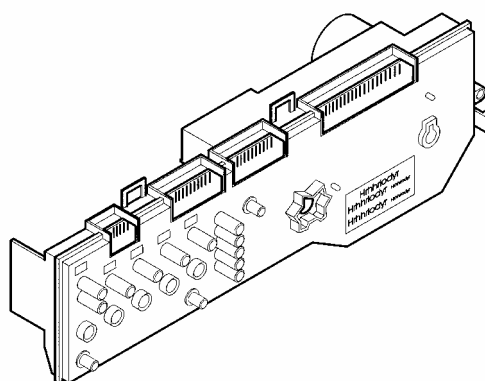
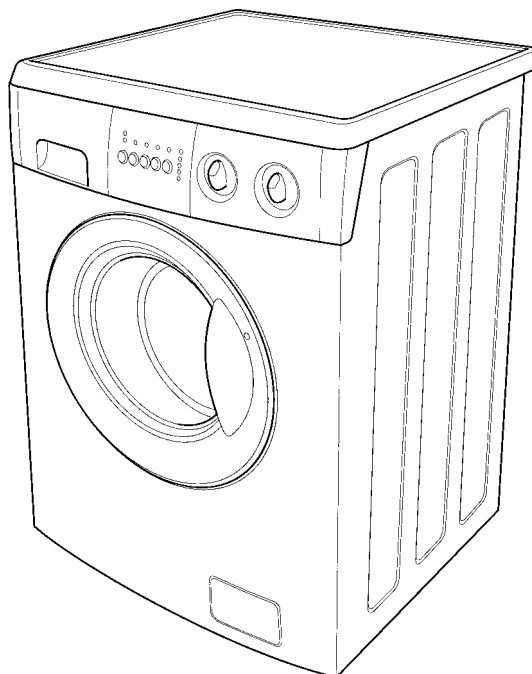




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**Washing machines with
EWM1000 electronic
control system:**

**Technical and functional
characteristics**

**Production:
ESA – Alcala de Henares (ES)**

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1 Purpose of this manual

The purpose of this manual is to provide service engineers who are already familiar with the repair procedures for traditional washing machines with information regarding appliances fitted with the EWM 1000 electronic control system and produced in Alcala de Henares (Spain).

The following topics are described:

- general characteristics
- control panel and washing programmes
- technical and functional characteristics
- access to the electronic control system

For detailed information concerning diagnostics and alarms, refer to the following manual:

“EWM1000 electronic control system: guide to diagnostics procedures”.

2 GENERAL CHARACTERISTICS

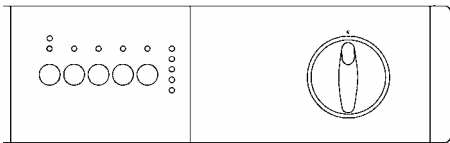
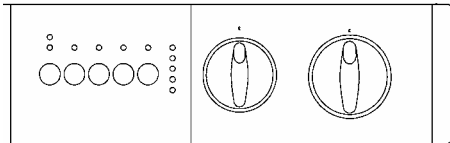
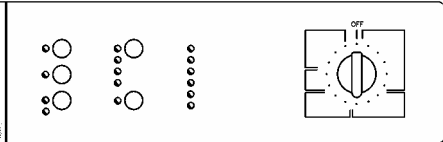
The EWM1000 electronic control system consists of a single PCB, which incorporates the power, control and display functions.

The PCB is contained in a protective casing located behind the control panel support. Two basic versions of the PCB are produced: one with horizontal pushbuttons and one with vertical pushbuttons.

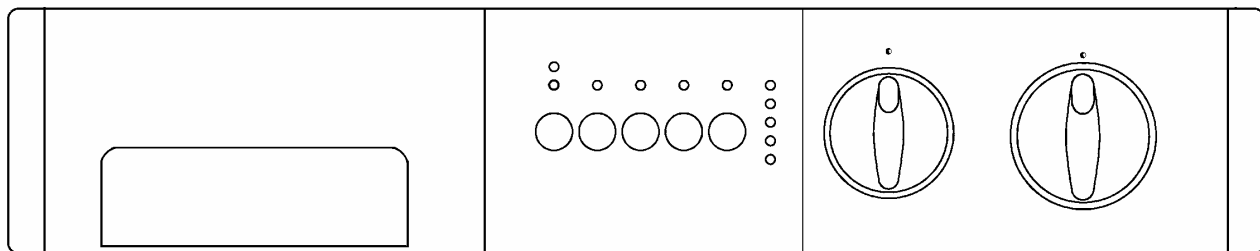
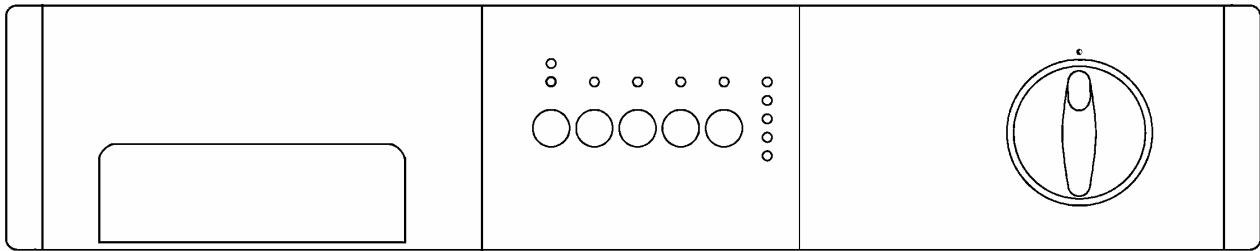


The EWM1000 electronic control system may be fitted to the following appliances:

- ◆ front-loading washing machines manufactured in Spain (Alcala de Henares) **(ESA)**
- ◆ front-loading washing machines manufactured in Germany (Nürnberg) **(DGN)**
- ◆ top-loading washing machines manufactured in France (Revin) **(FFH)**
- ◆ front-loading washing machines manufactured in Italy (Porcia) **(ZP)**

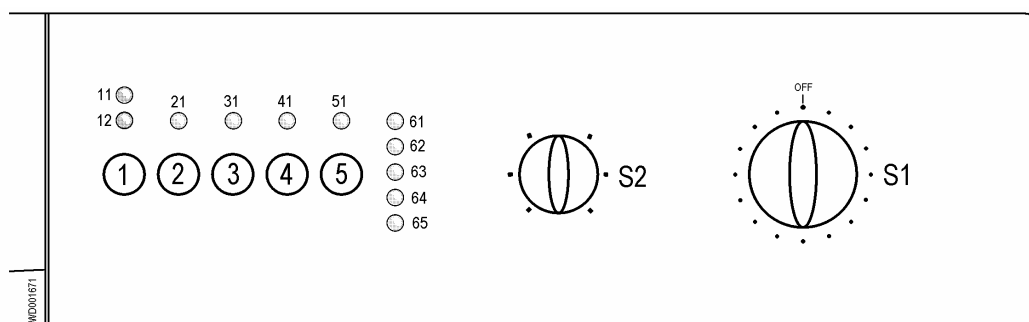
Versions with horizontal pushbuttons		
Version with vertical pushbuttons		
Number of buttons	▪ max. 5 (4 options + start/pause)	
Number of LEDs	▪ max. 11 for version with horizontal pushbuttons ▪ max. 15 for version with vertical pushbuttons	
Programme selector	▪ 16 positions with main switch (incorporated in the PCB)	
Secondary selector	▪ 6 positions for horizontal version only (incorporated in the PCB)	
Buzzer	▪ incorporated in the PCB (some models)	
Serial port	▪ DAAS-EAP communication protocol up to 38400 baud	
Power supply	▪ 220/240V ▪ 50/60 Hz (configurable in the factory)	
Type of washing	▪ traditional ▪ with "eco-ball" sphere	
Rinsing system	▪ Traditional	
Motor	▪ Commutator motor	
Spin speed	▪ 600 - 1400 rpm	
Anti-unbalancing system	▪ FUCS	
Water filling	▪ 1 solenoid valve with 1 inlet - 2 outlets	
Detergent drawer	▪ 3 compartments: pre-wash/stains, wash, softeners ▪ 4 compartments: pre-wash/stains, wash, softeners, bleach	
Control of water level in the tub	▪ two-level pressure switch: 1st level and anti-boiling safety level (the other levels refer to fixed-time fills) ▪ possible use of a three-level pressure switch: 1st level, anti-boiling and anti-flooding safety levels	
Door safety device	▪ Traditional (with PTC) ▪ Instantaneous	
Power of heating element	▪ Up to 1950W	
Temperature control	▪ NTC sensor	

3 CONTROL PANEL (horizontal pushbuttons)



- maximum 5 pushbuttons
- maximum 11 LEDs
- 16-position programme selector
- power switch incorporated in the programme selector
- version with 6-position secondary selector (some models)

3.1 Configuration of control panel



The washing programmes, the functions of the selector knob and the various pushbuttons vary according to the model, since these are determined by the configuration of the appliance.

3.1.1 Programme selector (S1)

The selector features 16 positions and incorporates the ON/OFF switch. The various positions of the selector may be configured to perform different washing programmes; in the first position, the appliance is switched off and the current programme is cancelled. For each programme, the compatible options and other parameters are defined.



- **Programme configuration**

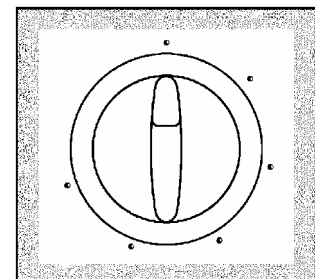
The table below lists the parameters that can be used to define the washing programmes.

Types of fabric	Cotton/linen, Synthetics, Delicates, Wool, Hand wash
Special programmes	Soak, Rinses, Spin, Drain, Softener
Temperature	Normal, Maximum: the initial and maximum temperatures that can be selected for a specific washing programme
Spin	Normal, Minimum, Maximum
Options (Normal / Possible)	Bleach, Economy (energy label), Stains, Short, Very short, Reduced spin speed, Night cycle, Half load, Easy-iron, Rinse hold, Extra rinse, Pre-wash
Programme phases	Pre-wash, Wash, Rinses, Spin, Economy, Delayed start

3.1.2 Secondary selector (S2)

Certain models may also feature a 6-position secondary selector. The function of this selector is defined during configuration of the appliance.

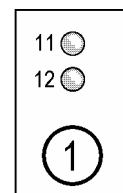
- **Temperature selector:** each position corresponds to a temperature or to the cold wash cycle.
- **Spin speed selector:** at each position it is possible to select a spin speed that is compatible with the programme. In the final positions, the following options can also be configured: **No spin, Rinse hold, Night cycle.**



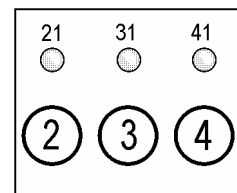
3.2 Pushbuttons and LEDs

The functions of each button are defined by the configuration of the appliance.

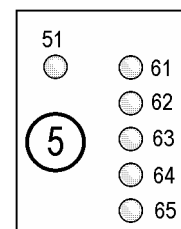
- **Button 1:** This pushbutton is connected to two LEDs (11 – 12) and, if used, it may be configured for selection of one or two options; in the latter case, the two options cannot be selected at the same time (only one at a time).



- **Buttons 2, 3, and 4:** These buttons are connected to LEDs 21, 31 and 41 respectively and each button, if used, can be configured for a single option.



- **Button 5:** This button can be configured in two ways:
 → **as a single option:** in this case, the button is connected to LED 51
 → **as a multi-selection button:** the button is connected to LEDs 61, 62, 63, 64, 65, and can be used to select the spin speed and the delayed-start time. Anyway, one of the LEDs must be configured as END OF CYCLE indicator; therefore this button uses not all the LEDs.

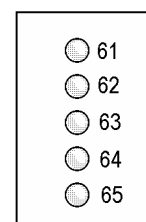


- **Combination of buttons:** The appliance can be configured to utilize a combination of two buttons (which must be pressed simultaneously for 5 seconds) to select the extra-rinse cycle or to switch off the buzzer (if featured). A similar procedure is used to access the diagnostics procedure of the appliance or to select the DEMO mode.

3.2.1 Wash phase LEDs

LEDs 61-65 can be used as wash phase indicators. In this case they do not operate in connection with button 5.

These LEDs can be configured too; the END OF CYCLE indicator is featured on all models.



Indicators	
Pre-wash	Lights during selection mode if the programme includes the pre-wash phase and during the execution of the pre-wash
Wash	Lights during selection mode if the programme includes the wash phase and during the execution of the wash
Pre-wash/Wash	Lights during selection mode if the programme includes the pre-wash or wash phases and during the execution of these phases
Rinses	Lights during selection mode if the programme includes rinse phases, and during the execution of the rinses
Spin	Lights during selection mode if the programme includes the spin phase, and during the execution of the spin
Drain	Lights during selection mode if the programme includes the drain phase, and during the execution of the drain
Extra rinse	Lights when this option has been memorized (if included in the cycle)
Rinse hold	Lights if the rinse hold has been selected and at the end of the cycle, when the appliance stops with water in the tub
Current cycle	Lights during the execution of the cycle
End of cycle	Lights when the programme has been completed; also used to display alarm conditions
ON/OFF	Lights when the appliance is switched on
Door locked	Lights when the door interlock prevents the door opening and switches off when the door can be opened. It blinks when the interlock is about to release the door (may be noticed if PTC devices are used, as these require one or two minutes before unlocking the door)

4 WASHING PROGRAMMES AND OPTIONS

4.1 Programmes

The washing programmes can be configured. The basic programmes are listed in the table below.

Programme		Temperature (°C)	Number of rinses	Final spin (rpm)
Cotton	90	87 / 82	3	450/650/850/1000
	90E	67		
	60	60		
	60E	53 (*)		
	50/40E	44 (*)		
	40	40		
	30	30		
	cold	20		
Synthetics	60	60	3	Max. 900
	60/50E	42		
	50	50		
	40	40		
	30	30		
	cold	20		
Delicates	40	40	3	450/700
	30	30		
	cold	20		
Wool	40	38	3	Max. 1000
	30	33		
	cold	20		
Hand wash	40	38	3	Max. 1000
	30	33		
	cold	20		
Soak		30/20	----	----
Rinses		----	3	Max. 1000
Delicate rinses		----	3	Max. 700
Softener		----	1	Max. 1000
Drain		----	----	----
Spin		----	----	Max. 1000
Delicate spin		----	----	Max. 700
Mini		30	2	Max. 1000

(*)“energy label” programmes

4.2 Options

The table below lists the possible options of the washing programmes, the compatibility of the various options and with the cycle, and when the options can be selected or modified.

The options can be selected in three different ways:

- by using the programme selector: in this case, the options are configured as **special programmes**.
- by using the secondary selector (temperature or spin speed)
- by using the pushbuttons

			OPTIONS												
			Rinse Hold	Night cycle	Pre-wash	Stains	Short (daily)	Very short	Economy	Extra rinse	Bleach	Half load	Easy-iron	Reduced spin speed	No spin
Compatibility with the PROGRAMMES	COTTON	90°C	x	x	x	x	x	x	x	x	x	x	x	x	x
		60°C	x	x	x	x	x	x	x	x	x	x	x	x	x
		50°C	x	x	x	x	x	x	x	x	x	x	x	x	x
		40°C	x	x	x	x	x	x	x	x	x	x	x	x	x
		30°C	x	x	x		x	x		x	x	x	x	x	x
		Cold	x	x	x		x	x		x	x	x	x	x	x
	SINTHETICS	60°C	x	x	x	x	x	x	x	x			x	x	x
		50°C	x	x	x	x	x	x	x	x			x	x	x
		40°C	x	x	x	x	x	x		x			x	x	x
		30°C	x	x	x		x	x		x			x	x	x
		Cold	x	x	x		x	x		x			x	x	x
	MINI Programme	30°C	x	x										x	x
		Cold	x	x										x	x
	Delicates	40°C	x	x	x			x		x				x	x
		30°C	x	x	x			x		x				x	x
		Cold	x	x	x			x		x				x	x
	WOOL / HAND WASH	40°C	x	x										x	x
		30°C	x	x										x	x
		Cold	x	x										x	x
	SOAK														
	RINSES		x	x						x	x		x	x	x
	SOFTENER		x	x									x	x	x
	DRAIN														
	SPIN													x	
Compatibility with the OPTIONS	Rinse hold				x	x	x	x	x	x	x	x	x	x	x
	Night cycle				x	x	x	x	x	x	x	x	x		
	Pre-wash		x	x			x	x	x	x		x	x	x	x
	Stains		x	x			x	x	x	x		x	x	x	x
	Short (daily)		x	x	x	x				x	x	x	x	x	x
	Very short		x	x	x	x				x	x	x	x	x	x
	Economy		x	x	x	x				x	x	x	x	x	x
	Extra rinse		x	x	x	x	x	x	x		x	x	x	x	x
	Bleach		x	x			x	x	x	x		x	x	x	x
	Half load		x	x	x	x	x	x	x	x	x		x	x	x
	Easy-iron		x	x	x	x	x	x	x	x	x	x		x	x
	Reduced spin speed		x		x	x	x	x	x	x	x	x	x		
	No spin		x		x	x	x	x	x	x	x	x	x		
Phase in which selection is possible	Selection		x	x	x	x	x	x	x	x	x	x	x	x	x
	Pre-wash		x	x		x	x	x	x	x	x	x	x	x	x
	Wash		x	x		x	x	x	x	x	x	x	x	x	x
	Rinses		x											x	x
	Spin													x	x

4.3 Description of options

- **Night cycle:**
 - Eliminates all spin phases and adds **three** rinses in COTTON cycles and **one** rinse in SYNTHETICS cycles.
 - Stops the appliance with water in the tub before the final rinse.
 - Switches off the buzzer (if featured and configured).
 - To drain the water, reset the programme and then select a drain or spin cycle.
- **Pre-wash:**
 - Adds a pre-wash phase at the start of the cycle with 30°C water (or cold, if selected).
 - In COTTON and SYNTHETICS cycles, performs a short spin before beginning the washing phase.
 - This option cannot be selected for WOOL and HAND WASH cycles.
- **Stains:**
 - Adds a 5-minute motor movement phase after 40°C water heating phase.
 - Ducts water to the pre-wash/stains compartment in order to introduce the special stain remover.
 - This option cannot be selected for DELICATES, WOOL and HAND WASH cycles.
- **Short (daily):**
 - Modifies the structure of the wash phase in COTTON and SYNTHETICS programmes in order to obtain good washing performance with a very short cycle (optimized for small loads).
- **Very short:**
 - Modifies the structure of COTTON, SYNTHETICS and DELICATES programmes in order to obtain very short washing times (optimized for small or slightly dirty loads).
 - Reduces the number of rinses (one less).
 - Increases the water level in the remaining two rinses.
- **Economy / Energy label:**
 - Modifies the structure of COTTON 40-60 and SYNTHETICS 50/60 programmes in order to reduce energy consumption.
 - Reduces the washing temperature.
 - Increases the duration of the wash phase.
- **Extra rinse:**
 - Adds **two** rinses in COTTON, SYNTHETICS and DELICATES cycles.
 - In COTTON cycles, performs only two intermediate 450 rpm-spin cycles. (CSR)
- **Bleach:**
 - Ducts water through the bleach compartment at the beginning of the first rinse in COTTON cycles.
- **Half load:**
 - Eliminates one rinse in COTTON programmes.
- **Easy-iron:**
 - In COTTON programmes:
 - adds **three** rinses
 - eliminates the intermediate spin cycles
 - performs one impulse spin phase
 - extends to 5 minutes the “untangling” phase after the spin cycle.
 - In SYNTHETICS programmes:
 - reduces the heating temperature in 50/60° cycles to 40°C
 - increases the washing time
 - extends the cooling phase at the end of the washing phase
 - adds **one** rinse
 - extends to 5 minutes the “untangling” phase after the spin cycle.

- **Rinse hold:**

- Stops the appliance with water in the tub before the final spin.
- To drain the water, reset the programme and then select a drain or spin cycle.

- **Reduced spin speed:**

- Reduces the speed of all spins as shown in the table:

Maximum spin speed (rpm)	600	700	800	900	1000
Reduced speed for COTTON (rpm)	450	450	450	450	500
Reduced speed for ALL OTHER CYCLES (rpm)	450	450	450	450	450

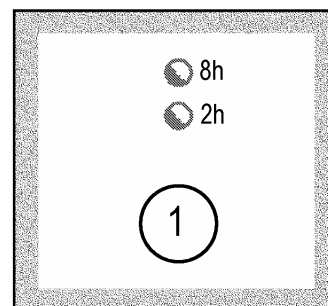
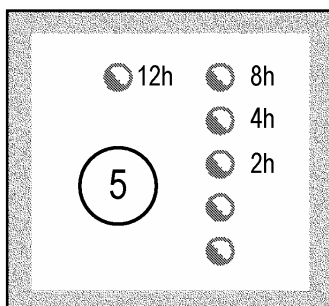
- **No spin:**

- Eliminates all spin phases.
- In COTTON cycles, adds three rinses.
- In SYNTHETICS cycles, adds one rinse.

- **Delayed-start time:**

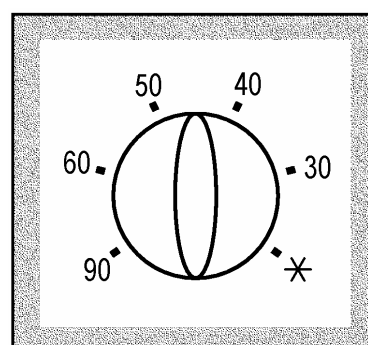
- Adds a pause before the start of the programme. The delay time is shown by the corresponding LEDs.
- To start the cycle immediately, after having selected a delayed start:
 - press START/PAUSE, cancel the delay time by pressing the appropriate button, and then press START/PAUSE again.

Examples of delay time buttons



4.3.1 Temperature adjustment:

- Enables to select the washing temperature according to the limit temperature of the cycle.
- Can be used during the cycle selection phase: the temperature can be modified only if the heating phase has not started (in pause mode).



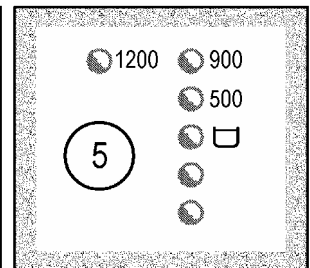
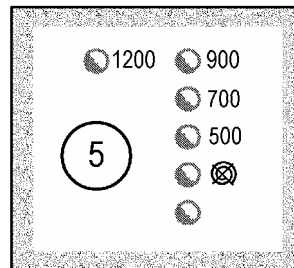
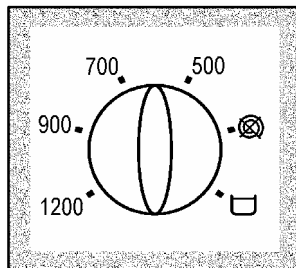
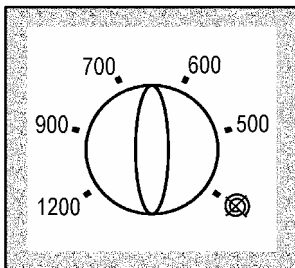
4.3.2 Modification of the spin speed:

- Reduces the speed of all spin cycles as shown in the table.
- The last position can be used for NO SPIN, RINSE HOLD or NIGHT CYCLE.
- If the NO-SPIN option is selected, three rinses are added in the COTTON cycle and one in the SYNTHETICS cycle.

The tables below list some examples of spin speed modification.

6-position selector with NO SPIN and RINSE HOLD (rpm)					
1 - Max. spin speed	600	700	800	900	1000
2	550	600	700	800	900
3	500	500	600	700	700
4	450	450	500	500	500
5	0	0	0	0	0
6 – Last position	Rinse hold	Rinse hold	Rinse hold	Rinse hold	Rinse hold

6-position selector with NO SPIN (rpm)					
1 - Max. spin speed	600	700	800	900	1000
2	550	600	700	800	900
3	500	500	600	700	700
4	450	450	500	600	600
5	400	400	400	500	500
6 – Last position	0	0	0	0	0



Button with 5 LEDs					
1 - Max. spin speed	600	700	800	900	1000
2	550	600	700	800	900
3	500	500	600	700	700
4	450	450	500	500	500
5 – Last value	No spin or rinse hold	No spin or rinse hold	No spin or rinse hold	No spin or rinse hold	No spin or rinse hold

Button with 4 LEDs					
1 - Max. spin speed	600	700	800	900	1000
2	500	600	700	700	700
3	400	500	500	500	500
4 – Last value	No spin or rinse hold	No spin or rinse hold	No spin or rinse hold	No spin or rinse hold	No spin or rinse hold

4.3.3 Buzzer

The buzzer (if featured) is incorporated in the PCB, but operates only if the appropriate configuration code is entered.

- **Switching off the buzzer**

The buzzer can be switched off by pressing a combination of two buttons simultaneously for 5 seconds. This option depends on the configuration; as a result, the buttons may vary according to the model.

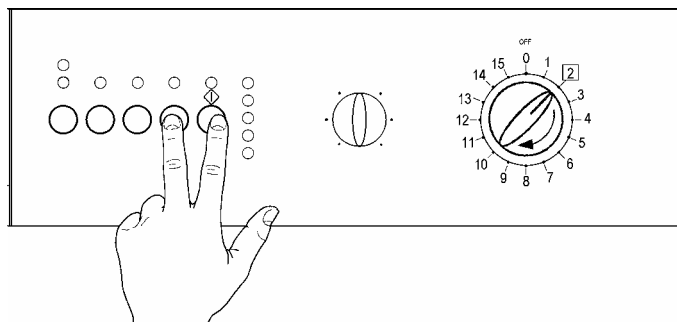
If the buzzer is switched off, the appliance will emit no acoustic signal during selection or at the end of the cycle; however, the alarm signalling system remains operative.

4.4 Modification of rinses according to the options selected

			Standard rinses	Number of rinses according to the options								
				Half load	Extra rinse	Night cycle	Easy-iron	No spin	Extra rinse + Half load	Extra rinse + Night cycle / Easy-iron / No spin	Half load + Night cycle / Easy-iron / No spin	Extra rinse + Half load + Night cycle / Easy-iron / No spin
PROGRAMMES	COTTON	Normal / Short	3	2	5	6	6	6	4	8	5	7
		Eco – Energy label	3	2	5	6	6	6	4	8	5	7
		Very short	2	2	4	5	5	5	3	7	4	6
	SYNTHETICS	Normal / Short	3	-	5	4	4	4	-	6	-	-
		Eco – Energy label	3	-	5	4	4	4	-	6	-	-
		Very short	2	-	4	3	3	3	-	5	-	-
	DELICATES	Normal	3	-	5	3	-	3	-	5	-	-
		Very short	2	-	4	2	-	2	-	4	-	-

4.5 Selecting DEMO mode

1. Switch off the appliance.
2. Press **START/PAUSE** and **one of the option buttons** simultaneously.
3. Holding down both buttons, switch the appliance on by turning the programme selector **two positions clockwise**.
4. Hold down START/PAUSE and the option buttons until the LEDs begin to blink (at least 2 seconds).



Important: The START/PAUSE button can be configured according to the styling of the model, and is therefore not always in the position shown in the picture!

4.5.1 Exiting DEMO mode

To exit DEMO mode, switch the appliance off (i.e. turn the programme selector to OFF/CANCEL).

5 WASHING PROGRAMMES

5.1 Normal (consumer) Cotton / Linen Cycles: cold - 30-40-50-60-90° (without options)

Phase	N.	Function	Time / control	Movement	Heat. °C	Notes
Delay	-	Delayed start	Delay time	No Mov		
Drain	0	Drain	VAE + 2" + 6" pause	No Mov		
Pre-wash	1	Water fill	P1 + QPW1 (*)	D55 from full		
	2	Cold wash	5'			Refill: P1
	3	Water fill	QPW2 (*)			
	4	Heating	T	D55	30	Cold = 20°C
	5	Movement	10'			
	6	Drain	VAE + 14"	No Mov		
	7	Drain + spin	4,5'	C0		300/450/650 rpm
	8	Drain	20"	No Mov		
Wash	9	Cotton water fill	P1 + Qh1 (*)	N55 from full		
	10	Cold wash	10'			Refill: P1+Qw
	11	Heating	T		40	Only with "stains" option
	12	Movement	5'	N55		
	13	"Stains" water fill	Qs (*)			
	14	Cotton heating	T	N55	20/30/40/60/87	82°C without steam outlet
	15	Maintenance	5'(20-30-40°) / 10'(60°) / 4'(87°)	N55	20/30/40/60/---	
	16	Cotton heating	T	E55	30/40/60/87	82°C without steam outlet
	17	Movement	14'(87°)/35'(20-40°) / 20'(60°)	E55		
	18	Cooling water fill	Qc (*)			Only if >67°C
	19	Movement	2'	D55		
	20	Drain	VAE + 14"	No Mov		
	21	Drain + spin	5'	C1		450/650/850 rpm
	22	Drain	20"	No Mov		
Rinses	23	Cotton water fill	P1	N 55 from full		
	24	Movement	5'			Refill: P1+Qn1
	25	Drain	VAE + 15"	No Mov		
	26	Drain + spin	5'	C2		450/650/850/1000 rpm
	27	Drain	20"	No Mov		
	28	Cotton water fill	P1+ Qn2 (*)	N 55 from full		
	29	Movement	5'			Refill: P1+Qne
	30	Drain	VAE + 15"	No Mov		
	31	Drain + spin	5'	C2		
	32	Drain	20"	No Mov		450/650/850/1000 rpm
	33	Cotton water fill	P1	N 55 from full		
	34	Movement	30"			
	35	Time water fill	Qn3			
Last rinse (softener)	36	Movement	8'			Refill: P1
	37	Drain	VAE + 14"	No Mov		
	38	Drain + spin	9'	COT_CF		450/650/850/1000 rpm
	39	Untangling	1'	N55		

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Notes:

P1 time needed to 1st level water fill

(*) time water fills are changeable and calculated by the electronic on the basis of the delivery rate (see specific table)

T time needed to heat the water at the set temperature

" seconds

' minutes

VAE time needed to drain the water till "empty" position of anti- boiling (safety heater) pressure switch

Movement: this column describes the drum movements at low speed and during spin (see paragraph "drum movements"). The length of drain phases with spin cycle is approximate and does not take into consideration the antiunbalance and antifoam safety systems.

5.2 Cotton / Linen Cycles: 90 Eco, 60 - 40/50 “energy label” (without options)

Phase		N.	Function	Time / control	Movement	Heat. °C	Notes
Delay		-	Delayed start	Delay time	No Mov		
Drain		0	Drain	VAE + 2" + 6" pause	No Mov		
Pre-wash		1	Water fill	P1 + QPW1 (*)	D55 from full		
		2	Cold wash	5'			Refill: P1
		3	Water fill	QPW2 (*)			
		4	Heating	T	D55	30	Cold = 20°C
		5	Movement	10'			
		6	Drain	VAE + 14"	No Mov		
		7	Drain + spin	4,5'	C0		300/450/650 rpm
		8	Drain	20"	No Mov		
Wash		9	Cotton water fill	P1 + Qe (*)	N55 from full		
		10	Cold wash	10'			Refill: P1+Qwe
		11	Heating	T	N55	67/53/44	
		12	Maintenance	10'(67°) / 5'(53°) / 40'(44°)	E55	67-64/---- /44-40	
		12a	Movement 40/50	15'	N55		Only with 44°C
		13	Cotton heating	T	E55	67/53/44	
		14	Movement	30'(67°) / 35'(53°)/20'(44°)	E55		N55 with 67°C
		15	Drain	VAE + 14"	No Mov		
		16	Drain + spin	5'	C1		450/650/850 rpm
		17	Drain	20"	No Mov		
Rinses	1st rinse	18	Cotton water fill	P1	N 55 from full		
		19	Movement	5'			Refill: P1+Qne
		20	Drain	VAE + 15"	No Mov		
		21	Drain + spin	5'	C2		450/650/850/1000 rpm
		22	Drain	20"	No Mov		
	2nd rinses	23	Cotton water fill	P1 if C1≥850 rpm P1+Qn2 (*) if C1<850 rpm)	N 55 from full		
		24	Movement	5'			Refill: P1+Qne
		25	Drain	VAE + 15"	No Mov		
		26	Drain + spin	5'	C2		450/650/850/1000 rpm
		27	Drain	20"	No Mov		
	Last rinse (softener)	28	Cotton water fill	P1	N 55 from full		
		29	Movement	30"			
		30	Time water fill	Qn3			
		31	Movement	8'			Refill: P1
		32	Drain	VAE + 14"	No Mov		
		33	Drain + spin	9'	COT_CF		450/650/850/1000 rpm
		34	Untangling	1'	N55		

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Notes:

- P1** time needed to 1st level water fill
- (*)** time water fills are changeable and calculated by the electronic on the basis of the delivery rate (see specific table)
- T** time needed to heat the water at the set temperature
- "** seconds
- '** minutes
- VAE** time needed to drain the water till “empty” position of anti-boiling (safety heater) pressure switch
- Movement:** this column describes the drum movements at low speed and during spin (see paragraph “drum movements”). The length of drain phases with spin cycle is approximate and does not take into consideration the antiunbalance and antifoam safety systems.

5.3 Normal (consumer) Synthetics Cycles: cold - 30 - 40 - 50 - 60° (without options)

Phase	N.	Function	Time / control	Movement	Heat. °C	Notes
Delay	-	Delayed start	Delay time	No Mov		
Drain	0	Drain	VAE + 2" + 6" pause	No Mov		
Pre-wash	1	Water fill	P1 + QPW1 (*)	D 55 from full		
	2	Cold wash	5'			Refill: P1
	3	Water fill	QPW2 (*)	D 55	30	Cold = 20°C
	4	Heating	T			
	5	Movement	5'			
	6	Drain	VAE + 15"	No Mov		
	7	Drain + spin	4,5'	C0		300/450/650 rpm
	8	Drain	20"	No Mov		
Wash	9	Synthetics water fill	P1 + Qsy (*)	N 55 from full		
	10	Cold wash	10'			Refill: P1+Qy1
	11	Heating	T	N 55	40	Only with "Stains" option
	12	Movement	5'			
	13	"Stains" water fill	Qs (*)			
	14	Heating	T	N55 with T > 40° E55 with T ≤ 40°	20/30/40/ 50/60	Economy = 42°C
	15	Movement	10'			
	16	Heating	T	E55	20/30/40/ 50/60	Economy = 42°C
	17	Movement	15'			Economy = 25'
	18	Cooling water fill	Qc (*)	N55		
	19	Movement	1'			
	20	Drain	VAE	No Mov		
	21	Drain	1'	D55		
Rinses	22	Water fill	P1+ Qyr1 (*)	E55 from full		
	23	Movement	3'			Refill: P1
	24	Drain	VAE	No Mov		
	25	Drain	1'	D55		
	26	Water fill	P1+ Qyr2 (*)	E 55 from full		
	27	Movement	3'			Refill: P1
	28	Drain	VAE	No Mov		
	29	Drain	1'	D55		
	30	Drain + spin	4'	C0		300/450/650 rpm
	31	Water fill	P1	E55 from full		
	32	Movement	30"			
	33	Time water fill	Qyr3			
	34	Movement	5'			Refill: P1
	35	Drain	VAE + 14"	No Mov		
	36	Drain + spin	4,5'	SYN_CF		(max. 900 rpm)
	37	Untangling	1'	N55		Not for Economy

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Notes:

P1 time needed to 1st level water fill

(*) time water fills are changeable and calculated by the electronic on the basis of the delivery rate (see specific table)

T time needed to heat the water at the set temperature

" seconds

' minutes

VAE time needed to drain the water till "empty" position of anti- boiling (safety heater) pressure switch

Movement: this column describes the drum movements at low speed and during spin (see paragraph "drum movements"). The length of drain phases with spin cycle is approximate and does not take into consideration the antiunbalance and antifoam safety systems.

5.4 Delicates Cycles: cold – 30° - 40° (without options)

Phase		N.	Function	Time / control	Movement	Heat. °C	Notes
Delay		-	Delayed start	Delay time	No Mov		
Drain		0	Drain	VAE + 2" + 6" pause	No Mov		
Pre-wash		1	Water fill	P1 + QPW1 (*)	D55 from full		
		2	Cold wash	5'			Refill: P1
		3	Water fill	QPW2 (*)	D55	30	Cold = 20°C
		4	Heating	T			
		5	Movement	3'			
		6	Drain	VAE + 15"	No Mov		
Wash		7	Delicates water fill	P1 + Qdw1 (*)	D55 from full		
		8	Cold wash	1'	D55		Refill: P1+Qdw2
		9	Heating	T	D55	20/30/40	
		10	Maintenance	10'		20-10/ 30-27/ 40-37	
		11	Heating	T		20/30/40	
		12	Movement	10'			
		13	Drain	VAE	No Mov		
		14	Drain	1'	D55		
Rinses	1st rinse	15	Water fill	P1+ Qrd1 (*)	D55 from full		
		16	Movement	5'	D55		Refill: P1
		17	Drain	VAE	No Mov		
		18	Drain	1'	D55		
	2nd rinse	19	Water fill	P1+ Qrd1 (*)	D55from full		
		20	Movement	5'	D55		Refill: P1
		21	Drain	VAE	No Mov		
		22	Drain	1'	D55		
	Last rinse (softener)	23	Water fill	P1	D55 from full		
		24	Movement	30"			
		25	Time water fill	Qrd2 (*)			
		26	Movement	3'			Refill: P1
		27	Drain	VAE	No Mov		
		28	Drain + spin	3,8'	DEL_CF		(450/700 rpm)
		29	Untangling	1'	N55		

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Notes:

- P1** time needed to 1st level water fill
- (*)** time water fills are changeable and calculated by the electronic on the basis of the delivery rate (see specific table)
- T** time needed to heat the water at the set temperature
- "** seconds
- '** minutes
- VAE** time needed to drain the water till "empty" position of anti- boiling (safety heater) pressure switch
- Movement:** this column describes the drum movements at low speed and during spin (see paragraph "drum movements"). The length of drain phases with spin cycle is approximate and does not take into consideration the antiunbalance and antifoam safety systems.

5.5 Wool Cycles: cold - 30° - 40°

Phase	N.	Function	Time / control	Movement	Heat. °C	Notes
Delay	-	Delayed start	Delay time	No Mov		
Drain	0	Drain	VAE + 2" + 6" pause	No Mov		
Wash	1	Wool water fill	P1 + Qwo (*)	Pwl_1	20/33/38 30-33 / 35-38	Refill: P1+Qwo1
	2	Cold wash	1'			
	3	Heating	T			
	4	Maintenance	14'			
	5	Drain	VAE+14"	No Mov		
Rinses	6	Water fill	P1	No Mov		
	7	Time water fill	Qwor1 (*)	Pwl_1		Refill: P1
	8	Movement	3'			
	9	Drain	VAE+14"			
	10	Water fill	P1	No Mov		
	11	Time water fill	Qwor1 (*)	Pwl_1		Refill: P1
	12	Movement	3'			
	13	Drain	VAE+14"			
	14	Water fill	P1	No Mov		
	15	Movement	30"	Pwl_1		Refill: P1
	16	Time water fill	Qwor2 (*)			
	17	Movement	5'			
	18	Drain	VAE+14"			
	19	Drain + spin	3,5'	WOOL_CF		(max. 1000 rpm)

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5.6 Hand wash Cycles: cold - 30° - 40°

Phase	N.	Function	Time / control	Movement	Heat. °C	Notes
Delay	-	Delayed start	Delay time	No Mov		
Drain	0	Drain	VAE + 2" + 6" pause	No Mov		
Wash	1	Wool water fill	P1 + Qwh (*)	Pwl_4	20/33/38 30-33 / 35-38	Refill: P1+Qwh1
	2	Cold wash	1'			
	3	Heating	T			
	4	Maintenance	14'			
	5	Drain	VAE+14"	No Mov		
Rinses	6	Water fill	P1	No Mov		
	7	Time water fill	Qwor1 (*)	Pwl_4		Refill: P1
	8	Movement	3'			
	9	Drain	VAE+14"			
	10	Water fill	P1	No Mov		
	11	Time water fill	Qwor1 (*)	Pwl_4		Refill: P1
	12	Movement	3'			
	13	Drain	VAE+14"			
	14	Water fill	P1	No Mov		
	15	Movement	30"	Pwl_4		Refill: P1
	16	Time water fill	Qwor2 (*)			
	17	Movement	5'			
	18	Drain	VAE+14"			
	19	Drain + spin	3,5'	WOOL_CF		(max. 1000 rpm)

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Notes:

P1 time needed to 1st level water fill

(*) time water fills are changeable and calculated by the electronic on the basis of the delivery rate (see specific table)

T time needed to heat the water at the set temperature
" seconds

' minutes

VAE time needed to drain the water till "empty" position of anti- boiling (safety heater) pressure switch

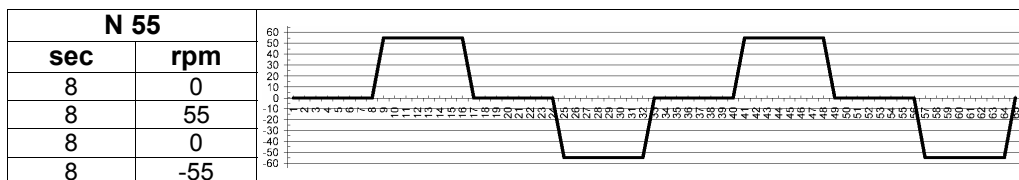
Movement: this column describes the drum movements at low speed and during spin (see paragraph "drum movements"). The length of drain phases with spin cycle is approximate and does not take into consideration the antiunbalance and antifoam safety systems.

5.7 Drum movements at low speed and during spin

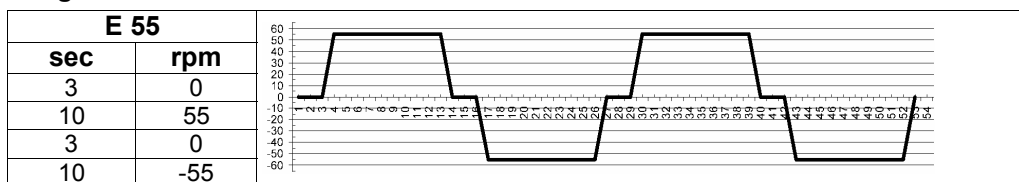
5.7.1 D55 Delicate movement



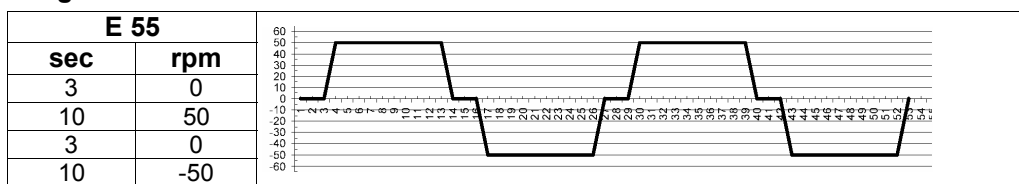
5.7.2 N55 Normal movement



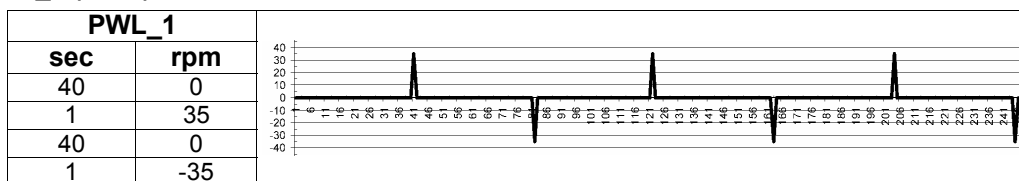
5.7.3 E55 Vigorous movement



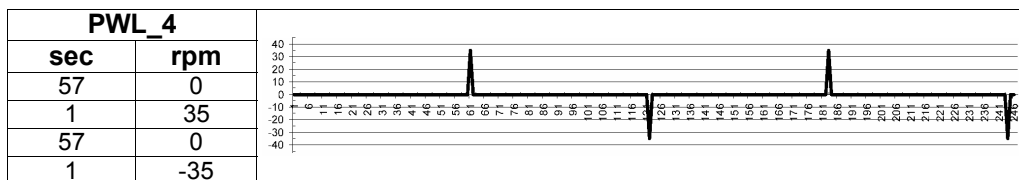
5.7.4 E50 Vigorous movement



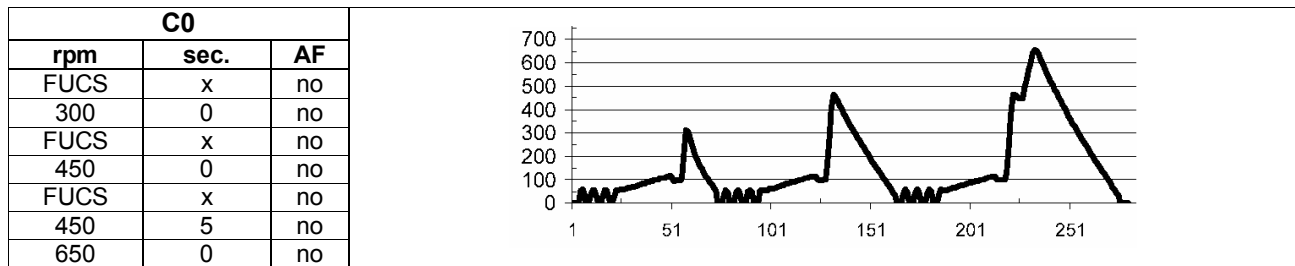
5.7.5 PWL_1 (wool) Delicate movement



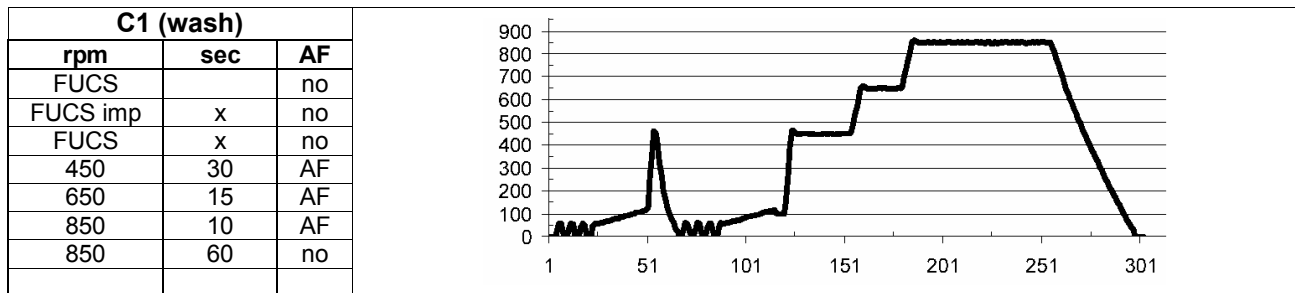
5.7.6 PWL_4 (hand wash) Delicate movement



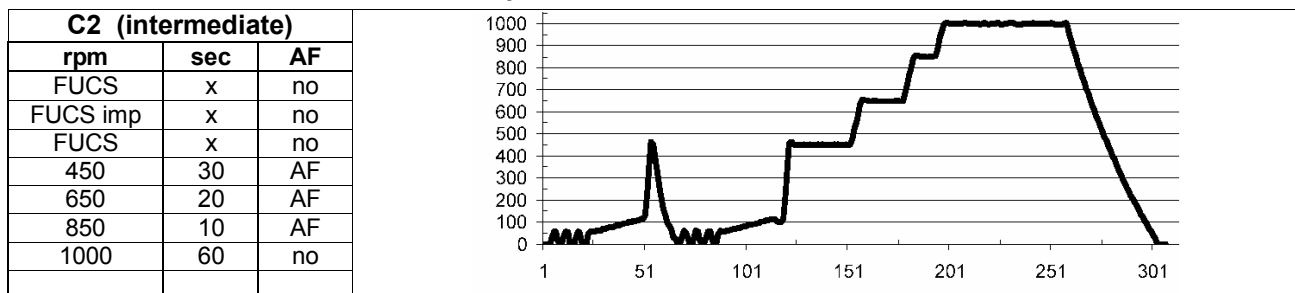
5.7.7 C0 Cotton/Linen, Synthetics – Intermediate Synthetics Pre-wash Spin



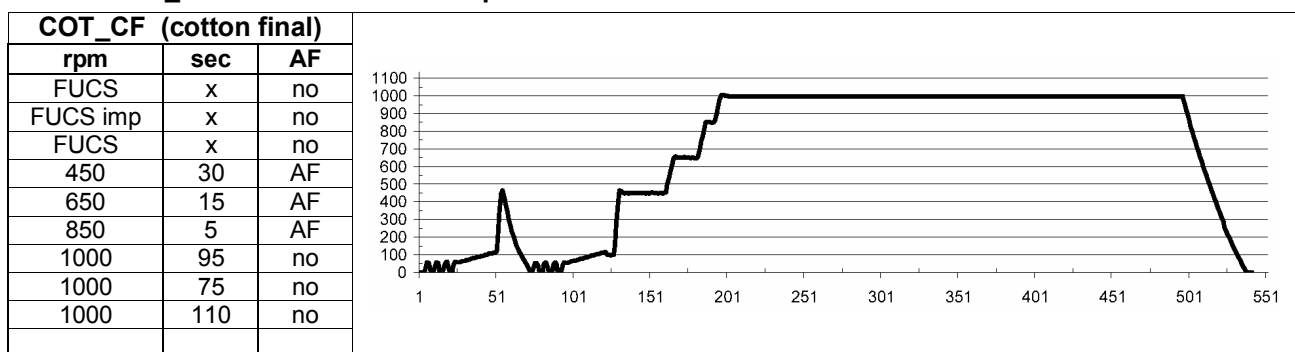
5.7.8 C1 Cotton/Linen Wash Spin



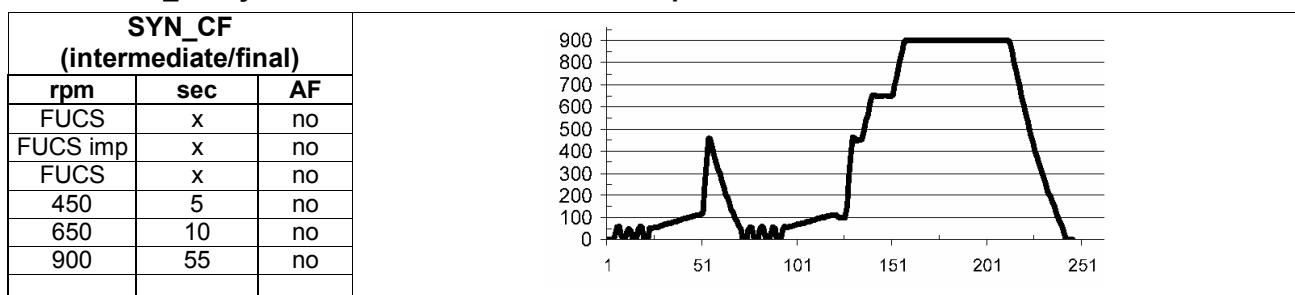
5.7.9 C2 Cotton/Linen Intermediate Spin



5.7.10 COT_CF Cotton/Linen Final Spin

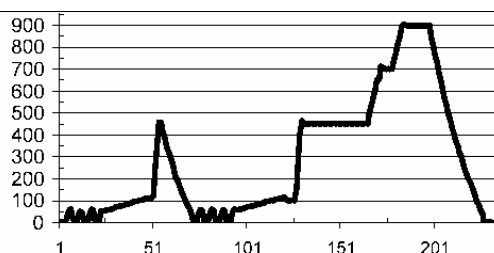


5.7.11 SYN_CF Synthetics Intermediate and Final Spin



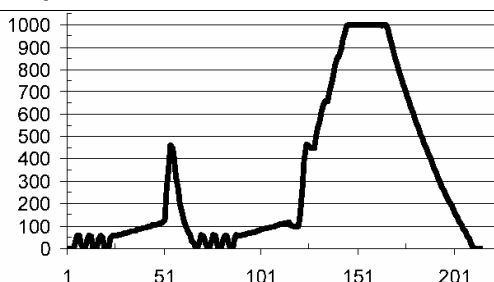
5.7.12 DEL_CF Delicates Final Spin

CF (delicates final)		
rpm	sec	AF
FUCS	x	no
FUCS imp	x	no
FUCS	x	no
450	35	AF
700	5	AF
900	20	AF



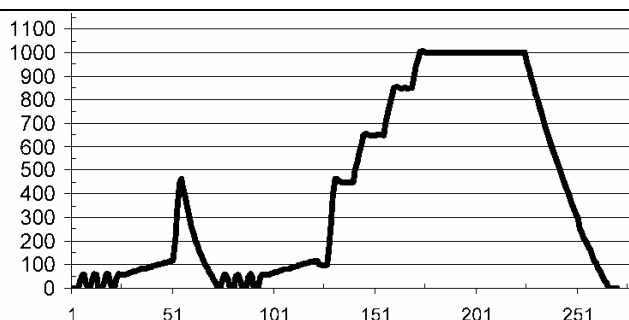
5.7.13 WOOL_CF Hand Wash and Wool Final Spin

CF (wool final)		
rpm	sec	AF
FUCS	x	no
FUCS imp	x	no
FUCS	x	no
450	5	AF
650	1	AF
850	1	AF
1000	20	no



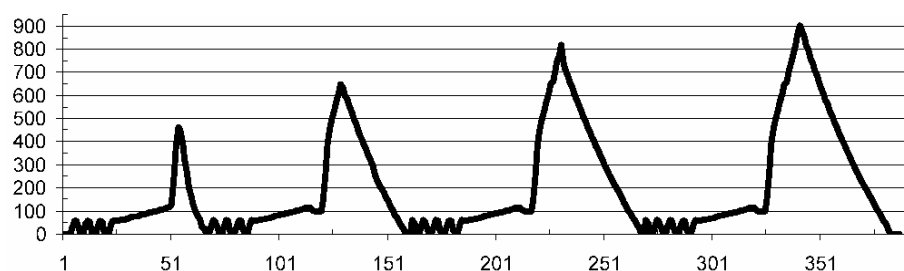
5.7.14 "Spin" Cycle

Spin Cycle		
rpm	sec	AF
FUCS	x	no
FUCS imp	x	no
FUCS	x	no
450	10	AF
650	10	AF
850	10	AF
1000	10	no
1000	10	no
1000	20	no



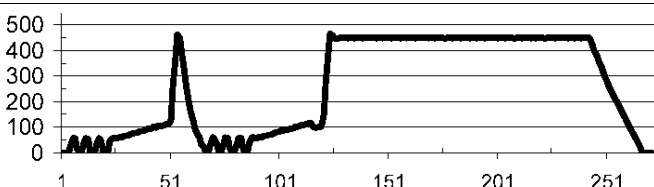
5.7.15 Easy iron Impulse Spin Cycle

EASY_IRON_IMP		
rpm	sec	AF
FUCS	x	no
450	0	no
FUCS	x	no
650	0	AF
FUCS	x	no
800	0	AF
FUCS	x	no
900	0	AF



5.7.16 CSR Intermediate Spin for Cotton/Linen with Extra-rinse option

CSR		
rpm	sec	AF
FUCS	x	no
FUCS imp	x	no
FUCS	x	no
450	120	AF



Notes:

- AF** indicates if antifoam function is active
- FUCS** antiunbalance function before spin phase
- x** variable duration

- In the diagrams the speed is indicated as rotations per minute and the time in seconds

5.8 Control of water level in the tub

The water fill is carried out in two phases:

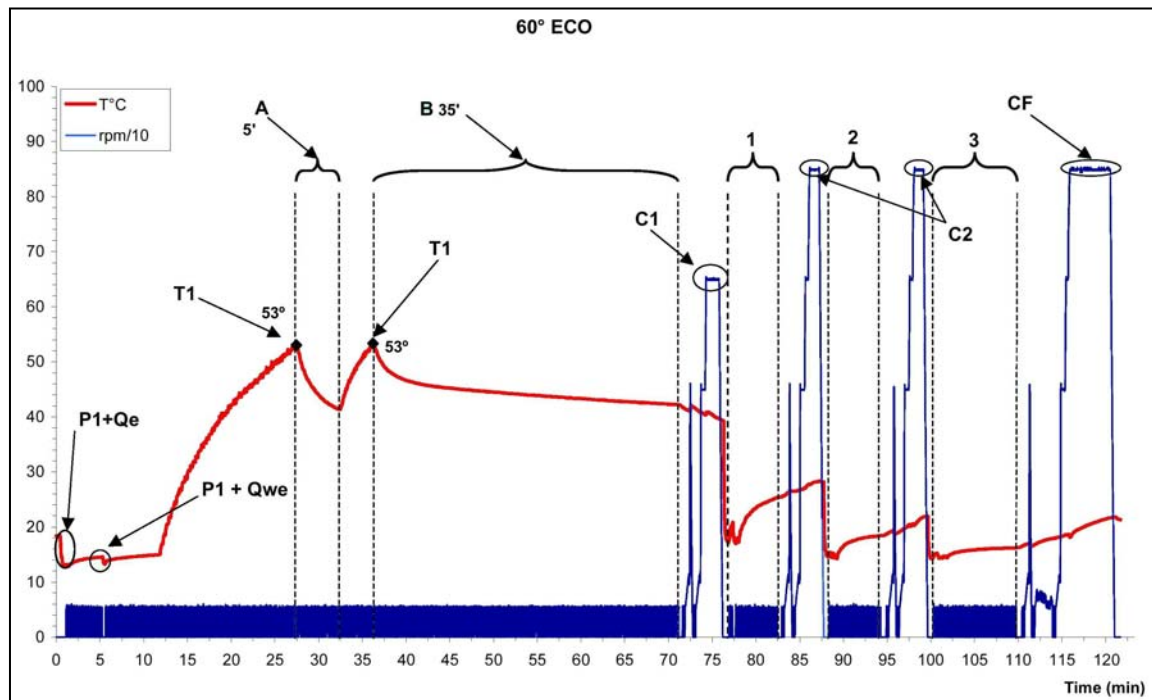
- **level fill:** is controlled by the closure of 1st level pressure switch in full position
- **time fill:** the duration is calculated by the electronic to fill the set quantity.

The different levels are determined by the model configuration and depend on the type of tub used.

PRESSURE SWITCH LEVELS		
Type	Calibration in mm (full-refill)	Quantity of filled water (litres) - Empty filter and without clothes -
AB Anti-boiling (safety heater)	55 - 35	≅ 3,5
P1 (1st level)	75 - 55	≅ 5,6

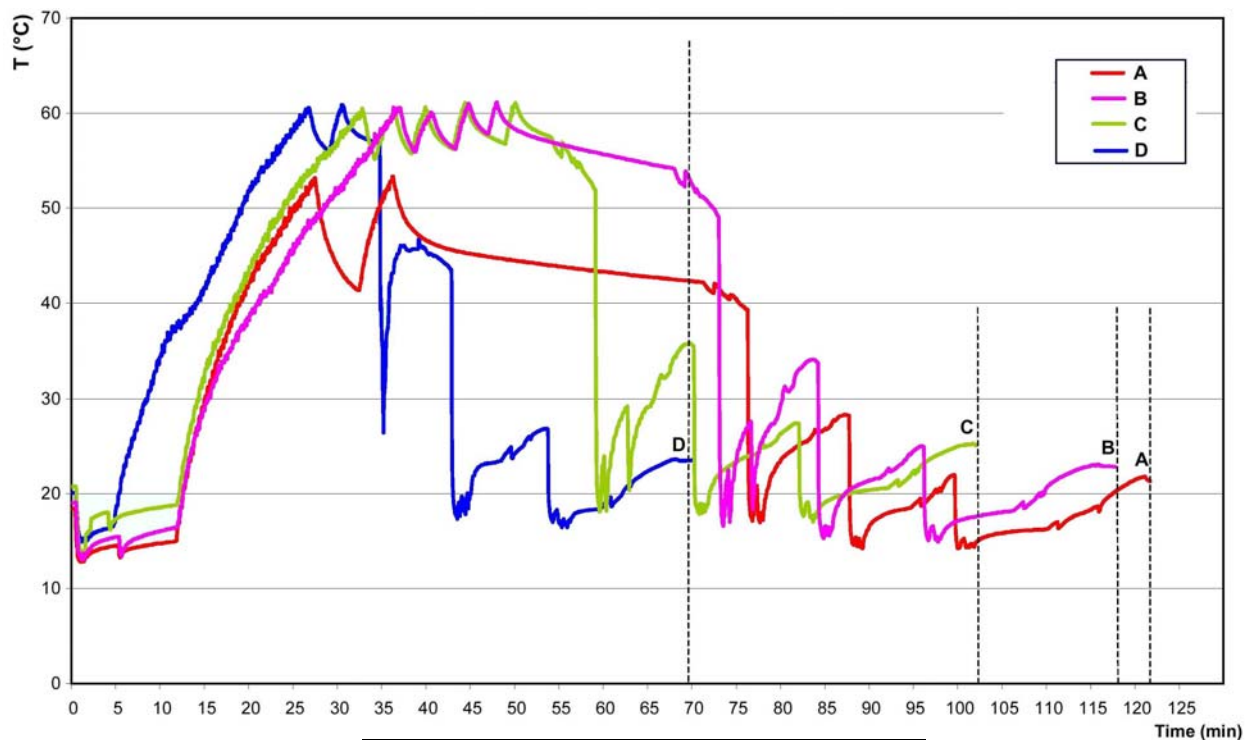
Type	Description of time fill	Litres
Levels for COTTON/LINEN		
Qpw1	First pre-wash water fill <i>(all cycles)</i>	6,0
Qpw2	Pre-wash water fill after cold wash <i>(all cycles)</i>	3,5
Qhl	Normal water fill/half load	2,5
Qhl2	Half load water fill for "VERY SHORT" cycle	4,0
Qe	Water fill for "energy label" cycle	3,0
Qwe	Refill for "energy label" cycle if pre-wash has not been selected	0
Qw	Wash refill if the cycle is not "energy label"	1,0
Qc	Cooling water fill	3,5
Qs	"Stains" compartment water fill	1,0
Qk	Water fill for "short cycle" rinses	12,0
Qn1	Normal water fill for 1st rinse	4,5
Qn2	Normal water fill for other rinses	6,5
Qn3	Normal water fill for last rinse	9,5
Qne	Normal water fill for rinse of "energy label" cycle	4,5
Qsr1	Water fill for extra rinse and night cycle if no spin has been previously performed	8,0
Qsr2	Water fill for extra rinse and night cycle if spin has been previously performed	6,0
Levels for SYNTHETICS		
Qsy	Wash water fill	0,5
Qsy1	Wash water fill for VERY SHORT cycle	4,0
Qy1	Wash water fill if pre-wash has not been selected	4,5
Qyr1	Normal water fill for 1st rinse	6,0
Qyr2	Normal water fill for other rinses	6,0
Qyr3	Normal water fill for last rinse	7,5
Levels for DELICATES		
Qdw1	Wash water fill	7,0
Qdw2	Wash refill	0
Qrd1	Normal water fill for 1st rinse and other rinses	7,0
Qrd2	Normal water fill for last rinse	9,0
Levels for WOOL		
Qwo	Wash water fill	8,0
Qwo1	Wash refill	0
Qwor1	Normal water fill for 1 st rinse and other rinses	8,0
Qwor2	Normal water fill for last rinse	8,0
Levels for HAND WASH		
Qwh	Wash water fill	8,0
Qwh1	Wash refill	0

5.9 Profile of COTTON 60 Economy / Energy label cycle



P1+Qe	1st water fill	1	1st rinse
P1+ Qwe	Refill water	2	2nd rinse
A	Movement for 5 minutes	3	3rd rinse
B	Movement for 35 minutes	C1	C1 wash spin
T1	Heating up to 53°C	C2	C2 intermediate spin
		CF	CF final spin

5.10 Profiles of COTTON 60° cycles



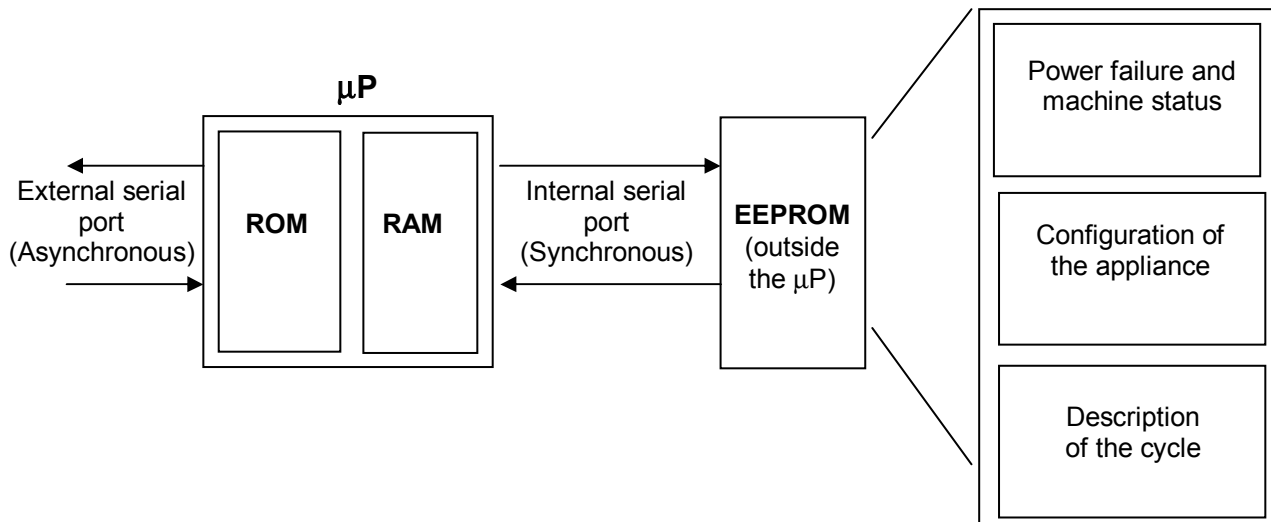
Cycle	
A	Economy or "energy label"
B	Normal (consumer)
C	Short (Daily)
D	Very short

6 TECHNICAL CHARACTERISTICS

6.1 Control system memory

6.1.1 General structure of the memory system

The system features an EEPROM memory module, fitted externally to the microprocessor, which serves to memorize the configuration data, the description of the cycle, the status of the appliance in the event of a power failure, and the alarms.



6.1.2 ROM

The ROM (Read-Only Memory) contains the firmware code relative to the functions of the appliance:

- ⇒ Control of electrical loads (motor, pump, solenoid valves etc.).
- ⇒ Control of the sensors (pressure switches, motor speed, door status etc.).
- ⇒ Control of the user interface
- ⇒ Control of the serial port
- ⇒ Control of power failure procedure and alarms
- ⇒ Execution of the washing programme

In normal production appliances, the ROM cannot be modified.

6.1.3 RAM

The RAM (Random-Access Memory) contains the variables, i.e. all the dynamic information used during execution of the programme:

- ⇒ Motor speed
- ⇒ Water temperature
- ⇒ Alarms
- ⇒ Cycle selected
- ⇒ Machine status

The RAM is cancelled when the power supply is disconnected (power failure or appliance switched off).

The contents of the RAM can be read by using a computer connected via a DAAS interface.

The same system can be used to send commands to the electronic control unit such as:

- ⇒ Select remote control mode
- ⇒ Control the various loads in remote mode
- ⇒ Select diagnostics mode
- ⇒ Select a cycle and the options, and start the cycle

6.1.4 EEPROM

The EEPROM contains data of various types:

- ⇒ Power failure, i.e. the information necessary to restart the appliance in the event of a power failure:
 - Selected cycle and options
 - Current phase and sub-phase
- ⇒ Machine status, used to perform special cycles such as:
 - Electrical test (used in the assembly line)
 - Continuous cycles (used in the factory workshops)
- ⇒ Machine configuration: the data contained in the EEPROM define the characteristics of the model and are interpreted by the function software. The variables are the following:
 - Type of appliance (front-loader, top-loader, compact)
 - Type of door interlock (PTC or instantaneous)
 - Anti-flooding safety device
 - Transmission ratio between drum pulley and motor pulley
 - Structure of the washing group
 - Power supply frequency (50/60 Hz)
 - Type of PCB (horizontal or vertical buttons)
 - Detergent drawer (3 or 4 compartments)
 - Final spin speed (600 – 1400 rpm)
- ⇒ Identification of the appliance:
 - Prod. N.
 - ELC
 - Serial number
- ⇒ Configuration of the user interface:
 - Programmes of main selector
 - Function of secondary selector (if featured)
 - Number and functions of buttons
 - Functions of the LEDs
 - Operation of the buzzer
- ⇒ Washing cycle tables: Each washing cycle consists of a series of phases (steps); the steps are the basic instructions comprising the description of the cycle, which is common to all appliances having the same characteristics:
 - Water fill
 - Motor movement
 - Refill
 - Heating
 - Drain
 - Spin
 - "IF" conditions.... (options, temperatures, etc.)
 - ...
- ⇒ Configuration of the washing cycle: for each family of appliances, certain parameters associated with the washing programme are defined:
 - Operational limits (voltage/frequency)
 - Transmission ratios
 - Parameters for control of the signal from the tachometric generator
 - Parameters for half-range operation of the motor
 - Structure of the washing group
 - Control parameters for the FUCS anti-unbalancing system
 - Water fill control algorithm
 - Alarm control system

6.2 Door interlock

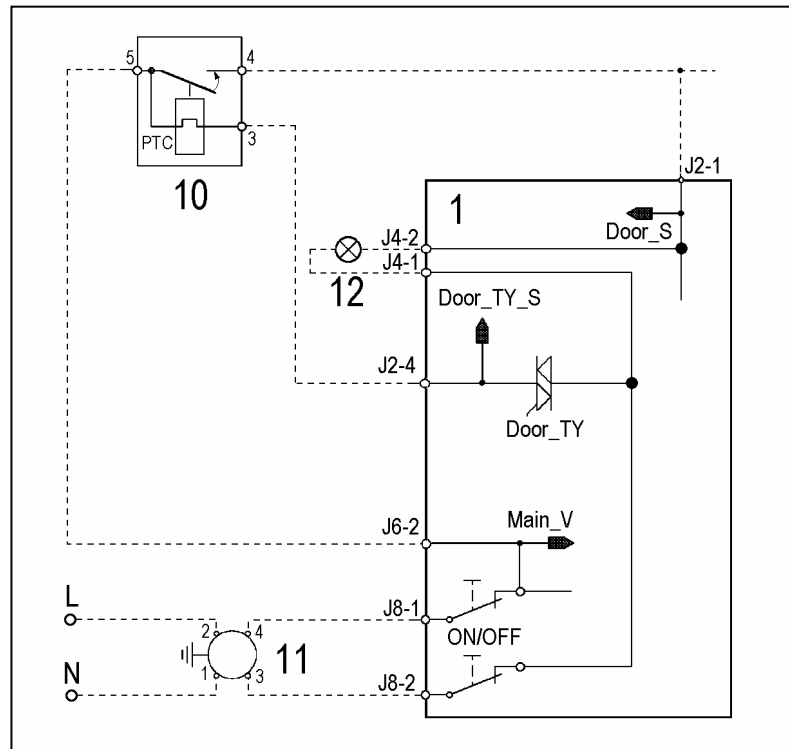
There are two types of door interlock:

- voltmetric with PTC: it is always necessary to wait from 1 to 2 minutes from the end of the cycle before opening the door.
- instantaneous: the door can be opened as soon as the cycle ends.

6.3 Voltmetric interlock with PTC

- 1 PCB
- 10 Door interlock
- 11 Suppressor
- 12 ("Door locked" pilot lamp)

ON/OFF = Main switch
(Programme selector)



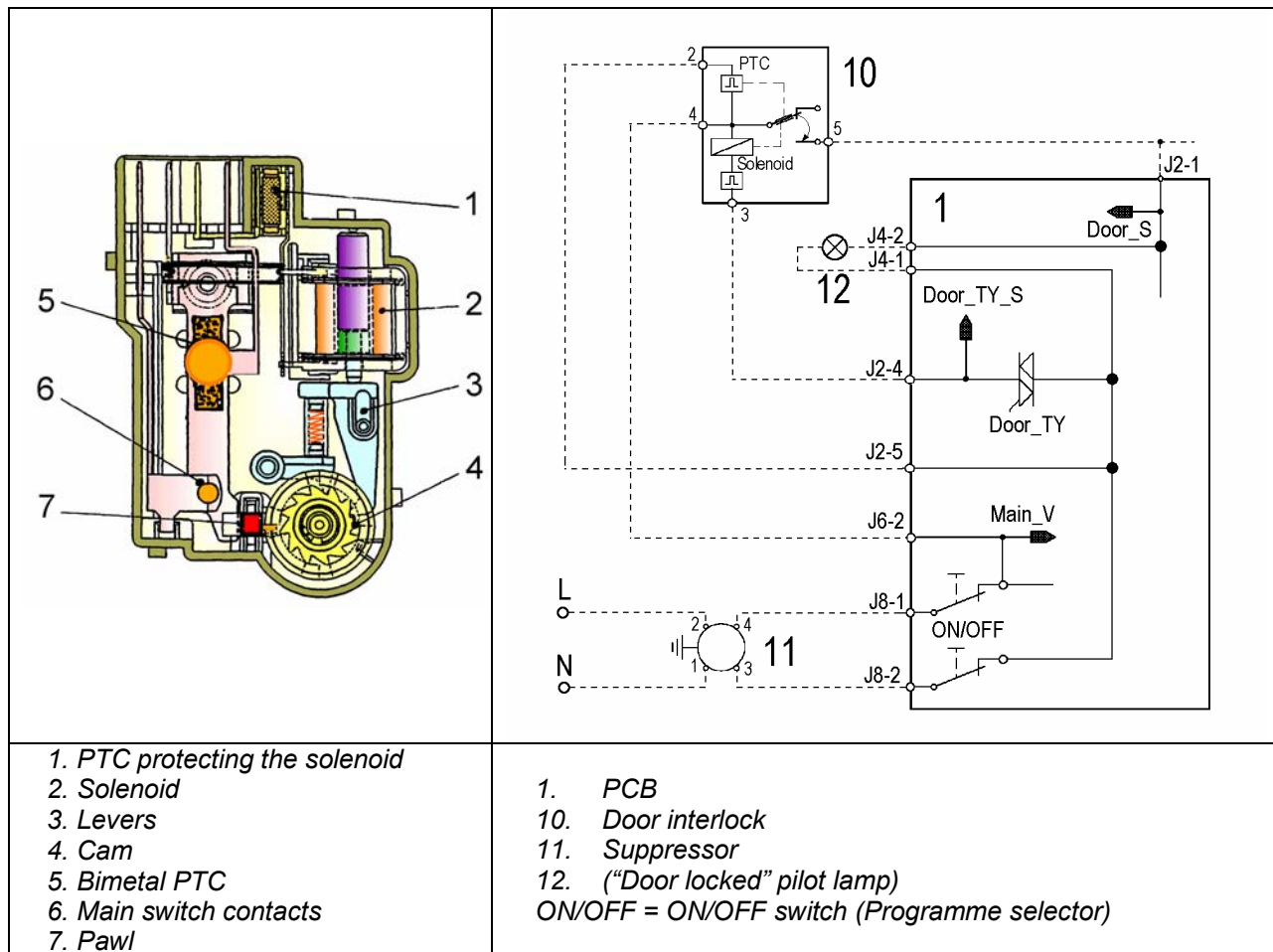
6.3.1 Operating principle

- When the washing programme is started by pressing the START/PAUSE button, the bimetal PTC (contacts 3-5) is powered by the triac on the PCB: after 2 – 4 seconds, this closes the switch (5-4) which powers the electrical components of the appliance (only if the door is closed).
- The door interlock prevents the door opening while the appliance is in operation.
- At the end of the washing programme, the PCB disconnects the device from the power supply, but the door remains locked for 1 to 2 minutes (PTC cooling time).

6.3.2 "Door locked" pilot lamp

Certain models might feature a pilot lamp that lights to indicate that the door is locked. This pilot lamp switches off when the door can be opened.

6.4 Instantaneous door interlock



6.4.1 Operating principle

- When the appliance is switched on, the ON/OFF switch closes and the bimetal PTC (contacts 4-2) is powered, but the cam takes a position that prevents the coming out of the pawl.
- When the programme starts (START), the PCB transmits a 20-msec voltage signal to contacts 4-3 of the solenoid (at least 6 seconds must elapse after switching on). This signal causes the cam turn one position - in this way the pawl blocking the device cursor is lifted - and, at the same time, it closes the contacts 4-5 (main switch), which power all the components in the appliance.
- At the end of the programme, the PCB transmits two 20-msec signals (at an interval of 200 msec).
 - the first signal causes the cam turn one more position, however without releasing the pawl.
 - the second signal (which is transmitted only if the system functions correctly) causes the cam turn one further position. In this way the pawl retracts to its housing and the door interlock is released; at the same time the contacts of the main switch (4-5) are opened.

6.4.2 Conditions necessary for door release

Before transmitting the door release signals, the main PCB checks for the following conditions:

- the drum must be stationary (no signal from the tachometric generator)
- the water level must not be higher than the lower edge of the door
- the water temperature must not exceed 40°C.

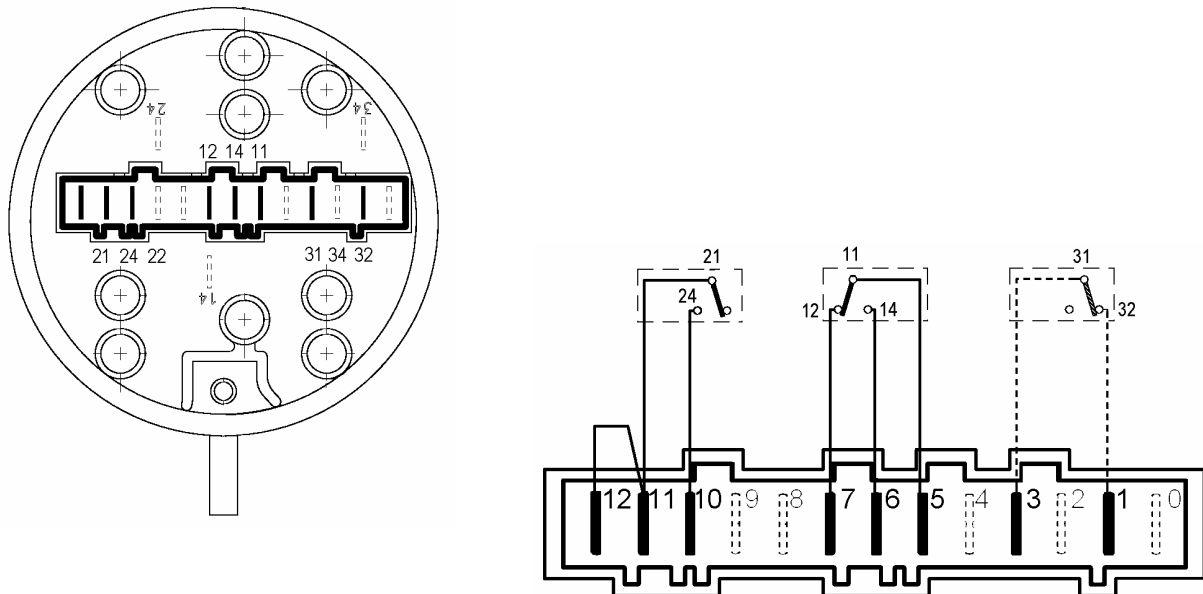
6.4.3 Automatic release device

In the event of a power failure, if the appliance is switched off or if the solenoid should malfunction, the bimetal PTC cools over a period of 1 to 4 minutes, and then releases the door.

6.5 Control pressure switch for water level in the tub

Control of the water level is performed by a three-level pressure switch which functions as follows:

- contact **11-14**: anti-boiling safety level
- contact **21-24**: first level
- contact **31-32**: anti-overflow safety level (*some models may not feature it*)



6.5.1 Pressure switch settings

	Full (mm)	Refill (mm)
Anti-boiling level	55± 3	35± 3
1st level	75± 3	55± 3
Anti-overflow level	390± 15	240±50

6.5.2 Water fill without wash load

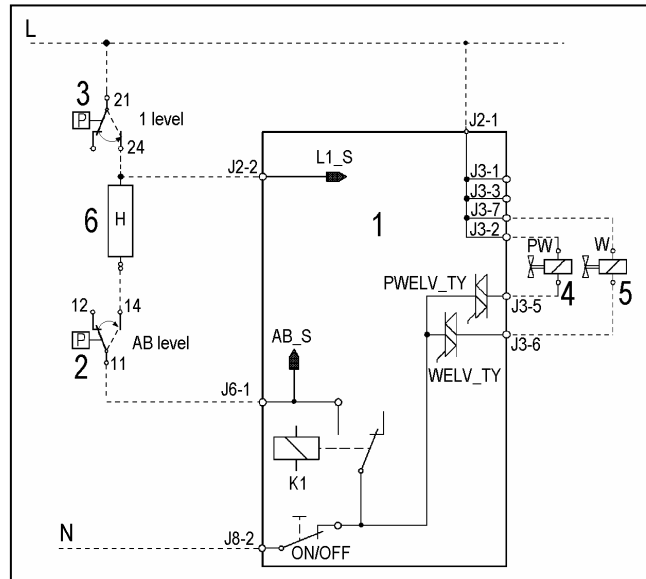
The table below shows the average water fill to reach the anti-boiling level and the first level without wash load: data are gathered with empty drain circuit (if the drain circuit has not been emptied the water quantity is reduced by about 0,7 litres).

	G19 tub
Anti-boiling level (litres)	3,5 (3,4÷3,7)
1st level (litres)	5,6 (5,4÷6)

6.6 Water fill system

The solenoid valves are powered by the PCB via two triacs. The status of the pressure switch (empty/full) is detected by two “sensing” lines.

1. PCB
2. Anti-boiling level
3. 1st level
4. Pre-wash solenoid valve
5. Wash solenoid valve
6. Heating element
- AB_S Anti-boiling level sensor
- L1_S 1st level sensor



6.6.1 Calculation of flow rate

Calculation of the capacity – necessary to determine the time for the supplementary fill – is performed by measuring the time that elapses between the closure of the anti-boiling contact on FULL and the closure of the 1st level contact.

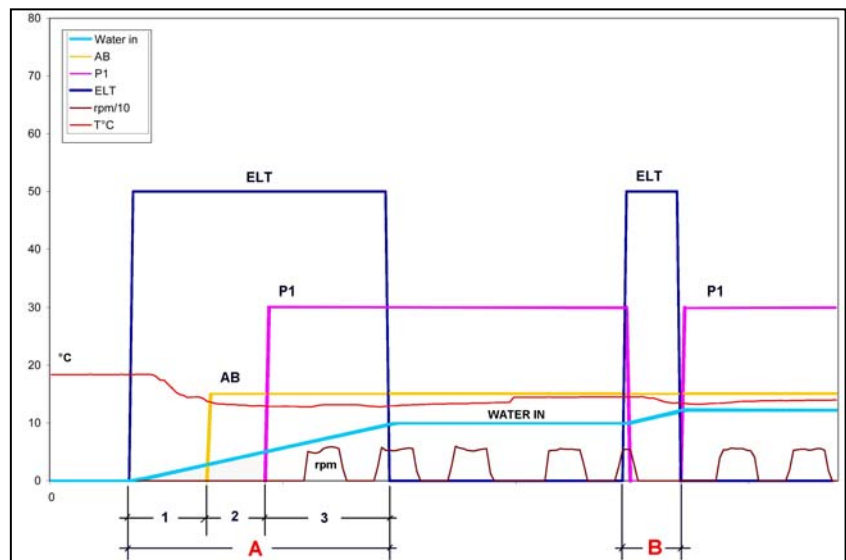
$$\text{Flow rate} = \frac{\text{Volume}}{\text{Time (T1-T2)}}$$

Volume = Volume of the tub between the two levels (anti-boiling and 1st level)

T1 –T2 = The time that elapses between the closure of the anti-boiling and 1st level contacts on FULL.

Water fill diagram

ELT = solenoid valve
P1 = 1st level
AB = anti-boiling level
rpm = drum rotation speed
Water in = water fill



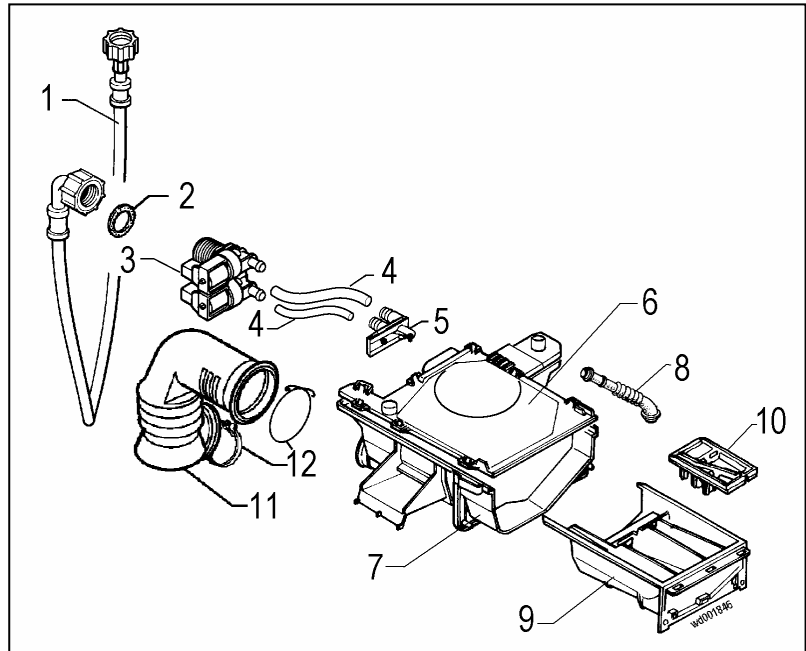
Phase A: The phase during which the initial fill takes place:

1. Water fill until the anti-boiling pressure switch closes on FULL.
2. Water fill until the 1st level pressure switch closes on FULL: the delivery of the solenoid is calculated during this phase.
3. Water fill for time **Q**, which varies according to delivery and cycle phase.

Phase B: If the 1st level pressure switch returns to EMPTY, a supplementary fill is performed until the pressure switch returns to close on FULL. This phase may be followed by a further timer-controlled fill.

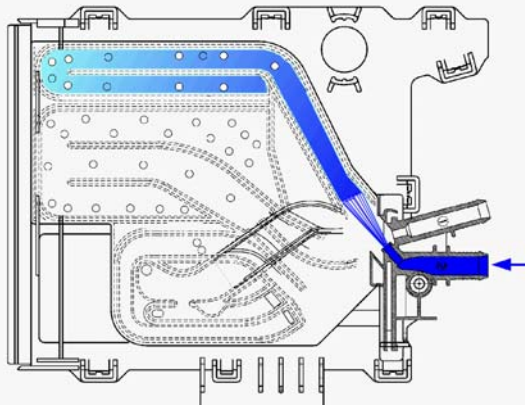
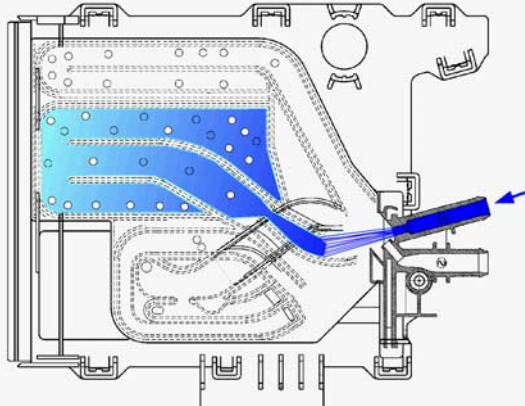
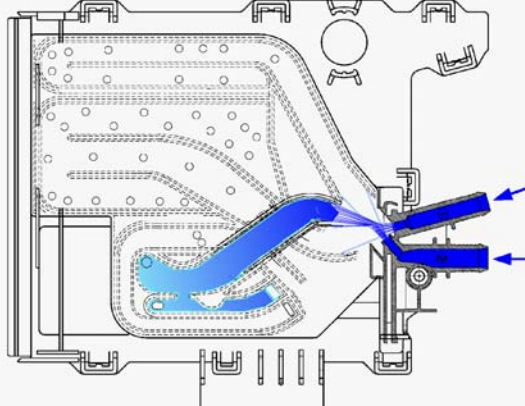
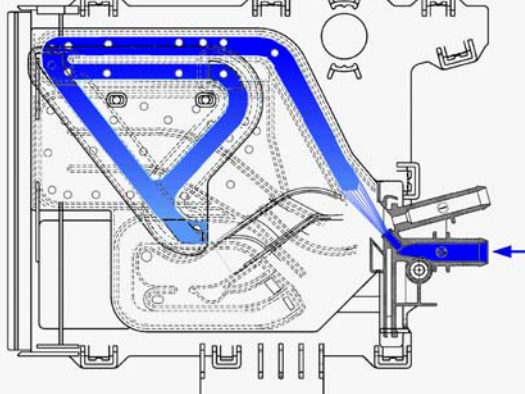
6.7 Detergent dispenser

1. Fill hose
2. Gasket
3. Cold water fill solenoid
4. Hose
5. Nozzle
6. Detergent dispenser duct
7. Detergent compartment
8. Steam venting hose (some models)
9. Detergent drawer
10. Siphon for additives
11. Detergent intake tub
12. Coupling clamps



Version with three compartments	Version with four compartments
• 4-compartment duct • Two-way water intake nozzle • 3-compartment detergent drawer	• 4-compartment duct with fork • Two-way water intake nozzle • 4-compartment detergent drawer
3 - 4 compartments: 2-way solenoid valve	

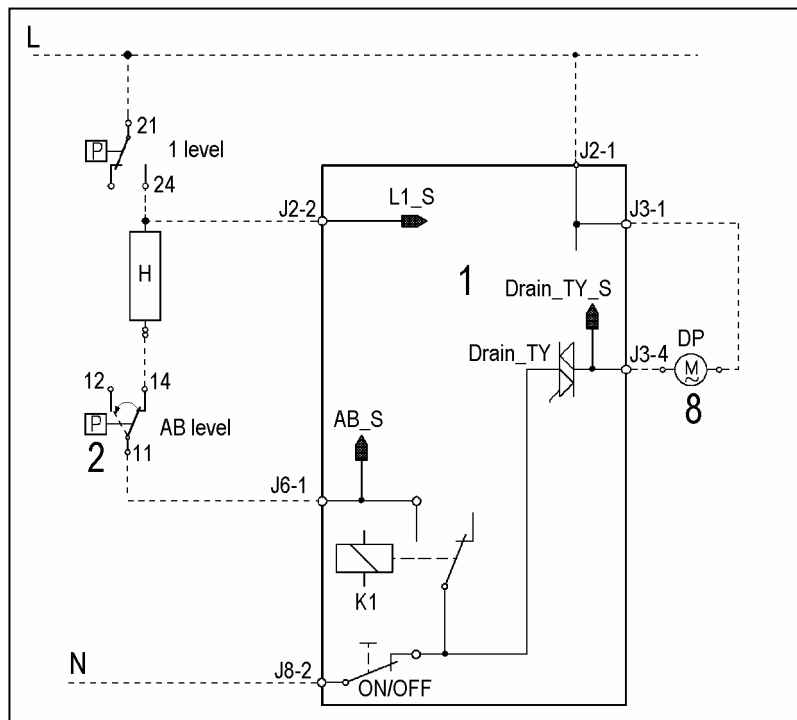
6.7.1 Operating principle

Water fill to pre-wash compartment (pre-wash solenoid) • This solution is used in models with 3-compartment detergent drawers. The detergent in compartment “a” is introduced at the beginning of the pre-wash phase. • In certain models featuring the “stains” option, compartment “a” may also be used to contain a stain-removal product, which is introduced during the washing phase.	
Water fill to wash compartment (wash solenoid) • In all models, compartment “b” contains the detergent, which is introduced at the beginning of the washing phase.	
Water fill to softener compartment (pre-wash/wash solenoids) • In all models, compartment “d” contains the softener, which is introduced at the beginning of the final rinse.	
Water fill to pre-wash and bleach compartments (pre-wash solenoid) • In models with four compartments, water is ducted through compartments “a” and “c”, which must not be used simultaneously. • If the user selects the pre-wash option, water is ducted through compartments “a” and “c” at the beginning of the pre-wash phase. • If this option is not selected, the water is ducted through the compartments at the beginning of the first rinse.	

6.8 Drain pump

- 1. PCB
- 2. Anti-boiling pressure switch
- 8. Drain pump

AB_S Anti-boiling level sensor



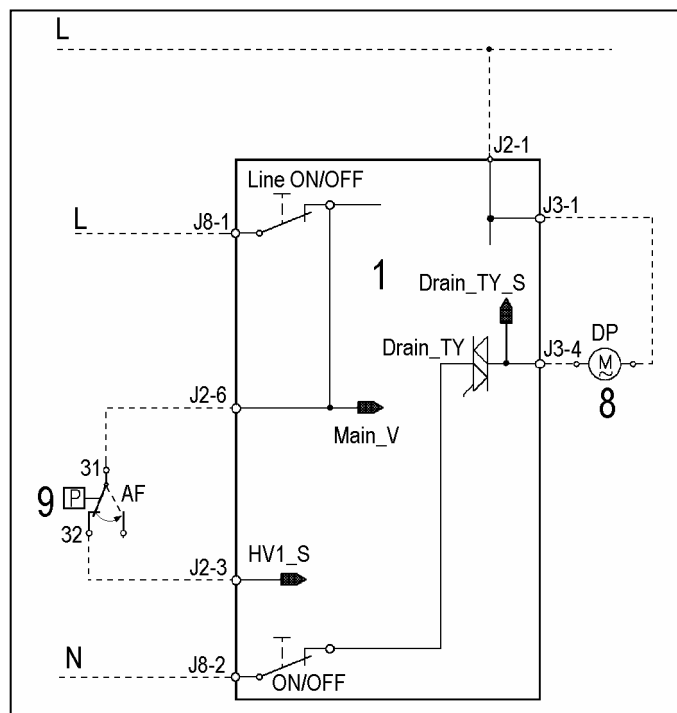
The PCB powers the drain pump via a triac as follows:

- for a pre-determined period
- until the anti-boiling pressure switch closes on EMPTY, after which the pump is actioned for a brief period or passes to the subsequent phase

6.9 Anti-overflow device

- 1. PCB
- 8. Drain pump
- 9. Anti-overflow pressure switch

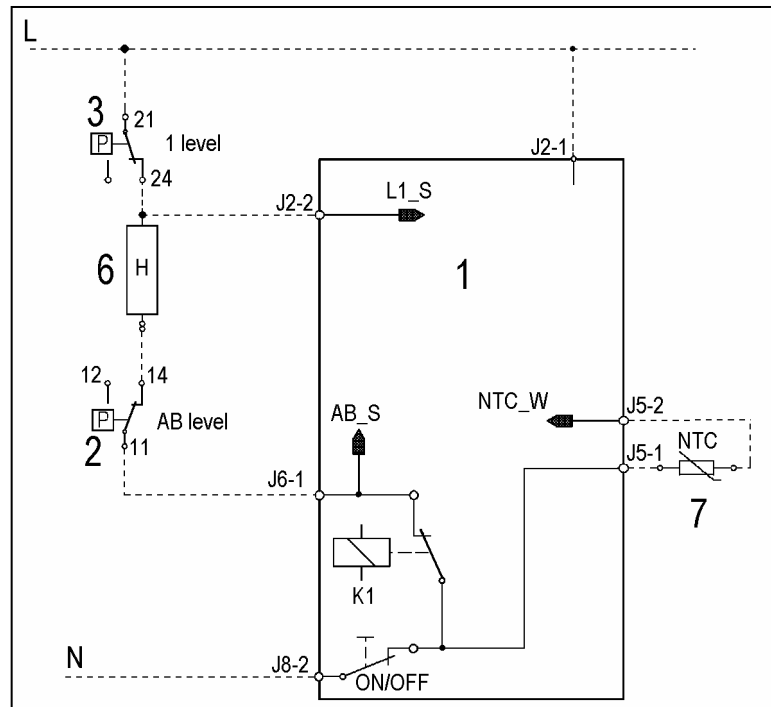
HV1_S Anti-overflow level sensor



The third pressure switch level (if featured) is used as an anti-overflow safety device: if the pressure switch contact should open in the FULL position, the PCB actions the drain pump until the pressure switch returns to the EMPTY position.

6.10 Heating

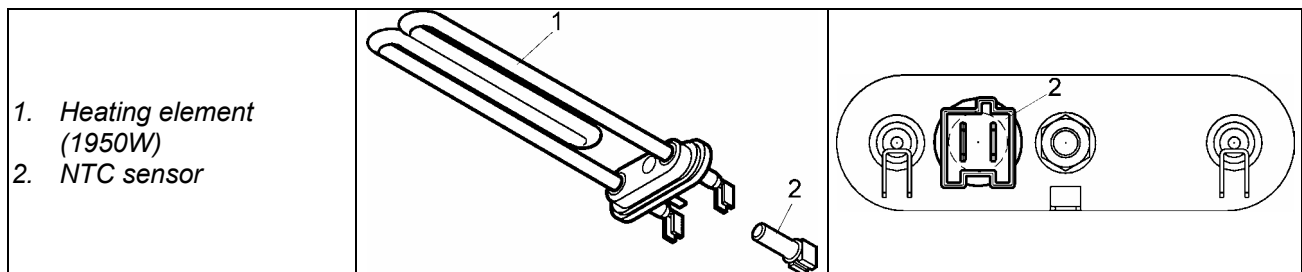
- 1. PCB
- 2. Anti-boiling pressure switch
- 3. 1st level pressure switch
- 6. Heating element
- 7. NTC temperature sensor
- K1 Relay
- AB_S Anti-boiling level sensor
- L1_S 1st level sensor



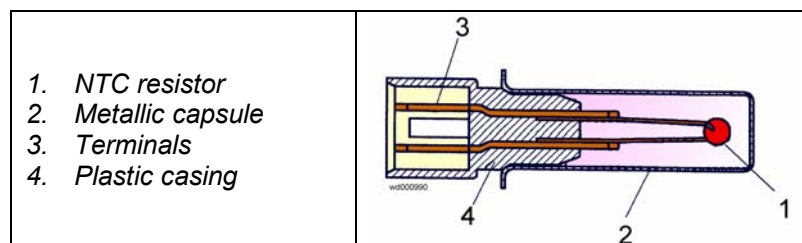
The heating element is powered by a relay on the PCB via the contacts of the pressure switch when closed on FULL.

The temperature is controlled by the PCB by means of a NTC temperature sensor.

6.10.1 Heating element



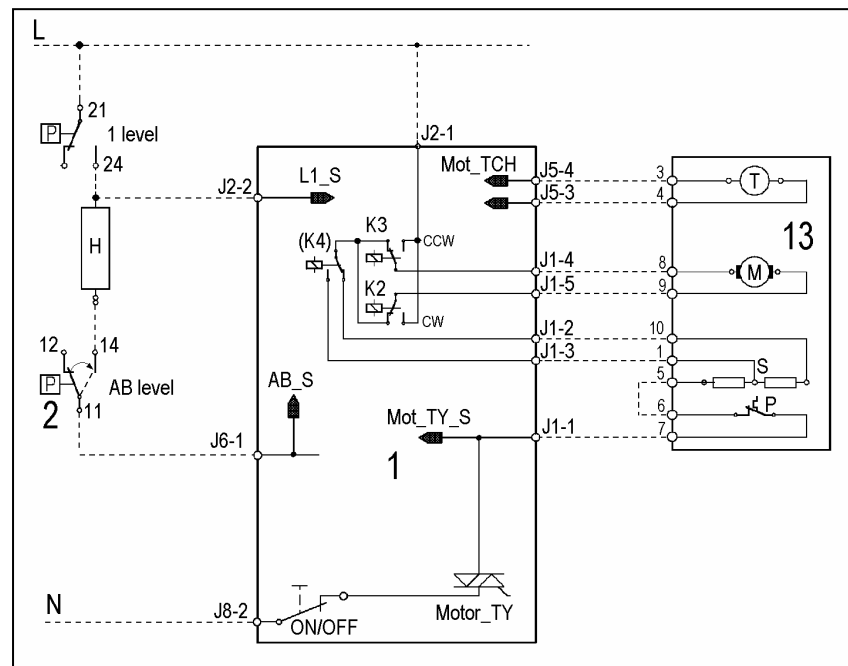
6.10.2 NTC temperature sensor



TEMPERATURE (°C)	RESISTANCE (Ω)		
	Nominal value	Maximum value	Minimum value
20	6050	6335	5765
60	1250	1278	1222
80	640	620	660

6.11 Motor

- 1. PCB
 - 2. Anti-boiling/anti-foam pressure switch
 - 13. Motor
 - M = Rotor
 - P = Motor safety cut-out
 - S = Stator
 - T = Tachometric generator
- AB_S Anti-boiling/anti-foam level sensor



6.11.1 Power supply to motor

The PCB powers the motor via a triac. The direction of rotation is reversed by switching of the contacts on two relays (K2-K3), which modify the connection between the rotor and the stator.

A third relay (K4) is used to power the stator (full or half field) according to the spin speed (*the half field is introduced only in models with spin speed over 1200 rpm*).

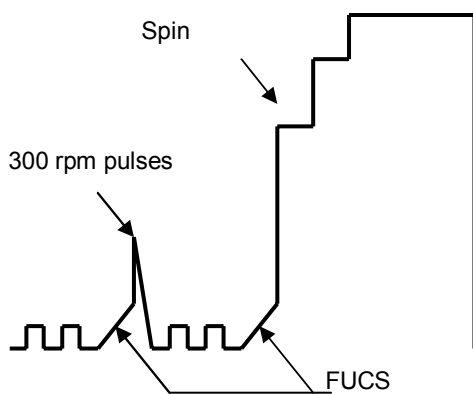
The speed of rotation of the motor is determined by the signal received from the tachometric generator.

During the spin phases, the microprocessor, depending on the software configuration, may perform the anti-foam control procedure (if featured) and the anti-unbalancing control procedure.

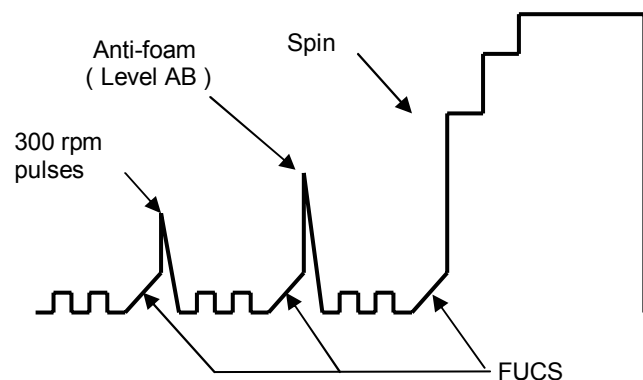
6.12 Anti-foam control system

The anti-foam control procedure (if featured) is performed via the anti-boiling pressure switch (AB).

Spin phase without foam



Spin phase with little foam



- **Spin with little foam:** if the contact of AB pressure switch closes on FULL, the spin phase is interrupted; the drain pump continues to operate and, when the contact returns to EMPTY, the spin phase is resumed.
- **Spin with excessive foam in the tub (critical situation):** The control system detects whether the pressure switch commutates 5 times to FULL. In this case, the spin phase is skipped, and a one-minute drain cycle is performed with the motor switched off; in the case of a washing phase, a supplementary rinse is added.

6.13 “FUCS” (Fast Unbalance Control System)

The control procedure for unbalanced loads is performed dynamically, before each spin cycle, as follows:

- An initial phase is performed in which the direction of rotation of the drum is alternated at 55 rpm.
- The phase begins at a speed of 55 rpm; the speed can never fall below this value, otherwise the check is repeated.
- At intervals of 300 ms, the balance is calculated and compared with predetermined limits. If the value is less than the lower limit, the speed of the drum is increased by 2 rpm; if the value is higher, the speed of the drum is reduced by 2 rpm. The reduction in the speed of the drum distributes the washing correctly; this procedure is repeated until the wash load is completely balanced.
- Correct balancing of the wash load is achieved at a speed of 115 rpm, after which the spin cycle begins.

The Unbalancing Control function may take place in four phases; each phase is characterized by an *unbalancing threshold* and a *time-out* (maximum time).

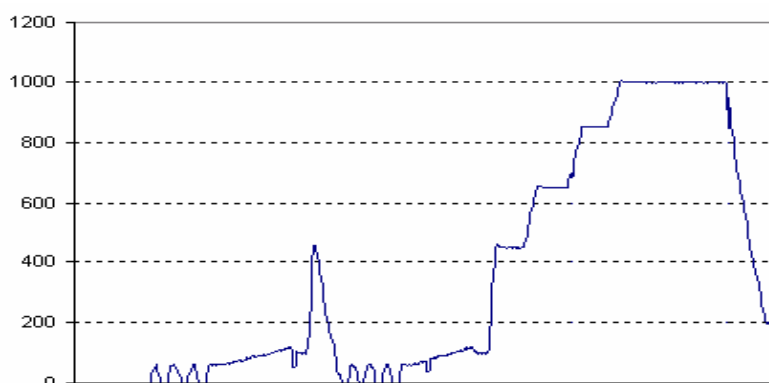
- Phase 0:** Phase 0 has a predetermined unbalancing threshold; if correct balancing of the wash load is achieved, the appliance performs a 470 rpm spin pulse, preceded by 5 seconds at 100 rpm and followed by phase 1; otherwise, after a maximum of 60 seconds, the cycle passes directly to phase 1.
- Phase 1:** The first phase has a different pre-set unbalancing threshold: if correct balancing is achieved, the appliance performs the spin cycle, preceded by 5 seconds at 100 rpm. If not, after a maximum of 120 seconds, the cycle passes to phase 2.
- Phase 2:** The pre-determined unbalancing threshold in the second phase is different: if correct balancing is not achieved within 60 seconds, the function passes to phase 3.
- Phase 3:** The third phase has a pre-determined unbalancing threshold: if correct balancing is achieved within 90 seconds, a spin pulse is performed, preceded by 5 seconds at 100 rpm and followed by a repeat of phase 1; otherwise, after a maximum of 90 seconds, the cycle passes directly to phase 1. If the load is highly unbalanced after the second attempt for phase 3, the spin cycle is skipped; if balancing is not perfect, a reduced-speed spin is performed.

6.13.1 Examples of operation of the unbalancing control function

The examples shown below describe the operation of an appliance with a final spin speed of 1000 rpm.

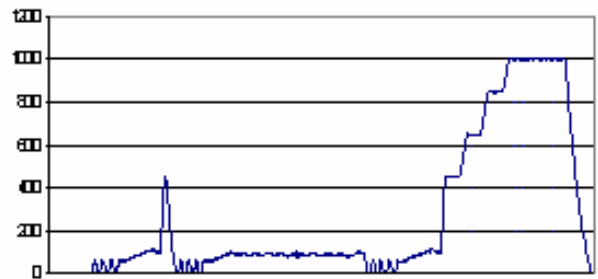
Perfect balancing

- Low speed
- FUCS phase 0 + spin pulse
- Low speed
- FUCS phase 1
- Normal spin



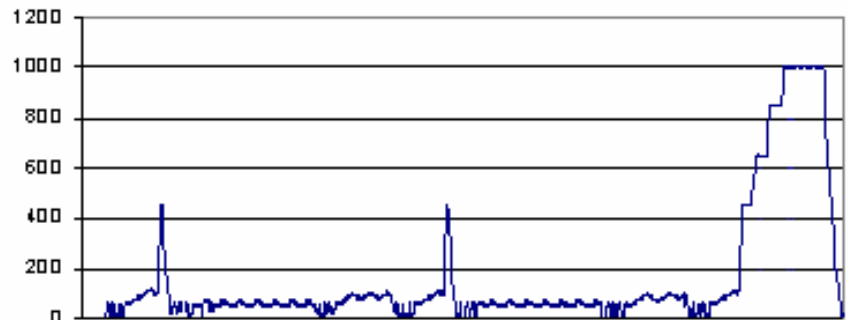
Balancing after two attempts:

- Low speed
- FUCS phase 0
- FUCS phase 1
- FUCS phase 2



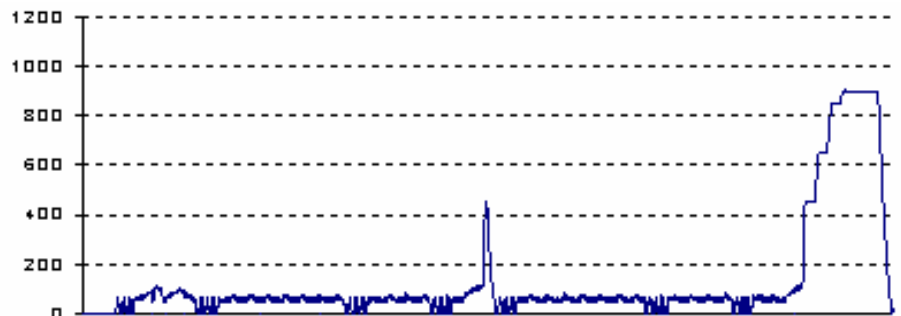
Balancing after the third phase Normal spin

- FUCS phase 0 with spin pulse
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3 with spin pulse
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- Normal spin



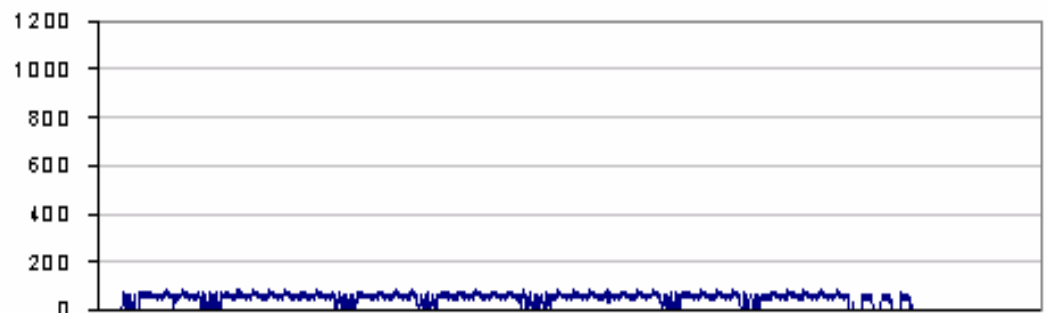
Balancing after the third phase Reduced-speed spin

- FUCS phase 0
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3 with spin pulse
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- Reduced -speed spin



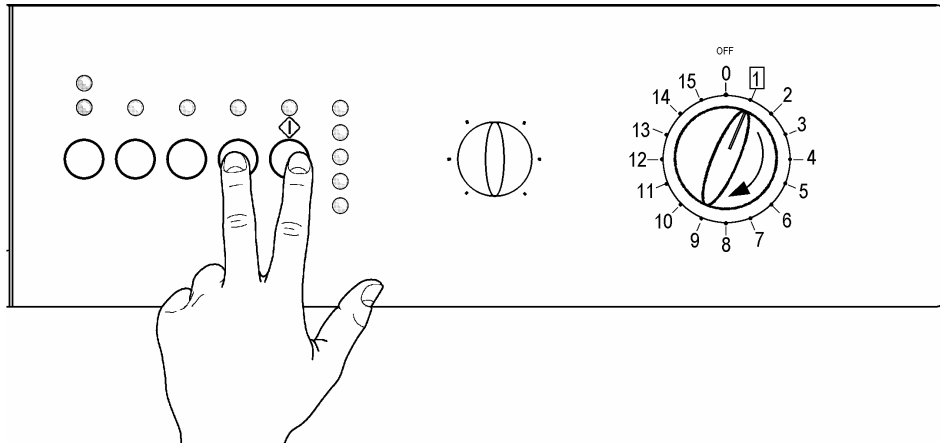
Unbalancing after the third phase:

- FUCS phase 0
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- No spin



7 DIAGNOSTICS SYSTEM

7.1 Access to diagnostics mode



1. Switch off the appliance.
2. Press and hold down **START/PAUSE** and **any one of the option buttons** simultaneously.
3. Holding down both buttons, switch the appliance on by turning the programme selector **one position to the right** (clockwise).
4. Continue to hold down the START/PAUSE and option buttons until the LED begins to flash (at least 2 seconds).

Important: The START/PAUSE button can be configured according to the styling of the model. Therefore it is not always in the position shown in the picture!

In the first selector position, the operation of the buttons and the relative LEDs is checked; turning the selector knob **clockwise** activates the diagnostics cycle for the operation of the various components and displays any alarm conditions.

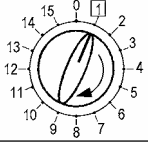
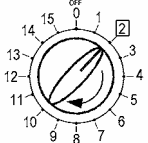
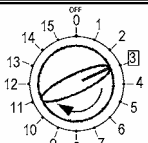
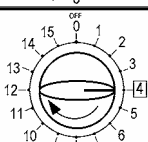
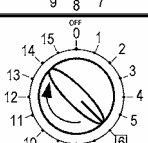
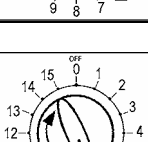
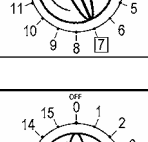
7.2 Exiting diagnostics mode

→ To exit the diagnostics cycle, switch the appliance off, then on, and then off again.

7.3 Diagnostics phases

Irrespective of the type of PCB (i.e. with horizontal or vertical buttons) and the configuration of the programme selector it is possible, after entering diagnostics mode, to perform diagnostics on the operation of the various components and to display the alarms by turning the programme selector **clockwise**.

All the alarms are enabled during the diagnostics cycle.

Selector position	Components actioned	Operating conditions	Function checked
1 	- All the LEDs light in sequence - When a button is pressed, the corresponding LED lights (and the buzzer, if featured, sounds)	Always activated	Operation of the user interface
2 	- Door interlock - Wash solenoid	Door locked Water level below anti-flooding level Maximum time 5 minutes	Water ducted through washing compartment
3 	- Door interlock - Pre-wash solenoid	Door locked Water level below anti-flooding level Maximum time 5 minutes	Water ducted through pre-wash compartment (bleach)
4 	- Door interlock - Pre-wash and wash solenoids	Door locked Water level below anti-flooding level Maximum time 5 minutes	Water ducted through softener compartment
6 	- Door interlock - Wash solenoid if the level of water in the tub is below 1st level - Heating element	Door locked Water level above 1st level Maximum time 10 minutes or up to 90°C (*)	Heating
7 	- Door interlock - Wash solenoid if the level of water in the tub is below 1st level - Motor (55 rpm clockwise, 55 rpm counter-clockwise, 250 rpm impulse)	Door locked Water level above 1st level	Check for leaks from the tub
8 	- Door interlock - Drain pump - Motor up to 650 rpm then at maximum spin speed	Door locked Water level lower than anti-boiling level for spinning	Drain and spin; control of congruence in closure of level pressure switches

(*) In most cases, this time is sufficient to check the heating. However, the time can be increased by repeating the phase without draining the water: pass for a moment to a different phase of the diagnostics cycle and then back to the heating control phase (if the temperature is higher than 80°C, heating does not take place).

8 ALARMS

8.1 Displaying the alarms to the user

Control of the alarm system can be configured; according to the model, therefore, some or all of the alarms may be displayed to the user.

Normally, all alarms are displayed to the user, with the exception of:

- E61 (insufficient heating during the washing phase),
- E83 (error in selector reading)

The alarms are enabled during the execution of the washing programme, with the exception of alarms associated with configuration and the power supply (voltage/frequency), which are also displayed during the programme selection phase.

The door can normally be opened (except where specified) when an alarm condition has occurred on condition that:

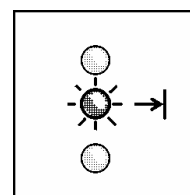
- The level of the water in the tub is below 1st level
- The temperature of the water is lower than 40°C.

Certain alarm conditions require a drain phase before the door can be opened:

- Cooling water fill if the temperature is in excess of 60°C.
- Drain until closure of both pressure switch contacts (1st level and anti-boiling safety system) on EMPTY within a maximum of 5 minutes.

8.1.1 Displaying the alarms during normal operation

The type of alarm condition is displayed to the user by the repeated flashing of the END OF CYCLE LED (0.4 seconds lit, 0.4 seconds off, with an interval of 2.5 seconds between sequences). This LED is featured on all models, though configured in different positions.



If, for example, the user should forget to close the door, the control system will detect alarm E41 about 15 seconds after the start of the cycle; the cycle remains in PAUSE mode and the LED flashes repeatedly in the sequence shown in the table.

The four flashes indicate the first of the two digits of alarm E41 (the alarms for a given function are grouped in “families”).

In this case, after closing the door, it is sufficient to press START in order to re-start the programme.

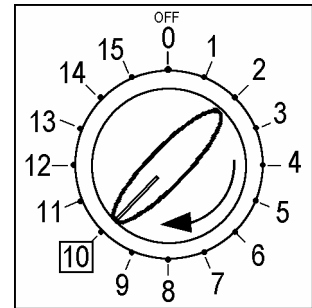
END OF CYCLE LED		→
ON / OFF	Time (sec.)	Value
	0.4	1
	0.4	
	0.4	2
	0.4	
	0.4	3
	0.4	
	0.4	4
	0.4	
	2.5	Pause between sequences

Configuration errors **E93-E96** are displayed by the lighting of all the LEDs.

8.2 Reading the alarm codes

In order to read the last alarm code memorized in the EEPROM on the PCB:

- Enter diagnostics mode
- Irrespective of the type of PCB and configuration, turn the programme selector **clockwise** to the **tenth position**.

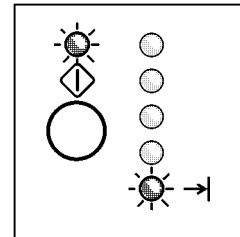


8.2.1 Displaying the alarm

The alarm is displayed by a repeated flashing sequence of the two LEDs (0.4 seconds lit, 0.4 seconds off, with an interval of 2.5 seconds between sequences). *The buzzer (if featured) will sound "beeps" in synchronization with the flashing of the LEDs:*

- **END OF CYCLE** LED → indicates the first digit of the alarm code (family)
- **START/PAUSE** → indicates the second digit of the alarm code (number within the family)

These two LEDs are featured on all models (though they are **configured differently**), and flash simultaneously.



Notes:

- The first letter of the alarm code "E" (Error) is not displayed, since this letter is common to all alarm codes.
- The alarm code "families" are shown in hexadecimal; in other words:

→ **A** is represented by **10** flashes

→ **B** is represented by **11** flashes

→ ...

→ **F** is represented by **15** flashes

- Configuration errors are shown by the flashing of all the LEDs (user interface not configured).

8.2.2 Examples of alarm displays

Example: Alarm E43 (problems with the door interlock triac) will display the following:

- the sequence of **four** flashes of the **END OF CYCLE** LED indicates the first number (**E43**);
- the sequence of **three** flashes of the **START/PAUSE** LED indicates the second number (**E43**);

END-OF-CYCLE LED →			START/PAUSE LED ↕		
ON / OFF	Time (sec.)	Value	ON / OFF	Time (sec.)	Value
	0.4	1		0.4	1
	0.4			0.4	
	0.4	2		0.4	2
	0.4			0.4	
	0.4	3		0.4	3
	0.4			0.4	
	0.4	4		3,3	Pause
	0.4				
	2.5	Pause			

8.2.3 Operation of alarms during diagnostics

All alarms are enabled during the diagnostics phase of the components. When the programme selector is turned from one test phase to another, the appliance exits the alarm condition and performs the phase selected (if the alarm condition does not occur again).

8.3 Notes concerning certain alarm codes

- **Configuration alarms E93-E96:** If these alarms are generated (when the appliance is switched on), operation of the appliance is blocked and all the LEDs light. The diagnostics procedure cannot be accessed; the only option is to switch the appliance OFF (by turning the selector to position "0").
- **Configuration alarm E94:** For this alarm code, only the family for alarm "9" is displayed; the diagnostics procedure cannot be accessed, and the "rapid alarm display" function cannot be used.
- **Alarms EB1-EB2-EB3:** In the event of problems with the mains power supply, the appliance remains in alarm mode until the mains frequency or voltage are restored to the correct value or the appliance is switched off (by turning the programme selector to "0"). The family of alarm "B" is displayed; the diagnostics procedure cannot be accessed, and the "rapid alarm display" function cannot be used. The complete alarm code can be read only when the abnormal situation has ceased.
- **Alarms E51- E52:** During the diagnostics test, all the alarms are displayed. Normally, when the programme selector is turned from one test phase to another, the appliance exits the alarm condition and performs the phase selected. This does not take place in the case of alarms E51 (power triac on motor short-circuited) and E52 (no signal from the tachometric generator on the motor): in these cases, the only option to exit the alarm condition is to switch the appliance OFF by turning the selector to position "0" (reset).

8.4 Rapid reading of alarm codes

The last alarm code can be displayed even if the programme selector is not in the tenth position (diagnostics) or if the appliance is in normal operating mode (e.g. during the execution of the washing programme):

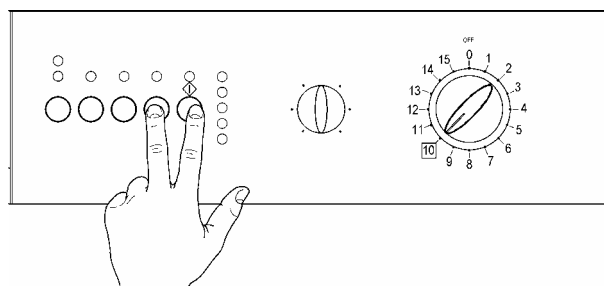
- Press and hold down **START/PAUSE** and **any of the option buttons** for at least two seconds: the LEDs initially switch off, and then display the flashing sequence corresponding to the alarm.
- The alarm sequence continues as long as the two buttons are held down.
- The alarm reading system is as described in paragraph 8.2.1.
- While the alarms are displayed, the appliance continues to perform the cycle or, if in the programme selection phase, maintains the previously selected options in memory.

8.5 Cancelling the last alarm

It is good practice to cancel the last alarm:

- after reading the alarm code, to check whether the alarm re-occurs during diagnostics
- after repairing the appliance, to check whether it re-occurs during testing.

1. Select diagnostics mode and turn the programme selector to the **tenth** position (alarm reading).
2. Press and hold down **START/PAUSE** and **any of the option buttons** at the same time.
3. Hold down the **START/PAUSE** and option buttons (at least 2 seconds).



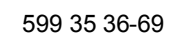
Important: The START/PAUSE button is configurable depending on the styling of the model, and is not necessarily in the position shown in the picture!

8.6 Table of alarm codes

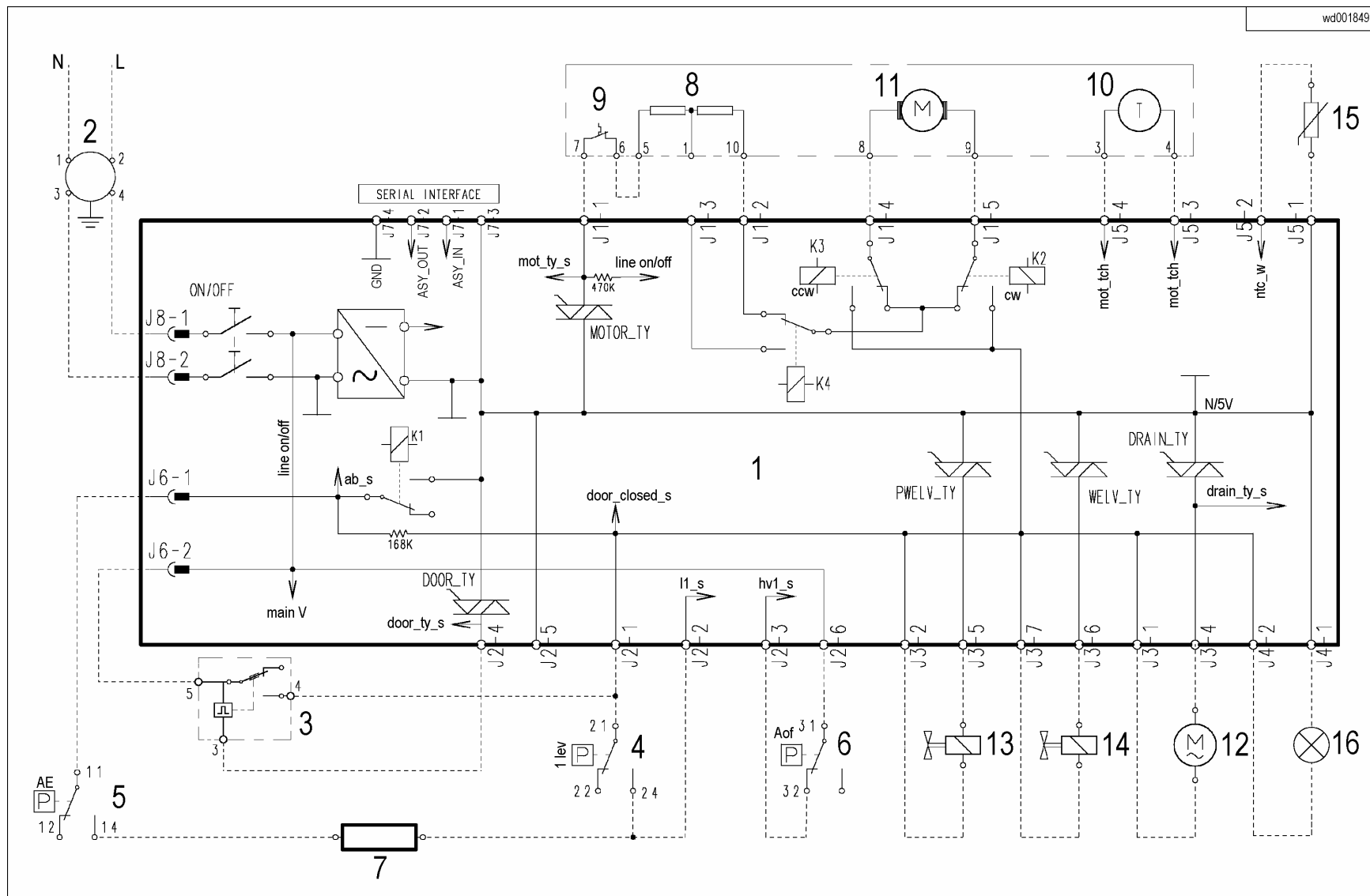
Alarm	Description	Possible fault	Action/machine status	Reset
E11	Difficulties in water fill for washing	Tap closed or water pressure insufficient; drain hose incorrectly positioned; water fill solenoid faulty; leaks from the hydraulic circuit of the pressure switch; pressure switch faulty; wiring faulty; PCB faulty.	Cycle paused	Start
E13	Water leakage	Drain hose incorrectly positioned; water pressure insufficient; water fill solenoid faulty; leakage/blockage of pressure switch hydraulic circuit; pressure switch faulty.	Cycle paused	Start
E21	Difficulties in draining	Drain hose kinked/blocked/incorrectly positioned; drain filter blocked/dirty; drain pump faulty; pressure switch faulty; wiring faulty; PCB faulty; current leakage from heating element to ground.	Cycle paused	Start
E23	Drain pump triac faulty	Drain pump faulty; wiring faulty; PCB faulty.	Safety drain cycle – Cycle stopped with door open	OFF
E24	Fault in “sensing” circuit of drain pump triac	PCB faulty.	Safety drain cycle – Cycle stopped with door released	OFF
E33	Incongruence between closure of anti-boiling and 1st level pressure switch contacts	Pressure switch faulty; current leakage from heating element to ground; heating element; wiring faulty; PCB faulty.	Safety drain cycle – Cycle stopped with door open	OFF
E35	Water overflow (flooding)	Water fill solenoid faulty; leakage from pressure switch hydraulic circuit; pressure switch faulty; wiring faulty; PCB faulty.	Cycle blocked. Safety drain cycle. Drain pump always in operation (5 minutes on, 5 minutes off etc.)	OFF
E36	Fault in “sensing” circuit of anti-boiling pressure switch	PCB faulty.	Cycle blocked, door locked	OFF
E37	1st level sensing circuit faulty	PCB faulty.	Cycle blocked, door locked	OFF
E39	“HV” sensor of anti-overflow level faulty	PCB faulty.	Cycle blocked, door locked	OFF
E41	Door open	Door interlock faulty; wiring faulty; PCB faulty.	Cycle paused	Start
E42	Problems of door closure	Door interlock faulty; wiring faulty; PCB faulty.	Cycle paused	Start
E43	Interlock power supply triac faulty	Door interlock faulty; wiring faulty; PCB faulty.	(Safety drain cycle) Cycle blocked	OFF
E44	Door interlock sensor faulty	PCB faulty.	(Safety drain cycle) Cycle blocked	OFF
E45	Door interlock sensing circuit triac faulty	PCB faulty.	(Safety drain cycle) Cycle blocked	OFF
E51	Motor power supply triac short-circuited	PCB faulty; current leakage from motor or from wiring.	Cycle blocked, door locked (after 5 attempts)	OFF
E52	No signal from motor tachometric generator	Motor faulty; wiring faulty; PCB faulty.	Cycle blocked, door locked (after 5 attempts)	OFF
E53	Motor triac sensing circuit faulty	PCB faulty.	Cycle blocked, door locked	OFF
E54	Motor relay contacts sticking	PCB faulty; current leakage from motor or from wiring.	Cycle blocked, door locked (after 5 attempts)	OFF

Alarm	Description	Possible fault	Action/machine status	Reset
E61	Insufficient heating during washing	NTC sensor faulty; heating element faulty; wiring faulty; PCB faulty.	The heating phase is skipped	---
E62	Overheating during washing	NTC sensor faulty; heating element faulty; wiring faulty; PCB faulty.	Safety drain cycle – Cycle stopped with door open	OFF
E66	Heating element power relay faulty	PCB faulty; current leakage from heating element to ground.	Safety drain cycle – Cycle stopped with door open	OFF
E71	Washing NTC sensor faulty	NTC sensor faulty; wiring faulty; PCB faulty.	The heating phase is skipped	Start
E82	Error in selector reset position	PCB faulty.	---	OFF
E83	Error in reading selector	(Incorrect configuration data); PCB faulty.	Cycle cancelled	---
E93	Incorrect configuration of appliance	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
E94	Incorrect configuration of washing cycle	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
E95	Communications error between microprocessor and EEPROM	PCB faulty.	Cycle interrupted	OFF
E96	Incongruency between hardware version and configuration	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
E97	Incongruency between programme selector and cycles configuration	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
EB1	Incorrect frequency of appliance	Power supply problems (incorrect / disturbance); PCB faulty.	Cycle interrupted	---
EB2	Voltage too high	Power supply problems (incorrect / disturbance); PCB faulty.	Cycle interrupted	---
EB3	Voltage too low	Power supply problems (incorrect / disturbance); PCB faulty.	Cycle interrupted	---

9.1 Version with instantaneous door interlock



9.2 Version with door interlock with PTC



9.3 Key to circuit diagram

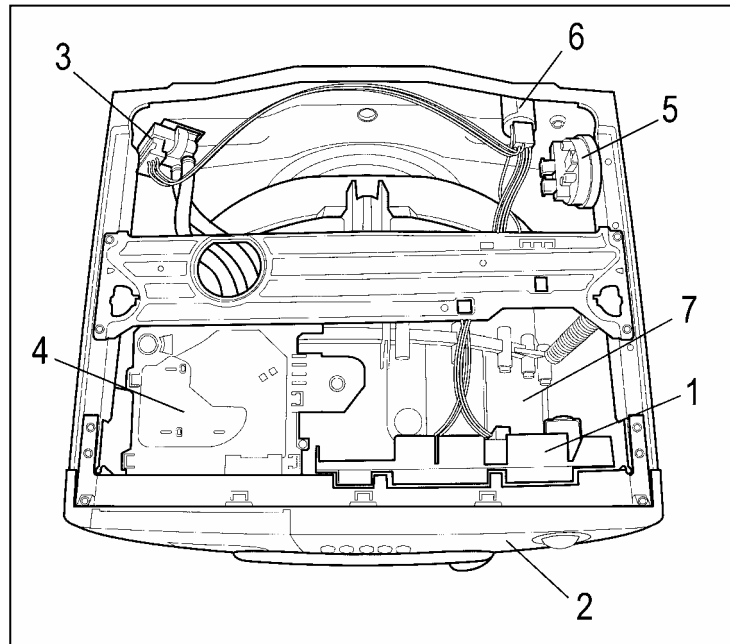
Components in the appliance	Components of the PCB	
1. Electronic board	DOOR_TY	Interlock triac
2. Suppressor	DRAIN_TY	Drain pump triac
3. Door interlock	K1	Heating element relay
4. 1st level pressure switch	K2	Motor relay: clockwise rotation
5. Anti-boiling pressure switch	K3	Motor relay: counter-clockwise rotation
6. Anti-overflow pressure switch (<i>some models</i>)	K4	Motor relay: half-field power (<i>models with spin speed over 1200 rpm</i>)
7. Heating element	MOTOR_TY	Motor triac
8. Stator (motor)	ON/OFF	Main switch (on programme selector)
9. Thermal overload cut-out (motor)	PWELW_TY	Pre-wash solenoid triac
10. Tachometric generator (motor)	Serial interface	Asynchronous serial interface
11. Rotor (motor)	WELV_TY	Wash solenoid triac
12. Drain pump		
13. Pre-wash solenoid valve		
14. Wash solenoid valve		
15. NTC temperature sensor		
16. "Door locked" pilot lamp (<i>some models</i>)		

10 ACCESS TO THE ELECTRONIC CONTROL SYSTEM

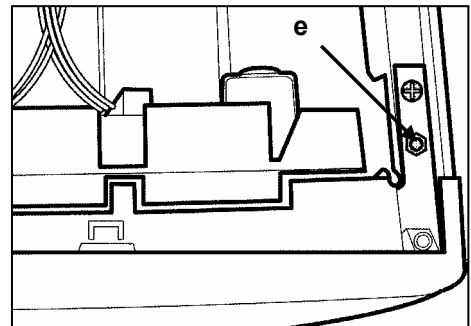
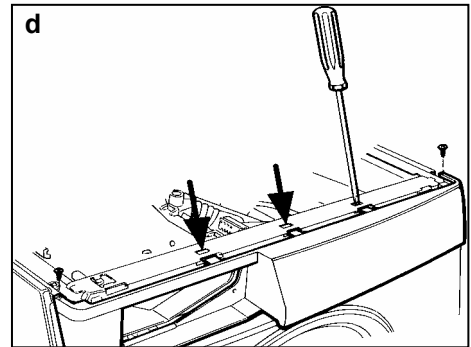
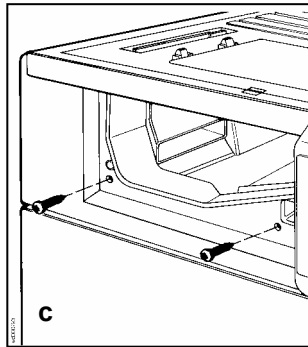
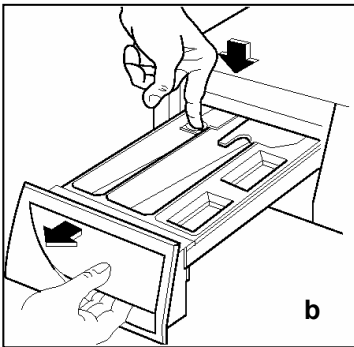
10.1.1 Top panel

- a. Remove the two rear screws, push the top panel towards the rear and release it from the cabinet.

1. *Electronic control system*
2. *Control panel*
3. *Solenoid valve*
4. *Detergent dispenser*
5. *Pressure switch*
6. *Suppressor*
7. *Tub*



10.1.2 Control panel

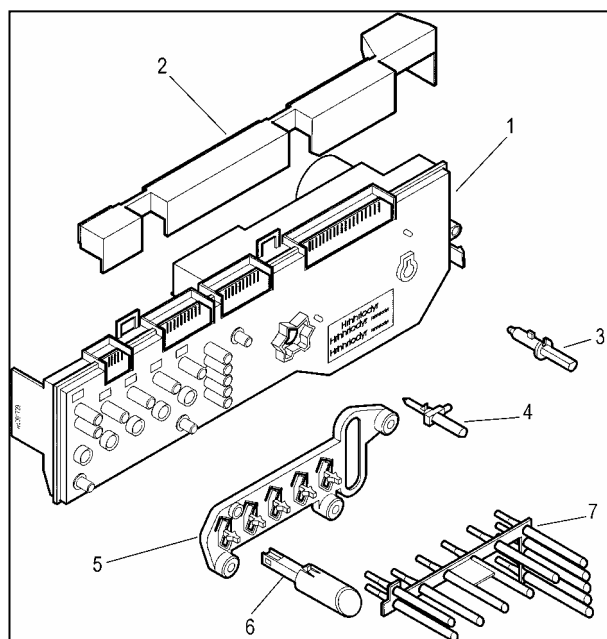


- a. Remove the top panel.
- b. Remove the detergent drawer.
- c. Remove the screws which secure the front of the control panel to the support cross-member.
- d. Remove the upper screws and release the anchor tabs from the support.
- e. Remove the control panel by releasing it from the lower right-hand guide. To facilitate its release, loosen the screws which secure it to the cabinet and raise it slightly.

When re-assembling, make sure that the knobs are placed in the correct positions.

10.1.3 Electronic control board

1. PCB assembly + casing
2. Cover for connectors
3. Spindle of programme selector knob
4. Spindle of secondary selector knob
5. Pushbutton support panel
6. Pushbutton
7. LED diffuser



- a. Remove the control panel.
- b. Detach the cover for the connectors from the control board casing.
- c. Detach the wiring from the PCB.
- d. If necessary, remove the LED diffusers from the board casing.
- e. Remove the knob flanges from the spindles of the selectors.
- f. Remove the spindles from the selectors. Make sure that the position of the selectors is as shown in the picture, i.e. CANCEL/OFF for the programme selector, last clockwise position for the secondary selector. Use pliers to remove the spindle of the second selector (if featured): this operation may damage the plastic board casing; it is therefore advisable to **use a new spindle for the new board**.
- g. Remove the four screws which secure the pushbutton support panel to the board and remove the support/pushbutton assembly.
- h. Remove the other screw which secures the board assembly to the control panel support.
- i. Release the two anchor tabs and remove the electronic board assembly.

