

**ROYAL CLASSIC
ROYAL EXCLUSIV
ROYAL DIGITAL
ROYAL DIGITAL REDESIGN
ROYAL DIGITAL PLUS
ROYAL PROFESSIONAL
ROYAL PROFESSIONAL REDESIGN
ROYAL CAPPUCCINO
ROYAL CAPPUCCINO REDESIGN
ROYAL COFFEEBAR
ROYAL OFFICE**

SERVICE MANUAL

Revision 4



Saeco

Saeco International Group

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CHAPTER 1

INTRODUCTION

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1. Documents required

The following documents and requirements are necessary to qualify for an authorised repair.

- Service manual
- Operating instructions where available

2. Tools

In addition to an electrical workshop, the following standard tools are necessary:

	Description	Comments
1	Special screwdriver (Pozi)	Size: PZ1
1	Special screwdriver (Pozi)	Size: PZ2
1	Special screwdriver (Torx)	Size: T10
1	Temperature measuring device	Temperature range > 150°C Suitable for point measurements

3. Material

Description	Comments	Brand
Heat conductive paste	Temperature resistance $\geq 200^{\circ}$	User's choice
Bolt adhesive	Temperature resistance $\geq 200^{\circ}$	User's choice
Descaler		Saeco
Grease solvent		User's choice
Silicone grease (food safe)		Saeco

4. Safety instructions

All prescriptions and regulations in force regarding the repair of electrical equipment must be observed!

The machine must be disconnected from the main power supply before performing repair work. Switching the machine off is not an adequate measure.

The Royal coffee machine is classified under Protection Class 1. Protective devices must be tested once the repair work has been completed.

5. Overview of product range



Royal Redesign



Royal

TYPE	Pre-grinding/ brewing	Cappuccino maker	Steam system	Second pump	Second heating system	Display
Classic *	Pre-brewing					Dial control
Exclusive	x					x
Digital	x					x
Digital Redesign	x					x
Digital Plus	x		Rapid Steam		Pipe heater	x
Professional (Instant Steam)	x	x	Instant Steam	x	Flow heater	x
Professional (Rapid Steam)	x	x	Rapid Steam		Pipe heater	x
Professional Redesign	x	x	Rapid Steam		Pipe heater	x
Cappuccino	x	x	Instant Steam	x	Flow heater	x
Cappuccino Redesign	x	x	Instant Steam	x	Pipe heater	x
Coffeebar **	x	x	Rapid Steam		Pipe heater	x
Office***	x					x

Note:

* All machines, with the exception of the Royal Classic, are fitted with a powder coffee feed.

** The Royal Coffeebar has a fixed water connection (reversible).

***Royal Office – no steam function.

Output capacity:

Royal Series (Household): Maximum average daily output: 30 coffees

Royal Office / Coffeebar: Maximum average daily output: 50 coffees

CHAPTER 2

TECHNICAL DATA

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1. Technical data (Royal Classic)

Royal Classic	
Technical data	
Power supply/output:	230V 50Hz 1250W
Safety system:	170°C Safety thermostat for instantaneous water heater
Temperature monitoring:	KTY Temperature sensors transmit respective temperatures to electronic system
Continuous flow thermoblock:	Instantaneous water heater (1090 W) for coffee and hot water dispensing
Pump:	Ulka reciprocating piston pump with angle connector and thermostat - 48 W, 230V, 50 Hz. Type EX5, 20 l/h
Safety valve:	Conventional safety valve connected to pump
Water filter:	Installed in machine in front of the turbine and pump.
Gearmotor:	Direct current, 30 - 35 V
Cup warmer/gear resistor:	Approx. 437W / 130Ω (only activated when gears are operational)
Grinder (conical grinder):	Plastic grinding screw, galvanised steel grinding cone and grinding disc
Motor:	260 V Direct current
Second doser:	230 V - Magnet coil
Power consumption:	During heating - approx. 4.5 A Standby - Approx. 0.04 A
Pump pressure:	Max. 15 bar
Dimensions W x D x H in mm:	330/385/395
Weight:	Approx. 15 kg
Capacity of coffee bean container:	Approx. 300g
Capacity of water tank:	Approx. 2.4 l max. filling volume
Instantaneous water heater capacity:	Approx. 1.0 ccm, 10 ml volume
De-aeration time:	Approx. 1 - 2 sec. for initial star-up
Heating time:	Approx. 80 sec. with water at 10°C to operating temperature
Re-heating time:	None due to boiler
Steam heating time:	From coffee temperature to 127°C - Approx. 50 sec.
Coffee dispensing temperature:	Approx. 86° C
Grinding time:	Initial grinding with completely empty machine: Approx. 15 sec. / subsequent grinding: approx. 5.5 sec.
Time to make espresso:	Approx. 28 sec. for 50 ml
Time to make cup of coffee:	Approx. 40 sec. for 100 ml

3. Technical data (Royal Professional Instant Steam / Cappuccino / Cappuccino Redesign)

Royal Professional Instant Steam / Cappuccino / Cappuccino Redesign	
Technical data	
Power supply/output:	230V 50Hz 2300W
Safety system:	170°C Safety thermostat for instantaneous water heater
Temperature monitoring:	KTY Temperature sensors transmit respective temperatures to electronic system
Continuous flow thermoblock:	Instantaneous water heater - 1090 W, supplementary heating 437 W for coffee and hot water dispensing
Second thermoblock:	Instantaneous water heater for steam dispensing (instant steam) - 1090 W In Redesign this feature takes the form of pipe heating.
Pump:	Ulka reciprocating piston pump with angle connector and thermostat - 48 W, 230V, 50 Hz. Type EX5, 20 l/h
Second pump:	Technical data as above (for instant steam function)
Safety valve:	Conventional safety valve connected to pump
Water filter:	Installed in machine in front of the turbine and pump.
Gearmotor:	Direct current, 30 - 35 V
Cup heater/Gear resistor:	Approx. 437W / 130Ω
Grinder (conical grinder):	Plastic grinding screw, galvanised steel grinding cone and grinding disc
Motor:	260 V Direct current
Second doser:	Coffee dose adjustable by means of lever (6 - 9g) outside housing 230 V - Magnet coil
Second doser:	Doser for powder coffee, by means of measuring spoon
Power consumption:	During heating - approx. 9 A Standby - Approx. 0.04 A
Pump pressure:	Max. 15 bar
Dimensions W x D x H in mm:	385/450/395
Weight:	Approx. 16 kg
Capacity of coffee bean container:	Approx. 300g
Capacity of water tank:	Approx. 2.4 l max.
Instantaneous water heater capacity:	Approx. 1.0 ccm, 10 ml volume
De-aeration time:	Approx. 1 - 2 sec. for initial star-up
Heating time:	Approx. 80 sec. with water at 10°C
Re-heating time:	None due to boiler
Steam heating time:	None due to second instantaneous water heater (steam dispensing possible even during coffee dispensing / second pump)
Coffee dispensing temperature:	Approx. 86° C
Grinding time:	Initial grinding with completely empty machine: Approx. 15 sec. / subsequent grinding: approx. 5.5 sec.
Time to make espresso:	Approx. 28 sec. for 50 ml
Time to make cup of coffee:	Approx. 40 sec. for 100 ml

4. Technical data (Royal Digital Plus / Professional Rapid Steam / Prof. Redesign / Coffeebar)

Royal Digital Plus / Professional Rapid Steam / Prof. Redesign / Coffeebar

Technical data	
Power supply/output:	230V 50Hz 1600W
Safety system:	170°C Safety thermostat for instantaneous water heater
Temperature monitoring:	KTY Temperature sensors transmit respective temperatures to electronic system
Continuous flow thermoblock:	Instantaneous water heater - 1090 W - supplementary heating 437 W for coffee and hot water dispensing
Pipe heating:	1000W – Steam dispensing (rapid steam)
Pump:	Ulka reciprocating piston pump with angle connector and thermostat - 48 W, 230V, 50 Hz. Type EX5, 20 l/h
Safety valve:	Conventional safety valve connected to pump
Water filter:	Installed in machine in front of the turbine and pump.
Gearmotor:	Direct current, 30 - 35 V
Cup heater/Gear resistor:	Approx. 437W / 130Ω
Grinder (conical grinder):	Plastic grinding screw, galvanised steel grinding cone and grinding disc
Motor:	260 V Direct current
Second doser:	Coffee dose adjustable by means of lever (6 - 9g) outside housing 230 V - Magnet coil
Second doser:	Doser for powder coffee, by means of measuring spoon
Power consumption:	During heating - approx. 5.7 A Standby - Approx. 0.04 A
Pump pressure:	Max. 15 bar
Dimensions W x D x H in mm:	385/450/395 (Royal Profi new) 385/480/395 (Royal Coffeebar)
Weight:	Approx. 16 kg
Capacity of coffee bean container:	Approx. 300g
Capacity of water tank:	Approx. 2.4 l max.
Fixed water connection: (only for Royal Coffeebar)	Inlet valve / non-return valve Pressure control - 0.8 bar
Instantaneous water heater capacity:	Approx. 1.0 ccm, 10 ml volume
De-aeration time:	Approx. 1 - 2 sec. for initial start-up
Heating time:	Approx. 90 sec. with water at 10°C
Re-heating time:	None due to boiler
Steam heating time:	None, due to pipe heating
Coffee dispensing temperature:	Approx. 86° C
Grinding time:	Initial grinding with completely empty machine: Approx. 15 sec. / subsequent grinding: approx. 5.5 sec.
Time to make expresso:	Approx. 28 sec. for 50 ml
Time to make cup of coffee:	Approx. 40 sec. for 100 ml

5. Technical data (Royal Office)

Royal Office	
Technical data	
Power supply/output:	230V 50Hz 1500W
Safety system:	170°C Safety thermostat for instantaneous water heater
Temperature monitoring:	KTY Temperature sensors transmit respective temperatures to electronic system
Continuous flow thermoblock:	Instantaneous water heater (1090 W) for coffee and hot water dispensing
Pump:	Ulka reciprocating piston pump with angle connector and thermostat - 48 W, 230V, 50 Hz., Type EX5 20 l/h
Safety valve:	Conventional safety valve connected to pump
Water filter:	Installed in machine in front of the turbine and pump.
Gearmotor:	Direct current, 30 - 35 V
Gear resistor:	Approx. 437W / 130Ω
Grinder (conical grinder):	Plastic grinding screw, galvanised steel grinding cone and grinding disc
Motor:	260 V Direct current
Second doser:	Coffee dose adjustable by means of lever (6 - 9g) outside housing 230 V - Magnet coil
Second doser:	No
Power consumption:	During heating - approx. 5.7 A Standby - Approx. 0.04 A
Pump pressure:	Max. 15 bar
Dimensions W x D x H in mm:	385/450/460
Weight:	Approx. 14 kg
Capacity of coffee bean container:	Approx. 1,000g
Capacity of water tank:	Approx. 6 l max.
Instantaneous water heater capacity:	Approx. 1.0 ccm, 10 ml volume
De-aeration time:	Approx. 1 - 2 sec. for initial star-up
Heating time:	Approx. 90 sec. with water at 10°C
Re-heating time:	None due to boiler
Steam heating time:	From coffee temperature to 127°C - Approx. 50 sec.
Coffee dispensing temperature:	Approx. 86° C
Grinding time:	Initial grinding with completely empty machine: Approx. 15 sec. / subsequent grinding: approx. 5.5 sec.
Time to make espresso:	Approx. 28 sec. for 50 ml
Time to make cup of coffee:	Approx. 40 sec. for 100 ml

CHAPTER 3 OPERATION

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1. Operation (Royal Classic)

1.1. Operating instructions (quick reference)

	Action	Comments	HS LED	Temp. LED	Steam LED
Getting started					
1	Unpack machine.	Check for damage.			
2	Fill water tank				
3	Fill coffee beans container.				
4	Connect mains plug.				
5	Turn on main switch.		Light on		
6	De-aerate water circuit.	Open hot water pressure valve until water flows.	Light on		
		Heating stage (approx. 1.5 min).	Light on	Light flashes	
		Ready	Light on	Light on	
Making coffee					
7	Select coffee quantity using the control dial.	Depending on cup size.	Light on	Light on	
8	Place cup under dispenser.		Light on	Light on	
9	Press start button (coffee button).	Press once = 1 cup of coffee. Press twice = 2 cups of coffee.	Light on	Flashes once Flashes twice	
10	To interrupt coffee making.	Press start button again.			
Dispensing steam					
11	Press steam button.	Heating stage.	Light on		Light flashes
12		Ready	Light on		Light on
13	Steam dispensing. Open tap valve.	To warm coffee. To froth milk.	Light on		Light on
14	Press steam button / deactivate steam function.	Cooling stage (can be accelerated by de-aerating)	Light on	Light flashes	Light flashes
		Ready (to make coffee)	Light on	Light on	
Cleaning					
Empty dregs drawer	Storage capacity of 30 tablespoons (dreg counter reset only if warning to empty grounds container is triggered and machine is turned on)				
Empty drip tray	After 30 servings				
Clean water tank	As required				
Clean coffee bean container.	As required				
Clean the housing	As required				
Rinse brewing unit	1 x per week				
Clean brewing unit and oil filter	1 x per month				
Descale	Depending on water hardness				

Descale	
Water hardness	Descaling frequency
Very hard water (over 21°dH)	About every 4 weeks
Hard water (15°-21°dH)	About every 6 weeks
Medium water (15°-21°dH)	About every 2 months
Soft water (up to 7°dH)	About every 3 months
Do not use vinegar! (damages the pump)	

Descaling procedure:

1. Place Saeco descaler into fresh water tank.
2. Fill with about one litre of hot water.
3. Make 2-3 coffees to descale coffee circuit.
4. Remove the remaining descaler mixture in cupfuls via the HWS valve in intervals of about 5 – 10 min.
6. Rinse the machine with about 2 litres of fresh water. Make 2-3 coffees to rinse coffee circuit (brewing unit filter(s) must be cleaned before descaling).

Troubleshooting		
Fault	Possible cause	Remedy
Does not function	No power	Check mains plug / mains circuit breaker / and ensure machine door is closed.
Brewing unit does not turn on (alarm LED flashes)	Brewing unit not properly installed or not closed.	Install brewing unit correctly.
	Coffee grinds container not properly installed.	Install brewing unit correctly.
Brewing unit does not turn on (alarm LED on)	Coffee bean container is empty.	Fill coffee beans container.
	Water tank is empty.	Fill water tank.
Brewing unit does not turn on (steam LED flashes)	After steam dispensing the system is not or is insufficiently de-aerated.	De-aerate machine.
No water / steam	Air in the circuit.	De-aerate.
	Steam nozzle blocked.	Free opening using a thin needle.
The coffee flows too quickly	Beans ground too coarsely.	Select lower grind level; e.g. change from 5 to 3.
The coffee flows too slowly	Beans ground too finely.	Select higher grind level; e.g. change from 5 to 7.
Coffee has no froth.	Unsuitable coffee blend.	Change brand of coffee.
	Coffee is no longer freshly roasted.	Use fresh coffee.
	Beans ground too coarsely or finely.	Change grind level.
Longer heating time or less hot water.	The machine is calcified.	Decalcify machine.
The brewing unit cannot be removed.	The brewing unit is not in home position.	Turn machine on, close service door and check dregs drawer (the brewing unit goes automatically to home position).

2. Operation (Royal Digital / Exclusive / Digital Redesign)

2.1. Operating instructions (quick reference)

	Action	Comments	Display
Getting started			
1	Unpack machine.	Check for damage.	
2	Fill water tank		
3	Fill coffee beans container.		
4	Connect mains plug.		
5	Turn on main switch.		Self test/ Heating
6	De-aerate water circuit.	Open hot water pressure valve until water flows.	Heating
		Heating stage (approx. 80 sec.)	Heating
		Ready	Select product Ready for operation
Making coffee			
7	Programme coffee quantity for each selection button. • Espresso lungo • Coffee • Espresso	Depending on cup size. Programme by keeping the coffee selection button pressed until the desired quantity is reached.	Quantity programme
8	Place cup under dispenser.		Select product Ready for operation
9	Select programme and press appropriate button.	Press once = 1 cup of coffee Press twice = 2 cups of coffee.	1 Coffee 2 Coffees
Coffee dispensing / Powder coffee			
10	Place cup under dispenser.	Place powder coffee in powder container (1 measuring spoonful)	
11	Select powder button and relevant coffee button (long coffee / coffee / espresso)	Only one coffee can be dispensed at a time.	Select product Powder coffee
Dispensing steam			
12	Press steam button.	Heating stage.	Steam Heating
		Ready	Steam Ready for operation
14	Steam dispensing. Open HWS valve	To warm coffee. To froth milk.	Steam
15	Press steam button / deactivate steam function.	Cooling stage (can be accelerated by de-aerating)	Overheating
16	De-aerate		Hot water Overheating
		Ready (to make coffee)	Ready for operation

Descaler: See Royal Cappuccino

Cleaning	
Empty dregs drawer	Storage capacity of 30 tablespoons (dreg counter reset only if warning to empty grounds container is triggered and machine is turned on).
Empty drip tray	After 30 servings
Clean water tank.	As required.
Clean coffee bean container.	As required.
Clean the housing.	As required.
Rinse brewing unit	1 x per week
Clean brewing unit and oil filter	1 x per month
Descale	Depending on water hardness.

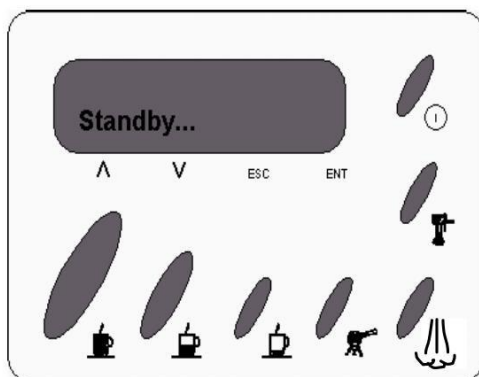
Troubleshooting		
Fault/Indicator	Possible cause	Remedy
Does not function	No power	Check mains plug / mains circuit breaker / Ensure machine door is closed.
BREWING UNIT NOT DETECTED	Brewing unit not properly installed or not closed.	Install brewing unit correctly.
GRINDS CONTAINER NOT DETECTED	Coffee grinds container not properly installed.	Brewing unit correctly installed.
COFFEE BEAN CONTAINER EMPTY	Coffee bean container is empty.	Fill coffee container.
FILL WATER DE-AERATE	Water tank is empty.	Water tank
OVERHEATING	After steam dispensing the system is not or is insufficiently de-aerated.	De-aerate machine.
GRINDER OBSTRUCTED		Clean grinder.
DE-AERATE	Air in water system.	Open water nozzle.
Instead of coffee, only water is dispensed.	Coffee powder selection button is pressed, but no coffee is dispensed.	Add one level measure of coffee powder.
No water / steam	Steam nozzle blocked.	Free opening using a thin needle.
The coffee flows too quickly	Beans ground too coarsely.	Select lower grind level; e.g. change from 5 to 3.
The coffee flows too slowly	Beans ground too finely.	Select higher grind level; e.g. change from 5 to 7.
Coffee is not hot enough	The cups are cold.	Pre-heat cups.
	Boiler temperature too low.	Increase temperature in user programme.
Coffee has no froth.	Unsuitable coffee blend.	Change brand of coffee.
	Coffee is no longer freshly roasted.	Use fresh coffee.
	Beans ground too coarsely or finely.	Change grind level.
Longer heating time or less hot water.	The machine is calcified.	Decalcify machine.
The brewing unit cannot be removed.	The brewing unit is not in home position.	Turn machine on, close service door and check dregs drawer.(the brewing unit goes automat. to home position)

2.2. User programme (Royal Digital / Exclusive / Digital Redesign)

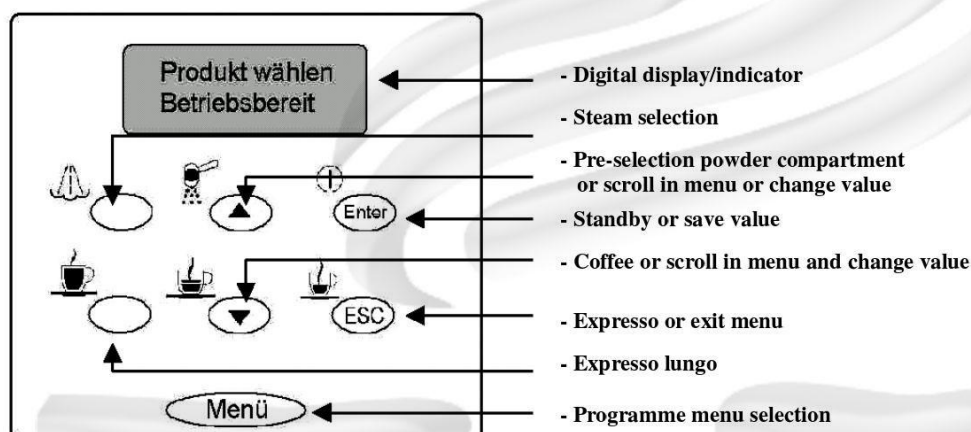
The table below indicates the various values, settings and programmes which can be read and selected through the user programme options.

Various cleaning programmes can also be activated.

Access (Royal Digital / Exclusive): Access via the ENTER button.



Access (Royal Digital Redesign): Selection entry via menu button.



Menu procedure:

1. Select desired programme using the cursor buttons (arrow buttons).
2. Access appropriate item using the ENTER button.
3. Use the arrow buttons to handle each item.
4. Confirm with the ENTER button.

Item	Setting/Indicator	Standard	Function
Language	Country	German	Display language
Rinse	ON/OFF	OFF	Rinses residual water from circuit every time the machine is turned on (temp. of instantaneous water heater < 50°C) (not in Royal Exclusive).
Water hardness	1 – 500 l	3	Change in coffee quantity until descaling required (1-4).
	2 – 300 l		
	3 – 150 l		
	4 – 80 l		

Item	Setting/Indicator	Standard	Function
Heating plate	ON/OFF		Activate / deactivate heating plate.
Temperature	Maximum	Medium	Adjustment of coffee temperature.
	High		
	Medium		
	Low		
	Minimum		
Pre-brewing	ON	ON	Coffee is moistened before actual brewing (better aroma)
	LONG		
	AUS		
Pre-grinding	ON/OFF	OFF	Pre-grinds the next coffee dose.
Total coffee	Number		Coffee quantity indicator
Descal			Activate descaling programme (when descaling required)
Scale indicator reset	YES/NO		Counter reset (only if descaling indicator is activated). With the exception of Royal Exclusive: Reset via steam button.
Timer	0-12.45 hours	0	Machine switches to standby mode if not used within the programmed time. (Standby mode can also be activated at any time via the menu buttons.)
Cleaning cycle			Cleaning programme for brewing unit
Factory settings			Initialise standard settings (only for Royal Dig. Redesign)

Exit: ESC button / Menu item - EXIT and ENTER (depending on programme).

3. Operation (Royal Professional Instant Steam / Prof. Redesign / Cappuccino / Capp. Redesign)

3.1. Operating instructions (quick reference)

	Action	Comments	Display
Getting started			
1	Unpack machine.	Check for damage.	
2	Fill water tank		
3	Fill coffee beans container.		
4	Connect mains plug.		
5	Turn on main switch.		Self test/ Heating
6	De-aerate water circuit.	Activate the hot water button until water flows continuously	Heating
		Heating stage (approx. 80 sec.)	Heating
		Ready	Select product Ready for operation
Making coffee			
7	Programme coffee quantity for each selection button. <ul style="list-style-type: none"> • Espresso lungo • Coffee • Espresso 	Depending on cup size. Programme by keeping the programme selection button pressed until the desired quantity is reached.	Quantity programme
8	Place cup under dispenser.		Select product Ready for operation
9	Select programme and press appropriate button.	Press once = 1 cup of coffee. Press twice = 2 cups of coffee.	1 Coffee 2 Coffees
Coffee dispensing / Powder coffee			
10	Place cup under dispenser.	Place powder coffee in powder container (1 measuring spoonful)	
11	Select powder button and relevant coffee button (long coffee / coffee / espresso)	Only one coffee can be dispensed at a time.	Select product Powder coffee
Dispensing steam			
14	Steam dispensing. Open steam valve	To warm coffee. To froth milk.	Steam
Hot water			
15	Hot water (only when hot water programme is deactivated in the user menu).	Press the hot water button briefly to start hot water dispensing; press again to stop.	Hot water
16	Hot water quantity programming (only when hot water programme is activated in the user menu).	Keep the hot water button pressed for the desired time. The last programme entered is saved	Hot water Quantity programme

	Action	Comments	Display
17	Hot water Quantity programme	The last programme saved is activated by pressing the hot water button briefly.	Hot water
Cappuccino maker			
18	Cappuccino (only when cappuccino maker programme is deactivated in the user menu)	Press the cappuccino button briefly to start cappuccino dispensing; press again to stop.	Cappuccino
19	Cappuccino Quantity programme (only when cappuccino maker programme is activated in the user menu)	Keep the cappuccino button pressed for the desired time. The last programme entered is saved	Cappuccino Quantity programme
20	Cappuccino Quantity programme	The last programme saved is activated by pressing the Cappuccino button briefly.	Cappuccino

Note: The Steam and Cappuccino functions can be used parallel to the coffee programme in the Royal Professional Instant Steam, Royal Cappuccino and Royal Cappuccino Redesign systems.

Cleaning	
Empty dregs drawer	Storage capacity of 30 tablespoons (dreg counter reset only if warning to empty grounds container is triggered and machine is turned on)
Empty drip tray	After 30 servings
Clean water tank.	As required
Clean coffee bean container.	As required
Clean the housing.	As required
Rinse brewing unit	1 x per week
Clean brewing unit and lubricate Clean filter	1 x per month
Descale	Depending on water hardness.

Descale:

1. Place Saeco descaler into fresh water tank.
2. Fill with about one litre of hot water.
3. Remove about two to three cups via the brewing unit (cannot be poured).
4. Activate the Descale item in the user menu by selecting OK and open the HWS valve (place a sufficiently large container under the steam pipe). The descaler mixture is pumped at intervals through the circuit.
5. Rinse: Fill the water tank once again and open the steam valve (about 2-3 cups via brewing unit).

Reset: Under the descale indicator item (Enter - YES - Enter).

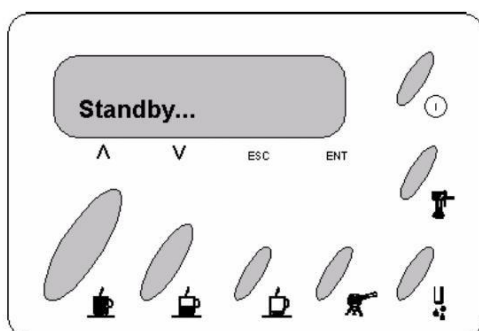
Troubleshooting		
Fault/Indicator	Possible cause	Remedy
Does not function	No power	Check mains plug / mains circuit breaker / Ensure machine door is closed.
BREWING UNIT NOT DETECTED	Brewing unit not properly installed or not closed.	Install brewing unit correctly.
GRINDS CONTAINER NOT DETECTED	Coffee grinds container not properly installed.	Brewing unit correctly installed.
COFFEE BEAN CONTAINER EMPTY	Coffee bean container is empty.	Fill coffee container.
FILL WATER DE-AERATE	Water tank is empty.	Water tank
OVERHEATING	After steam dispensing the system is not or is insufficiently de-aerated.	De-aerate machine.
GRINDER OBSTRUCTED		Clean grinder.
DE-AERATE	Air in water system.	Press hot water button.
Instead of coffee, only water is dispensed.	Coffee powder selection button is pressed, but no coffee powder is dispensed.	Add one level measure of coffee powder.
No water / steam	Steam nozzle blocked.	Free opening using a thin needle.
The coffee flows too quickly	Beans ground too coarsely.	Select lower grind level; e.g. change from 5 to 3.
The coffee flows too slowly	Beans ground too finely.	Select higher grind level; e.g. change from 5 to 7.
Coffee is not hot enough	The cups are cold.	Pre-heat cups.
	Instantaneous water heater temperature too low.	Increase temperature in user programme.
Coffee has no froth.	Unsuitable coffee blend.	Change brand of coffee.
	Coffee is no longer freshly roasted.	Use fresh coffee.
	Beans ground too coarsely or finely.	Change grind level.
Longer heating time or less hot water.	The machine is calcified.	Decalcify machine.
The brewing unit cannot be removed.	The brewing unit is not in home position.	Turn machine on, close service door and check dregs drawer. (the brewing unit goes automatically to home position)

3.2. User programme (Royal Professional Instant Steam / Royal Cappuccino)

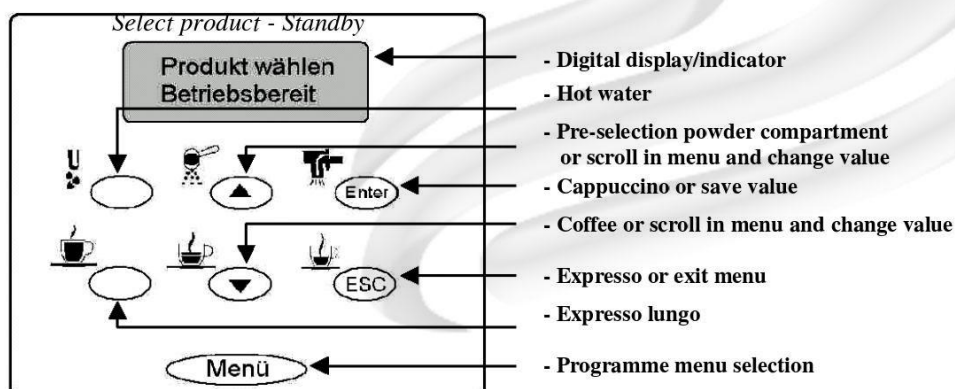
The table below indicates the various values, settings and programmes which can be read and selected through the user programme options.

Various cleaning programmes can also be activated.

Access: Access is via the ENTER button (keep pressed for a few seconds).



Access (Royal Prof. Redesign / Capp Redesign): Selection entry via menu button.



Menu procedure:

1. Select desired programme using the cursor buttons (arrow buttons).
2. Access appropriate item using the ENTER button.
3. Use the arrow buttons to handle each item.
4. Confirm with the ENTER button.

Item	Setting/Indicator	Standard	Function
Standby	Standby		
			Only for Redesign Series
Language	Country	German	Display language
Rinse	ON/OFF	OFF	Rinses every time the machine is turned on (temp. of instantaneous water heater < 50°C) Not Roy. Cappuccino

Item	Setting/Indicator	Standard	Function
System 2	ON/OFF		Steam function deactivation Not for Roy. Prof. Redes.
Water hardness	1 – 500 l	3	Change in coffee quantity until descaling required (1-4).
	2 – 300 l		
	3 – 150 l		
	4 – 80 l		
Heating plate	ON/OFF	OFF	Activate / deactivate heating plate.
Temperature (Espresso lungo)	Maximum	Medium	Adjustment of coffee temperature.
	High		
	Medium		
	Low		
	Minimum		
Temperature (Coffee)	Maximum	Medium	Adjustment of coffee temperature.
	High		
	Medium		
	Low		
	Minimum		
Temperature (Espresso)	Maximum	Medium	Adjustment of espresso temperature.
	High		
	Medium		
	Low		
	Minimum		
Pre-brewing	ON	ON	Coffee is moistened before actual brewing (better aroma)
	LONG		
	OFF		
Pre-grinding	ON/OFF	OFF	Pre-grinds the next coffee dose.
Hot water programme	ON/OFF		Activates or deactivates the hot water quantity programme (see Operation)
Cappuccino programme	ON/OFF		Activates or deactivates the cappuccino quantity programme (see Operation)
Total coffee	Number		Indicates the number of coffees dispensed
Descale			Activate descaling programme
Scale indicator	YES/NO		Counter reset (only if descaling indicator is activated).
Timer	0-12.45 hours	0	Machine switches to standby mode if not used within the programmed time. (Standby mode can also be activated at any time via the menu buttons.)
Vending			Programming for the purposes of vending
Cleaning cycle			Not relevant in Austria Not Roy. Cappuccino
Factory settings			Reset standard values Not Roy. Cappuccino
Exit			Exit Not Roy. Redesign

Exit: Exit – Enter / ESC depending on type

4. Operation (Professional Rapid Steam / Coffeebar / Digital Plus)

4.1. Operating instructions (quick reference)

	Action	Comments	Display
Getting started			
1	Unpack machine.	Check for damage.	
2	Fill water tank		
3	Fill coffee beans container.		
4	Connect mains plug.		
5	Turn on main switch.		Self test/ Heating
6	De-aerate water circuit.	Activate the hot water button until water flows continuously	Heating
		Heating stage (approx. 80 sec.)	Heating
		Ready	Select product Ready for operation
Making coffee			
7	Programme coffee quantity for each selection button. • Espresso lungo • Coffee • Espresso	Depending on cup size. Programme by keeping the programme selection button pressed until the desired quantity is reached.	Quantity programme
8	Place cup under dispenser.		Select product Ready for operation
9	Select programme and press appropriate button.	Press once = 1 cup of coffee. Press twice = 2 cups of coffee.	1 Coffee 2 Coffees
Coffee dispensing / Powder coffee			
10	Place cup under dispenser.	Place powder coffee in powder container (1 measuring spoonful)	
11	Select powder button and relevant coffee button (long coffee / coffee / espresso)	Only one coffee can be dispensed at a time.	Select product Powder coffee
Dispensing steam			
14	Steam dispensing. Open steam valve	To warm coffee. To froth milk.	Steam
Hot water			
15	Hot water (only when hot water programme is deactivated in the user menu).	Press the hot water button briefly to start hot water dispensing; press again to stop.	Hot water
16	Hot water quantity programming (only when hot water programme is activated in the user programme).	Keep the hot water button pressed for the desired time. The last programme entered is saved .	Hot water Quantity programme

	Action	Comments	Display
17	Hot water Quantity programme	The last programme saved is activated by pressing the hot water button briefly.	Hot water
Cappuccino Maker (not in Royal Digital+)			
18	Cappuccino (only when cappuccino maker programme is deactivated in the user menu)	Press the cappuccino button briefly to start cappuccino dispensing; press again to stop.	Cappuccino
19	Cappuccino Quantity programme (only when cappuccino maker programme is activated in the user menu)	Keep the cappuccino button pressed for the desired time. The last programme entered is saved	Cappuccino Quantity programme
20	Cappuccino Quantity programme	The last programme saved is activated by pressing the Cappuccino button briefly.	Cappuccino

Note: The Steam and Cappuccino functions cannot be used parallel to the coffee programme in the Royal Professional Rapid Steam, Royal Coffeebar and Royal Digital + systems.

Cleaning	
Empty dregs drawer	Storage capacity of 30 tablespoons (dreg counter reset only if warning to empty grounds container is triggered and machine is turned on).
Empty drip tray	As required
Clean water tank.	As required
Clean coffee bean container.	As required
Clean the housing.	As required
Clean brewing unit and grease filter.	1 x per month
Descale	According to indicator

Descale:

1. Place Saeco descaler into fresh water tank.
2. Fill with about one litre of hot water.
3. Remove about two to three cups via the brewing unit.
4. Activate the Descale item in the user menu by selecting OK and open the HWS valve (place a sufficiently large container under the steam pipe). The descaler mixture is pumped at intervals through the circuit.
5. Rinse: Fill the water tank once again and open the steam valve (about 2 cups via brewing unit).

Reset: Under the descale indicator item Enter - YES - Enter.

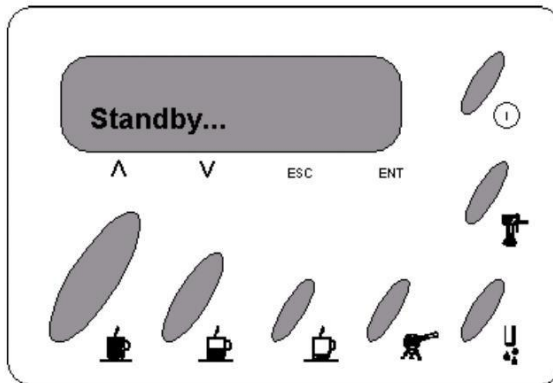
Troubleshooting		
Fault/Indicator	Possible cause	Remedy
Does not function	No power	Check mains plug / mains circuit breaker / Ensure machine door is closed.
BREWING UNIT NOT DETECTED	Brewing unit not properly installed or not closed.	Install brewing unit correctly.
GRINDS CONTAINER NOT DETECTED	Coffee grinds container not properly installed.	Brewing unit correctly installed.
COFFEE BEAN CONTAINER EMPTY	Coffee bean container is empty.	Fill coffee container.
FILL WATER DE-AERATE	Water tank is empty.	Water tank
OVERHEATING	After steam dispensing the system is not or is insufficiently de-aerated.	De-aerate machine.
GRINDER OBSTRUCTED		Clean grinder.
DE-AERATE	Air in water system.	Press hot water button.
Instead of coffee, only water is dispensed.	Coffee powder selection button is pressed, but no coffee powder is dispensed.	Add one level measure of coffee powder.
No water / steam	Steam nozzle blocked.	Free opening using a thin needle.
The coffee flows too quickly	Beans ground too coarsely.	Select lower grind level; e.g. change from 5 to 3.
The coffee flows too slowly	Beans ground too finely.	Select higher grind level; e.g. change from 5 to 7.
Coffee is not hot enough	The cups are cold.	Pre-heat cups.
	Boiler temperature too low.	Increase temperature in user programme.
Coffee has no froth.	Unsuitable coffee blend.	Change brand of coffee.
	Coffee is no longer freshly roasted.	Use fresh coffee.
	Beans ground too coarsely or finely.	Change grind level.
Longer heating time or less hot water.	The machine is calcified.	Decalcify machine.
The brewing unit cannot be removed.	The brewing unit is not in home position.	Turn machine on, close service door and check dregs drawer. (the brewing unit goes automatically to home position)

4.2. User programme (Royal Professional Rapid Steam / Coffeebar / Digital Plus)

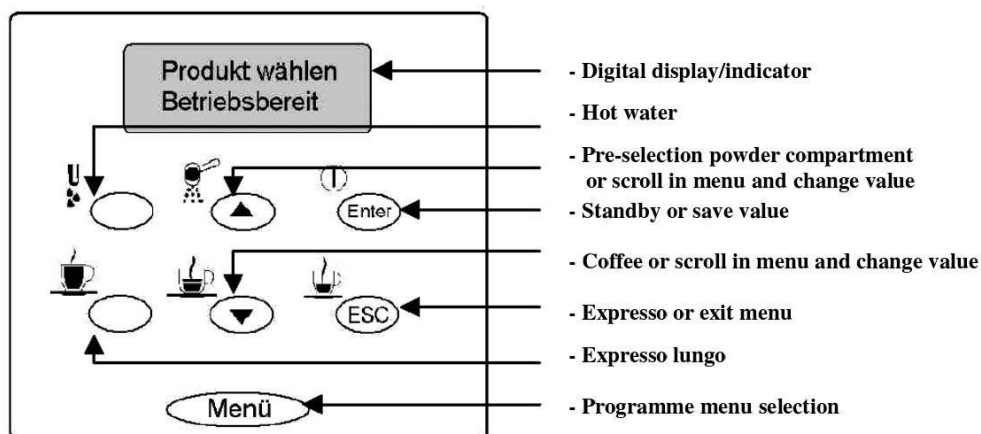
The table below indicates the various values, settings and programmes which can be read and selected through the user programme options.

Various cleaning programmes can also be activated.

Access: Access is via the ENTER button.



Access (Digital+): Selection entry via menu button.



Menu procedure:

1. Select desired programme using the cursor buttons (arrow buttons).
2. Access appropriate item using the ENTER button.
3. Use the arrow buttons to handle each item.
4. Confirm with the ENTER button.

Item	Setting/Indicator	Standard	Function
Language		German	Select display language.
Rinse	ON/OFF	OFF	Rinses residual water through pipes each time machine turned on (only when machine is cold).
Water hardness	1 – 500 l	3	Change in coffee quantity until descaling required (1-4).
	2 – 300 l		
	3 – 150 l		
	4 – 80 l		

Item	Setting/Indicator	Standard	Function
Heating plate	ON/OFF		Activate / deactivate heating plate. Heating plate
Temperature (Espresso lungo)	Maximum	Medium	Adjustment of coffee temperature.
	High		
	Medium		
	Low		
	Minimum		
Temperature (Coffee)	Maximum	Medium	Adjustment of coffee temperature.
	High		
	Medium		
	Low		
	Minimum		
Temperature (Espresso)	Maximum	Medium	Adjustment of espresso temperature.
	High		
	Medium		
	Low		
	Minimum		
Pre-brewing	ON	ON	Coffee is moistened before actual brewing (better aroma)
	LONG		
	OFF		
Pre-grinding	ON/OFF	OFF	Pre-grinds the next coffee dose.
Hot water programme	ON/OFF		Activates or deactivates the hot water quantity programme (see Operation)
Cappuccino programme	ON/OFF		Activates or deactivates the cappuccino quantity programme (see Operation) (not for Digital+)
Total coffee	Number		Coffee quantity indicator
Descale			Activate descaling programme (when descaling required)
Scale indicator	YES/NO		Counter reset (only if descaling indicator is activated).
Timer	0-12.45 hours	0	Machine switches to standby mode if not used within the programmed time. (Standby mode can also be activated at any time via the standby button.)
Vending			Programming for the purposes of vending (not for Digital+)
Cleaning cycle	YES/NO		Activates the cleaning programme for the brewing unit.
Factory settings	YES/NO		Activates fixed water connection. (only Roy. Digital+)
Fixed water	YES/NO		Activates fixed water connection. (only Roy. Coffeebar/ Professional)

Exit: ESC button

4.3. Vending menu:

	Action	Procedure	Display
	Enter code		
	Access	Confirm vending in user menu via ENTER.	Code ****
	Call up code entry	Press ENTER	Change code / New code? 0***
	Code entry	Enter required number combination by using the arrow and enter buttons	New code = number Save No
	Confirm code	Use arrow button to select Yes	New code = number Save Yes
	Confirm code	Press ENTER	Code ****
		Use arrow button to access menu items.	
	Change code		
	Access	Confirm vending in user menu via ENTER.	Code ****
	Call up code entry	Press ENTER	Change code / Old code? 0***
	Code entry	Enter number combination by using the arrow and enter buttons	New code? 0***
	Code entry	Enter required number combination by using the arrow and enter buttons	New code = number Save No
	Confirm code	Use arrow button to select Yes	New code = number Save Yes
	Confirm code	Press ENTER	Code ****
		Use arrow button to access menu items.	
	Vending menu		
	Item	Indication	Comments
	1 espresso lungo Total Number	Number of espresso lungo dispensed since last reset	Reset: Espresso lungo + ESC
	1 coffees Total Number	Number of coffees dispensed since last reset	Reset: Espresso lungo + ESC
	1 espresso Total Number	Number of espresso dispensed since last reset	Reset: Espresso lungo + ESC
	Hot water Total Number	Number of hot water portions dispensed since last reset	Reset: Espresso lungo + ESC
	Counter Lock: Number	Number of coffees dispensed	Reset: Espresso lungo + ESC Change value: Arrow button Espresso lungo + arrow button
	Counter Cycles Number	Number of coffees dispensed since last reset	Reset: Espresso lungo + ESC Change value: Arrow button Espresso lungo + arrow button

Note:

- The vending menu can also be used unsecured (no code entry / skip code entry via arrow button).
- Cancelling code: Enter with new code 0000.
- If the programmed code is only used to read the counter reading, the code entry can also be skipped. However, if an attempt is made to change the counter reading, the code request appears.

Attention: If you forget the code, a new code must be requested from Saeco Austria!



5. Operation (Royal Office)

5.1. Operating instructions (quick reference)

	Action	Comments	Display
Getting started			
1	Unpack machine.	Check for damage.	
2	Fill water tank		
3	Fill coffee beans container.		
4	Connect mains plug.		
5	Turn on main switch.		Self test/ Heating
6	De-aerate water circuit.	Activate the hot water button until water flows continuously	Heating
		Heating stage (approx. 80 sec.)	Heating
		Ready	Select product Ready for operation
Making coffee			
7	Programme coffee quantity for each selection button. <ul style="list-style-type: none"> Coffee Espresso 	Depending on cup size. Programme by keeping the programme selection button pressed until the desired quantity is reached. Programming is only possible when quantity programme in the user menu is ON.	Quantity programme
8	Place cup under dispenser.		Select product Ready for operation
9	Select programme and press appropriate button.	Press once = 1 cup of coffee. Press twice = 2 cups of coffee.	1 Coffee 2 Coffees
Hot water			
15	Hot water	Press the hot water button briefly to start hot water dispensing; press again to stop.	Hot water

Counter reading indicator:

Indication	Command	Comments
Total coffee	C	Indicates the espressos and coffees dispensed Not resettable
1 coffee	C + Espresso	Indicates the espressos dispensed Resettable (in vending menu)
2 coffees	C + Coffee	Indicates the coffees dispensed Resettable (in vending menu)
Total	C + Espr. + Coffee	Indicates the espressos and coffees dispensed Resettable (in vending menu)
Hot water	C + Hot water	Indicates the hot water dispensed Resettable (in vending menu)

Cleaning	
Empty dregs drawer	Storage capacity of 30 tablespoons (dreg counter reset only if warning to empty grounds container is triggered and machine is turned on).
Empty drip tray	With dregs drawer
Clean water tank.	As required
Clean coffee bean container.	As required
Clean the housing.	As required
Rinse brewing unit	1 x per week
Clean brewing unit and lubricate	1 x per month
Clean filter	
Descale	According to indicator

- Descale:**
1. Place Saeco descaler into fresh water tank.
 2. Fill with about one litre of hot water.
 3. Remove about two to three cups via the brewing unit.
 4. Confirm the Descale item in the user menu by pressing twice the E-button (place a sufficiently large container under the hot water pipe). The descaler mixture is pumped at intervals through the circuit.
 5. Rinse: Fill the water tank once again and press the E-button twice (about 2 cups via brewing unit).

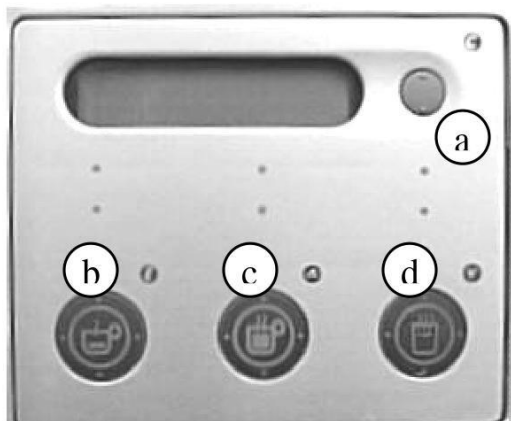
Reset: Under the descale indicator item Enter - YES - Enter.

Troubleshooting		
Fault/Indicator	Possible cause	Remedy
Does not function	No power	Check mains plug / mains circuit breaker / Ensure machine door is closed.
BREWING UNIT NOT DETECTED	Brewing unit not properly installed or not closed.	Install brewing unit correctly.
GRINDS CONTAINER NOT DETECTED	Coffee grinds container not properly installed.	Brewing unit correctly installed.
COFFEE BEAN CONTAINER EMPTY	Coffee bean container is empty.	Fill coffee container. Reset: Enter button
FILL WATER DE-AERATE	Water tank is empty.	Water tank
OVERHEATING	After steam dispensing the system is not or is insufficiently de-aerated.	De-aerate machine.
GRINDER OBSTRUCTED		Clean grinder.
DE-AERATE	Air in water system.	Press hot water button.
Instead of coffee, only water is dispensed.	Coffee powder selection button is pressed, but no coffee powder is dispensed.	Add one level measure of coffee powder.
No water / steam	Steam nozzle blocked.	Free opening using a thin needle.

Attention: The coffee beans low indicator must be reset (**keep the enter button pressed for a minimum of 5 sec.**).

Troubleshooting		
Fault/Indicator	Possible cause	Remedy
The coffee flows too quickly	Beans ground too coarsely.	Select lower grind level; e.g. change from 5 to 3.
The coffee flows too slowly	Beans ground too finely.	Select higher grind level; e.g. change from 5 to 7.
Coffee is not hot enough	The cups are cold.	Pre-heat cups.
	Boiler temperature too low.	Increase temperature in user programme.
Coffee has no froth.	Unsuitable coffee blend.	Change brand of coffee.
	Coffee is no longer freshly roasted.	Use fresh coffee.
	Beans ground too coarsely or finely.	Change grind level.
Longer heating time or less hot water.	The machine is calcified.	Decalcify machine.
The brewing unit cannot be removed.	The brewing unit is not in home position.	Turn machine on, close service door and check dregs drawer. (the brewing unit goes automatically to home position)

5.2. User programme (Royal Office):



Access programming by keeping the V (hot water) and C (Esc) buttons pressed and switching the machine on from the main switch.

- (a) C button ESC – Return to previous programme level.
- (b) E button ENT – Espresso. To select and save a value entered.
- (c) ↑ button UP – Coffee. Scroll in menu and change value.
- (d) ↓ button DOWN – Hot water. Scroll in menu and change value.

When entering the code or PUC code, the buttons have the following value:

E = Espresso = 1
 ↓ = Coffee = 2
 ↑ = Hot water = 3
 C = ESC = 4

Item	Setting/Indicator	Standard	Function
Code		111111	Programme protection If the code is entered five times incorrectly, the PUC code must be entered. Request from Saeco Austria.
Vending			The counter can be read and locking function activated via the vending menu.
Language	Country	German	Display language
Rinse	ON/OFF	OFF	Rinses every time the machine is turned on (temp. of instantaneous water heater < 50°C)
Water hardness	1 – 500 l	3	Change in coffee quantity until descaling required (1-4).
	2 – 300 l		
	3 – 150 l		
	4 – 80 l		
Temperature (Espresso)	Maximum	Medium	Adjustment of espresso temperature.
	High		
	Medium		
	Low		
	Minimum		

Item	Setting/Indicator	Standard	Function
Temperature (Coffee)	Maximum	Medium	Adjustment of coffee temperature.
	High		
	Medium		
	Low		
	Minimum		
Pre-brewing	ON	ON	Coffee is moistened before actual brewing (better aroma)
	LONG		
	OFF		
Pre-grinding	ON/OFF	OFF	Pre-grinds the next coffee dose.
Quantity programme	ON/OFF	OFF	Locking or releasing of quantity programme
Descalc			Activate descaling programme Duration: Approx. 45 min
Scale indicator	YES/NO		Counter reset (only if descaling indicator is activated).
Timer	0-12.45 hours	0	Machine switches to standby mode if not used within the programmed time. (Standby mode can also be activated at any time via the menu buttons.)
Cleaning cycle			No relevant in Austria

5.3. Vending menu:

Access: In user menu (C+Espresso button+turn on machine), enter code and confirm item Vending with the E-button.

Vending menu			
	Item	Indication	Comments
	Reset counter		Reset: Espresso counter Coffee counter Hot water counter Cycle counter
	1 espresso Total Number	Number of espressos dispensed since last reset	
	1 coffees Total Number	Number of coffees dispensed since last reset	
	Hot water Total Number	Number of hot water portions dispensed since last reset	
	Counter Cycles Number	Counts the coffees dispensed since last reset and locks machine for coffee dispensing when a specific number is reached	
	Counter Lock: Number	Number of coffees dispensed	Programmable via arrow buttons
	Total coffee Total: Number	Number of total coffees dispensed	Not resettable
	Beverages Total Number	Number of total beverages dispensed	Not resettable
Action		Procedure	Display
Change code			
	Access	Confirm vending in user menu via ENTER.	Reset counter
	Call up code entry	Press up arrow once	*****
	Call up code entry	Confirm with E-button	Change code / Old code? *****
	Call up code entry	Old code by: Espresso button = 1 Coffee button = 2 Hot water button = 3 C-button = 4 Enter and confirm with E-button.	Change code / Old code? *****
	Code entry	New code by: Espresso button = 1 Coffee button = 2 Hot water button = 3 C-button = 4 Enter and confirm with E-button.	New code? *****

	Action	Procedure	Display
	Change code		
	Code entry	Enter required number combination by using the arrow and enter buttons	New code = number Save No
	Confirm code	Use arrow button to select Yes	New code = number Save Yes
	Confirm code	Press ENTER	Code *****
	Exit	Press C-button twice	

Attention: If you forget the code, a new code must be requested from Saeco Austria!

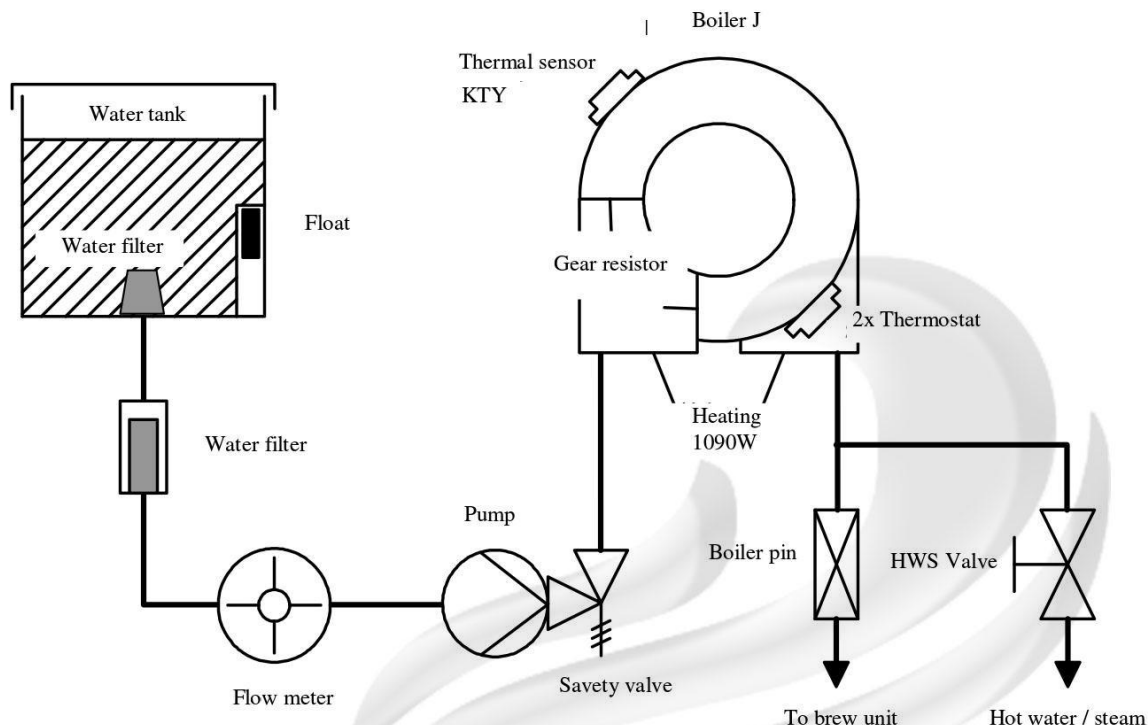
CHAPTER 4

FUNCTIONS AND TIMING

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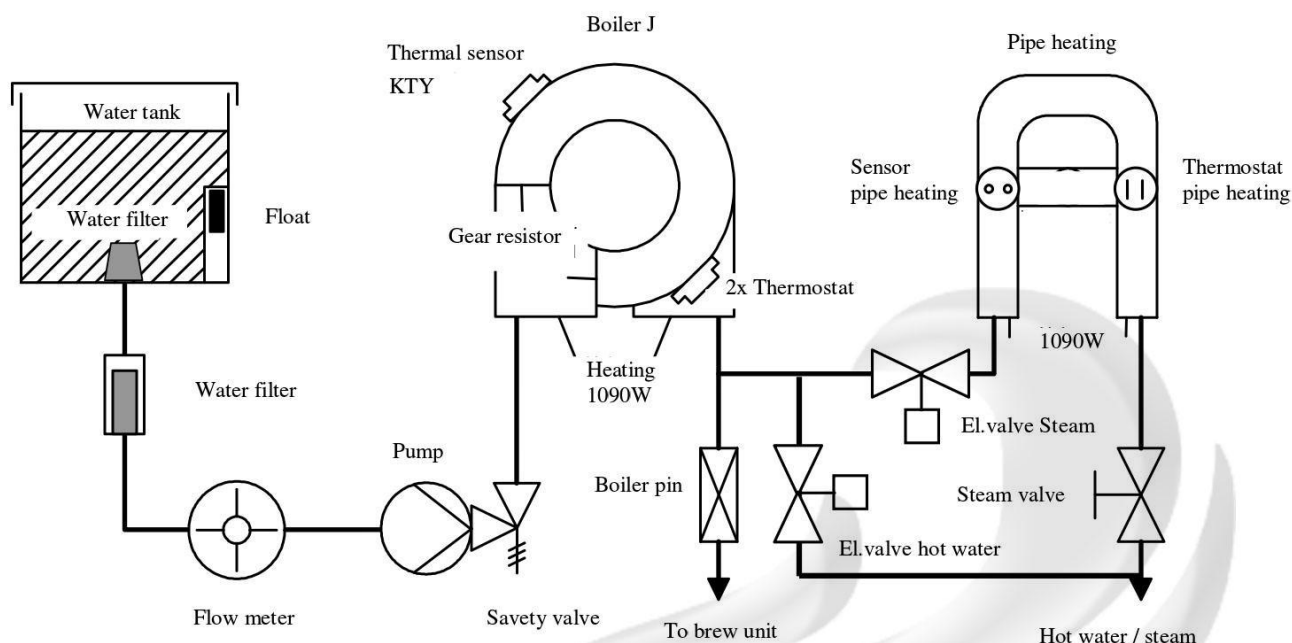
1. Water system

1.1. Water system (Royal Classic / Digital / Exclusive / Digital Redesign)



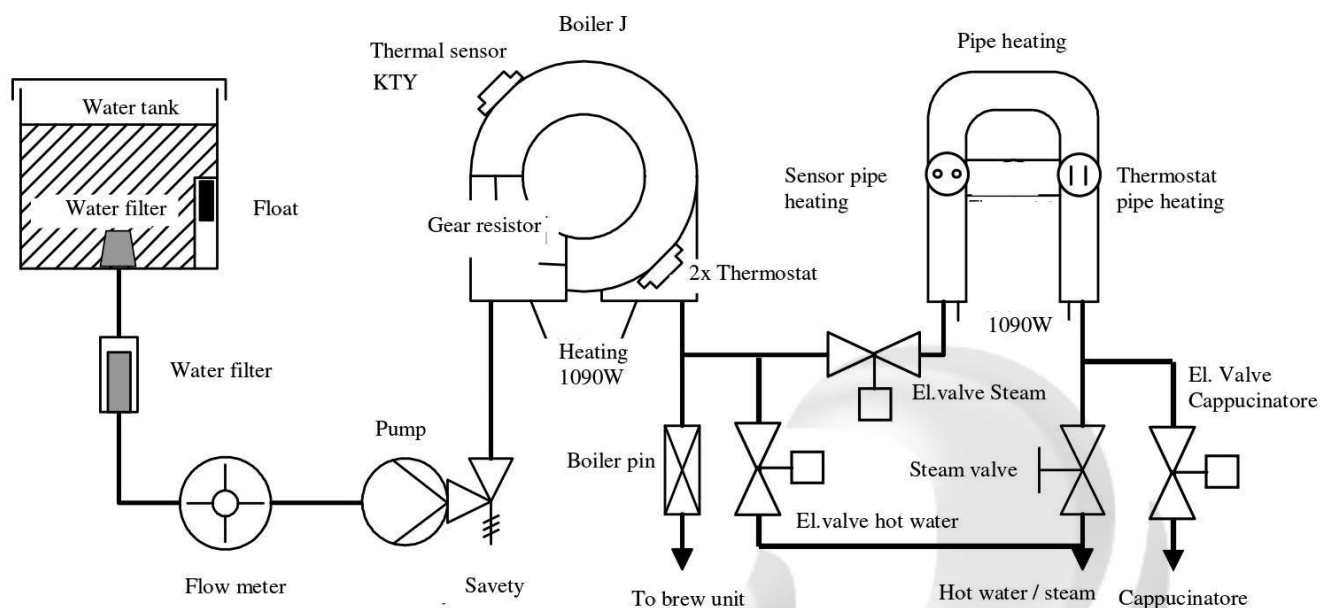
Component	Function
Water tank	Water supply
Float	Water level monitoring
Water filter	Water cleaned of solid matter (one or two depending)
Flow meter (turbine)	Measure flow rate
Pump	Water flow/Pressure build-up (13 to 15 bar)
Safety valve	Protect boiler against overpressure (opens at 17 bar)
Boiler (flow heater)	Heats water to approx. 84°C (for brewing process)
Sensor (KTY)	Transmits current temperature value to electronic system
Thermostat	Interrupts complete flow supply if overheating.
Boiler pin (Valve plug)	Opens when brewing unit is aligned with water circuit to the unit itself.
HWS valve	For hot water and steam dispensing

1.2. Water system (Royal Digital Plus)



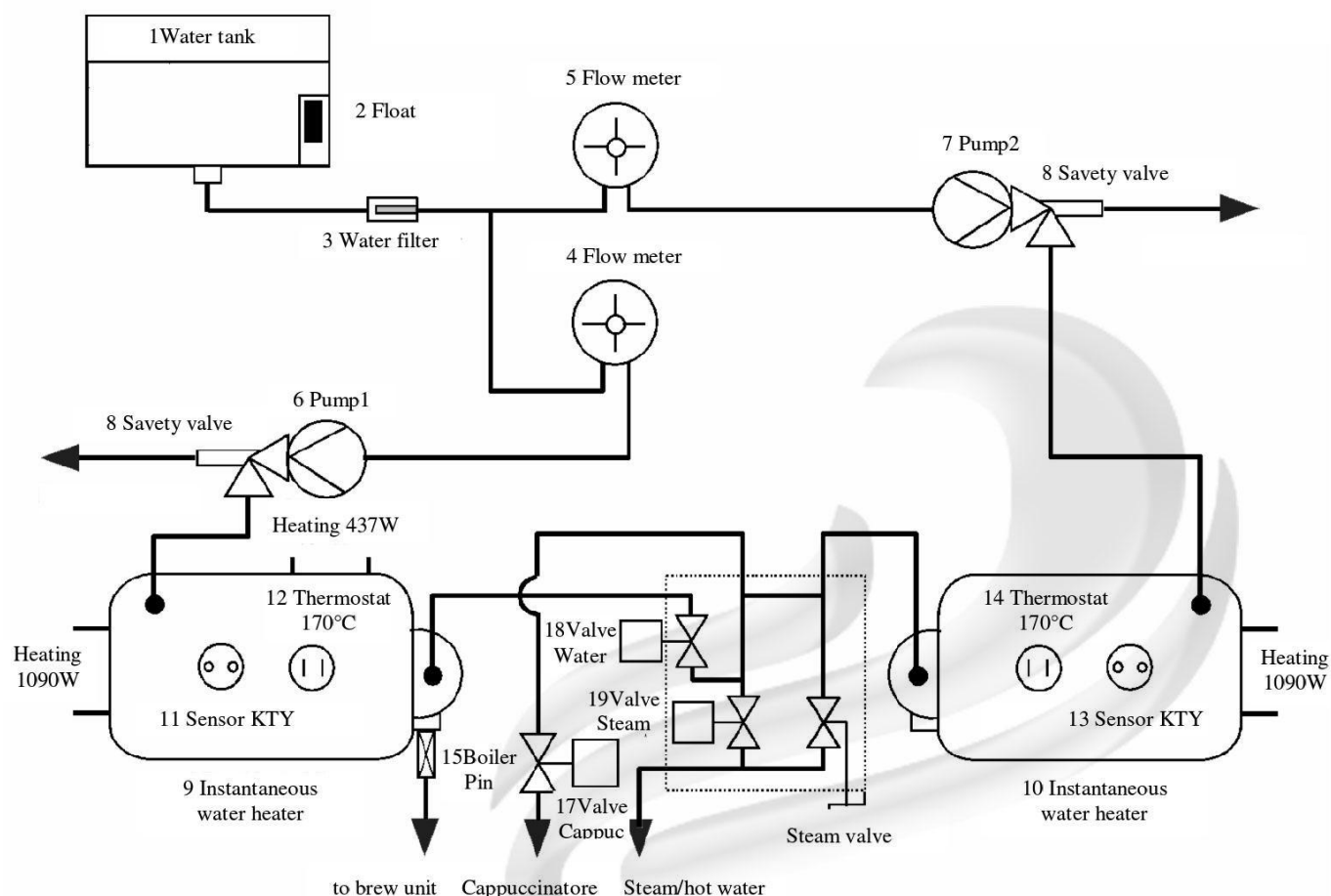
Component	Function
Water tank	Water supply
Float	Water level monitoring
Water filter	Water cleaned of solid matter (one or two depending)
Flow meter (turbine)	Measure flow rate
Pump	Water flow/Pressure build-up (13 to 15 bar)
Safety valve	Protect instantaneous water heater against overpressure
Instantaneous water heater/Heating (coffee/hot water)	Heats water to approx. 94°C (for brewing process and hot water preparation)
Pipe heating	Steam generation / Temperature approx. 130°C
Sensor (KTY) Instantaneous water heater	Transmits current temperature value to electronic system
Thermostat (170°C) Instantaneous water heater	Alternates current supply for heating system in event of overheating.
Sensor (KTY) Pipe heating	Transmits current temperature value to electronic system
Thermostat (170°C) Pipe heating	Alternates current supply for heating system in event of overheating.
Boiler pin (Valve plug)	Opens when brewing unit is aligned with water circuit to the unit itself.
Steam valve	For hot water and steam dispensing
Electro-valve (hot water)	Solenoid valve for water dispensing
Electro-valve (for boiler filling)	Solenoid valve for filling pipe heating system

1.3. Water system (Royal Professional Rapid Steam / Professional Redesign)



Component	Function
Water tank	Water supply
Float	Water level monitoring
Water filter	Water cleaned of solid matter
Flow meter (turbine)	Measure flow rate
Pump	Water flow/Pressure build-up (13 to 15 bar)
Safety valve	Protect instantaneous water heater against overpressure
Instantaneous water heater/Heating (coffee/hot water)	Heats water to approx. 94°C (for brewing process and hot water preparation)
Pipe heating	Steam generation / Temperature approx. 130°C
Sensor (KTY) Instantaneous water heater	Transmits current temperature value to electronic system
Thermostat (170°C) Instantaneous water heater	Alternates current supply for heating system in event of overheating.
Sensor (KTY) Pipe heating	Transmits current temperature value to electronic system
Thermostat (170°C) Pipe heating	Alternates current supply for heating system in event of overheating.
Boiler pin (Valve plug)	Opens when brewing unit is aligned with water circuit to the unit itself.
Steam-valve	For hot water and steam dispensing
Electro-valve (for cappuccino maker)	Solenoid valve/steam dispensing for cappuccino
Electro-valve (water)	Solenoid valve for water dispensing
Electro-valve (steam)	Solenoid valve for filling pipe heating system

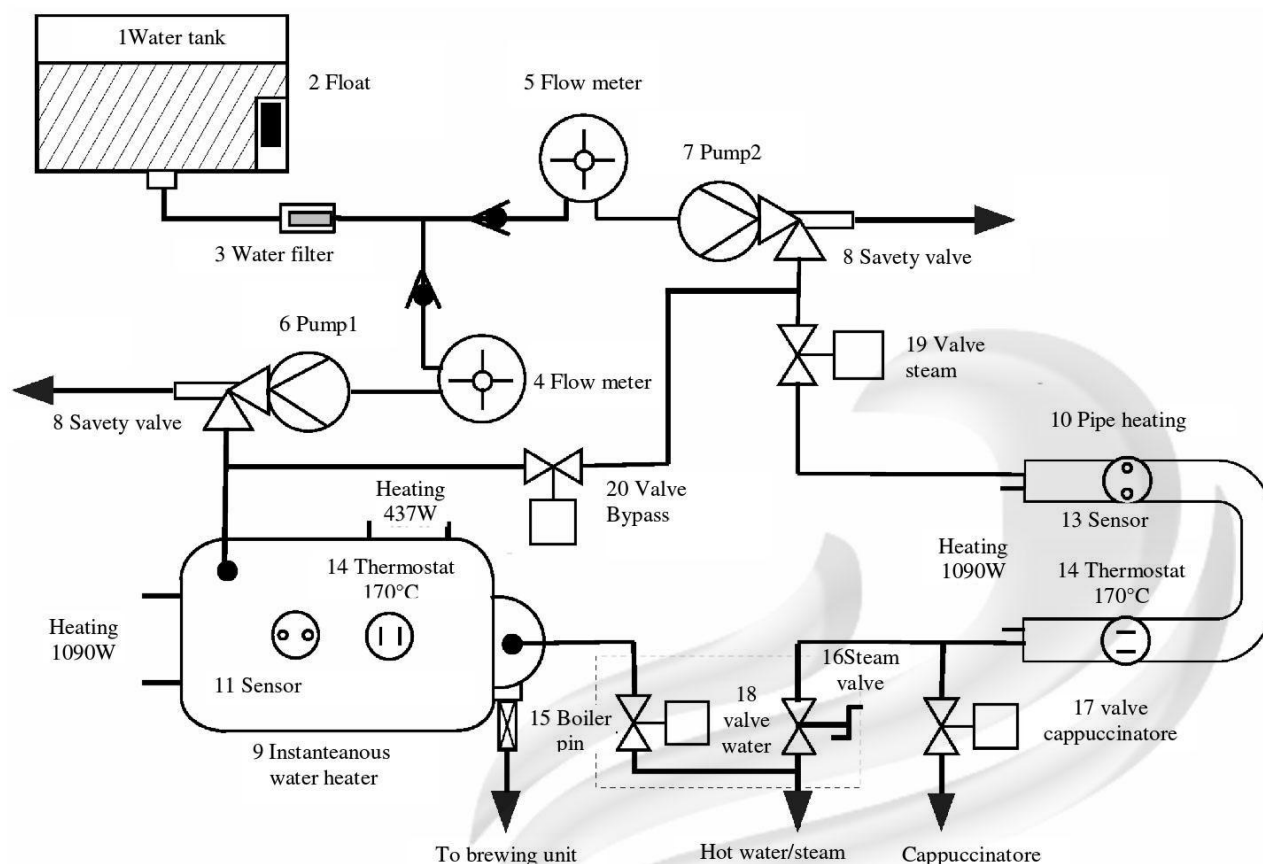
1.4. Water system (Royal Cappuccino / Professional Instant Steam)



	Component	Function
1	Water tank	Water supply
2	Float	Water level monitoring
3	Water filter	Water cleaned of solid matter
4	Flow meter (turbine) System 1	Measure flow rate
5	Flow meter (turbine) System 2	Measure flow rate
6	Pump System 1	Water flow/Pressure build-up (13 to 15 bar)
7	Pump System 2	Steam dispensing/Pressure build-up (13 to 15 bar)
8	Safety valve	Protect instantaneous water heater against overpressure (opens at 17 bar)
9	Instantaneous water heater/Heating (coffee/hot water)	Heats water to approx. 94°C (for brewing process and hot water preparation)
10	Instantaneous water heater/Heating (steam)	Steam generation / Temperature approx. 130°C
11	Sensor (KTY) System 1 (Water)	Transmits current temperature value to electronic system
12	Thermostat System 1 (Water)	Alternates current supply for heating system in event of overheating.

	Component	Function
13	Sensor (KTY) System 2 (steam)	Transmits current temperature value to electronic system
14	Thermostat System 2 (steam)	Alternates current supply for heating system in event of overheating.
15	Boiler pin (Valve plug)	Opens when brewing unit is aligned with water circuit to the unit itself.
16	Steam valve	For steam dispensing
17	Valve cappuccinatore (for cappuccino maker)	Solenoid valve/steam dispensing for cappuccino
18	Valve (water)	Solenoid valve for water dispensing
19	Valve (steam)	Solenoid valve for steam dispensing (turbowater)

1.5. Water system (Royal Cappuccino Redesign)



	Component	Function
1	Water tank	Water supply
2	Float	Water level monitoring
3	Water filter	Water cleaned of solid matter
4	Flow meter System 1	Measure flow rate
5	Flow meter System 2	Measure flow rate
6	Pump System 1	Water flow/Pressure build-up (13 to 15 bar)
7	Pump System 2	Steam dispensing/Pressure build-up (13 to 15 bar)
8	Safety valve	Protect instantaneous water heater against overpressure (opens at 17 bar)
9	Instantaneous water heater/Heating (coffee/hot water)	Heats water to approx. 94°C (for brewing process and hot water preparation)
10	Pipe heating / Heating (steam)	Steam generation / Temperature approx. 130°C
11	Sensor (KTY) System 1 (Water)	Transmits current temperature value to electronic system
12	Thermostat System 1 (Water)	Alternates current supply for heating system in event of overheating.

	Component	Function
13	Sensor (KTY) System 2 (steam)	Transmits current temperature value to electronic system
14	Thermostat System 2 (steam)	Alternates current supply for heating system in event of overheating.
15	Valve plug	Opens when brewing unit is aligned with water circuit to the unit itself.
16	Steam valve	For steam dispensing
17	Valve (for cappuccino maker)	Solenoid valve/steam dispensing for cappuccino
18	Valve (water)	Solenoid valve for water dispensing
19	Valve (steam)	Solenoid valve for steam dispensing (turbowater)
20	Valve (by-pass)	Solenoid valve for water dispensing

1. General functioning

The electromagnetic valve **EV1** is a by-pass valve located between **pump 2** and **pump 1**. It must be installed in the opposite direction to the flow.

When coffee and steam are dispensed simultaneously, a pressure difference exists between the two water circuits (up to 12 bar for the water system as opposed to 4 bar for the steam system), which enables the electromagnetic valve **EV1** to open.

In the event of a fault, very humid steam and inconsistent coffee quantities are obtained since the quantity of water, determined by **Turbine 1**, does not completely reach the coffee/steam system.

2. Simultaneous coffee and steam dispensing

- Solenoid valve **EV1**: Closed
- Solenoid valve **EV2**: Open
- Solenoid valve **EV3**: Closed
- Solenoid valve **EV4**: Closed or open, depending on whether the steam is dispensed via the Cappumore or the rotary valve.
- **Pump 1** functions for coffee production, while **pump 2** pulses the steam.

3. Simultaneous hot water and steam dispensing

- Solenoid valve **EV1**: Closed
- Solenoid valve **EV2**: Open
- Solenoid valve **EV3**: Open
- Solenoid valve **EV4**: Closed or open, depending on whether the steam is dispensed via the Cappumore or the rotary valve.
- **Pump 1** functions for hot water production, while **pump 2** pulses the steam.

4. Dispensing only hot water

- Solenoid valve **EV1**: Open
- Solenoid valve **EV2**: Closed
- Solenoid valve **EV3**: Open
- Solenoid valve **EV4**: Closed
- **Pump 2** functions to produce hot water. This ensures that both pumps are regularly flushed with water and no damage is caused by standing dry for too long.

5. Automatic descaling

Stage 1)

- Solenoid valve **EV1**: Closed
- Solenoid valve **EV2**: Open
- Solenoid valve **EV4**: Open
- 55 pulses are generated via **pump 1** and 55 pulses via **pump 2**.

Stage 2)

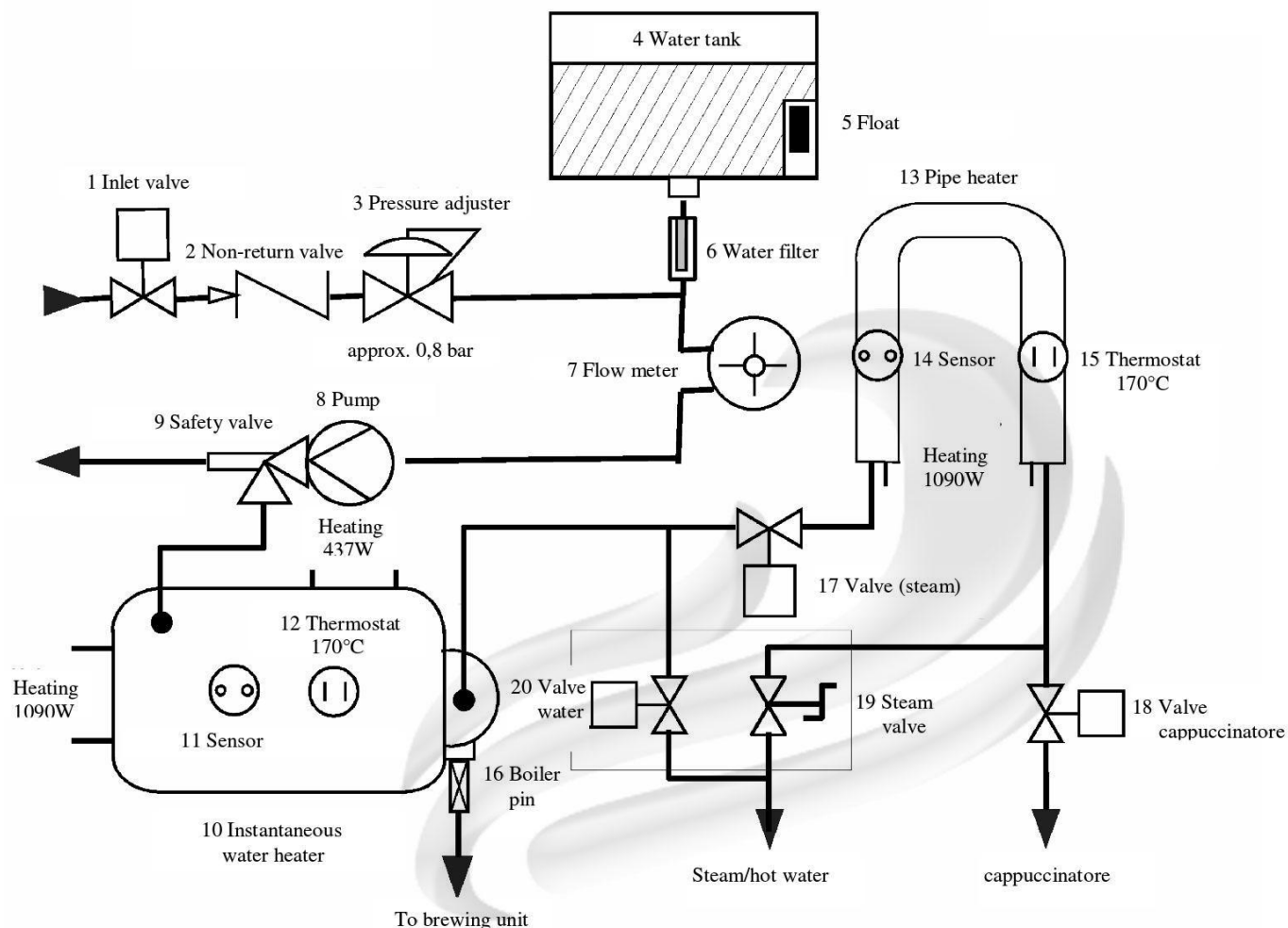
- Solenoid valve **EV1**: Open
- Solenoid valve **EV2**: Closed
- Solenoid valve **EV3**: Open
- 30 water pulses are generated via **pump 2**.

Stage 3)

- Solenoid valve **EV1**: Closed
- Solenoid valve **EV2**: Open
- One minute pause is allowed for the descaling solution to take effect. All solenoid valves, **EV1-2-3-4** are open to prevent an increased pressure in the water system caused by the descaling solution.

All three processes are repeated several times automatically (about 45 minutes).
A final rinse with no descaling solution must be performed.

1.6. Water system (Royal Coffeebar)

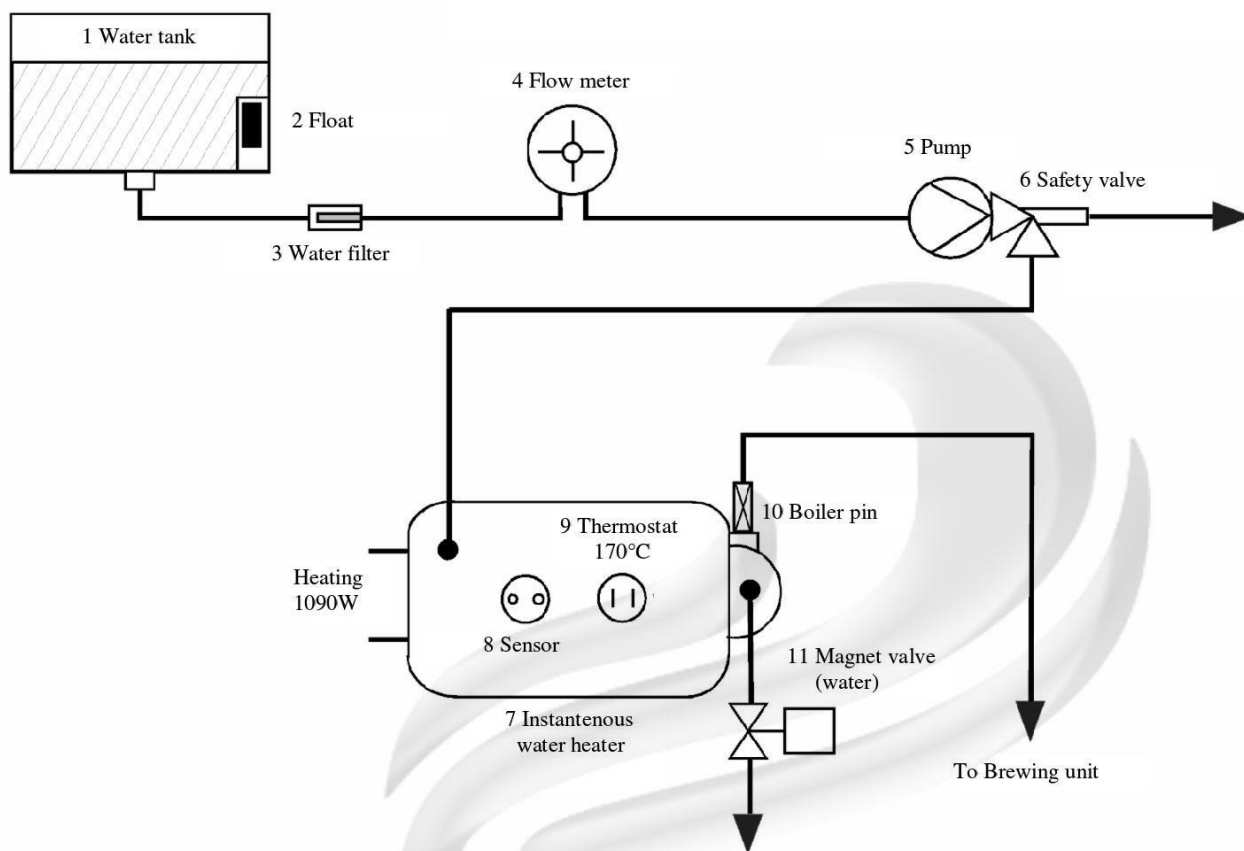


	Component	Function
1	Inlet valve	Activates external water supply
2	Non-return valve	
3	Pressure adjuster	Reduces the water circuit pressure to about 0.8 bar
4	Water tank	Water supply
5	Float	Water level monitoring
6	Water filter	Water cleaned of solid matter
7	Flow meter (turbine)	Measure flow rate
8	Pump	Water flow/Pressure build-up (13 to 15 bar)
9	Safety valve	Protect instantaneous water heater against overpressure
10	Instantaneous water heater/Heating (coffee/hot water)	Heats water to approx. 94°C (for brewing process and hot water preparation)
11	Sensor (KTY) Instantaneous water heater	Transmits current temperature value to electronic system
12	Thermostat Instantaneous water heater	Alternates current supply for heating system in event of overheating.
13	Pipe heating	Steam generation / Temperature approx. 130°C

	Component	Function
14	Sensor (KTY) Pipe heating	Transmits current temperature value to electronic system
15	Pipe heating thermostat	Alternates current supply for heating system in event of overheating.
16	Valve plug	Opens when brewing unit is aligned with water circuit to the unit itself.
17	Valve (for boiler filling)	Solenoid valve for filling pipe heating system
18	Valve (Cappumore)	Solenoid valve/steam dispensing for Cappumore
19	Valve (steam)	For hot water and steam dispensing
20	Valve (water)	Solenoid valve for water dispensing

Note: In the Royal Coffeebar it is possible to operate the machine directly from the fixed water connection. The inlet valve is activated via the user programme (Chap. 3, Page 16). A pressure reducer installed at the inlet point maintains an almost pressureless operation before the pump.
However, a separate flow meter is used to measure the flow rate.

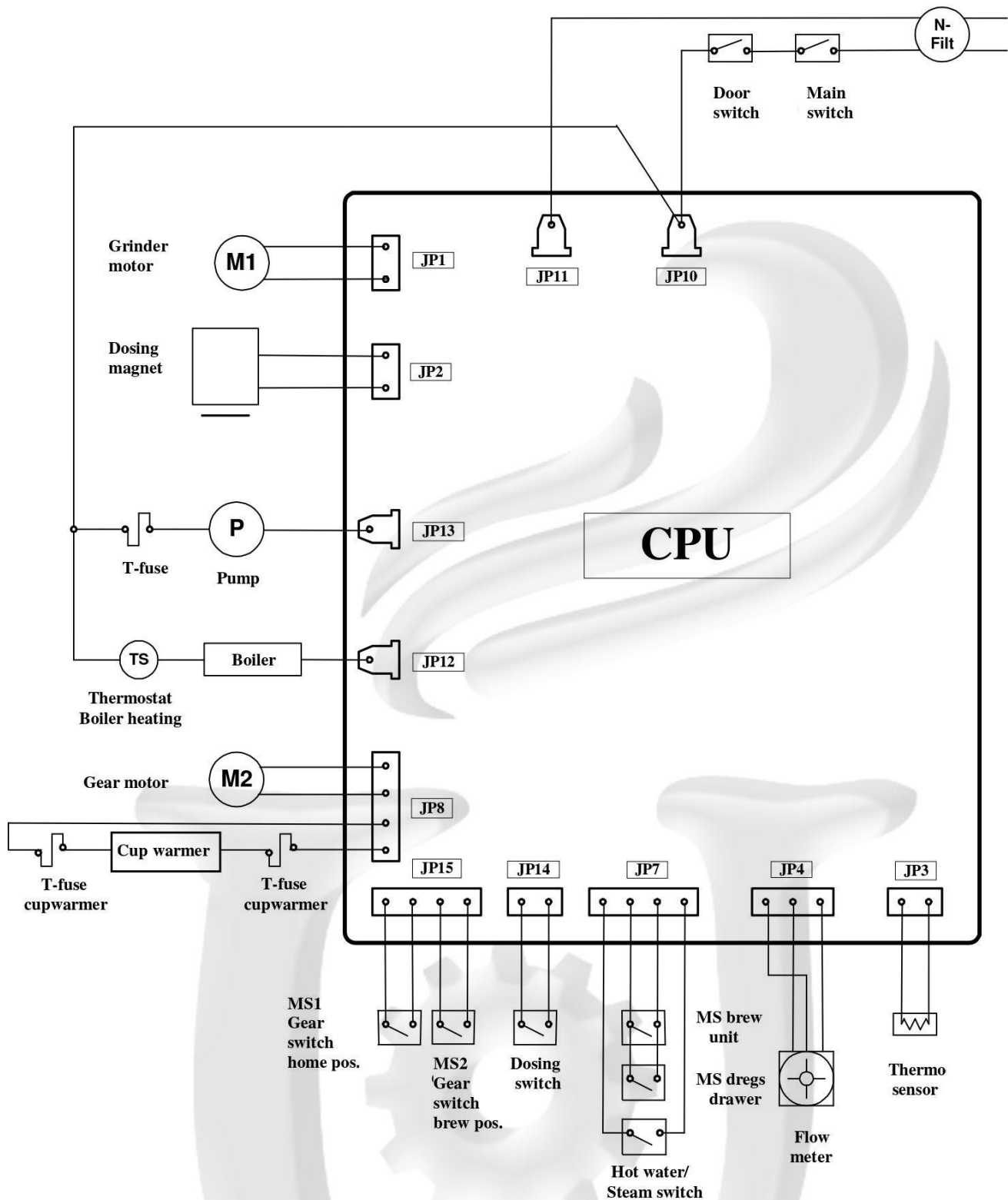
1.7. Water system (Office)



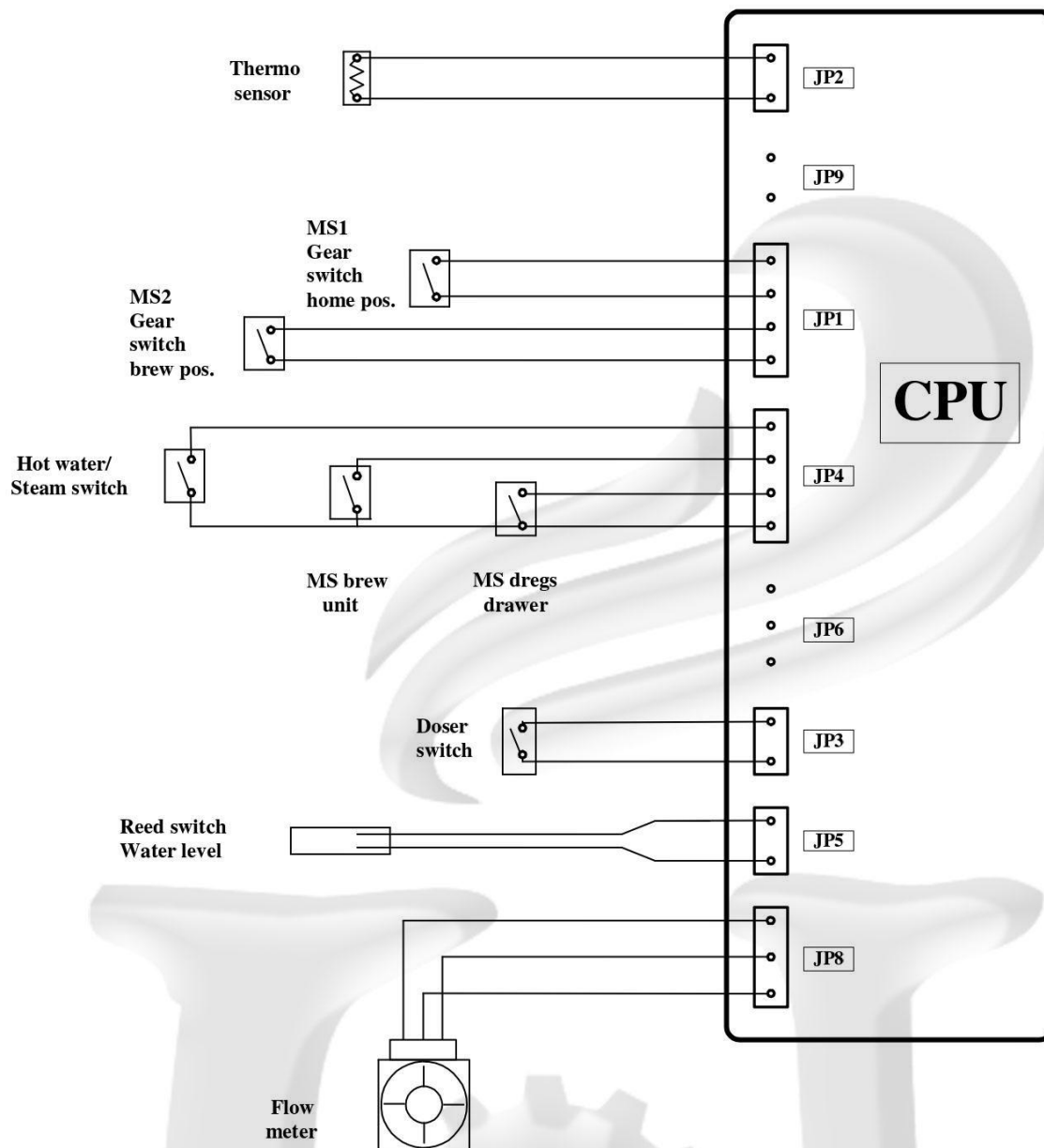
	Component	Function
1	Water tank	Water supply
2	Float	Water level monitoring
3	Water filter	Water cleaned of solid matter
4	Flow meter (turbine)	Measure flow rate
5	Pump	Water flow/Pressure build-up (13 to 15 bar)
6	Safety valve	Protect instantaneous water heater against overpressure (opens at 17 bar)
7	Instantaneous water heater/Heating	Heats water to approx. 94°C (for brewing process)
8	Sensor (KTY)	Transmits current temperature value to electronic system
9	Thermostat	Alternates current supply for heating system in event of overheating.
10	Valve plug	Opens when brewing unit is aligned with water circuit to the unit itself.
11	Magnet valve (water)	Solenoid valve for water dispensing

2. Electrical system

2.1. CPU – IN / OUT (Royal Classic)

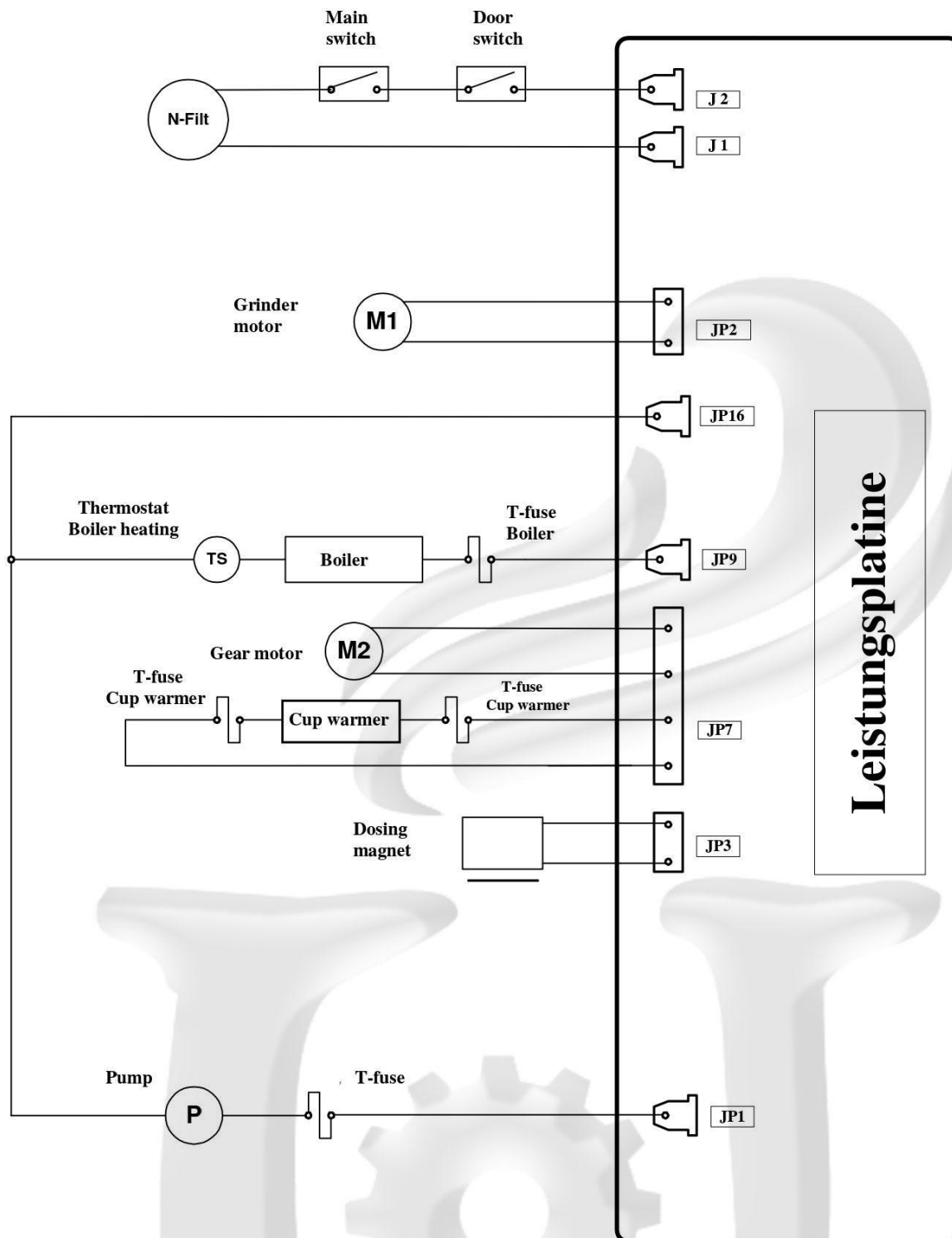


2.2.1. CPU – INPUT (Royal Digital / Exclusive)



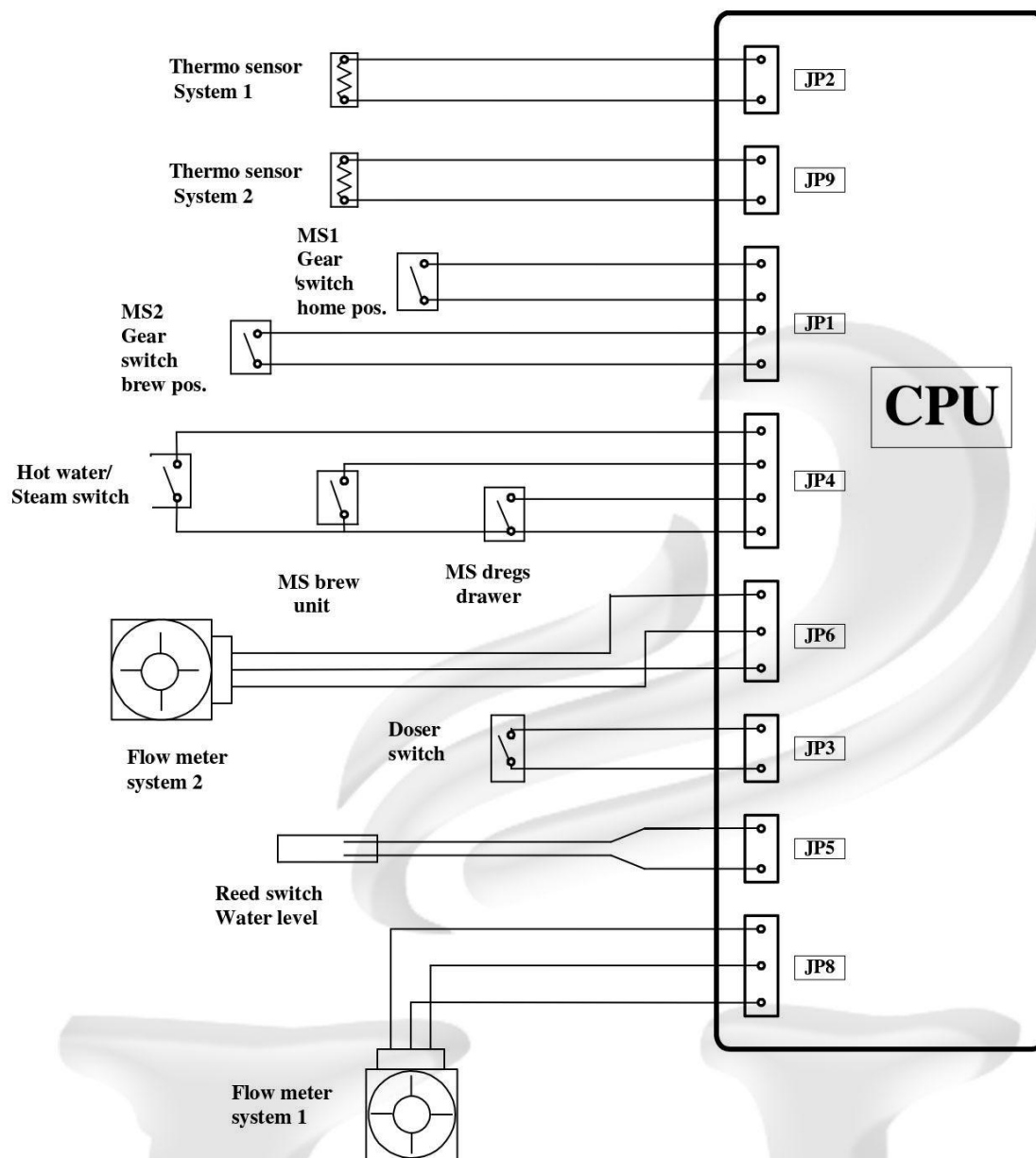
Component	Voltage	Comments
Microswitch MS1	15/5V =	Gears in home position
Microswitch MS2	15/5V =	Gears in brewing position
Microswitch MS3	15/5V =	Brewing unit
Microswitch MS4	15/5V =	Doser
Microswitch MS5	15/5V =	HWS valve
Microswitch MS6	15/5V =	Dregs drawer

2.2.2. Control panel (Royal Digital / Exclusive)



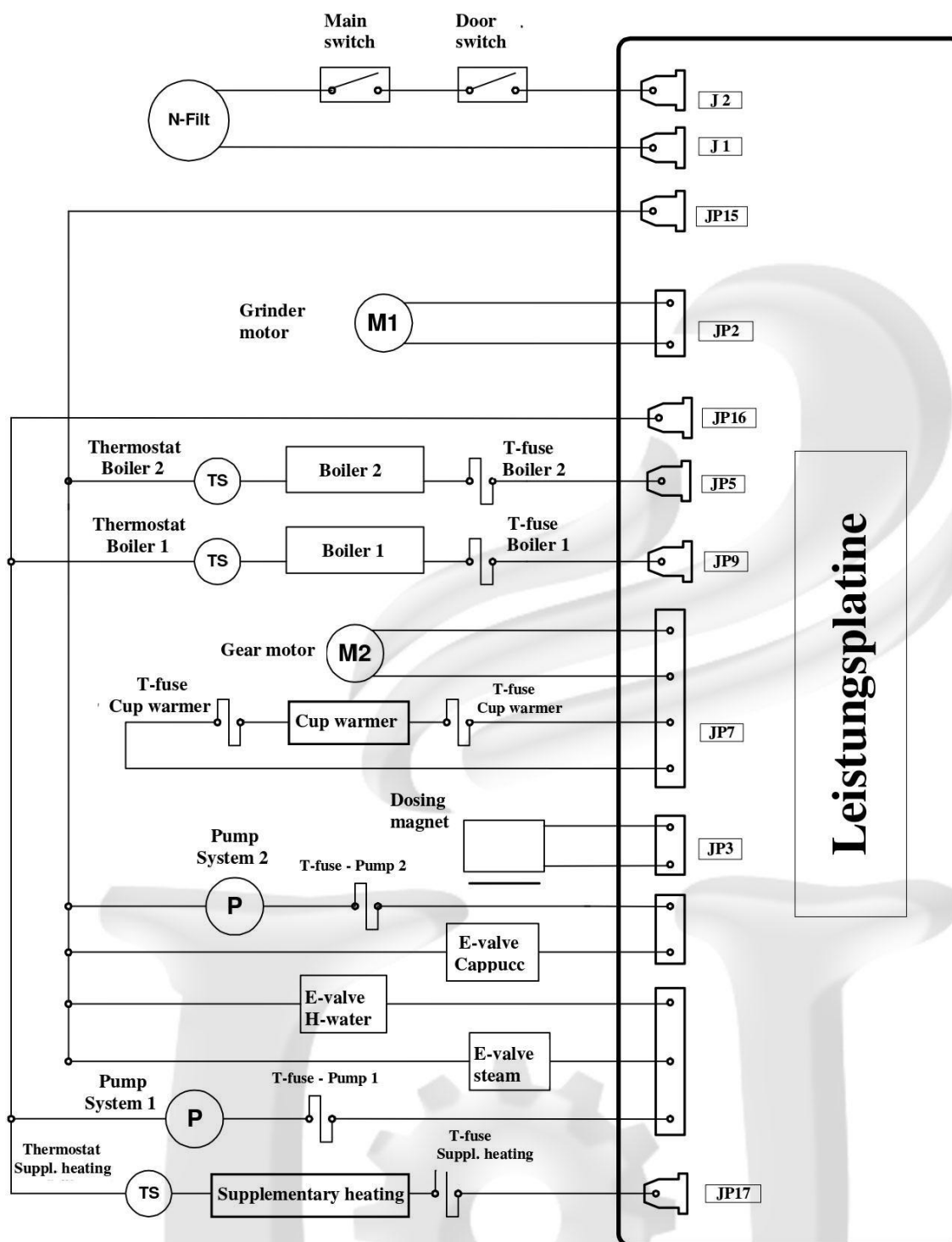
Pump	Approx. 190V~	Diode in pump
Mains switch	230 V~	
Door microswitch	230 V~	
Doser coil	230 V~ / 300Ohm	
Microfuse F1	230 V~ / 8AT	

2.3.1. CPU – INPUT (Royal Cappuccino / Professional Instant Steam)



Component	Voltage	Comments
Microswitch MS1	15/5V =	Gears in home position
Microswitch MS2	15/5V =	Gears in brewing position
Microswitch MS3	15/5V =	Brewing unit
Microswitch MS4	15/5V =	Doser
Microswitch MS5	15/5V =	HWS valve
Microswitch MS6	15/5V =	Dregs drawer

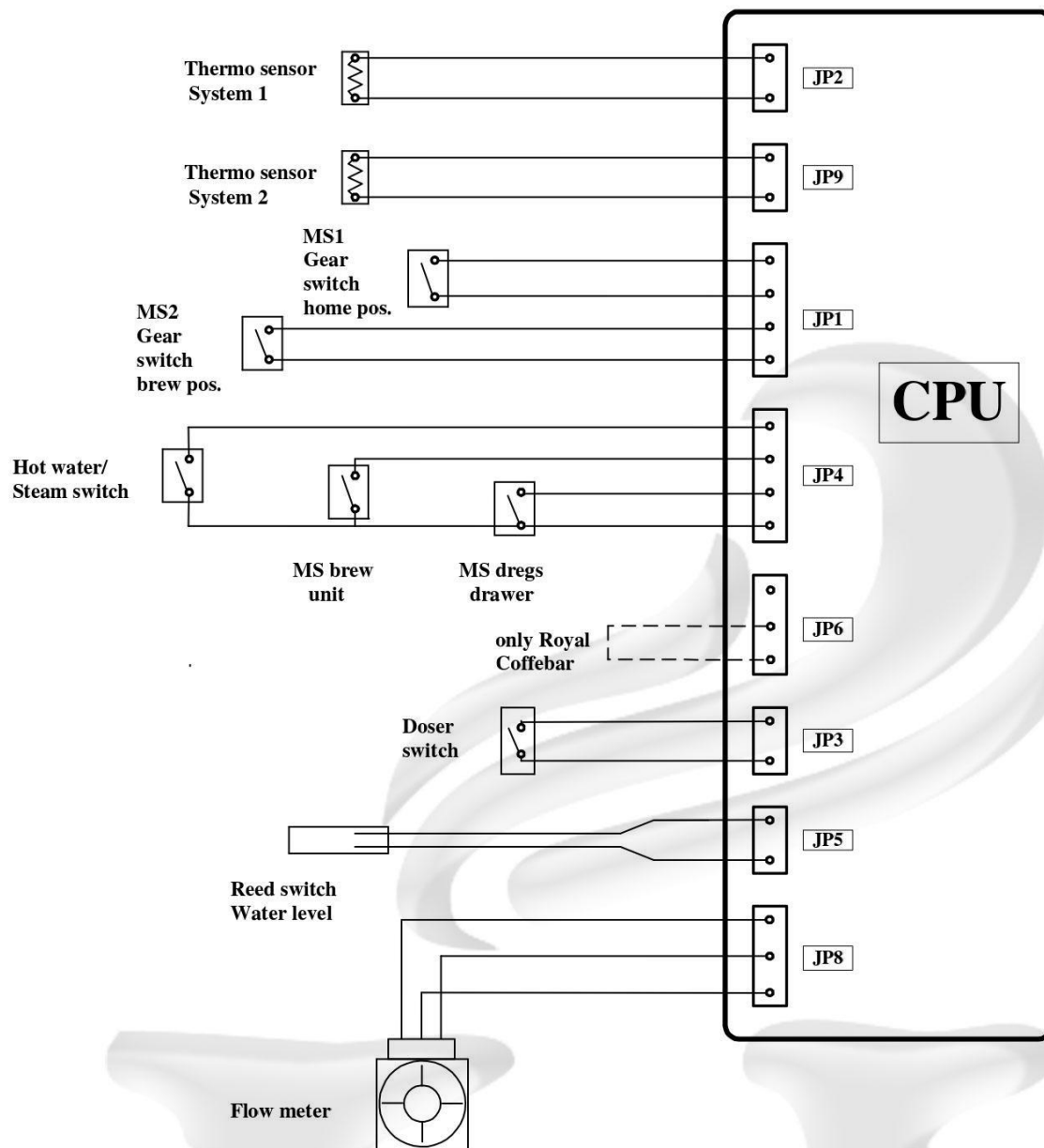
2.3.2. Control panel (Royal Cappuccino / Professional Instant Steam)



Leistungsplatine

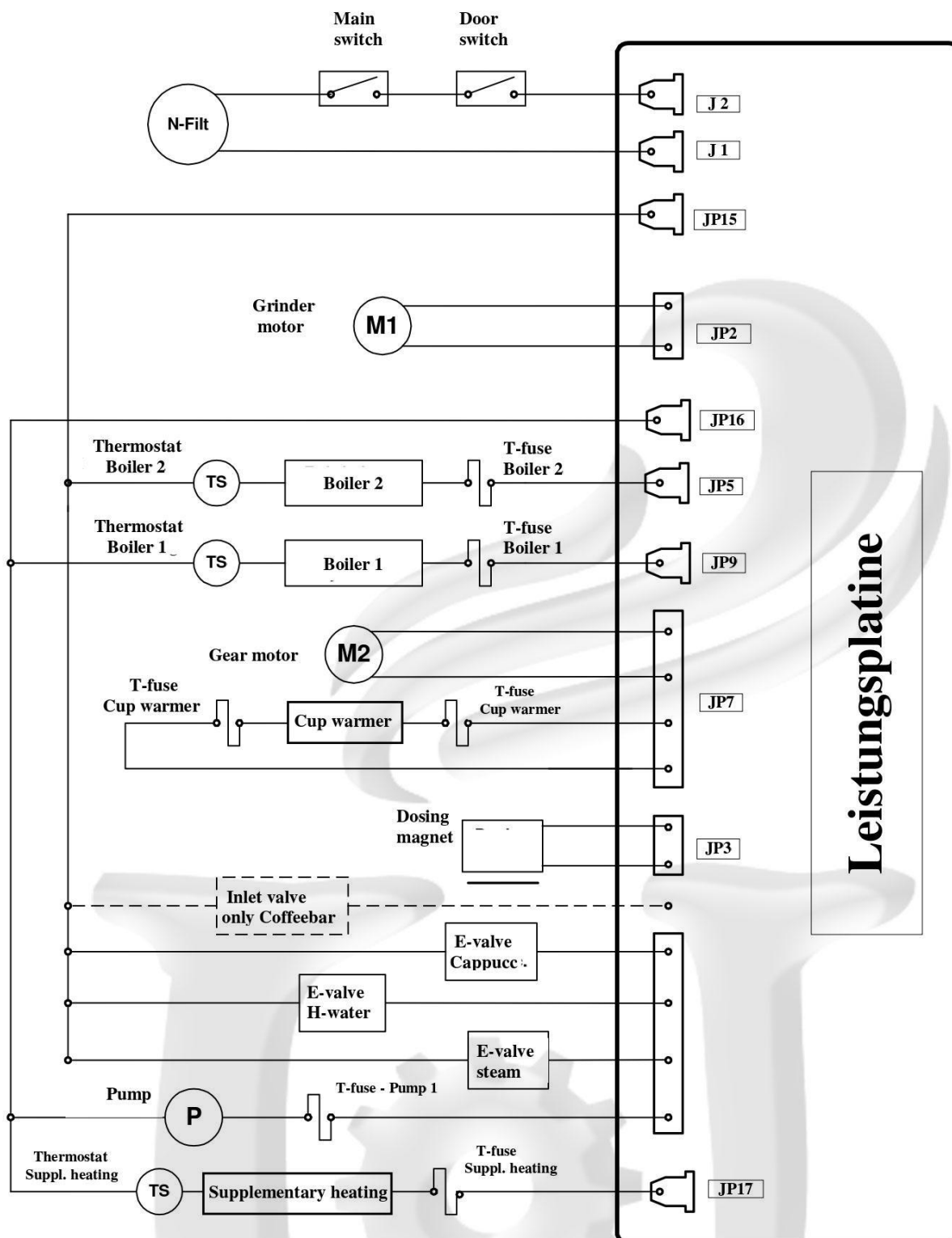
Microfuse F1	230 V~ / 32mAT	Control
Microfuse F2	230 V~ / 8AT	Pipe heating
Microfuse F3	230 V~ / 8AT	Instantaneous water heater

2.4.1. CPU – INPUT (Royal Professional Rapid Steam / Royal Coffeebar)



Component	Voltage	Comments
Microswitch MS1	15/5V =	Gears in home position
Microswitch MS2	15/5V =	Gears in brewing position
Microswitch MS3	15/5V =	Brewing unit
Microswitch MS4	15/5V =	Doser
Microswitch MS5	15/5V =	HWS valve
Microswitch MS6	15/5V =	Dregs drawer

2.4.2 Control panel (Royal Professional Rapid Steam / Royal Coffeebar)



Microfuse F1	230 V~ / 32mAT	Control
Microfuse F2	230 V~ / 8AT	Pipe heating
Microfuse F3	230 V~ / 8AT	Instantaneous water heater

3. Timing

The following time chart indicates the functions of the individual components in terms to time (excluding Royal Classic, see process for Vienna)

Grinder motor			app.5.5 sec	
Doser				
Heating	app. 1.5 min			
Pump			*	depending on coffee qty
Gearmotor	down up		up	down up
Status	Heating stage	Standby	Coffee dispensing process	

Note: * Only in machines with pre-brewing systems

Explanation:

Two processes start when the main switch is activated:

Firstly, the gearmotor is initialised. The gears move to MS1 (lower limit switch), change rotating direction, leave MS1 and move to the home position (about 2 mm after MS1). **Exception:** Royal Classic – process as for Vienna (moves to brewing position and back / see Vienna).

The instantaneous water heater is then activated for about 1 min 30 sec., heating the water to operating temperature, whereby heating takes place for about 60 sec. continuously and then is alternated for the rest of the time.

After activating the start button:

1. The grinder starts operating (about 5.5 sec.).
2. The doser is activated twice.
3. The gears move to brewing position.
4. Depending on the type of machine, pre-brewing begins (brief pump activation).
5. Main brewing process (duration of pump activation depending on selected coffee quantity).
6. The gears move to home position (dregs are discarded).

Note:

If the machine is disconnected from the main power supply during operation (power failure/side doors opened), the gears will complete the function commenced but without brewing (if the interruption occurs before brewing, the coffee will be dispensed dry).

If operation is interrupted by removal of the dregs drawer, the machine will continue its function unrestricted once the drawer is returned.

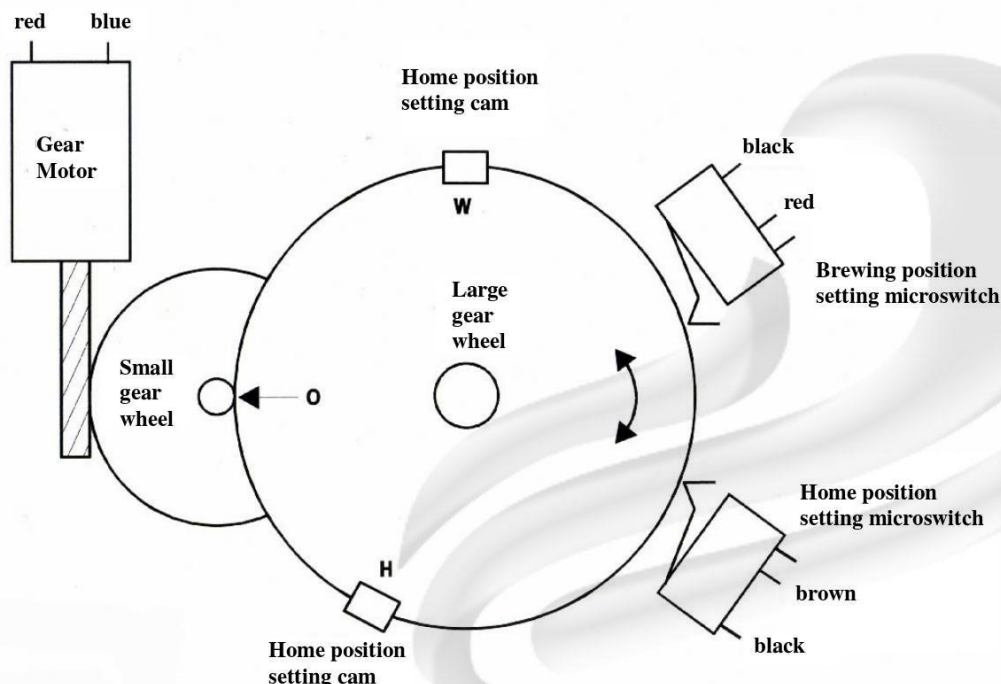
4. Function

4.1. Gearmotor

The gearmotor is a direct current motor and is controlled by the CPU at approx. 30 – 35 V.

In order to perform forwards and backwards movements, the gearmotor is controlled alternately with a positive and negative half wave.

In the event of overload the motor's electronic system switches off after 8-10 sec. and the machine is stopped. This situation is indicated by the flashing fault LED. In digital display indicator systems: brewing unit locked.



Important: During installation of the large gear wheel care must be taken that the marking on the large gear wheel always faces the direction of the small gear wheel axis, and that both limit switches are positioned in the larger segment between both switching cams.

If the motor is replaced, it is important that the blue cable (-) is fitted onto the motor connection near the writing "Italy" (+ and - are not marked).

4.2. Heating plate (Gear resistor)

The heating plate is operated with a wave packet control system. The ratio of the power-on time is approx. 1:40 (0.1 sec on, 3.9 sec. off). The heating plate is activated via the corresponding item in the user menu. It is only active when the machine is not operational. The heating plate output is approx. 437 W.

In order to reduce the total power output of the machine, the heating plate is turned off during the heating stage.

The heating plate can act as a resistor for the gearmotor.

In the event that several coffees are brewed consecutively, the heating plate warms up without being turned on. The heating plate is protected against overload by 2 thermal fuses.

If one of the thermal fuses is compromised or the heating plate is defective, the gearmotor also does not function.

Exception: The Royal Office does not have a heating plate. The gear resistor is the small resistor on the instantaneous water heater.

4.3. Water level indicator

The water level in the water tank is monitored by a float fitted with a magnet core. If the water level is too low, the magnet is no longer within the range of the reed contact, which transmits the low water level signal to the CPU.

4.4. Flow meter (Turbine)

The machine is also equipped with a flow rate monitoring system. The system checks whether the water monitoring flow meter (turbine) turns. If no pulses are generated from the flow meter within 10 seconds, the current cycle is interrupted. The fault is indicated by the water low indicator (machine without float) or by the de-aerate indicator in machines with float (reed sensor). If this control mechanism is activated, the machine must be de-aerated. During these signals, the pump operates at maximum output. As soon as the pump has created sufficient flow, the pump output is reduced to approx. 20 l/hr.

The water quantity is generally controlled according to the coffee quantity programmed through the flow meter (turbine) pulses.

4.5. HWS valve (steam operation)

The HWS valve is required for water and steam dispensing, as well as during de-aeration.

If the hot water valve is opened during brewing, the coffee flow is interrupted and the Water Low indicator begins to flash or the message Close Dial appear on the display. As soon as the hot water valve is closed, the brewing process will continue (**only in machines without Instant Steam**).

The operating temperature during steam dispensing is approx. 125°C. The steam button is pressed to activate steam production (in machines without Rapid or Instant Steam). Steam dispensing occurs via the HWS valve.

In machines with Rapid Steam, the steam can be dispensed immediately after the end of the coffee cycle (second instantaneous water heater).

In machines with Instant Steam, the steam or cappuccino can be dispensed even during the coffee cycle. The pump pulses the steam dispensed. This means that constant steam dispensing is ensured over a long period of time. The flow rate of the pump is adjusted on the basis of the thermoblock temperature. If the temperature is too low, the pump pulses are slowed down. This may occur, for instance, when the hot water valve opens before the temperature indicator lights up.

In machines with Instant Steam, the steam is added during hot water dispensing in order to reach an even higher water temperature. The flow volume can be adjusted under the items HOT WATER or TURBOWATER (when System 2 is turned on).

Once the steam has been dispensed, the steam valve closes and the steam button must be pressed for normal operating mode. The steam and coffee temperature indicators flash or the message OVERHEATING appears in machines with digital display, until the machine has cooled and the machine cannot dispense coffee. Cooling can be achieved by dispensing hot water. The pump functions at maximum output and the heating remains turned off as long as the temperature indicator flashes (R. Classic) / Overheating signal remains on (Royal Digital/Exclusive). These measures ensure that the cooling process is accelerated and the overheating signal will disappear after a few seconds (**only in machines without Instant or Rapid Steam**).

4.6. Temperature sensor (KTY 10)

The temperature sensor is a temperature-sensitive resistance mechanism, converting the instantaneous water heater temperature into an electrical signal which is measurable by the CPU.

The CPU compares this signal with the programmed reference signal and, depending on the outcome of the comparison, controls the instantaneous water heater output.

The resistance applied has a positive temperature coefficient; i.e. higher instantaneous water heater temperature - higher sensor resistance.

The table below indicates the trend in resistance values in relation to the temperature.

Measured values:

Temperature	Resistance (Ω)	Resistance trend (Ω)
0	1629	0
15	1845	216
20	1922	77
40	2246	324
90	3168	922
100	3366	198
130	3979	613
140	4188	209

At room temperature the resistance is 1.9K Ω .

4.7. Grinder

The grinder is a conical grinder with upper and lower grinding disc. The grind level is set by adjusting the height of the upper grinding disc by means of the screw thread.

If the grinding discs are drawn apart by turning the grind level adjusting ring (turning anti-clockwise), the grind is coarser, while turning the adjusting ring clockwise will result in a finer grind.

ATTENTION: Adjust the grind level only when the grinder is in operation!

The grinder operates with a direct current motor and the grinding disc rotation speed is determined by a gearmotor. The grinder motor operates with a voltage of 260 V.

4.8. Doser

The coffee quantity for the current coffee process is portioned (dosed) in the doser chamber; a higher dose results in a stronger (more concentrated) coffee. A lower dose results in a weaker (less concentrated coffee). The doser is controlled by a microswitch. The ground coffee is pressed into the doser chamber from the grinder. When the dosing chamber is full, the microswitch is activated and transmits to the CPU the signal to turn the grinding motor OFF.

Grinding is stopped, the dosing magnet engages (2x), opens the dosing flap and the coffee falls into the brewing unit.

If the dosing microswitch is not activated within 20 seconds from start of the grinder motor, the coffee beans low signal appears.

The dosing quantity is set automatically by shifting the doser housing wall together with its microswitch.

CHAPTER 5

SERVICE PROGRAMME

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1. Service programme (Royal Classic):

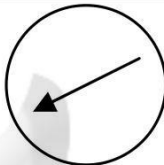

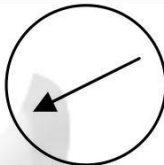





1.1. Test mode

Access: Access the service mode by turning on the machine and simultaneously pressing the Coffee and steam buttons.

Press Coffee and Steam buttons.

Various test functions can be activated in the service mode by activating either the coffee or steam buttons in conjunction with various coffee quantity settings.

Programme table

Function	Button	Control setting	LED Indicator
Pump/Turbine *	Coffee		Fault LED (flow meter pulses)
Brewing unit (Gearmotor) 	Steam		Coffee LED Gear switch (brewing setting)
Heating	Coffee		
Brewing unit (Gearmotor) 	Steam		Coffee LED Gear switch (home position)
Dosing magnet	Coffee		
Grinder	Steam		Steam LED Doser full
HWS microswitch			Steam LED

* The HWS valve must be open.

The current boiler temperature can be read in service mode by pressing the coffee and steam buttons at the same time.

Each combination of LEDs provides an indication on the current boiler temperature (see table below).

Temperature table

Temperature status	Coffee LED	Steam LED	Fault LED
$T \leq 94^{\circ}\text{C}$			X
$T = 95^{\circ}\text{C}$	X		X
$T = 96^{\circ}\text{C}$	X		
$T = 97^{\circ}\text{C}$	X	X	
$T \geq 98^{\circ}\text{C}$		X	

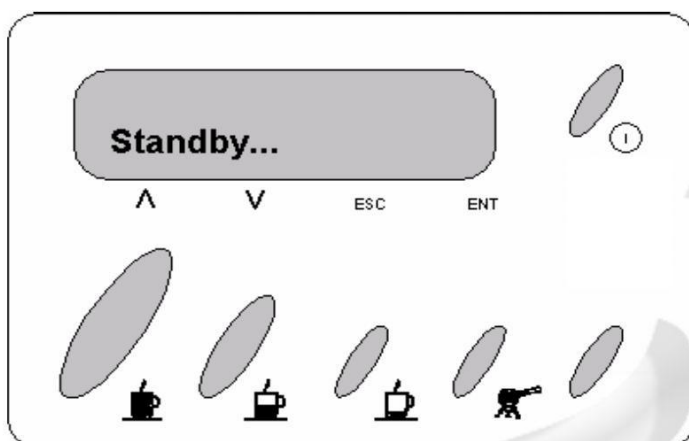
2. Service programme (Royal Digital / Exclusive / Digital Redesign)

2.1. Test mode

Access (Royal Digital / Exclusive):

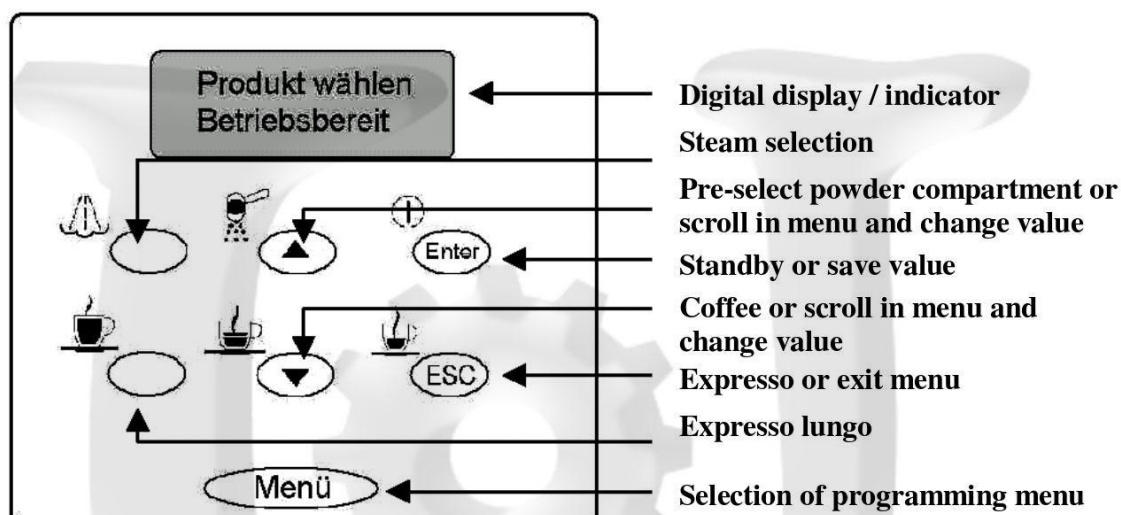
Access the test mode by turning on the machine and simultaneously pressing the coffee and steam buttons.

Keep the EXPRESSO and STEAM buttons pressed, whilst pressing the STANDBY button.



Access (Digital Redesign):

Access the service programme from the standby mode (Menu + Enter) by keeping the coffee, powder coffee and espresso buttons pressed, whilst pressing the Menu button. **(Important: Press the menu button only briefly to enter the service mode!)**



The various functions indicated in the table can be checked by pressing the button combinations listed below.

Flow rate

If the pump is activated during test mode and the hot water valve opened, a two-digit number appears at the bottom right side indicating the flow rate. This value must be between 40 - 60.

Grinder rate

If no button is activated, a number appears at the bottom right side referring to the grinder rate. This value must be between 125 - 135.

Exit: Switch the machine off from the main switch.

