

Bolero Turbo (XL)

OPERATING PRINCIPLE



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1. OPERATING PRINCIPLE

1.1 General operation

The machine works according to a pump system developed by Bravilor Bonamat. This system has the following advantages:

- The components that are responsible for the correct dosing of the water are housed in a cold water unit. As a result, the largest cause of faults with machines, the formation of scale on the dosing valves, is limited to a minimum.
- The float that regulates the water level is also located in the cold-water circuit. This is another reason why the formation of scale is limited to a minimum.

1.2 Water dosing system

After a selection key is pressed, the pump motor is driven with a controlled time and speed. The pump rotor displaces a certain amount of cold water from the cold water reservoir to the bottom of the boiler. As a result, the hot water in the boiler is pushed upwards towards a water selector. This selector uses a rotating movement to select its position (beverage-dependent). Depending on the selected beverage, an ingredient is dosed which, together with the dosed water, is or is not mixed and poured into a cup.

The water dosing system consists of the following main components:

1. Magnetic valve
2. Float tank
3. Boiler
4. Element
5. Temperature sensor (NTC)
6. Hot water selector
7. Protection float tray
8. Drain hose

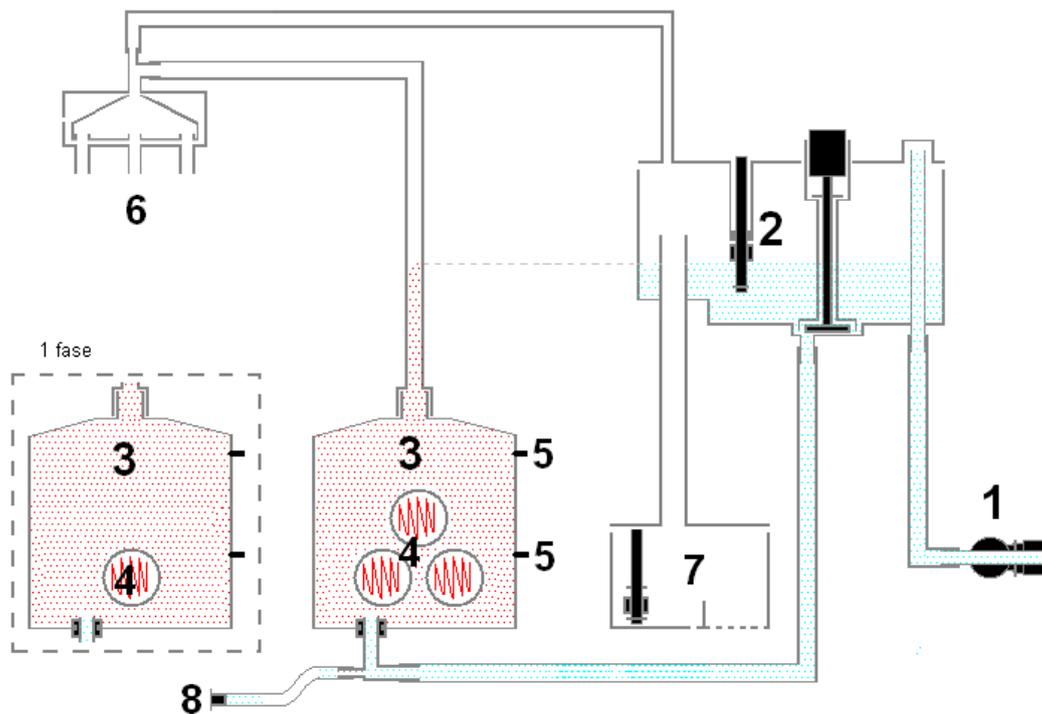


Fig. 1 The water dosing system

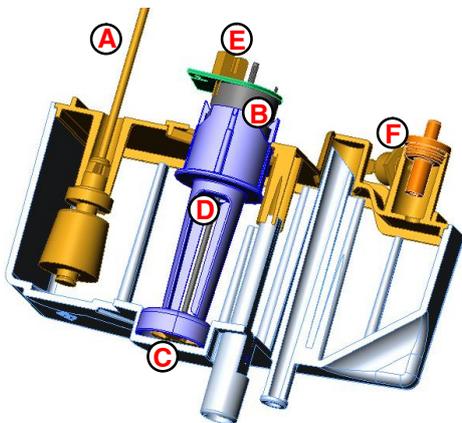


Fig. 2 Float tank, complete

- A. Float
- B. Pump motor
- C. Pump rotor
- D. Pump housing
- E. Encoder

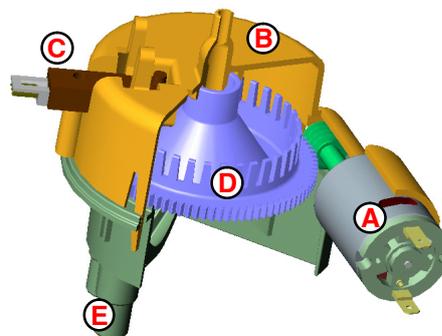


Fig. 3 Water selector, complete

- A. Water selector motor
- B. Top cover of water selector
- C. Light sensor
- D. Water rotation disk
- E. Water distributor

1.3 Start-up

1.3.1 Initialisation

The machine is switched on with the main switch. On the LCD (Liquid Crystal Display) the following appear in succession:

- all symbols that the display can show.
- the version number of the software (microprocessor) loaded from the factory.
- the version of the software table (Eeprom), also loaded from the factory.

This process takes approx. 3 seconds and ends with the steaming cup in the LCD display to show that this phase has successfully finished.

1.3.2 Filling

The float tank and the boiler are connected by a siphon hose. Together, they form a communicating vessel. When the machine is switched on for the first time, the float tank will be empty and the float will be low.

- The magnetic valve is opened and fills water in the float tank with a speed of 3,5 litres per minute, depending on the pressure.
- The water in the float tank flows to the boiler through the hose under the float tank.
- After the water level has pushed the float upwards, the water level in the float tank is the same as that of the boiler. The magnetic valve is switched off.
- A signal sounds when the level of the float is reached.

Please note:

Because the float tank is filled faster than the water "drops" to the boiler, the filling process will be made with short intervals.

1.3.3 Heating

After the system is completely filled with water, element is switched on by means of a relay in the machine.

The lower temperature sensor measures the current temperature of the water. This ensures that the water in the boiler is heated to the required final temperature. The upper temperature sensor releases the machine for dosing or not. The heating is switched off when the pre-set temperature has been reached.

Hot water has a lower specific weight than cold water. As a result, the hot water in the boiler will not want to flow back to the float tank through the siphon hose at the bottom. That part of the system will therefore remain cold. The latter is very important because precisely the parts of the float tank are sensitive for scale.

1.3.4 Dosing

Dosing is allowed when:

- The float is in the top position.
- The second temperature sensor measures a temperature higher than the blocking temperature.
- After a selection key is pressed, the pump motor (fig.4) is driven for a certain time, depending on the programmed amount, with a certain speed (number of revolutions).

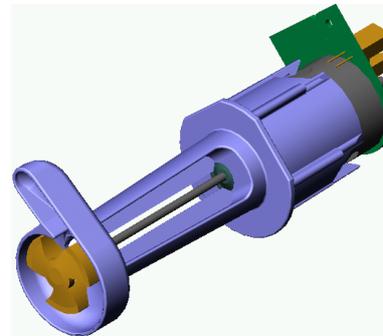


Fig. 4 Pump motor + rotor

- The pump rotor rotates in the pump chamber, which is filled with water. This is formed by the bottom of the float tank and the underneath of the pump housing (fig.5).

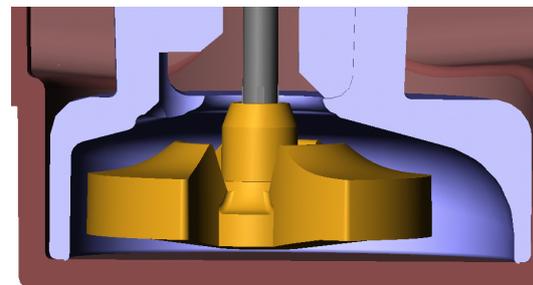


Fig. 5 Pump housing

- The pump rotor pumps the water out of the pump chamber, through the siphon hose in the bottom of the boiler.
- As a result, the hot water in the boiler is pushed out of the boiler.
- The float and the magnetic valve ensure that the level in the float tank is maintained and that water remains in the pump chamber.

The volume of the displaced liquid (yield) is mainly determined by the time and speed of the pump motor.

The time that the motor is on is regulated from the software and is very accurate.

The number of revolutions of the motor is measured with an active revolution counter.

Figure 6 shows that a disc is mounted on the shaft of the pump motor (A = Encoder). This disc rotates at the same speed as the pump rotor.

The encoder rotates between a light sensor (B) and interrupts a light beam. The interruption of the light beam is converted to pulses that can be read by the electronics.

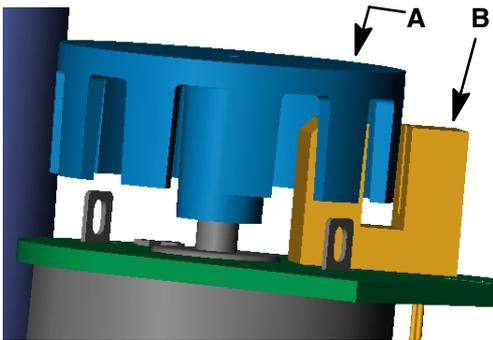


Fig. 6 Encoder

This forms an active revolution regulation that guarantees that, during the time that the pump motor is on, the speed and thus the water yield remain constant.

Selection of the dosed hot water:

This machine is fitted with a hot water selector. This component (fig.7) is responsible for the dosed water from the boiler being dosed in a minimum of 3 and a maximum of 6 directions (type-dependent).

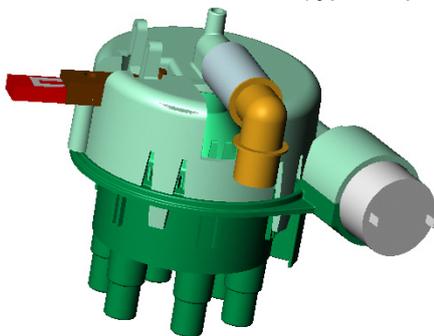


Fig. 7 Water selector

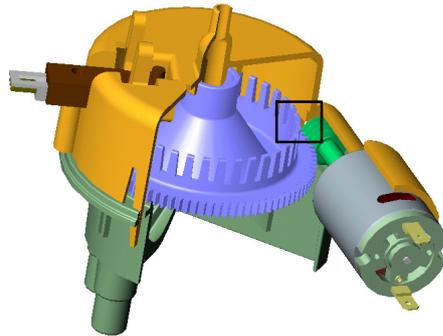


Fig. 8 Water selector internal

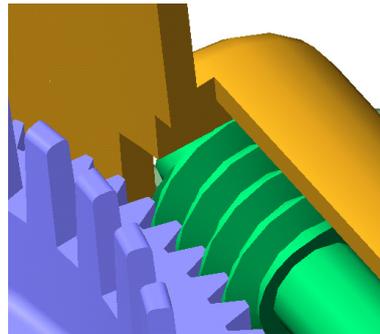


Fig. 9 Water distribution disc

After the machine is switched on, the water selector goes to the stand-by position according to the following procedure:

- The water selector motor is driven.
- This motor uses a plastic worm to drive the water distribution disc (fig.8 / 9).
- The cams on the distribution disc interrupt the light beam of the light sensor and pass these pulses to the control (fig.10).
- When the light sensor observes the wide cam on the distribution disc (fig.10 / 11), the initial position is determined.

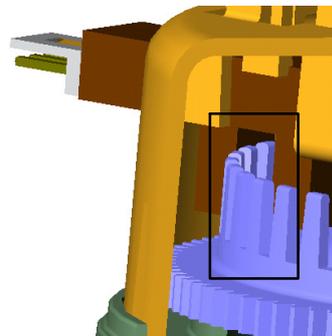


Fig. 10 Water distribution disc

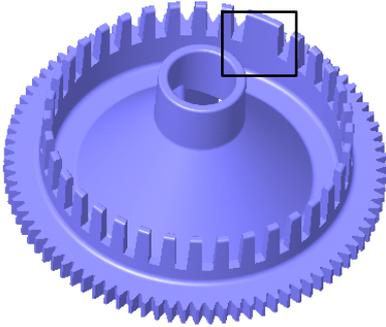
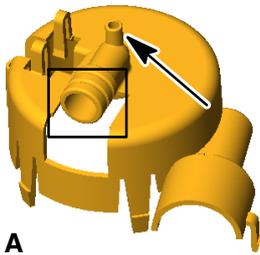


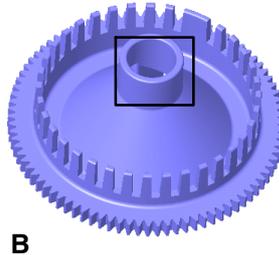
Fig. 11 Water distribution disc with wide cam

Operation of the water selector after a selection key is pressed:

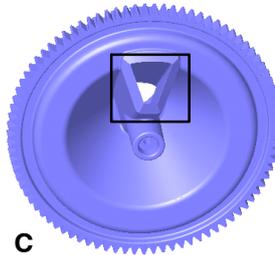
- Depending on the selected beverage, the water selector determines its position.
- After the position is determined, the pump motor is driven.
- The dosed hot water is pumped into the top of the water selector (fig.12 A).



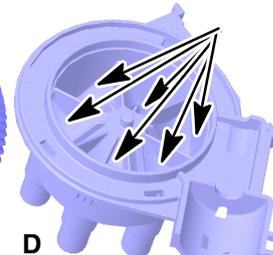
A



B



C



D

Fig. 12 Water selector components

- The water runs through the central hole of the distribution disc (fig.12 B). It comes out through the slanted hole at the bottom (fig.12 C).
- After this, the water falls into one of the chambers in the bottom of the water selector (fig.12 D).
- The water runs to the relevant part through the hoses that are connected to the water selector.
- The water selector rotates back to its initial position.

Please note:

The arrow in fig.12 A shows a small hole on the top of the water selector cover. This is an aeration hole, which prevents siphoning. A hose, which goes to the top of the float tank, is connected to the tulle.

Please note:

Depending on the selected beverage, the water selector can also rotate during the pumping. This is done if water has to go to several mixing systems.

1.4 Powder dosing system

The powder dosing system consists of an ingredient holder (canister) that is driven by a motor (canister motor).

After the start key is pressed, the canister motor will rotate after a certain delay. This motor drives a worm, which transports the ingredient to the canister outlet.

The control of the canister motor makes it possible to regulate timing and dosing speed independently. As a result, the ingredient can be poured into the mixer at the same time that the water flows out. However, the canister motor will stop slightly earlier than the water, to rinse the mixing jug clean.

Depending on the type of ingredient, "beater springs" are used in the canister. These springs ensure that less tunnel formation occurs. This is the caking of ingredient against the walls.

1.5 Mixing system

The mixing unit (fig.13) mixes the hot water and the ingredient. After a selection key is pressed, the water will be dosed in the mixing chamber after a certain delay. The product falls into the mixing chamber from above. Depending on the selected beverage, the mixer will start to rotate with a certain number of revolutions.

An exhaust opening is mounted on top of the mixing chamber (fig.14). This cover has an opening at the rear, which is pressed into an exhaust opening through the sheet-metal work. The function of this exhaust system is to ensure that vapour from the mixing chamber does not get the chance to reach the ingredient holder outlet. Figure 15 shows an example of an exhaust system suited for three mixing systems.

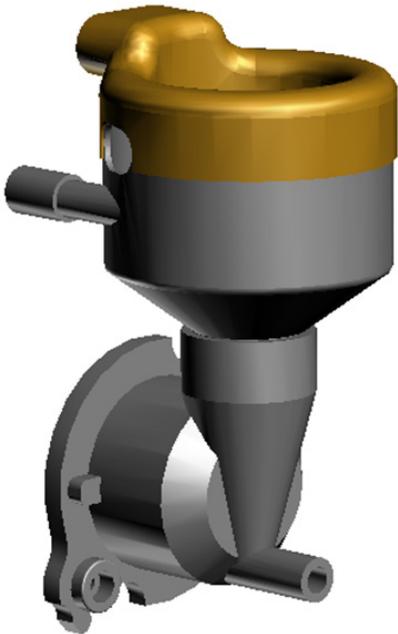


Fig. 13 Mixing unit



Fig. 14 Exhaust hood

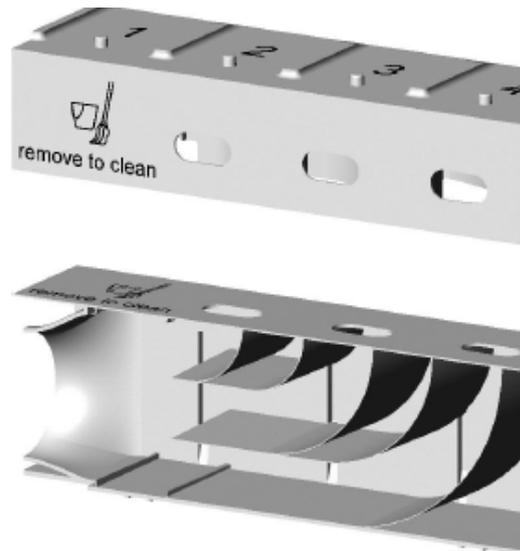


Fig. 15 Exhaust system for three mixing systems

1.6 Ventilation system

The ventilation system (fig.16) removes the steam, that develops during dosing. So the settling of warm steam and condensation in the mixing chamber will be prevented. Therefore the mixing chamber will get less dirty.

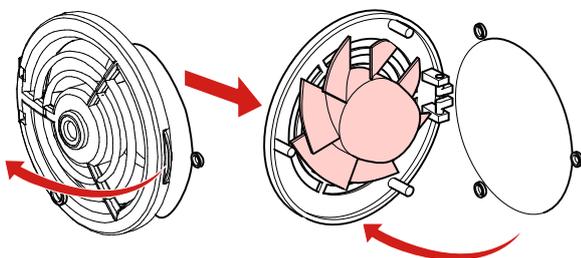


Fig. 16 Ventilation system

1.7 Operating system

The operating system consists of a:

- Keyboard
- Main board

1.7.1 Keyboard

The keyboard is located on the front of the machine and contains various keys and the display. Saved settings such as the dosing quantities, counters, etc. are stored here. When this circuit board is replaced, the customer-specific settings will be lost. A flat cable connects the keyboard to the main board in the machine.

1.7.2 Main board

The main board is located on the rear inside the machine and it is supplied from an external transformer. This board contains inputs and outputs of the machine.

1.8 Hardware protections

The machine is equipped with a number of hardware protections. These protections ensure that no dangerous situations can arise, such as overheating and/or water in the machine.

1.8.1 Overflow protection

This protection is in the float tank and ensures that, if the water becomes too high, excess water is passed through the overflow and hose to the bottom of the machine.

1.8.2 Back-flow protection

The water from the magnetic valve is sprayed against the cover of the float tank, via a pipe in the float tank. Then, it goes into the float tank itself. In this way, water is prevented from flowing back into the system and getting into the water system if the water pressure is released from the magnetic valve.

1.8.3 Boiling protection

The element is controlled by a relay on the main board. A so-called safety relay has been connected in series with this relay. If a fault occurs and the element is still under tension, the safety relay will interrupt this tension (see the electrical diagram) and prevent boiling dry.

1.8.4 High temperature safety switch

The boiling-dry protection is mounted on the outside of the boiler by means of two Klixon. If the boiler, for whatever reason, is not switched off by the control, the Klixon make sure that the voltage on the element is mechanically switched off to prevent overheating.

During the boiling dry process, evaporation escapes from the boiler. This vapour enters the water selector and can possibly exit between the cover and distributor. To prevent a few drops from entering the machine, a drip tray for the water selector has been made (fig.17).

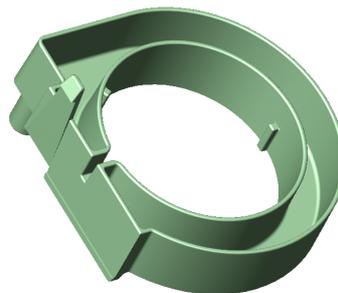


Fig. 17 Drip tray water selector

1.9 Software protection

The machine has been equipped with a number of software protections; the software monitors all inputs and outputs of the machine throughout the process. If non-allowed situations arise, the software will intervene. This intervention results in the machine being switched off and an error message being shown on the display.

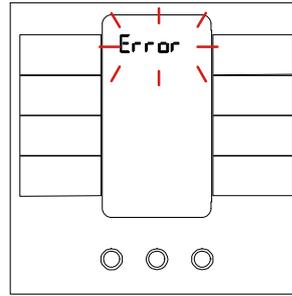


Fig. 18 LCD display with error message

ERROR LIST

Error 1 *Not applicable*

Error 2 *Temperature in boiler too high:*

- If the temperature sensor (NTC) measures a value that is outside its range (0 Ohm or infinity), the machine is switched off and 'Error 2' appears in the LCD display. This also applies if the boiling protection (see hardware protection) is activated.

Error 3 *Magnetic valve open without selection / Heating process takes too long:*

- When a dosing key is pressed, the magnetic valve is enabled. If this valve is enabled without pressing the start key, a timer is activated. If the magnetic valve is enabled more than three times within 15 minutes without the start key being pressed, this indicates that there is a leakage in the water system or that the water is boiling. In that case the machine is switched off.
- At the moment that the float in the protection water tray has reached the upper position once, the software enables the protection relay and all elements are switched off immediately. In this case the machine will not be switched off, but show error 3 after 15 minutes.
 - Reset the machine after having remedied the fault. This resetting is done by pressing the reset key on the main board through the hole in the rear panel using a small screwdriver (see figure). After this switch off the machine and on again to make the error code 3 disappear from the screen.

Error 4 *Not applicable*

Error 5 *Water selector in wrong position:*

- The water selector returns to its initial position during start-up and after each dosing. If the selector cannot find its position during the execution of this routine, it switches off and 'Error 5' appears in the LCD display.

Error 6 *Magnetic valve opened too long:*

- If, for whatever reason, the process of filling the float tank takes too long, the machine is switched off and 'Error 6' appears in the LCD display.

Error 7 *Wrong Chip card:*

- In a number of cases, it is possible to place a chip card in a chip card reader. This is present on the keyboard. Any data present can be downloaded or uploaded. If the software on this chip card does not correspond with the software in the machine, 'Error 7' appears in the LCD display.

Error 8 *Communication error between both prints:*

- There is constant communication during machine start-up and during use. This is done via the flatcable between the keyboard and the main board. If communication is impossible, 'Error 8' appears in the LCD display.

Error 9 *Pump motor rotates too slow or does not rotate at all:*

- The pump motor is rotating during machine start-up and during use. The light sensor detects no or too little pulses and 'Error 9' will appear in the LCD display.



1.10 Programming

The programming is built up by means of a simple programming carrousel. Have the user instructions open next to this text. After the programming is activated by means of the programming key, settings can be simply activated or changed. By pressing the programming key again, the settings are saved the machine returns to the standby mode.

1. Open the door with the key.

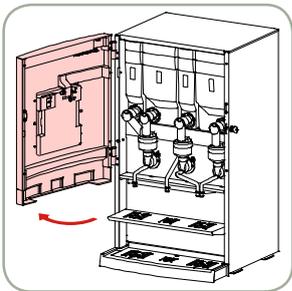


Fig. 19 Door open

2. Press the programming key P to start the programming sequence.

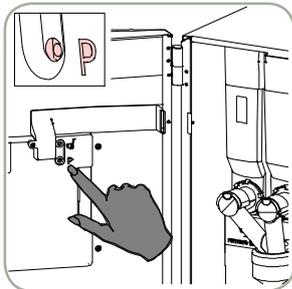


Fig. 20 Programming key

3. Counter contents read-out of all beverages at the same time. The display shows a 3- and 6-digit number alternately:
 - The 3-digit number denotes the total number of units that were poured since the counter settings were last reset to zero (day counter).
 - The 6-digit number denotes the total number of units that were poured since the machine was put into operation (total counter).

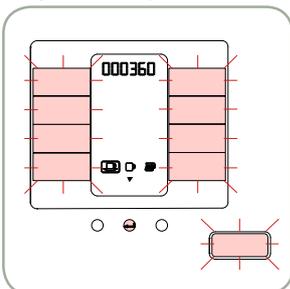


Fig. 21 Total counter

- 3.1 Separate read-out of counter contents of poured beverages:

- Select the desired beverage with one of the selection buttons. The relevant counter contents will appear in the LCD display. After a few seconds, the counter contents return to the counter of all beverages at the same time.

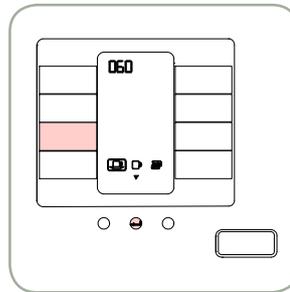


Fig. 22 Separate counter contents

- 3.2 Resetting day counter:

- Select any beverage using one of the selection buttons.
- Keep the desired selection button pressed until the day counter is set at 0.

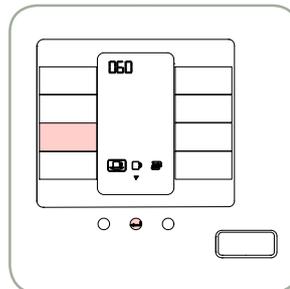


Fig. 23 Day counter

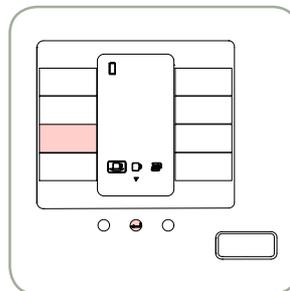


Fig. 24 Day counter to zero

- Press the Enter key to go to the general selection screen (fig.25).

4. General selection screen:

- *General programming*: press the Enter key and continue with point 5.
- *Beverage-dependent settings*: press the selection key and continue with point 13.

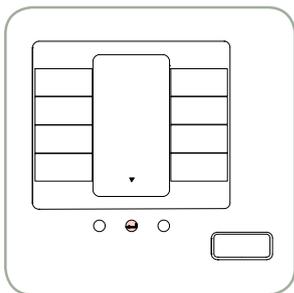


Fig. 25 General selection screen

5. Setting the timer (CL):

- The default setting of the timer is OFF, see fig.26 . Beverages can be poured at any time.
- When the timer (CL) is set at ON, it is possible to switch the machine on and off at a maximum of four various times. Only during these times hot beverages can be poured from the machine. Only hot water can be poured at all times! If the setting is changed to ON, the current time has to be set, see fig.27 . This time will appear as default on the display. To set the various times, go to point 12.

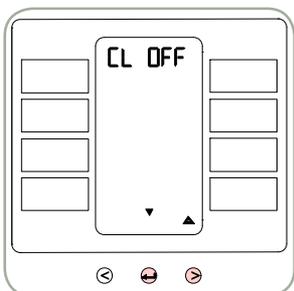


Fig. 26 Default setting of the Timer (CL)

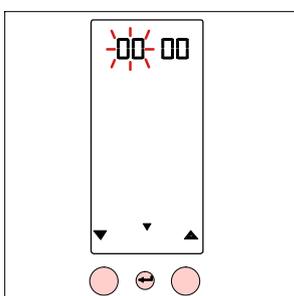


Fig. 27 Set current time

6. Descaling program:

- This machine is fitted with a descaling program. After the START key is pressed in this state of the LCD display, the de-scaling program is started. (For this purpose, read the relevant section of the user instructions.)
- Press CANCEL within 5 seconds if you decide not to start the de-scaling program.

7. Preselect the cup/mug/jug setting:

- The machine will return to the set preference after having distributed the drink or after a certain time.

8. Boiler temperature:

- Set the temperature of the water in the boiler. (–5°C – +5°C)

9. Descaling signal:

- Ask your local water company about the hardness of the water supply. Always select the right setting. The default setting of the machine is position 3 (1000L). The machine continuously registers the time that the inlet valve is open and therefore the number of litres of water that has passed through the system. When the number of registered litres is greater than or equal to the programmed value, the descaling symbol in the LCD display starts to flash.
- The positions 6 – 9 are reserved for the use of a water softening filter preceding the machine. Always choose the correct setting that corresponds with the capacity of the water softening filter.



Fig. 28 Descaling symbol

10. Energy-saving mode:

- Setting the number of minutes/hours, after which the machine must switch over to the ECO mode. All functions such as boiler, ventilator and display illumination switch off and [ECO] appears in the LCD display. The next time that a selection key is pressed, the machine switches on again. Depending on the switch-off time, it can take a few minutes before the machine is ready for use again.

11. Copy Card:

- Customer-specific settings can be copied to the chip card, after which they can be downloaded to other equivalent machines.
- The procedure can be found on the extranet under 'Special codes'.

12. Now set the on- and off swichting times. A maximum of four times can be set in succession, P1 till P4. Beware of the fact that the times do not overlap!

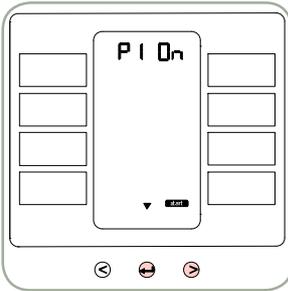


Fig. 29 First switching on time (P1)

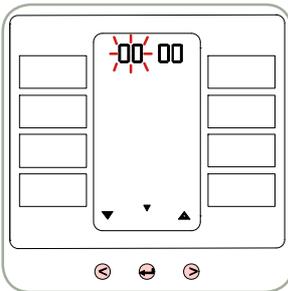


Fig. 30 Set time (ON)

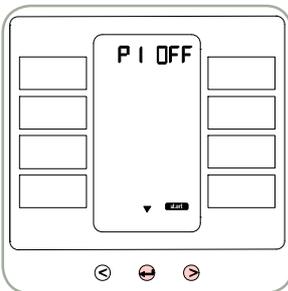


Fig. 31 First switching off time (P1)

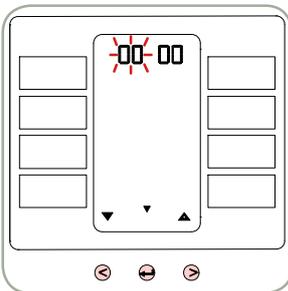


Fig. 32 Set time (OFF)

13. General selection screen (all keys that are now lit can be selected).
 14. Amount drink dependent (cup/mug/decanter).
 - Setting the amount of water in ml. The software will convert a larger amount to a longer pumping time. If the amount of water is changed, the basic strength is automatically adapted, so that the strength increases or decreases proportionally.
 - 14.1 Block dosing:
 - Decrease the set value to the minimum. The display will show 'OFF'.
 15. Basic strength (drink dependent):
 - Setting amount of ingredient (in %). The software translates the programmed percentage to the speed of the canister motor and therefore the strength of the ingredient. (See ingredient sheet).
 16. General selection screen.
 17. Programming (hot water):
 18. Amount hot water (cup/mug/decanter).
 - Here, the amount of water can be set in ml. The software will convert a larger amount to a longer pumping time.
 - 18.1 Blocking amount:
 - Decrease the value set to the minimum. The display will show 'OFF'.
 19. General selection screen.
- By pressing the programming key P again, the settings are saved and the machine returns to the standby mode.

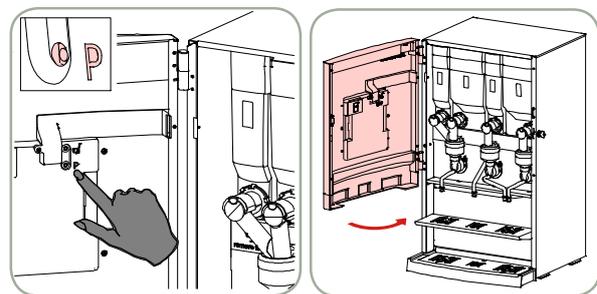


Fig. 33 Programming key / Door closed

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