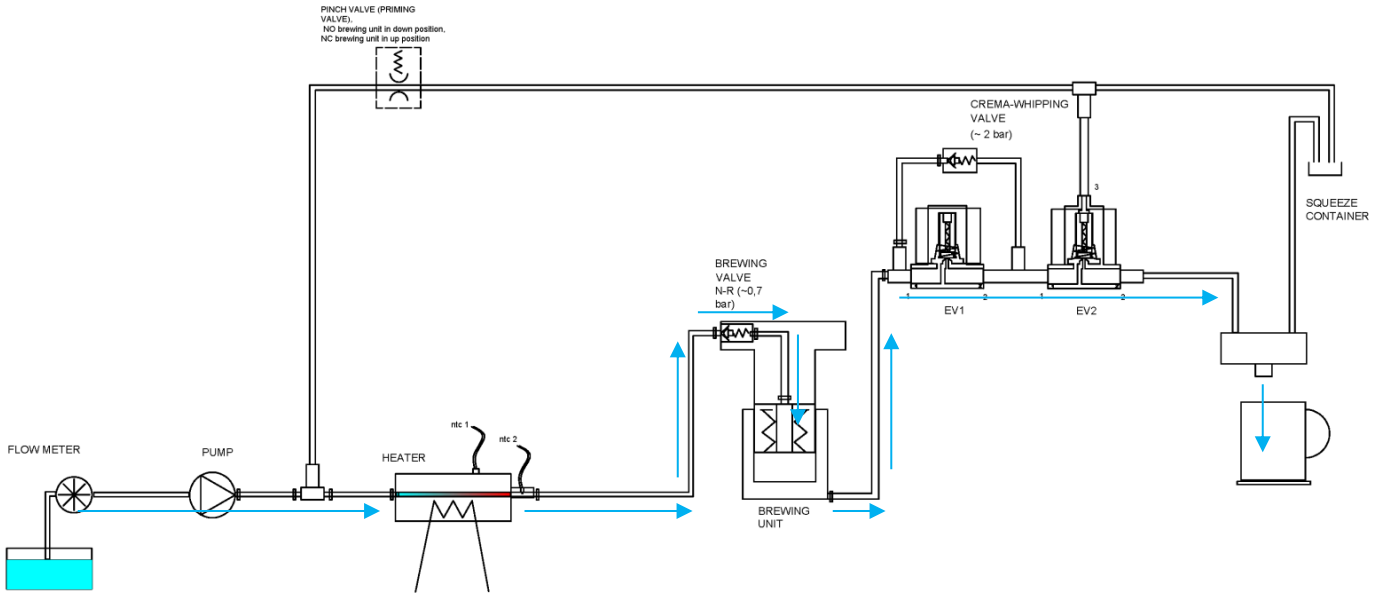
MICROSWITCHES	**Function**	**Logic**
M1 = UPPER MICROSWITCH	Detects when the infuser is on top position	"NO", it closes when the infuser is in top position
M2 = LOWER MICROSWITCH	Detects when the infuser is on down position	"NO", it closes when the infuser is in down position
M3 = GROUNDS CONTAINER MICROSWITCH	Detects when the grounds container is in correct position	"NO", it closes when the grounds container is in place
M4 = SQUEEZE CONTAINER MICRO SWITCH	Detects when the squeeze container is in correct position	Change-over micro switch. When the squeeze container is inserted: - the contact for the squeeze container detection is OPEN; - the contact for the transmission motor power supply is CLOSED.
EV1 = 2-WAYS SOLENOID VALVE	Switch between Drip Coffee preparation and Espresso Style preparation	- It opens when the machine prepares a Drip Coffee beverage. - It is closed when the machine prepares the Espresso Style beverage, thus making the coffee to flow through the Crema Whipping Valve.
EV2 = 3-WAYS SOLENOID VALVE	Manages the coffee delivery and the squeeze discharge	- It opens to deliver both Drip Coffee beverages and the Espresso Style beverage. - It closes when the coffee beverage delivery finishes and the coffee pod is squeezed to release water into the squeeze container
REED AND ENCODER	**Function**	**Logic**
HALL SENSOR ENCODER	Detects rotations of transmission motor	
BEANS SENSOR	Detects when the coffee beans run out	It has only the function to inform the user when the coffee beans are almost finished, it does not disable the grinder

MECHANICAL COMPONENTS	Function	Logic
PINCH VALVE	Allows the water circuit priming at the first ignition of the machine	"NO" when the brewing unit is in DOWN position to allow the water circuit filling. It closes when the brewing unit moves to the UP position, this happens when the flowmeter starts measuring water flow.
BREWING VALVE	It is located at the inlet of the mechanical valve. It is used to keep a pressure of about 0,7Bars (above the atmospheric pressure) into the Thermoblock	
CREMA WHIPPING VALVE	It is located at the outlet of the mechanical valve. It by-passes the EV1 solenoid valve and creates a pressure gap of about 2 Bars (above the atmospheric pressure) only during the Espresso Style preparation to allow the formation of the crema on top of the 3oz beverage	

5.2 WATER CIRCUIT PRIMING



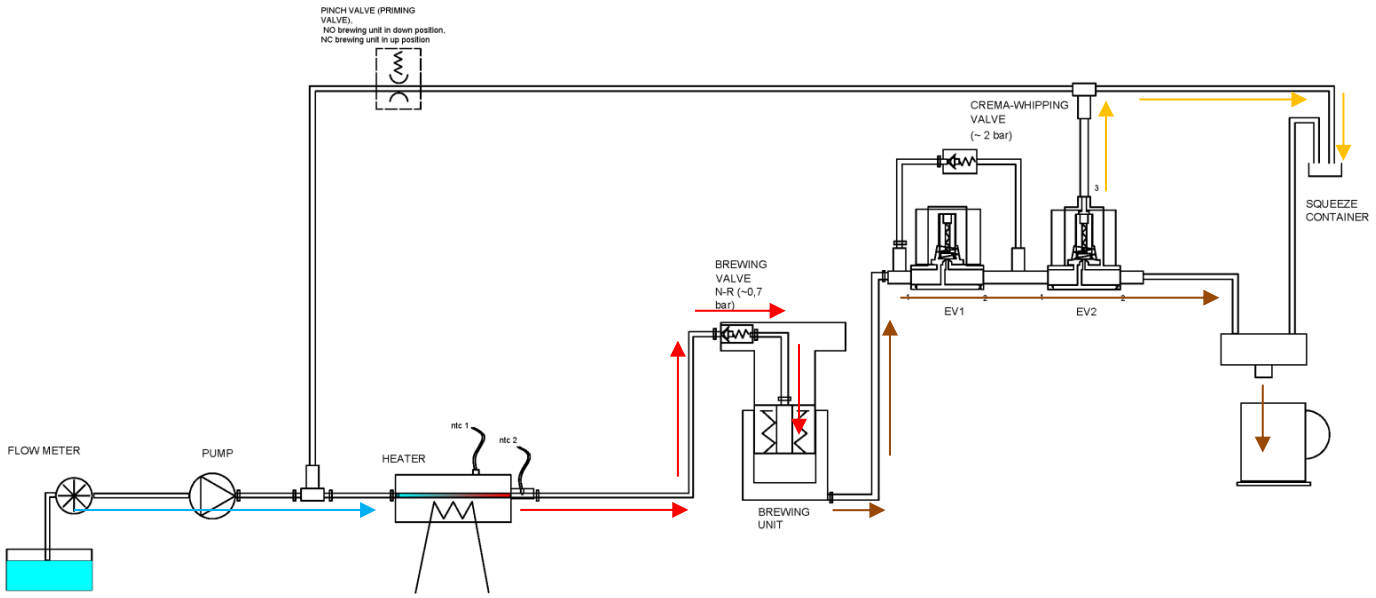
- After having turned the appliance ON for the first time and pressed the BREW button, the brewing unit is in DOWN position and the pinch valve is open to make the air in the circuit to flow to purge towards the squeeze container. This condition remains until the water starts flow into the circuit and the flowmeter starts to rotate because of the water flow.



- Once the flowmeter starts to measure the water flow, the brewing unit moves to the UP positon, thus closing the pinch valve. At the same time, EV1 and EV2 solenoid valves open and the machine

delivers about 3,5floz (100ml) of water from the coffee spouts. Then EV2 closes and the machine delivers about 3,5floz (100ml) of water in the squeeze container (7floz – 200ml in total).

5.3 DRIP COFFEE DELIVERY

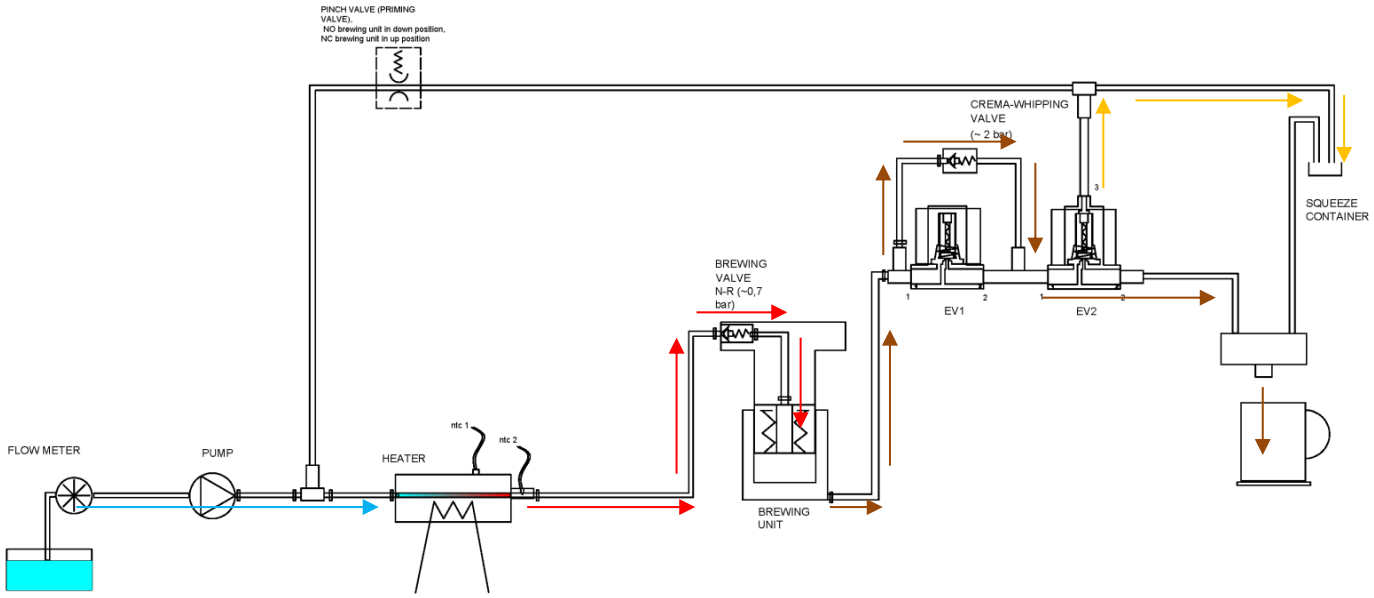


During a Drip Coffee recipe preparation:

- The **grinder** activates for a certain time to grind the proper amount of coffee into the brewing unit.
- Then the brewing unit moves towards the UP limit position, by **matching the mechanical valve but without pressing the UP limit switch**. In this way the coffee dose will not be pressed. **EV2** solenoid valve opens.
- The **pump** activates **in continuous mode for a few seconds** to perform the coffee **pre-infusion**.
- The **EV1** solenoid valve opens to allow the coffee to flow towards the coffee spouts.
- The **pump** then activates in **very fast pulsing mode** to perform the **Drip Coffee brewing**.
- The **pump** deactivates and the **EV2** solenoid valve closes.
- The **brewing unit** is moved to the **UP limit position** for a few seconds, this will allow to squeeze the coffee pods and discharge the residues of coffee mostly into the cup; then **EV1** solenoid valve closes only in little part into the squeeze container through the EV2 solenoid valve discharging hose.
- Finally the **brewing unit** moves back to the **DOWN limit position** to eject the used coffee pod, then it moves back in the “coffee ready” position under the grinder.

IMPORTANT NOTICE: Depending on the size of Drip Coffee beverage selected, the machine could perform multiple grindings and brewing, refer to paragraph 5.5 for more details.

5.4 ESPRESSO STYLE DELIVERY



During the Espresso Style recipe preparation:

- The **grinder** activates for a certain time to grind the proper amount of coffee into the brewing unit.
- Then the brewing unit moves towards the UP limit position, by **matching the mechanical valve and by pressing the UP limit switch** to tamp the coffee pod. Then the brewing unit is moving slightly back to leave a small space between the coffee pod and the mechanical valve.
- The **pump** activates **in continuous mode for a few seconds** to perform the coffee **pre-infusion**.
- The only **EV2** solenoid valve opens, in this way the coffee will flow towards the **crema whipping valve** first and finally towards the coffee spouts.
- The **pump** then activates in **very fast pulsing mode** to perform the **Espresso Style coffee brewing**.
- The **pump** deactivates and the **EV2** solenoid valve closes.
- The **brewing unit** is moved to the **UP limit position** for a few seconds, this will allow to squeeze the coffee pods and discharge the residues of coffee mostly into the squeeze container through the EV2 solenoid valve discharging hose.
- Finally the **brewing unit** moves back to the **DOWN limit position** to eject the used coffee pod, then it moves back in the “coffee ready” position under the grinder.

IMPORTANT NOTICE: The squeezing process at the end of the Espresso Style preparation will mostly discharge coffee residues into the squeeze container compared to the Drip Coffee beverages, therefore a large amount of Espresso Style beverage prepared will make the squeeze container to fill much quicker compared to the Drip Coffee beverages.

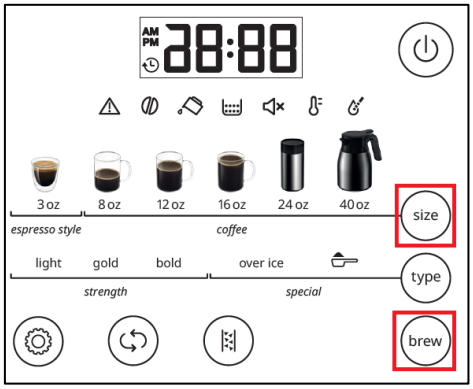
5.5 NUMBER OF CYCLES FOR EACH BEVERAGE PREPARATION

The below table resumes the number of grinding and brewing cycles required to prepare each type of beverages on TrueBrew coffee makers:

Coffee Beverage	Number of Grinding/Brewing Cycles
3oz (Espresso Style)	1
8oz	1
12oz	1
16oz	1
20oz	2
24oz	2
40oz	3

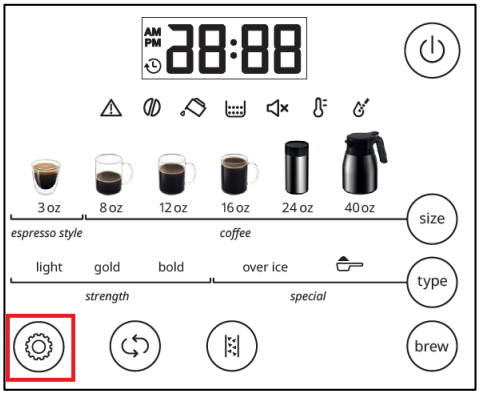
6 TEST MODE

To access the **Test Mode**, make sure the machine is in stand-by mode. Then, remove the drip tray and press at the same time the buttons **SIZE** and **BREW**:



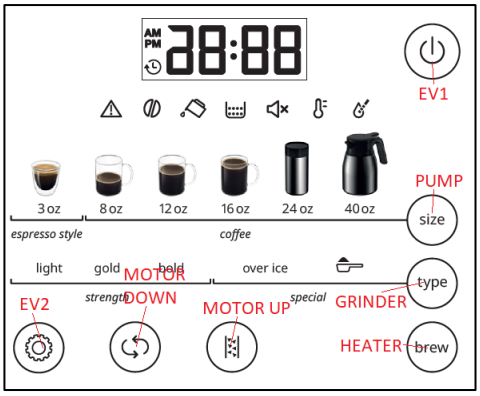
Release the buttons when the lights of the user interface will light up, then (within 5 seconds) insert the drip tray and select one of the following test options.

6.1 LOAD TEST MODE



After having accessed the test mode as indicated previously, press the **SETTINGS** button to access the **LOAD TEST MODE**.

The GENERAL ALARM will lit steady ON (the COFFEE BEANS will flash in case the beans hopper will be empty).

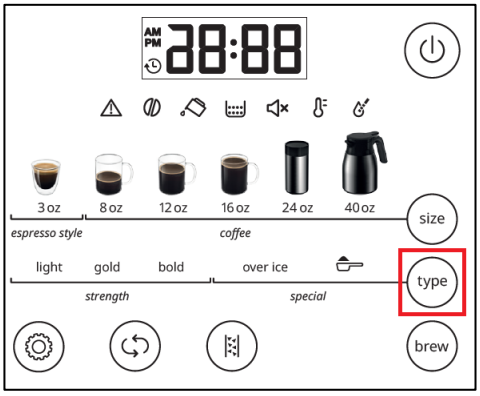


Press one of the icons as shown in the image to activate the relative load:

- **ON-Standby:** EV1 solenoid valve
- **SIZE:** Pump
- **TYPE:** Grinder
- **BREW:** Heater
- **DESCALE:** Motor UP (beep when UP limit switch is pressed)
- **ARROWS:** Motor DOWN (beep when DOWN limit switch is pressed)
- **SETTINGS:** EV2 solenoid valve

To quit the **LOAD TEST MODE**, disconnect the power cord for about 10 seconds.

6.2 DISPLAY TEST MODE



After having accessed the test mode as indicated previously, press the **TYPE** button to access the **DISPLAY TEST MODE**.

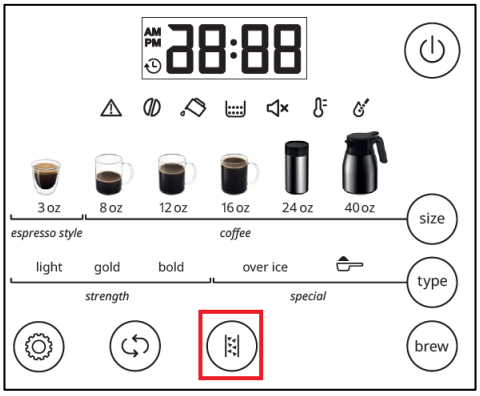
During the display test mode all the LEDs are OFF.

- By pressing the **SIZE** button, all the beverages size icons will illuminate.
- By pressing the **TYPE** button, all the coffee strength icons will illuminate.
- By pressing the **BREW** button, the ON-Standby button will illuminate.
- By pressing the **ON-STANDBY** button, the BREW button will illuminate.
- By pressing the **SETTINGS** button, all the top alarms icons and the DESCALE button will illuminate.
- By pressing the **ARROWS** button, all the top icons, the LCD display segments and the DESCALE button will illuminate.
- By pressing the **DESCALE** button, the ON-STANDBY and the BREW buttons will illuminate.

To quit the **DISPLAY TEST MODE**, disconnect the power cord for about 10 seconds.

IMPORTANT: The **DISPLAY TEST MODE** execution will put the appliance back to "**first use**", i.e. forcing it to ask again for the water circuit priming.

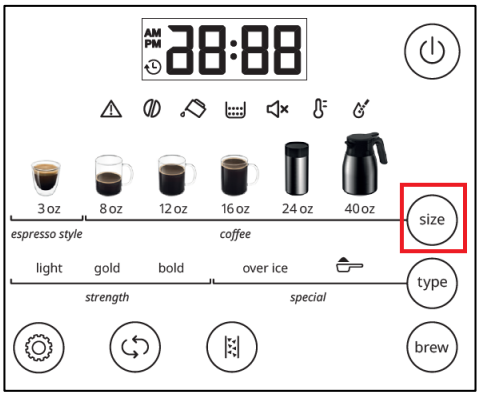
6.3 ENCODER RESET



After having accessed the test mode as indicated previously, press the **DESCALE** button to perform the **ENCODER RESET**.

The GROUNDS CONTAINER alarm will lit on for a few seconds to confirm the completion of the operation.

7 STATISTICS MODE



After having accessed the test mode as indicated in the previous chapter, press the **SIZE** button to access the **STATISTICS** readings.

The appliance will show cyclically for three times on the display:

- The **number of each beverage delivered** (the size icon of each beverage will illuminate);
- The **number of descaling cycles performed** (the water hardness icon will illuminate);
- The **liters of water processed** (the water tank icon will illuminate).

8 HEATING ELEMENTS RESISTANCE CHECK

Thermoblock Resistance Value: ≈ 9,9 Ohms.

Resistance/temperature characteristics for the Thermoblock's NTCs:

TH1 R100=6.691KΩ±2% B0/100=3970K 料号：(A09)(D11-241) 版本：A							
T(℃)	Rmin(KΩ)	Rnom(KΩ)	Rmax(K	T(℃)	Rmin(KΩ)	Rnom(KΩ)	Rmax(K
-40	3060.799	3323.300	3606.870	-3	363.307	386.064	410.083
-39	2864.562	3108.153	3371.108	-2	345.291	366.731	389.346
-38	2682.684	2908.880	3152.886	-1	328.258	348.463	369.763
-37	2513.965	2724.147	2950.721	0	312.152	331.196	351.262
-36	2357.318	2552.744	2763.265	1	296.916	314.872	333.780
-35	2211.759	2393.577	2589.304	2	282.500	299.433	317.255
-34	2076.393	2245.650	2427.732	3	268.855	284.828	301.630
-33	1950.407	2108.061	2277.547	4	255.937	271.008	286.852
-32	1833.065	1979.992	2137.841	5	243.704	257.927	272.871
-31	1723.691	1860.695	2007.784	6	232.116	245.542	259.640
-30	1621.672	1749.489	1886.625	7	221.137	233.813	247.117
-29	1526.448	1645.753	1773.674	8	210.731	222.702	235.259
-28	1437.509	1548.923	1668.305	9	200.866	212.175	224.030
-27	1354.383	1458.477	1569.943	10	191.513	202.197	213.392
-26	1276.644	1373.943	1478.065	11	182.641	192.738	203.312
-25	1203.899	1294.886	1392.192	12	174.225	183.769	193.758
-24	1135.786	1220.907	1311.881	13	166.239	175.262	184.701
-23	1071.975	1151.640	1236.731	14	158.659	167.192	176.113
-22	1012.161	1086.751	1166.370	15	151.462	159.533	167.968
-21	956.063	1025.927	1100.457	16	144.629	152.265	160.240
-20	903.424	968.887	1038.679	17	138.138	145.364	152.907
-19	854.004	915.366	980.745	18	131.972	138.812	145.947
-18	807.586	865.125	926.392	19	126.113	132.588	139.340
-17	763.966	817.938	875.373	20	120.545	126.676	133.066
-16	722.957	773.600	827.460	21	115.251	121.058	127.106
-15	684.385	731.921	782.445	22	110.217	115.718	121.445
-14	648.089	692.723	740.134	23	105.430	110.642	116.066
-13	613.922	655.843	700.347	24	100.875	105.816	110.953
-12	581.745	621.131	662.919	25	96.542	101.225	106.093
-11	551.430	588.445	627.695	26	92.419	96.859	101.472
-10	522.858	557.656	594.532	27	88.493	92.704	97.077
-9	495.920	528.642	563.299	28	84.756	88.751	92.896
-8	470.512	501.291	533.871	29	81.197	84.987	88.919
-7	446.538	475.499	506.135	30	77.807	81.404	85.133
-6	423.912	451.167	479.983	31	74.578	77.992	81.530
-5	402.548	428.206	455.318	32	71.501	74.742	78.099
-4	382.370	406.531	432.046	33	68.568	71.646	74.833

TH1 R100=6.691KΩ±2% B0/100=3970K 料号：(A09)(D11-241) 版本：A							
T(℃)	Rmin(KΩ)	Rnom(KΩ)	Rmax(K	T(℃)	Rmin(KΩ)	Rnom(KΩ)	Rmax(K
34	65.773	68.696	71.721	71	16.471	16.964	17.465
35	63.107	65.885	68.757	72	15.921	16.393	16.871
36	60.565	63.204	65.933	73	15.393	15.843	16.300
37	58.140	60.649	63.241	74	14.885	15.315	15.751
38	55.827	58.212	60.675	75	14.396	14.807	15.223
39	53.619	55.887	58.228	76	13.925	14.318	14.716
40	51.513	53.670	55.895	77	13.472	13.847	14.227
41	49.501	51.553	53.669	78	13.035	13.394	13.757
42	47.581	49.534	51.546	79	12.615	12.958	13.305
43	45.747	47.605	49.520	80	12.210	12.538	12.869
44	43.995	45.764	47.586	81	11.820	12.134	12.450
45	42.321	44.006	45.740	82	11.445	11.744	12.047
46	40.722	42.326	43.977	83	11.082	11.369	11.658
47	39.193	40.722	42.293	84	10.733	11.007	11.283
48	37.732	39.188	40.685	85	10.397	10.659	10.923
49	36.334	37.723	39.148	86	10.072	10.323	10.575
50	34.998	36.322	37.680	87	9.760	9.999	10.240
51	33.700	34.961	36.254	88	9.458	9.686	9.917
52	32.456	33.658	34.890	89	9.167	9.385	9.605
53	31.264	32.410	33.584	90	8.886	9.095	9.305
54	30.123	31.214	32.333	91	8.614	8.815	9.016
55	29.028	30.069	31.135	92	8.353	8.544	8.736
56	27.979	28.971	29.987	93	8.100	8.283	8.467
57	26.973	27.919	28.888	94	7.856	8.031	8.207
58	26.008	26.911	27.834	95	7.621	7.788	7.956
59	25.082	25.944	26.823	96	7.393	7.553	7.714
60	24.194	25.016	25.855	97	7.173	7.326	7.480
61	23.342	24.126	24.926	98	6.961	7.107	7.254
62	22.524	23.272	24.035	99	6.756	6.896	7.036
63	21.739	22.453	23.180	100	6.558	6.691	6.825
64	20.984	21.666	22.360	101	6.366	6.494	6.622
65	20.260	20.910	21.573	102	6.181	6.303	6.425
66	19.564	20.185	20.817	103	6.001	6.118	6.235
67	18.896	19.488	20.092	104	5.828	5.940	6.052
68	18.253	18.819	19.395	105	5.661	5.768	5.874
69	17.635	18.176	18.726	106	5.499	5.601	5.703
70	17.042	17.558	18.083	107	5.342	5.440	5.537

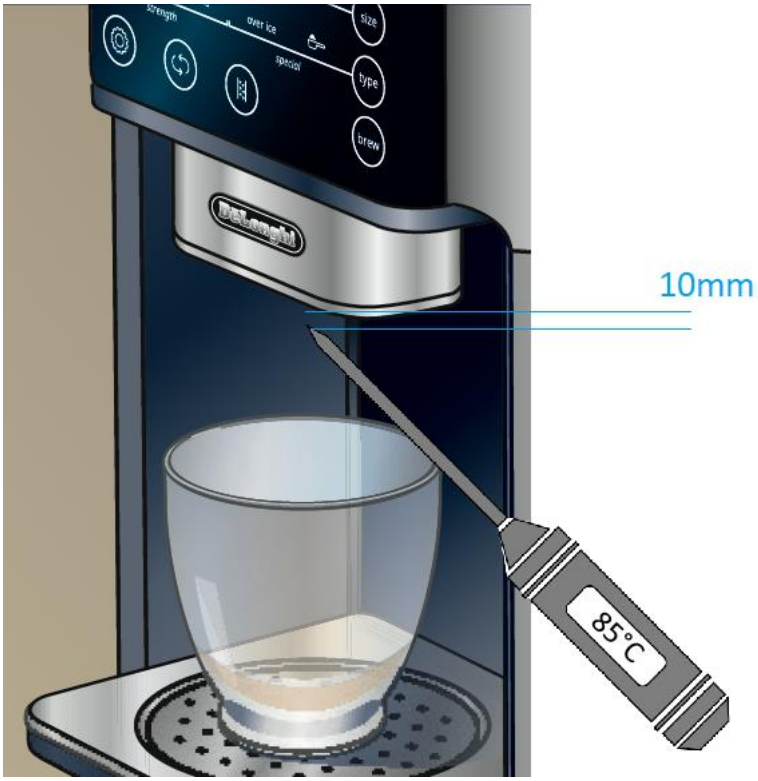
9 COFFEE TEMPERATURE TEST

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. Make sure the temperature setting will be at level 2 (default).
3. Prepare a 24oz beverage to warm up the hydraulic circuit.
4. Select to prepare a **12oz beverage** (refer to the user manual for more details)
5. Start the coffee preparation
6. Wait until the coffee will start being delivered into the glass
7. Measure the coffee flow temperature at about 2÷10mm from the coffee spout, as shown in the below picture:

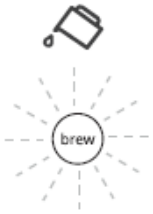
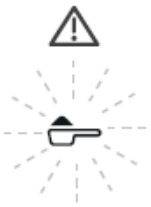


The **optimal indicative temperature measurement** for coffee should be **85°C ± 5°C**.

10 TROUBLESHOOTING

10.1 GENERAL TROUBLESHOOTING

The icons lights	Probable cause	Solution
	The infuser is not present	Pull the drip tray out, insert the infuser then put back the drip tray
	Brewing unit alarm	Clean the inside of the appliance, if the message is still displayed contact De'Longhi customer service
	The beans container (C) is almost empty	Fill the beans container (C).
	The water tank (F) is empty.	Fill the water tank (F) with fresh water and press brew button to complete the delivery of the beverage, except 'espresso style' that will not be completed.

	No water in the water circuit	Press the brew button to fill the water circuit
	The coffee grounds container (Q) or the disposal water container (P) is full.	Empty the coffee grounds container (Q) and the disposal water container (P)
	Tray assemble (L) is not inserted correctly.	Insert correctly tray assemble (L), disposal water container (P) and coffee grounds container (Q).
	Not enough pre-ground coffee has been filled.	Place pre-ground coffee in the funnel and repeat delivery.

The appliance does not come on.	Plug into the mains socket.
The appliance does not start.	Insert correctly tray assemble (L), disposal water container (P) and coffee grounds container (Q).
The appliance does not respond to commands.	Insert correctly tray assemble (L), disposal water container (P) and coffee grounds container (Q).
Water tank (F) is full but the icon lights on.	Insert correctly the water tank and press (brew) button for start the circuit filling procedure.
Once remove the tray assemble coffee grounds there are coffee grounds outside the ground container	You might have added the pre-ground coffee while the unit was turned off. Please make sure to follow the procedure explained on section "pre-ground"
the infuser cannot be extracted	the unit must be turned off completely to be able to extract the infuser

10.2 ADVANCED TROUBLESHOOTING TIPS

- The **TCOs** are connected in series to the power cord, therefore in case the appliance won't turn ON, it could be that one or both the TCOs are interrupted.

- In case the temperature of the brewed coffee would be very low (e.g. about 60°C), this could indicate that one of the two heating elements of the Thermoblock is interrupted. In this case a wattmeter would confirm a power absorption of 730Watts only.

- If the coffee is delivered at "room temperature", this means that the heating element is damaged and it has to be replaced.

- The **GENERAL ALARM** (**BREWING UNIT ALARM**) is triggered in the following main cases:

    - when the **squeeze container micro switch** is unable to provide power supply to the transmission motor;
    - when the **NTC sensors** are interrupted;
    - when the **heating element** is not supplied;
    - in case the **UP limit switch is not pressed or remains open** and the infuser overcomes the maximum height accepted by the position encoder;
    - in case the **DOWN limit switch is not pressed or remains open** and the motor keeps pushing down until the PCB times out with the alarm trigger.