



Electrolux

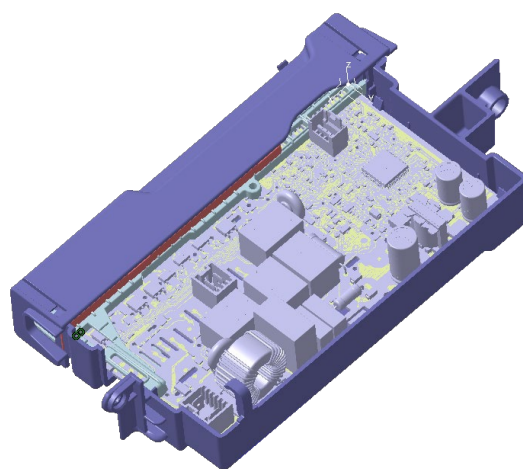
SERVICE MANUAL

EWX1493M

service manual

EWX1493M

Gemini project



EN

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1 PURPOSE OF THIS MANUAL

The purpose of this service manual is to provide service provider who is already authority with the repair procedures with information regarding appliances

This document specifies the EWX1493M electronic platforms to be used for Gemini range or relate Top load washing machine with Reed switch, washing heater, and Inverter motor.

The manual deals with the following topics:

- Safety
- Guide to diagnostics
- Technical and functional characteristics
- Access

Document Revisions

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00	02/2022	Document creation	Vatcharapong S,



- Any work on electrical appliances must only be carried out by qualified personnel.
- Before carrying out work on the appliance, use suitable instruments to check that the power supply system in the house is fully efficient.
- This platform is not fitted with an ON/OFF switch. Before you access internal components, take the plug out of the socket to disconnect the power supply.
- When the servicing is completed, ensure that all the connections have been made properly and that all the appliance's safety conditions are as good as new.
- The connection between the earth terminal and the earthed metallic parts must have a low resistance.
- All the work to be performed inside the appliance requires specific skills and knowledge and may only be carried out by qualified and authorised service engineers.
- Some of the components in the mechanical part could cause injuries, so wear suitable protection and proceed with caution.



3 INTRODUCTION

EWX1493M platform is a new variant electronic control for TL washing machines with Reed switch, washing heater and Inverter motor.

This platform will replace the current electronic platform (EWX14937) with a new range of electronic washing machines designed to standardize components and integrate more functions.

The new electronic controls are based at least in three electronic boards:

- User Interface Board
- Power Board
- FCV motor control board

The Power Board electronic controls have the purpose to:

- Drive all the machine loads (valves, motor control board, pumps, heating element, brake actuator).
- Read the several inputs necessary to control the functionality (water levels, door status, motor speed, water temperature, power supply status).
- Manage a serial port to connect the machine to external devices for testing, configuration, remote control purpose (EAP protocol).

The User Interface Board electronic control has the purpose to:

- Manage the user selections and the machine status display by driving Leds and LCDs, and by reading push buttons and touch button and/or rotary knobs,
- Manage a serial port to allow connection to external devices for testing, remote control purpose (EAP protocol).

The purpose of this document is to describe the diagnostic architecture implemented on this electronic platform.

Using the serial interface communication port it's possible to have more sophisticated diagnostic tools; this possibility is not described on this document.

For more detailed information, please refer to the following specification:

- DAAS protocol
- MACS protocol
- Electrolux Appliance Protocol

4 SYSTEM ARCHITECTURE

The machine can work in several functional modes:

- User mode
- Demo mode
- Diagnostic mode

All the other modes are available using the machine itself.

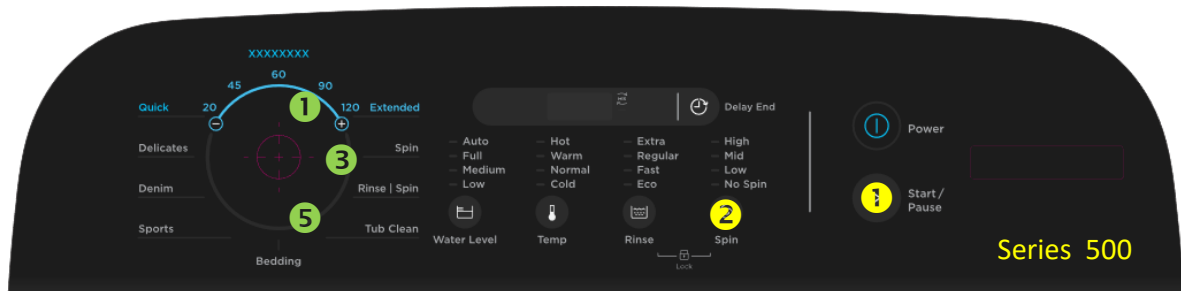
User mode is the normal way to use the machine to execute normal cycles (used by the end customer).

Demo mode is used in the shops to show to the customer how to set and execute a cycle without load/draining water.

Diagnostic mode is used by service/lab people to test the machine, read/reset alarms.

To Enter the diagnostic mode, Demo mode and see the working hours counter, below instruction needs to following.

- Switch on machine with press key combination for each user interface it is START/PAUSE push button and the nearest one refer to each UI as below.
- If the key combination is recognized within 7 seconds since the machine was switched on, a specific mode is entered according to the position of the main knob:
 - Position 1: Diagnostic mode set.
 - Position 3: Demo mode set.
 - Position 5: Working hours counter.
- After the diagnostic mode was entered, the same combination has the following functions:
 - In “last alarm display” selector position (the 11th counting clockwise) the last alarms are cleared.





5 DEMO MODE

In the shops and exhibitions some time it could be necessary to show to the customer the machine behavior in set-up condition and also during cycle execution.

In order to give a full demonstration of the machine, the water net and the draining net need to be connected. The duration of a cycle execution is in any case too long for a brief show.

The Demo works in two ways: one interactive mode and one automatic loop.

The interactive mode enables the user to try the interface without activating the appliance.

If no one has interacted with the interface for 3 minutes, or Start button hasn't been pushed, it proceeds to display an automatic loop instead, simulating the cycle execution only on display.

DEMO mode alters the execution of a cycle in such a way that all these problems are avoided:

In set-up state the machine behavior is the same of the user mode one.

During cycle execution all times are shorter.

No water load/drain is executed: it means that if it's necessary to show machine running with water inside the drum, it's loaded by hand and never drained (no spin phases are executed in this case). All the user interface functionality is shown as in the normal condition (time to end ...).

For top-loader appliances, while DEMO mode is active, only set-up phase is available (START/PAUSE button is disabled), since without the porthole the motor moving can't be seen and so it is useless.

As described before, to enter in this mode the procedure is the following:

Switch on the machine via On/Off button and do not press any other button;

Turn the selector in the 3rd position CW; in case of Hi-Fi type selector, the 3rd upper light of right column program LEDs switches on;

Press and hold for some seconds the defined key combination (START/PAUSE and the nearest one);

Within about 3 seconds the acknowledge of the operation is given by the text "dEM" blinking 3 times on cycle time digits;

In no acknowledge, switch machine off and repeat sequence from the beginning.

To exit the DEMO mode the machine has to be unplugged from mains net.

6 DIAGNOSTIC MODE

This mode is used in several conditions:

1. In factory assembly line to perform a manual test of the machine functionality (final assembly test).
2. By service people to check for faults and repair the machine.
3. In the labs to check the right machine functionality.

As described before, to enter in this mode the procedure is the following:

1. Switch on the machine via On/Off button and do not press any other button;
2. Turn the selector in the 1st position CW;
3. Press and hold for some seconds the defined key combination (START/PAUSE and the nearest one);
4. Within about 3 seconds the UI shall enter the diagnostic mode; the acknowledge of the operation is given by all LEDs and groups of display icons switching on sequentially; otherwise, switch machine off and repeat sequence from the beginning.

To exit from DIAGNOSTIC mode it's sufficient to switch off the machine.

Diagnostic program definition

In the 1st selector position the User Interface test is performed; all LEDs are lighted on sequentially to allow checking the outputs. Pressing any button the associated LEDs are lighted on and the related position number is shown on cycle time (TTE) digits, till button is released; besides, the buzzer plays a single "click" sound.

When the selector knob is moved the TTE digits show the "C" letter followed by the number code for about 2 seconds.

Moving in clockwise direction, for any position there is a different test. And switch between sub program 1 and subprogram 2 by press "Start/Pause" button:

For example: At knob position 2 the default sub program is "C01" if "Start/Pause" button is pressed the subprogram will switch to "D01" and press "Start/Pause" button again the subprogram will switch back to "C01".

Moving in clockwise direction, for any position there is a different test:

- Position 2: Sub1: C01 - Water load from hot valve.
Sub2: D01 - Water load from cold valve.
- Position 3: Sub1: C02 - Water load from ECO valve.
Sub2: D02 - Water load from Softener valve.
- Position 4: Sub1: C03 - Drain system test (drain pump or brake actuator).
Sub2: D03 - N/A.
- Position 5: Sub1: C04 - Lid switch and Knock off switch test.
Sub2: D04 - N/A.
- Position 6: Sub1: C05 - Motor test in agitation mode.
Sub2: D05 - Motor test in spin mode.
- Position 7: Sub1: C06 - Heater test (available only model has heater).
Sub2: D06 - N/A.
- Position 8: Sub1: C07 - Wet test (For Manufacture production line).
Sub2: D07 - N/A.
- Position 9: Sub1: C08 - Dry test (For Manufacture production line).
Sub2: D08 - N/A.
- Position 10: Sub1: C09 - Calibration drain.
Sub2: D09 - Reserve for reliability test.
- Position 11: Sub1: C10 - Last alarm display.
Sub2: N/A.

The test cycles are working only if:

- There is no communication error between main board and user interface.
- The machine is configured with a valid configuration (no configuration alarm).

In case of MB-UI communication alarm, the only test available is the user interface test, because the user interface can be tested alone only supplying the 12 Volts.

Pressing together the key combination during one of the diagnostic cycles (from position 2 to 10) the machine will set in electric test mode at the next power on.

Pressing together the key combination in the last alarm display position, the alarm codes that were stored in memory will be reset.

During the test the LED will show some data concerning the cycle being performed. The details are explained in the following tables, which also specify, for each selector position, the purpose of the associated test, the components activated and the conditions under that the test is performed.

6.1 User interface test

Selector position:	Position 1 in clockwise direction
Purpose of test:	To test the functionality of all lights, switches and buzzer.
Activated components:	All LEDs, LCD display and buzzer
UI behaviour	All LEDs and groups of display icons switching on sequentially.
Working conditions:	There isn't any control to run the test (always active).

Test of outputs

All visible LEDs are switched on singularly and sequentially for about 300 milliseconds.

In the same way also the 7 segments of the three digits for UI displays are lighted on sequentially

The buzzer plays a “beep” sound each time a button is pressed.

Test of inputs

Pressing a button the LEDs sequence stops, the associated button LEDs are lighted on, the button position is displayed on time digits.

Moving the selector the LEDs sequence stops, the display clears and shows only on TTE digits the “C” letter followed by the number code.

6.2 Hot Electro valve test

Selector position:	Position 2 in clockwise direction.
Purpose of test:	To test the water loading from Hot Electro Valve.
Activated components:	Hot electric valve.
UI behavior	The Display reports the actual water level (in mm).
Working conditions:	Lid is closed, Water level lower than “MAX Wload level”.

6.3 Cold Electro valve test

Selector position:	Position 2 in clockwise direction and press “start/pause” button.
Purpose of test:	To test the water loading from Cold Electro Valve.
Activated components:	Cold electric valve.
UI behavior	The Display reports the actual water level (in mm).
Working conditions:	Lid is closed, Water level lower than “MAX Wload level”.

6.4 Eco Electro valve test

Selector position:	Position 3 in clockwise direction.
Purpose of test:	To test the water loading from Eco Electro Valve.
Activated components:	ECO electric valve.
UI behavior	The Display reports the actual water level (in mm).
Working conditions:	Lid is closed, Water level lower than “MAX Wload level”.

6.5 Softener Electro valve test

Selector position:	Position 3 in clockwise direction and press “start/pause” button.
Purpose of test:	To test the water loading from Softener Electro Valve.
Activated components:	Softener electric valve.
UI behavior	The Display reports the actual water level (in mm).
Working conditions:	Lid is closed, Water level lower than “MAX Wload level”.

6.6 Drain system test (drain pump or brake actuator)

Selector position:	Position 4 in clockwise direction.
Purpose of test:	To test the drain system (drain pump or brake actuator).
Activated components:	Drain pump or brake actuator.

UI behavior	The Display reports the actual water level (in mm).
Working conditions:	Lid is closed.

6.7 Lid and Knock off switch test

Selector position:	Position 5 in clockwise direction.
Purpose of test:	To test the Lid switch and Knock off switch.
Activated components:	Lid switch and Knock off switch.
UI behavior	The Display reports the “Ld” if the lid is open or reports the “CLd” if the lid is close. While the lid is open if the Knock off signal is detected the display will report the “obo”.
Working conditions:	Open and close the Lid and push the bowl to touch the knock off switch.

6.8 Motor test with agitation mode

Selector position:	Position 6 in clockwise direction.
Purpose of test:	To test the motor in agitation mode.
Activated components:	Motor.
UI behavior	The Display reports the word “Agi”.
Working conditions:	Lid is closed.

6.9 Motor test with spin mode

Selector position:	Position 6 in clockwise direction and press “start/pause” button.
Purpose of test:	To test the motor in spin mode with maximum spin speed.
Activated components:	Motor, Brake actuator.
UI behavior	The display reports the actual drum speed in rpm.
Working conditions:	Lid is closed.

6.10 Heater test (available only model has heater)

Selector position:	Position 7 in clockwise direction.
Purpose of test:	To test the heater and NTC.
Activated components:	Heater, NTC.
UI behavior	The Display reports water temperature.
Working conditions:	Water level is more than safety level (55 mm).

6.11 Wet test function

Selector position:	Position 8 in clockwise direction.
Purpose of test:	Functional test for production line.
Activated components:	All valves, pressure sensor and motor.
UI behavior	Show water level for fill process, and show text according to component.
Working conditions:	<ol style="list-style-type: none"> 1. Machine will start both inlet valve on, the display show the current water level. 2. Machine will turn off all inlet valve and start agitate automatically if water reach the set level. 3. When machine agitate if the lid is open the display will show "Ld". If the lid is close the display will show "Agi".

6.12 Dry test function

Selector position:	Position 9 in clockwise direction.
Purpose of test:	Functional test for production line.
Activated components:	Motor, Drain pump, Brake actuator, OOB switch, Lid switch.
UI behavior	Show water level for fill process, and show text according to component.
Working conditions:	<ol style="list-style-type: none"> 1. Machine will force clod valve on and force to drain water to empty (drain pump or brake actuator to turn on), The display shows the current water level. 2. Machine will drain until water level is empty and then it will wait for unbalance test. The display will show "___", if the balance switch is activate the display will show "obo" and then will go back to "Ld".

	<ol style="list-style-type: none"> 3. Close the lid to display show “CLd” and then repeat again to open lid and close lid then display will show “Spi”. 4. When motor spinning the display reports “Spi” and drum speed rpm, When LEDs at last option are ON, open the lid to check the drum stop by brake. Close the lid to finish the dry test display shows “End”.
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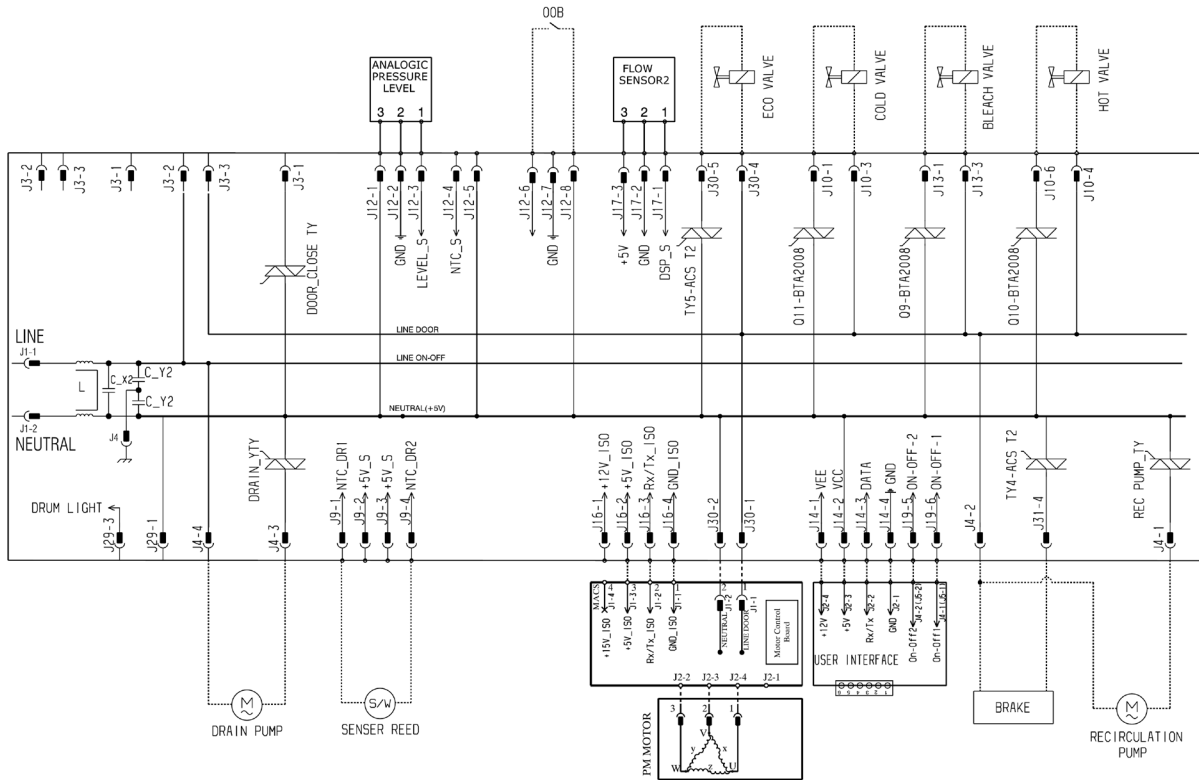
6.13 Calibration drain functional

Selector position:	Position 10 in clockwise direction.
Purpose of test:	To calibration the pressure sensor.
Activated components:	Pressure sensor and drain pump or brake actuator.
UI behavior	Show water level when calibration and show “END” when finish.
Working conditions:	Lid is closed.

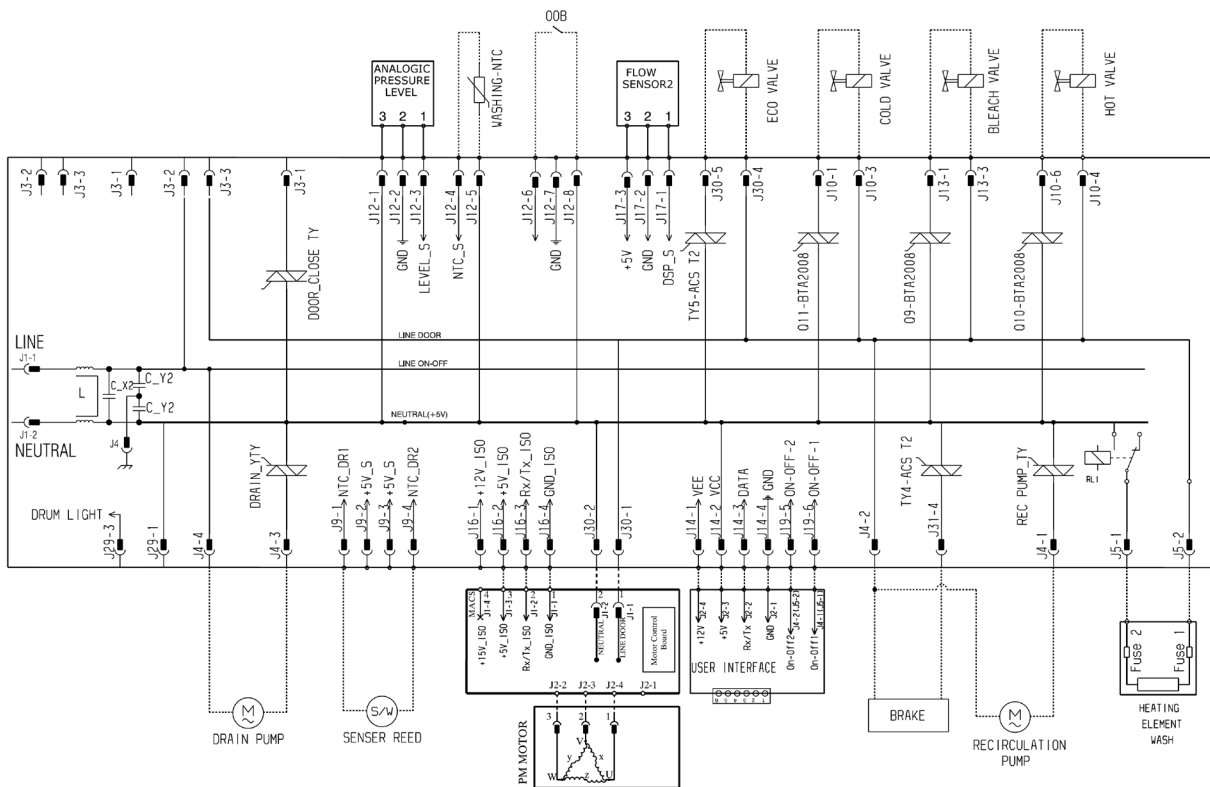
*** Important Note: In case of re-programming the main board, or change the main board or change the pressure sensor, the calibration drain must be implementing until display show “END” for 1 time before normally use in user mode.

7 MACHINE SCHEMATICS

7.1 No Heater model.



7.2 Heater model.



8 ALARM

One of the main requirements of the diagnostic system is to be transparent to the final user except for some most common warning related to the door handling and water inlet and drain management.

To increase the flexibility of the system it was introduced the possibility to enable/disable the alarms display by the machine configuration in order to cover requirement as field test context, particular countries requirement ...

Some alarms require a drain cycle activation in order to put the machine in a safe condition.

All alarms display is enabled during diagnostic test/cycles. Alarm codes are displayed on the TTE digits of the display.

If the machine is in normal mode and an alarm must be displayed according to the configuration, the error code is drawn using the format "E" + alarm family digit + "0".

If the machine is in diagnostic mode and an alarm is raised, its full code is always shown regardless of the configuration. On all UI series the indication is given by the "Exx" code (E11, E21, etc) displayed in the TTE digits.

Please note that writing an alarm code on the Display, all occurrences of "b" are replaced by "H" in order to avoid mistaking the "6" symbol, so for instance "EB3" is shown like "EH3".

8.1 Last Alarm Rest

The alarm indication is also used when the user interface (UI) enters LAST ALARM mode that is when the user pushes the "special key" combination while the board is in normal mode or when the main knob is set to the 11th position while the board is in diagnostic mode. While this mode is set, it's possible to read the code of the three latest alarms, starting from the most recent. Each time the leftmost key in the "special key" combination is pressed, the UI starts displaying the following alarm code among those stored in memory. So, if the left key is pressed once while the last alarm was being displayed, the last but one alarm is displayed instead; after the key is pressed again, the last but two alarms code is shown. Pressing at any time the rightmost key in the "special key" combination the displayed sequence comes back at once to the latest alarm.

It's possible to reset Last alarm pressing the defined key combination (START/PAUSE and the previous one for every UI) when in Diagnostic mode with selector in 11th position

8.2 Alarms software management description

In the following chapter for each alarm there is a detailed description of the alarm management implemented in the board firmware.

8.2.1 E11 – Washing water load timeout

This alarm will be set when the water load timeout has been exceeded and the water level not increase more than 10 mm.

For example, if set the time out to be 10 minutes, the alarm should be set when the water level is not increase more than 10 mm in 10 minutes.

The configured timeout value is divided into steps of 10 seconds. So the maximum value available is $255 \times 10 = 2550$ seconds (42 minutes).

The timeout is set at the beginning of each load phase at the beginning of every cycle phases and decreased until the target level (Virtual Level) is reached.

This alarm forced a cycle pause. This alarm can be reset by pressing Start/pause button or switch off the machine. It is not reset after a power fail.

8.2.2 E13 – Water leakage

This alarm is set when the water level gets below the target level during wash phase by the level to check is depending on conditions as below.

- If target level is higher than 300 mm, the alarm is set if water level is loss 220 mm from target level with continue for 10 seconds.
- If target level is higher than 200 mm and lower or equal 300 mm, the alarm is set if water level is loss 150 mm from target level with continue for 10 seconds.
- If target level is higher than 130 mm and lower or equal 200 mm, the alarm is set if water level is loss 130 mm from target level with continue for 10 seconds.

This alarm forces a stop cycle. Switch off machine to reset this alarm, this alarm cannot be reset by pressing Start/pause button. It is not reset after a power fail.

8.2.3 E21 – Wash water drain timeout

This alarm happens when the water drain timeout (managed for each drain phase) has been exceeded.

The timeout is a configurable value set at the beginning of each drain phase and decreased until the pressure switch is on the empty state. The level checked during each drain phases is specific and used only to manage this alarm.

If the timeout has expired the drain pump/drain valve is switched off for 1 minute while the drain pump/drain valve can cool itself. After that the drain phase was repeated from the beginning.

The alarm will be set after 2 consecutive trials.

This alarm forces a cycle pause and it is reset coming back from a power fail.

This alarm can be reset also pressing Start/pause button or resetting the current cycle.

8.2.4 E23 – Drain pump triac failure (available only for drain pump machine)

There is an incongruent situation between the sensing of the triac that drives the drain pump and the output given by the microprocessor.

It can happen in several ways:

- the pump is disconnected (or the thermal protection is opened)
- or the triac is not connected to the load (hardware fault on the board).
- the triac is not driven by the microprocessor while the sensing reads a lower value (< 4.40 Volt) on the negative half wave of the signal. It can happen when the triac is short circuited.

The alarm appears if these situations persist for 3 seconds during 2 consecutive trials performed after a pause of 10 seconds.

If the machine is in set-up the alarm is set immediately after the first trial.

This alarm action is done only in case of triac not driven. In this case the pump can start properly and drain the water. In this condition we are able to open the door and remove the power to the pump. In the other case we don't perform the action (safety drain) to avoid useless overheating of the pump.

This alarm forces safety drain cycle. Switch off machine to reset this alarm, this alarm cannot be reset by pressing Start/pause button. It is not reset after a power fail.

8.2.5 E24 – Drain pump triac sensing failure (available only for drain pump machine)

The sensing of the drain pump triac gives to the microprocessor a signal out of the limits.

With the new sensing circuit is not possible read continuously a signal less 3.5 Volt.

In fact when the pump is switched off on the negative half wave we have to read a signal closed to 5 Volts.

This alarm forces safety drain cycle. Switch off machine to reset this alarm, this alarm cannot be reset by pressing Start/pause button. It is not reset after a power fail.

8.2.6 E31 – Electronic pressure sensor failure

Frequency coming from electronic pressure sensor is out of acceptable limits for at least 5 seconds. The alarm will be set after 2 consecutive attempts performed after a pause of 10 seconds. Valid values are $44.676 \div 36.130$ Hertz. This fault can be caused by a defective electronic pressure sensor or due to wiring/main boards problems.

This alarm forces a stop cycle. Switch off machine to reset this alarm, this alarm cannot be reset by pressing Start/pause button. It is not reset after a power fail.

8.2.7 E32 – Electronic pressure sensor calibration problems.

At least in every cycle start or end, the electronic control performs a calibration of electronic pressure sensor.

This procedure is executed the draining and checks continuously the signal frequency coming from the electronic pressure sensor. If this signal changes continuously value (variation greater than 2 mm of water) until timeout expiration the alarm is set. The timeout value is configurable on the GCF file and is called "ee_wc_lev_lscal_tout".

This alarm forces a cycle pause and it is reset coming back from a power fail.

This alarm can be reset also pressing Start/pause button or resetting the current cycle.

8.2.8 E35 – Water overload

This alarm is monitoring the water level if it is greater than water over flood level, this alarm will be set and force safety drain cycle to drain the drum to empty. This alarm is operating when the machine is in standoff mode, set up mode, execution mode and also end mode.

This alarm cannot be reset by pressing Start/Pause button.

To stop this alarm is necessary to switch off the machine.

During standoff mode if this alarm is set, the draining can be operated by needed the lid to be closed only.

8.2.9 E41 (Ld) – Door opened

This alarm happens if the door is open while the machine is executed the cycle. Display will be show "Ld" and the cycle paused. This alarm is clear by closed the door

8.2.10 E52 – No tachometer signal

While motor is running, this alarm is set because of bad tachometer signal for example due to a no perfect connection of tachometer (unsettled contacts) or a high level of electromagnetic noise. When this condition is detected the Motor Control SW power off the motor and goes into a safety state waiting for an alarm reset command from MB.

The alarm appears only after 5 trials during a normal cycle. The first 4 trials separated by 5 minutes (time necessary to cool the thermal protection) and the last one after 20 minutes. If the machine is still in the alarm situation the alarm code is memorized and the machine is stopped in safety condition.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.11 E57 – FCV current trip failure

A sudden inverter current rising is occurred. It could be due to either a short circuit between motor phases or an electronic damage. The level of this threshold (15A) is set by the hardware. This is a hardware protection. The Motor Control Board power off the motor via hardware, than the DSP SW goes into a safety state.

The alarm appears only after 5 trials during a normal cycle. Every trial is separated by 2 minutes of pause where the FCV board is switched off. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety condition.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.12 E58 – FCV over current failure

A sudden abnormal motor phase currents is occurred. It could be due to an abnormal or an over load of the motor. Furthermore, the wiring and an electronic damage can cause this alarm too. The level of this software threshold (6A) is configurable via MB. The Motor Control Board power off the motor via software, than the DSP SW goes into a safety state waiting for an alarm reset command from MB.

The alarm appears only after 5 trials during a normal cycle. Every trial is separated by 10 seconds of pause where the FCV board is switched off. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety condition.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.13 E59 – FCV not following failure

No tacho signal for 3 seconds after new speed target different from zero. It occurs at the motor start up. It could be due to either motor wiring (motor phases and/or tachometer) or electronic damage. If the problem is on tachometer circuitry (wiring or electronic) the Motor Control board supplies the motor with a current limited to about 4 Arms. Under this condition, it runs at very low speed (~200rpm of motor) until the software protection power off the motor. Therefore, DSP SW goes into a safety state waiting for an alarm reset command from MB.

The alarm appears after 15 trials during a normal cycle. Every trial is separated by 10 seconds of pause where the FCV board is switched off. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety condition.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.14 E5A – FCV heating failure

It occurs when the Heat Sink temperature goes above a configurable threshold (88°C) for a configurable time (1s). In this case, it is due to either an over load conditions or electronic damage. Otherwise, it could be caused by the opening of the NTC. This condition is detected after the measured temperature stays at very low value (-11°C) for more than 20 seconds.

Under these conditions, the Motor Control Board power off the motor via software, then the DSP SW goes into a safety state waiting for an alarm reset command from MB. The reset of alarm is enabled only if the heat sink temperature goes within allowed temperature range.

The alarm appears only after 5 trials during a normal cycle. Every trial is separated by 2 minutes of pause. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety conditions.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.15 E5B (E5H) – FCV under voltage failure

It occurs when the dc bus voltage goes below a configurable threshold (175V) for a configurable time (5ms). This alarm can happen if the Motor Control board is not properly supplied due to either bad wiring or mains out of range. Furthermore, electronic could be damaged.

Under these conditions, the Motor Control Board power off the motor via software, then the DSP SW goes into a safety state waiting for an alarm reset command from MB. The reset of alarm is enabled only if the dc bus voltage goes above a second voltage threshold (225V).

The alarm appears only after 5 trials during a normal cycle. Every trial is separated by 10 seconds of pause where the FCV board is switched off. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety conditions.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.16 E5C – FCV over voltage failure

It occurs when the dc bus voltage goes above a configurable threshold (430V) for a configurable time (5ms). It could be due to an electronic damaged.

Under these conditions, the Motor Control Board power off the motor via software, then the DSP SW goes into a safety state waiting for an alarm reset command from MB. The reset of alarm is enabled only if the dc bus voltage goes below a second voltage threshold (420V).

The alarm appears only after 5 trials during a normal cycle. Every trial is separated by 10 seconds of pause where the FCV board is switched off. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety conditions.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.17 E5D – FCV unknown message failure

It is set when FCV cannot receive and/or transmit a message for more than 2 seconds. It is due to the communication wiring or an electronic damage.

The alarm appears only after 5 trials during a normal cycle. Every trial is separated by 10 seconds of pause where the FCV board is switched off. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety conditions.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.18 E5E – FCV- motherboard communication failure

There are communication problems in between FCV control board and Motherboard.

Problems could be due to Hardware (problems on connectors for example disconnection, on FCV or mother board) or due to disturb (burst on wiring).

The alarm appears after 25 seconds of missing communication.

When the alarm is set the machine is stopped in safety conditions.

This alarm cannot be reset pressing Start/Pause button.

To clear this alarm is necessary reset the current cycle or switch off the machine.

8.2.19 E5F – FCV fault alarm

FCV control board is continuously asking for configuration parameters due to a repetitive hardware reset.

The alarm appears only after 5 trials during a normal cycle. Every trial is separated by 10 seconds of pause where the FCV board is switched off. At the end of last trial if the machine is still in the alarm situation the alarm code is memorized, the machine is stopped in safety conditions.

This alarm cannot be reset pressing Start/Pause button.

To clear this alarm is necessary reset the current cycle or switching off the machine.

8.2.20 E66 – Heating element relay failure (available only for wash heater machine)

There is an incongruent situation between the heater relay sensing and the status of the heater relay that connects the washing heating element.

This fault can be detected checking the congruence between the relay status and the heater relay sensing.

This allows the detection of all possible faults conditions (relay not driven, relay contact glue closed or opened, sensing damaged).

If the heaters relay sensing remains in the faulty conditions for a time longer than 3 seconds, some component might be damaged and the safety of the machine is compromised.

When the alarm is set the machine is stopped in safety conditions.

To clear this alarm is necessary switch off the machine or reset the current cycle.

8.2.21 E68 – Ground current leakage (available only for wash heater machine)

The voltage value read by Heater Relay sensing is out of limits.

This can happen if we have a ground current leakage through the heating element or other components.

According to the hardware configuration of the board a current leakage can be detected only with lid is closed.

The alarm appears if the read value exceeds some thresholds for a time longer than 12 seconds.

In detail the conditions to set the alarm are:

- if the heater sensing circuit reads a signal greater than
 $\text{Main voltage}/2 - \text{Main voltage}/16 + 75$
- or if the heater sensing circuit reads a signal less than
 $\text{Main voltage}/2 - \text{Main voltage}/16 - 45$

With these thresholds we are able to detect a leakage less than:

- ~ 90 K Ω versus Line
- ~ 60 K Ω versus Neutral

When the alarm is set the machine is stopped in safety conditions.

To clear the alarm is necessary reset the current cycle or switch off the machine.

8.2.22 E69 – Heating element opened (available only for wash heater machine)

As on the previous alarm the voltage value read by Heater Relay sensing is out of limits when the cycle is in execution and the heating element is not powered.

This can happen due to a faulty component (some heating elements can open at the end of heating phase) or really due to the thermo-fuses protection.

The alarm appears if the read value exceeds a specific range for a time longer than “E69 timeout”.

In detail the condition to set the alarm is:

- door closed, both relays switched off and sensing signal greater than

$$\text{Main voltage}/2 - \text{Main voltage}/16 + 55$$

or less than

$$\text{Main voltage}/2 - \text{Main voltage}/16 + 75$$

“E69 timeout” is fixed in 10 seconds, but we can have 2 different behaviors according to machine status. In particular:

- during diagnostic cycles after that timeout the alarm is set immediately,
- Whereas in normal cycle mode the alarm will be set after a retrial when the heating element is activated for 10 seconds and after that was switched off and re-tested. If the faulty condition still persist the alarm will be set.

To clear the alarm is necessary reset the current cycle by selector or pressing start/pause button at the end of cycle or simply switching off the machine.

8.2.23 E71 – Water NTC failure (available only for wash heater machine)

The voltage value read on the NTC sensing is out of limits and it means that the NTC sensor is in open circuit or in short circuit.

The limits are referred to the conversion steps of the A/D converter, the high value is 250 and the low value is 5.

The alarm appears if the read value exceeds this interval for a time longer than 5 seconds.

This alarm forces the washing heating phases skip.

To clear the alarm is necessary reset the current cycle by selector or pressing start/pause button at the end of cycle.

8.2.24 E83 – Wrong selector position reading

The code read on the selector is not supported by the configuration data.

8.2.25 E86 – Selector configuration table error

This alarm will be set by UI if the area containing the configuration thresholds for the selector is missing or corrupted.

This alarm doesn't allow cycle start.

To clear the alarm is necessary reset the current cycle by selector or pressing start/pause button at the end of cycle or simply switching off the machine.

8.2.26 E87 – USER Interface microcontroller fault

This warning is set when the user interface fails a certification protection check.

On UI with a faulty microcontroller memory will be set.

The alarm is not displayed.

To clear the alarm is necessary reset the current cycle by selector or pressing start/pause button at the end of cycle or simply switching off the machine.

8.2.27 E91 – Communication error between UI and Motherboard

There are communication problems in between User Interface and Motherboard.

Problems could be due to Hardware (problems on connectors for example disconnection of user interface or of the motherboard) or due to noise (burst on wiring).

In this case the cycle doesn't start if the problem is detected at the power-ON.

During machine is executing, if the alarm appears after 25 seconds of missing communication, when the alarm is set the machine is stopped in safety conditions.

This alarm cannot be reset pressing Start/Pause button.

To clear this alarm is necessary reset the current cycle by switch off the machine.

8.2.28 E92 – User interface mother board protocol incongruence

The communication protocol in between user interface and motherboard is not aligned. This could be due to incompatible configuration between user interface and motherboard. This alarm is checked at the power-ON and the machine is stopped.

The alarm is displayed on the display.

To clear the alarm is necessary to switch off the machine.

8.2.29 E93 – Machine configuration error

There is an incongruent situation between the stored checksum and the calculated one at the power-on of the machine.

The configuration saved on the FLASH is divided into 3 parts, each one with a separated checksum. One of them is the machine configuration; the others are related to the cycle.

At the power-on, during the reading of the configuration, the machine calculates the checksum and compares it with the written one.

When an error condition is detected the machine is blocked.

The alarm is displayed on the display.

8.2.30 E94 – Cycle configuration error

There is an incongruent situation between the stored checksum and the calculated one at the power-on of the machine.

Differently from the E93 the checksum of the cycle configuration is divided into two parts and so the machine has to check both.

When an error condition is detected the machine is blocked.

The alarm is displayed by led and display.

8.2.31 E97 – Incongruence between selector and cycle tables configuration

The program id value read from the selector table, contained in the machine configuration data area, is not available in the cycle table contained in the cycle configuration data area.

This situation can be caused by a read error from FLASH or by a wrong configuration file selected for the appliance configuration.

When an error condition is detected the machine is blocked.

To clear the alarm is necessary switch off the machine or reset the current cycle.

8.2.32 E98 – FCV and MB PROTOCOL incongruence

The communication protocol between FCV and motherboard is not aligned.

This could be due to incompatible configuration between FCV and motherboard.

This alarm is checked at the power-ON of FCV and the machine is stopped.

To clear the alarm is necessary switch off the machine or reset the current cycle.

This alarm cannot be reset pressing the start/pause button.

8.2.33 E9C – User Interface wrong Configuration

Configuration wrongly or not received correctly by UI

To clear the alarm is necessary reset the current cycle or pressing start/pause button at the end of cycle or simply switching off the machine.

8.2.34 E9E – User Interface Touch failure

User Interface touch sensor not working.

To clear the alarm is necessary reset the current cycle by selector or pressing start/pause button at the end of cycle or simply switching off the machine.

8.2.35 EB1 (EH1) – Power supply frequency out of limits

Power supply period lower or higher than configured values (45 and 55 Hz).

The machine measures continuously the power supply period and if its value exceeds a configurable interval the machine starts the power failure management.

At the restart the machine waits a stable frequency value and measures the reaching time needed, if it exceeds a prefixed timeout (5 sec.) the machine is blocked in alarm condition.

This alarm can be auto reset if the power supply period returns at normal values.

8.2.36 EB2 (EH2) – Power supply voltage too high

The power supply voltage value is higher than the maximum accepted value (~270 Volt).

The machine measures continuously the power supply voltage and if its value exceeds the limit for a time longer than 5 seconds, the machine is blocked in alarm situation.

The limit is referred to the conversion steps of the A/D converter and the value is calculated in order to recognize the wrong reading of the voltage sensing.

This alarm can be auto reset if the power supplies voltage return at normal values.

8.2.37 EB3 (EH3) – Power supply voltage too low

The power supply voltage value is lower than the configured value (~160 Volt).

The machine measures continuously the power supply voltage and if its value exceeds the configurable limit the machine starts the power failure management.

At the restart the machine waits a stable voltage value and measures the reaching time needed, if it exceeds the 5 seconds timeout, the machine is blocked in alarm situation.

The limit is referred to the conversion steps of the A/D converter and the value is calculated in order to recognize the wrong reading of the voltage sensing or a voltage value lower than the configured one.

To avoid intermittence problem (due to a voltage level very close to the threshold) a hysteresis of $5V_{RMS}$ is managed. It means that to restart, the supply voltage must go over the voltage threshold level by $5V_{RMS}$.

This alarm can be auto reset if the power supplies voltage return at normal values.

8.2.38 EBD (EHD) – Main relay sensing failure.

The sensing of the main relay gives to the microprocessor a signal out of the limits:

- Greater than 10 A/D steps on the negative half wave (sensing floating).

The alarm appears if the read value exceeds these intervals for a time longer than 2.5 seconds.

When the alarm is set the machine is stopped in safety conditions.

This alarm cannot be reset pressing the Start/Pause button.

To clear the alarm is necessary reset the current cycle or switch off the machine.

8.2.39 EBE (EHE) – FCV relay failure

There is an incongruent situation between the sensing of the relay and the driving circuit state.

The situation can happen in several ways:

- the relay is driven by the microprocessor while the sensing returns a high value.
- the relay is not driven by the microprocessor while the sensing returns a low value.

Differently from the previous platform, the FCV relay sensing circuit is based on an enabling signal (used to reduce power consumptions in stand-by) that allow the reading of the sensing only when needed.

For this reason also if the enabling circuit is not properly working it was set an alarm because it was not possible read correctly the relay status.

The alarm appears if these situations persist for 1 seconds.

This alarm management performs the safety drain cycle.

To clear the alarm is necessary reset the current cycle or switch off the machine.

8.2.40 EC6 – DRIVE_TRAIN_TRIAC_AL (Brake actuator Triac)

There is an incongruent situation between the sensing of the triac that drives the drive train device (brake actuator) and the output given by the microprocessor.

It can happen in several ways:

- the triac is driven while the sensing reads a higher value. It can happen if the circuit is open for example the load is unplugged.
- the triac is not driven by the microprocessor while the sensing reads a lower value. It can happen when the triac is short circuited.

This alarm forces a cycle stop, to clear the alarm is necessary reset the current cycle or switch off the machine.

8.2.41 EC7 – DRIVE_TRAIN_TRIAC_S_AL

The sensing of the drive train device triac gives to the microprocessor a signal out of the limits.

With the new sensing circuit is not possible read continuously a signal less 3.5 Volt.

In fact when the drive train device is switched off on the negative half wave we have to read a signal closed to 5 Volts.

This alarm forces a cycle stop, to clear the alarm is necessary reset the current cycle or switch off the machine.

8.2.42 EF2 – Foam warning

There are two fault conditions detecting during spinning for this alarm, this management is related to UVER measurement which the threshold is configured in GCF which are “Suds lock max threshold” and “UVER difference for suds detect”. This alarm is set when:

- If two UVER measurements are made in the same speed and the value of the second is higher than the first one with the value setting in “UVER difference for suds detect”.
- If one UVER measurement is higher than value setting in “Suds lock max threshold”.

This alarm forced a cycle pause, need the time to wait for clearing the foam.

This alarm can be reset pressing Start/pause button or resetting the current cycle.

It is not reset after a power fail.

8.2.43 EF5 – Load unbalanced

This warning is set when the last spinning is skipped due to an unbalance to high.

This means that the unbalance algorithm has tried to balance the load without success and so the spinning phase is skipped.

This alarm forced a cycle pause for user re-arranges the load in drum to balance.

This alarm can be reset pressing Start/pause button or resetting the current cycle.

It is not reset after a power fail.

8.2.44 EF6 – Safety reset

This warning is set when the machine fails a certification protection check.

When it recognizes a possible safety risk the machine “reset” itself and restarts again.

Can be set also if the machine is driven externally by a PC and the “Remote control mode” isn’t activated. In this case reset itself to avoid wrong load activations.

8.2.45 EFA – Load unbalance by knock-off switch

This alarm is set when the machine is in spinning phase, the drum spins with high unbalance and touch the knock off switch more than 5 milliseconds, the cycle will stop with show alarm on display

This alarm forced a cycle pause for user re-arranges the load in drum to balance.

This alarm can be reset by pressing Start/pause button or switch off the machine.

It is not reset after a power fail.

8.3 Alarm possible fault summary table

Alarm Code	Alarm Description	Fault Condition	Possible Fault
E11	Difficulties in water fill for washing.	Water load timeout expired.	<ul style="list-style-type: none"> - Tap closed or water flow too low. - Wrong drain pipe position. - Water inlet valve defective. - Machine leaking in somewhere. - Pressure sensor defective. - Main board defective. - Connector or wiring defective.
E13	Water leakage.	Water loss during washing.	<ul style="list-style-type: none"> - Wrong drain pipe position. - Machine leaking in somewhere. - Pressure sensor defective. - Drain valve defective.
E21	Difficulties in draining for washing.	Water drain timeout expired.	<ul style="list-style-type: none"> - Drain pipe blocked up. - Blocked somewhere in drain system. - Drain pump/drain valve defective. - Pressure sensor defective. - Main board defective. - Connector or wiring defective.
E23	Drain pump triac failure.	Incongruence between drain pump triac sensing and triac status.	<ul style="list-style-type: none"> - Drain pump defective. - Main board defective. - Connector or wiring defective.
E24	Drain pump triac sensing failure.	Wrong input signal to microprocessor.	<ul style="list-style-type: none"> - Drain pump defective. - Main board defective. - Connector or wiring defective.
E31	Electronic pressure sensor faulty.	Frequency of electronic pressure switch out of limits.	<ul style="list-style-type: none"> - Pressure sensor defective. - Main board defective. - Connector or wiring defective.
E32	Electronic pressure sensor calibration problems.	Frequency of electronic pressure switch not stable during draining phase.	<ul style="list-style-type: none"> - Water inlet valve defective. - Pressure sensor defective. - Drain pipe blocked up. - Blocked somewhere in drain system. - Drain pump/drain valve defective. - Main board defective. - Connector or wiring defective.
E35	Water Overload.	Overload pressure sensor on full state for a time longer than 15 seconds.	<ul style="list-style-type: none"> - Water inlet valve defective. - Pressure sensor defective. - Wiring or main board defective.
E41	Door opened.	Door opened while the machine executing the cycle.	<ul style="list-style-type: none"> - Door opened while running the cycle. - Door switch defective.
E52	Tachometer faulty.	Bad or no signal from tachometer.	<ul style="list-style-type: none"> - Motor defective. - Motor wiring or motor control board defective.
E57	FCV Current trip.	High current on inverter (>15A).	<ul style="list-style-type: none"> - Motor defective. - Motor wiring or motor control board defective.

Alarm Code	Alarm Description	Fault Condition	Possible Fault
E58	FCV Over current.	High current on motor phase (>4.5A).	<ul style="list-style-type: none"> - Motor defective, motor wiring or motor control board defective. - Motor abnormal working condition. - Any problem that make transmission broken. - Some cloth gets stuck between inner and outer bowl.
E59	FCV Not Following.	No tacho signal from tachometer for 3 seconds.	<ul style="list-style-type: none"> - Motor defective. - Motor wiring or motor control board defective. - Any problem that make transmission broken. - Some cloth gets stuck between inner and outer bowl.
E5A	FCV Heating.	High temperature on Heat Sink (>88°C) or NTC of motor control board open.	<ul style="list-style-type: none"> - Overload condition. - Motor control board defective.
E5H	FCV Under Voltage.	Dc bus voltage bellow the allowed value (175V).	<ul style="list-style-type: none"> - Mains wiring or connector of motor control board defective.
E5C	FCV Over Voltage.	Dc bus voltage above the allowed value (430V).	<ul style="list-style-type: none"> - Motor control board defective. - Power line voltage too high.
E5D	FCV Unknown Message.	Message received by motor control board is not correct.	<ul style="list-style-type: none"> - Transmission line noisy. - Motor control board defective. - Main board defective. - Connector or wiring defective.
E5E	FCV-MB Communication.	Protocol communication between motor control board and Main board not aligned.	<ul style="list-style-type: none"> - Connector or wiring defective. - Motor control board defective. - UI defective. - Main board defective.
E5F	FCV Fault.	Motor control board is continuously in reset.	<ul style="list-style-type: none"> - Motor control board defective. - Connector or wiring defective. - Main board defective
E66	Heater or drying relay failure.	Incongruence between heater relay sensing and relay status.	<ul style="list-style-type: none"> - Main board defective. - Current leakage between wash heater element and earth.
E68	Ground current leakage.	Voltage value on heater sensing (wash or dry) different from Vmains value.	<ul style="list-style-type: none"> - Current leakage between wash heater element and earth.
E69	Washing heating element opened.	Voltage value different from Vmains value when heating element is not powered during the cycle execution.	<ul style="list-style-type: none"> - Wash heating element faulty (thermo fuses opened). - Wiring or connector defective. - Main board defective.
E71	Washing NTC failure.	Wrong input signal to microprocessor (open circuit or short circuit).	<ul style="list-style-type: none"> - Washing NTC defective. - Main board defective. - Connector or wiring defective.
E83	Wrong selector reading.	Selector position code value not supported by the configuration data.	<ul style="list-style-type: none"> - Wrong configuration data on microprocessor. - Main board defective.

Alarm Code	Alarm Description	Fault Condition	Possible Fault
E86	Selector table configuration error.	Incorrect configuration of the User Interface.	- Wrong or missing selector configuration data on UI microprocessor. - UI defective.
E87	User Interface microcontroller fault.	User interface microcontroller damaged.	- Wrong or missing selector configuration data on UI microprocessor. - UI defective.
E91	UI-MB communication error.	Communication problem between UI and main board.	- Connector or wiring defective. - Motor control board defective. - UI defective. - Main board defective.
E92	UI-MB protocol incongruence error.	Protocol communication between UI and main board not compatible.	- Main board incompatible with UI board.
E93	Machine configuration error.	Incorrect configuration of appliance.	- Incorrect configuration data. - Main board defective.
E94	Cycle Configuration error.	Incorrect configuration of washing cycles.	- Incorrect configuration data. - Main board defective.
E97	Incongruence between selector and cycles configuration.	Incongruence between program selector and cycle configuration.	- Incorrect configuration data. - Main board defective.
E98	FCV_MB protocol incongruence error.	Protocol communication between motor control board and main board not aligned.	- Main board incompatible with motor control board.
E9C	User Interface Configuration fault.	Configuration wrongly or not received.	- UI SW configuration fault.
E9E	UI touch fault.	Touch key on UI is not working.	- UI defective.
EB1 (EH1)	Power supply frequency out of limits.	Power supply period lower/higher than configured values.	- Wrong or disturbed power supply line. - Main board defective.
EB2 (EH2)	Power supply voltage too high.	MAIN_V sensing input voltage value greater than configured value.	- Wrong or disturbed power supply line. - Main board defective.
EB3 (EH3)	Power supply voltage too low.	MAIN_V sensing input voltage value lower than configured value.	- Wrong or disturbed power supply line. - Main board defective.
EBD (EHD)	Main relay sensing alarm.	Wrong input signal to microprocessor.	- Main board defective.
EBE (EHE)	FCV Relay failure.	Incongruence between safeties relay sensing and motor control board relay status.	- Motor control board relay defective. - Motor control board sensing circuit defective. - Main board defective. - Connector or wiring defective.
EC6	Drive train triac failure (brake actuator).	Incongruence between brake actuator triac sensing and triac status.	- Main board defective. - Connector or wiring defective.

Alarm Code	Alarm Description	Fault Condition	Possible Fault
EC7	Drive train triac sensing failure (brake actuator).	Wrong input signal to microprocessor.	- Main board defective.
EF2	Foam warning.	Too much foam during spinning.	- Excessive detergent dosing. - Drain system dirty or clogged. - Drain pipe kinked or clogged.
EF5	Load too unbalanced.	UVER detect high unbalance during spinning.	- Load unbalanced.
EF6	Safety reset.	Main board microcontroller damaged.	- Main board defective.
EFA	Load unbalance by knock-off switch.	Knock-off switch is touched due to a high unbalance load.	- Load unbalanced.