Electronic Washing Machine

LED

LCD

SERVICE MANUAL

LAUNDRY

Washing machine
with electronic control

Functional and technical characteristics

Aesthetics

RRXXXL
RRXXXD

Index

1 Scope

The scope of this manual is to furnish technicians, who already have the basic knowledge to carryout repairs on domestic washing machines and understanding of washing machine with electronic controller.

The treated topics are:

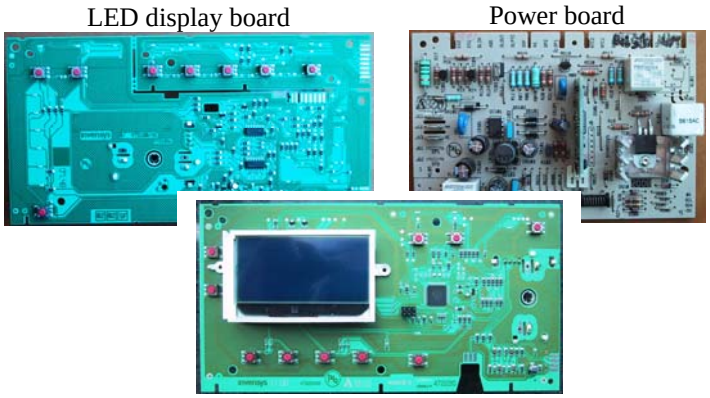
- general characteristics
- control panel and wash programmes
- technical and functional characteristics
- accessibility to electronic controller

2 WARNINGS

- Maintain of the electric device must be carried out only by a qualified person.
- Take out the power plug from the power supply before manipulating the internal parts.
- In case of replacement of heating element, replace it with one of the same characteristics in order to ensure the safety of the equipment.

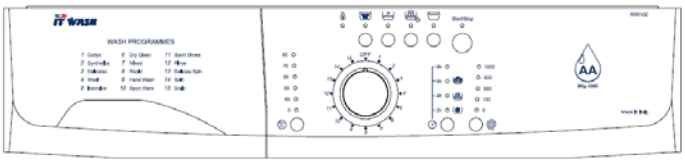
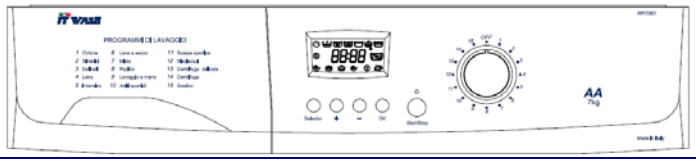
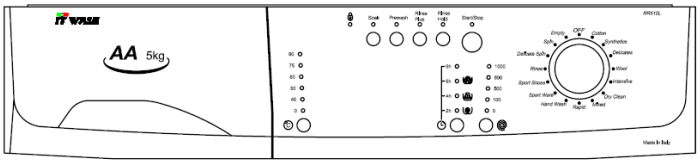
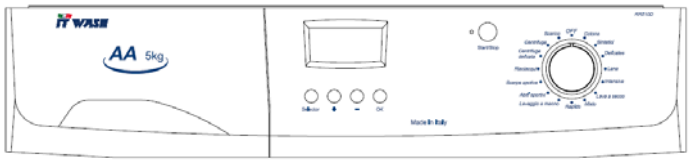
3 GENERAL CHARACTERISTICS

The control system RRXXXX has two electronic cards that play the role of power and visualization management.



There are three versions of power boards and four versions of display board:

- basic version of power board;
- 1400 speed model version of power board with tapped field
- power board with hot relay and tapped field
- LED display board with a central selector
- LED display board with a lateral selector
- LCD display board with a central selector
- LCD display board with a lateral selector.

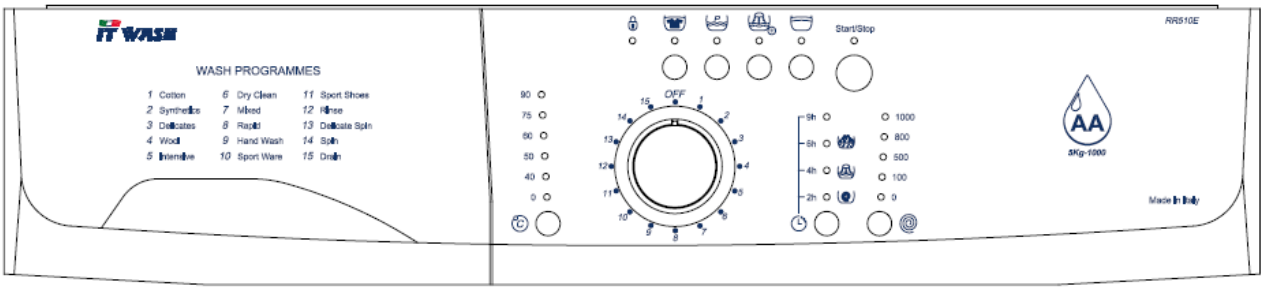
LED version with a central selector	
LCD version with a central selector	
LED version with a lateral	
LCD version with a lateral selector	
Number of buttons	Maximum of 10
Number of LED	Maximum of 23
Programme selector	16 position selector with integrated OFF
Current	220/240V 50 Hz
Type of washing	With sphere “eco ball”
Rinsing system	Traditional
Motor	Universal with tachometer
Spin speed	600 - 1400 r.p.m.
Unbalance control	FUCS
Water uptake	Cold water model only: 1 electro-valve with 1 inlet and 2 outlets Model with hot water only: 1 electro-valve with 1 inlet and 1 outlet

Detergent drawer	3 sector: pre-wash, main-wash and softener
Water level control in drum	3 level pressure switch (load, drain and overflow)
Door safety device	Traditional (with PTC)
Heating element input	1700W with integrated thermo-fuse
Temperature control	With NTC probe integrated at the base of the heating element

4CONTROL PANEL

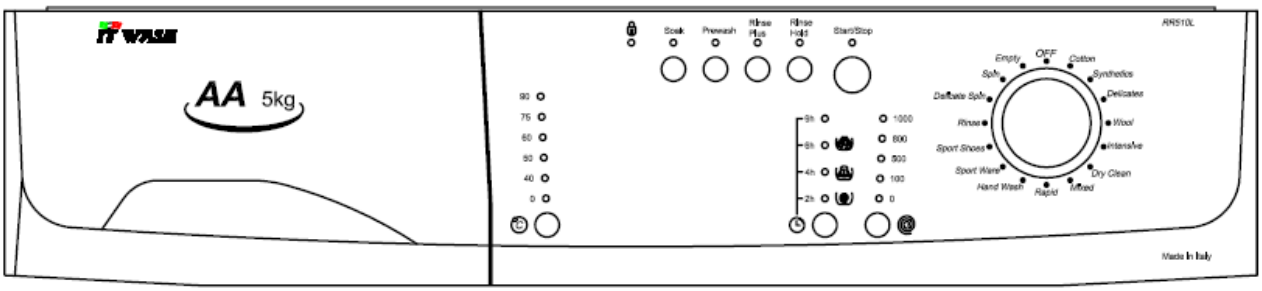
4.1 LED central knob aesthetic

- Maximum of 10 buttons
- 16 positions programme selector integrated OFF
- Number of leds 23

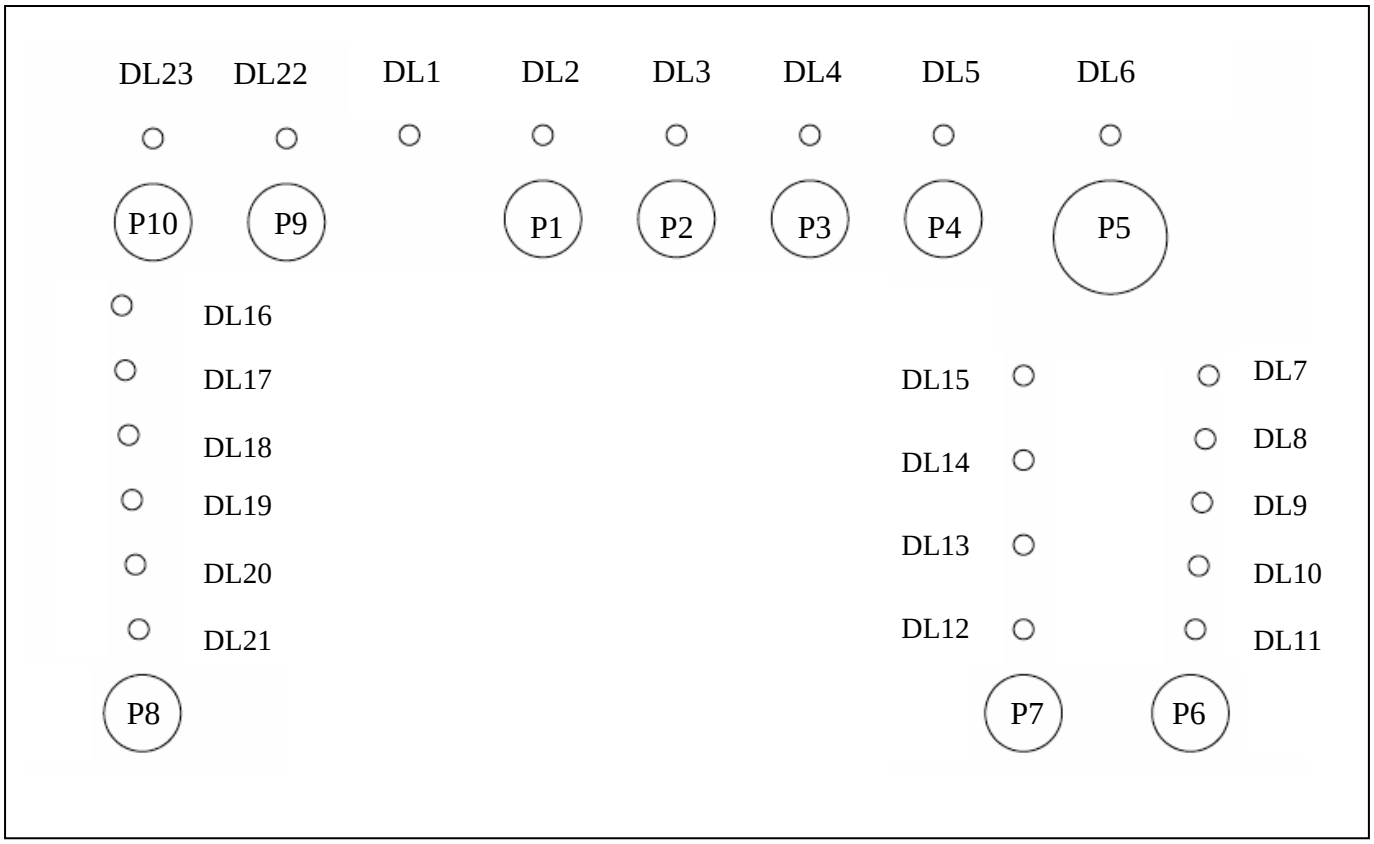


4.2 LED lateral knob aesthetic

- Maximum of 10 buttons
- 16 positions programme selector integrated OFF
- Number of leds 23

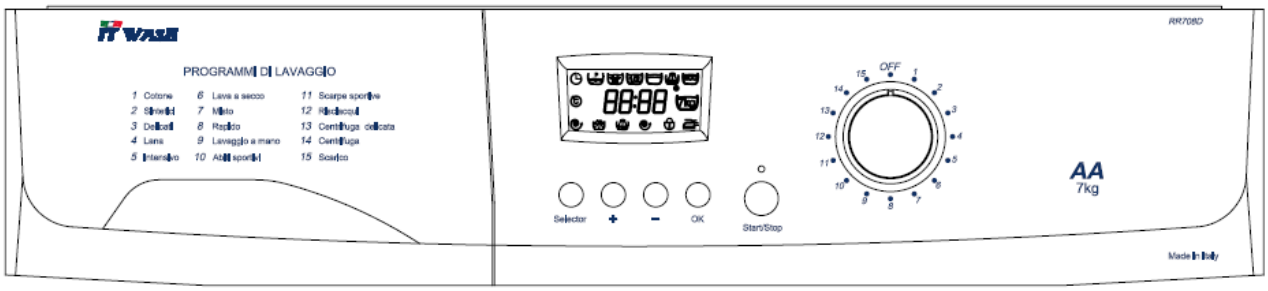


- LEDs and buttons arrangement



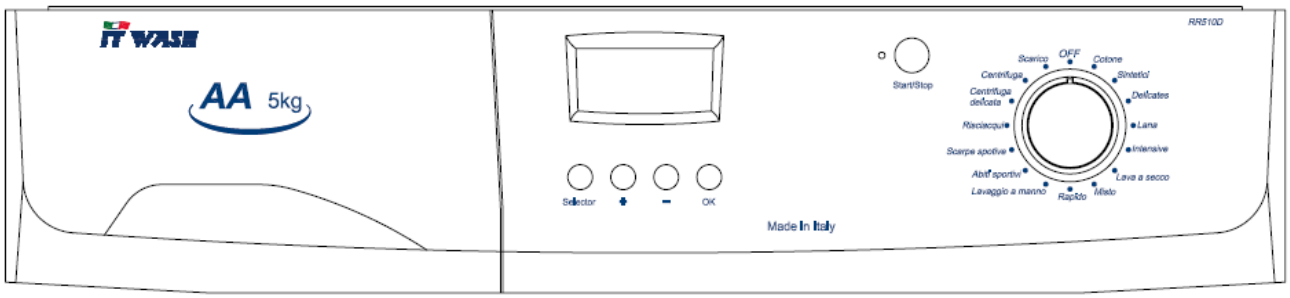
4.3 LCD central knob aesthetic

- Maximum of 10 buttons
- 16 positions programme selector integrated OFF
- LCD display

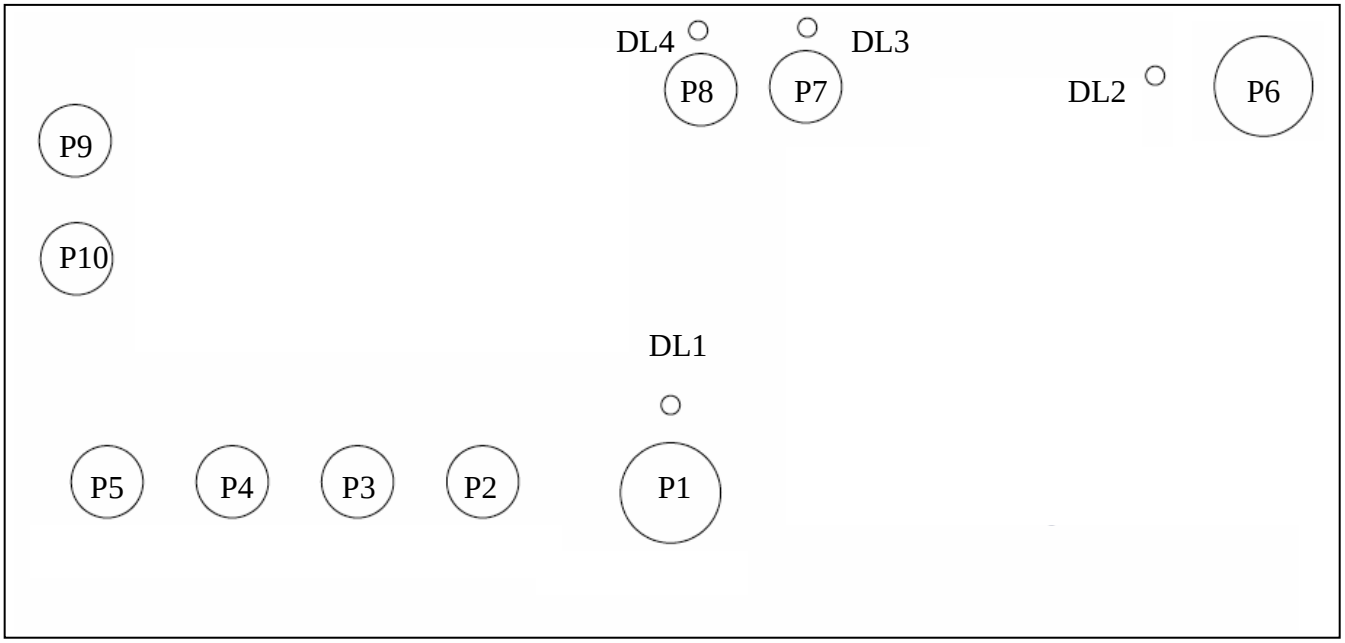


4.4 LCD lateral knob

- Maximum of 10 buttons
- 16 positions programme selector integrated OFF
- LCD display

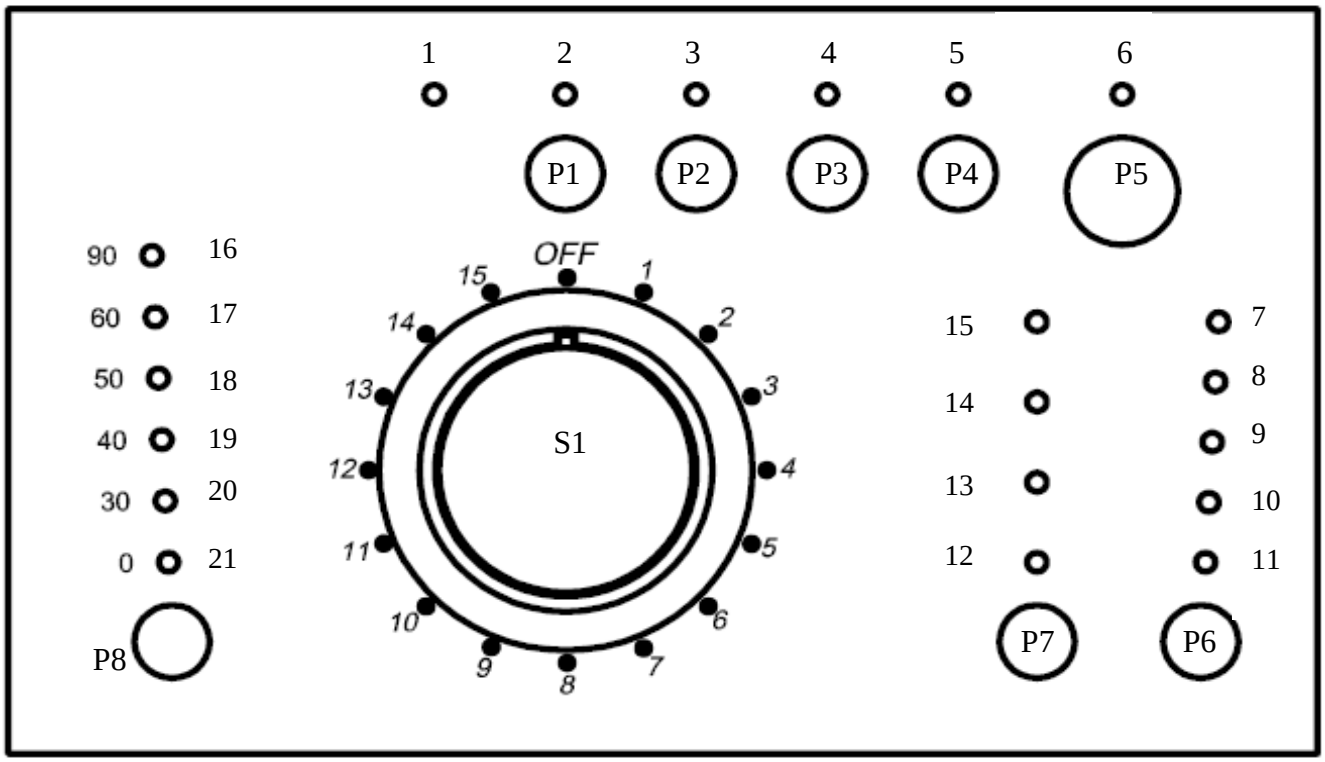


- LCD display and buttons arrangement

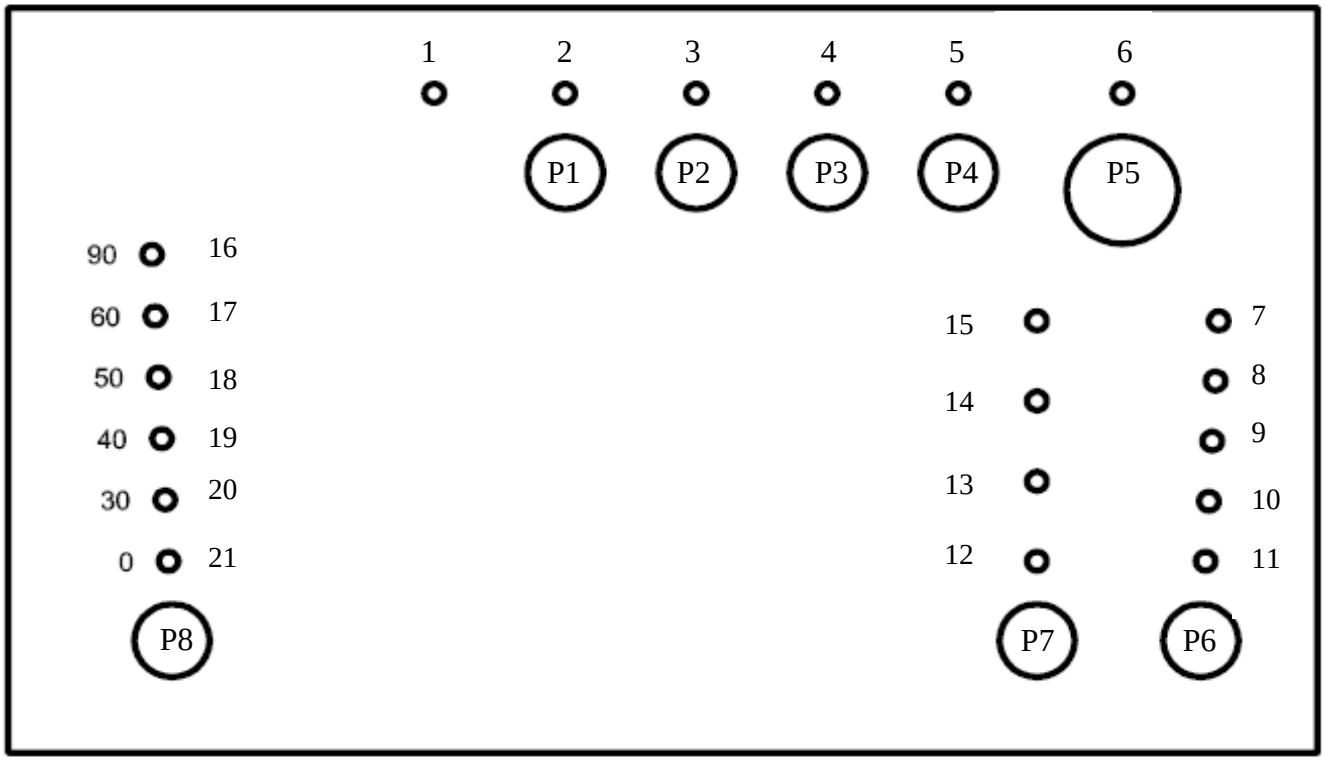


4.5 Control panel configuration

LED central knob model



LED lateral knob model



4.6 Buttons and LED

The functionality of each button is defined by the configuration o the machine.

LED version

- Button P1: this button is configurable and it is bound to LED 2. Generally it is associated to soak or special 7Kg function.
- Button P2: This button is configurable and it is bound to LED 3. Generally it is associated to the function of pre-wash
- Button P3: this button functionality is configurable and it is bound to LED 4. Generally it is associated to the extra-rinse function.
- Button P4: This button is configurable and it is bound to LED 5. Generally it is associated the rinse hold function.
- Button P5: This button is bound to LED 6 and it has the function of start or stop of selected programme.
- Button P6: This button is bound to LED 7 – 11; pressing the key sequentially the spin is varied from maximum to minimum.
- Button P7: This button is bound to LEDs 12 – 15; pressing the key sequentially the delay start of 9-6-4-2 hours is activated.
- Button P8: This button is bound to LEDs 16 – 21; pressing this sequentially the washing temperature is varied from 90°C to ambient temperature.
- Button P9: This button is configurable, optional and it is bound to LED 22.
- Button 10: This button is configurable, optional and it is bound to LED 23.

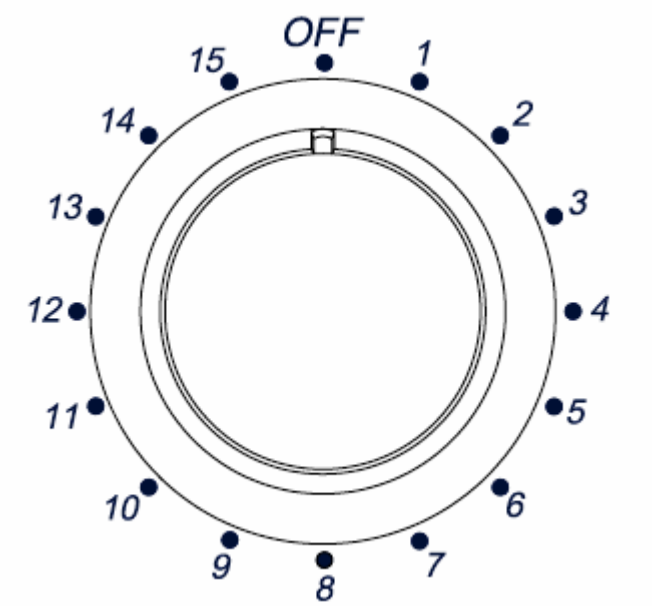
LED indicators in washing cycles

LEDs 12, 13, and 14 are used also to as indicators for the washing cycles.

Possible indications	
Pre-wash	It is illuminated in the active status if pre-wash is defined in the programme.
Main wash	It lights in the active phase.
Rinse	It lights in the active phase.
Spin	It lights in the active phase.
Extra rinse	It lights in the activated status if extra rinse is defined in the programme
Softener	It lights in the activated status if softener is defined in the programme.
Rinse hold	It lights in the activated status if rinse hold is defined in the programme and at the end of the cycle it blinks when the machine stops with water in the drum.
Door locked	It lights when the door safety system locks the door and it turns off when the door is unlocked.
Delay start	It lights in the activated status and blinks in the execution status.

4.6.1 Programme selector (S1)

The selector has 16 positions; from 0 to 15 with integrated ON/OFF. The various positions can be configured to perform different wash programmes. In the first position the machine is in the off state and the programme already in execution will be annulled. Compatible options and parameters are predefined for each programme.

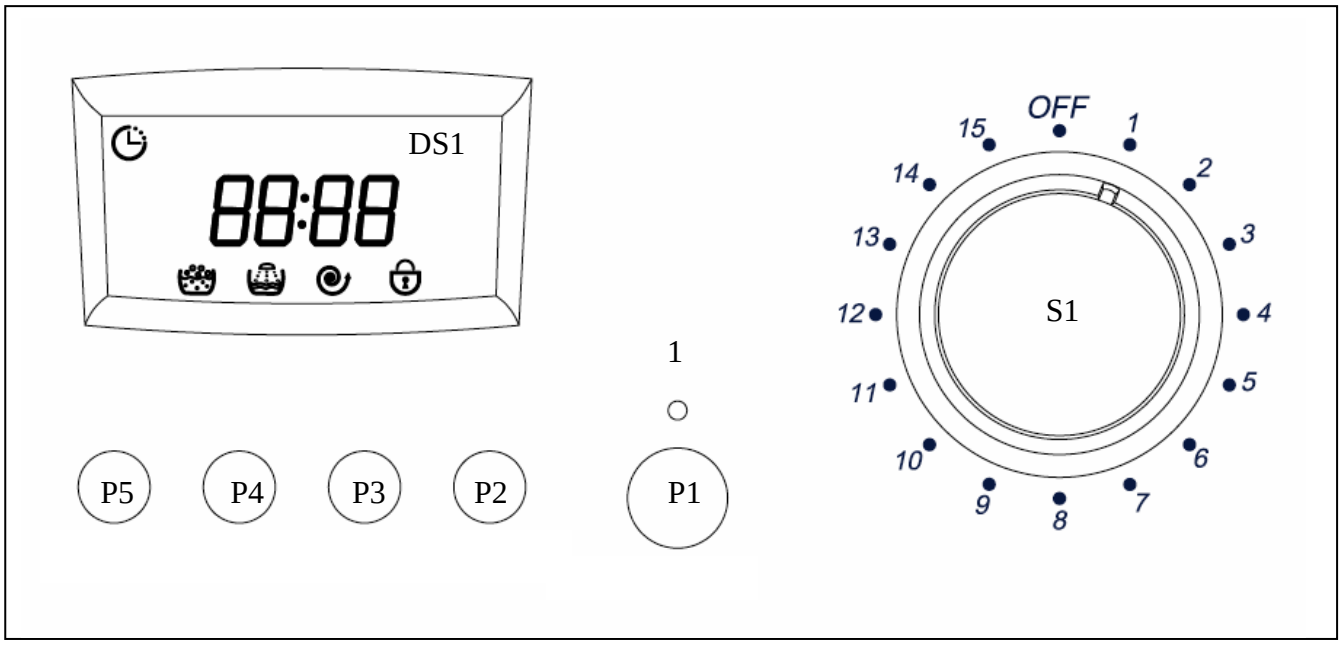


- Configuration of programmes

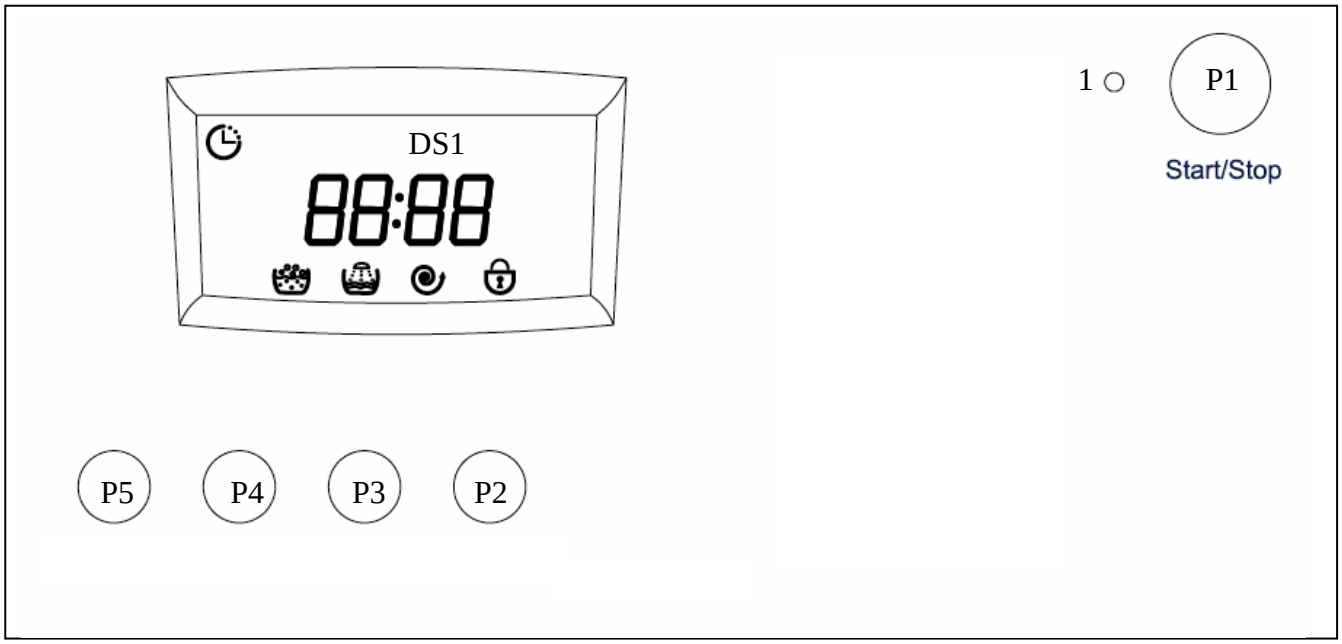
In the table bellow the parameters that can be used for the definition of the wash programme are indicated.

Type of fabric	Cotton, Synthetics, Delicates, Wool, Hand wash, Shoes.
Special programmes	Softener, Rinse, Delicate rinse, Drain, Delicate spin, Spin.
Temperature	Variable: up to 6 steps are selectable
Spin	Variable: up to 5 steps
LED unit options	From 3,5 Kg a 6 Kg Rinse hold, Pre-wash, Soak, Extra-rinse From 7Kg Rinse hold, Pre-wash, 7kg special, Extra-rinse.
LCD unit options	Rinse hold, Pre-wash, Soak, Extra-rinse, 7kg special, Extra-rinse if available, easy iron, economy, half load
Programme steps	Main wash, Rinse Spin, Delay start.

LCD central knob model



LCD lateral knob model



The washing programs and functions of the individual buttons vary for different models as are defined by the configuration of the machine.

4.7 LCD Version

- Button P1: This button is bound to LED 1 and has the function of starting or stopping the selected programme.

- Button P2: This button has the function of confirming the options selected o modified.

- Button P3: This button has the function of selecting the icons on the LCD display. The icons are selected in anticlockwise by pressing the key. This key also has the function of reducing the preset values for spin, temperature and delay start. Furthermore, it has the function of modifying the status of the options selected.

- Button P4: This button has the function of selecting the icons on the LCD display. The icons are selected in clockwise by pressing the key. This key also has the function of increasing the preset values for spin, temperature, delay start. Furthermore, it has the function of modifying the status of the options selected.

- Button P5: The button has the function of the icons or values highlighted.

- Button P6: This key is optional and it is bound to LED 2. It has the function of starting or stopping washing programmes.

- Button P7: This key is optional. It is bound to LED 3 and it is programmable.

- Button P8: This button is optional, bound to LED 4 and it is programmable.

- Button P9: This button is option and it has the function of selecting the icons on the LCD. The icons are selected in anticlockwise manner by pressing the key. This button also has the function of diminishing the preset values for spin, temperature, delay start and to modify the status of a selected icon.

- Button P10: This button is optional and it has the function of selecting the icons on the LCD display. The icons are selected in clockwise manner by pressing the button. This key also has the function to increase the preset values for spin, temperature, delay start and to modify the status of a selected icon

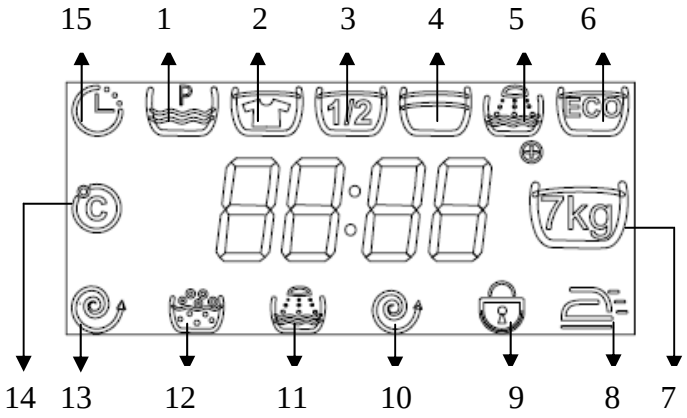
4.7.1 Navigation in LCD display:

Once the desired programme has been selected, it is possible to navigate through the display in clockwise or anticlockwise by pressing the +/- key to select the functions available for the programme. The selected function will blink and the OK key is pressed to render it active. From this moment the icon eases to blink and navigation can proceed with the +/- key.
For the variation of the washing settings, as well as for spin, temperature and delay start it is necessary to press the **Selector** key, + and – key to select the desired value and the OK key to confirm the choice.

Special function icons

The icons from:

- Number 1 to 8 represent the special functions;
- Number 10 to 12 represent the washing status;
- Number 13 to 15 represent the washing options.



- Icon number 1: This icon is bound to pre-wash function;
- Icon number 2: This icon is bound to soak function;
- Icon number 3: This icon is bound to half load function;
- Icon number 4: This icon is bound to rinse hold function;
- Icon number 5: This icon is bound to extra rinse function;
- Icon number 6: This icon is bound to economy function;
- Icon number 7: This icon is bound to 7 kg special;
- Icon number 8: This icon is bound to easy iron function
- Icon number 13: This icon is bound to option spin washing spin;
- Icon number 14: This icon is bound to washing option temperature;
- Icon number 15: This icon is bound to washing option delay start.

Washing phase icon indicators

Icons 12, 11 and 10 indicate the phases of washing

Possible indications	
Pre-wash icon	It illuminates in the active status if it is predefined in the programme.
Washing icon	It illuminates in the execution phase
Rinse icon	It illuminated in the execution phase.
Spin icon	It illuminates in the execution phase.
Extra rinse icon	It illuminates in the active status if it is predefined in the programme
Soak icon	It illuminates in the active status if it is predefined in the programme.
Rinse hold icon	It illuminates in the active status if it is predefined in the programme and at the end of the cycle it blinks when the machine comes to a halt water in the drum.
Door lock icon	It illuminates when the safety door device blocks the door from opening and it is turned off when is possible to open the door.
Delay start icon	It illuminates in the active status and blinks in the execution phase.
Half load icon	It illuminates in the active status if it is predefined in the programme.
Economy icon	It illuminates in the active status if it is predefined in the programme.
7 kg icon	It illuminate in the active status if the 7k function is predefined in the programme
Easy iron icon	It illuminated in the active status if the easy iron function is predefined in the programme.

At the end of washing programmes the machine emits three bips while END is written on the display, as shown in the photograph.

5 WASHING PROGRAMMES AND OPTIONS

5.1 Programmes

The programmes are selectable rotating the knob in both directions. The cancellation of the programmes already in execution is by pressing first the START/STOP key to bring the machine to pause, subsequently the knob is rotated take it to OFF position.

Programme		Temp. (°C)	Average time(min)	N° Rinse	Spin (r.p.m.)
1	**Cotton**	90	163	2	800/1000/1200 according to type of machine
		60	133		
		50	129		
		40	67		
		30	65		
		0	59		
2	**Synthetics**	60	106	4	800
		50	95		
		40	80		
		30	66		
		0	61		
3	**Delicates**	40	45	3	800
		30	42		
		0	44		
4	**Wool**	40	49	5	400/500 according to type of machine
		30	45		
		0	40		
5	**Intensive**	90/80/70/ 60	179	2	800/1000/1200 according to type of machine
		50	168		
		40	166		
		30	165		
		0	164		
6	**Economy**	40	79	4	800/1000/1200 according to type of machine
		30	78		
		0	78		
7	**Mix**	60	72	3	800
		50	72		
		40	72		
		30	71		
		0	71		

Programme		Temp. (°C)	Average time(min)	N° Rinse	Spin (r.p.m.)
8	**Rapid**	60	62	2	800/1000/1200 according to type of machine
		50	62		
		40	62		
		30	62		
		0	57		
9	**Hand wash**	50	71	4	400/500 according to type of machine
		40	71		
		30	71		
		0	71		
10	**Sport wear**	50	70	2	800
		40	70		
		30	70		
		0	73		
11	**Sport shoes**	40	54	2	100
		30	54		
		0	54		
12	**Rinse**	0	29	2	800/1000/1200 according to type of machine
13	**Delicate spin**	0	4	--	800/900 according to type of machine
14	**Spin**	0	7	--	800/1000/1200 according to type of machine
15	**Drain**	0	2	--	0

5.2 Options and programmes

In the following table are shown the possible options in each washing programme with their compatibility.

The options can be activated or deactivated by pressing the buttons in the correspondence of the icons' positions, before starting the programme.

			OPTIONS							
			Pre-wash	**Soak**	**Half load**	**Rinse hold**	**Extra rinse**	**Economy**	**7 Kg Special**	**Easy iron**
COMPATIBILY WITH PROGRAMMES	1	Cotton	♦	♦	♦	♦	♦	♦	♦	♦
	2	Synthetics		♦		♦	♦	♦	♦	♦
	3	Delicates				♦	♦			
	4	Wool				♦	♦			
	5	Intensive	♦	♦	♦	♦	♦	♦	♦	♦
	6	Economy								♦
	7	Mix	♦	♦	♦	♦	♦	♦	♦	♦
	8	Rapid			♦	♦	♦	♦	♦	♦
	9	Hand wash		♦	♦	♦	♦	♦	♦	♦
	10	Sport wear			♦	♦	♦			
	11	Sport shoes			♦	♦	♦			
	12	Rinse			♦		♦			
	13	Delicate spin								
	14	Spin								
	15	Drain								

♦ options selectable with programmes

5.2.1 Compatibility between options

		Options							
		Half load	Extra rinse	Rinse hold	Easy iron	Pre-wash	Soak	Economy	7Kg
Options	Half load	♦	x	♦	♦	x	x	♦	♦
	Extra rinse	x	♦	♦	♦	♦	♦	♦	♦
	Rinse hold	♦	♦	♦	♦	♦	x	♦	♦
	Easy iron	♦	♦	♦	♦	♦	♦	♦	♦
	Pre-wash	x	♦	♦	♦	♦	♦	x	♦
	Soak	x	♦	x	♦	♦	♦	x	♦
	Economy	♦	♦	♦	♦	x	x	♦	♦
	7Kg	♦	♦	♦	♦	♦	♦	♦	♦

♦ compatible and selectable options
x non compatible options and annul the other.

5.3 DESCRIPTION OF OPTIONS

RINSE HOLD
This function is used to stop the washing machine with water in the drum awaiting the start of the spin phase by pressing the appropriate button.

EXTRA RINSE
This function adds one rinse cycle to the standard cycles.

PRE-WASH
This function is used to carry out cold water washing before the main washing to eliminate stains.

½ LAOD
This function indicates to the machine that it has half the normal load (e.g. 2.5k), hence the machine automatically reduces its water in-take. The washing cycle duration remains unchanged.

ECONOMY
The temperature is reduced by 10°C to 30 °C in relation to the temperature setting.

7KG SPECIAL FUNCTION
This function increases washing time of the programme.

SOAK FUNCTION AMMOLLO
This function is used to soak the fabrics before the main washing cycle. The machine is automatically put to halt for 10 minutes before the washing phase.

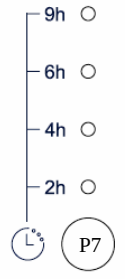
EASY IRON FUNCTION
This function facilitates ironing. This is achieved through al particular agitation in the spinning phase (delicate spinning at a reduced speed) hence avoiding over creasing of fabrics.

SPIN REDUCTION FUNCTION
It reduces the spin speed of all intermediate and final spins as indicated in the table.

SPIN EXCLUSION
It eliminates the all spinning cycles in the intermediate and final spin.

5.3.1 DELALY START
It retards the starting of the programme. The time is indicated by a blinking lead in the corresponding time, from the minimum of two hours to 9 hours for the LED version.
In the LCD version it numerically indicates the delay start time, which start from the minimum of 1 hour to the maximum of 24 hours.

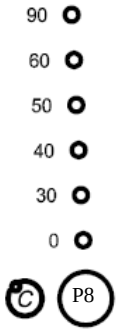
Example of “delay start” button LED version



5.3.2 Temperature regulation

- It allows for the selection of washing temperature compatible to the temperature limit of the cycle.
- It is available in the cycle selection phase. Once the cycle is launched, it is no longer possible to vary the setting.

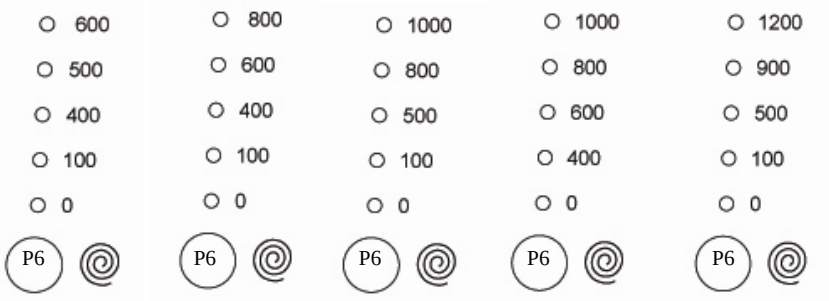
Example of “temperature regulation” button



5.3.3 Spin regulation

- It reduces the speed of all spins as indicated the table.
- On the zero position the spin of the intermediate and final spins are annulled.

Example of “spin regulation” button

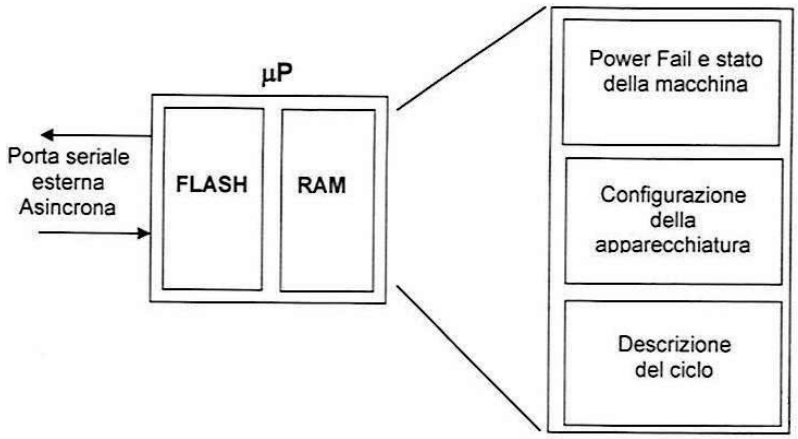


6 TECHNICAL CAHRACTERESTICS

6.1 Electronic control memory

6.1.1 General structure of memory system

The system is equipped FLASH memory in the microprocessor which allows for the writing of the configuration data, description of washing cycle and the status of the machine in case of abrupt interruption of power and other alarms.



6.1.2 FLASH

This area of the memory contains the “firmware” code corresponding to the device functionality:

- Management of electric load (motor, pump, electro-valve, etc)
- Management of sensors (motor speed, pressure switch, door status, etc)
- Management of users’ interface
- Management of serial interface
- Management of power failure and alarms
- Execution of washing programmes
- Power failure, i.e. necessary to restart the device in case of power failure:
- - washing cycle and options
- - Phase and sub-phase in progress
- Machine status, used to execute special cycles like:
- - Electrical test (used in assembly line)
- - Continuous cycles (used in factory’s laboratory)
- Machine configuration, the data contained in this portion of the memory define the characteristics of the model. The data are interpreted by the functional software. The variables are:
- - Type of machine (compact, slim, 5Kg, 7Kg)
- - Type of door safety device (instantaneous PTC)
- - Transition belt ratio between drum and motor pulley
- - Current frequency (50 Hz)
- - Type of electronic board (LED LCD)
- - Final spin speed (300 – 1400).
- Configuration of users’ interface:
- - Programmes for the selector
- Washing cycle table, every washing cycle is composed of various steps. The steps are basic instructions which compose the description of the cycle, common to different series of machines with the same characteristics.
- - water in-take
- - motor movement
- - Restoration
- - Heating
- - Drainage
- - Spinning
- - “if” condition……(options, temperature, etc)
- Configuration of washing cycle, for each family of washing machine some parameters relating to the washing cycle is defined.
- - functioning limits (current/frequency)
- - values of transition ratio
- - parameters for the management of the tachometric generator
- - Parameters of motor operation in mid-field
- - Unbalance control parameters
- - Algorithm for water up-take control
- - Alarm management system
- - sensors parameters

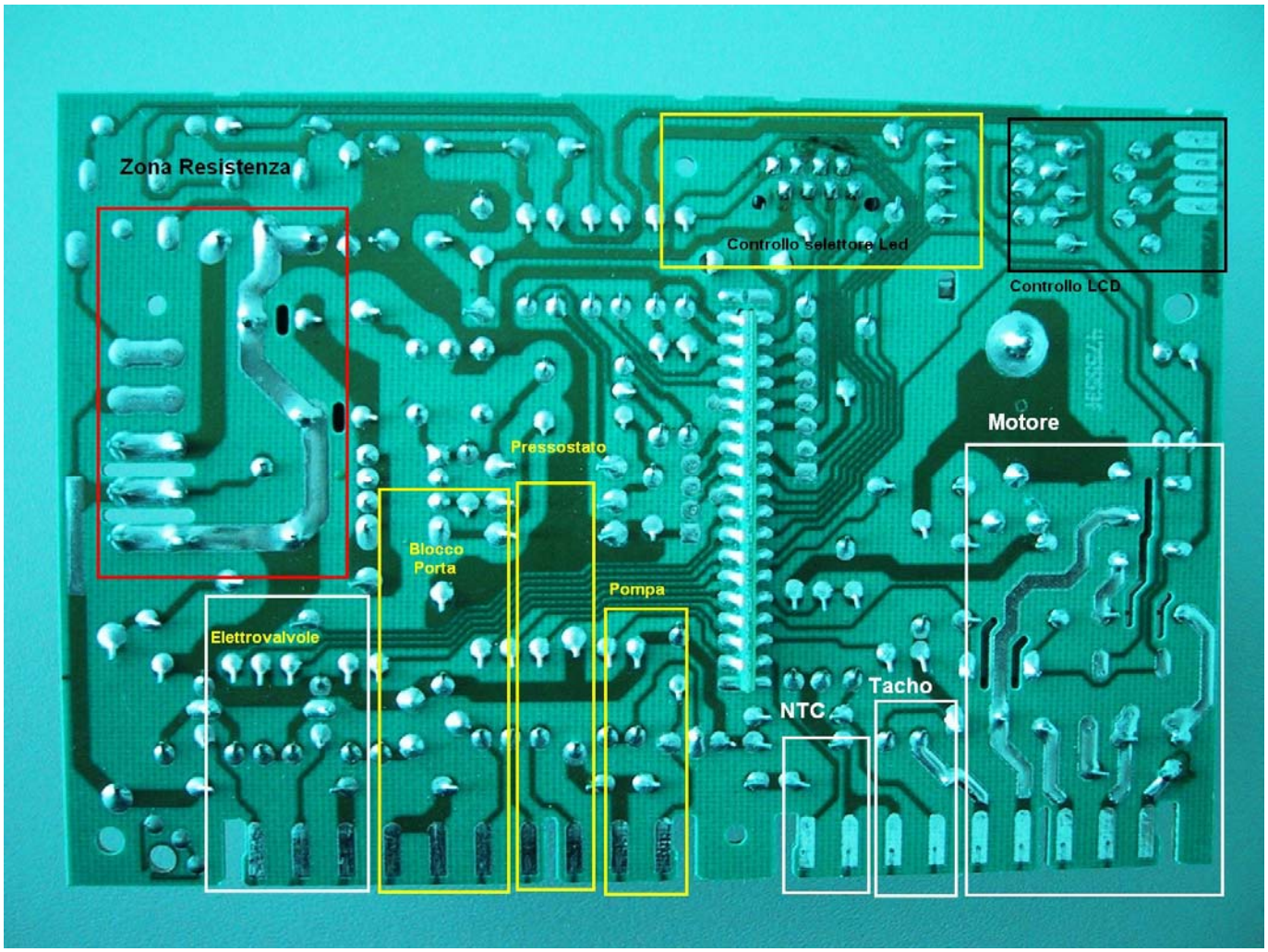
6.1.3 RAM

This memory contains the variables, i.e. all dynamic information that is used during the execution of a programme:

- Motor speed
- Water temperature
- Alarms
- Selected cycle
- Machine status

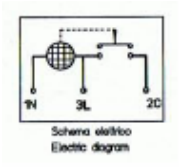
The memory is cancelled each time there is power failure or seizure (power failure or machine turned off).

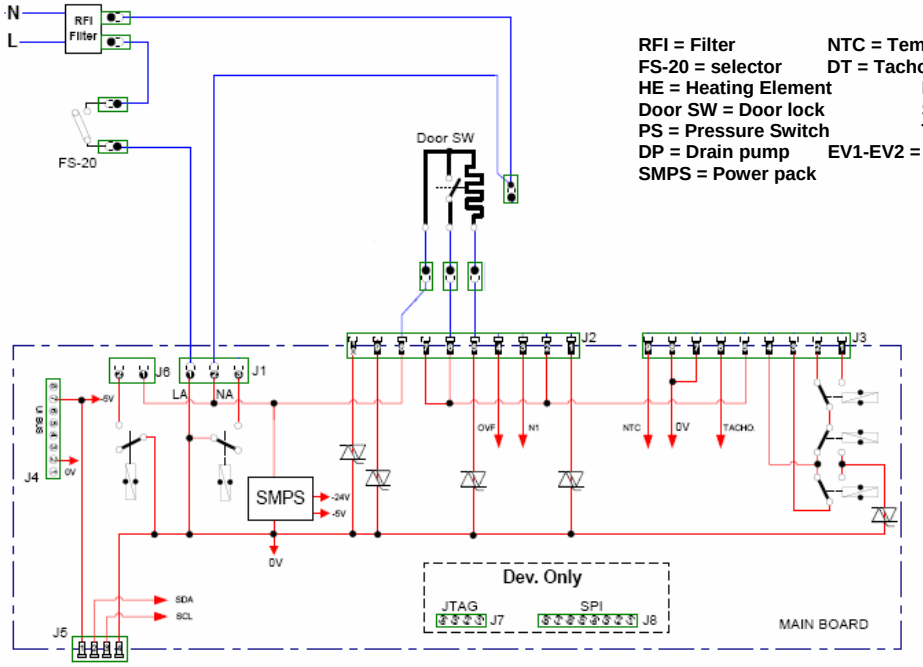
6.1.3.1 Power board section



6.2 Door safety device

This PTC volumetric device uses 1 – 3 minutes to unlock the door at the end of the cycle.





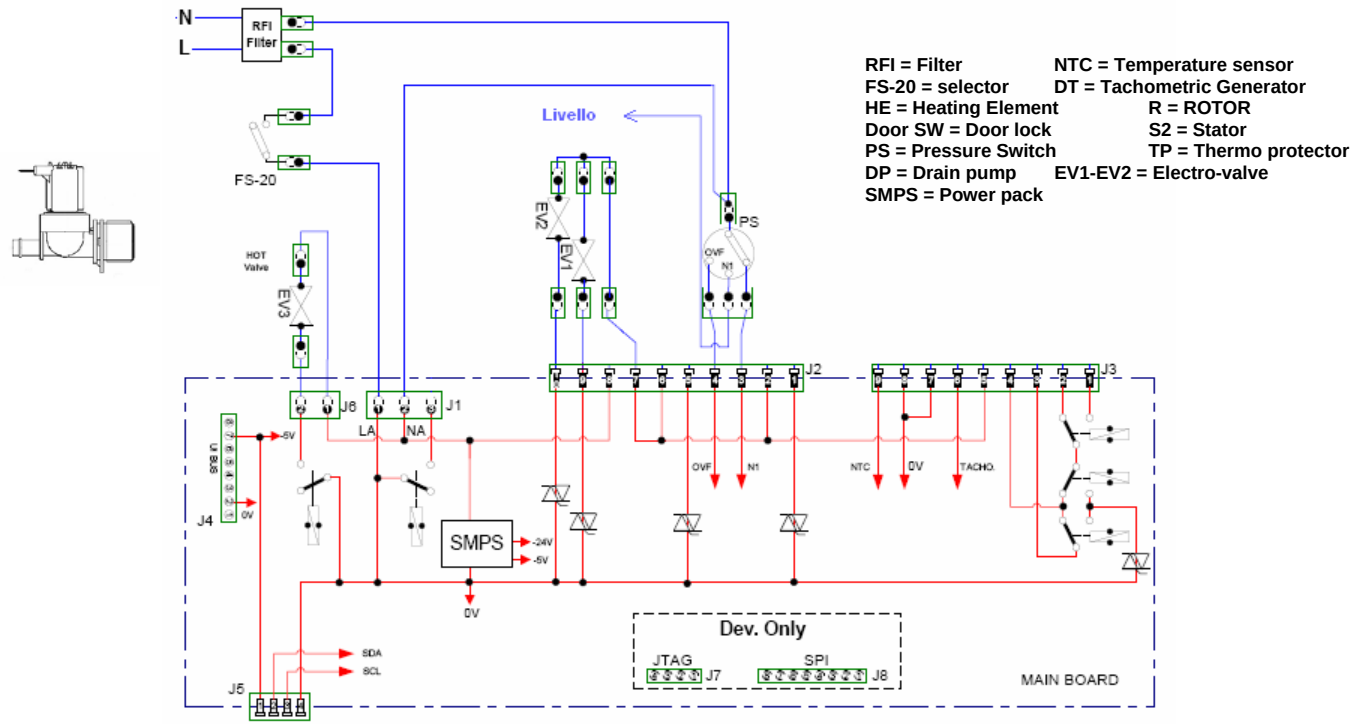
RFI = Filter **NTC = Temperature sensor**
FS-20 = selector **DT = Tachometric Generator**
HE = Heating Element **R = ROTOR**
Door SW = Door lock **S2 = Stator**
PS = Pressure Switch **TP = Thermo protector**
DP = Drain pump **EV1-EV2 = Electro-valve**
SMPS = Power pack

6.2.1 Functional principle

Once the programme has been launched by pressing the start/stop button, the bimetal PTC (contacts 1 – 3) is powered by the triac on the power board. After 2 to 4 seconds the switch (3-2) is bridged which powers the electrical components of the washing machine (only if the door is closed).
Door is prevented from open when the device is functioning. At the end of the programme, the electronic board cut-off power from the device, but the door remains still locked for 1 to 2 minutes (cooling time of the PTC).

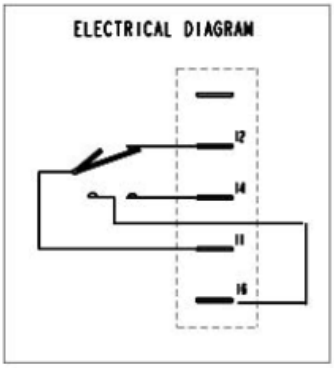
6.3 Water in-take system

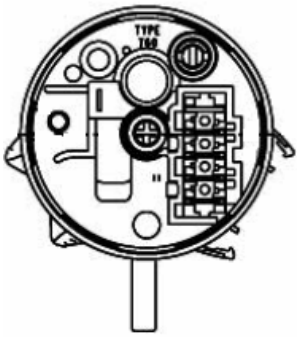
The electro-valves are powered by the electronic board through the triac and the control of water level in the drum is achieved through the mechanical pressure switch.



6.4 One level mechanical pressure switch for drum water level control

The mechanical pressure switch is a mechanical device which has the function of controlling the level of water in the drum.





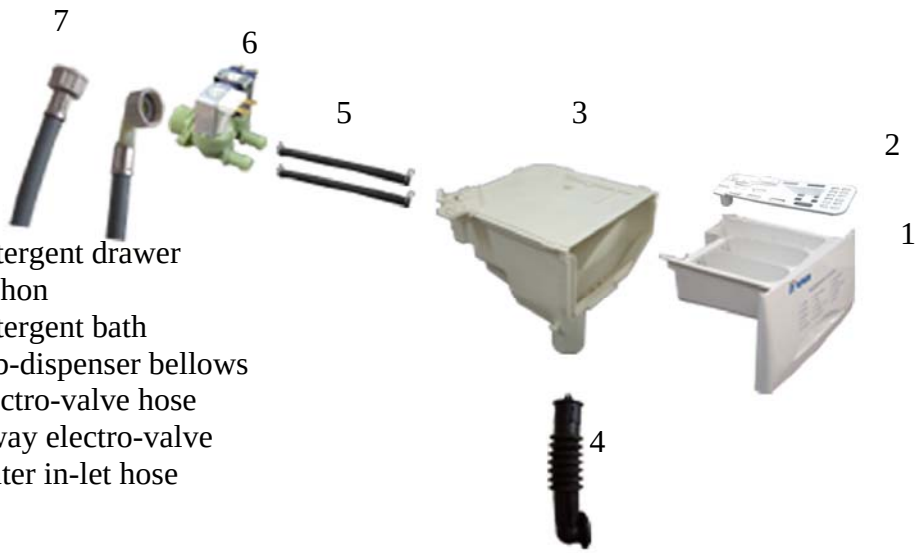
Level calibration		
Compact		
Full 87±3	Empty 62±3	Refill 320±3
5-6-7kg		
Full 95±3	Empty 70±3	Refill 320±3

The pressure switch is collected to the bell jar by a hose. When water is taken into the drum, a pressure is created within the hydraulic circuit which causes the drifting of the membrane. This drifting modifies the position of the pressure switch internal contact (11-12) to position (11-14). The electronic board at this point receives impulse from pin 14 and it recognises the quantity of water to take.

6.5 DETERGENT DISPENSER

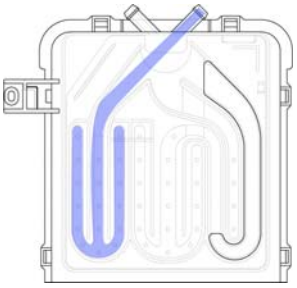
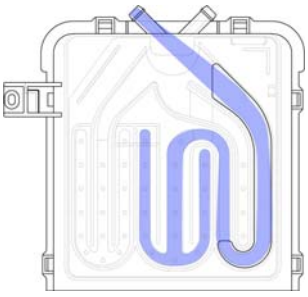
The detergent drawer is a three compartments (pre-wash, main wash, softener). The main composition and operation are indicated below.

6.5.1 RR Drawer

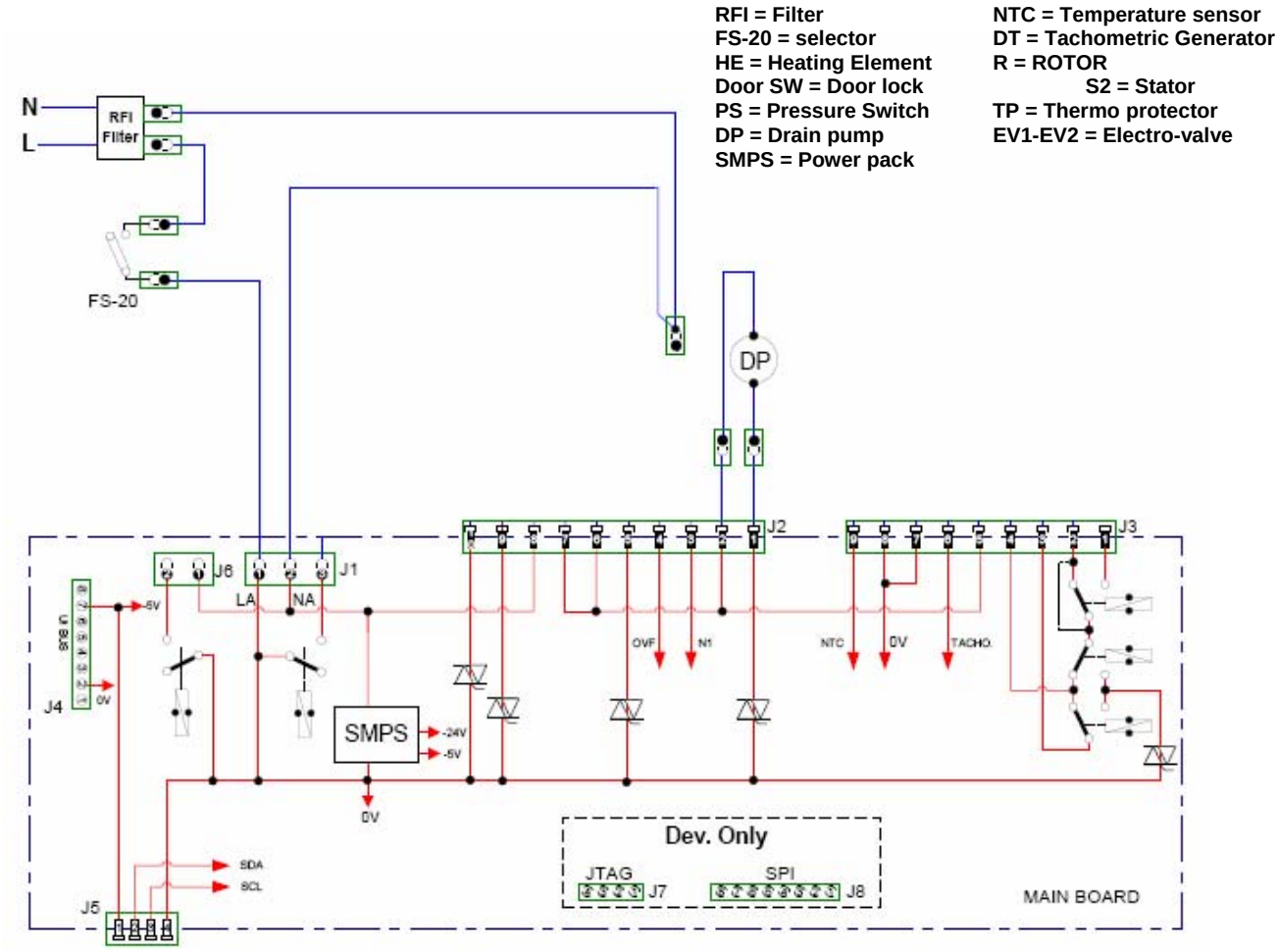


1. Detergent drawer
2. Siphon
3. Detergent bath
4. Tub-dispenser bellows
5. Electro-valve hose
6. 2-way electro-valve
7. Water in-let hose

6.5.1.1 Functional principle

Water up-take into pre-water compartment (Activation of electro-valve N°1) The detergent contained in the compartment is washed away at the beginning of pre-wash.	
Water up-take in the main wash compartment (Activation of electro-valve N°2) For all washing programmes, the main wash compartment is used to hold the detergent which washed away at the beginning of washing.	
Water up-take in the softener compartment (Activation of electro-valve N°1 e 2) For all the washing programmes, the softener compartment is used to hold the softener which is washed away at the beginning of the last rinse.	

6.6 Drain pump



Motor pump resistivity values

Resistance (Ω)	Wire thickness	Number of turns
160 +/-7%	0.21 mm	1800 (x2)

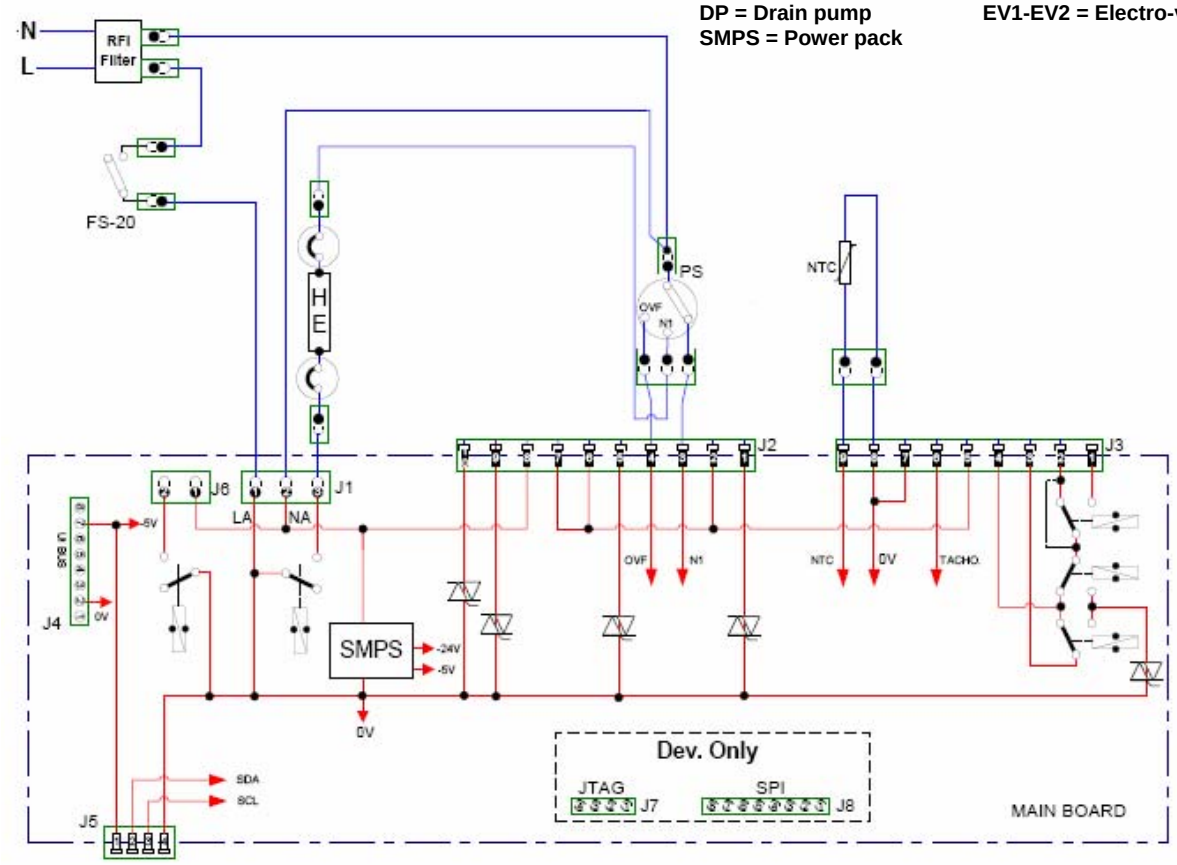
The electronic board powers the drain pump through a triac in the following way:

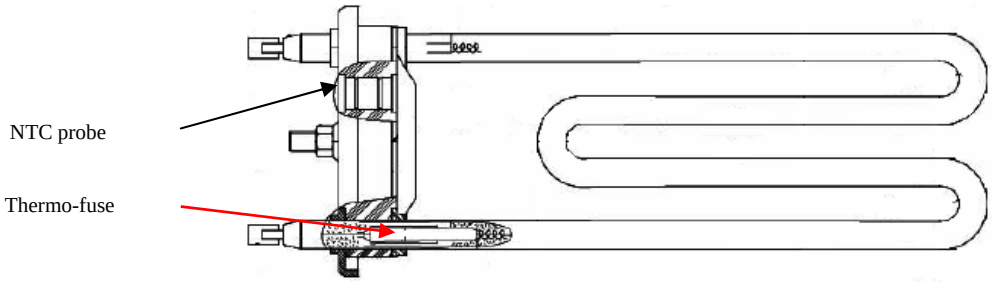
- at the end to mechanical pressure switch activation in the empty status, there after a time trigger is launched or it passes to the next step.
- if the pressure switch is not in the empty state , an alarm is launched after 5 minutes.

6.7 Heating

RFI = Filter
FS-20 = selector
HE = Heating Element
Door SW = Door lock
PS = Pressure Switch
DP = Drain pump
SMPS = Power pack

NTC = Temperature sensor
DT = Tachometric Generator
R = ROTOR
S2 = Stator
TP = Thermo protector
EV1-EV2 = Electro-valve



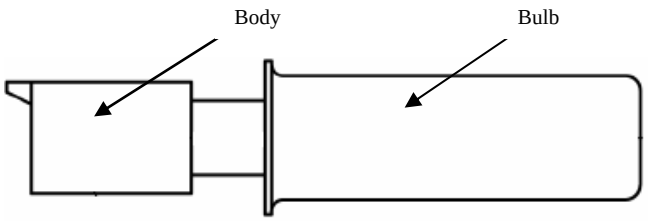


The heating element is powered by a relay (DS04) on the electronic board. It is equipped with a thermo-fuse, with which it interrupts heating in case of emergency when the level of heating surpasses the calibrated values.

In case of substitution of the heating element, it must be substituted with one having the same characteristics so the safety is not compromised.

6.8 Temperature probe

The temperature is controlled by the electronic board through an NTC temperature probe integrated to base of the heating element.

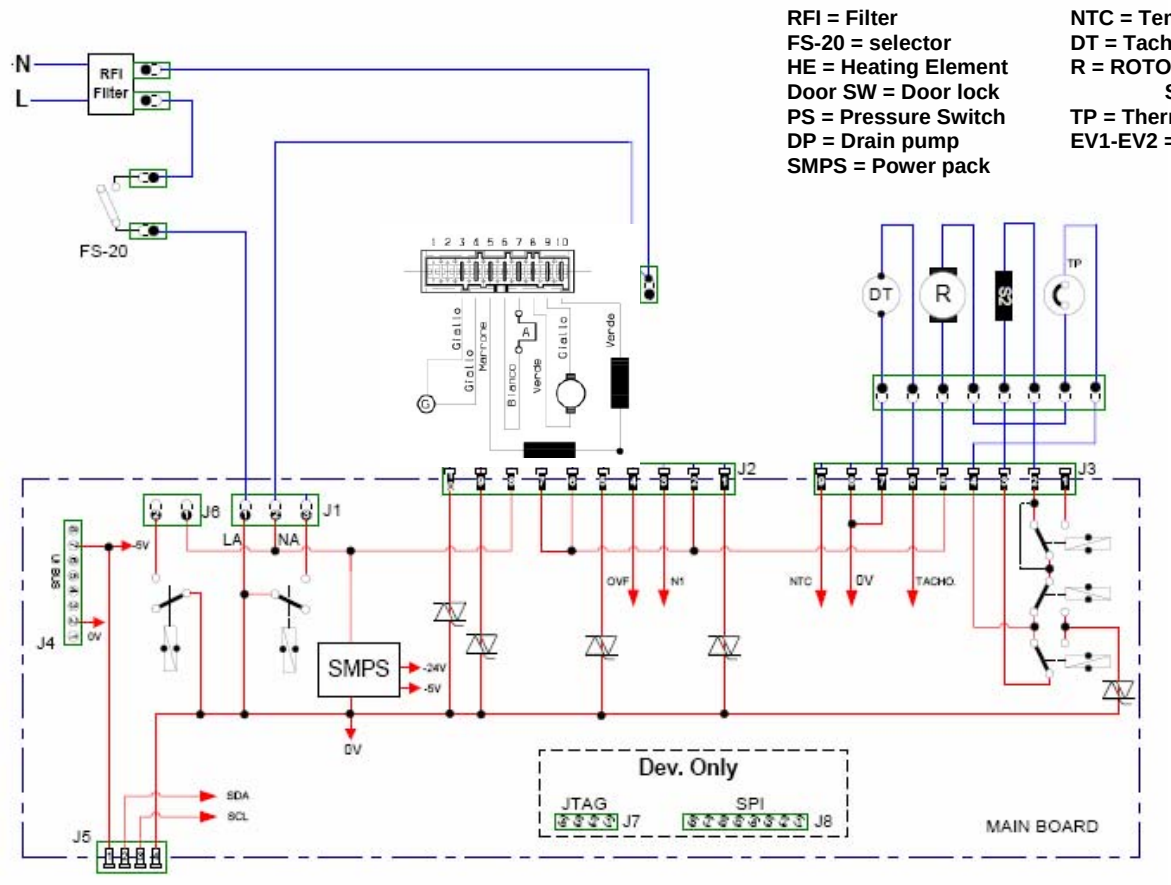


0 °C	30 °C	40 °C	50 °C	60 °C	70°C	95°C
35.975	9.786	6.653	4.608	3.243	2.332	1.093
±5.8%	±3.7%	±3.1%	±2.6%	±2.0%	±2.5%	±3.7%

6.9 Motor

RFI = Filter
FS-20 = selector
HE = Heating Element
Door SW = Door lock
PS = Pressure Switch
DP = Drain pump
SMPS = Power pack

NTC = Temperature sensor
DT = Tachometric Generator
R = ROTOR
S2 = Stator
TP = Thermo protector
EV1-EV2 = Electro-valve



600/800 r.p.m. motor resistance values

		Widerstand (Ω) (Resistance)		Drahtdicke (mm) (Wire-diam./ -insulation)		Windungszahl (number of turns)
Wicklung						
Polpaket	(Stator)	2,85	± 8 %	0,8	L	2x185 Wdg.
Läufer	(Rotor)	2,85	± 8 %	0,5	2L	18 Wdg./coil
Generator	(Gen.)	135	± 10 %	0,09	L	620 Wdg

1000 r.p.m. resistance values

		RESISTANCE ±7% (OHM)	WIRE DIAMETER (mm.)	COILS
WINDING:	FIELD	1,47	0,95	112 + 112
	ARMATURE	2,06	0,56	36 x 13
	TACHOGENERATOR	184	0,09	760

1200 r.p.m. motor resistance values

		RESISTANCE ±7% (OHM)	WIRE DIAMETER (mm.)	COILS
WINDING:	FIELD	1,05	1,06	95 + 95
	ARMATURE	1,60	0,60	36 x 11
	TACHOGENERATOR	184	0,09	760

6.10 Motor power

The electronic board powers the motor through a triac. Reversing the direction of rotation is obtained by switching the contacts of two relays (KL01-KL02) which varies the connection between rotor and stator.
In some models, a third relay (KL03) is used to power full or half stator field depending on the spin speed.
The speed of the motor is controlled by the signal of the tachometric generator. In spin step the microprocessor controls the anti-foam and the of unbalance.

6.11 Unbalance control - FUCS

The unbalance control is in a dynamic manner through an electronic **F**ast **U**nbalance **C**ontrol **S**ystem – FUCS. Such a control is in the initial step of spinning a 130 r.p.m for about 20 seconds. The value of unbalance detected is matched against the limit predefined. If the data is less or equal to the limit, the spin increase up to the maximum for the machine (see figure 1).

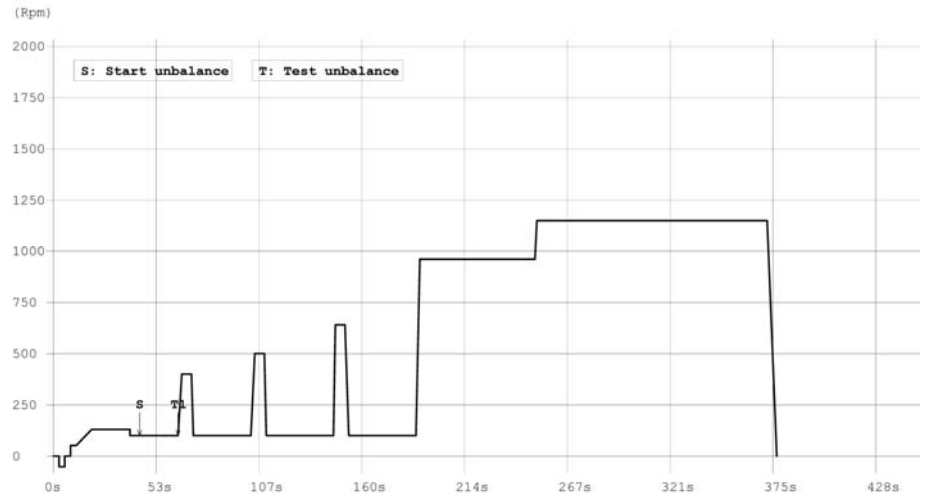


Figure 1

In case the value is greater than that the predefined, the machine makes a series of attempts during which it dynamically verifies the unbalance values. The attempt steps to eliminate unbalancing are identified as T_1 and T_2 (see figure 2).

In the T_1 step, if the unbalance value is lesser or equal to the preset data for the T_1 unbalance, the machine make the normal spin up to the maximum. In the T_1 step there are six possible trial. In case the machine fails to make normal spin the T_1 step, it passes automatically to the T_2 step. In this second step there are four possible trials for reduced spin. If the value of unbalance is greater than the value for the T1 and lesser than or equal to the T2 value the machine makes a reduced spin. No spin is registered in a situation where the value in the T2 step is higher than the preset.

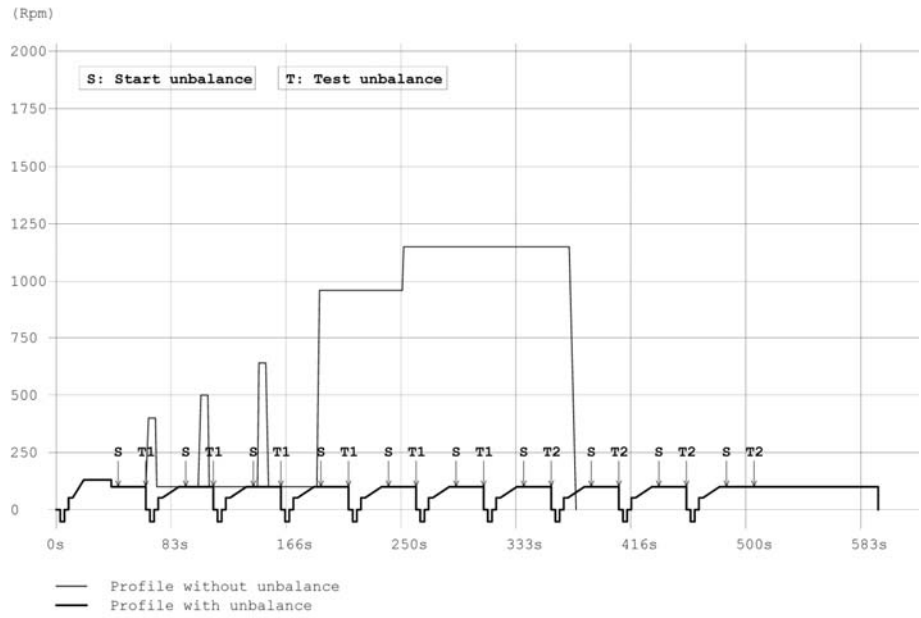


Figure 2

The charter explains the procedure for activating various test programmes.

7.1 Service test

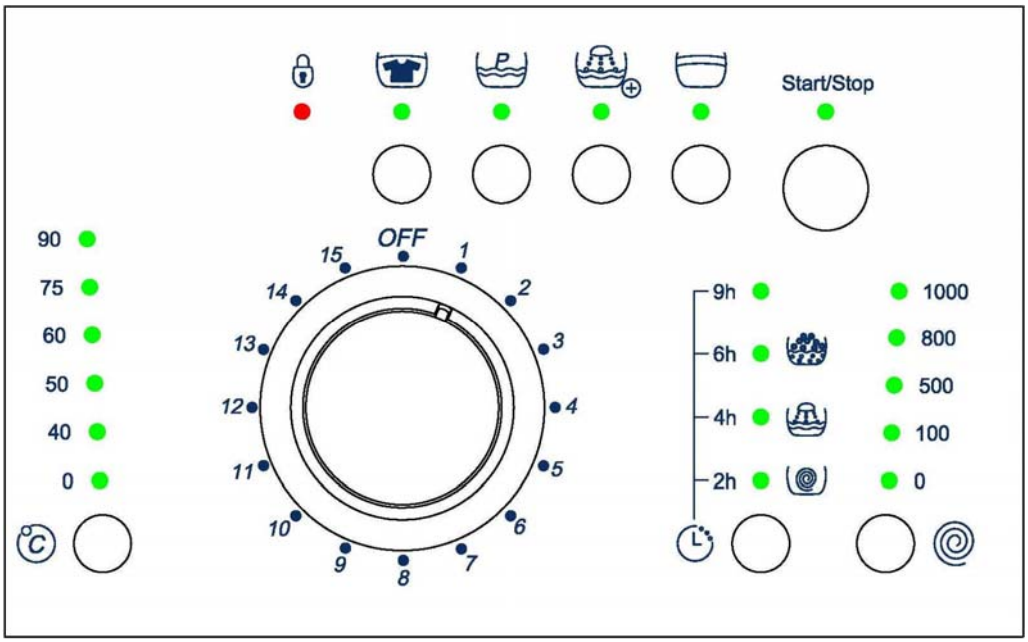
This describes the modality for activating the programme for verifying either function test in production line or in repairs.

→ Access mode:

_ Position the programme section knob on **ON/OFF**
_ Hold press the S**TART/STOP** button
_ Position the programme selection knob on **1**
_ Wait for 15 - 20 seconds
_ Release the **START/STOP** button.

→ Interface behaviour:

All led will be blinking



→ Washing machine activity

→ The duration is 135 seconds, the machine is left on programme1 ready for use.

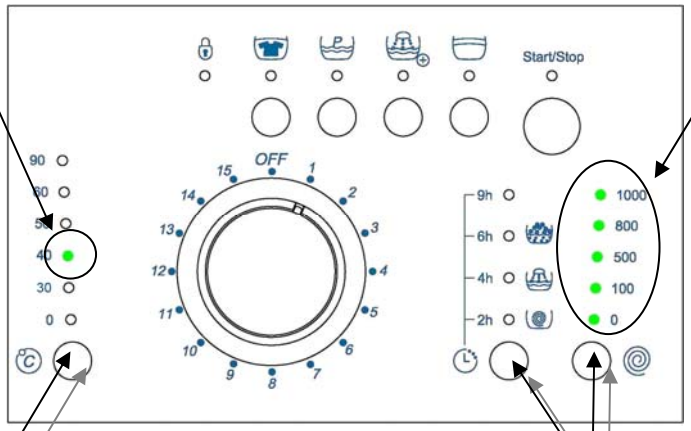
7.2 LIFE TEST

→ Access mode:

- _ Position the programme selection knob on **ON/OFF**
- _ Hold press the **START/STOP** button
- _ Position the programme selection knob on 3
- _ Wait for 15 - 20 seconds
- _ Reposition the programme selection knob on **1**
- _ Release the **START/STOP** button.

→ Interface behaviour:

A lamp of temperature and all the lamps of the spin will light



Temperature regulation is possible

Not regulatable

→ Washing machine activity

- execute one cotton 40 °C complete washing cycle
- rinse
- spin

At the end of the cycle it repeats the cycle for an infinite times.

→ To exit the programme, take the knob to OFF position.

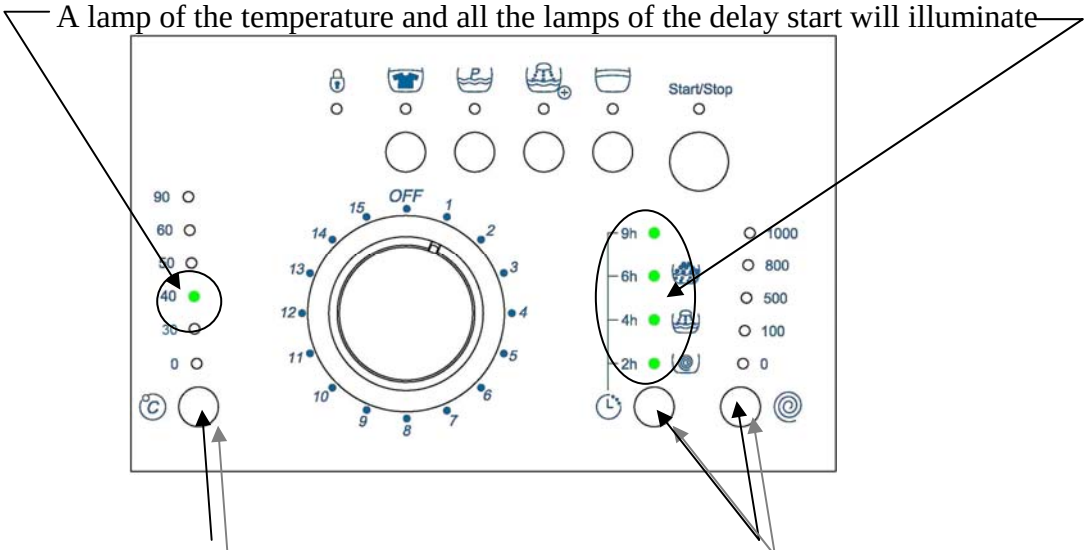
7.3 STATISTICAL TEST

→ Access mode:

- _ Position the programme selection knob on **ON/OFF**
- _ Hold press the **START/STOP** button
- _ Position the programme selection knob on **4**
- _ Wait for 15 - 20 seconds
- _ Reposition the programme selection knob on **1**
- _ Release the **START/STOP** button.

→ Interface behaviour:

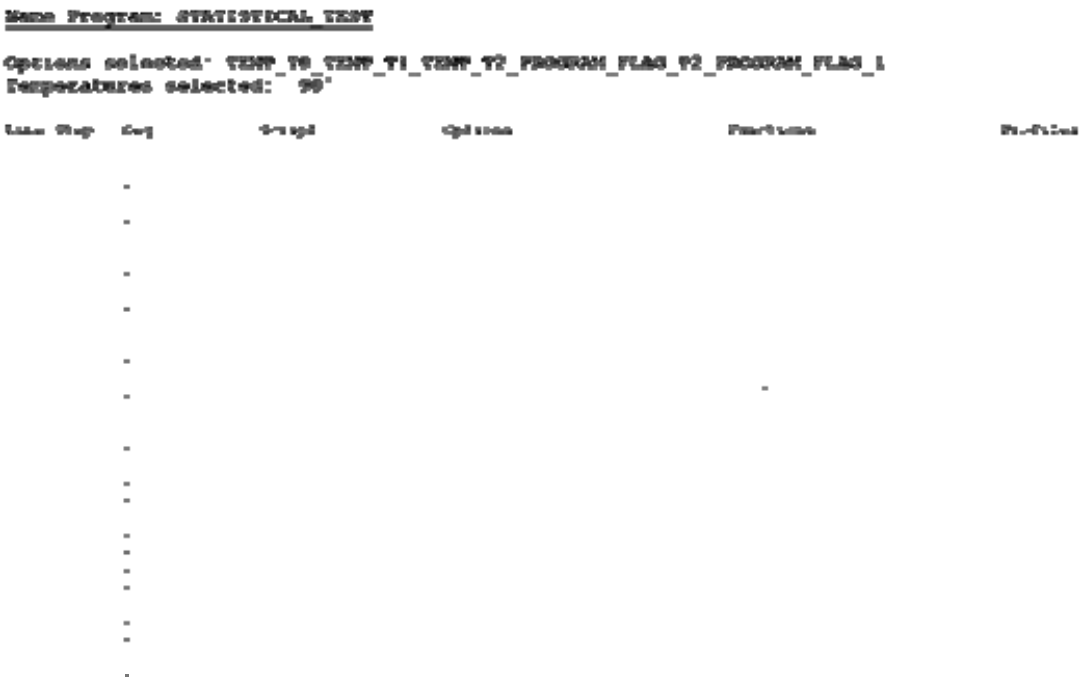
A lamp of the temperature and all the lamps of the delay start will illuminate



Regulation of the temperature is possible

Not regulatable

→ This programme executes only one cotton washing cycle with a duration of 49 minutes.



8 ALARMS

All faults are indicated by an error code which is indicated on interface board (LED or LCD). When an error is detected, the code is indicated by one or more blinking leds. If the machine is turned off the alarm will be cancelled because the are not memorised.

The type alarm identified depends on the nature of the fault.

Fault description	Error code	Available interface		Possible remedy	Status
		LED spin section	LCD		
FAUTLY SELECTOR	0	o o o o •	"Sel"	1) Verify the connection between the LCD or LED and the power board. 2) Check the connecting cable 3) Substitute the LED or LCD board 4) Substitute the power board	Machine remains still with door unlocked
FOAM SENESORE	1	o o o • o	None	1) Make many rinse 2) Check the pressure switch hose 3) Check the tub-pump bellows and eco-ball 4) Check the air trap bell jar 5) Substitute the pressure switch	Machine door remains locked
NTC OUT OF TOLLERANCE	2	o o o • •	"F2"	1) Check the connector on the NTC sensor 2) Check the connector on the power board 3) Measure the value of the NTC at empty drum at room temperature and compare the reading with data of sensor, and eventually substitute it 4) Substitute the power board	The machine stops with the door locked
HEATING FAILURE	3	o o • o o	"F3"	1) Check the connection of the heating element 2) Check the connection on the power board 3) Check the continuity of the resistance and eventually substitute it if the circuit is open or short circuited. 4) Check the NTC at empty drum as indicated in the table and if necessary substitute it. 5) Substitute the power board.	The machine stops with the door locked
DRAIN FAILURE	4	o o • o •	"F4"	1) Check the adequacy of the discharge (height, fluidity, blockages or bottlenecks) 2) Check the drain pump connection 3) Check the resistivity of the pump as indicated in the table and if necessary substitute it in presence of broken or short circuit. 4) Check the connection on the power board 5) Substitute the power board	The machine stops with the door locked

Fault description	Error code	Available interface		Possible remedy	Status
		LED spin section	LCD		
PRESSURE SWITCH LEVEL FAILUR	5	o o • • o	“F5”	1) Check the pressure switch connection 2) Check the connection on the power board 3) Check the pressure switch hose that is not disconnected or has bottleneck 4) Substitute the pressure switch 5) Substitute the power board	The machine takes water for six minutes after which it stops with the door locked
MOTOR FAILURE	6	o o • • •	“F6”	1) Check the motor connection 2) Check the connection on the power board 3) Substitute the power board 4) Substitute the motor	The machine stops with the door locked
POWER FREQUENCY OUT OF TOLLERANCE	7	o • o o o	“F7”	1) Check the frequency stability of the power supply 2) Change the power supply filter 3) Substitute the power board	The machine stops with the door locked
OVERFLOW SENSOR	8	o • o o •	“F8”	1) Check the pressure switch hose 2) Check the pressure switch connection 3) Check the connection on the power board 4) Check the pressure switch and if necessary substitute it 5) Substitute the power board	The machine stops with the door locked
TACHOMETRIC ERROR	9	o • o • o	“F9”	1) Make sure it is due to motor overheating. Wait for 10 minutes restart the machine 2) Check motor connection 3) Check the connection on the power board 4) Check the resistance value of the tachometer as indicated in the table, in case of error substitute the motor 5) Substitute the power board	The machine stops with the door locked
DOOR LOCK COMAND FAILURE	10	o • o • •	“ F10”	1) Check the connection on the door lock 2) Check the power board connection 3) Substitute the door lock 4) Substitute the power board	The machine stops with the door unlocked
DOOR LOCK CONTACT FAILURE	11	o • • o o	“door ”	1) Check door lock connection 2) Check the connection with the power board 3) Substitute door lock 4) Substitute power board	The machine stops with the door unlocked

Fault description	Error code	Available interface		Possible remedy	Status
		LED spin section	LCD		
TRIAC SHOR CIRCUIT	12	o • • o •	"F12"	1) Check the connection on the motor 2) Check the connection on the power board 3) Check value of the resistance of the tachometer as indicated in the table attached, if error occurs substitute the motor 4) Substitute the power board	The machine stops with the door locked
VARIANT ERROR	13	o • • • o	"F13"	1) Make sure the power board matches the interface LED or LCD board 2) Substitute the LED or LCD 3) Substitute the power board	The machine stops with the door unlocked
POWER BOARD EEPROM FAILURE	14	o • • • •	"F14"	1) Substitute the power board	The machine stops with the door unlocked

8.1 List of alarms

The following alarms are managed in by the washing machine:

Description of alarms	*Priority
Selector failure	1
Foam present	2
NTC failure	3
Heating element failure	4
Pump failure	5
Electro-valve failure	6
Motor relay failure	7
Power supply disturbance	8
Overflow failure	9
Tachometric failure	10
Triac , door lock command failure	11
Door lock failure	12
Motor triac failure	13
Variant failure	14
I2C failure	15

*The priority (1: low, 14 : high): is used if two or more alarms appear at the same time. In this case the alarm with the highest priority appears first.

8.1.1 Detection of alarms

SELECTOR FAILURE Code 0

Use : problems of selector del selector

Input : To detect this alarm the level current out put from the selector.

This is alarm is detected in the case where the selector is on dead position or it is not connected.

Foam alarm Code 1

Use : foam management
Input : To detect this alarm the first water level N1 is used.
The alarm is detected when the first water level N1 is detected in spin step.

NTC failure Code 2

Use : NTC in open circuit/short circuit
Input : an impulse corresponding to the value of the NTC is use
The is failure is detected if the value is lesser than -20°C or greater than 120°C.

Heating element failure Code 3

Use : Heating element error
Input : the NTC value is used to detect the failure
In the heating step the temperature is controlled very 15 minutes, if the temperature do not increase by 2°C an error will be signalled.

Drain time out Code 4

Use : Problems of drainage pump
Input : The difference between the pump activation time and the first level filling time is used to detect the error. Upon activation of the pump a reverse time clock of three minute is launched. If at the end of the this time the first level filling is not detected the machine will give the signal of drain problem.

Filling time out Code 5

Use : problems of electro-valve
Input : the difference in the time of activation of electro-valve and the first level filling is used to detect this error. When EV_1 and EV_2 are activated a reverse clock of 6,5 minutes is launched. If the time finishes before the level N1 is detected, an error will be signalled.

Motor failure code 6

Use : problems with motor command
Input : it is used to signal tachometric fault.
When the motor command is in off position and the speed of the motor is found to more than 0 rpm a reverse clock of 3 minutes in launched. If the time terminates but the speed is still different from 0 rpm an alarm is triggered.

High disturbance in power frequency Code 7

Use : problems of power supply frequency
Input : input synchronism of current
It is detected as an error if the current frequency in lower than 44.5Hz or higher than 665.5Hz.
When synchronisation of current should disappear, this will be signalled as an error.

Over flow failure Code 8

Use : check the presence of valve/overflow level
Input : The corresponding signal for the water level status from the pressure switch is used.
The error is launched when the value of overflow is detected.

Tachometric failure Code 9

Use : problems of tachometric input
Input : it uses the tachometric impulse
When motor command is activated a reverse clock of 3 minutes is launched. If at the end to the time the speed of the motor remains 0 rpm, this alarm then appears.

Triac door lock failure Code 10

Use : error on door lock triac
Input : it uses impulse corresponding to the triac status
The error is detected :

- if the command is off and the return input is on
- if the command is on and the return input is off

Door lock failure Code 11

Use : error on the door lock input
Input : the impulse of the door lock status is used
When a programme is started a reverse clock of 5 minutes is launched.
If the time finishes before the activation of the door lock an alarm is detected.

Motor triac short circuit failure Code 12

Use : problems on the motor triac command
Input : an impulse corresponding to the triac status is used
The failure is detected if driving triac is short circuited.

Variant failure Code 13

Use : problems on the definition of variants.
Input : reading of the variants in the initialization step.
As soon the variants are read by the E^2PROM, it controls the *checksum* and compares 16 times with the *checksum* placed at the main stream of the variants. If these two *checksum* are different an error will be detected.

I2C failure Code 14

Use : problems of communication with I2C.
Input : I2C request exchange, particularly in the step of variant reading and initialization of the system.
An error is detected if the variant reading by the I2C does not occur.

8.1.2 Programme alarms detection

All the alarms are not detected in all modes (selection, excursion …). The following tables summarise the compatibility, excursion modes and programmes.

Alarm	Initialization	Selection	Delay start	Execution	Pause	End of cycle
Selector failure	N/A	X	N/A	N/A	N/A	X
Foam presence	N/A	N/A	N/A	X	N/A	N/A
NTC failure	N/A	N/A	N/A	X	N/A	N/A
Resistance failure	N/A	N/A	N/A	X	N/A	N/A
Pump failure	N/A	N/A	N/A	X	N/A	N/A
Electro-valve failure	N/A	N/A	N/A	X	N/A	N/A
Motor relay failure	N/A	N/A	N/A	X	N/A	N/A
Current disturbance	N/A	X	X	X	X	X
Over flow failure	N/A	X	X	X	X	X
Tachometer failure	N/A	N/A	N/A	X	N/A	N/A
Triac command door lock failure	N/A	X	X	X	X	X
Door lock failure	N/A	N/A	N/A	X	N/A	N/A
Motor triac failure	N/A	N/A	N/A	X	N/A	N/A
Variant error	X	N/A	N/A	N/A	N/A	N/A
I2C failure	X	X	X	X	X	X

X *Detectable*
N/A *Non applicable*

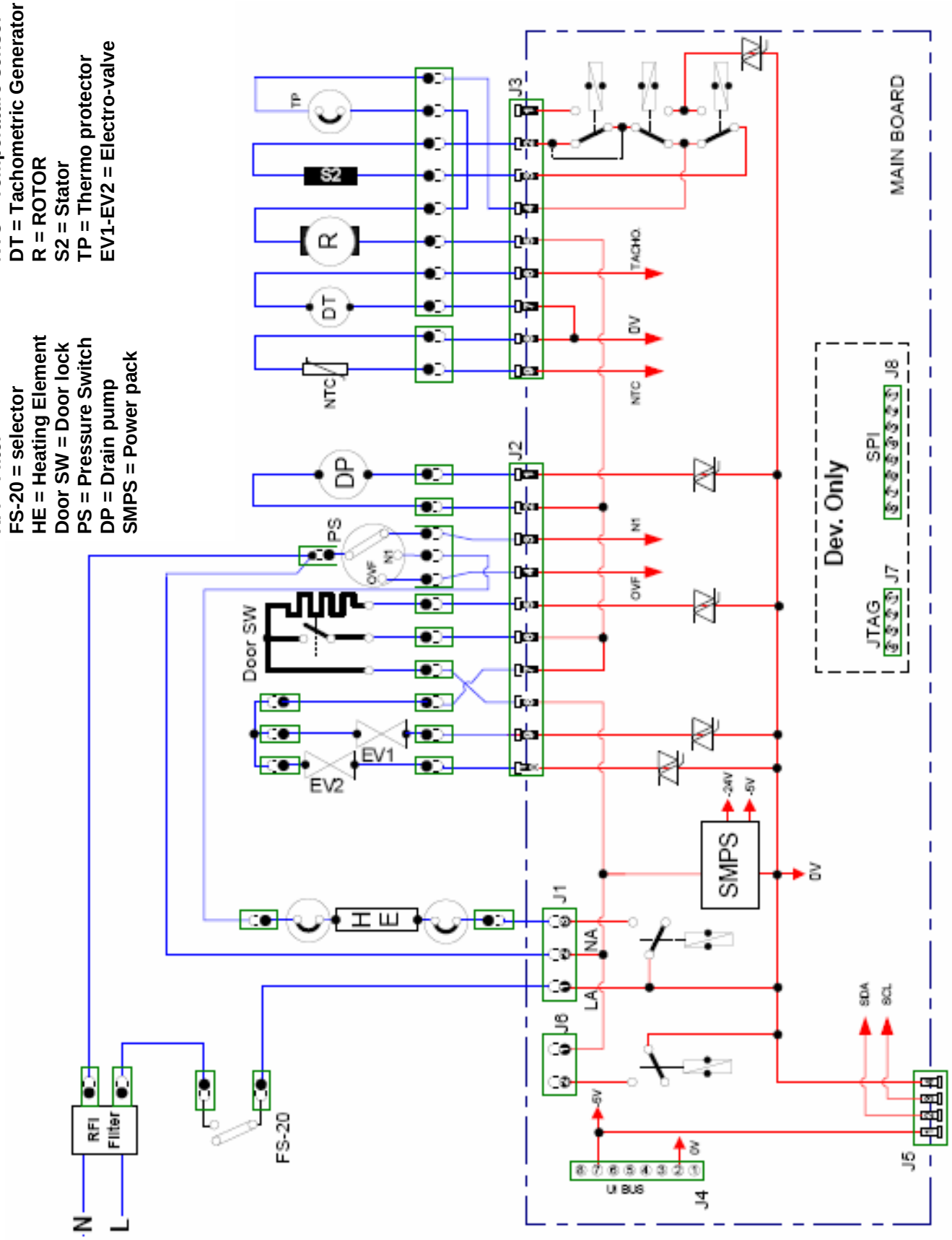
Alarms	Pre-wash	Soak	Main wash	Rinse	Rinse hold	Spin
Selector failure	N/A	N/A	N/A	N/A	N/A	N/A
Foam presence	N/A	N/A	X	X	N/A	X
NTC failure	X	X	X	X	X	X
Resistance failure	X	N/A	X	N/A	N/A	N/A
Pump failure	X	N/A	X	X	N/A	X
Electro-valve failure	X	N/A	X	X	N/A	X
Motor relay failure	X	N/A	X	X	N/A	X
Current disturbance	X	X	X	X	X	X
Over flow failure	X	X	X	X	X	X
Tachometer failure	X	N/A	X	X	N/A	X
Triac command door lock failure	X	X	X	X	X	X
Door lock failure	X	X	X	X	X	X
Motor triac failure	X	X	X	X	X	X
Variant error	N/A	N/A	N/A	N/A	N/A	N/A
I2C failure	X	X	X	X	X	X

X *Detectable*
N/A *Non applicable*

9 Washing machine main circuit

NTC = Temperature sensor
DT = Tachometric Generator
R = ROTOR
S2 = Stator
TP = Thermo protector
EV1-EV2 = Electro-valve

RFI = Filter
FS-20 = selector
HE = Heating Element
Door SW = Door lock
PS = Pressure Switch
DP = Drain pump
SMPS = Power pack



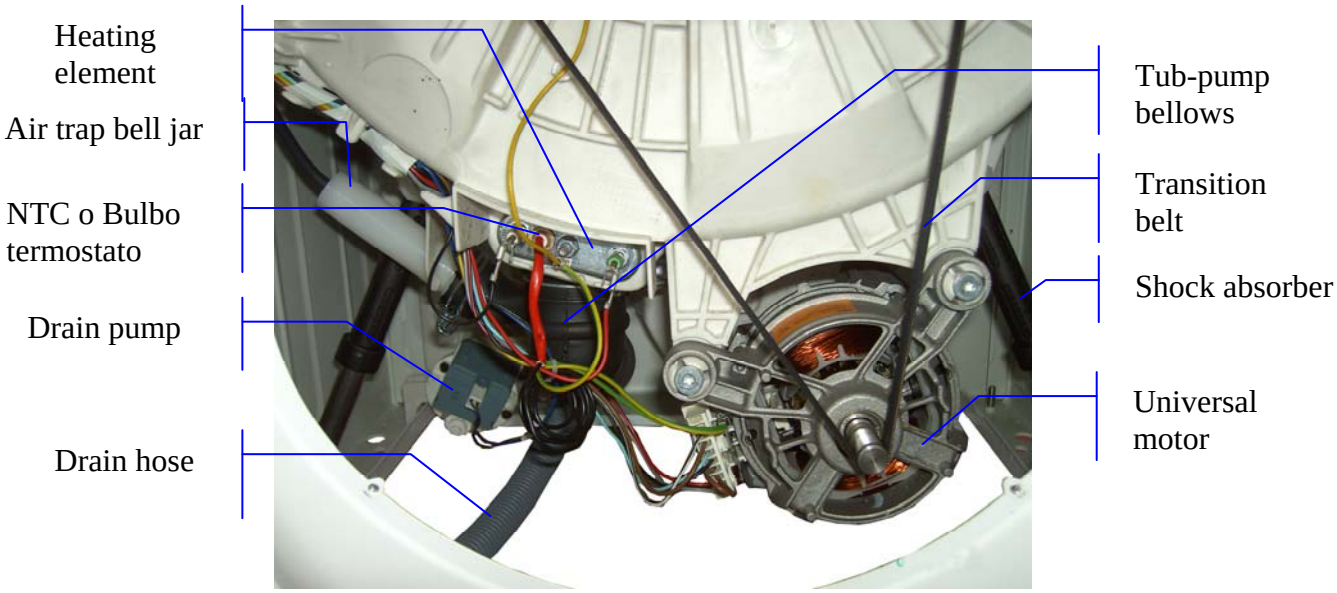
10 ACCESSIBILITY TO COMPONENTS

The components are easily accessible either from the posterior, removing protection, or from the superior by removing the top.

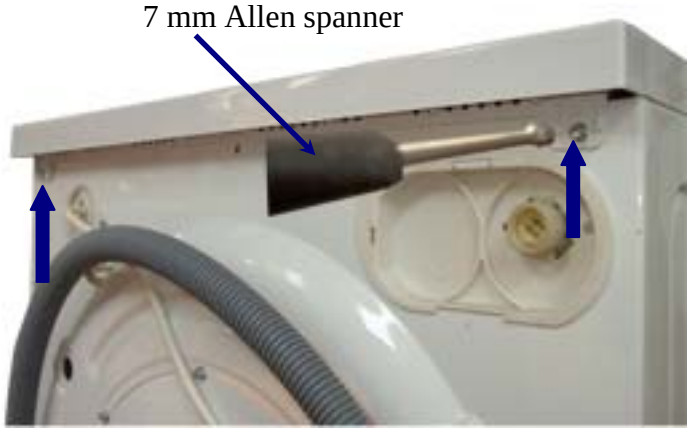
Positioning the washing machine as shown in the photo, it is possible to access the following components:

a – main motor
b – drain pump
c – heating element
d – NTC o thermometer probe
e – drain hose grafting
f – shock absorbers
g – air trap bell jar
h – tub-pump bellows
i – drum pulley

- Unscrew the fixing screws holding the back cover



- Unscrew the due screws behind the machine

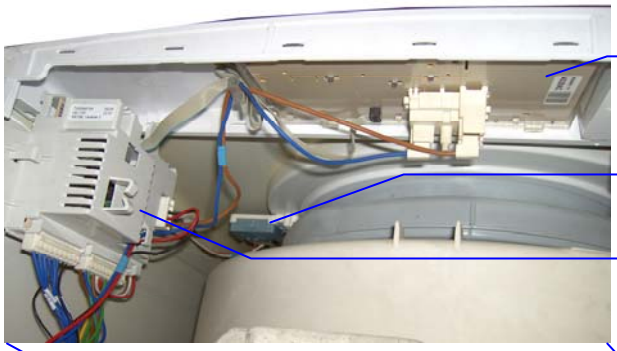


- Give a rap on the side of the dispenser and lift it from behind.

After having done these two operation, is possible to access the following components:

a – power board
b – Led and LCD boards
c – pressure switch
d – filter
e – electro- valve
f – door lock

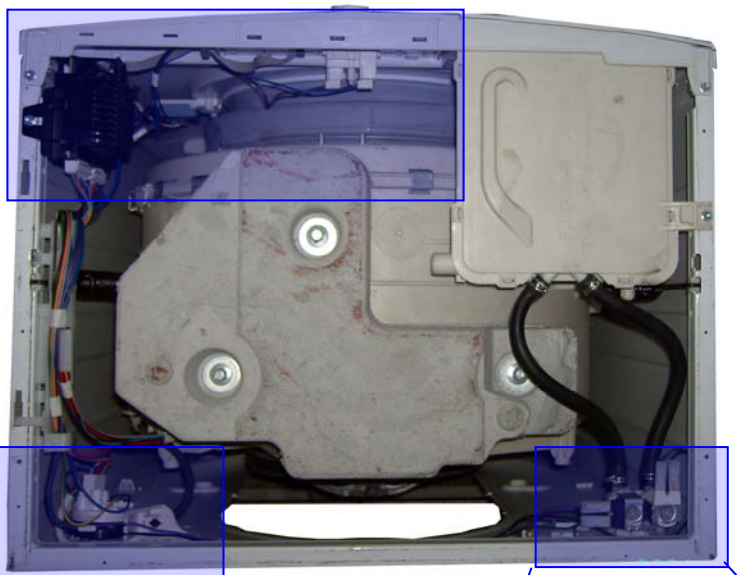
RR model internal view

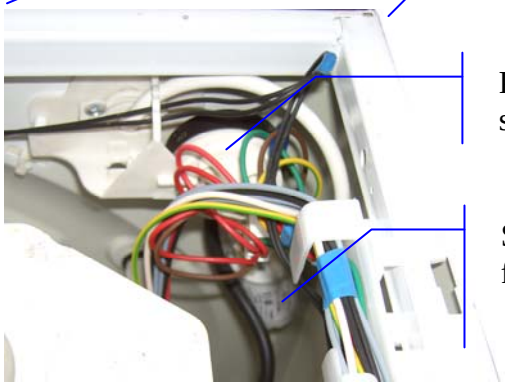


LED or LCD board

Door lock

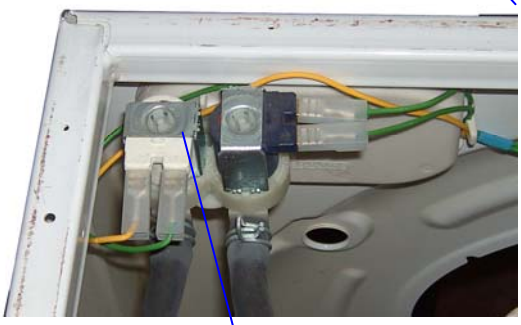
Power board





Pressure switch

Suppression filter



2 way electro-valve

Disassembly of control panel components

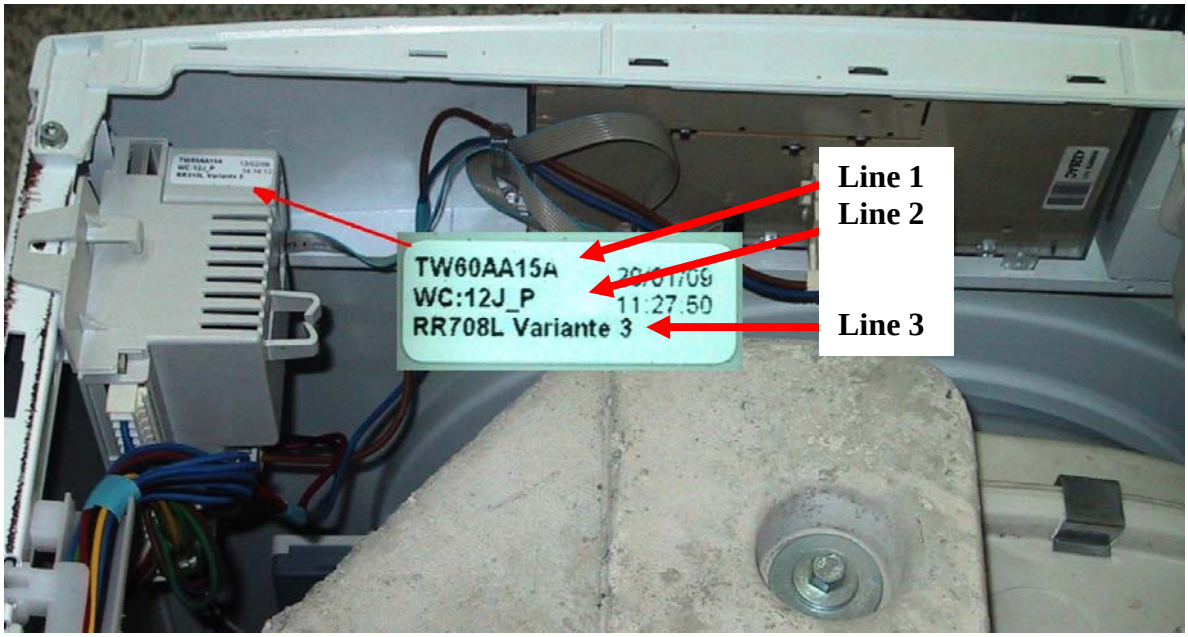
Once the top has been removed, extract the LED or LCD board applying a leverage with a screw driver on the board housing hooks, working from one extreme to the other.

RR LED model

Substitution of power board

The power board is located in the anterior on the right hand side to the machine. It is protected by a extinguishing plastic covering.
Each power board is programmed for each model of machine. The code is indicated on the label visible up on the opening of the top.
In case of substitution it is important to take note of the code, because board of the same characteristic must be installed. A different code could change the machine.

Figure 7



On the code on the sticker is composed of 3 lines. The first two lines identify the washing software.
The last line has the information concerning the version of the machine.

Important information to be indicated in case of substitution of power board

The code in the first two lines (line 1 and line 2) of the sticker can vary based the updating of the washing software. These do not have any impact on the options and functionalities of the machine; while the last line (line 3) indicates he model and the options of the machine must be identical. Hence, in case of substitution of the board be very sure to correctly matching the third line.

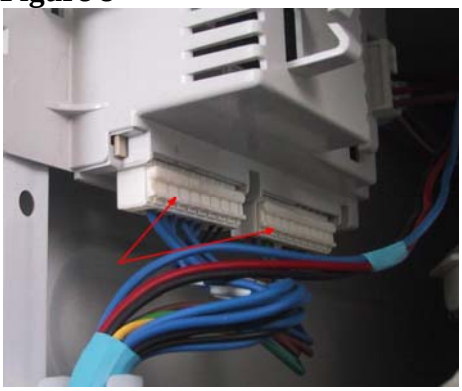
In case of various abnormalities, it is also advisable to verify the connectors and possibly make a review.

Connector revision

Remove the top cover to gain access to the internal part.
Go to the power board zone where the connectors are present on which intervention is necessary.

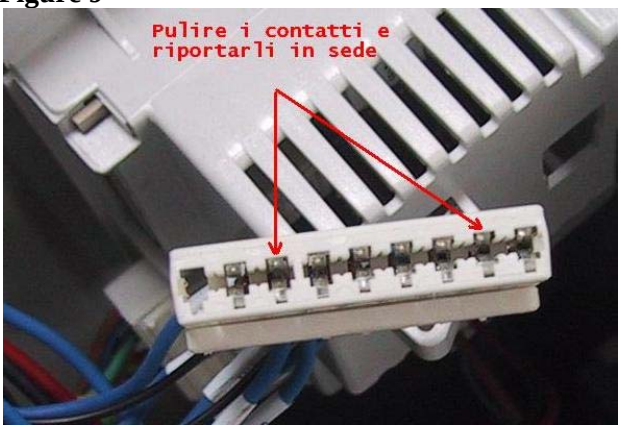
Enlargement of the power board zone

Figure 8



The connectors must be extracted with care to avoid breakage of the housing. Once it is extracted, the fork arm of the contacts must be cleaned from any eventual oxide residue and reconnect it. For such an operation it is necessary it must be done on the external part of the fork arm place inside the connector by applying a pressure to enhance contact (see photo).

Figure 9



Substitution of tub-pump bellows

The tub-pump bellows used on the ITW machine is the polarized type.
The polarization is necessary for the correct functioning of the machine. A wrong assembly can cause a general malfunctioning of the machine in the washing step.

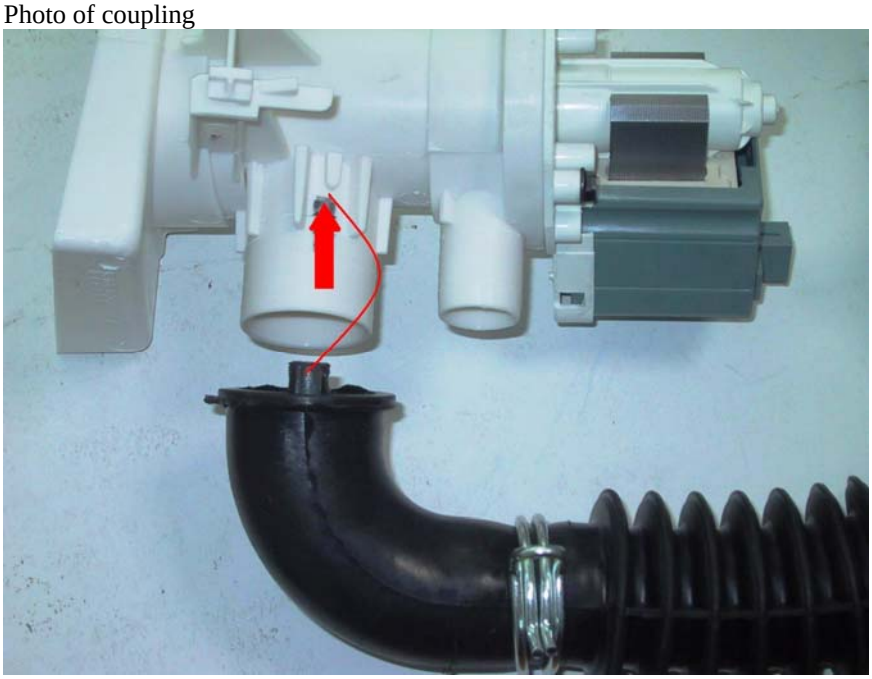
Here are the photos of the bellows showing the polarization.

Photo of bellows showing the pump side

Photo of bellows showing the tub side

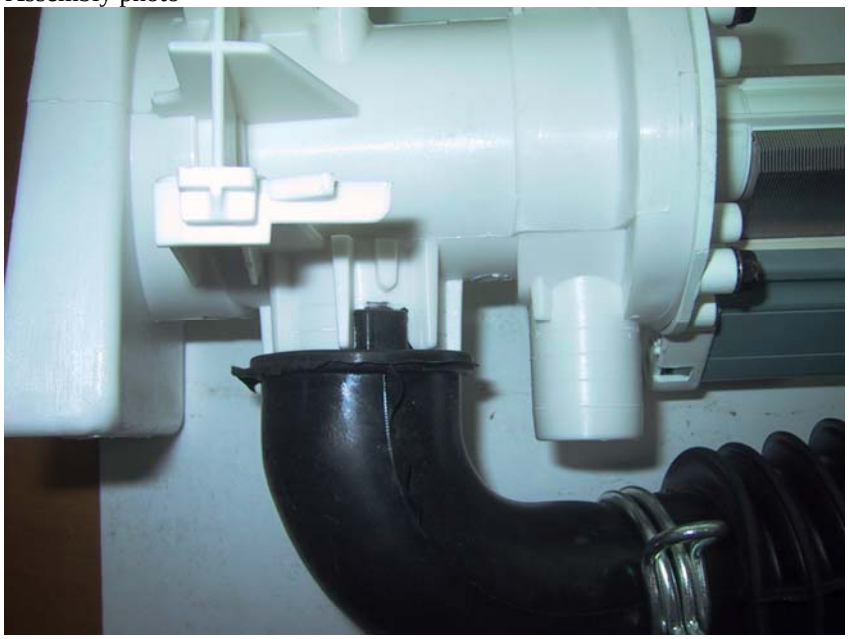
For the correct assembly of the pumping unit, position the bellows as shown in the photo.

Photo of coupling



Push in the direction of the arrow till a perfect alignment is obtained as shown.

Assembly photo



On tub side it necessary to proceed in a similar way as show in the photo

Coupling photo

Push in the direction of the arrow to attain as shown in the photo:

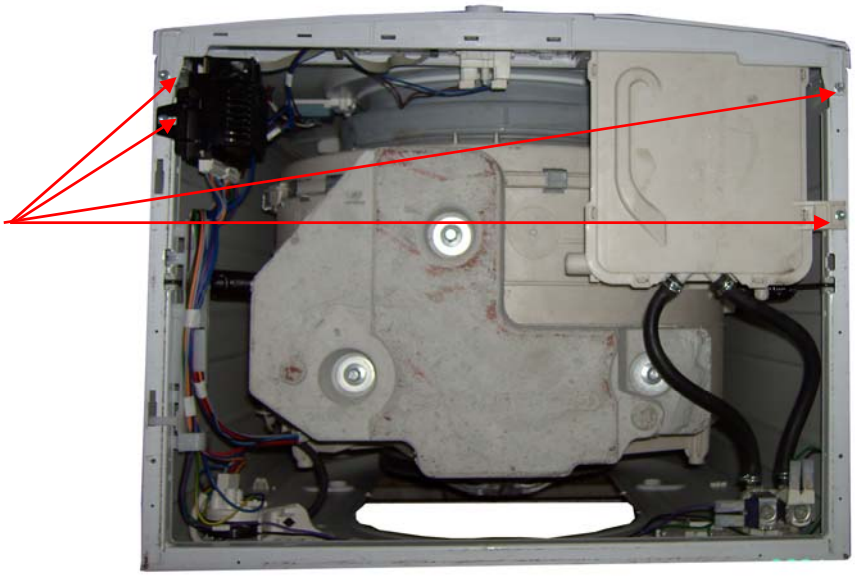
Photo of assembly

On a general note it is reminded that the pump used in the washing machine do not have suction force but rotary blades that push liquid with gently into the drain hose. A wrong assembly could cause problem in drainage.

10.1 Tub maintainace

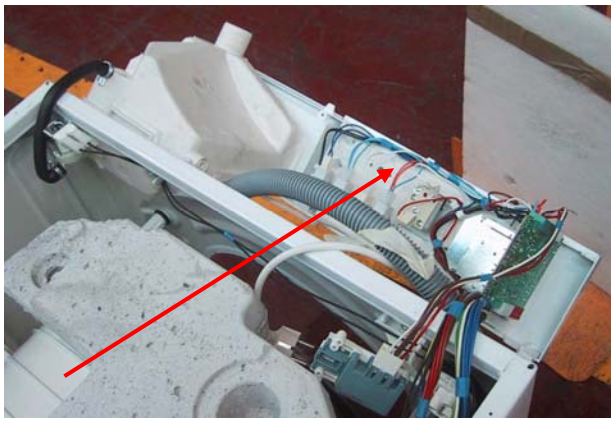
The electronic washing machines can be produced with a family of tubs which could be welled or locked together by clamps.
For the former there is no possibility of repair as the whole bath (washing group) must be changed.
For the latter there is the possibility of intervening to replace bearings, drum and front or rear tub.
To remove either the welled washing group or that locked together with clamps, the procedure is as follows:

- The first step is to remove the top as indicated in chapter 10.
- Remove the control panel and the power board by unfastening the four screws holding to the cabinet as shown in the photo.

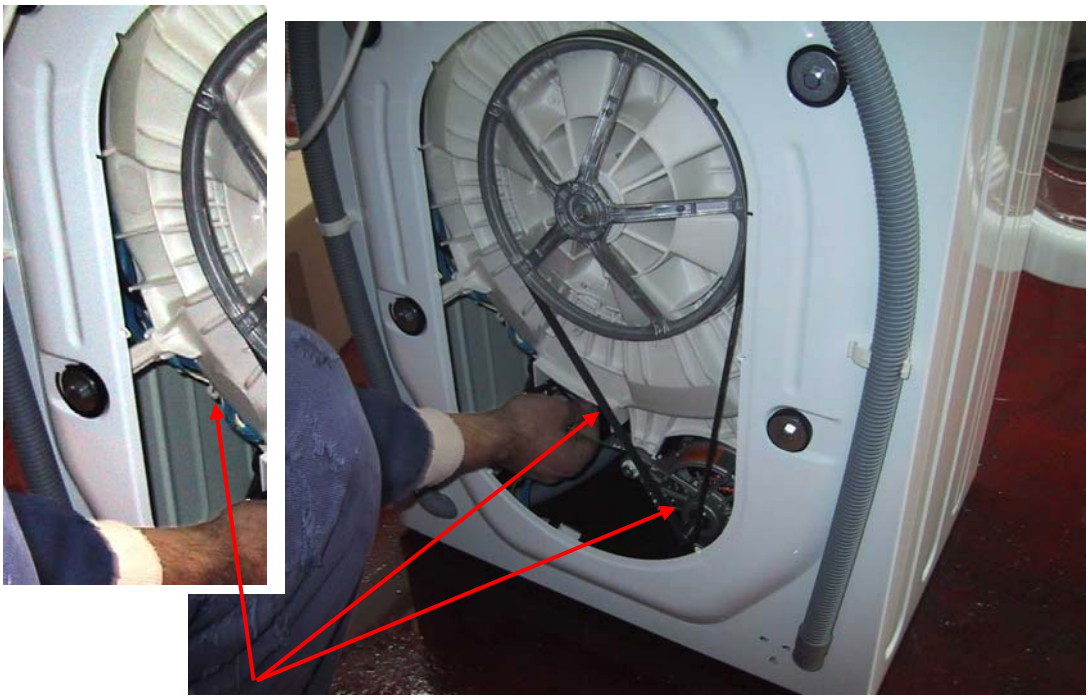


- Lift the control panel on the left hand side and unhook the bellows connecting the detergent bath to the tub at the anterior.
- Unfasten the door lock fixing screws.

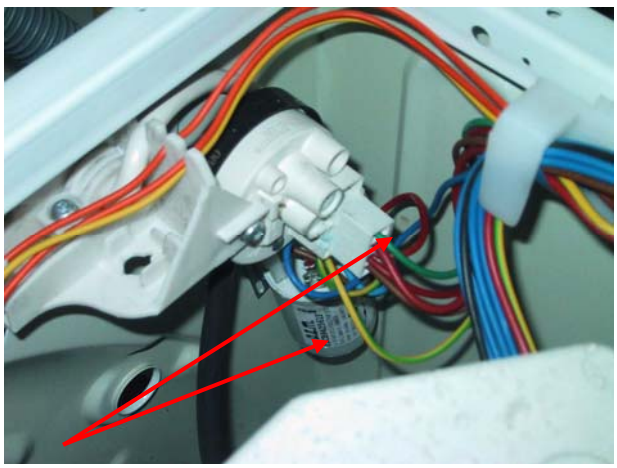
- Overturn the control panel to the back of the washing machine as indicated in below.



- Access the rear components as indicated in chapter 10. Disassemble the wiring by first disconnecting the motor connector, the heating element, the NTC probe in the heating element and drain pump. Proceed to remove the wiring from the hooks on the tub.

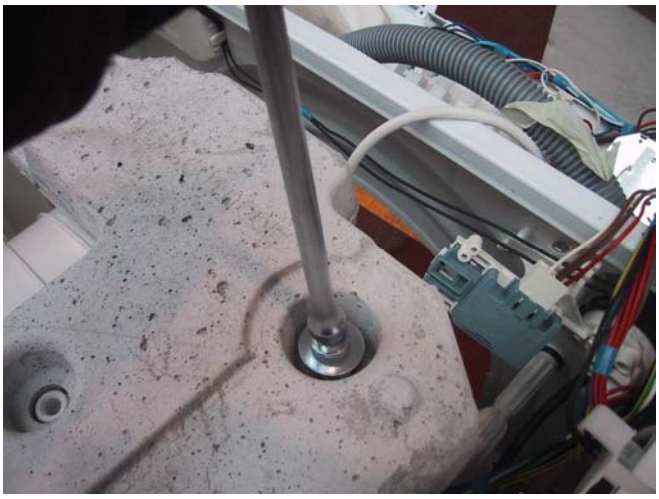


- Disconnect the wiring from the pressure switch and the filter.



- Remove the door gasket.

- Get rid of the wiring, remove the superior counterweight blots as indicated in the figure below.

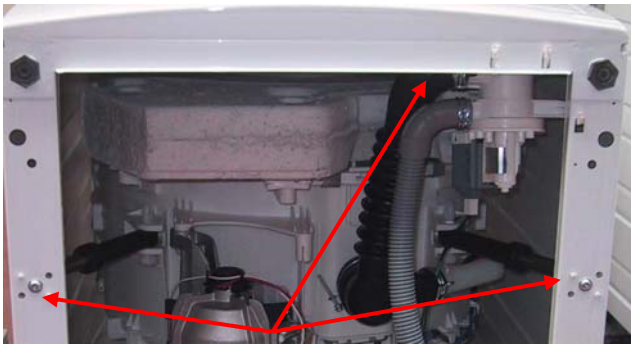


- **Lift out the counterweight. At the end the machine should present as indicated in the photo.**

Overturn the machine to lie on its back on the floor to have access to inferior components.

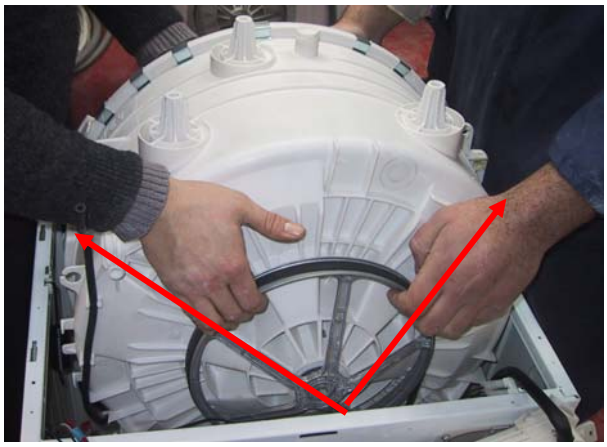
- Remove the splash proof protection by pulling outward first the superior part then the inferior U-shape part.


- Unfasten the shock absorber fixing screws; remove the sleeve (bellows) connecting the tub to the to the pump from the pump side.




- At this point take the machine to its vertical status to takeout the washing (oscillating) group.

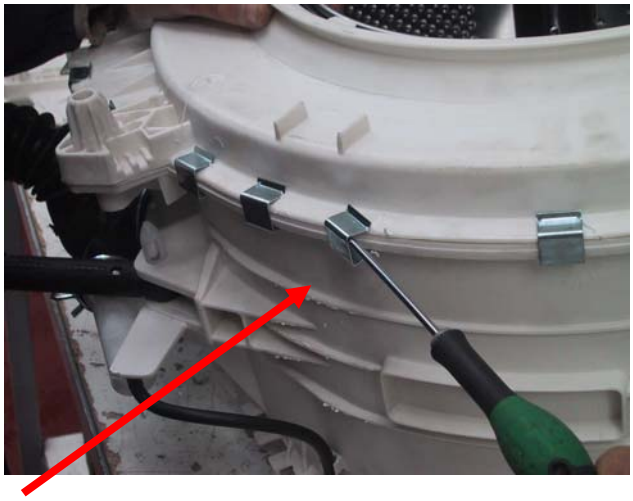
  It is necessary to use small sized crane or two people to takeout the washing group as indicated in the photo. Where crane is used, the hook slots placed in the vicinity of the suspension spring slots are utilized for hanging.



  At this point, if the tubs are welled the group will be entirely substituted, while if group is the type grafted with clamps, proceed to open as follows:

- Position the group on its back on a bench.
- Remove the inferior counterweight as shown in the photo.

- Takeaway the 23 clamps. This operation can be carried out with medium sized screw driver as shown in the photo.



- At this point the anterior tub is lifted to gain access to the drum.

- It must be recalled that it necessary to first remove the drum pulley before taking out the drum.
  It is recommended to always change the tub seal after this operation.
  The clamps can be reused but it is advised to change the position by about 5mm from the previous.
  The use of medium sized plastic headed hammer is recommended for their insertion.