

Service Service Service

Gaggia Anima



Service Manual

Rev. 00 July 2015

General Information

Description

Housing material
Size (w x h x d) Anima OTC AMF CMF
Size (w x h x d) Anima XL
Weight OTC AMF CMF
Weight Anima XL
Power cord length
Control panel
Cup size
Water tank OTC AMF CMF
Water tank Anima XL
Coffee bean hopper capacity Anima OTC AMF CMF
Coffee bean hopper capacity Anima XL
Coffee grounds drawer capacity
Milk carafe capacity
Pump pressure
Boiler
Safety devices
Energy saving mode
Nominal voltage - Power rating - Power supply

Value

Thermoplastic type
221 x 340 x 430 mm (data may vary depending on the model)
221 x 386 x 430 mm
7,5 kg (data may vary depending on the model)
8 kg
800 - 1200 mm
Front type
Up to 152 mm
1.8 litres - Removable type
2.5 litres - Removable type
250 g
500 g
15
0,5 l (OTC version)
15 bar
Stainless steel boiler
Thermal fuse
< 1 Wh
Read the data plate placed inside the service door

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CHAPTER 1

INTRODUCTION

1.1 Documentation required

The following documentation is needed for repair procedures:

- Instruction booklet for specific model
- Technical documentation for specific model (diagrams, exploded view, symptom cure and service manual)

1.2 Tools and equipment required

As well as the standard equipment, the following is required:

Qty.	Description	Notes
1	Screwdriver	
1	Pliers for Oetiker clamps	
1	CC -A - Vdc tester	
1	Digital thermometer	Scale limit > 150°C
1	SSC (Saeco Service Center)	Programmer (for programming and diagnostics mode)

1.3 Material

Description	Notes
Thermal paste	Heating element > 200°C
Descaler	Saeco descaler
Grease solvent	Personal choice
Silicone grease	Safe to use with food

1.4 Safety warnings

We recommend you consult the technical manual of the machine before performing any maintenance work.

Observe all applicable standards relating to the repair of electrical appliances.

Always disconnect the power plug from the mains before beginning repair work.



Simply turning off the main machine power switch is not an adequate safety precaution.

This domestic appliance is rated as insulation class I.

On completion of the repair work, insulation and dielectric rigidity tests must be performed.

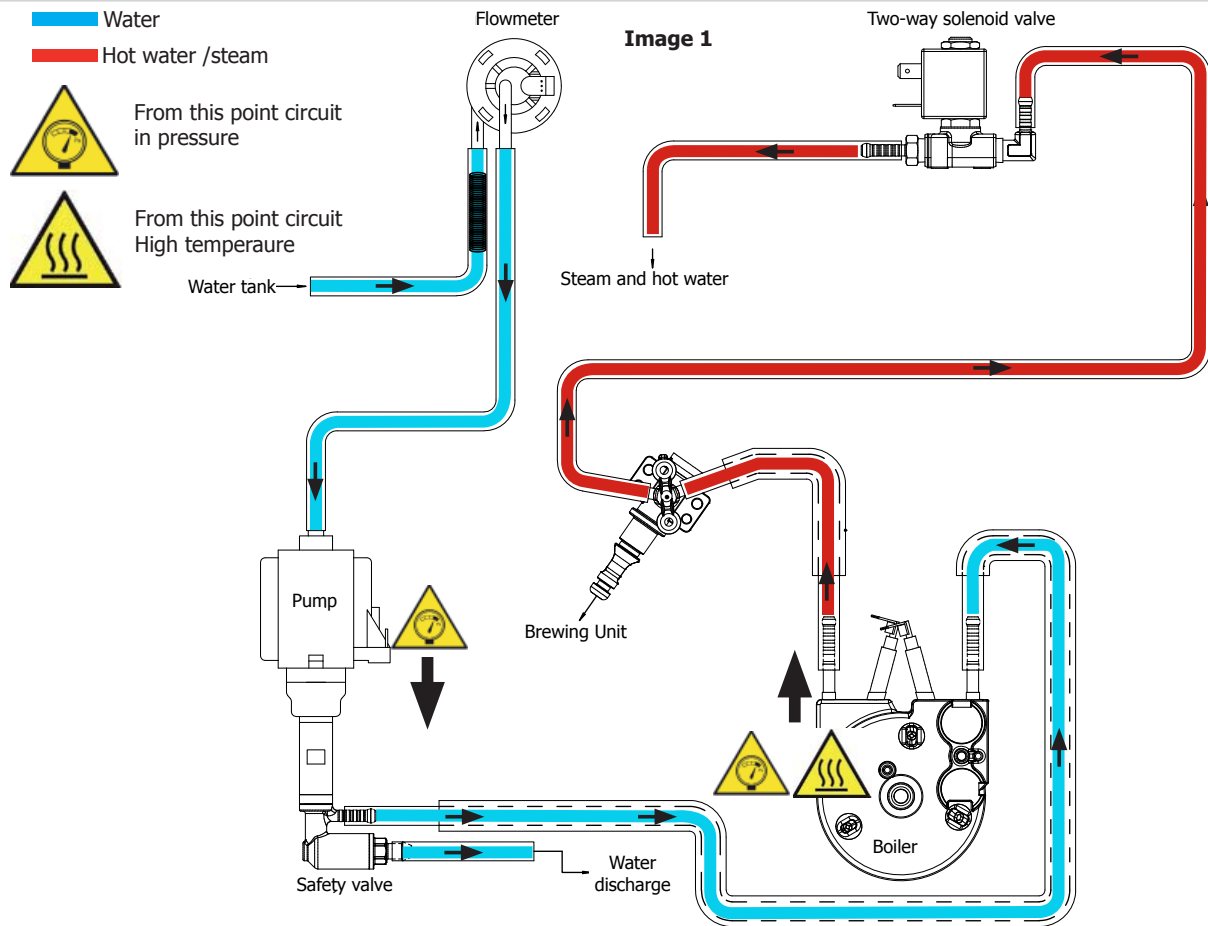


Disassembling the machine, the operator must pay attention to hot and under Pressure parts: boiler, pin-boiler, valves, dispensing, steam tube, brew unit, connections and pipes to avoid burns. Please refer to specific hydraulic circuit (Image1) to know the parts in detail.



The machine hydraulic circuit can reach maximum pressure of 16/18 bar.

To operate in safety condition is recommended to perform the Steam Out procedure in order to remove the pressure and hot water inside the hydraulic circuit.



1.5 Service POLICY grid as used for coffee machine

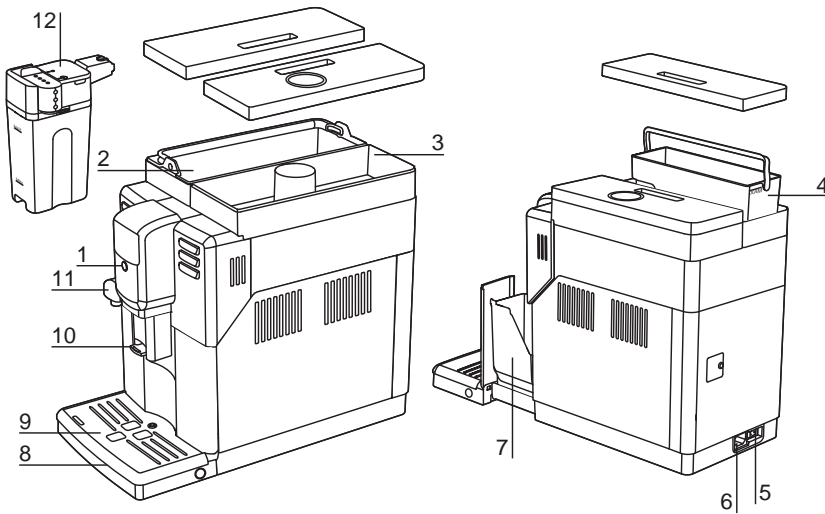
For IN WARRANTY repairs is mandatory to use the single components (not the assembly) available in the exploded views of the coffee machines or of the specific components. If you find the information "SEE THE EXPLODED VIEW E....." in the assembly description field, it means that the single components of the assembly are available in the other pages of the exploded view. It's possible to use the assembly only if there is a specific Symptom Cure that include this possibility or when the single components are not available for the order.

List of principal assembly present in all our coffee machines

Components	Assembly use	Single components available
COFFEE GRINDER	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the machine or of the Coffee Grinder on website
BREWING UNIT	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the machine or of the Brewing unit on website
BOILER	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the machine on website
GEAR MOTOR	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the machine on website
FILTER HOLDER	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the machine on website
MILK CARAFE	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the machine on website
THERMAL CARAFE	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the Thermal Carafe on website
MILK ISLAND	<u>Only for OOW repairs</u>	YES , to consult the specific exploded-view of the Milk Island on website

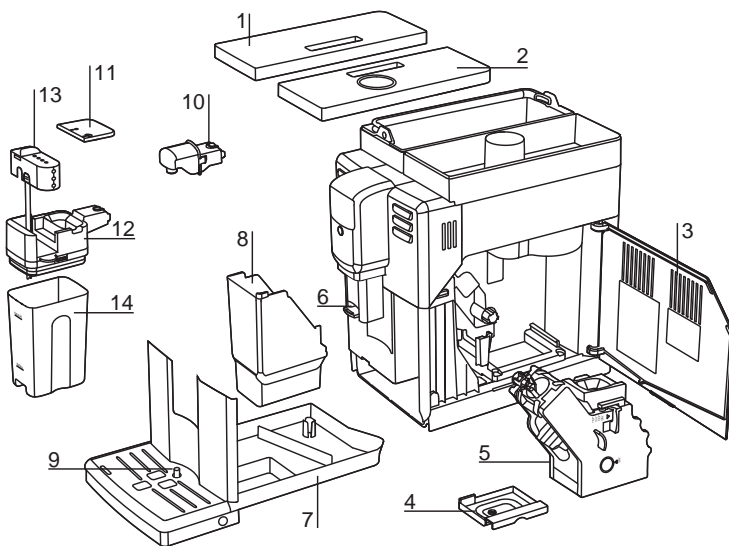
1.6.1. External machine parts Anima XL

Main components

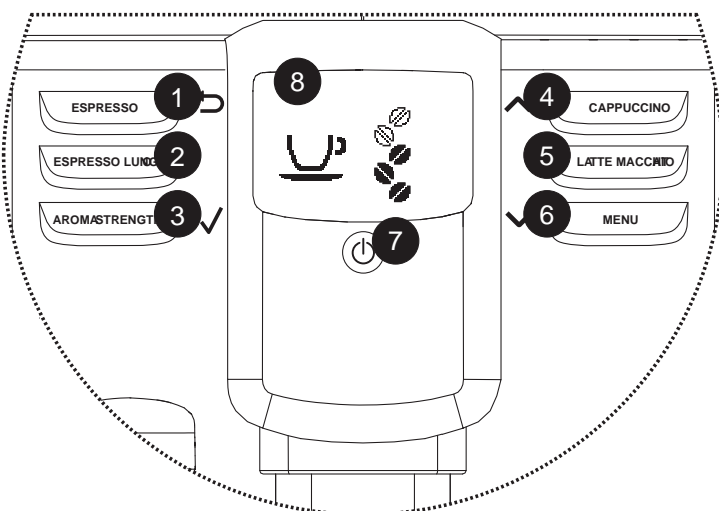


1	STAND-BY button
2	Water tank seat
3	Coffee bean hopper
4	Removable water tank
5	Main switch
	I. ON
	O. OFF
6	Power cord socket
7	Coffee grounds drawer
8	Drip tray
9	Drip tray grill
10	Coffee dispensing spout
11	Hot water dispensing spout
12	Milk carafe

Main removable parts



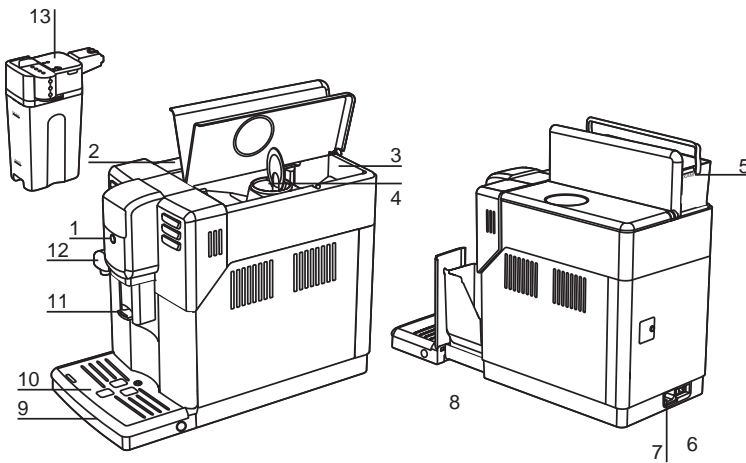
1	Water tank lid
2	Coffee bean hopper lid
3	Service door
4	Coffee residues drawer
5	Brew group
6	Coffee dispensing spout
7	Drip tray
8	Coffee grounds drawer
9	'Drip tray full' indicator
10	Hot water dispensing spout
11	Milk carafe lid
12	Milk carafe top
13	Milk frother dispensing spout
14	Milk container



1		ESPRESSO button
		ESC button
2		ESPRESSO LUNGO button
3		AROMA STRENGTH button
		OK button
4		CAPPUCCINO button
		UP button
5		LATTE MACCHIATO button
6		MENU button
		DOWN button
7		STAND-BY button
8		Display
		In the example: Main menu; ready for brewing

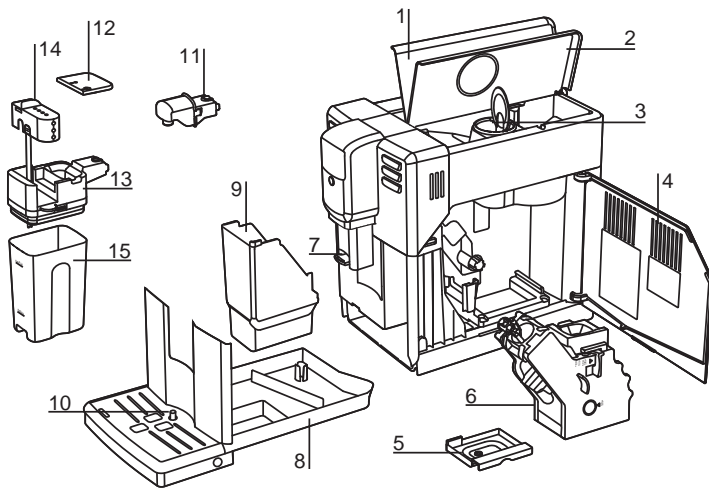
1.6.2. External machine parts Anima OTC

Main components



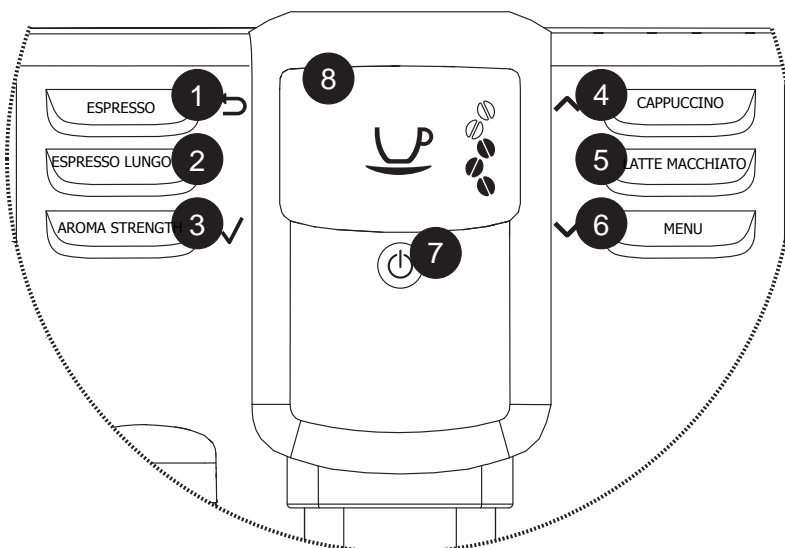
1	STAND-BY button
2	Water tank seat
3	Coffee bean hopper
4	Pre-ground coffee compartment
5	Removable water tank
6	Main switch
	I. ON
	O. OFF
7	Power cord socket
8	Coffee grounds drawer
9	Drip tray
10	Drip tray grill
11	Coffee dispensing spout
12	Hot water dispensing spout
13	Milk carafe

Main removable parts



1	Water tank lid
2	Coffee bean hopper lid
3	Pre-ground coffee compartment lid
4	Service door
5	Coffee residues drawer
6	Brew group
7	Coffee dispensing spout
8	Drip tray
9	Coffee grounds drawer
10	'Drip tray full' indicator
11	Hot water dispensing spout
12	Milk carafe lid
13	Milk carafe top
14	Milk frother dispensing spout
15	Milk container

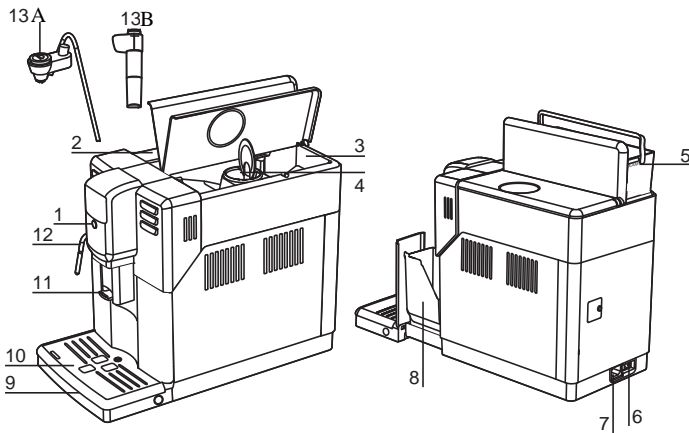
Control buttons and display OTC



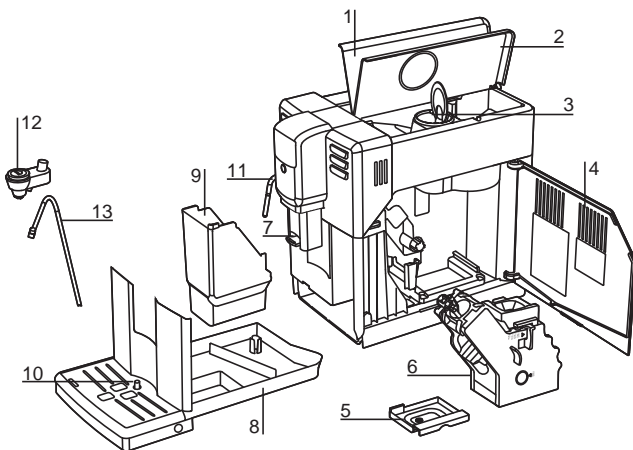
1		ESPRESSO button
		ESC button
2		ESPRESSO LUNGO button
3		AROMA STRENGTH button
		OK button
4		CAPPUCCINO button
		UP button
5		LATTE MACCHIATO button
6		MENU button
		DOWN button
7		STAND-BY button
8		Display
		In the example: Main menu; ready for brewing

1.6.3. External machine parts Incanto AMF CMF

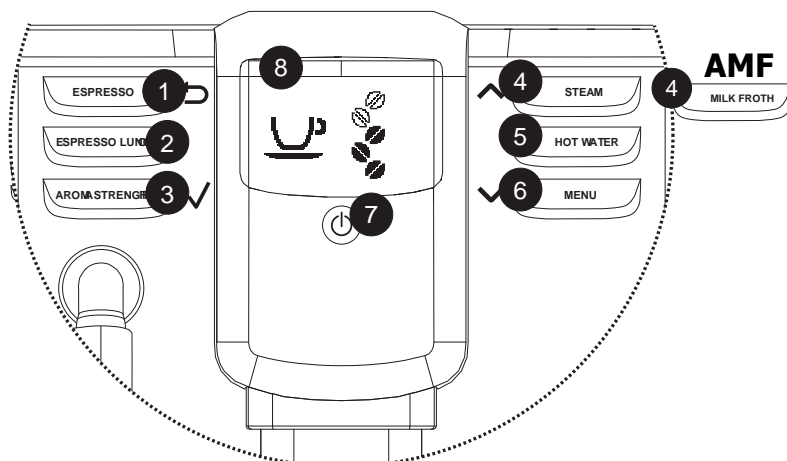
Main components



Main removable parts



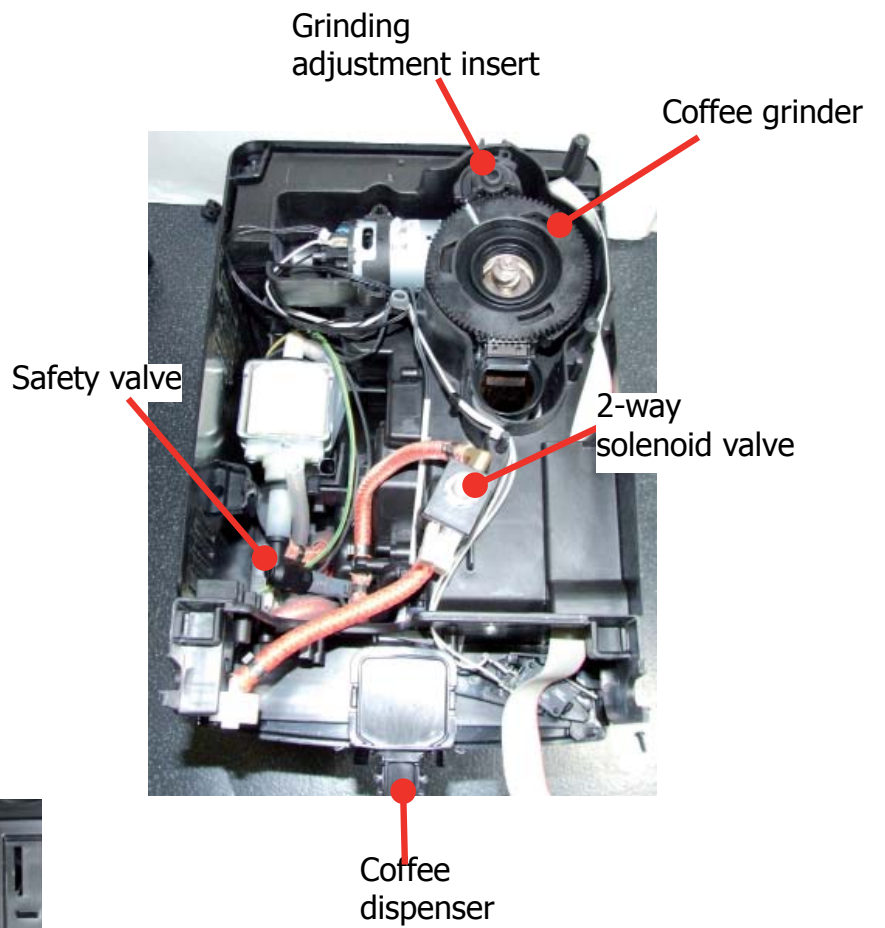
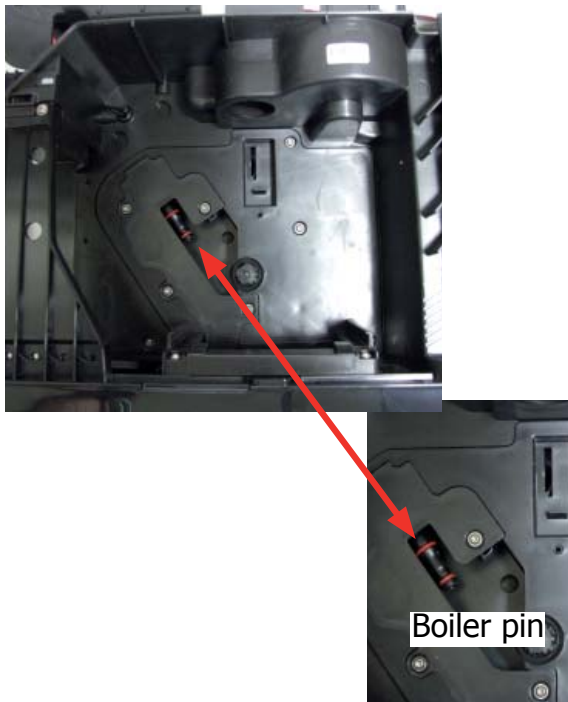
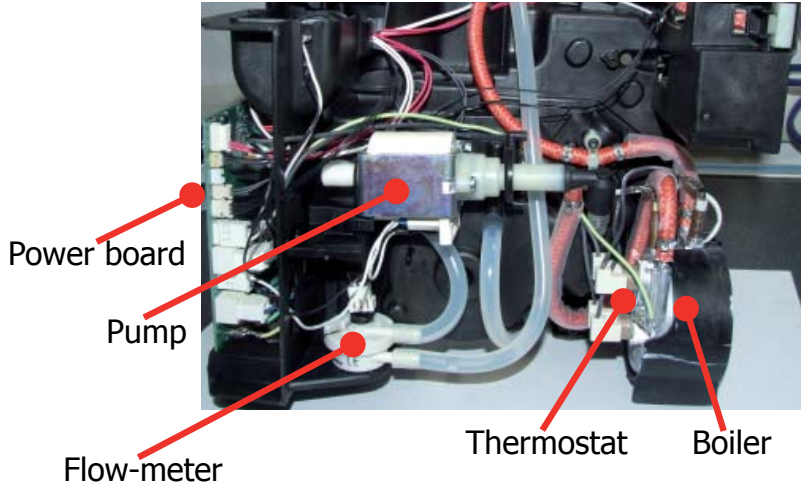
Control buttons and display CMF and AMF



1	STAND-BY button
2	Water tank seat
3	Coffee bean hopper
4	Pre-ground coffee compartment
5	Removable water tank
6	Main switch
	I. ON
	O. OFF
7	Power cord socket
8	Coffee grounds drawer
9	Drip tray
10	Drip tray grill
11	Coffee dispensing spout
12	Steam/hot water dispensing spout
13A	Automatic milk frother (AMF)
13B	Classic milk frother (CMF)
1	Water tank lid
2	Coffee bean hopper lid
3	Pre-ground coffee compartment lid
4	Service door
5	Coffee residues drawer
6	Brew group
7	Coffee dispensing spout
8	Drip tray
9	Coffee grounds drawer
10	'Drip tray full' indicator
11	Steam/hot water dispensing spout
	Steam wand (fixed)
	Rubber grip
12	Automatic milk frother top
13	Milk frother suction tube

1		ESPRESSO button
		ESC button
2		ESPRESSO LUNGO button
3		AROMA STRENGTH button
		OK button
4		STEAM or MILK FROTH button
		UP button
5		HOT WATER button
6		MENU button
		DOWN button
7		STAND-BY button
8		Display In the example: Main menu; ready for brewing

1.6.4 Internal machine parts



CHAPTER 2

TECHNICAL SPECIFICATIONS

2.1. Technical specifications

Power supply and output:	240 V~ 50 Hz 1850 W - 230 V~ 50/60 Hz 1850 W 120 V~ 60 Hz 1500 W
Temperature monitoring:	(NTC) variable resistor sensor - transmits the value to the electronic card
Safety system:	2 thermostats at 190°C one shot
Coffee heat exchanger output: Stainless steel	(230 V~) 1900 W - (120 V~) 1300 W - (100 V~) 1100 W for coffee, hot water and steam dispensing
Gear motor:	2 rotation directions; power supply 24VC
Pump:	Ulka Type EP5/S GW approx. 13-15 bar with reciprocating piston and thermal switch 100°C 48 W, 230V, 50 Hz, 120V, 60Hz 100V, 50/60 Hz
Overpressure valve:	Opening at approx. 16-18 bar
Water filter:	In tank
Coffee grinder:	Direct current motor with flat ceramic grinder blades
Automatic dosage:	Dose adjustment controlled by the electronic system
Power consumption:	During heating phase- approx. 5.6 A
Dimensions: W x H x D in mm:	221 x 340 x 430 mm (Anima OTC AMF CMF) (data may vary depending on the model)
	221 x 386 x 430 mm (Anima XL)
Weight:	7.5kg (Anima OTC AMF CMF) (data may vary depending on the model)
	8kg (Anima XL)
Water tank capacity:	1.8 l. (Anima OTC AMF CMF) 2.5 l. (Anima XL)
Coffee bean hopper capacity:	250 g. (Anima OTC AMF CMF) 500 g. (Anima XL)
Dreg drawer capacity:	15
Water circuit filling time:	Approx. 15 sec Max. on first filling cycle
Heating time:	Approx. 45 sec.
Grinding time:	Approx. 8-10 sec.

2.2.1. Specification for the measurement of the coffee products temperature.

The temperature is influenced by the flow from the dispenser and stratification of temperatures in the glass. In order to consider these phenomena and to introduce measures that allow comparisons in controlled conditions, below guidelines must be followed:

Conditions:

- Water temperature in tank: 23°C (+/-2°C).
- It must be used a plastic cup (see picture N°1).
- It must be used a thermocouple thermometer (e.g. type K - see picture N°2).
- The coffee machine is tested without any change of parameters or calibrations, which may affect the temperature of products, so the measurement of temperature must be done with machine in default factory setting.

Procedure:

- The temperature must be measured in the cup, immediately after dispensing. Cup has to be placed on a non-metal surface using a thermocouple thermometer (Picture 1).
- The temperature in the cup is measured by immersing the probe of the thermometer up to touch the bottom. The probe then must be moved in a circular motion for 5/6 rotations. At the of the rotations, stop in the center of the cup (Picture 2).
- The highest temperature measured during the rotations is the value we are searching for, and that must be reported;
- Test measurement: from end of dispensing to the end of rotations must be completed within 12 seconds.
- the distance of the probe from the bottom of the glass is a function of the quantity of coffee dispensed: 10mm for 35gr - 17mm for 60gr - 35mm for 120gr and superior (Picture 3).

Limits of acceptability

The acceptance limits are divided by features and products and are the following:

Espresso Coffee Italy Q.ty 25/40 gr.

Temperature of 1st product 69°C ≤ 85°C
Temperature of 2nd product 72°C ≤ 85°C

Coffee Q.ty 70/120 gr.

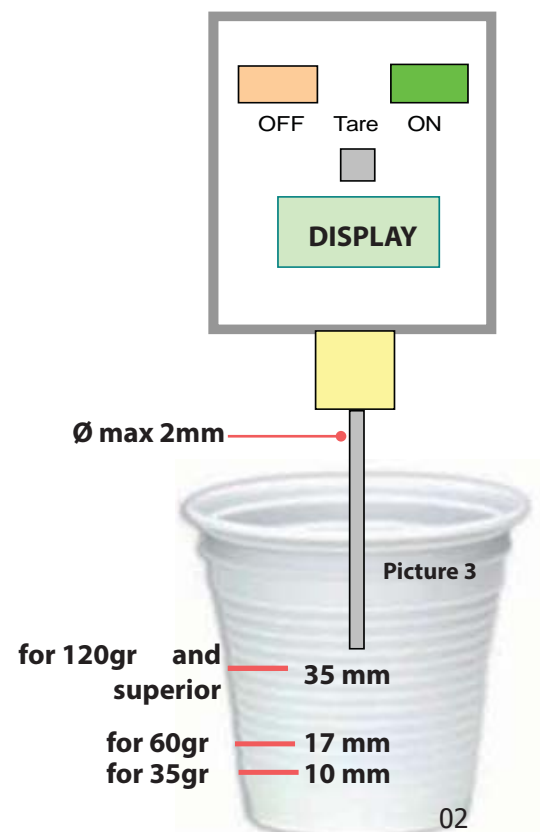
Temperature of 1st product 69°C ≤ 85°C
Temperature of 2nd product 72°C ≤ 85°C



Picture 1



Picture 2



2.2.2. Specification for the measurement of the Milk products temperature.

Milk evaluation

To carry out the test, a partially skimmed UHT milk with a percentage of grease between 1.5-1.8% at a refrigerator temperature $T_{refr.}$ (between 4 to 10°C) must be used.

The milk product must be checked on a beaker of 250 ml of capability and with an inner diameter of 70mm, brewing 100gr of product.

Parameters to be respected:

The parameters to be respected are: milk temperature and height of the cream. Each of these parameters, however, must be evaluated depending on the type of system used for the production of hot milk.

Actually three types of devices are present on the appliances:

- Manual system (pannarello)
- Semi-Automatic system (cappuccinatore)
- Automatic system (carafe, Pinless wonder system, etc.)

Milk temperature in the beaker:

System without Pinless Wonder: e.g. Xelsis, Exprelia, Syntia, Intelia.

With milk at $T_{refr.}$ (about 4-10 °C): $\rightarrow \Delta \geq 36$

System with Pinless Wonder: e.g. New royal, Energica Pure, Intelia EVO Latte.

With milk at $T_{refr.}$ (about 4-10 °C): $\rightarrow \Delta \geq 45$

Height of the milk cream in the beaker:

Manual system (pannarello) ≥ 15 mm on 100gr. of brewed product

Semi-automatic system (cappuccinatore) ≥ 20 mm on 100gr. of brewed product

Automatic system: carafe, cappuccinatore, Pinless wonder e.g. (New Royal, Energica Pure, Intelia EVO latte) ≥ 20 mm on 100gr. of brewed product

How to measure the temperature of the milk.

1. The measurement is carried out in the beaker, immediately after the end of milk brew, positioned on a non-metallic surface, using a thermocouple thermometer (eg. Type K). Stop the preparation of mixed product: at the end of milk brewing, where "One Touch product" function is present.
2. The temperature is measured by immersing the probe of the thermometer, positioning the probe inside the beaker at about 10mm from the bottom of the container, then the probe moves in a circular motion for 3-5 turns, stopping at the end, at the center of the beaker. It detects the maximum temperature reached in a time of relief between 3 to 5 seconds. It is important the mixing of milk before the measurement at 10mm from the bottom of the beaker. If the mixing is correct, temperature, for a few fractions of a second, during the measurement should not oscillate.

How to measure the milk cream.

The temperature (T_{refr} or T_{amb}) of the milk doesn't affect as much the test result on measuring the milk cream; by convection is assumed to always use milk at refrigerator temperature T_{refr} .

Manual systems (Pannarello)

Pour 100cc. of milk at T_{refr} . in a beaker of 250 ml of capacity and with a inner diameter of 70 mm; with machine in steam mode:

1. Open the steam knob to discharger water circuit for 4 sec, then close the knob.
2. Place the beaker with the frother dipped in milk, open the steam knob to maximum and start the chronometer.
3. After about 30 to 60 seconds, close the knob and check the result on milk.

Semi-automatic systems (cappuccino)

Pours milk at T_{refr} . in a container ; with the machine in steam mode:

1. Open the steam knob to discharge water circuit for 4 sec. then close the knob.
2. Insert the silicone tube in the milk container, placing a beaker of 250 ml capacity and with an inner diameter of 70 mm under the cappuccino maker and open the steam knob.
3. After having provided 100gr. of product, close the knob and check the result obtained on milk. Note: The same applies to machines which have a steam key on the user interface and a solenoid valve in place of the steam tap.

Automatic: Carafe, Cappuccino Pinless wonder e.g.:(New Royal, Energica Pure, Intelia EVO Latte), etc..

After setting the machine to delivery of 100gr. of product:

1. Launch the "hot milk" function.
2. Collect the product in a beaker with a 250ml of capacity and with an inner diameter of 70 mm, and verify the result obtained on milk. Carry out the test using milk at a T_{refr} .

In case the machine allows modify of the emulsion through the menu, use the machine with the emulsion set to the default value.

Related to the above testing procedure derives the following table of acceptability:

Manual, Semi-Automatic and Automatic's Milk System	
Grams of Product	Minimum Height of the milk cream
≥ 130	≥ 30mm
120	≥ 25mm
110	≥ 22mm
100	≥ 20mm
90	≥ 16mm
80	≥ 13mm
70	≥ 11mm

NB: To verify more accurately the height of the cream, a practical expedient dictated by experience is to add to the product just delivered a small amount of coffee. The addition of coffee immediately put in evidence the surface of separation between liquid and cream.

2.3. Machine parameters and performance

PRODUCT QUANTITY	Default quantity (Grams)	User programmable	Programm. by Production / Service
Espresso	40 +/- 10gr	Yes	No
Espresso lungo	120 +/- 14%	Yes	No
Hot water	Continues until the water supply has been exhausted (capacitive sensor)		
Steam pannarello (frother)	time-out 03 minutes.		

DREG DRAWER	Description and values
Time-out for dreg drawer	5 sec.
Reset dreg counter	Dreg emptying alarm, if the dreg drawer is removed for more than 5 seconds.

STANDBY	Description and values
Inlet time (default)	15 minutes
Inlet time programmed by Production/Service	Yes
Boiler temperature during Standby	Boiler OFF

WATER TANK	Description
Water reserve (pulses) with water filter	200
Water reserve (pulses) with no water filter	200
Water reserve modifiable by Production/Service departments	No
"Fill tank" alarm	Yes
"No tray" alarm	Yes (Fill tank)
Water mains	No

Descaling frequency			
Hardness	Water hardness	Without anti-scale filter	With anti-scale filter
1	Soft (up to 7°dH)	240 litres (480,000 pulses)	480 litres (960,000 pulses)
2	Medium (7° - 14°dH)	120 litres (240,000 pulses)	240 litres (480,000 pulses)
3	Hard (15° - 21°dH)	60 litres (120,000 pulses)	120 litres (240,000 pulses)
4	Very hard (over 21°dH)	30 litres (60,000 pulses)	60 litres (120,000 pulses)




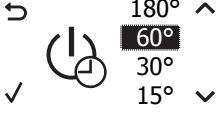






The default water hardness level is 3. Each litre of water corresponds to approximately 2,000 pulses

CHAPTER 3

USER INSTRUCTIONS

3.1. Customer menu


List of default settings

Display	Setting	Setting	Value	Description
		Coffee temperature	average	Coffee brewing temperature setting.
		Stand-by time	15 minutes	Stand-by time setting.
		Contrast	average	Display contrast setting.
		Water hardness	4 (very hard water)	Water hardness setting.
		INTENZA+ water filter	OFF (not installed)	INTENZA+ settings.


Changing the default settings

It is possible to customise the machine functions through the programming menu. The machine must be turned on and ready to work.




If necessary, refer to the "8.1 List of default settings" chapter.

- >  Press the MENU button and scroll through functions list to select the function whose settings are to be modified:



Note: the images at the side refer to a sample function.

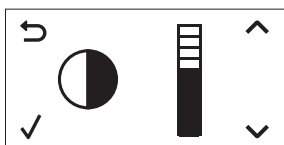
- >  Press the OK button to select the desired function

Once selected:

- >  Press the UP button to increase the value.
- >  Press the DOWN button to decrease the value.
- >  Press the OK button to confirm the change.

When the change has been implemented, the OK message will be displayed.

- >  The modified but unconfirmed values will not be stored.
- >  Press the ESC button to exit the programming function.
The machine automatically exits the programming mode if no button is pressed for 3 minutes.



Reset to the default settings



- It is possible to restore the default settings through the programming menu. The machine must be turned on and ready to work.
- > Press the MENU button and scroll through functions list to select the RESET function.
 - > Press the OK button to select the function.
When the change has been implemented, the OK message will be displayed.
 - > Press the ESC button to exit the programming function.
The machine automatically exits the programming mode if no button is pressed for 3 minutes.

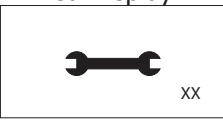
Alarm signals summary: red display

Display	Description	Display	Description
	Put back the drip tray and coffee grounds drawer; close the service door.		Coffee grounds drawer full.
	Coffee bean hopper empty.		Water tank empty.
	Brew group not inserted.		
	The machine is out of service.		


Warnings signals summary

Display	Description	Display	Description
	The machine is ready to brew products: coffee bean hopper empty		The machine must be descaled.
	The machine is ready to brew products: replace the INTENZA+ water filter.		The machine is heating up.
	The machine is waiting to start the water circuit priming process.		The machine is rinsing.
	The milk carafe ducts should be cleaned.		Brew group rebooting.

The machine is out of service

<p>Red Display</p> 		<p>If the machine error alarm signal is triggered, the error code is displayed in the bottom right corner of the display. (Following table)</p>	
Error code	Behaviour	Cause	Action
1	Coffee grinder blocked	Coffee outlet duct clogged	Clean the coffee outlet duct thoroughly.
3 - 4	Brew group locked, cannot be taken out	The brew group is incorrectly positioned.	Close the service door. Turn the machine off and back on again. Wait for the 'Ready for brewing' signal and then remove the brew group.
5	Water circuit error	Air in the water circuit	Remove and restore the water tank a couple of times, making sure to position it correctly. Check that the water tank seat is clean.

3.2. Operation, cleaning and maintenance

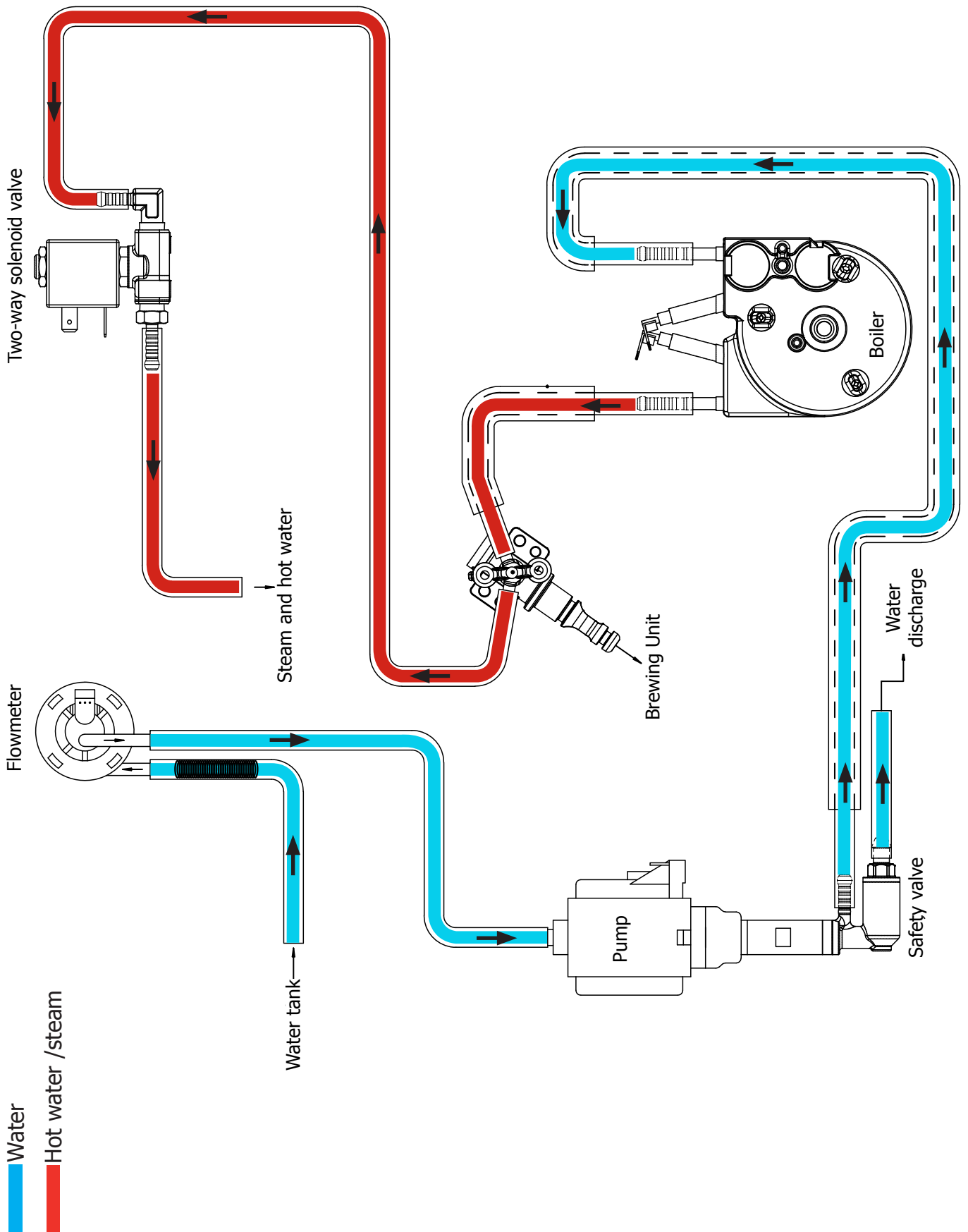
Operating the machine		
1	Fill water tank	
2	Fill the coffee bean hopper	
3	Switch on the appliance	
4	Press the button to start the appliance	
5	Heating	When the heating phase begins, wait for it to finish
6	Rinse	Carry out a rinse cycle for the internal circuits
7	Machine ready	The machine is ready to dispense beverages

CLEANING AND TECHNICAL SERVICING		
A	Empty the dregs drawer	When indicated
B	Empty the drip tray	As necessary
C	Clean the water tank	Weekly
D	Clean the coffee bean hopper	As necessary
E	Clean the casing	As necessary
F	Clean the brewing unit	Every time the coffee bean hopper is filled or weekly
	Lubricate the brewing unit	After 500 dispensing cycles or when the grease is no longer present on the brewing unit
	Clean the unit housing	Weekly
H	Descaling	When indicated

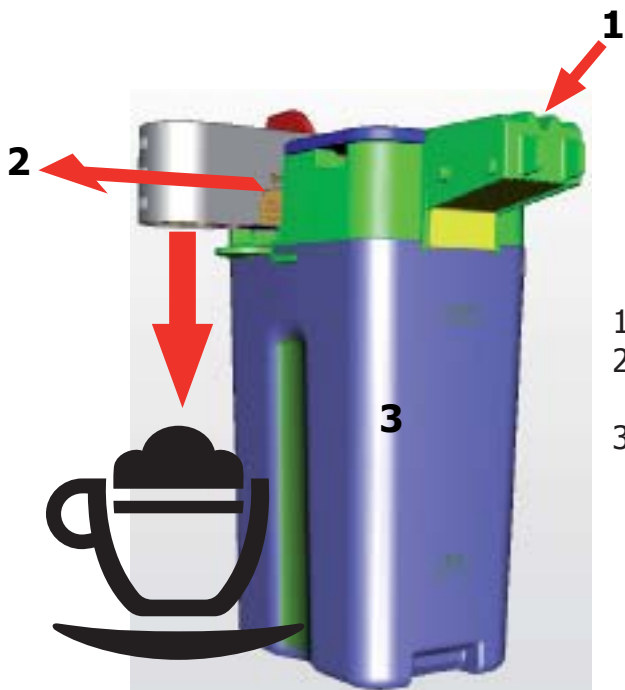
CHAPTER 4

OPERATING LOGIC

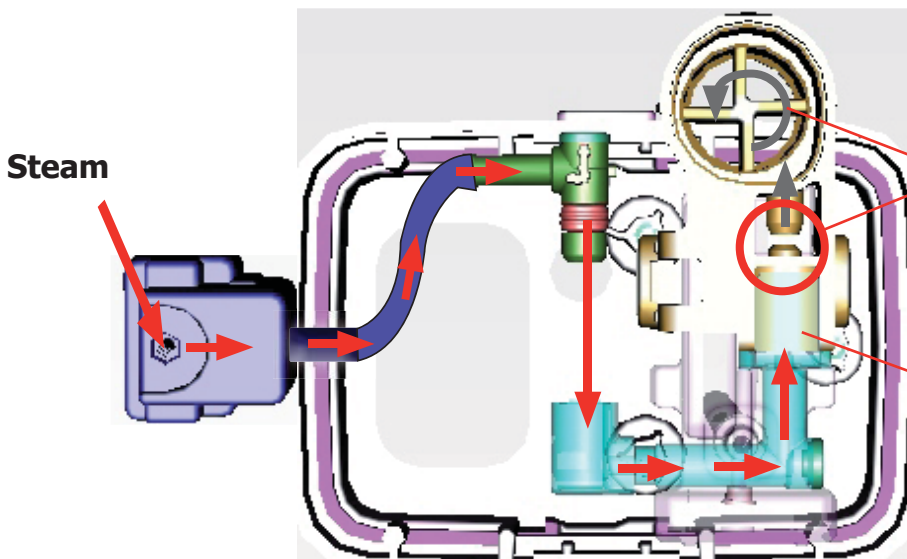
4.1. Water circuit



4.2. Milk Carafe



- 1) Steam input
- 2) Bring the cappuccino maker into dispensing position
- 3) Milk tank



The milk is heated by the steam and taken towards the emulsion chamber where it is mixed with air and transformed into foam

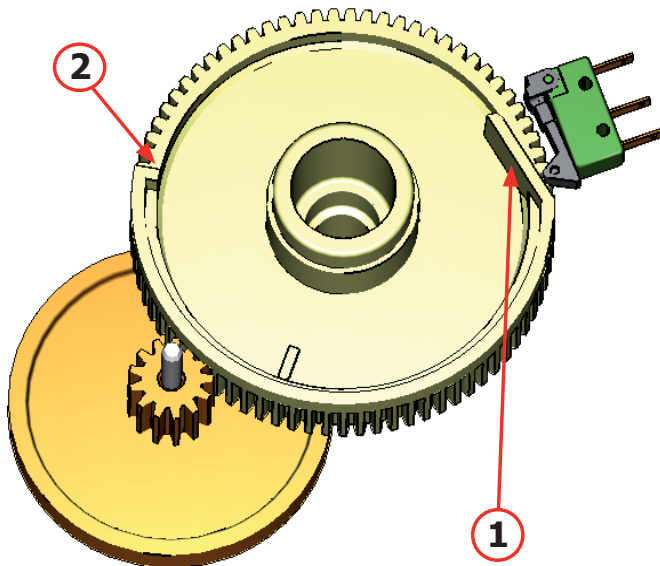
The steam passes through the pipe creating a sucking effect that pulls the milk upwards

4.3. Single microswitch

Switching on

When the machine is switched on, the gear motor repositions itself as follows:

- It acts on microswitch 1
- The gear motor changes its rotation direction and moves upwards again by approx. 1-2 mm.
- The boiler begins to heat the water for approx. 45 sec., at full power, in order to reach the optimal temperature. The temperature will then remain at a constant level.



The gear motor is powered by a direct current motor that engages with the smaller double toothed wheel using a worm screw. The unit is mounted on the axle of the large gear wheel and when a coffee is requested, it moves from the standby position to the dispensing position, and then back to the standby position again.

- **Standby position: 1**
- **Dispensing position: 2**

4.4. Temperature sensor (adjustment)

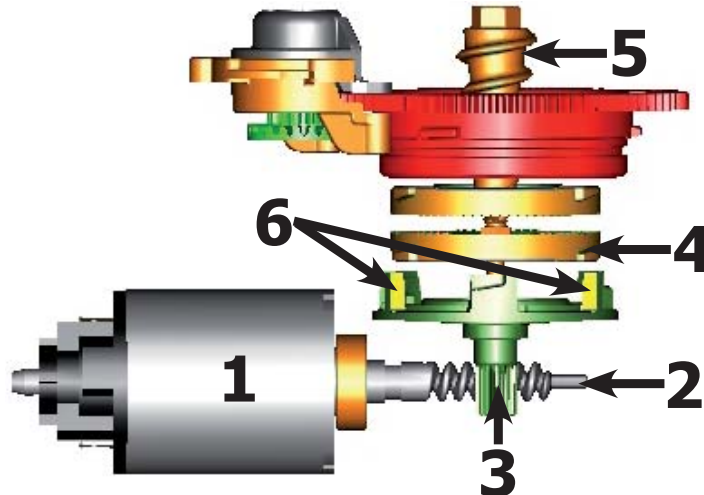
Temp. (°C)	R nom (kΩ)	ΔR (+/- %)
20	61.465	8.6
50	17.599	5.9
75	7.214	4.1
80	6.121	3.7
85	5.213	3.4
90	4.459	3.1
100	3.3	2.5
125	1.653	3.9
150	0.893	5.1

An NTC is used as a temperature sensor; in the event of overheating this reduces boiler element power consumption.

The electronic system detects the current boiler temperature from the drop in voltage of the sensor and adjusts it accordingly.

Heating element values and corresponding temperatures: see table.

4.5. Coffee grinder only for 120v

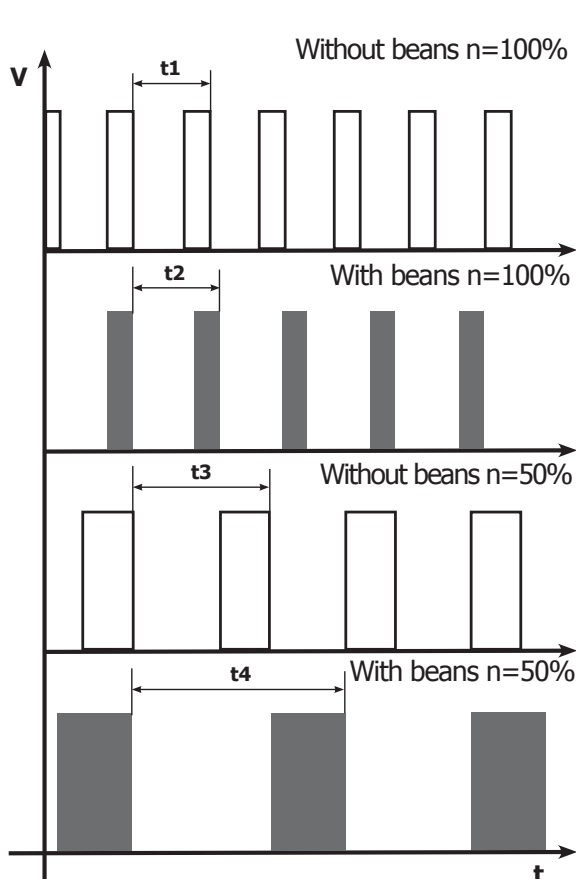


The coffee grinder is activated by a direct current motor (1) via helicoidal wheel transmission and a worm screw (2).

The worm screw (2) activates a plastic toothed wheel (3), which turns the lower grinder blade (4) and the increment pin (5).

There are two magnets (6) in the toothed wheel and with every rotation they transmit two pulses to a Hall sensor, which in turn transmits them to the electronic system.

4.6. Detection of coffee bean absence, dose adjustment, blocked coffee grinder



No coffee

when no coffee beans are present, this is detected by the Hall sensor due to variations in the pulse frequency (with or without coffee).

If there are no coffee beans (operation while empty), the number of rotations and therefore the number of pulses, will be greater

t1 = no coffee signal

If there are coffee beans, the number of rotations will be lower due to the force created during the grinding process

t2 = no signal

t3 and t4 = this reading is taken

at the end of each grinding process

Dose quantity adjustment

The dose quantity is adjusted in accordance with the pulses detected

(number of rotations proportional to the weak, medium and strong flavour selection)

Blocked grinder blades

If the coffee grinder is blocked for any reason, pulses will no longer be transmitted to the electronic system and the grinder stops

4.7. Dose self-learning (SAS) only for 120v

The aim of this function is to automatically regulate the average dose of ground coffee (SELF-LEARNING); this takes place with an algorithm based on the following values and setting by the user:

1. Number of coffee grinder pulses during the grinding cycle.
2. Max. average value of the power consumed by the gear motor during the coffee brewing cycle.
3. Aroma selected by the user.

The algorithm compares the maximum average value of the power consumed by the gear motor with the value listed in the table for the selected aroma, in order to calculate the new grinding pulse value for the next coffee produced.

If the power consumption value is less than the minimum current value, the grinding pulses will be increased by 2.

If the power consumption value is greater than the maximum current value, the grinding pulses will be decreased by 4.

If the power consumption value falls within the "over-torque" interval, the product will be dispensed and the grinding pulses will be decreased by 10.

If the power consumption value falls within the "abort cycle" interval, the dreg will be expelled and the grinding pulses will be decreased by 10.

If the "pre-ground" flavour is selected by the user, no modification will be made.

This guarantees that, regardless of the coffee type used, the grinding level setting and the wear on the grinders, the ground coffee dose always remains constant.

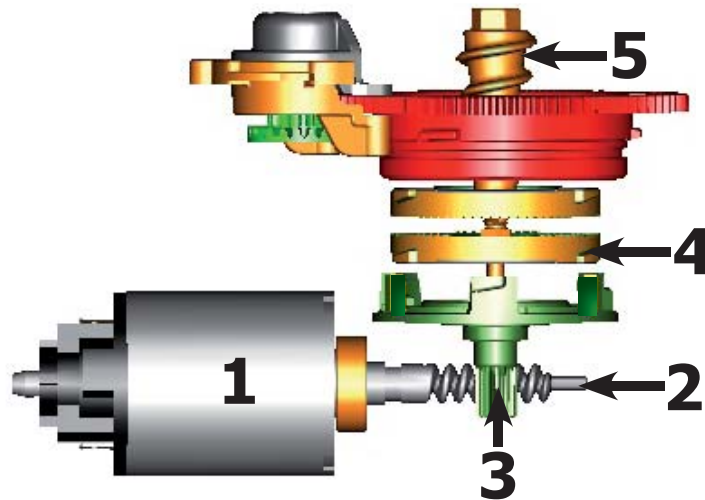
		DOSE ADJUSTMENT (NUMBER OF GRINDER IMPULSES) TO APPLY TO MED AROMA						
		3 levels	5 levels	+2	0	-4	-10	-10 and CYCLE ABORTED
Aroma of the grinded product	A	Light	Very Light	MAX_CURRENT_mA <150mA	<=150mA MAX_CURRENT_mA <=250mA	MAX_CURRENT_mA >250mA	MAX_CURRENT_mA >800mA	MAX_CURRENT_mA >1000mA
		Med	Light	MAX_CURRENT_mA <250mA	<=250mA MAX_CURRENT_mA <=350mA	MAX_CURRENT_mA >350mA	MAX_CURRENT_mA >800mA	MAX_CURRENT_mA >1000mA
	Med							
	C	Strong	Strong	MAX_CURRENT_mA <350mA	<=350mA MAX_CURRENT_mA <=500mA	MAX_CURRENT_mA >500mA	MAX_CURRENT_mA >800mA	MAX_CURRENT_mA >1000mA
			Very Strong					

Important:

For perfect operation, machine adjustment should take place in the area of the fields highlighted in green (A, B, C). When the type or brand of coffee is changed, there may be variations in the size of the beans and their stickiness or roasting level. This leads to variations in power consumption (mA), with resulting excessive or insufficient doses (until the necessary adjustments have been made to compensate for this change).

Caution: In the case of excessive dosage, powder may be expelled into the dreg drawer. This is not a fault, but can occur during preliminary operation or after a service.

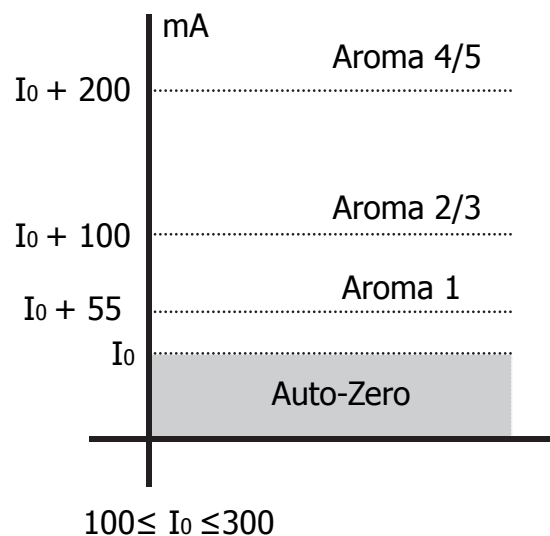
4.8. Coffee grinder



The coffee grinder is driven by a direct current motor (1) using a worm screw helicoidal wheel transmission (2).

The worm screw (2) drives a plastic gear wheel (3), which turns the lower grinder (4) and the increment pin (5)

4.9. Autodose system description



I_0 = current when the BU is moving without load, i.e. without coffee. It occurs, for example, during the rinsing phase of coffee spout.

Current targets:

Aroma 1 → 55mA
 Aroma 2/3 → 100mA
 Aroma 4/5 → 200mA
 $100 \text{ mA} \leq I_0 \leq 300 \text{ mA}$

If the BU current is \leq the current target → the grinding time ↑
 If the BU current is \geq the current target → the grinding time ↓

1) When the system get the stability (i.e. the system got the current target) the coffee doses should be:

A1	A2/3	A4/5	
7,5	9,0	10	±1,5 grams

with medium grinding ($500\pm 60\mu\text{m}$) and using coffee of test.

2) the 3 grinding times are always:

$$T_1 < T_2 < T_3$$

beside, every grinding time is, respectively:

$$4,0\text{s} \leq T_3 \leq 10\text{s} \quad (10000\text{ms})$$

$$3,5\text{s} \leq T_2 \leq 9\text{s} \quad (9000\text{ms})$$

$$3,0\text{s} \leq T_1 \leq 8,1\text{s} \quad (8100\text{ms})$$

5 levels		DOSE ADJUSTMENT			
		Grinder Time	Min Grinder Time	Max Grinder Time	Curret target
Aroma of the grinded product	Aroma1 Very Light	T_1	3s	8,1s	$I_0 + 55\text{mA}$
	Aroma2 Light	T_2	3,5s	9s	$I_0 + 100\text{mA}$
	Aroma3 Med				
	Aroma4 Strong	T_3	4s	10s	$I_0 + 200\text{mA}$
	Aroma5 Very Strong				

4.10. Coffee lack detection and coffee grinder blocked

The machine uses an **ALGORITHM** that considers the **current absorbed** by the coffee grinder, beside it considers if the grinder is old or new and if it is warm or cold.

4.11. Coffee cycle

Main switch ON	START		STOP
Time			
Coffee grinder			Time (Dosage)
Heating	approx. 45 sec.		
Pump			Pump operation (flow meter pulses) in accordance with the amount of product selected.
Brewing unit gear motor			*
Status	Heating	Ready	Coffee cycle

Notes: * Only with Pre-brewing



Single microswitch gear motor

Switching on

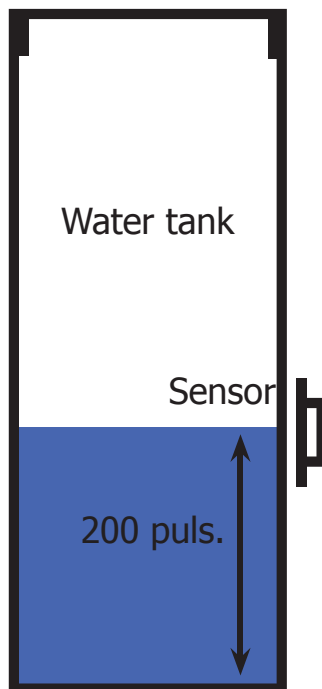
When the machine is switched on, the gear motor repositions itself as follows:

- It acts on microswitch 1 (see following chapter).
- The gear motor changes its rotation direction and moves upwards again by approx. 1-2 mm.
- The boiler begins to heat the water for approx. 45 sec., at full power, in order to reach the optimal temperature. The temperature will then remain at a constant level.

Coffee cycle

1. The coffee grinder starts the grinding process (controlled by Time).
2. The gear motor (brewing unit) moves to the brewing position.
3. Preliminary dispensing phase (short pump activity, short pause).
4. Product dispensing (the pump operation period is defined by the amount of product dispensed).
5. The gear motor moves to its home position (the dregs are expelled automatically).

4.12. Water level detection (water tank)



“Water low” message (water reserve)

Function:

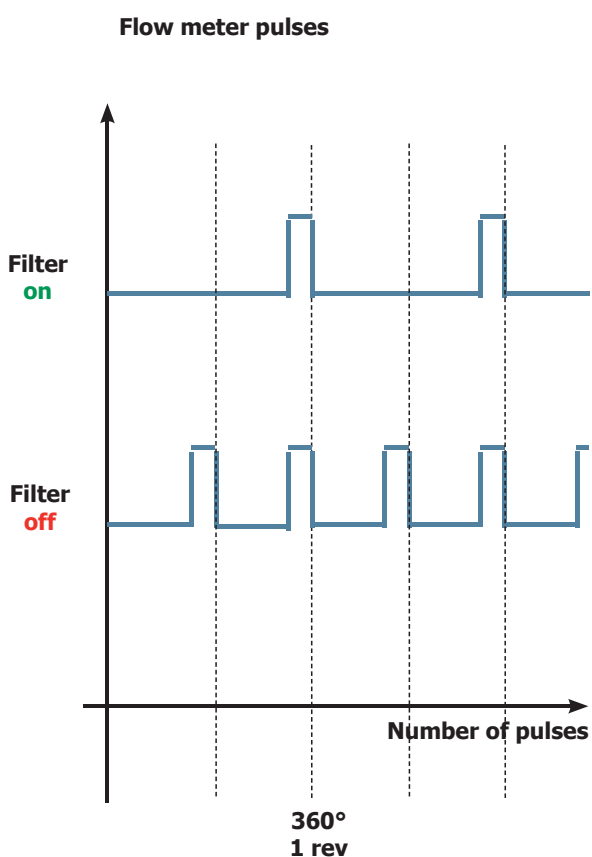
The water level is monitored by a capacitive sensor, located one third of the way up the water tank wall.

If the electronics assembly detects, by means of the sensor, that the amount of water in the tank has dropped below the above mentioned level, a water reserve remains available for the dispensing process underway (this will cover 200 flow meter pulses).

The product dispensing process will then come to an end.

If a dispensing cycle ends after the sensor has been triggered (in the reserve) then the display “Water low” continues to be displayed during the following dispensing cycle.

4.13. Descaling request



“Descaling” – message with water filter inserted

(appliances with display only)

The water hardness is set on the basis of the regional water hardness analysis (1, 2, 3, 4).

Filter off:

If the function is turned off the electronics assembly monitors the flow meter pulses, recording one pulse each turn.

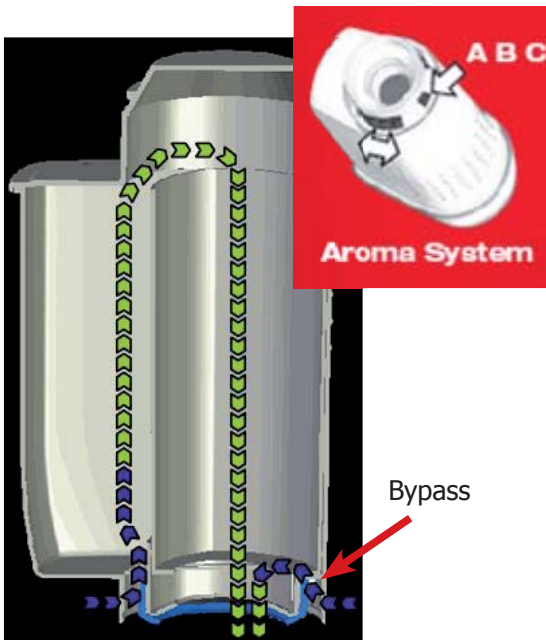
Filter on:

If the function is turned on the electronics assembly monitors the flow meter pulses, recording one pulse every two turns.

“Change water filter” message

The electronics assembly uses the flow meter impulses to keep track of the amount of water which has flowed through; after the specified amount (set in accordance with the water hardness level), the “Replace filter” message appears.

4.14. Water filter

**Function:**

- Reduced limescale deposits which take longer to form.
- Improved water quality.
- Improved taste due to the ideal water hardness.

Life span / descaling performance:

- - 10 ° dH
- 60 litres
- 2 months

To achieve the best possible operating mode consistency over the total life span, the water is channelled using a 3-stage bypass (A, B, C) depending on the degree of hardness. See small image.

CHAPTER 5

TROUBLESHOOTING

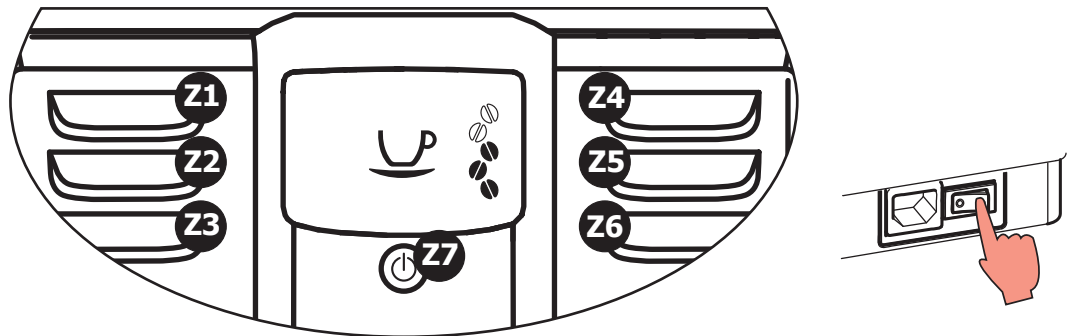
5.1. Test Mode

Introduction

This document describes the Test Mode of the Anima (CMF,AMF, OTC and XL) Coffee Machine. This application is used in order to test the machine in its mechanics and electronic components.

To enter Test Mode

The machine enters in Test mode by holding pressed together **Z1** and **Z6** buttons while switching on the machine by the main switch on the backside of the CA. Once entered in Test Mode, the display shows the firmware version (Level 0).



The Test Mode is organized into **6 different** pages, each level the coffee machine can execute different commands:

Page 0: The display shows:

- Firmware version.
- Version of machine (Focus ⇒ CMF, Class ⇒ AMF, Top ⇒ OTC).
- Voltage of PCB.
- Main supply frequency (50 or 60 Hz).

Page 1: Keyboard and display's colour test:

- Z1 button
- Z2 button
- Z3 button
- Z4 button
- Z5 button
- Z6 button
- Z7 button
- Backlight colors

Page 2: Input signals test:

- Water level sensor
- Micro-switch door closed/opened
- Microswitch presence of the Brew Unit

Page 3: Low voltage loads test:

- Brew Unit movement upward and downward (24V DC)

Page 4: High/Low voltage loads test (Pump, E.Valve) :

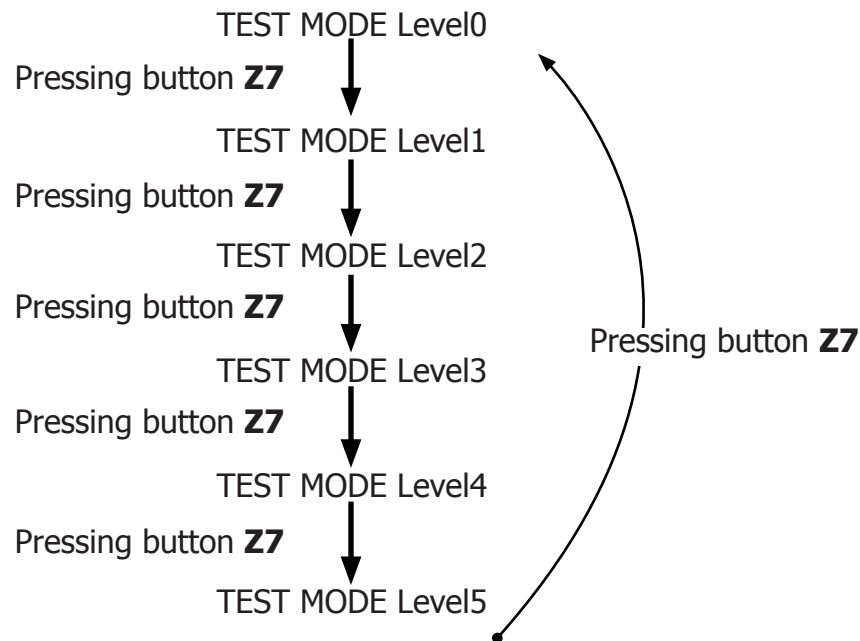
- Pump (230V AC)
- DC Solenoid valve (24V) (The door must be closed !!)
- Flow-meter

Page 5: High voltage loads test (Heater , Grinder):

- a) Heater (230V AC)
- b) Grinder (320V DC)

The user can change the page by pressing the **Z7** button.

Page 0 is accessible only entering Test Mode from power-off mode; at the start up all loads are turned off.

**Page 0 (FIRMWARE)****Verify the firmware version**

Firmware version on the display.

The machine model is shown (Focus ⇒CMF, Class ⇒AMF, Top ⇒OTC).

The voltage of the main supply "230V"

The frequency of the main supply is shown (50 or 60 Hz)

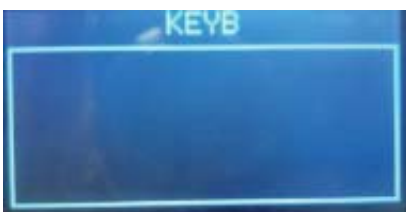
ERROR: If in machine model field is written "Unknow" and backlight of display is Red, check the jumper in interface.



The firmware version is the same as the label on MicroController

ERROR: The firmware version is different from the label on MicroController; change the CPU_POWER Boards !

Press **Z7** "  " to move to the next screen



The machine passes to the Page 1 (KEYBOARD)

ERROR: The page does not change; Check the interface board and the flat cable (JP21)

Page 1 (KEYBOARD)

Start condition

Press buttons from 1 to 7

Only when a button is pressed a 0 appears on the relative position of button pressed.



In the middle of display appears the name of the button pressed and the backlight color changes from WHITE to RED.

When a button is pressed, also the Stand-By led (RED) turn ON.

Note: Press button Z7 as the last once, since it makes change the test page.

Note: If 2 or more buttons are pressed the name that appears on display could be wrong.

ERROR: If nothing appears on display; check the interface board and the flat cable (JP21).

ERROR: If during the movement the backlight remain WHITE check the wiring (JP1) from the interface board and the display.

ERROR: The name displayed is wrong; check the position of jumper in interface in JP5. It must be the same of machine model.

Press **Z7** "  " to move to the next screen



The machine passes to the level 2 (INPUTS)

Page 2 (INPUTS)

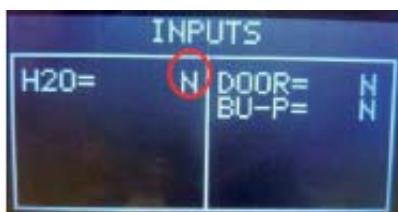
Start condition

Insert a full Water Tank.

The indication H20 changes from "N" to "Y".

NOTE: the switching from "N" to "Y" requires about 1-2 seconds.

ERROR: The indication TANK-H2O doesn't change; check the capacitive sensor (fixing) and the wiring (JP23)





Insert the BrewUnit

The indications **BU-P** changes from "N" to "Y".

Note: removing the BrewUnit the indication from "Y" to "N" requires about 2-3 seconds to switch.

ERROR: Check the BU presence Microswitch and the wiring (JP16).



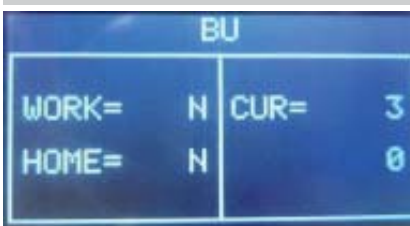
Close the Door and Dreg Drawer

The indication **DOOR** change from "N" to "Y"

ERROR: The indication **DOOR** does not change; check the Microswitch for the door and the wiring (JP14).

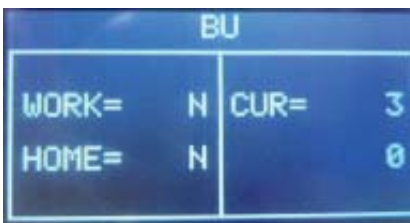
Note: without the Dreg Drawer correctly inserted the DOOR indication cannot change!

Press **Z7** "  " to move to the next screen



The machine passes to the Page 3 (**BU PAGE**)

Page 3 (BU)

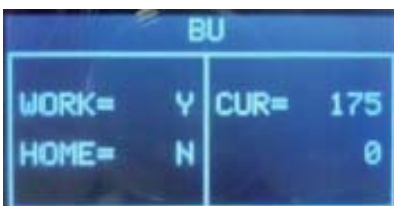


Start condition

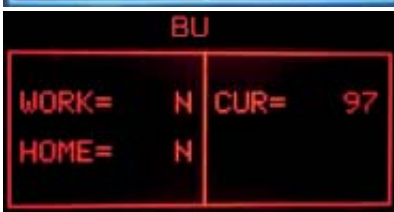


Press the Z1 button to move the BU to Work

IMPORTANT NOTE: If the DREGDRAWER is not inserted or the DOOR is not closed the BU test cannot be performed. If these 2 inputs are not in the right position, a warning message will be shown and the display turns to red.



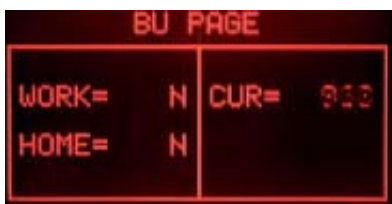
When the BU reaches the work position the indication **WORK** changes from "N" to "Y", the number of the current is less than 200mA (without BU) or 300mA (with BU).



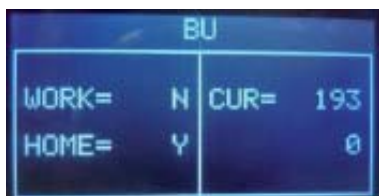
ERROR: The indication **WORK** doesn't change and remain "N", the display backlight changes from white to red; Check the work microswitch (broken?), the BU motor (blocked?) and the wiring (JP16).



ERROR: (Without BU) The absorbed current is more than 200mA, the display backlight changes from white to red; check the BU and the motor.

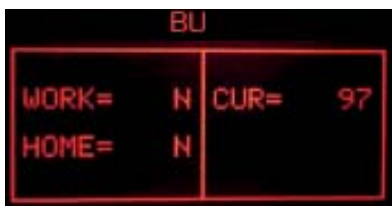


ERROR: (With BU) The absorbed current is more than 300mA, the display backlight changes from white to red; check the BU and the motor



Press the Z3 button to move the BU to Home

When the BU reaches the home position the indication **HOME** changes from "N" to "Y", the number of the current is minus than 200mA (without BU) or 300mA (with BU).



ERROR: The indication **HOME** doesn't change and remain "N", the display backlight changes from white to red; Check the work microswitch (is broken), the BU motor (is blocked) and the wiring (JP16)

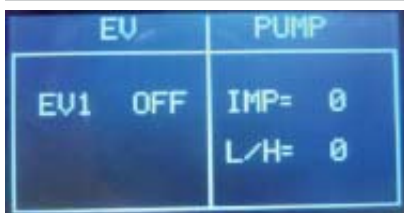


ERROR: (Without BU) The absorbed current is higher than 200mA, the display backlight changes from white to red; check the BU and the motor.



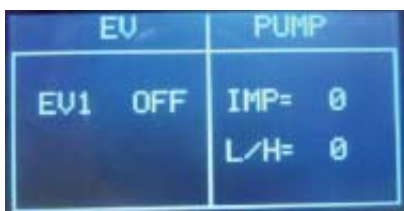
ERROR: (With BU) The absorbed current is higher than 300mA, the display backlight changes from white to red; check the BU and the motor.

Press **Z7** "  " to move to the next screen



The machine passes to the Page 4 (**EV - PUMP**)

Page 4 (EV - PUMP)



Start condition



Press the Z1 button to open the Electro Valve

IMPORTANT NOTE: If the DREGDRAWER is not inserted or the DOOR is not closed the EV test cannot be performed. If these 2 inputs are not in the right position, a warning message will be shown and the display turns to red.

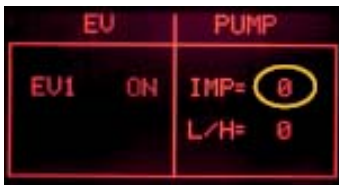


It is possible to hear the "click" from Electro Valve. The indication beside the **EV1** changes from "OFF" to "ON".



Press and Release the Z4 button to switch on the pump (100 impulses)

The water goes out from the pipe and the indication **IMP** shows increasing numbers. The indication L/H must be within the range 10-18.



ERROR: The display backlight changes from white to red and the impulse remains 0; If water comes out the pipe: check the wiring from the flowmeter to the CPU/POWER board (JP5). If no water comes out the pipe: check the pump and the wiring from the pump to the CPU/POWER board (JP24).



ERROR: The L/H is zero or very low; the Electro Valve does not open. Check the wiring from the Electro Valve to the CPU/POWER board (JP3) and the Electro Valve.

Press **Z7** "  " to move to the next screen



The machine passes to the level 5 (Heater-Grinder)



Press the Z4 button to switch on the grinder.

The grinder rotates and in the indication **GRINDER** the number increasing up to 5000 (5seconds test). The other numbers inside the **GRINDER** box are not important for this test.



ERROR: The number remains 0 or the grinder does not run, the display backlight changes from white to red; check the Grinder and the wiring from the Grinder to the CPU/POWER board (JP8)



Check the temperature

The number shows the heater temperature.



ERROR: In the indication **HEATER** appears "**SHORT**", the **NTC** temperature-sensor is shorted, the display backlight changes from white to red; check the wiring from the NTC temperature-sensor to the CPU/POWER board (JP13).



ERROR: In the indication **HEATER** appears "**OPEN**", the **NTC** temperature-sensor is detached or broken, the display backlight changes from white to red; check the wiring from the NTC temperature-sensor to the CPU/POWER board (JP13).



Press the Z1 button to switch on the Heater

The absorbed current (Amperometer on the main supply) is OK, the indication **HEATER** changes from "OFF" to "ON" and the temperature starts increasing.



If temperature is over 100°C, the backlight change from WHITE to RED. This is a ALERT message to avoid heating the HEATER element over dangerous temperature.

ERROR: the absorbed current is KO or the temperature does not increase; check the wiring from the heater to the CPU/POWER board (JP19) and the wiring of the NTC temperature-sensor (JP13).

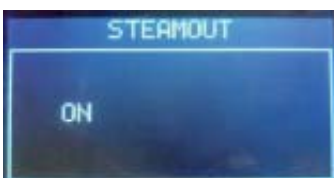
5.1.1. SteamOut

This document describes the Steam-Out procedure; the application is used in order to empty the heater.



To enter in SteamOut

The machine enters in Steam-Out mode by holding pressed together: the "**ESPRESSO LUNGO**" button and the **MENU** button; while switching on the machine by main switch behind the machine.



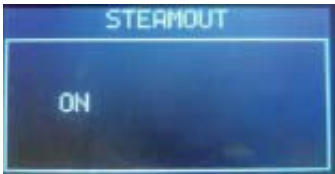
Once entered the Steam Out mode the display shows the "**STEAM OUT**" indication. Buttons can be released



IMPORTANT NOTE: to execute the Steam-out procedure the Ntc sensor must work correctly; if some errors occurs on Ntc during the steam-out, the procedure can't continue and an error message is shown on the display.

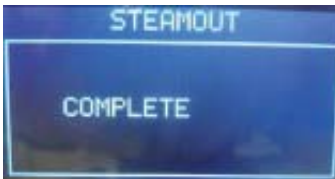


IMPORTANT NOTE: to execute the Steam-Out procedure the DREGDRAWER must be in place and the DOOR must be closed. If these 2 conditions are not respected a warning message is shown on the display and the Steam-Out is interrupted.



The machine starts the Steam Out and in the display appears the indication "ON".

While the Steam Out runs the Electro valve is opened and water comes out the Water/Steam pipe.



When the Steam Out is complete the message "COMPLETE" is shown on the Display. The Electro valves automatically closes and the machine can be switched off.

When the Steam-Out is complete the following parameters are reset to their default values:	
Length "Espresso" product	(Default 145 impulses)
Length "Espresso Lungo" product	(Default 345 impulses)
Length "Cappuccino" (Coffee + Milk product)	(Default 170 impulses coffee & 34sec milk)
Length "Milk" product	(Default 34 seconds)
Stand-By Time	(Default 15 minutes)
Count Coffee	(Default 0)
The request for Priming the Circuit at the first switch on is set.	
Brewing Unit Empty	
Aroma Strength	(Default 3 beans)
BU current array (BU during rinsing)	(Default 150mA)
Grinder Sensing Array	Default 2000ms)
Grinding time Aroma Very Light (1 Bean)	(Default 3000ms)
Grinding time Aroma Light/Medium (2/3 Beans)	(Default 3500ms)
Grinding time Aroma Strong/Extra Strong (4/5 Beans)	(Default 4000ms)
Filter Presence	(Default OFF)
Filter Pulses	(Default 0)
Last Error Log	(Default 0)
Coffee Duct Empty = TRUE (To grind more first time after steam-out and refill duct with coffee)	

5.2. Error codes

ERROR CODES	DESCRIPTION
01	The coffee grinder is blocked
02	The grinder is disconnected
03	The brewing unit is blocked in work position
04	The brewing unit is blocked in home position
05	The hydraulic circuit is clogged
10	The temperature sensor is in short circuit
11	The temperature sensor is opened
14	The temperature was up to 170°
15	The machine doesn't heat up
19	The net is not stable
22	The keyboard is not recognized

CHAPTER 6

STANDARD CHECKS

6.1. Repair schedule

	Action
1	Visual inspection (transport damage)
2	Machine data check (rating plate)
3	Operational check / problem analysis
4	Opening machine
5	Visual inspection
6	Operational tests
7	Repairing the faults encountered
8	Checking any modifications (view Symptom Cure, new software, etc.)
9	Service activities in accordance with the operating schedule
10	Internal cleaning
11	Operational test while the appliance is open
12	Assembly
13	Final inspection test
14	Draining the circuit (in winter)
15	External cleaning
16	Lubricating the brewing unit with suitable grease
17	Insulation test HG 701 (dielectric)
18	Documentation

6.2. Service schedule

S	Replacement
ES	Visual inspection
D	Descaling

P	Cleaning
TR	Noise test
R	Adjustment

Component	Action	Support/tool
Water filter	P/S	
Water tank lip seal	S	
Boiler pin O-ring	S	
Brewing unit	ES/P	Grease solvent / Grease
Hoses, attachments and Oetiker clamps	ES	
Pump	ES/TR	
Gear motor	ES/TR	
Coffee grinder	P/R	Vacuum cleaner / brush
Water circuit	D	Saeco descaler
Hot water/steam valve	ES/S	

6.3. Final test

Test	Procedure	Support/ tool	Standard	Tolerance
Espresso	2-3 Espressos for adjustment purposes	Measuring scoop	Same amount	15%
Coffee	2-3 Coffees for adjustment purposes	Measuring scoop	Same amount	15%
Noise			Standard	
Amount of cream	Blow into the cup until the cream separates		The cream should come together again to form a complete layer	
Cream colour			Hazel brown	
Grinding level	Check the grain size of the ground coffee			
Hot water	Dispense water			
Steam	Dispense steam			
Dreg drawer missing indication	Remove the dreg drawer		Dreg drawer missing indication	
Low bean level indication	Start brewing a coffee while the coffee bean hopper is empty		Low bean level indication	

CHAPTER 7

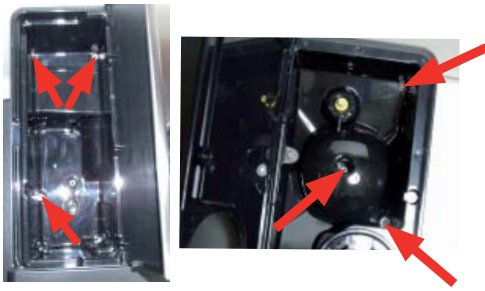
DISASSEMBLY

7.1. Outer Shell



Remove the water tank, coffee container cover, drip tray, dreg drawer, brewing unit.

Upper cover



Unscrew the screws shown



Remove the cover as in the photo.



Remove the cover as in the photo. In case of any issues please you can try with the alternative way below described.



Cover a screwdriver with adhesive paper to prevent scratching the chromed shell.



Remove the cap, unscrew the screw shown and remove the steam tube.



Unscrew the screw shown and remove the cover.

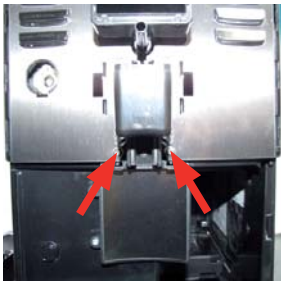


Unscrew the screw shown

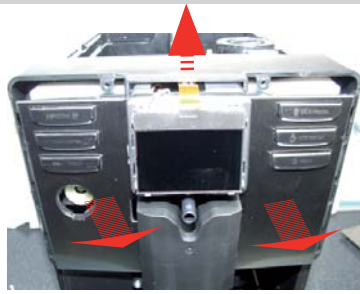


Press the sides and remove the cover and dispenser. Insert as before to reassemble the dispenser in the rail and then the coverage.

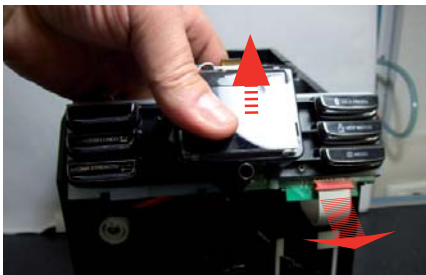




Unscrew the screws shown



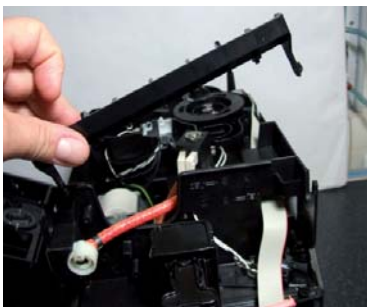
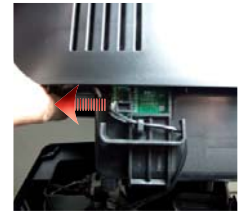
Remove the insert the upper cover



Remove the support KYB assy. and disconnect the flat cable.



Remove the upper cover and remove the electrical and water circuit connections.



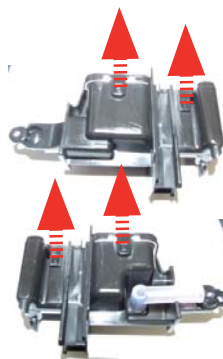
remove the block support KYB assy.



7.2. Dispenser



Unscrew the screws shown and remove the dispenser



unlock where highlighted and remove the cover in the dispenser

7.3. Coffee grinder

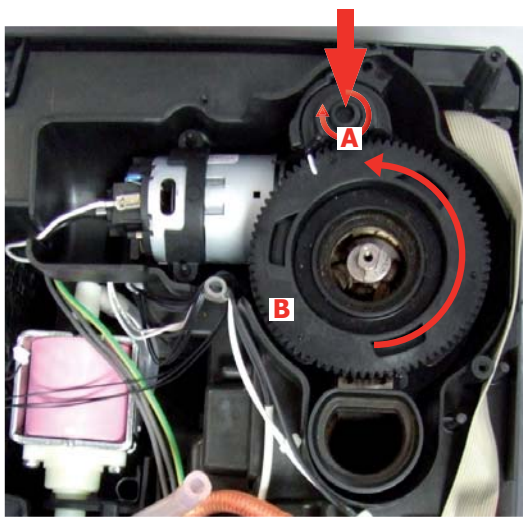


Raise the coffee grinder and remove the connections.

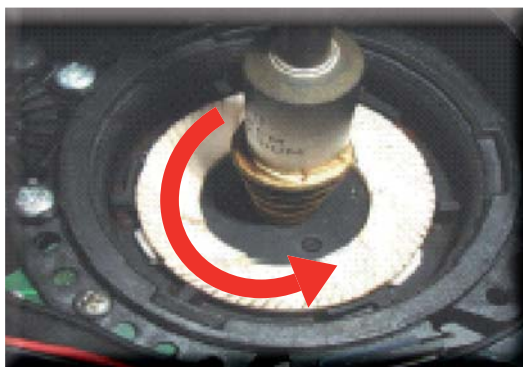


When reassembling the coffee grinder, make sure the spring is repositioned correctly (see photo).

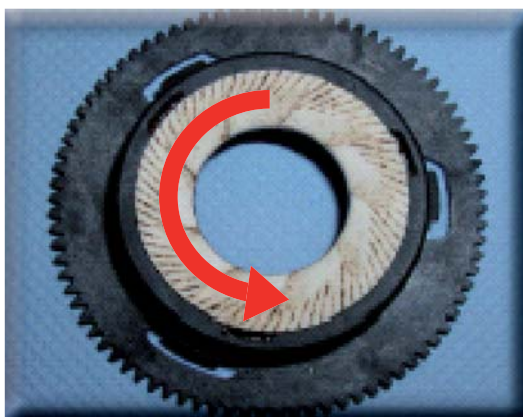
7.4. Grinder blades



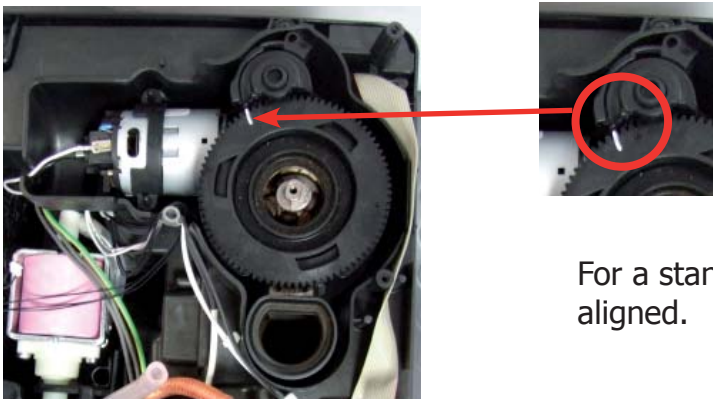
To extract the top support of the appliance, press on the grinding adjustment spindle (A) and turn the support anticlockwise until it unhooks.



Turn the grinder blades anticlockwise out of the support.

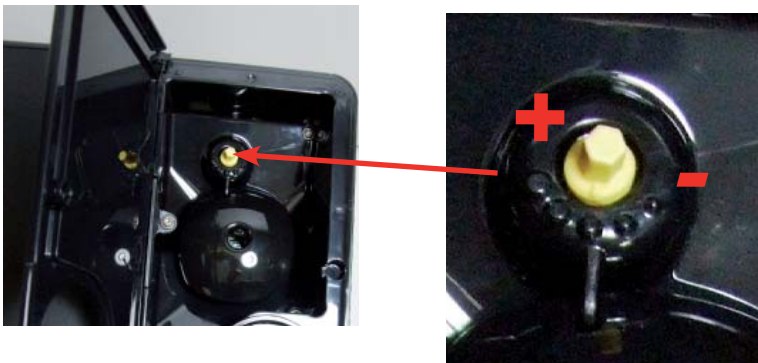


Turn the grinder blades clockwise out of the support. The bayonet connections can be accessed from the rear.



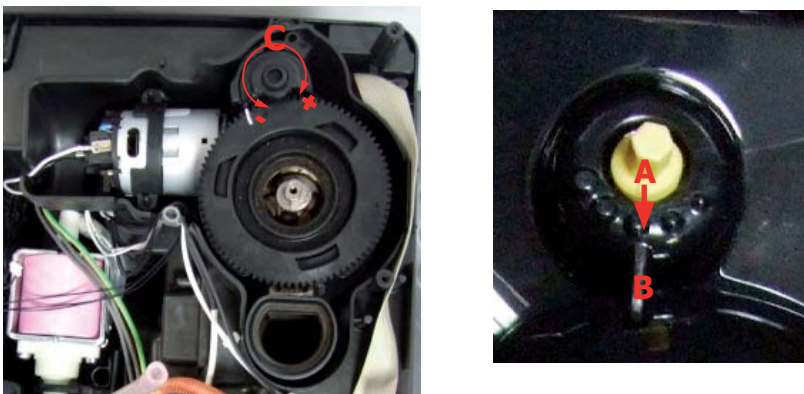
For a standard adjustment, both markings must be aligned.

7.5. Coffee grinder adjustment



The grinding adjustment can be set by the user (only with the coffee grinder in operation) by pressing and turning (only by one click at a time) the insert inside the coffee bean hopper with the aid of the wrench supplied.

Adjustment by a service center



To adjust grinding further, the engineer can work directly on the coffee grinder by pressing and turning the ring nut (C) shown. (clockwise + to increase the particle size of the coffee and anticlockwise - to decrease it).

If there are any remains of coffee powder between the two grinding blades it is recommended to tighten by max. two marks at a time.

Lastly, move the arrow (A) on the adjustment knob to the center of the adjustment dots on the cover (B).

7.6. Carafe connection and hot/steam water dispenser



Slide out the fork as illustrated



Loosen the screws holding the carafe connection



When reassembling the assembly to be careful to correctly position the spring.

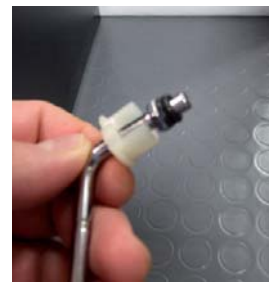
hot water dispenser



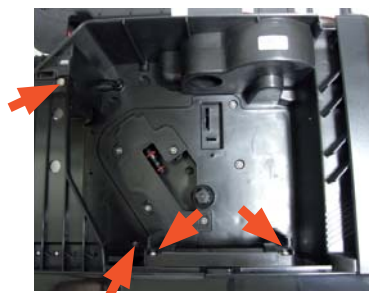
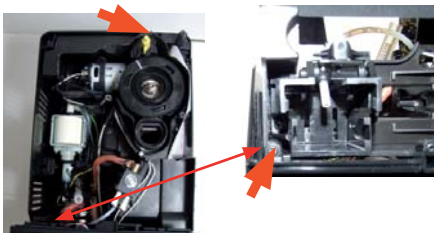
Removes the covers shown



unscrew the screws shown



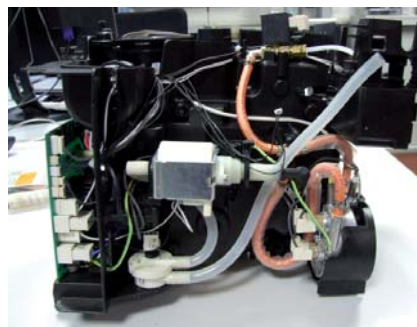
7.7. Central plate



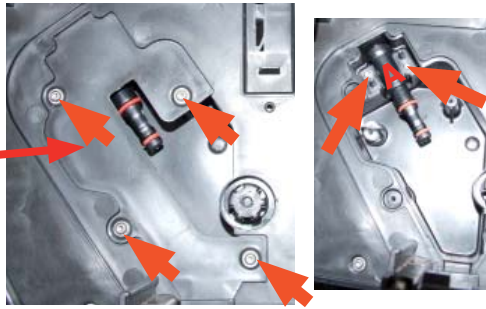
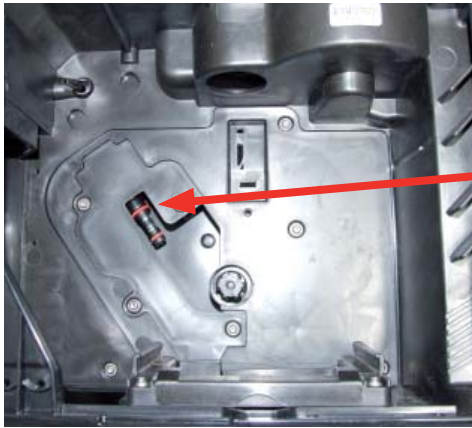
unscrew the screws shown



Lift up the center plate

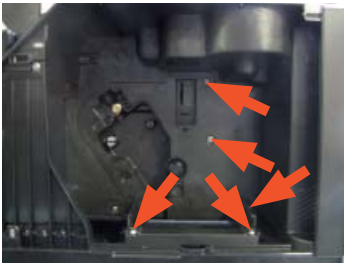


7.8. Pin boiler

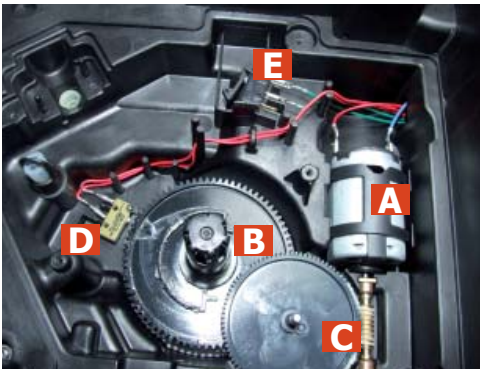


Loosen the screws as illustrated and remove the boiler pin (A).

7.9. Gear motor

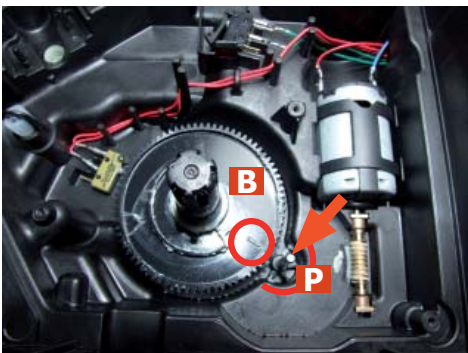


Loosen the screws as illustrated and remove the gear motor cover.



The following are located inside the compartment protected by the casing:

- Electric motor (A) with gears (B) and (C) for transmission and timing of the dispenser.
- Brewing unit present microswitch (E).
- Microswitch (D) detecting brewing unit home and work positions.
- Remove the gear (C) that meshes with the motor transmission shaft.
- Remove the large gear (B).
- Remove the motor (A), complete with transmission shaft.



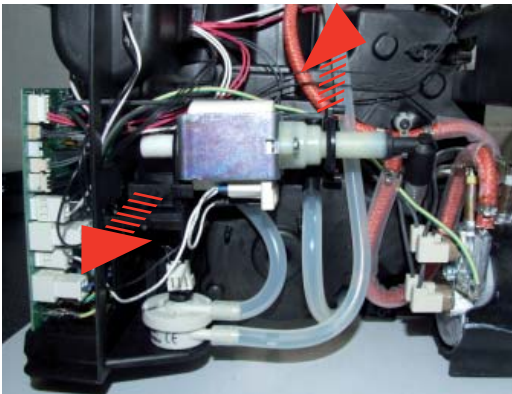
Replace the gear (B), making sure that the imprint of the arrow is aligned with the opening containing the pin (P).



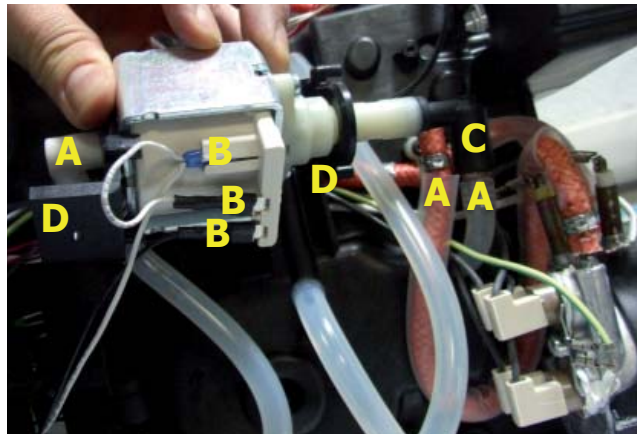
When replacing the motor and the transmission shaft, make sure the guide runners (L) are in the right position.

Grease the shaft thoroughly and evenly.

7.10. Pump

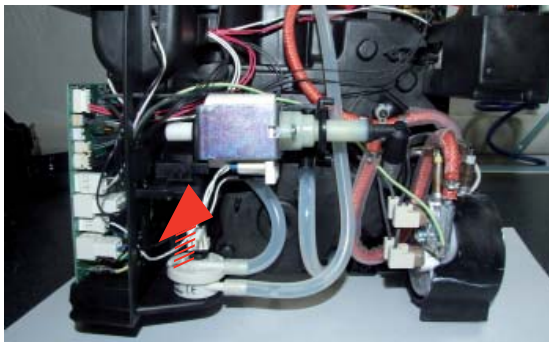


Unhook the pump from the supports.

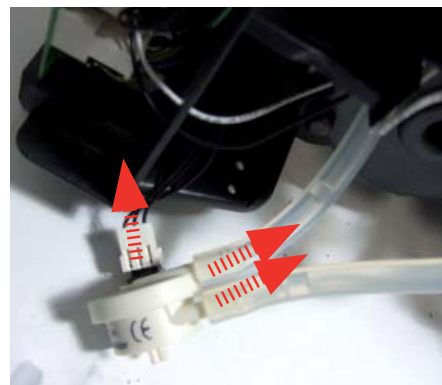


Disconnect the water circuit connections (A) and electrical connections (B), loosen the safety valve (C) and slide the pump off the brackets (D).

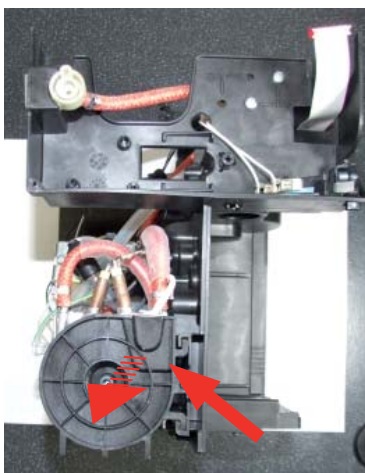
7.11. Flow-meter



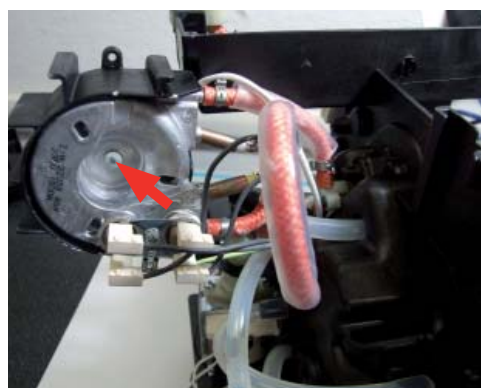
Lift the flow meter out of the casing assembly and remove the electrical and water circuit connections.



7.12. Boiler

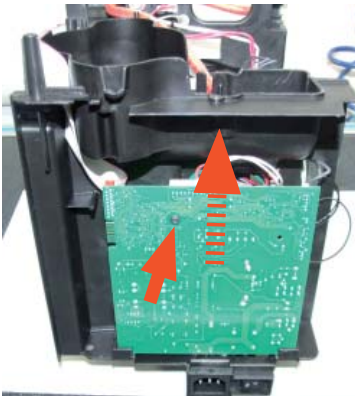


Unscrew the screw shown at unthread the support boiler



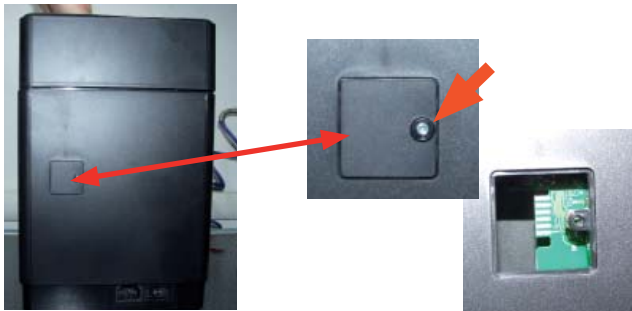
Unscrew the screw shown and remove the electrical and water circuit connections.

7.13. CPU board



Loosen the screws slide the card off the support and disconnect the electrical connections.

7.14. Programming access for SSC (Saeco Service Center)



Loosen the screw for remove the cover.

7.15. KYB interface and display



Remove the cap, unscrew the screw shown and remove the steam tube.



Remove the cover.

Unscrew the screw shown

Press the sides and remove the cover and dispenser. Insert as before to reassemble the dispenser in the rail and then the coverage.

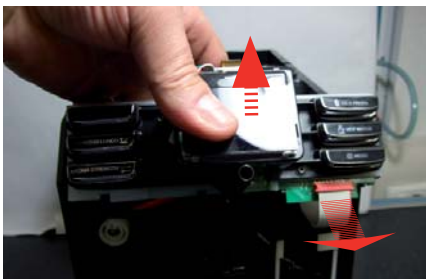


Unscrew the screws shown



Remove the insert the upper cover

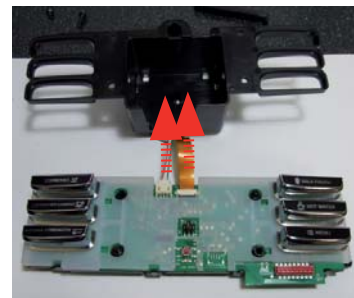




Remove the support KYB assy. and disconnect the flat cable.



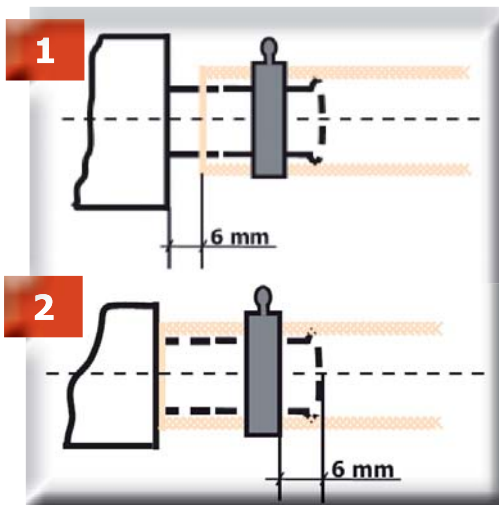
Loosen the screws for remove the cover.



Disconnect the electrical connections.



7.16. Fitting and removing Oetiker clamps



1) Boiler connection.

2) Other connections.



Use a suitable pair of pliers to remove the clamp (as illustrated).



Tighten the clamp as illustrated.

CHAPTER 8

NOTES

CHAPTER 9

WATER CIRCUIT DIAGRAM

CHAPTER 10

ELECTRICAL DIAGRAM

