

# TECHNICIAN MANUAL

**E-type Electronic Table -Top Autoclaves  
models 1730, 2340, 2540, 3140, 3850, 3870  
E, EK, EA & EKA**

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## 1. **INTRODUCTION**

This manual, together with the operator's manual, forms the complete edition of the Operation and Maintenance instructions. This manual is intended for the use of the technician. It is forbidden for unqualified and unauthorized personnel to service the autoclave in accordance with the instructions in this manual. Any unauthorized service may result in the invalidation of the manufacturer's guarantee.

The qualified technician shall be an authorized electrician with the right qualifications in electronics and shall be familiar with the local technical/electrical regulations.

## 2. **SYMBOL DESCRIPTION**



**Caution! Consult accompanying documents**



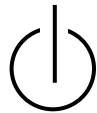
**Caution! Hot surface.**



**Caution! Hot steam.**



**Protective earth (Ground)**



**On-Off**

### 3. TESTS

#### 3.1 Installation Tests



The service technician shall perform the following preliminary checks before operating the autoclave:

- a. **Integrity Check**  
Perform a visual check to verify that there are no dents, scratches, broken gauges, etc.
- b. **Leveling Check**  
Check that the autoclave is leveled.
- c. **Leakage current test**  
Check the precise operation of the earth leakage relay.
- d. **Continuity Check**  
Check the continuity of the grounding connection.

At this stage operate the autoclave and continue with the tests:

- e. **Safety Check**  
Check the safety elements; safety valve and the door locking mechanisms.
- f. **Programs Check**  
Run basic programs of the autoclave and check the operation sequences, the sterilization parameters etc.
- g. **Validation**  
Validate the sterilization cycles, taking in consideration the interface of packaging/goods/autoclave.

After the above steps are performed, the autoclave is ready for operation.

#### 3.2 Periodical Tests

PERIOD	TEST
1 months	Test the safety valve by operating it.
6 months	Remove the cover of the autoclave, tighten the screws of the heaters and the electrical connections at the heaters, valves and connectors in the control box.
Year	Check the continuity of the grounding connections.
	Check the temperature and pressure calibration.
	Perform validation of the autoclave.
	Check the precise operation of the earth leakage relay.
	Check that the autoclave is levelled.
	Check the safety elements; safety valve, safety and cut-off thermostats door locking mechanisms.
	Run basic programs of the autoclave and check the operation sequences, the sterilization parameters etc.
	Check the water reservoir, piping, plastic parts and electric wires.
5 years	Check and tighten the piping joints to avoid leakage.
	Check and tighten all screw connections in the control box, heaters and valves and instrumentation.
5 years	Observe the closing device for excessive wear
Safety tests (pressure vessel, efficiency, electrical) shall be performed in accordance with local rules or regulations, by an authorised inspector.	

Only an authorized technician shall perform the 6-months and yearly tests!

#### 4. **WATER QUALITY**

##### 4.1. **Water quality**

The distilled or mineral – free water supplied to the sterilizer shall be according to the table below:

Physical Characteristics and Maximum acceptable contaminants levels  
in water or steam for sterilizers  
(According to EN 285:2006).

Evaporate residue	≤ 10 mg/l
Silicate (SiO <sub>2</sub> )	≤ 1 mg/l
Iron	≤ 0.2mg/l
Cadmium	≤ 0.005 mg/l
Lead	≤ 0.05 mg/l
Rest of heavy metals except iron, cadmium, lead	≤ 0.1 mg/l
Chloride (Cl)	≤ 2 mg/l
Phosphate (P <sub>2</sub> O <sub>5</sub> )	≤ 0.5 mg/l
Conductivity (at 25°C)	≤ 15 µS/cm
pH value (degree of acidity)	5 to 7.5
Hardness (Σ ions of alkaline earth)	≤ 0.02 mmol/l
Appearance	Colourless, clean, without sediments

Compliance with the above data should be tested in accordance with acknowledged analytical methods, by an authorized laboratory.

##### **Attention:**

*We recommend testing the water quality once a month. The use of water that does not comply with the table above may have severe impact on the working life of the sterilizer and can invalidate the manufacturer's guarantee.*

##### 4.2. **Reverse Osmosis**

A Reverse Osmosis system may be used to improve the quality of the water used to generate steam in the autoclave chamber. The use of mineral free will contribute to better performance and longer life of the autoclave.

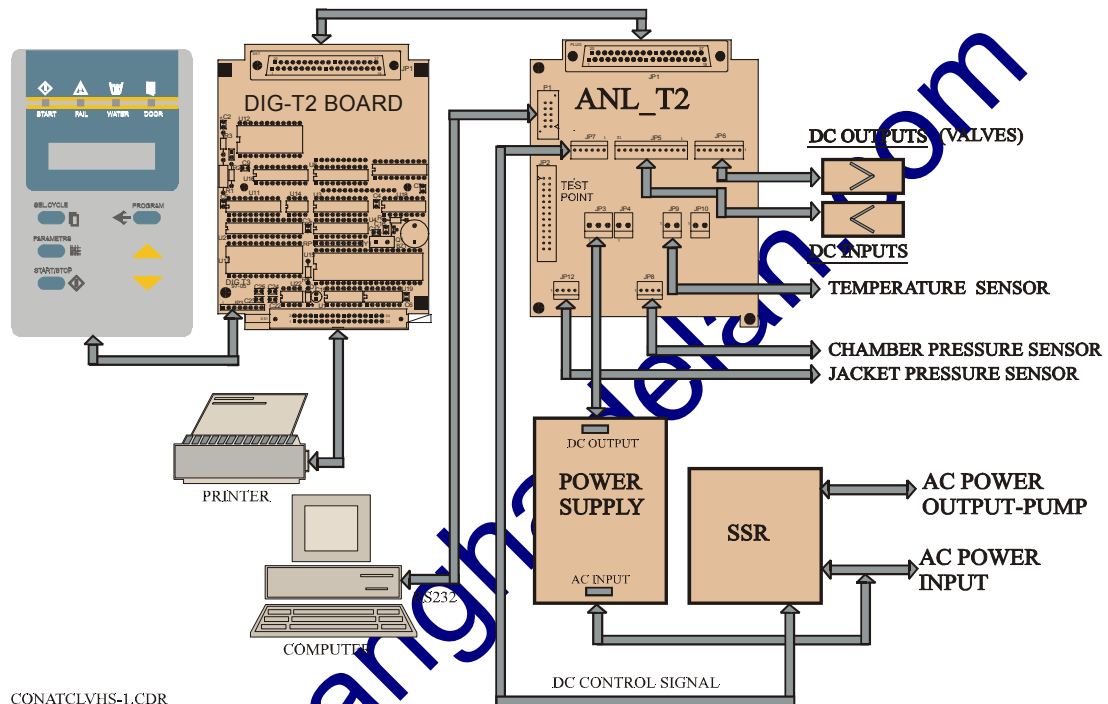


## 5. DESCRIPTION OF THE CONTROL SYSTEM.

(See CDR Control diagram).

The control system is based on 3 electronic boards designed according to the autoclave requirements, the digital board DIG-T2 containing the micro-controller memories, buffers and digital ICs and the analog board ANL-T2 which performs the processing of signals coming from the sensors and switches. The AC-T1 board consists of filters and AC drivers. DC voltages 12V and 5V, supplied by a switching type power supply, powers the 3 electronic boards.

### CONTROL SYSTEM BLOCK-DIAGRAM



The system is provided with communication interfaces RS 232 to PC and to parallel printer.

#### 5.1 Digital Board DIG - T2

The digital board is connected to the keypad panel, to the parallel printer and to the analog board ANL-T2.

- The board contains the micro-controller (U15) type 80C32 that runs the software program of the system.
- On the board, are three types of memories:
  - 1) EPROM memory (U17), part no. 27512 storing the program codes.
  - 2) RAM memory (U21) with a capacity of 32KB for the temporary data during the running of the program.
  - 3) EPROM memory (U22) that is a fixed serial memory with an electrical writing and erasing.
- This EPROM serves as a non-volatile memory, enabling the system to change follow-up tables during running of program codes, and ensuring this data is not lost in case of power failure.

- The board contains an optimal Real Time Clock (U12), which serves as a clock to the system, including a back-up battery, which ensures the clock, runs continuously even when the autoclave is not powered.

This component is optimal because it is related to the operation of the printer, which is also an optional item.

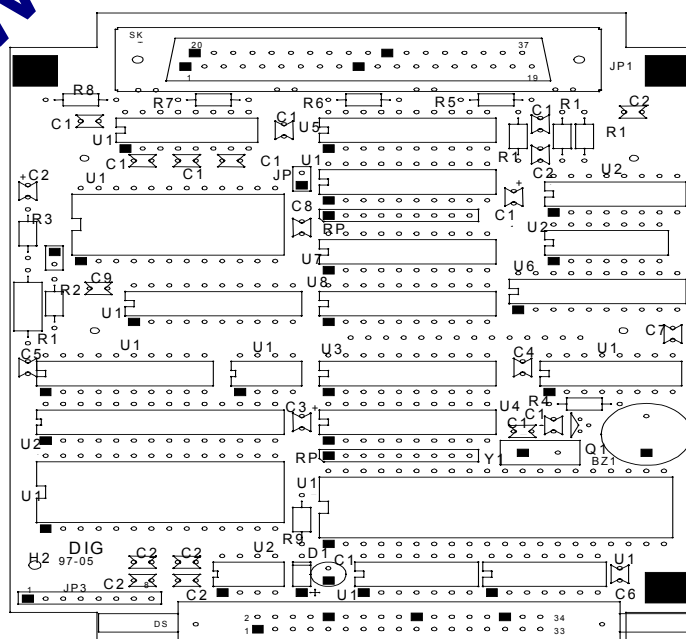
- The board contains a watchdog, which detects any faulty situation in the running program code. It performs an automatic reset of the micro-controller and stops all the commands to avoid an uncontrolled activation of any of the heating elements or the valves.
- The board functions as an MMI (Man-Machine Interface). It is connected to a LCD display of two rows with 16 characters on each row and to the following light indicators:
  - START (autoclave in process),
  - FAIL (the process failed),
  - WATER (no water in the reservoir),
  - DOOR (the door is not closed).

A keyboard connected to the digital board, serves as a control panel containing the command and programming keys.

- The digital inputs and outputs are transferred to the system, as follows:
  - Through the digital board to the analog board by means of buffers 74HC377.
  - RS232 interface is performed on the board by the U13 component, the signal is transmitted to the communication connector located on the ANL-T2 board.
  - The printer is connected directly to this board, connector DS1 enables to connect the DPU-20 printer manufactured by SEIKO. The printer receives the data and the supply voltage directly from this connector.

The layout of the DIG-T2 board components is provided below

### DIG- T2 BOARD



## 5.2 Analog Board ANL-T2

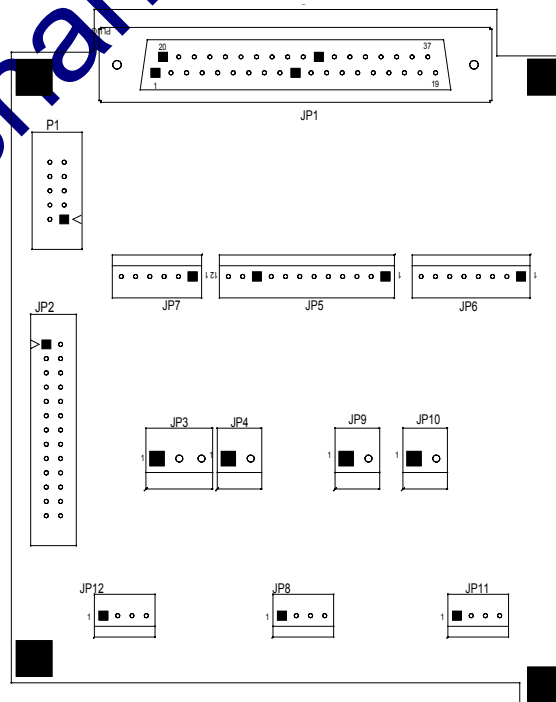
The analog board contains the drivers of the valves, heaters and pump. It contains the sensors circuits connected to the control system, and serves as a junction to the autoclave connections.

The input is 12VDC & 5VDC and the output is for all the signals to the autoclave.

- The power supply provides the DC voltages 12V and 5V through the connector JP3 to the board and further to the DIG-T2 board.
- The computer is connected to the board through the connector P1, by RS232 interface.
- The analog and digital inputs, from the temperature sensor, electrode door switch, etc. are connected through connector JP6, the conversion circuits of the sensors are located on this board.
- The pressure sensor MPX2200 that measures the chamber pressure is connected to the board through connector JP8, to the conversion circuit of the sensor that is located on this board.
- The analog to digital conversion circuit A/D (U5) and the analog multiplexer (U6) for 8 analog inputs (temperature, pressure, and electrode) are located on this board and transfer digital signal to the DIG-T2 board.
- All the drivers and power circuits to the solenoids (valves, door locking) are included on this board.

Layout diagram of the ANL-T2 is provided below.

**ANL-T2 BOARD**



### 5.3 AC - Board - AC-T1

This board receives command signals from ANL-T2 board designated to activate AC devices. It converts them to AC mode.

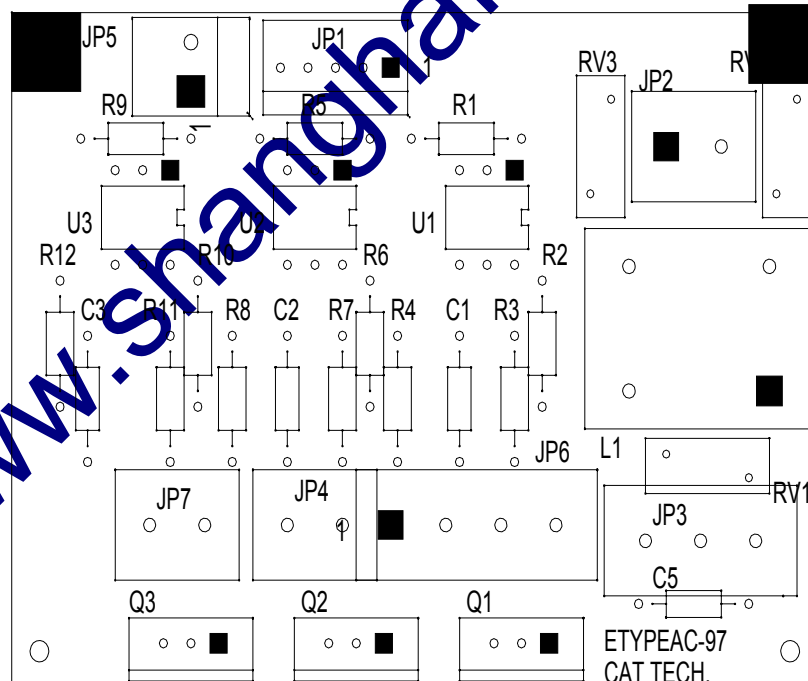
The AC-T1 board provides AC filtering for the power supply to the control system and protection from sharp current fluctuations.

The AC-T1 board includes:

- AC drivers for the AC devices (pump, heaters, etc.) up to 6A.
- AC - input connector JP3.
- Filter circuit based on L1C5, the power transfer from the filter to power supply via JP2.
- Spike protection - RV1÷3.
- Three - 230/115 VAC output channels, triac control circuit.
  - Q1 - 16Amp - JP4/1,2
  - Q2 - 8 Amp - JP7/1
  - Q3 - 8 Amp - JP7/2

#### AC-T1 BOARD

(JP3,JP4,JP7 ON THE BOTTOM SIDE OF THE BOARD)



## 6. CALIBRATION OF TEMPERATURE AND PRESSURE

### 6.1 Method of Calibration:

The calibration of temperature and pressure is performed digitally.

The temperature and pressure measuring circuits are designed with components having 1% accuracy.

The temperature circuit is linear and has an output of 100mV÷2400mV for a temperature range 20°C÷150°C.

The pressure circuit is also linear and has an output of 100mV÷2400mV for a pressure range 0÷400 kPa.

The measuring at the A/D is limited for values higher than 2400mV or below 100mV.

The system has a non-volatile memory in which the offset and gain data of the sensors are stored.

Calibration is performed by use of the keyboard (or the communication port for computer use).

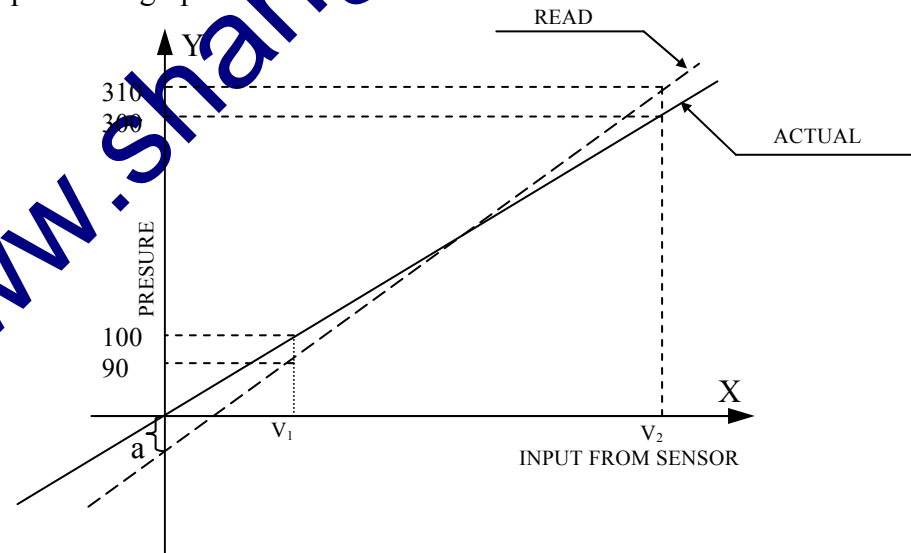
Following is a description of the calibration of temperature and pressure using the keyboard. The calibration procedure is identical to all autoclave models.

#### Definition of Gain and Offset:

Every straight line can be defined by the equation  $ax+b=y$ . “a” is the deviation from  $y=0$  and “b” is the slope of the line. In our case  $a$ =Gain and  $b$ =Offset.

The system is based on calculation of offset and gain of two points as in the following example






If the actual measured pressures are 100 kPa & 300 kPa and the displayed pressures are 90 kPa & 310 kPa respectively, the ‘input Vs pressure’ graph will be as follows.



The calibration method enables to input this data into the system in order to perform automatic correction of OFFSET and GAIN.

It is necessary to define the two points, which have to be input to the system, prior to performing calibration.

## 6.2 Temperature Calibration Procedure

- Press the *PROGRAM*  key.
- The system enables to set the system's date the time.
- This operation is skipped by pressing *PROGRAM* key  six times.
- **CODE: 000** will be displayed.
- Select Technician Code (011) by the UP/DN keys and press the *PROGRAM*  key.
- Select CALIB CODE: 107 to calibrate the system by means of the UP/DN keys and press the *PROGRAM*  key again until TEMP CAL: 000 will be displayed.
- Set calibration code to **TEMP CAL: 001**
- Press the *PROGRAM*  key again and do not change the code.
- The following data will be displayed:





UPPER ROW: A 60.0 R 60.0

LOWER ROW: A 130.0 R 130.0

Enter the actual data (A) and the displayed data (R) for two known points as in the following example:


The actual temperatures are 70°C & 120°C and the displayed temperatures are 68°C & 120°C respectively.


Proceed as follows:

- On the upper row, change A60.0 to A 70.0 by means of UP/DN keys.
- Press the *PROGRAM*  key.
- The cursor on the upper row will move to R60.0, change to R68.0 by means of UP/DN keys.
- Press the *PROGRAM*  key.
- The cursor moves to the lower row to A 130.0, change it to A 120.0 by means of UP/DN keys.
- Press the *PROGRAM*  key.
- The cursor on the lower row will move to R130.0, change to R123.0 by means of keys UP/DN, then press the *PROGRAM*  key


This completes calibration procedure for temperature.

**Remarks:**

- When cursor is set under any figure, pressing the START/STOP  key stops calibration.

- When the cursor is set under any figure, it enables to feed this value to the reading of temperature by pressing the *PARAMETERS* key. 

**Example:**

If the cursor is set under R68.0 on the upper row and the actual temperature of the autoclave is now 66.0°C, by pressing the *PARAMETERS*  key, the temperature reading will be corrected from R68.0 to R 66.0.

This calibration method enables the technician to change a certain point without affecting a second point.

**Example:**

*When the working temperatures are 134°C and 121°C but the actual temperature are 132°C and 121°C*

The measured temperature for 134°C must be corrected without changing the temperature at 121°C,

Considering the above example, the setting of data can be done as follows:

A 121.0    R 121.0






A 132.0    R 134.0

The system will calibrate the new offset and gain and retain them into the non-erasable memory.

As a result, while running a 134°C program the correction is automatically made, while at 121°C no change is felt.

### 6.3 Pressure Calibration Procedure




To perform the pressure calibration two points have to be defined allowing the calculation of new OFFSET and GAIN values.


- Press the PROGRAM  key.
- Skip date and the time setting by pressing the PROGRAM  key six times.
- **CODE: 000** will be displayed.
- Select the Technician Code (011) by the UP/DN keys and press the PROGRAM  key.
- Select **CALIB CODE: 107** to calibrate the system by means of the UP/DN keys and press the PROGRAM  key again until the system displays: **PRES CAL: 000**
- Press the PROGRAM  key.

The following is displayed:

**Point 1 – Upper Row A 100 R 100**

**Point 2 - Lower Row A 300 R 300**

- Open the door, do not alter A 100.
- Press the PROGRAM  key, the cursor will move to R 100.
- Press the PARAMETERS  key. The system performs reading pressure and displays it instead of R100. E.g. R97 (i.e. the system reads out 97kPa, when the door is open).
- Press the PROGRAM  key.
- The cursor moves to the lower row to A300.

If the system reads out 280kPa, do not change A300. Press the PROGRAM  key to move to R300 and change it to the actual pressure value 280kPa by means of the keys UP/DN.

- Press the PROGRAM  key again.

The system calculates the new values for offset and gain and stores these values in the non-volatile memory.

This completes the calibration procedure for the pressure.



## 7. **TEST POINTS**

The test point list provides testing points on the junctions on board to assist in locating the malfunction.

NU TP	FUNCTION	VALVE
TP1	GND	—
TP2	+5V DC	—
TP3	+12V DC	—
TP4	OUT - HEATERS	‘0’V-Off 5V-On
TP5	—	—
TP6	—	—
TP7	OUT-AIR-VALVE	0V-Off 5V-On
TP8	OUT-EXH-VALVE	0V-Off 5V-On
TP9	OUT-WATER-VALVE	0V-Off 5V-On
TP10	OUT-DRY-VALVE	0V-Off 5V-On
TP11	OUT-DOOR-VALVE	0V-Off 5V-On
TP12	—	—
TP13	—	—
TP14	—	—
TP15	—	—
TP16	—	—
TP17	—	—
TP 18	—	—
TP19	—	—
TP20	—	—
TP21	IN-TEMPERATURE	0÷2.5V
TP22	—	—
TP23	—	—
TP24	IN-PRESSURE	0 ÷2.5V
TP25	—	—
TP26	IN-ELECTR.	2.5V NO WATER

## 8. SOFTWARE PROGRAMMING PROCEDURES

### 8.1 General

The software for the control system of E-Type autoclaves is AS FOLLOWS:

EaEn3WP20 for standard autoclaves.

EaEn3WP20AR for autoclaves designed to operate at high altitude (above 2500 m).

The software contains a table of parameters of which part of them defines the autoclave, and part defines the processes in the autoclave. This document describes parameters and their task in the software.

### 8.2 Changing Cycle Parameters

Access to the program is achieved by inserting the access code.

Access code 1 – This access code enables change of the sterilization time, sterilization temperature and the drying time.

Access code 11 – changes that may be done by the supervisor. Enables to change a few parameters.

Access code 33 – changes that may be done by the technician. Enables to change all the parameters.

To change the parameters listed below, proceed as follows:

- Select the cycle.
- Enable the operation by entering the ACCESS CODE (11).
- Set the parameter that has to be modified, by pressing successively the PROGRAM key.
- Set the desired data by means of the UP/DN keys.
- Pressing the PROGRAM key enters the modified data into memory, and moves to the next parameter.

The pre-set parameters values will replace the last default values and become the updated default values.

#### 8.2.1 SteTemp – Required sterilization temperature for the process

Entry Code – 1

Resolution – 1°C

Minimum value for the change – 60°C

Maximum value for the change – 137°C

Set value	Cycle	1	2	3	4	5
	Value	134	121	134	121	121

#### 8.2.2 SteTime – Required sterilization time for the process

Entry code – 1

Resolution – 1 minute

Minimum value – 3 minutes

Maximum value – 99 minutes

Set value	Cycle	1	2	3	4	5
	Value	3	15	7	20	30

### 8.2.3 Heat Standby – Heating elements operation in Standby Mode

Access Code – 1

Resolution – 1

Value – 0 or 1

— If Heat Standby = 0, the heating elements will not operate in the Standby Mode.

— If Heat Standby = 1, the heating elements will operate in the Standby mode, in a shoot mode of 1 second on, 59 seconds off.

### 8.2.4 Dry Time – Required drying time for the process

Entry Code – 1

Resolution – 1 minute

Minimum Value – Ø minutes

Maximum Value – 99 minutes

Set value	Cycle		1	2	3	4	5
	Value per model	E, EK	0	0	30	30	0
		EA, EKA		1	30	30	0

### 8.2.5 Heat T.O. - Maximum time allowed for the heating stage (testing)

After this time, if the system does not enter the sterilization stage, it will receive a 'Low Heat' message and the process will abort.

Entry Code – 11

Resolution – 1min

Minimum Value – 20min

Maximum Value – 120 min

Cycle		1	2	3	4	5
Set value	Value	60	60	60	60	90

### 8.2.6 Ex Mode – The method for exhausting the steam at the end of the process

Entry Code – 11

Resolution – 1

Ex Mode

Fast Ex 1

N.A. 2

Slow Ex (Waste) 3

Slow Ex (Liquids) 4

Cycle		1	2	3	4	5
Set value	Value	1	1	1	1	4

### 8.2.7 *End Temp - The ending temperature of the process*

If at the end of the process the temperature is higher than this temperature, the process will not end and the door will remain closed.

Entry Code – 11  
Resolution – 1°C  
Minimum Value – 40°C  
Maximum value – 137°C

Set value	Cycle	1	2	3	4	5
	Value	125	121	125	134	95

### 8.2.8 *Air Temp – Controls the closing of the air valve*

Defines the temperature of the chamber's outlet at which the valve closes.

Access Code - 11  
Resolution - 1  
Minimum Value - 50°C  
Maximum Value - 95°C  
Factory pre-set 90°C

Set value	Cycle	1	2	3	4	5
	Value	90	90	90	90	90

### 8.2.9 *Calib Code – Calibration Code*

This allows entry to the calibration mode.

It must be set on 107 in order to allow the code to be entered.

Entry Code – 11  
Resolution – 1  
Minimum Value – Ø  
Maximum Value – 255

Set value	Cycle	1	2	3	4	5
	Value	100	100	100	100	100

### 8.2.10 *Water Time – Time for entering water to the autoclave*

This value defines the entry time of the water to the autoclave to locate the electrode touching the water.

This time will change from process to process and even for different autoclaves.

When the autoclave is vertical and the defined time is 0 seconds, the water valve will not open at all.

Entry Code – 11  
Resolution – 1 second  
Minimum Value – 1 second  
Maximum Value – 90 seconds

Set value	Cycle	1	2	3	4	5
	1730	50	50	50	50	50
	2340	30	30	30	30	30
	2540	30	30	30	30	30
	3140	40	40	40	40	40
	3850	45	45	45	45	45
	3870	60	60	60	60	60

### 8.2.11 *LimitP add – The allowable addition to the maximum pressure in every process*

If the maximum pressure is 225kpa, the system will not heat beyond this pressure. If LimitP add will be 0, the maximum pressure will remain 225kpa. If LimitP add equals 10, the maximum pressure will be 235kpa.

Entry Code – 11  
Resolution – 1kpa  
Minimum Value – 0kpa  
Maximum Value – 30kpa

Set value	Cycle	1	2	3	4	5
	Value	0	0	0	0	0

### 8.2.12 *EA Type – The autoclave contains a drying pump for the Dry Stage*

Access Code – 33  
Resolution – 1  
Value – 0 or 1  
Autoclave contains Drying Pump = 1  
Autoclave does not contain a Drying Pump = 0

Set value	Cycle	1	2	3	4	5
	Value per model	E, EK	0	0	0	0
		EA, EKA	1	0	0	0

### 8.2.13 *Req Prs+*

This defines the required addition to the sterilization pressure in kpa.

For example, for a sterilization temperature of 121°C the required pressure is 204kpa. Since the system controls the sterilization process according to pressure and temperature, if Req Prs+ equals Ø, the system will maintain the pressure at 204kpa. If the value is at 5kpa, the system will be maintained at 209kpa, and so on.

Entry Code – 33  
Resolution – 1  
Minimum Value – 0kpa  
Maximum Value – 15kpa

Cycle		1	2	3	4	5
Set value	Value per model					
	1730					
	2340	7	5	7	5	5
	2540					
	3140					
	3850	9	9	9	9	9
	3870					

### 8.2.14 *Auto. Num – Autoclave serial number*

This parameter is used to set the serial number in the facility. This number enables the operator to identify each autoclave. This number is printed on the autoclave's printout.

Access Code – 13  
Resolution – 1  
Minimum Value – 1  
Maximum Value – 99

## 8.3 *Resetting the Autoclave*

Whenever certain data, stored in the back-up memory, must be erased the system must be reset, in order to restore the system to normal operation or for situations that follow:

- When the machine is operated for the first time or after a long interruption, and disorders appear in the operations sequence.
- When operation was stopped in the middle of the cycle, as a result of a power failure or manual stop and the cycle has not been completed.

To reset the system; proceed as follows:

- Turn the main power switch OFF.
- Turn the main power switch ON, while pressing the SEL. CYCLE key, until the program parameters are displayed.

After resetting the autoclave, the autoclave is in stand-by mode

## 9. **REPLACEMENT OF COMPONENTS**

### 9.1 **Safety Tests after Repair**



#### **ATTENTION!**

*After every repair or dismantling the enclosure, the autoclave should pass two safety electrical test by the Service Engineer. The following shall be performed:*

#### **1. Enclosure Leakage Current Test.**

Every autoclave should pass this test as follows:

1. Remove the outer cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect receptacle from JP3.
3. Remove all fuses
4. Connect the electrical cord to the autoclave.
5. Turn on the circuit breaker.
6. Short-circuit the L and N pins on the cord's plug.
7. Connect the Short-circuit pins to the L pole on the Megger.
8. Connect the earth pins to the earth pole on the Megger.
9. Impose an electrical potential of 500-1000V on the tested autoclave. The insulation resistance should be at least 2 MΩ.

The test is successful if there was no leakage.

#### **2. Protective Earth Impedance Test**

1. Connect the grounding pin of the power cord plug to one pole of an Ohmmeter.
2. Connect any other metallic part (preferable – the metallic part of the locking screw) to the second pole of the Ohmmeter.
3. The resistance should not exceed 0.3 Ω.

After performing these tests, the Service Engineer should complete and sign the Work Order.

## 9.2 Dismantling the Outer Covers of the Autoclave

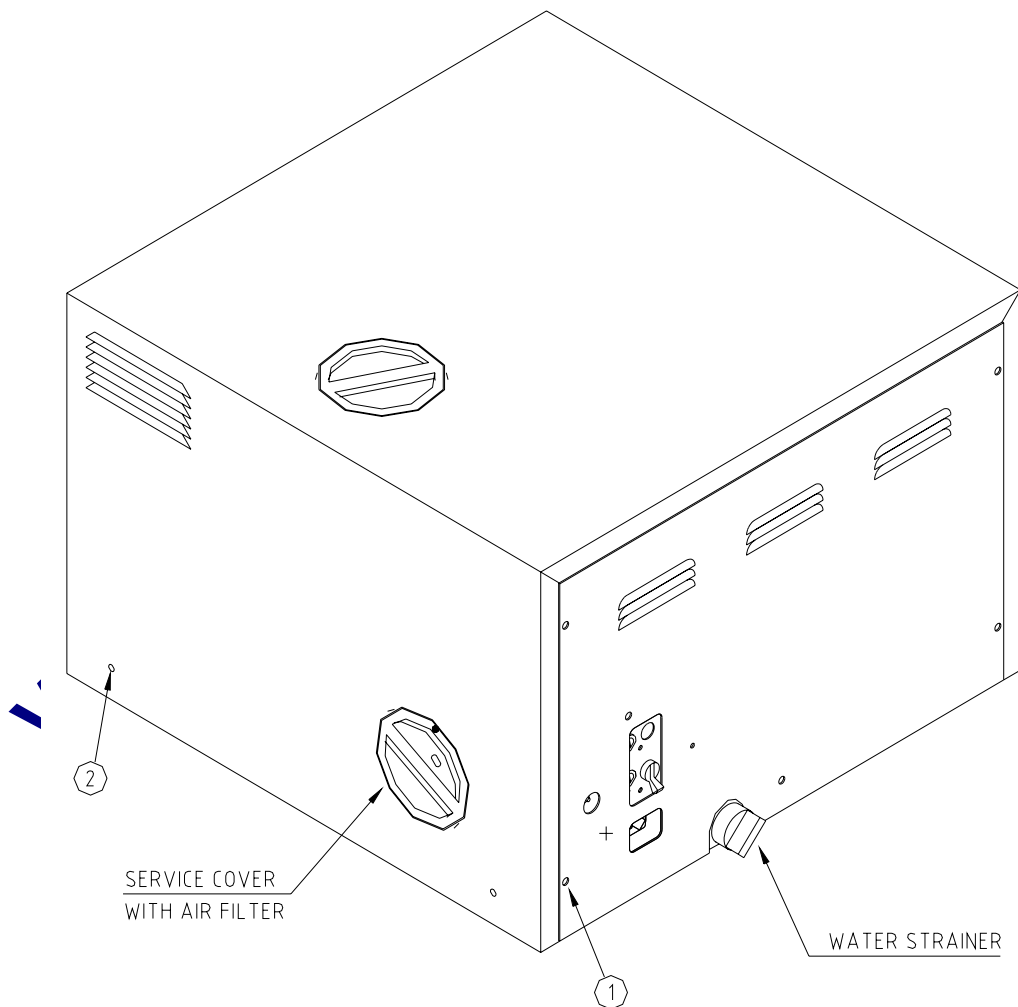


### Caution!

*Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.*

*Allow the autoclave to cool before removing outer covers.*

1. Remove the screws holding the rear cover (1).
2. Remove the screws holding the cover to the base (2).
3. On EA and EKA models dismantle the air filter from the service opening cover (3).
  - 3.1. Remove the screws holding the filter cover (on EA, EKA).
4. Remove the grounding wires from the cover.
5. Pull the cover upwards.





### 9.3 Replacing the Safety Valve



#### **Caution!**

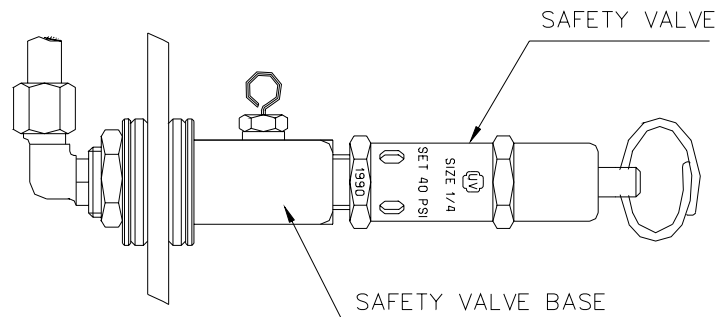
*Before starting, be sure that the electric cord is disconnected and that there is no pressure in the autoclave.*

#### **Note:**

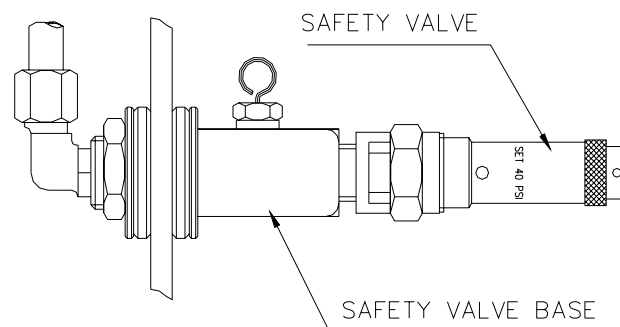
**These instructions are valid for both, PED and ASME type safety valves.**

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Remove the water reservoir cover.
3. Unscrew the safety valve and remove it from the safety valve base.
4. Replace the valve with a new safety valve (install an original only!). use Teflon tape for sealing the thread.
5. Perform one cycle and verify that the valve operates correctly.

#### **ASME approved Type**



#### **CEmarked Type**



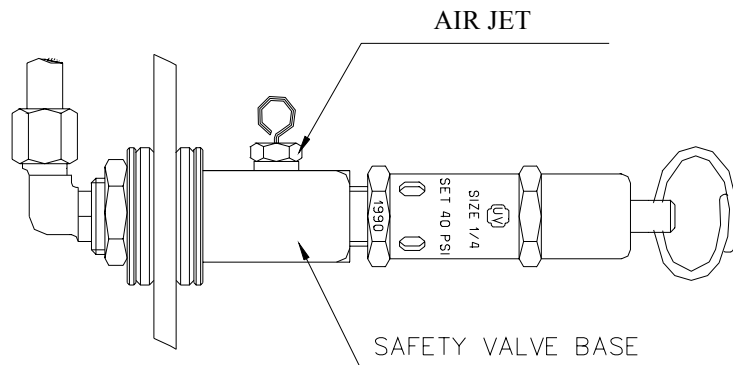
#### 9.4 Replacing the Air Jet



##### **Caution!**

*Before starting, be sure that the electric cord is disconnected and that there is no pressure in the autoclave.*

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Remove the water reservoir cover.
3. Remove the water reservoir silicon gasket.
4. Unscrew the air Jet with a 10 mm wrench and remove it from the safety valve base.
5. Replace the valve with a new air Jet (install an original only!). use Teflon tape for sealing the thread.
6. Test any autoclave cycle to verify that the valve operates correctly.



### 9.5 Replacing the Air Relief-safety relief Valve block

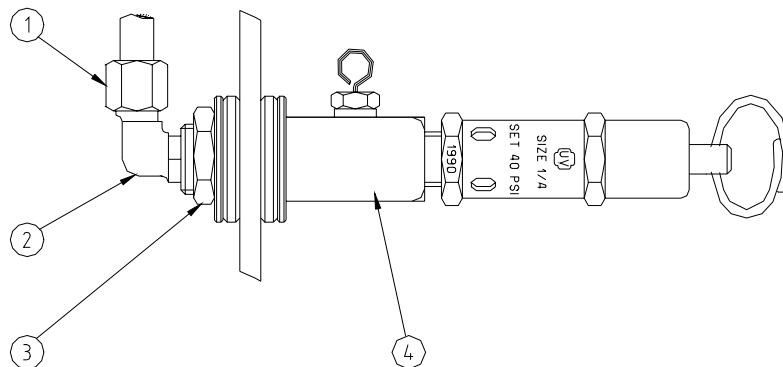


#### **Caution!**

***Before starting, be sure that the electric cord is disconnected and that there is no pressure in the autoclave.***

In case the water reservoir is deeply contaminated (soil, lime stone, etc.) it is recommended to replace the entire unit.

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Remove the water reservoir cover.
3. Remove the water reservoir silicon gasket.
4. Unscrew and remove nut (1) with a 1/2” wrench.
5. Remove angle 1/8”-1/4” (2) from the relief valve base.
6. Unscrew and remove nut (3).
7. Remove the air-relief-safety valve block (4).
8. Install the new unit using Teflon tape for sealing the thread.
9. Perform one cycle and verify that the valve operates correctly.



### 9.6 Replacing the electronics board (control panel)

#### Caution!



***Make sure that the power cord is disconnected!***

***If the electronic box was damaged by any liquid that entered the box, do not attempt to replace it. In this case only the factory technicians may repair the autoclave.***

***Allow the autoclave to cool before removing outer covers.***

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Remove the two screws that connected the plastic panel with the digital electronic board to the autoclave (2).
3. Disconnect the flat cable from JP1-DIG-T2 to JP1 ANL-T2 (4).
4. Disconnect the flat cable of communicator from P1-ANL-T2 (6).
5. Disconnect the grounding cable shoe (5).
6. On autoclave models 2340 and 2540 disconnect the main switch.
7. Remove the plastic panel, including the electronics board (control panel), from the autoclave.
8. Disconnect the control panel from the plastic panel and replace it with a new one.

### 9.7 Replacing the Electronics Box

#### Caution!

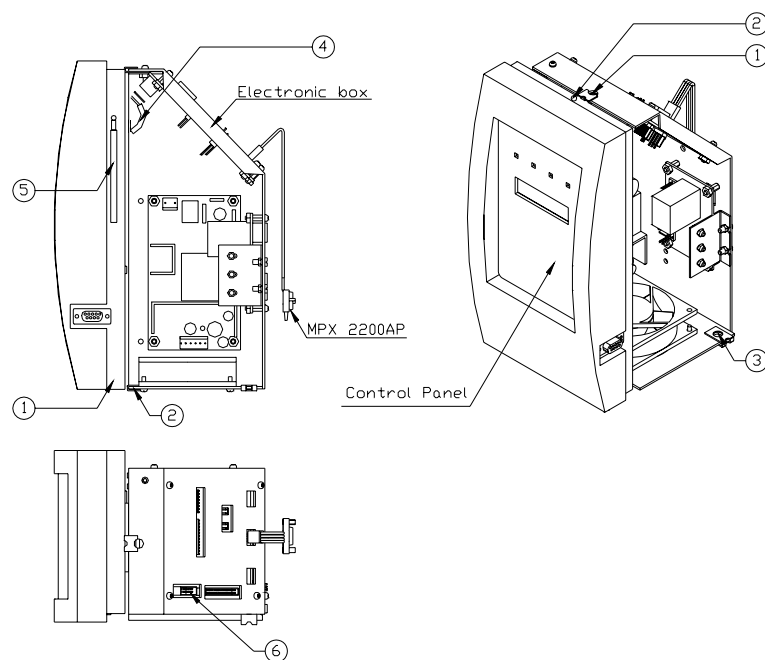


***Make sure that the power cord is disconnected!***

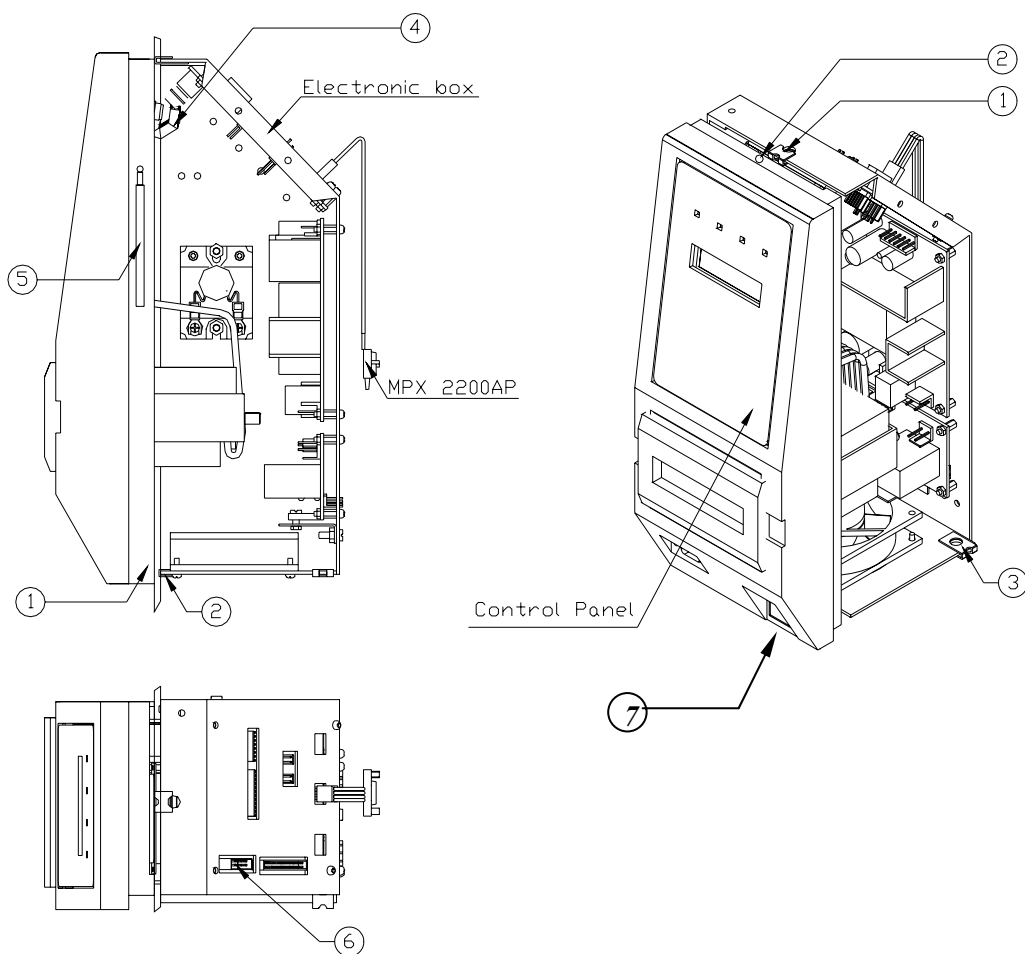
***If the electronic box was damaged by any liquid that entered the box, do not attempt to replace it. In this case only the factory technicians may repair the autoclave.***

***Allow the autoclave to cool before removing outer covers.***

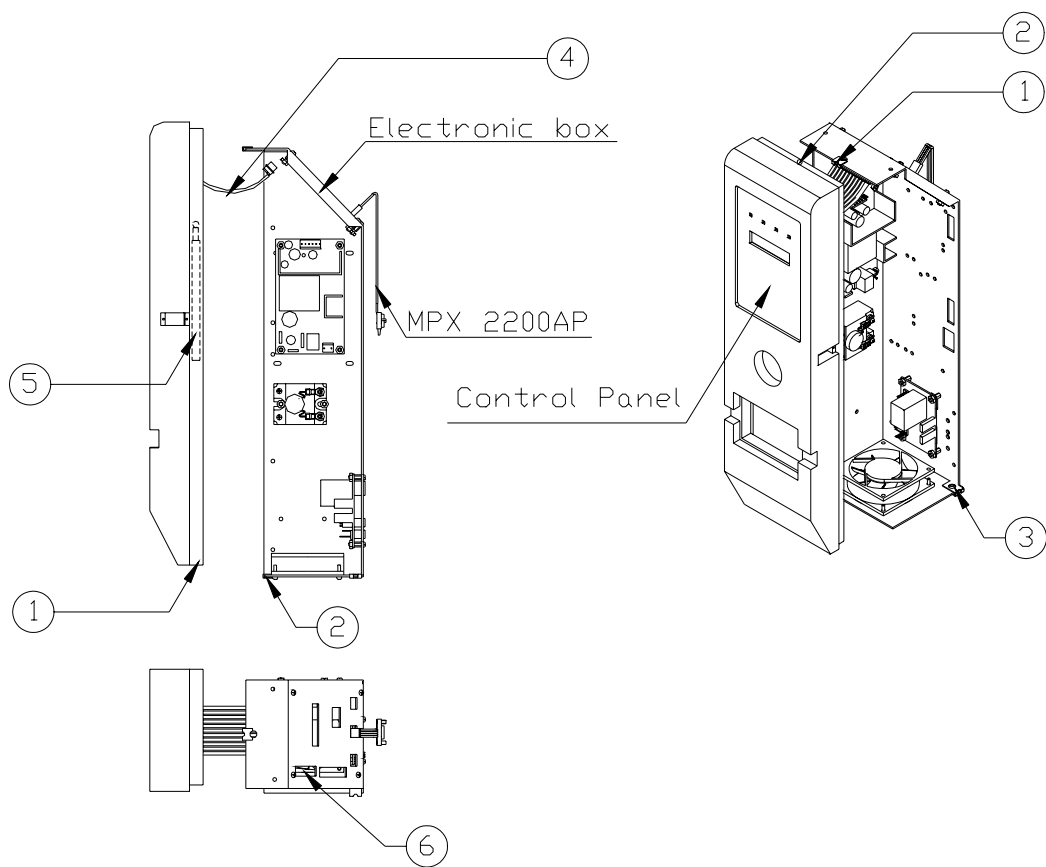
1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Remove two screws from the bottom side and from the top (1, 3).
3. Disconnect all the electric system connectors from the electronics base (including the MPX connectors).
4. Remove electronics box and replace with new one.
5. Re-assemble the instrument. Verify that the grounding connections are connected correctly.
6. Test any cycle and verify that the autoclave operates as required.



**Electronic box: 1730**



**Electronic box: 2340/2540**



Electronic box: 3140/3850/3870

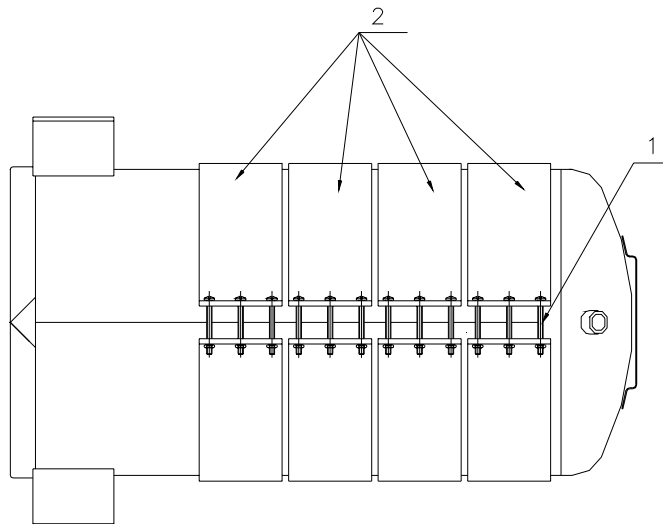
### 9.8 Replacing Heating elements



#### Caution:

*Before starting, be sure that the electric cord is disconnected from the power source and that there is no pressure in the autoclave chamber.*

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Remove the insulation.
3. Remove the heating element tightening bolts (1).
4. Release the two terminal wires from the heating element.
5. Replace the heating element (s)
  - 5.1 Verify that the upper thermo-couple tube is connected to the upper (cut-off) thermostat and that the lower thermo-couple tube is connected to the lower (safety) thermostat.
6. Ensure that the heating element strap is well tightened to the autoclave body, ensuring proper heat dissipation from the heating element.
7. After replacing one or more heating elements run a cycle and verify that it operates as required.
8. Retighten the fixing screws of the heaters. This operation is done with the autoclave hot, but with the power cord disconnected from the power outlet and autoclave door open, to ensure that the chamber is not pressurized.
9. Re-assemble the autoclave insulation and cover.



### 9.9 Replacing the Temperature Safety Thermostat

The autoclave is supplied with a temperature thermostat, which protects the heaters and autoclave against overheating, during the dry cycle.

This device reconnects automatically when the chamber cools down.

#### **Caution**

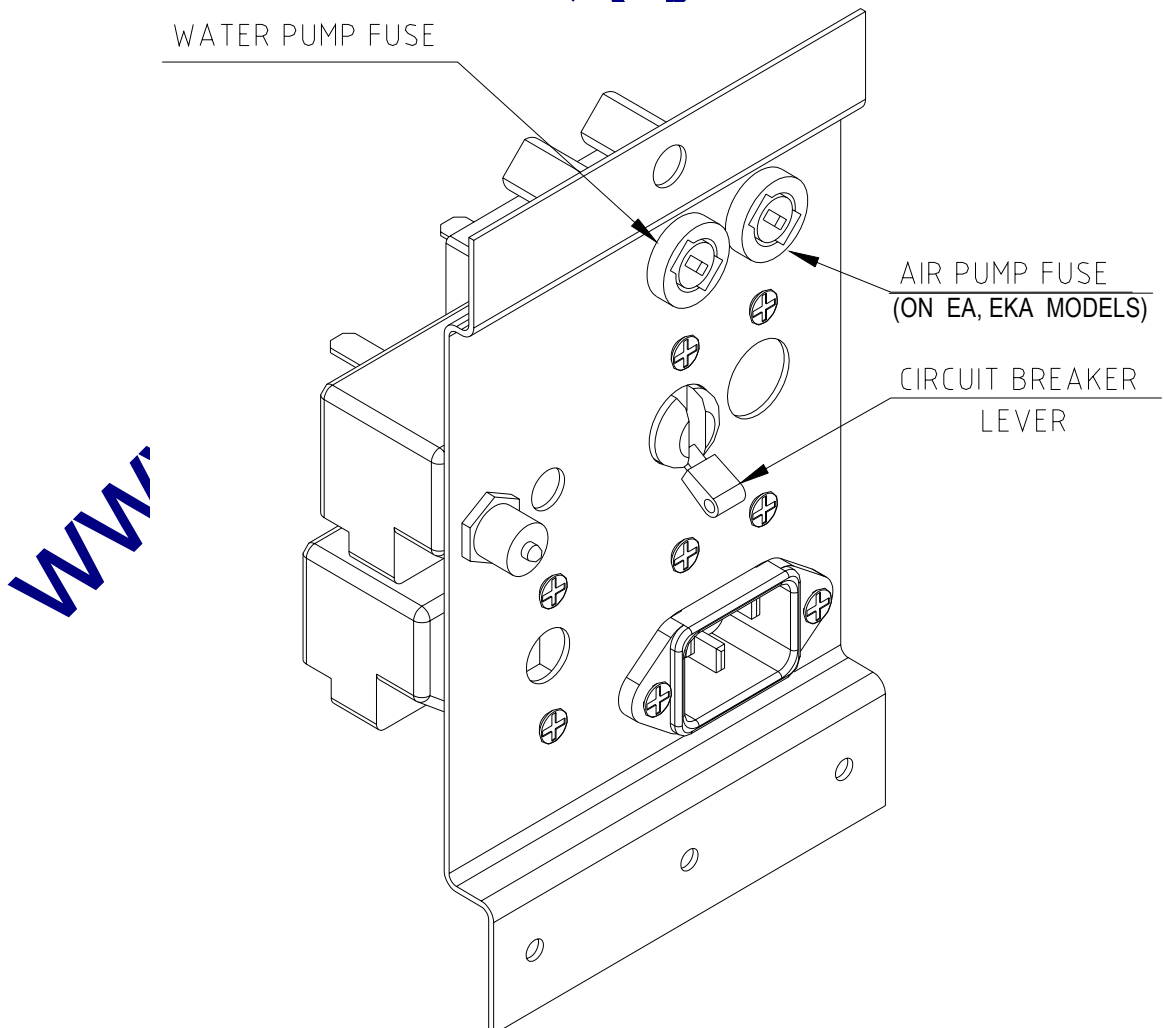


*Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.*

*Allow the autoclave to cool before removing outer covers.*

The temperature safety thermostat is located on the lower side of the fuse and socket panel on the rear of the autoclave.

1. Remove the rear cover.
2. Loosen the heating band.
3. Unscrew the thermostat and replace it with a new one.
4. Perform any dry cycle to verify that the temperature safety thermostat disconnects the heating units.





### 9.10 Replacing the Cut-Off Thermostat

This thermostat cuts out power to the autoclave, in the event that all other safety means do not function.

For example: If the safety thermostat is defective and the temperature continues to rise, then the cut-off thermostat cuts out the power to the autoclave. In order to restart the operation press the Reset Button. If the autoclave is operated according to the instructions, and the thermostat again cuts out, the Cut-Off Thermostat must be replaced.

#### Caution

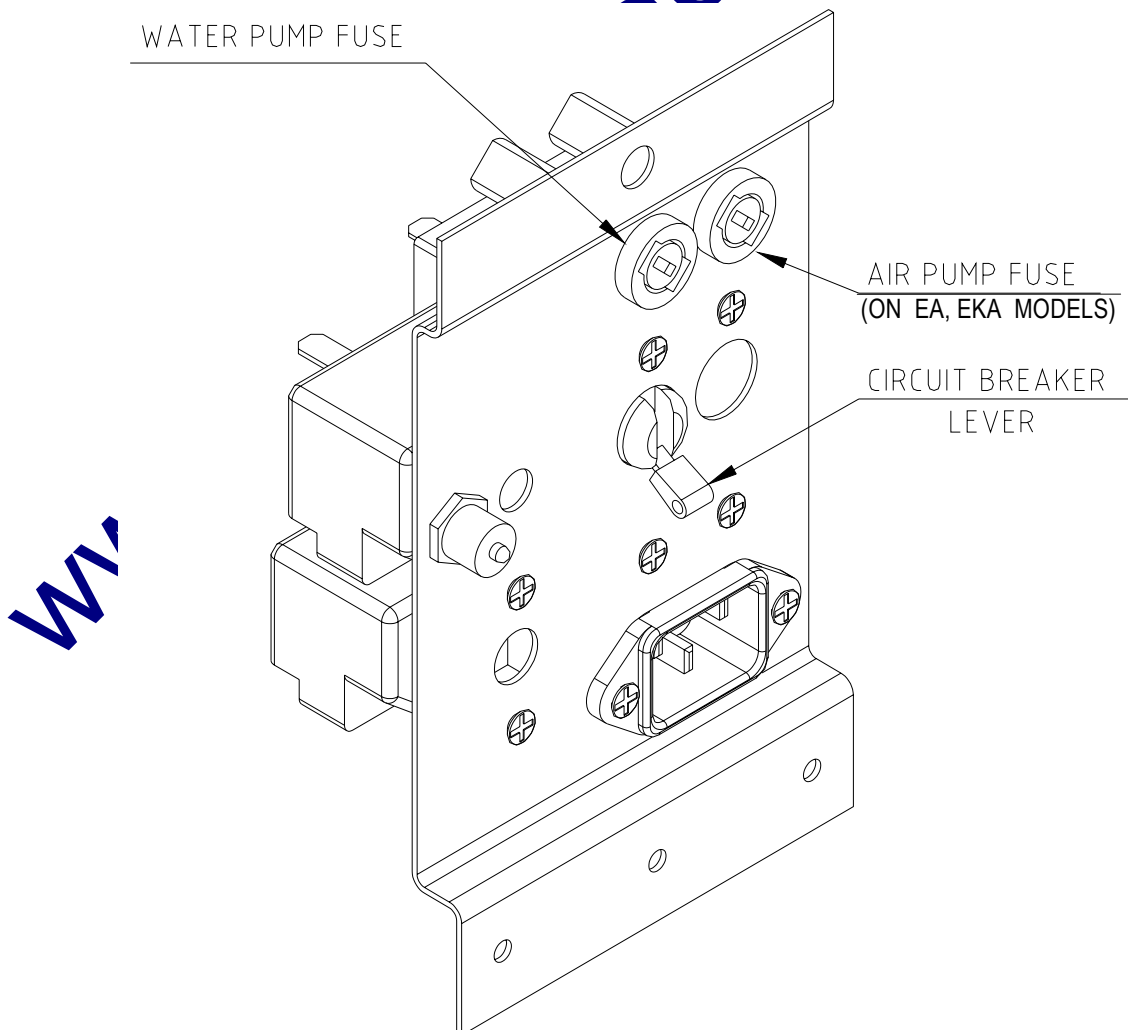


**Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.**

**Allow the autoclave to cool before removing outer covers.**

The Cut-Off Thermostat is located on the upper side of the fuse and socket panel on the rear of the autoclave.

1. Remove the rear cover.
2. Loosen the heating band.
3. Unscrew the thermostat and replace it with a new one.



### 9.11 *Cleaning and Replacing the Water Level Electrodes*

The water level electrode is located at the rear bottom area of the chamber.

#### 9.11.1 *Replacing*

##### *Caution*

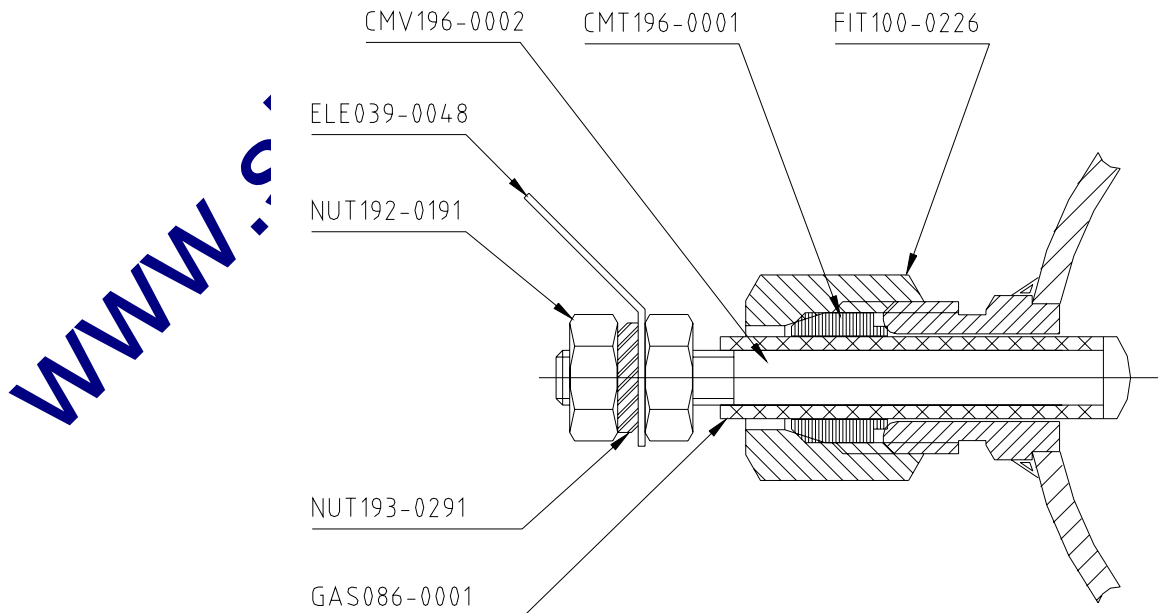


*Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave. Allow the autoclave to cool before removing outer covers.*

1. Remove the rear cover.
2. Disconnect the wire from the electrode connection.
3. Open the nut that tightens the electrode.
4. Insert a new electrode and tighten the fixing nut to avoid leakage.
5. Reconnect the wire to the electrode.
6. Test the unit.

#### 9.11.2 *Cleaning*

1. Pull out the trays and tray holder.
2. Clean the electrode tip.
3. Test the unit.



**Water level electrode assembly**  
**Cat No. CMT196-0004**

### 9.12 Replacing the Drain Valve

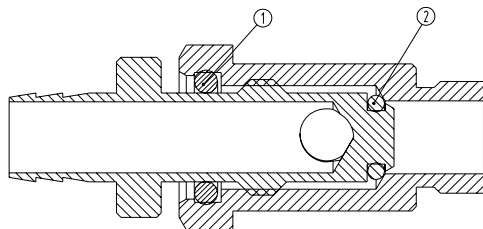
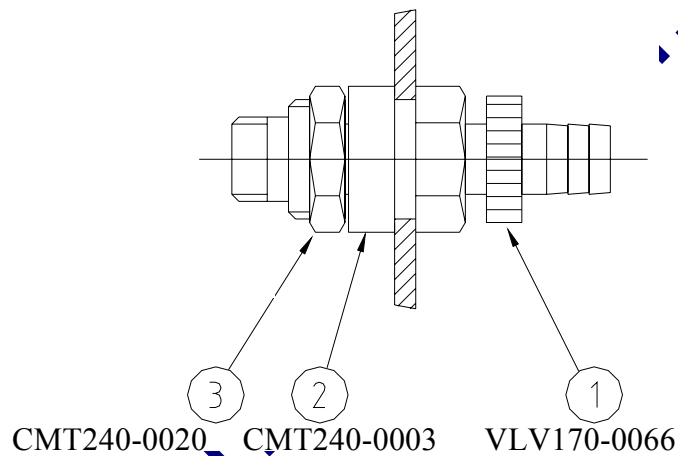


#### **Caution!**

**Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.**

**Allow the autoclave to cool before removing outer covers.**

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the drainpipe from the valve, using a 9/16” wrench.
3. Remove the nut (3) and the “ring for drain valve” (2).
4. Remove the drain valve (1) from the panel.
5. Install a new valve according to the drawing below.
6. Verify that there is no leakage.



Item	Cat No.
1	GAS082-0020
2	GAS082-0021

### 9.13 Replacing the Pressure Gauge



**Caution!**

*Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.*

#### 9.13.1 Models 2340, 2540

1. Remove the door cover (see para. 9.20 “Dismantling the Autoclave’s Door Cover”).
2. Remove the pressure gauge from the door.
3. Install the new pressure gauge using Teflon tape for sealing the thread. Verify that the gauge’s tube does not protrude from the door inner surface.
4. Operate the autoclave and verify that there is no leakage.
5. Install the door cover.

#### 9.13.2 Models 3140, 3850, 3870

The gauge is located in adjacent to the electronic box

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Autoclave’s Outer Covers”).
2. Remove the pressure gauge.
3. Install the new pressure gauge using Teflon tape for sealing the thread.
4. Reassemble the electronic box and the control panel.
5. Reassemble the autoclave’s cover.
6. Operate the autoclave and verify that there is no leakage.

### 9.14 Replacing the Locking Solenoid



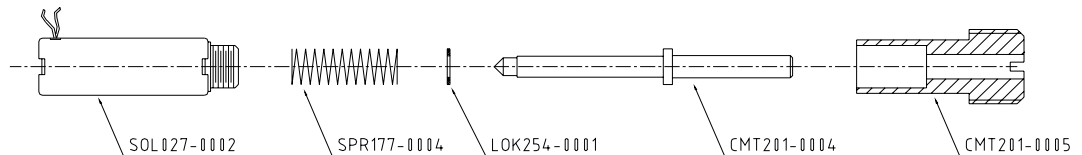
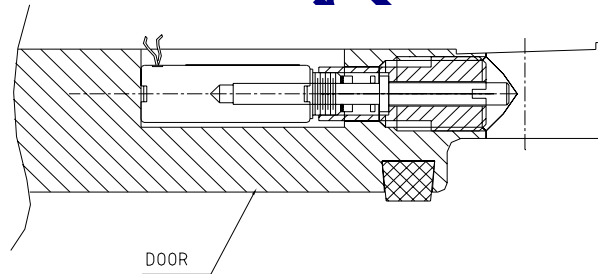
#### Caution!

*Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.*

1. Remove the door cover.
2. Disconnect the wires from the connector.
3. Unscrew the tightening nut (cat. No. CMV100-0002 or CMT201-0005 as appropriate).
4. Remove the pin, the spring and the solenoid.
5. Replace the damaged items and reinstall according to drawing below.
6. Operate the autoclave and verify that the pin is retracted when the cycle reaches “stand-by” stage.

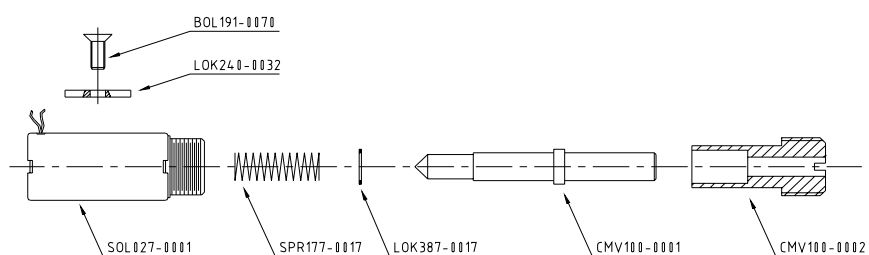
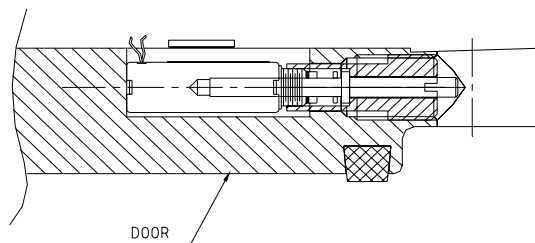
**For models**

**1730, 2340, 2540**



**For models**

**3140, 3850, 3870**



## 9.15 Replacing the Printer

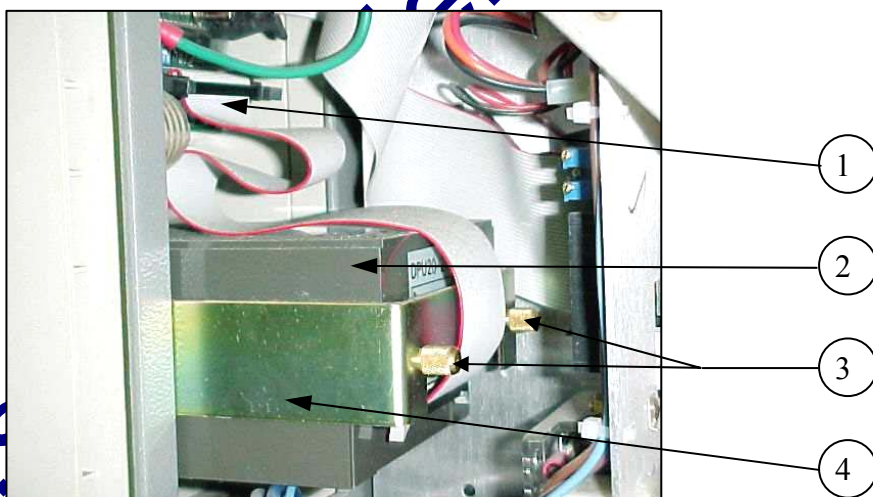
### 9.15.1 DPU20 Printer



#### **Caution!**

**Before starting, disconnect the instrument from the power source.**

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the connector of the flat cable (1) connecting the electronic box to the printer (2).
3. Unscrew the two screws (3) attaching the fastening bracket (4) to the printer.
4. Remove the printer and insert the new one.
5. Assemble the fastening bracket to the printer with the two screws (2) and verify that it "sits" firmly in its seat.
6. Connect the flat cable (1) to the printer.
7. Verify connection of power by performing a self-test.
8. Run a cycle and verify that the printer operates correctly.



No.	Cat. No.	Description
1	WIR040-0070	Cable, Flat, Printer, DPU20, 25CM, 34P
2	THE002-0005	Printer, DPU-20, Seiko
3	BOL190-0144	Screw, printer tightening
4	Supplied with the printer	Fastening bracket

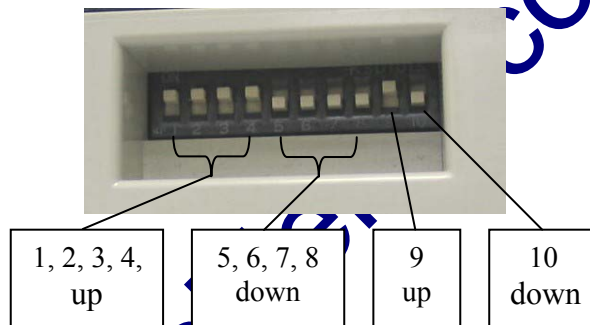
### 9.15.2 DPU30 Printer



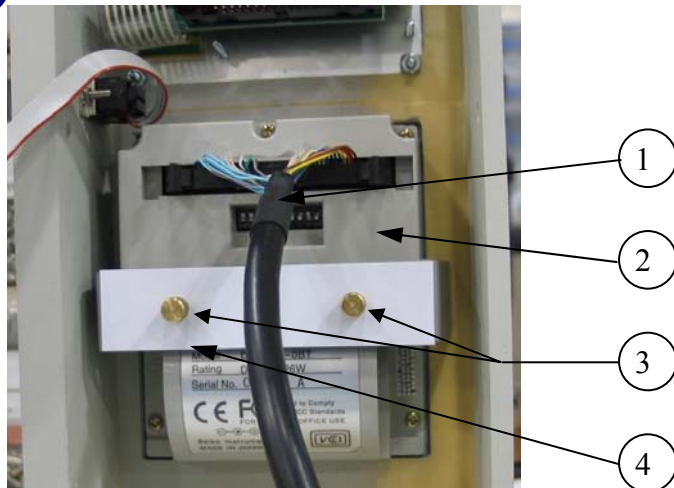
#### **Caution!**

**Before starting, disconnect the instrument from the power source.**

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the connector of the cable (1) connecting the electronic box to the printer (2).
3. Unscrew the two screws (3) attaching the fastening bracket (4) to the printer.
4. Remove the printer.
5. Set the dip switches on the new printer, located on the back side of the printer, as follows:



6. Insert the new printer into its frame.
7. Assemble the fastening bracket to the printer with the two screws (2) and verify that it is placed firmly.
8. Connect the (1) cable to the printer.
9. Verify connection of power by performing a self-test.
10. Run a cycle and verify that the printer operates correctly.



No.	Cat. No.	Description
1	CTP201-0127	Cable, Printer, DPU-30, 30cm, 34p
2	THE002-0022	Printer, DPU-30, Seiko
3	BOL190-0144	Screw, printer tightening
4	Supplied with the printer	Fastening bracket

### 9.16 Replacing the Door Switch

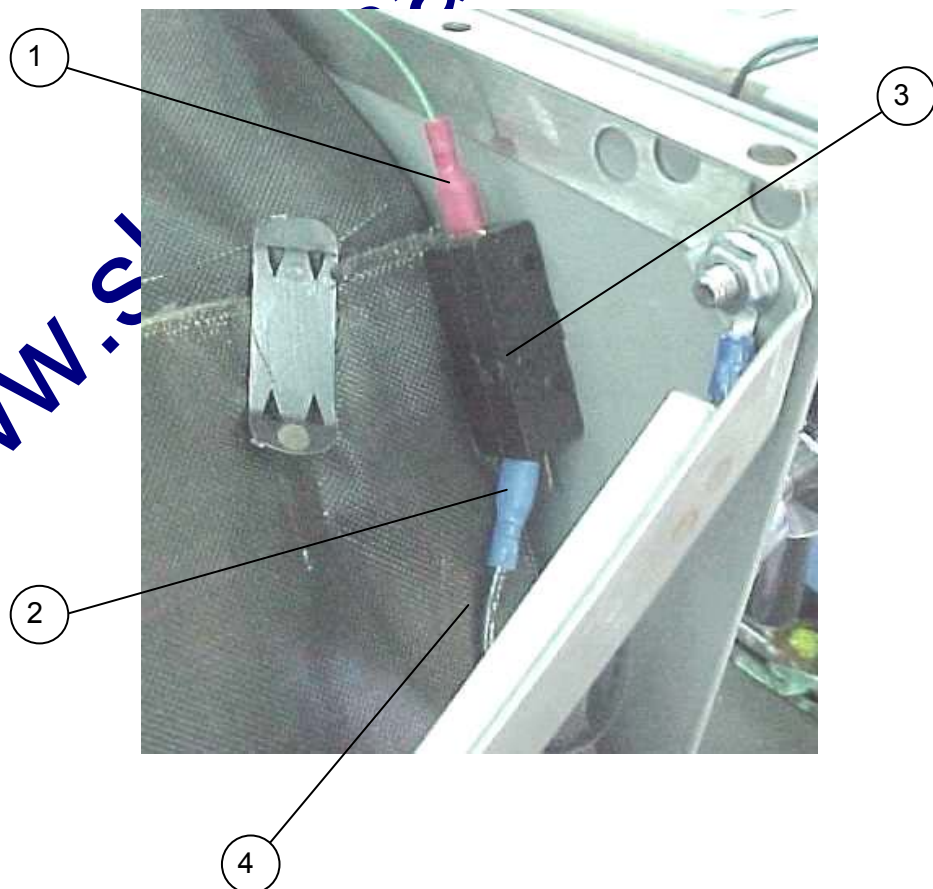


#### **Caution!**

*Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.*

*Allow the autoclave to cool before removing outer covers.*

1. Take off the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the wires (1), (3) from the door microswitch (2).
3. Remove the microswitch and replace it with a new one.
4. Reconnect the black ground wire (3) to the microswitch.
5. Test the connection with an ohmmeter. Connect the ohmmeter to the common terminal of the microswitch and chassis ground. In the “door open” position the ohmmeter should show no continuity and in “door close” position the ohmmeter should show a complete circuit.
  - 5.1 If it fails the test then check that the ground wire is connected to the correct terminal. If it is then replace the microswitch.
  - 5.2 If it passes the test then connect the green wire from the electronic box to the common terminal (1) of the switch
6. Reassemble the autoclave cover





### 9.17 *Cleaning water inlet strainer*

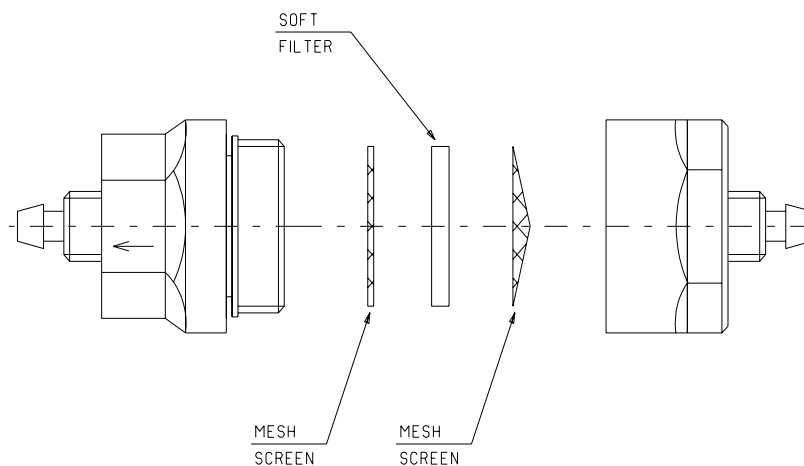


#### **Caution!**

*Before proceeding, make sure that the electric cord is disconnected and there is no pressure in the autoclave.*

1. Remove the cover of the autoclave.
2. Drain the water from the water reservoir.
3. Remove the water filter from the silicon tube.
4. Open the filter by unscrewing the two filter parts.
5. Clean the filter by flushing it under running water for a few minutes.
6. Replace the filter parts and reconnect it to the silicon tube.
7. Open the water valve.

#### **Water Reservoir Filter (FIL175-0020)**



### 9.18 Replacing the circuit breaker



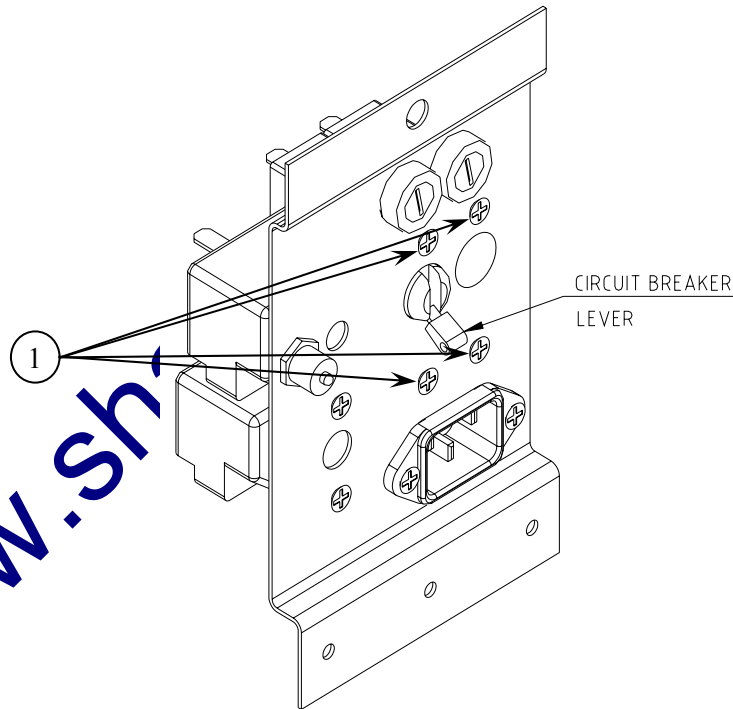
#### **Caution!**

**Before starting, disconnect the instrument from the power source.**

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the wires from the circuit breaker.
3. Remove the four screws connecting the circuit breaker to the panel (1).
4. Replace the circuit breaker with a new one.
5. Reconnect the electrical wires.
6. Reassemble the cover.
7. Turn on the autoclave and verify it operates correctly.
8. Move the circuit breaker’s lever to the “tripped” position and verify that the autoclave turns off.



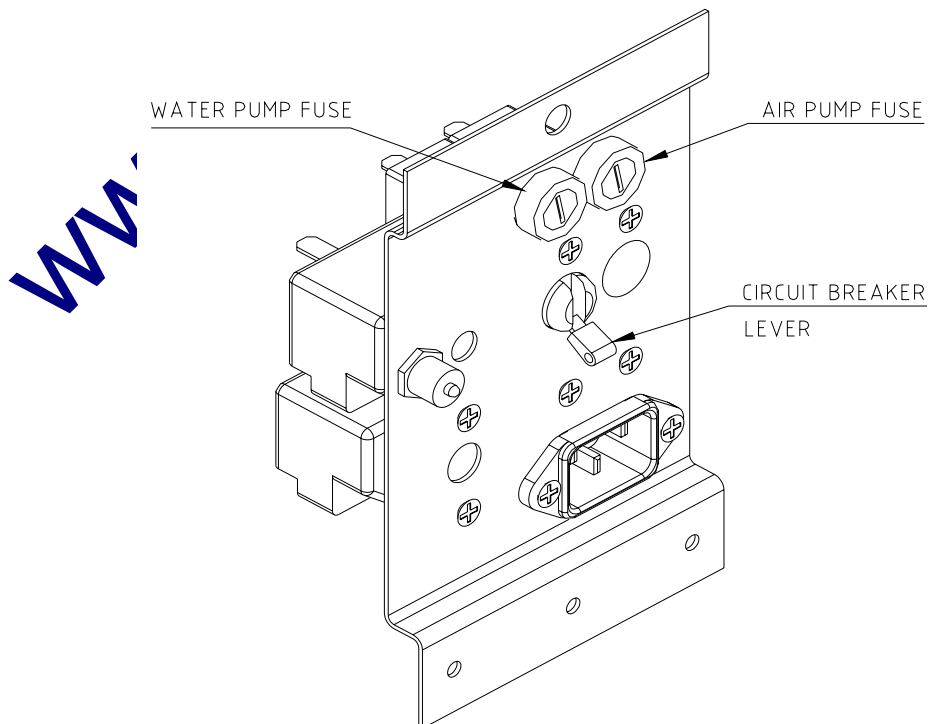
**Make sure that the correct circuit breaker is installed as marked in para. 9.19 (Fuses and Circuit Breaker Data).**



### 9.19 Fuses and Circuit Breaker Data

DESCRIPTION	AUTOCLAVE TYPE							
	<i>E</i>		<i>EA</i>		<i>EK</i>		<i>EKA</i>	
	120V	230V	120V	230V	120V	230V	120V	230V
	1730							
Circuit breaker (A)	15	10	—	—	15	10	—	—
Air pump fuse (A)	—	—	—	—	—	—	—	—
Water pump fuse (A)	—	—	—	—	—	—	—	—
	2340/2540							
Circuit breaker (A)	15	10	15	10	—	15	—	15
Air pump fuse (A)	—	—	3.15	1.25	—	—	—	1.25
Water pump fuse (A)	1.25	1.25	1.25	1.25	—	1.25	—	1.25
	3140/3850/3870							
Circuit breaker (A)	—	15	—	15	—	—	—	—
Air pump fuse (A)	—	—	—	1.25	—	—	—	—
Water pump fuse (A)	—	1.25	—	1.25	—	—	—	—

The drawing below refers to models EKA, EA. Models E, EK do not have an air pump fuse. Model 1730 does not have any fuse.



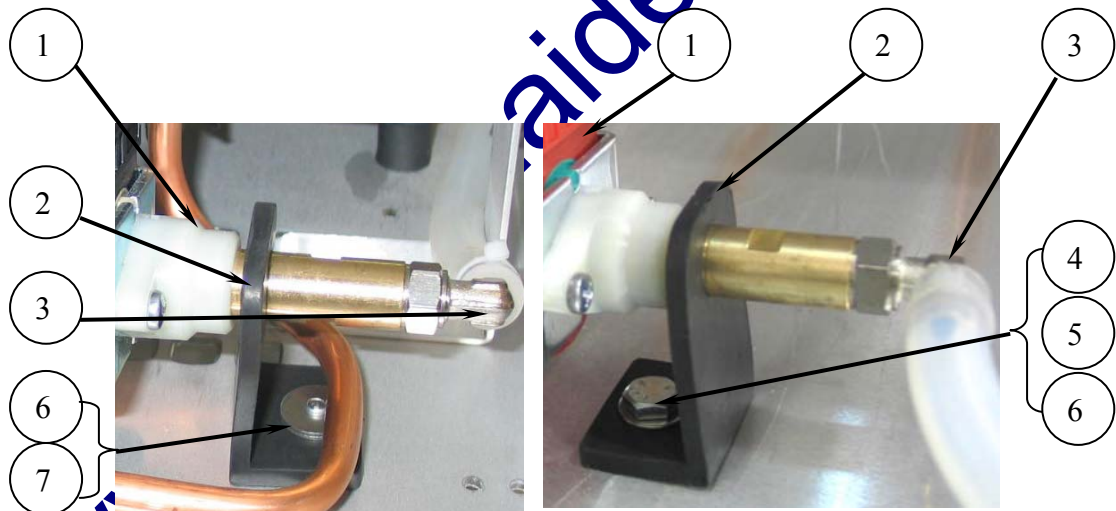
## 9.20 Replacing the water pump



### Caution!

*Before starting, disconnect the instrument from the power source.*

1. Remove the autoclave cover (see para. 9.2 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the wires from the pump
3. Empty the water reservoir.
4. Disconnect the piping from the pump.
5. Remove the pump from the rubber shock absorbers.
  - 5.1 If the rubber shock absorbers are damaged, replace them. Note that on models 2340/2540 the shock absorber's bases are pointed outward and on models 3140/3850/3870 they are pointed inward.
6. Replace the damaged pump with a new pump.
7. Reconnect wiring and piping.
8. Reassemble the cover.
9. Turn on the autoclave and verify it operates correctly.



2340/2540

3140/3850/3870

No.	Description	2340/2540	3140/3850/3870
1	Pump, Water, EX7, 230V 50/60HZ, Ulka	PUM055-0006	PUM055-0006
2	Rubber shock absorber	SKR203-0006	SKR203-0006
3	Hose adaptor, male, elbow, 1/8BSP, for 6 mm Hose.	FIT100-0806	FIT100-0806
4	Screw	—	BOL194-0342
5	Nut, Hex, Flange, 1/4NC	—	NUT192-0155
6	washer	NUT193-0347	NUT193-0276
7	Rivet, Dome Head, Aluminum, 4x14	BOL194-0331	—

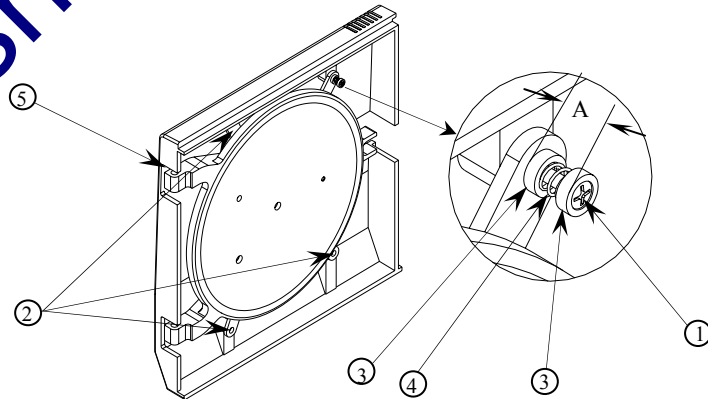
### 9.21 Replacement of the Door Cover



#### Caution:

*Before starting, be sure that the electric cord is disconnected from the power source and that there is no pressure in the autoclave chamber.*

1. Unscrew the four screws attaching the door cover and remove the door cover. Since the screw pressing the door microswitch includes two washers and a spring, be aware not to lose them.
2. Reassemble the new cover.
3. Insert screw (1) until dimension A is approximately 15 mm.
  - 3.1 Please note that on model 3140 two washers (2) are placed between the spring (4) and the door.
4. Perform final adjustment of the screw as follows:
  - 4.1 While the autoclave is disconnected from electricity turn on the circuit breaker.
  - 4.2 Connect the electrical plug to a multi-meter.
  - 4.3 Press the microswitch and verify that the microswitch functions as required.
  - 4.4 Close the door and verify that the microswitch operates.
  - 4.5 If the microswitch does not operate unscrew the screw one turn counter- clockwise and check per para. 4.4. Repeat until microswitch operates.
  - 4.6 Connect the autoclave to electricity.
  - 4.7 Close the door until the microswitch indicates that the door is closed. Operate the autoclave and verify that there is no steam or pressure leak.
  - 4.8 If there is steam leak, stop the autoclave's operation, reduce steam pressure, open the door and turn the screw one turn clockwise and check per para. 4.7. Repeat until leakage ceases.



No.	Description	Model	Cat. No.	No.	Description	Model	Cat. No.
1	screw	2340, 2540	BOL191-0032	3	washer	All models	ELE036-0009
		1730, 3140 3850, 3870	BOL191-0091	4	spring	All models	SPR177-0012
2	screw	2340, 2540	BOL191-0033	5	door cover	1730	POL065-0001
		3140	BOL191-0115			2340, 2540	POL066-0002
		1730, 3850, 3870	BOL191-0140			3140	COV314-0001
						3850, 3870	POL065-0003

## 9.22 Replacing the Locking Device

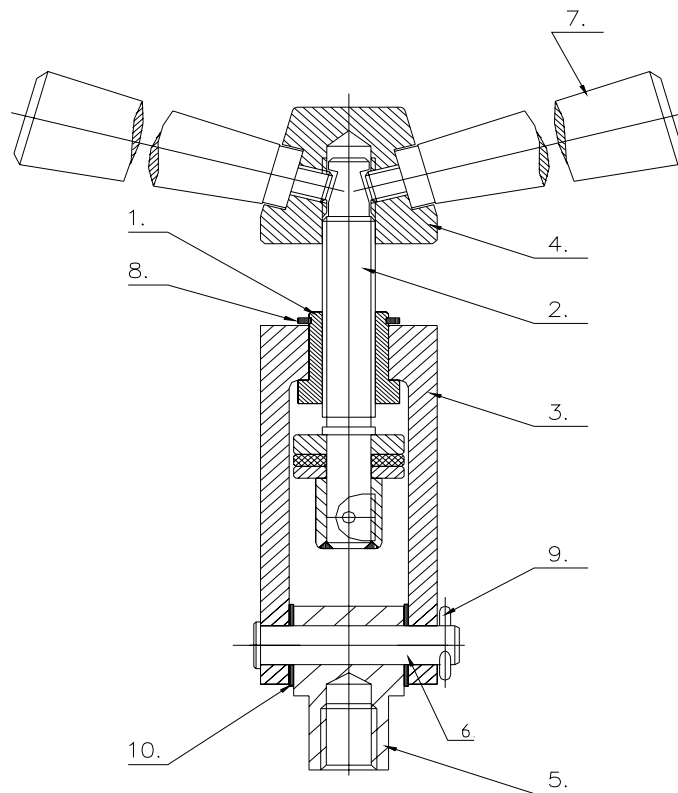


### Caution:

*Before starting, verify that there is no pressure in the autoclave chamber.*

1. Remove the security ring (9) using a special tool.
2. Remove pin (6).
3. Remove locking device. Take care not to lose the Teflon disk (10).
4. Reassemble the new locking device.
5. Insert the pin (6).
6. Reassemble the security ring (9).

### CLOSING DEVICE



No.	Description	No.	Description
1	Bushing	6	Door locking device pin
2	Door tightening bolt assembly	7	Bakelite handle
3	Locking screw housing	8	Closing bridge "c" clip
4	Locking base	9	Cotter pin
5	Locking housing axe	10	Teflon disk

### 9.23 Validation

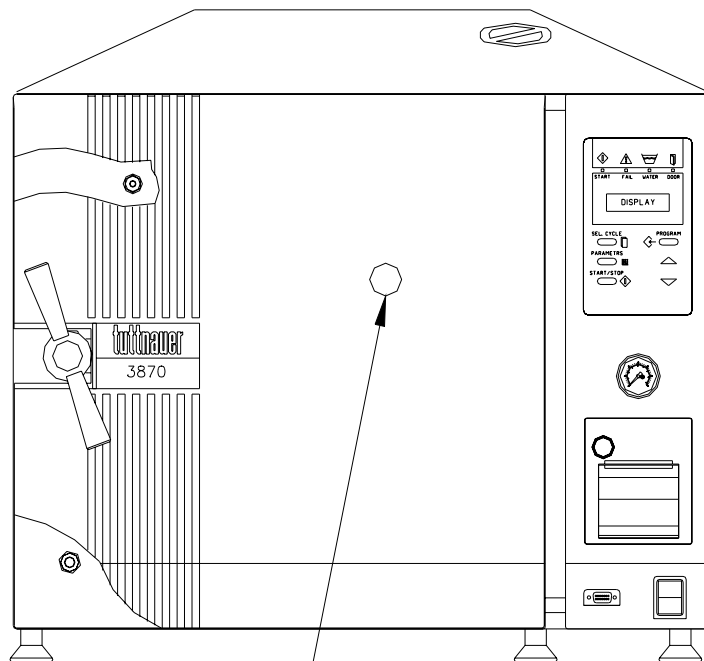


#### Caution!

*Before starting the preparations for the validation, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.*

*The validation port is located on the autoclave's door, behind a plastic plug inserted in the door cover.*

1. Remove the plastic plug from the door cover.
2. Unscrew the validation plug from the door.
3. Attach the validation adapter to the validation port. The 1/4" BSP thread of the validation port matches the thread of the adapter.
4. Perform the validation according to EN554 or the appropriate Pharmacopea.
5. After completing the validation, reassemble the validation plug. Use Teflon tape on the plug's thread to assure sealing. Tighten the plug carefully to avoid damage to the door.



VALIDATION PORT COVER

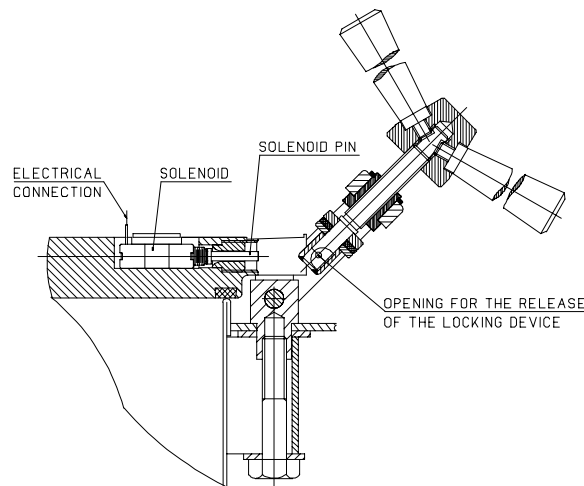
### 9.24 Emergency Door Opening



#### **Caution!**

***Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.***

In order to facilitate the initial installation, the door locking position is taped in this retracted position at the factory. On completion of all installation activities this tape must be removed. If for any reason the door locking mechanism is permanently locked, it is possible to open the door and provide access for eventual repairs to the locking mechanism. The swing bolt has a drilled opening located in the lock catch. By pushing the piston back with a 2mm. pin, the swing bolt may be turned another 3/4 turn until the position catches again. Repeat these operations until the bolt can be swung away and the door opened.





## 10. **IN-OUT TEST**

Before performing any trouble shooting on the autoclave, perform an “in-out test”. In this test the technician tests all the components of the system as follows:

1. Turn on the autoclave and immediately press the Up button until “IN-OUT TEST” is displayed.
3. Release the button.
4. To proceed, press the UP button. Each time the UP button is pressed the test advances one step, and the tested component is displayed on the display.
5. When a solenoid is tested, verify that it is activated, by touching it with a screwdriver. If the solenoid is magnetized – it is activated.
6. After completing the “in-out test” “Press Up” will be displayed. If you wish to repeat the test - press “UP” and if you wish to exit – press “STOP”

DISPLAYED NOTICE	ITEM ACTIVATED	REMARKS
Heaters ON	Heating Elements	Heating elements are activated.
Water ON	Water inlet valve and water pump	Water inlet valve is open and ULKA water PUMP operates.
Exh ON	Exhaust valve	Exhaust valve is open
Dry Vlv ON	Dry valve	On models EA, EKA only dry valve is open.
Dry Pmp ON	Dry valve and air pump	On models EA, EKA only dry valve is open and air pump operates.
Air Vlv ON	Air valve	Air valve is open.
Door Lock On	Door locking solenoid	Door locking solenoid is activated.
Thermostat “0”	Safety thermostat	Thermost is in “connected” position
Thermostat “1”		Thermost is in “disconnected” position
E0	Water level electrode. Displayed together with Thermostat and with Float Sw.	Electrode tip sort circuited with the chamber. Simulates water in chamber
E255		Electrode tip disconnected from the chamber. Simulates no water in chamber
Float Sw “0”	Float switch (move the float switch and verify that it operates)	Float switch senses water
Float Sw “1”		Float switch does not sense water
Door Sw “0”	Door switch (Press and release the door switch and verify that it operates)	Door switch closed
Door Sw “1”		Door switch open

## 11. TROUBLESHOOTING

### 11.1 Displayed Messages and Reference to Trouble Shooting

Message	Refer to trouble shooting section				
	Para. 11.2	Para. 11.3.1	Para. 11.3.2	11.4	11.5
Low Temp.	1		23, 28		
Low Heat	1		4, 5, 18, 24		3
High Temp.	1		1, 5, 13, 14, 24, 28, 29	2, 5	1
Low Pres.			5, 13, 14, 24, 27, 28, 29	1, 4, 5	3
High Pres.			5, 19, 24, 26, 28		1
Add Water	7		11, 34		
Door Unlock			2, 32		
Low Water		1, 2, 3	3, 8, 10, 13, 14, 30, 34, 35, 36	2, 5	1, 2

## 11.2 Pre-process malfunction

Symptom	Possible cause check-up and tests	Corrections
1. No response when the system is turned on	<p>1.1 Check the power cord and the connections at the autoclave input.</p> <p>1.2 Check the cut-out thermostat. If operation continues after resetting the cut-out, find out what caused the thermostat to switch off.</p> <p>1.3 Check the circuit breaker. If it tripped, there is a short-circuit.</p> <p>1.4 Check the fuse of the power supply. If the fuse is blowing, check if one of the valve coils or one of the electronic boards causes a short circuit.</p> <p>1.5 Check the AC voltage.</p> <ul style="list-style-type: none"> <li>— The input supplies voltage at the control system - See Electrical Wiring Diagram.</li> <li>— Switch off the power of the unit.</li> <li>— Set the multimeter on the AC voltage measuring range.</li> <li>— Connect the negative probe at pin 3 to AC-INPUT connector and the positive probe to pin 1 or 2 on AC-T1 board.</li> <li>— Turn on the power. The indication of the instrument must be the same as the power network voltage, if not: <ul style="list-style-type: none"> <li>— Main power switch\Rocker switch contacts may be loose.</li> <li>— Electrical power source may be faulty.</li> </ul> </li> </ul>	<p>1.1 Replace damaged cord or repair faulty connections.</p> <p>1.2 Reset cut-off.</p> <p>1.3 Return the circuit breaker lever to the "ON" position after fixing the cause for the short circuit.</p> <p>1.4 Replace the blown fuse after fixing the cause for the short circuit.</p> <ul style="list-style-type: none"> <li>— Fasten contacts.</li> <li>— Restore power source.</li> </ul>

Symptom	Possible cause check-up and tests	Corrections
1. (cont.)	<p>— It is possible that the dual power supplies outputs 12V, but the 5V circuit is faulty. To identify the faulty item proceed as follows:</p> <p>— Check the connection between the two electronic boards ANL-T2 and DIG-T2.</p> <p>— Check the cable, which transfers the voltage from the AC-T1/JP2 connector to the power supply.</p> <p>— Check the input voltage of the electric box, at the AC-INPUT connector, on the AC-T1 board (JP3).</p> <p>— Check if there is no short-circuit at the AC-OUTPUT connector on the AC-T1 board (JP2).</p> <p>— Check if there is no short-circuit at the input connector (JP3) or at the output connector (JP5) on the ANL-T2 board.</p> <p>1.6 Check the DC voltages supply to the system.</p> <p>— Check main power switch.</p> <p>Check the grounding</p> <p>— Plug connector 26 pin FLAT of the test board into connector JP5 mounted on board ANL-T2.</p> <p>— Connect the negative probe of the multimeter to TP1 on the test board.</p>	<p>— Fix connections.</p> <p>— Replace faulty cables.</p> <p>— Replace faulty connector.</p> <p>— Replace faulty connector.</p> <p>— Replace faulty power switch</p>

Symptom	Possible cause check-up and tests	Corrections
1. (cont.)	<p>— Check with the positive probe of the multimeter the voltage at different grounding points of the autoclave, on the ANL-T2 and DIG-T2 boards, on the enclosure of the electric box and the main grounding screw of the machine.</p> <p>The voltage differences must be less than 5mV.</p> <p>Higher voltage may indicate that ANL-T2 board fastening screws are loose or that the power supply cable is loose.</p> <p>1.6.2 Check the 12VDC voltage:</p> <ul style="list-style-type: none"> <li>— Connect the negative probe of the multimeter to TP1 (GND).</li> <li>— Connect the positive probe of the multimeter to TP3. The indication of the instrument must be 10.8-12.5V.</li> <li>— If indication is not as specified, disconnect the output connector of the power supply. If the right value is achieved there is a short circuit.</li> <li>— Identify and locate the short circuit.</li> </ul> <p>If instrument indication is below or above specified range the power supply is faulty.</p> <p>1.6.3 If neither 12V nor 5V voltages are output:</p> <ul style="list-style-type: none"> <li>— Check the voltage transfer to the power supply through the connector JP2 on the AC - T1 board.</li> </ul>	<ul style="list-style-type: none"> <li>— Tighten loose screws.</li> <li>— Reconnect grounding cable.</li> <li>— Repair or replace the faulty item.</li> <li>— Replace faulty power supply.</li> </ul>

Symptom	Possible cause check-up and tests	Corrections
1. (cont.)	<p>1.6.4 Check the 5VDC voltage.</p> <ul style="list-style-type: none"> <li>— Connect the negative probe of the multimeter to TP1 (GND).</li> <li>— Connect the positive probe of the multimeter to TP2. The indication of the instrument must be <math>4.9 \div 5.3V</math>.</li> <li>— Check if the fuse of the power supply is blown. It is possible that one of the valve coils or the electronic board cause a short circuit.</li> <li>— Disconnect the power from the AC-T1 board/connector JP2, and switch on the unit. If a no-load condition the power supply delivers 12V and 5V voltages, it can probably be that there is a problem on one of the boards, one of the inputs or outputs.</li> <li>— Connect the AV-T1/JP2 connector back to the board and disconnect the connectors JP6 (inputs), JP5 (outputs), pressure sensor.</li> <li>— Reapply the power from the ANL-T2 board.</li> <li>— If the voltages 12V and 5V reappear, the problem is one of the external elements connected to the system (valves, sensors, etc.).</li> <li>— If voltages 12V and 5V do not appear, one of the boards is damaged. Disconnect board DIG-T2 and check board ANL-T2.</li> </ul>	<p>1.6.4 calibrate voltage to 2.2V by adjusting the internal potentiometer. This operation must be done with great care to avoid electrical shock.</p> <ul style="list-style-type: none"> <li>— Replace faulty coil and reset fuse.</li> <li>— Replace faulty unit.</li> <li>— Replace faulty board.</li> </ul>

Symptom	Possible cause check-up and tests	Corrections
2. System is on and display is not lit.	2.1 If the other functions are OK, the display is probably damaged.	2.1 Replace the DIG-T2 board
3. System on and erroneous or fragmented digits.	3.1 DIG-T2 board is faulty.	3.1 Replace DIG-T2 board.
4. No response from one of the keys.	4.1 Keyboard is faulty. 4.2 DIG-T2 board is faulty.	4.1 Replace the keyboard. 4.2 Replace the DIG-T2 board.
5. The displayed readout for the atmospheric pressure, when the door of the chamber is open, does not conform to the actual absolute pressure.	5.1 Check if the displayed value is near the atmospheric pressure. 5.2 If the displayed value is significantly different from the atmospheric pressure, probably that there is a problem with the pressure measuring.	5.1 Calibrate sensor and check calibration accuracy during the operation. 5.2 The sensor is faulty. Replace sensor.
6. Pressing the START key does not start the process, despite the door is closed.	6.1 Incorrect reading of the door switch position.	6.1 See symptom s 32 in para. 11.3.2.
7. Pressing the START key does not start the process and the error message ADD WATER is displayed despite the water reservoir being full.	7.1 Incorrect reading of the reservoir float switch position.	7.1 See symptom s 34 in para. 11.3.2.

### 11.3 In Process Malfunction Water Inlet Stage

Symptom	Possible cause check-up and tests	Corrections
1. If there is any malfunction related to inlet water quantity (Low Water, High Temp, Low Press or Low Heat), check the automatic water filling.	1. Press door switch while the door is open and simultaneously press START push-button. Message: Water inlet will appear on the display and water enters the chamber until it reaches the groove adjacent to the door. On this point the water must stop inserting the chamber. If the autoclave does not operate as described above, proceed as follows.	
2. The water inlet phase is short and the water level in the chamber is low.	2.1 Incorrect reading of the water sensing electrode, 2.2 Programmed interval after the electrode senses water surface is very short.	2.1 See symptoms 29 in para. 11.3.2. 2.2 Increase the Program interval. Add 5-10 seconds to the water inlet.
3. The water inlet time is prolonged and the quantity of water is not acceptable.	3.1 Probably water piping or valve is clogged. This leads to a long filling time,	3.1 Clean the piping or the valve.



Symptom	Possible cause check-up and tests	Corrections
4. Water does not enter chamber during “FILL WATER” stage.	<p>Operate the autoclave. Open the door while in “water inlet” stage. If no water enters the chamber, there is no water in the reservoir and display indicates that there is water:</p> <p>4.1 Float is stuck. Check if heat exchanger moved and prevents the float from moving or if float is stuck due to dirt.</p> <p>4.2 Float is faulty.</p> <p>There is water in the reservoir and the display indicates that there is water. Despite this, water does not enter the chamber.</p> <p>4.3 No voltage at solenoid input. Verify command at Test Point TP9 from electronic box.</p> <p>4.4 solenoid faulty.</p> <p>4.5 Water inlet pipe is clogged.</p> <p>4.6 Water inlet valve (21) is faulty.</p> <p>4.7 Valve's solenoid is faulty.</p> <p>4.8 Air release valve (41) is faulty.</p>	<p>4.1 Relocate heat exchanger and release float or clean the float.</p> <p>4.2 Replace float.</p> <p>4.3 Fix disconnection.</p> <p>4.4 Replace plunger or complete solenoid.</p> <p>4.5 Clean water inlet pipe</p> <p>4.6 See symptom s 11 &amp; 13 in para. 11.3.2. Replace water inlet valve.</p> <p>4.7 Replace plunger or complete solenoid.</p> <p>4.8 Replace air release valve.</p>

### Heating Stage

Symptom	Possible cause check-up and tests	Corrections
1. Process fails while initiating the heating stage message HIGH TEMP is displayed.	1.1 The problem is the incorrect reading of the temperature sensor.	1.1 See symptoms 22, 24 and 25 in para. 11.3.2.
2. Message DOOR UNLOCK is displayed during the heating stage, although the door is closed.	2.1 The pressure in the chamber rises during the heating stage and is pressing on the door. If the door switch is lightly pressed it could be turned off.	2.1 Close the door more tightly or set the door switch more steadily.
3. LOW WATER message is displayed during the heating stage and process fails.	3.1 The process fails if the electrode is above the water surface and the safety thermostat switches off. Check if the amount of water in the chamber is over 350cc. 3.2 If the water quantity remains insufficient, the problem is a wrong electrode signal. 3.3 Process fails despite correct quantity of water. 3.4 Presence of dirt inside the water inlet valve may cause slowdown of the flow.	3.1 If amount of water is not correct, clean the electrode and set the water level 3.2 See symptom 29 in para. 11.3.2. 3.3 The thermostat must be set at a higher switching point and the time after the electrode touches the water be prolonged. 3.4 Clean or replace water inlet valve and exhaust valve.
4. Message LOW HEAT is displayed during the heating stage.	4.1 The heating time is very long and the heating rate is normal. 4.1.1 Excess quantity of water in the chamber due to dirty electrode, loose electrode connections or faulty electrode. 4.1.2 Excess quantity of water in the chamber due to un-levelled autoclave. 4.2 Heating elements damaged.	4.1.1 Clean or replace electrode. 4.1.2 Level autoclave. 4.2 See symptom 18 in para. 11.3.2.

Symptom	Possible cause check-up and tests	Corrections
5. Process fails on HIGH TEMP, LOW TEMP, HIGH PRES, or LOW PRES during the sterilisation stage.	Generally these problems are a result of the incompatibility between temperature and pressure. Insufficient quantity of water in the chamber due to short circuit electrode or faulty inlet valve.	5.1 Fix electrode or replace valve.
	5.2 The air trap jet is clogged, the air elimination is insufficient.	5.2 Replace air trap.
	5.3 One of the sensors is defective.	5.3 Pinpoint the pressure sensor (See symptoms 26 & 27 in para. 11.3.2.) or the temperature sensor and replace the defective sensor.
6. The fast exhaust operation is too slow.	6.1 Exhaust valve is faulty or pipe is clogged.	6.1 Replace exhaust valve or clean pipe.
7. The dry operation is not effective.	7.1 The autoclave is over loaded.	7.1 Reload the autoclave as instructed.
	7.2 Check if the thermostat switch is off at a very low temperature.	7.2 Change setting of thermostat.
	7.3 Check if the upper exhaust valve is open.	7.3 See symptoms 8 & 9 in para. 11.3.2.
	7.4 Check if the pump is OK (models EA, EKA only).	7.4 See symptoms 20 & 21 in para. 11.3.2.
	7.5 Check if the dry valve is open (models EA, EKA only).	7.5 See symptoms 14 & 15 in para. 11.3.2.
	7.6 Check if the air filter is clogged (models EA, EKA only).	7.6 Replace air filter.

Symptom	Possible cause check-up and tests	Corrections
8. Exhaust valve is always open.	<p>The problem may be a mechanical failure of the valve, the valve driver located on ANL-T2 board or the control circuit on board DIG-T2.</p> <p>8.1 Exhaust valve is stuck.</p> <p>8.2 Check tp8. If the voltage is higher than 4V and there is control signal to the valve, DIG-T2 board is faulty.</p> <p>If the voltage is 0VDC the valve is open, the problem is not the control circuit but some other element of the system.</p> <p>8.3 Check the connection between the connector JP5/4 and the valve.</p> <p>8.3 Remove the cover protecting the terminals of the coil and check the voltage when the solenoid is connected. If the valve is open despite the coil voltage less than 2V, there is a mechanical problem.</p> <p>8.5 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>8.1 Replace faulty valve.</p> <p>8.2 Replace the board.</p> <p>8.3 Fix the connections.</p> <p>8.4 The valve must be fixed or replaced.</p> <p>8.5 Replace ANL-T2 board.</p>
9. Exhaust valve is always closed.	<p>The problem may be caused by the mechanical part of the valve or the driver located on board ANL-T2 or the control circuit on board DIG-T2.</p> <p>9.1 Check TP8. If the voltage is constantly 0VDC, while the valve must be open, then the problem is on the DIG-T2 board.</p> <p>9.2 Check the connection between connector JP5/4 and the valve.</p> <p>9.3 Check the coil input voltage with the solenoid connected to the valve. If the voltage is higher than 10VDC and the valve does not open, the solenoid or the mechanical part of the valve are faulty.</p>	<p>9.1 Replace board DIG-T2.</p> <p>9.2 Fix the connections.</p> <p>9.3 Replace the solenoid. If this does not help, repair the mechanical part of the valve or replace the valve.</p>

Symptom	Possible cause check-up and tests	Corrections
10. Water valve is always closed.	<p>The problem may be caused by the mechanical part of the valve, the solenoid, the driver on ANL-T2 board or the control circuit on DIG-T2.</p> <p>10.1 Check the solenoid coil input voltage with the solenoid connected to the valve. If the valve is closed despite the voltage being higher than 10V, the problem could be the solenoid or a mechanical problem at the valve.</p> <p>10.2 Check the connection between connector JP5/5 and the valve.</p> <p>10.3 Check TP9. If the voltage is constantly 0VDC while the valve must be open, DIG-T2 board is faulty.</p> <p>10.4 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>10.1 Replace the solenoid. If this does not help, repair the mechanical part of the valve or replace the valve.</p> <p>10.2 Fix the connections.</p> <p>10.3 Replace board DIG-T2.</p> <p>10.4 Replace ANL-T2 board.</p>
11. Water valve is always open	<p>The problem may be caused by the mechanical part of the valve, the solenoid, the driver located on the ANL-T2 board or the control circuit on the DIG-T2 board.</p> <p>11.1 Water valve is stuck</p> <p>11.2 Check TP9. If the voltage is higher than 4V, the control of the valve is OK, and board DIG-T2 is faulty.</p> <p>If the voltage is 0V and valve is open, the problem is not the control circuit but other elements of the system.</p> <p>11.3 Check the connection between connector JP5/5 and the valve.</p> <p>11.4 Check the solenoid coil input voltage with the solenoid connected. Remove the cover that protects the terminals of the coil. If the valve is open despite the voltage being less than 2VDC, there is a mechanical problem.</p> <p>11.5 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>11.1 Replace faulty valve.</p> <p>11.2 Replace the board.</p> <p>11.3 Fix the connections.</p> <p>11.4 — Replace the solenoid. — Repair or replace the valve.</p> <p>11.5 Replace ANL-T2 board.</p>

Symptom	Possible cause check-up and tests	Corrections
12. Air valve is always closed.	<p>The problem may be the mechanical part of the valve, the solenoid, the driver on ANL-T2 board or the control circuit on DIG-T2 board.</p> <p>12.1 Check TP7. If voltage is constantly 0V at the stage when the valve must be open then DIG-T2 board is faulty.</p> <p>12.2 Check the connection between connector JP5/3 and the valve.</p> <p>12.3 Check the voltage coming to the solenoid coil while the solenoid is connected to the valve. If the valve is closed despite the voltage being higher than 10VDC, the solenoid is faulty, or there is a mechanical problem with the valve.</p> <p>12.4 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>12.1 Replace board DIG-T2.</p> <p>12.2 Fix the connections.</p> <p>12.3 Replace the solenoid. If this does not solve the problem, repair or replace the valve</p> <p>12.4 Replace ANL-T2 board.</p>
13. Air valve is always open.	<p>The problem could be the mechanical part of the valve, the driver located on ANL-T2 board or the control circuit on DIG-T2 board.</p> <p>13.1 Air valve is stuck.</p> <p>13.2 Check TP7. If the voltage is higher than 4VDC and there is a control signal to the valve, the problem is on DIG-T2 board.</p> <p>If the voltage is 0VDC and the valve is open, the problem is not the control circuit but one of the other elements of the system.</p> <p>13.3 Check the connection between connector JP5/3 and the valve.</p> <p>13.4 Check the voltage at the solenoid coil, while the solenoid is connected to the valve, by removing the cover which protects the terminals of the coil. If the valve is open despite the voltage being lower than 2VDC, there is a mechanical problem with the valve.</p> <p>13.5 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>13.1 replace faulty valve.</p> <p>13.2 Replace board DIG-T2.</p> <p>13.3 Fix the connections.</p> <p>13.4 repair or replace the valve.</p> <p>13.5 Replace ANL-T2 board.</p>

Symptom	Possible cause check-up and tests	Corrections
14. Dry valve is always open (models EA, EKA).	<p>The problem may be with the mechanical part of the valve, the solenoid, the driver on ANL-T2 board or the control circuit on DIG-T2 board.</p> <p>14.1 Dry valve is stuck.</p> <p>14.2 Check TP10. If the voltage is higher than 4VDE and there is a control signal to the valve the problem is on DIG-T2 board.</p> <p>If the voltage is 0VDC and the valve is open, the problem is not the control circuit but one of the other elements of the system.</p> <p>14.3 Check the connection between connector JP5/6 and the valve.</p> <p>14.4 Check the solenoid coil input voltage while the solenoid is connected to the valve, by removing the cover that protects the terminals of the coils. If the valve is open, despite the voltage being less than 2VDE, there is a mechanical problem.</p>	<p>14.1 Replace faulty valve.</p> <p>14.2 Replace board DIG-T2.</p> <p>14.3 Fix the connections.</p> <p>14.4 Repair or replace the valve.</p>
15. Dry valve is always closed (models EA, EKA).	<p>The problem may be the mechanical part of the valve, the solenoid, the driver on ANL-T2 board or the control circuit on DIG-T2 board.</p> <p>15.1 Check TP10. If the voltage is constantly 0VDC, at the stage when the valve must be open, then the problem must be on DIG-T2 board.</p> <p>15.2 Check the connection between connector JP5/6 and the valve.</p> <p>15.3 Check the solenoid coil input voltage while the solenoid is connected to the valve. If the valve is closed, despite the voltage being higher than 10VDC, there is a mechanical problem with the valve.</p> <p>15.4 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>15.1 Replace board DIG-T2.</p> <p>15.2 Fix the connections.</p> <p>15.3 Replace the solenoid. If this does not help, repair or replace the valve.</p> <p>15.4 Replace ANL-T2 board.</p>

Symptom	Possible cause check-up and tests	Corrections
16. Door lock is always on.	<p>Since the locking device is NORMALLY ON, this means that the locking pin is always pushed out and opening of the door is impossible. If for any reason, the process failed, the opening of the door will be possible only after pressing the STOP key.</p> <p>If the cause of the trouble is not a cycle failure, the problem could be in the control circuit on DIG-T2 board, in the air valve, in the pressure sensor, in the driver on ANL-T2 board, from connections or the solenoid.</p> <p>16.1 Check TP11. If voltage is 0VDC the cause may be as follows.</p> <p>16.1.1 High pressure in the chamber due to faulty air valve or clogged piping.</p> <p>16.1.2 Pressure sensor is faulty.</p> <p>16.1.3 DIG-T2 board is faulty.</p> <p>16.2 Check the connection between JP5/7 on ANL-T2 board to the locking solenoid. Check if the cable is not damaged.</p> <p>16.3 Check the solenoid input voltage, without interrupting the solenoid. if the voltage is higher than 10VDC, the problem is the solenoid or a mechanical problem, preventing the locking pin from moving freely inside the solenoid.</p> <p>16.4 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>16.1.1 Clean clogged piping or replace faulty air valve. If voltage is higher than 4VDC proceed as follows:</p> <p>16.1.2 Replace faulty pressure sensor.</p> <p>16.1.3 Replace DIG-T2 board</p> <p>16.2 Fix the connections.</p> <p>16.3 Replace the solenoid. If this does not help, repair or replace the locking mechanism.</p> <p>16.4 Replace ANL-T2 board.</p>



Symptom	Possible cause check-up and tests	Corrections
17. 'Door lock' is always off.	<p>The door is never locked.</p> <p>17.1 Check TP11 if the voltage during the process is higher than 4VDC, the problem is in the DIG-T2 board.</p> <p>17.2 Check the connection between JP5/7 on board ANL-T2 and the locking solenoid. Check if the cable is damaged.</p> <p>17.3 Check the locking solenoid input voltage without disconnecting it. If the voltage is less than 2VDC and the locking pins inside the solenoid there is a mechanical problem preventing the plunger to move freely.</p>	<p>17.1 Replace board DIG-T2.</p> <p>17.2 Fix the connections or replace defective cables.</p> <p>17.3 Repair or replace the locking mechanism.</p>
18. Heating elements do not work	<p>18.1 Check the rated AC voltage (115V or 230V) at the AC-OUTPUT of AC-T1/ JP4. Verify that AC voltage exists and has the required value.</p> <p>18.2 Uncover cautiously the heating elements connections and measure the heating elements input voltage. If no voltage reaches the heating elements locate the interruption between connector AC-OUTPUT (JP4) and the heating elements.</p> <p>18.3 If there is no AC voltage at the output of the SSR the problem is the SSR.</p> <p>18.4 The heating elements receive the normal voltage, but do not work.</p>	<p>18.1 — If ac voltage exists – check according to par. 18.2 ahead. — If ac voltage does not exists – check according to par. 18.3 ahead. Fix the connections.</p> <p>18.2 Replace the SSR.</p> <p>18.3 Replace the heating elements. Locate the cause of this malfunction and fix the unit. It is important to identify the cause of the thermostat malfunction that did not switch on the heating element.</p>

Symptom	Possible cause check-up and tests	Corrections
19. The heating elements are permanently activated.	<p>Generally, this situation is the result of a control failure on DIG-T2 board or of the driver to the heating elements on ANL-T2.</p> <p>19.1 Check TP4. If the voltage is constantly higher than 4VDC the problem is on DIG-T2 board.</p> <p>19.2 Voltage at TP4 is close to 0VDC and despite this the heating elements are activated.</p> <p>19.3 If all items checked above conform to requirements, ANL-T2 board is faulty.</p>	<p>19.1 Replace DIG-T2 board.</p> <p>19.2 Replace the SSR (Solid State Relay) board located inside the electronic box.</p> <p>19.3 Replace ANL-T2 board.</p>
20. The air Pump works continuously after 30 minutes have elapsed from the end of the cycle (EA & EKA only).	<p>Generally this situation is caused by a control failure on DIG-T2 or a problem at the heaters driver located on AC-T1 board.</p> <p>20.1 Check the voltage at TP5. If it is constantly higher than 4VDC, the problem is on DIG-T2 board.</p> <p>20.2 Check the voltage at TP5. If it is 0 VDC and the pump works the problem is on AC-T1 board.</p>	<p>20.1 Replace DIG-T2 board.</p> <p>20.2 Replace AC-T1 board or one of the components Q2 (TRIAC) or U2 (MOC).</p>
21. Pump does not work (EA & EKA only).	<p>21.1 Check if the installed software is the model EA version and not model E.</p> <p>21.2 If the dry valve works despite pump is not running, check AC voltage between pin 1 at JP7 on AC-T1 board to neutral.</p> <p>21.3 Sometimes, due to overheating of the pump caused by blocking of the filter or by the dry valve that is not functioning, the thermal protection of the pump will be activated and stop the pump.</p>	<p>21.1 Install the right software in the control unit.</p> <p>21.2 If AC voltage exist the pump is faulty and shall be replaced. If not, replaced the AC-T1 board.</p> <p>21.3 Replace filter or dry valve.</p>

Symptom	Possible cause check-up and tests	Corrections
22. The temperature readout permanently indicates temperature higher than 140 °C.	<p>22.1 The sensor switches off. Check the connections of the sensor to the board. Check that the wires and connector are in good condition.</p> <p>22.2 Temperature sensor is damaged. Disconnect the PT100 from the connector and check its resistance. (at 0 °C, R=100 ohms and the gradient is approx. 0.4 ohms/°C).</p>	<p>22.1 Fix the connections</p> <p>22.2 If the resistance does not correlate with the temperature, replace the temperature sensor.</p>
23. The temperature readout permanently indicates temperature less than 30 °C, although chamber temperature is high.	<p>23.1 The sensor is short-circuit. Check the connections of the sensor to the board. Make sure that the wires and connectors are in good condition.</p> <p>23.2 The temperature sensor is defective.</p> <p>23.3 The temperature measuring circuit on ANL-T2 board is defective.</p> <p>23.4 The A/D component on ANL-T2 board is defective.</p>	<p>23.1 Fix the connections.</p> <p>23.2 Replace The temperature sensor (See symptom s 22.2 in this paragraph).</p> <p>23.3 Replace ANL-T2 board.</p> <p>23.4 Replace ANL-T2 board.</p>
24. The temperature readout is significantly different from the actual temperature.	<p>24.1 The air trap is blocked.</p> <p>24.2 Connect a simulator to the PT100 on the control unit. If the display is identical to the simulator the sensor PT100 is faulty.</p> <p>24.3 The display differs from the actual temperature in the same direction as the PT100</p> <p>24.4 System cannot be calibrated.</p>	<p>24.1 replace the air trap.</p> <p>24.2 Replace the sensor</p> <p>24.3 Calibrate the system.</p> <p>24.4 replace ANL-T2board.</p>
25. The temperature readout is not accurate. There is a deviation of $\pm 20^{\circ}\text{C}$ .	<p>25.1 The system must be calibrated.</p> <p>25.2 System cannot be calibrated.</p>	<p>25.1 Calibrate the temperature measuring circuit, as described in para. 6.2 (Temperature Calibration).</p> <p>25.2 replace ANL-T2board.</p>

Symptom	Possible cause check-up and tests	Corrections
26. The pressure readout indicates permanently pressure over 350 kPa	<p>26.1 Check the sensor connections and the soldering at the pins of the sensor connections to ANL - T2 board.</p> <p>26.2 The pressure sensor is defective.</p> <p>26.3 The pressure measuring circuit on ANL-T2 board is defective.</p> <p>26.4 The A/D component on ANL-T2 board is defective.</p>	<p>26.1 Fix the connections.</p> <p>26.2 Replace the pressure sensor.</p> <p>26.3 Replace board ANL-T2.</p> <p>26.4 Replace board ANL-T2.</p>
27. The-pressure readout indicates permanently pressure less than 50kPa.	<p>27.1 Check the sensor connections and the soldering at the pins of the sensor connections to ANL-T2 board.</p> <p>27.2 The pressure sensor is defective.</p> <p>27.3 The pressure measuring circuit on ANL-T2 board is defective.</p> <p>27.4 The A/D component on ANL-T2 board is defective.</p>	<p>27.1 Fix the connections.</p> <p>27.2 Replace the pressure sensor.</p> <p>27.3 Replace board ANL-T2.</p> <p>27.4 Replace board ANL-T2.</p>
28. The pressure readout is not accurate. There is a deviation of $\pm 30$ . kPa	28.1 The system must be calibrated	28.1 Calibrate the pressure measuring circuit, as described in para. 6.3 (Pressure Calibration).
29. The electrode indicates that there is permanently water in the chamber although there is no water.	<p>29.1 Check if the wire connecting the electrode to the board or the electrode is short circuit to the ground.</p> <p>29.2 The electrode is not clean.</p> <p>29.3 If there is no short circuit, ANL-T2 board is damaged.</p>	<p>29.1 Fix the connections.</p> <p>29.2 Clean the electrode with alcohol.</p> <p>29.3 Replace ANL- T2 board.</p>
30. The electrode does not sense water	<p>30.1 Electrode is not clean.</p> <p>30.2 Check wire connecting electrode to board.</p> <p>30.3 If there is no short circuit, ANL-T2 board is damaged.</p>	<p>30.1 Clean electrode with alcohol and check water level.</p> <p>30.2 Fix the connections.</p> <p>30.3 Replace ANL- T2 board.</p>

Symptom	Possible cause check-up and tests	Corrections
31. The door switch indicates door is permanently closed.	<p>31.1 Check if door switch is stuck or faulty.</p> <p>31.2 Check connection of switch to ANL-T2 board. Verify that no short circuit exist on both connections (to switch and to board) and on the entire wire.</p> <p>31.3 If the switch is in order the input circuit on ANL-T2 board is faulty.</p>	<p>31.1 Replace the door switch.</p> <p>31.2 Fix the connections.</p> <p>31.3 Replace board ANL-T2.</p>
32. The door switch indicates door is permanently open.	<p>32.1 Door switch stuck.</p> <p>32.2 Check connection of switch to ANL-T2 board. Verify that no short circuit exist on both connections (to switch and to board) and on the entire wire.</p> <p>32.3 If the switch is in order the switch-input circuit on ANL-T2 board is faulty.</p>	<p>32.1 Press the switch a few times and watch that it opens and closes correctly. Replace if switch is faulty.</p> <p>32.2 Fix the connections.</p> <p>32.3 Replace board ANL-T2.</p>
33. Steam leaks through the door, despite the fact that door is tightly closed.	<p>33.1 Check if the gasket is smooth, while verifying that the door closes properly.</p>	<p>33.1 Replace the faulty gasket.</p>
34. The float switch at the water reservoir is always ON or OFF.	<p>34.1 Check if the switch is stuck. Move it up and down and watch that it opens and closes correctly.</p> <p>34.2 Disconnect the wire from the float switch and touch ground. Check reaction. If there is reaction the float is damaged.</p> <p>34.3 Check the wires between the float switch and JP6/1 on ANL-T2.</p> <p>34.4 If previous checks are OK ANL-T2 board is faulty.</p>	<p>34.1 Replace if switch is faulty.</p> <p>34.2 Replace float.</p> <p>34.3 Replace damaged wires.</p> <p>34.4 Replace ANL-T2 board.</p>

Symptom	Possible cause check-up and tests	Corrections
35. The safety thermostat circuit indicates permanently that thermostat is ON or OFF.	<p>35.1 Disconnect the wires from the thermostat and simulate opening the circuit and short circuit. Watch the system react.</p> <p>35.2 Check the wires from the thermostat to ANL-T2 board JP6/3.</p> <p>35.3 If previous checks are OK, ANL-T2 board is faulty.</p>	<p>35.1 Replace faulty thermostat.</p> <p>35.2 Replace damaged wires.</p> <p>35.3 Replace ANL-T2 board.</p>
36. The safety thermostat switches off at a very low temperature.	<p>36.1 Thermostat is not calibrated.</p> <p>36.2 If calibrating the thermostat does not solve the problem the thermostat is faulty.</p>	<p>36.1 Calibrate the thermostat by raising the setting point, each time by a quarter turn.</p> <p>36.2 Replace the thermostat</p>
37. The door locking mechanism enables opening the door, even at a pressure of 150kPa.	37.1 The locking mechanism is faulty.	37.1 Repair or replace the locking mechanism

### 11.4 Mechanical malfunction

Symptom	Possible cause check-up and tests	Corrections
1. The safety valve does not release pressure when blow-off test is performed.	1.1 Check the path of safety valve ensuring circulation is free. 1.2 Safety relief valve is faulty	1.1 If circulation is not free, remove the block. 1.2 Replace the faulty valve.
2. Safety relief valve opens at pressure lower than specified.	2.1 Safety relief valve is clogged. 2.2 Safety relief valve is faulty.	2.1 Replace relief valve and check the water quality. 2.2 Replace relief valve
3. Safety relief valve opens at pressure higher (more than 10%) than specified.	3.1 Safety relief valve is faulty.	3.1 Replace relief valve
4. Safety relief valve does not close in time (2-3 seconds).	4.1 Safety relief valve is faulty.	4.1 Replace relief valve
5. Safety relief valve leaks constantly.	5.1 Safety relief valve is faulty.	5.1 Replace relief valve and check the water quality.
6. Locking pin is loose in the bronze sleeve.	6.1 Wear of components.	6.1 Replace pin and sleeve.
7. Vibration during operation of pump.	7.1 Pump's rubber legs are loose or damaged.	7.1 Tighten or replace rubber legs.

### 11.5 Water pump malfunction

Symptom	Possible cause check-up and tests	Corrections
1. Pump is operating but no water flow or low water flow.	<p>Check pipes connecting the water reservoir, strainer and pump.</p> <p>1.1 Air accumulates at the pump inlet.</p> <p>1.2 Pipe is clogged.</p> <p>1.3 Strainer is clogged</p>	<p>1.1 Disconnect pipe from the pump, let water flow to remove air accumulation and reconnect pipe.</p> <p>1.2 Clean pipe.</p> <p>1.3 Clean strainer according to instructions.</p>
2. Pump does not work.	<p>Voltage exists at the pump</p> <p>Check AC-T1 board</p> <p>2.1 If there is a command “0” (logic level) on connector JP1/3 check AC voltage output (230V) on connector JP72.</p> <p>2.1.1 If there is voltage on the connector, the pump’s fuse is blown or wiring is faulty.</p> <p>2.1.2 If there is no voltage on the connector, AC-T1 is faulty.</p> <p>2.2 If there is no command (“1” logic level) on connector JP1/3 check wiring between AC-T1 and ANL-T2 V3 board.</p> <p>2.2.1 Wiring is faulty.</p> <p>2.2.2 ANL-T2 V3 board is faulty.</p>	<p>2.1.1 Replace fuse of fix wiring.</p> <p>2.1.2 Replace AC-T1 board.</p> <p>2.2.1 Fix wiring and connections.</p> <p>2.2.2 Replace faulty ANL-T2 V3 board</p>



## 12. LIST OF SPARE PARTS

Description		Cat. No.					
		1730	2340	2540	3140	3850	3870
Printer	DPU 20	—	THE002-0005	THE002-0005	—	—	—
	DPU 30	—	—	—	THE002-0022	THE002-0022	THE002-0022
Printer paper roll	DPU 20	—	THE002-0003	THE002-0003	—	—	—
	DPU 30	—	—	—	THE002-0025	THE002-0025	THE002-0025
Cable, Flat, Printer, DPU20, 25cm, 34P		—	WIR040-0070	WIR040-0070	—	—	—
Cable, Printer, DPU-30, 30cm, 34p		—	—	—	CTP201-0127	CTP201-0127	CTP201-0127
Temperature sensor PT100 5 x 80		THE003-0013	THE003-0013	THE003-0013	THE003-0013	THE003-0013	THE003-0013
Safety thermostat		THE005-0003	THE005-0003	THE005-0003	THE005-0003	THE005-0003	THE005-0003
Cut out thermostat		THE005-0014	THE005-0014	THE005-0014	THE005-0014	THE005-0014	THE005-0014
Pressure sensor MPX2200		THE006-0003	THE006-0003	THE006-0003	THE006-0003	THE006-0003	THE006-0003
Float switch		THE007-0001	THE007-0001	THE007-0001	THE007-0001	THE007-0001	THE007-0001
Heating element, 120V/350W E		HEA009-0001	HEA009-0002	HEA009-0003	—	—	—
Heating element, 230V/350W E		HEA009-0004	HEA009-0005	HEA009-0006	—	—	—
Heating element, 120V/450W EK		HEA010-0007	—	—	—	—	—
Heating element, 230V/450W EK		HEA010-0008	—	—	—	—	—
Heating element, 230V/550W EK/EKA		—	HEA010-0003	HEA010-0004	—	—	—
Heating element, w/o groove, 230V/800W		—	—	—	HEA009-0015	—	—
Heating element with groove, 230V/800W		—	—	—	HEA009-0016	—	—
Heating element, 230V/600W E/EA		—	—	—	—	HEA009-0007	—
Heating element, 230V/500W E/EA		—	—	—	—	—	HEA009-0008
Solenoid valve 1/4 x 6		SOL026-0006	SOL026-0006	SOL026-0006	SOL026-0006	SOL026-0006	SOL026-0006
Solenoid valve 1/4 x 3		SOL026-0004	SOL026-0004	SOL026-0004	SOL026-0004	SOL026-0004	SOL026-0004
Coil, Solenoid 230VAC-8W, Bac.		SOL026-0047	SOL026-0047	SOL026-0047	SOL026-0047	SOL026-0047	SOL026-0047
Plunger for 3mm solenoid		SOL026-0015	SOL026-0015	SOL026-0015	SOL026-0015	SOL026-0015	SOL026-0015
Plunger for 6mm solenoid		SOL026-0016	SOL026-0016	SOL026-0016	SOL026-0016	SOL026-0016	SOL026-0016

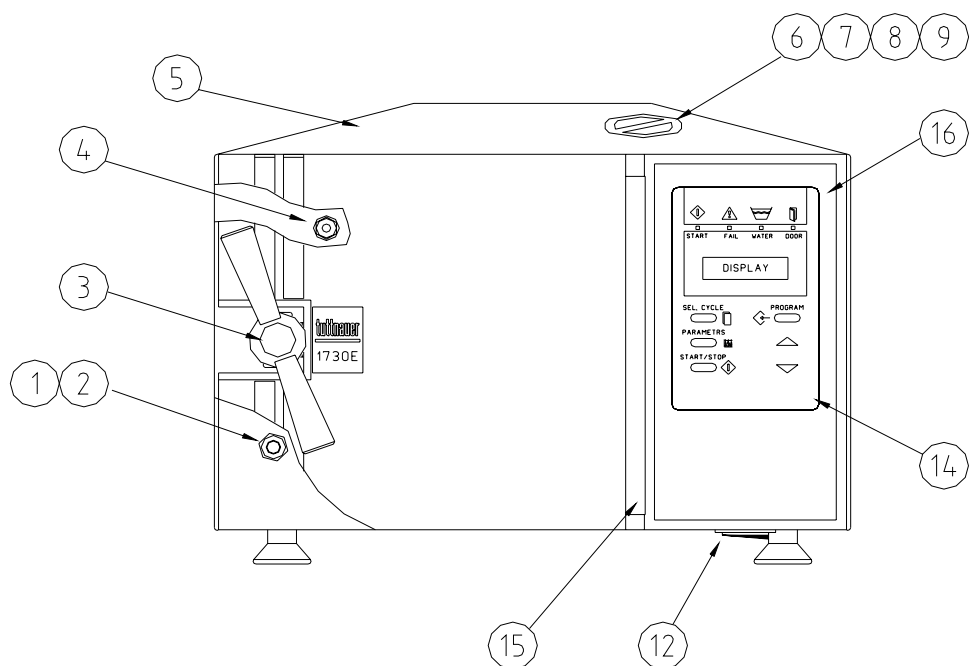
Description		Cat. No.					
		1730	2340	2540	3140	3850	3870
Fuseholder, mini 1/4 x 32		—	ELE035-0002	ELE035-0002	ELE035-0002	ELE035-0002	ELE035-0002
Fuse, 1/4x32, 1.25A (slow blow)		—	ELE035-0055	ELE035-0055	ELE035-0055	ELE035-0055	ELE035-0055
Main power switch		ELE035-0012	ELE035-0012	ELE035-0012	ELE035-0012	ELE035-0012	ELE035-0012
Electrode - water level, assembly		CMT196-0004	CMT196-0004	CMT196-0004	CMT196-0004	CMT196-0004	CMT196-0004
Capacitor 470NF, 400V		—	CTP201-0016	CTP201-0016	CTP201-0016	CTP201-0016	CTP201-0016
Safety valve	CE marked 1/4x2.76 Bar	SVL029-0028	SVL029-0028	SVL029-0028	SVL029-0028	SVL029-0028	SVL029-0028
	ASME 1/4"-40 psi	SVL029-0004	SVL029-0004	SVL029-0004	SVL029-0004	SVL029-0004	SVL029-0004
Flat cable for DIG-T2, ANL-T2		CTP201-0083	CTP201-0083	CTP201-0083	CTP201-0083	CTP201-0083	CTP201-0083
Flat cable for ANLT2- RS232		CTP201-0084	CTP201-0084	CTP201-0084	CTP201-0084	CTP201-0084	CTP201-0084
Air filter for EA, EKA		—	FIL175-0010	FIL175-0010	FIL175-0010	FIL175-0010	FIL175-0010
Drain valve		VLV170-0066	VLV170-0066	VLV170-0066	VLV170-0066	VLV170-0066	VLV170-0066
Brass spacer for drain valve		CMT240-0003	CMT240-0003	CMT240-0003	CMT240-0003	CMT240-0003	CMT240-0003
Nut for drain valve		CMT240-0020	CMT240-0020	CMT240-0020	CMT240-0020	CMT240-0020	CMT240-0020
O-Ring (drain valve) 10 x 2.5		GAS082-0020	GAS082-0020	GAS082-0020	GAS082-0020	GAS082-0020	GAS082-0020
O-Ring (drain valve) 6 x 2		GAS082-0021	GAS082-0021	GAS082-0021	GAS082-0021	GAS082-0021	GAS082-0021
Sheet bolt 4.8 x 12		BOL194-0340	BOL194-0340	BOL194-0340	BOL194-0340	BOL194-0340	BOL194-0340
Sheet nut 4.8 x 1.2		NUT192-0230	NUT192-0230	NUT192-0230	NUT192-0230	NUT192-0230	NUT192-0230
Sheet nut 4.8 x 2		NUT192-0236	NUT192-0214	NUT192-0214	NUT192-0231	NUT192-0231	NUT192-0231
Bolts 1/2 UNC short		BOL194-0121	BOL194-0121	BOL194-0121	BOL194-0123	BOL194-0123	BOL194-0123
ANL-T2 board		CTP201-0119	CTP201-0119	CTP201-0119	CTP201-0119	CTP201-0119	CTP201-0119
DIG-T2 board		CTP201-0102	CTP201-0102	CTP201-0102	CTP201-0102	CTP201-0102	CTP201-0102
AC-T1 board		CTP201-0060	CTP201-0060	CTP201-0060	CTP201-0060	CTP201-0060	CTP201-0060
Keypad panel DIG-T1V3		CPN064-0007	CPN064-0007	CPN064-0007	CPN064-0007	CPN064-0007	CPN064-0007
Front leg		WHE070-0012	WHE070-0012	WHE070-0012	WHE070-0013	WHE070-0013	WHE070-0013
Rear rubber leg		WHE070-0016	WHE070-0016	WHE070-0016	WHE070-0016	WHE070-0016	WHE070-0016
Power supply PU40-23S		ELE035-0031	ELE035-0031	ELE035-0031	ELE035-0031	ELE035-0031	ELE035-0031
SSR for heating element 25A		CTP201-0065	CTP201-0065	CTP201-0065	CTP201-0065	CTP201-0065	CTP201-0065

Description		Cat. No.					
		1730	2340	2540	3140	3850	3870
Control system for E models		CTP200-0050	CTP200-0051	CTP200-0051	CTP200-0072	CTP200-0076	CTP200-0038
Control system for EA & EKA models		—	CTP200-0052	CTP200-0052	—	CTP200-0054	CTP200-0076
Outer cover for E,EK		COV173-0002	COV240-0002	COV240-0002	COV314-0002	COV385-0002	COV387-0002
Outer cover for EA,EKA		—	COV240-0011	COV240-0011	—	COV385-0013	COV387-0012
Rear cover all models		RCV173-0002	RCV240-0002	RCV240-0002	RCV314-0001	RCV387-0005	RCV387-0005
Complete closing device		LOK240-0001	LOK240-0001	LOK240-0001	LOK387-0032	LOK387-0032	LOK387-0032
Locking Solenoid		SOL027-0002	SOL027-0002	SOL027-0002	SOL027-0002	SOL027-0001	SOL027-0001
Air relief valve for EK & EKA (red)		CMT100-0003	CMT100-0003	CMT100-0003	—	—	—
Air relief valve for E & EA (black)		CMT100-0006	CMT100-0006	CMT100-0006	CMT100-0006	CMT100-0006	CMT100-0006
Tray holder		TRH173-0001	TRH234-0001	TRH254-0001	TRH314-0004	TRH385-0001	TRH387-0001
Tray (big)		TRY173-0002	TRY240-0001	TRY240-0001	TRY314-0001	TRY385-0003	TRY387-0001
Tray (small )		—	—	—	TRY314-0002	TRY385-0004	TRY387-0003
Door seal		GAS080-0021	GAS080-0002	GAS080-0003	GAS080-0029	GAS080-0004	GAS080-0004
Tray handle		CMT240-0001	CMT240-0001	CMT240-0001	—	—	—
Water reservoir – assembly, E, EA		CMT173-0029	CMT254-0011	CMT254-0011	CMT314-0005	CMT387-0026	CMT387-0026
Water reservoir – assembly, EK, EKA		CMT173-0030	CMT254-0013	CMT254-0013	—	—	—
Water reservoir cover		POL067-0004	POL067-0004	POL067-0004	POL067-0004	POL067-0004	POL067-0004
Silicon gasket for water reservoir		GAS080-0007	GAS080-0007	GAS080-0007	GAS080-0007	GAS080-0007	GAS080-0007
Water reservoir dipstick		POL067-0005	POL067-0005	POL067-0005	POL067-0005	POL067-0005	POL067-0005
Door micro switch E13-00M		ELE036-0001	ELE036-0001	ELE036-0001	ELE036-0001	ELE036-0001	ELE036-0001
Gauge Pressure, Steam, -30+60 psi, 1.5"		—	GAU029-0009	GAU029-0009	GAU029-0009	GAU029-0009	GAU029-0009
Cover, Door	E	POL065-0001	POL065-0019	POL065-0023	COV314-0001	—	—
	EA	POL065-0001	POL065-0020	POL065-0025	—	POL065-0003	POL065-0003
	EK	—	POL065-0021	POL065-0024	—	—	—
	EKA	—	POL065-0022	POL065-0026	—	—	—
washer		ELE036-0009	ELE036-0009	ELE036-0009	ELE036-0009	ELE036-0009	ELE036-0009
spring		SPR177-0012	SPR177-0012	SPR177-0012	SPR177-0012	SPR177-0012	SPR177-0012
Validation port cover		—	POL065-0006	POL065-0006	POL065-0006	POL065-0006	POL065-0006

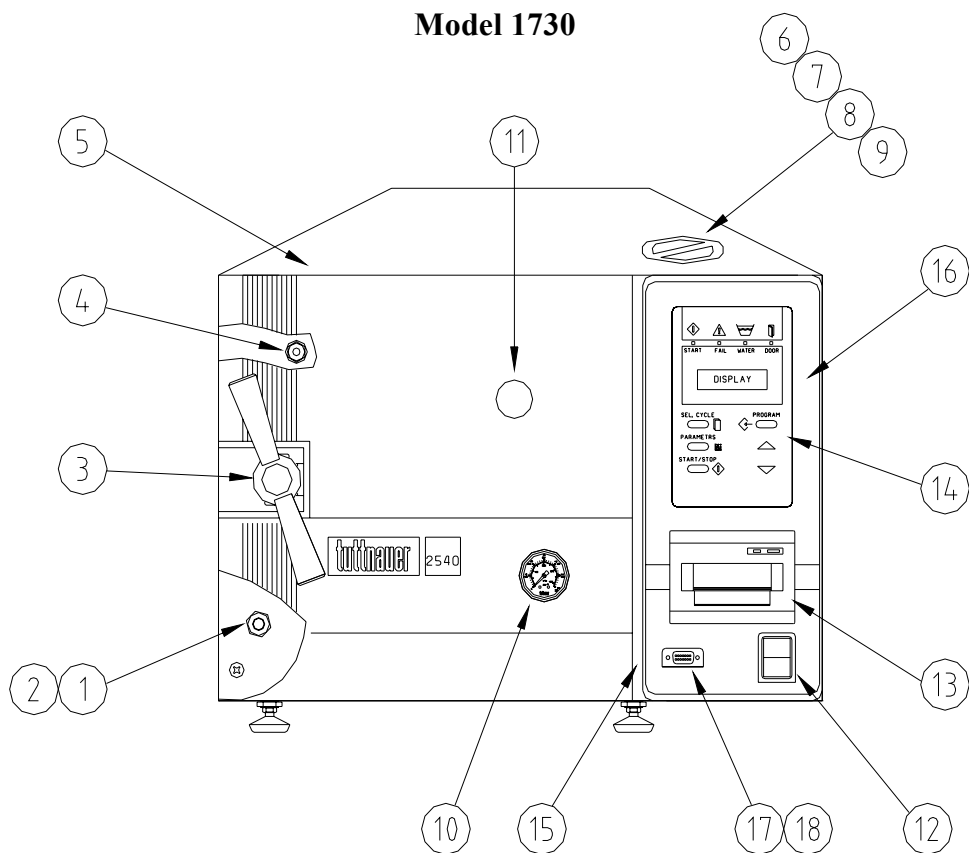
Description		Cat. No.					
		1730	2340	2540	3140	3850	3870
Door safety solenoid		SOL027-0002	SOL027-0002	SOL027-0002	SOL027-0001	SOL027-0001	SOL027-0001
Locking pin		CMT201-0004	CMT201-0004	CMT201-0004	CMV100-0001	CMV100-0001	CMV100-0001
Spring for solenoid		SPR177-0004	SPR177-0004	SPR177-0004	SPR177-0017	SPR177-0017	SPR177-0017
Tightening nut		CMT201-0005	CMT201-0005	CMT201-0005	CMV10-0002	CMV10-0002	CMV10-0002
Okolon disc		LOK240-0017	LOK240-0017	LOK240-0017	LOK387-0017	LOK387-0017	LOK387-0017
Door tightening bolt – assembly		LOK240-0029	LOK240-0029	LOK240-0029	LOK387-0029	LOK387-0029	LOK387-0029
Electrode locking nut		CMT098-0001	CMT098-0001	CMT098-0001	CMT098-0001	CMT098-0001	CMT098-0001
Eyelet $\phi 6$ for electrode		CMT196-0001	CMT196-0001	CMT196-0001	CMT196-0001	CMT196-0001	CMT196-0001
Nut 5/32"		NUT192-0217	NUT192-0217	NUT192-0217	NUT192-0217	NUT192-0217	NUT192-0217
Star disc 5/32"		NUT193-0291	NUT193-0291	NUT193-0291	NUT193-0291	NUT193-0291	NUT193-0291
Teflon tube for electrode		GAS086-0001	GAS086-0001	GAS086-0001	GAS086-0001	GAS086-0001	GAS086-0001
Screw		BOL191-0070	BOL191-0070	BOL191-0070	BOL191-0070	BOL191-0070	BOL191-0070
Cover plate		—	—	—	LOK240-0032	LOK240-0032	LOK240-0032
Completion to panel		POL063-0004	POL063-0002	POL063-0002	POL063-0005	POL062-0005	POL062-0005
Panel (console) base	DPU20	POL062-0001	POL062-0002	POL062-0002	—	—	—
	DPU30		—	—	POL062-0013	POL062-0003	POL062-0003
Printer opening cover	DPU20	—	POL067-0002	POL067-0002	—	—	—
	DPU30	—	—	—	POL067-0007	POL067-0007	POL067-0007
Screw, printer tightening		—	BOL190-0144	BOL190-0144	BOL190-0144	BOL190-0144	BOL190-0144
RS232 port cover		POL067-0003	POL067-0003	POL067-0003	POL067-0003	POL067-0003	POL067-0003
Cable shoe 68-4		ELE039-0048	ELE039-0048	ELE039-0048	ELE039-0048	ELE039-0048	ELE039-0048
Water strainer 1/4"		FIL175-0020	FIL175-0020	FIL175-0020	FIL175-0020	FIL175-0020	FIL175-0020
Strainer element		FIL175-0046	FIL175-0046	FIL175-0046	FIL175-0046	FIL175-0046	FIL175-0046
Teflon gasket 4 mm		GAS082-0008	GAS082-0008	GAS082-0008	GAS082-0008	GAS082-0008	GAS082-0008
Cap for 1/4" strainer		FIL175-0027	FIL175-0027	FIL175-0027	FIL175-0027	FIL175-0027	FIL175-0027
Housing Assy. (Housing + cap)		FIL175-0051	FIL175-0051	FIL175-0051	FIL175-0051	FIL175-0051	FIL175-0051
Circuit breaker 10A		ELE035-0069	ELE035-0069	ELE035-0069	—	ELE035-0069	ELE035-0069
Circuit breaker 15A		ELE035-0021	ELE035-0021	ELE035-0021	ELE035-0021	ELE035-0021	ELE035-0021
Pump, Water, EX7, 120v, Ulka		—	PUM055-0005	PUM055-0005	PUM055-0005	PUM055-0005	PUM055-0005
Pump, Water, EX7, 230V 50/60HZ, Ulka		—	PUM055-0006	PUM055-0006	PUM055-0006	PUM055-0006	PUM055-0006

<i>Description</i>	<i>Cat. No.</i>					
	<i>1730</i>	<i>2340</i>	<i>2540</i>	<i>3140</i>	<i>3850</i>	<i>3870</i>
Rubber shock absorber for Ulka	—	SKR203-0006	SKR203-0006	SKR203-0006	SKR203-0006	SKR203-0006
Screw	—	BOL191-0140	BOL191-0140	BOL194-0342	BOL194-0342	BOL194-0342
Nut	—	NUT192-0191	NUT192-0191	NUT192-0155	NUT192-0155	NUT192-0155
Washer	—	NUT193-0347	NUT193-0347	NUT193-0276	NUT193-0276	NUT193-0276
Rivet, Dome Head, 4x14	—	BOL194-0331	BOL194-0331	—	—	—
Air pump	—	PUM058-0011	PUM058-0011	PUM058-0011	PUM058-0011	PUM058-0011
Elbow Connection O-RING - 1/8" M / 6 Hose	—	FIT100-0806	FIT100-0806	FIT100-0806	FIT100-0806	FIT100-0806
Fitting 5/16"x1/8" (straight)	—	—	—	FIT100-0287	FIT100-0287	FIT100-0287

## FRONT VIEW

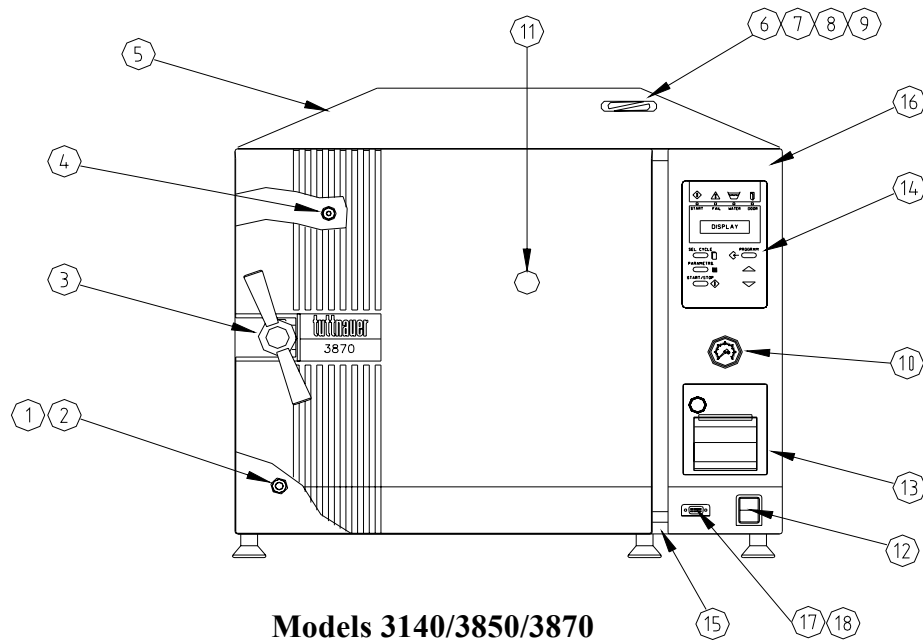


**Model 1730**



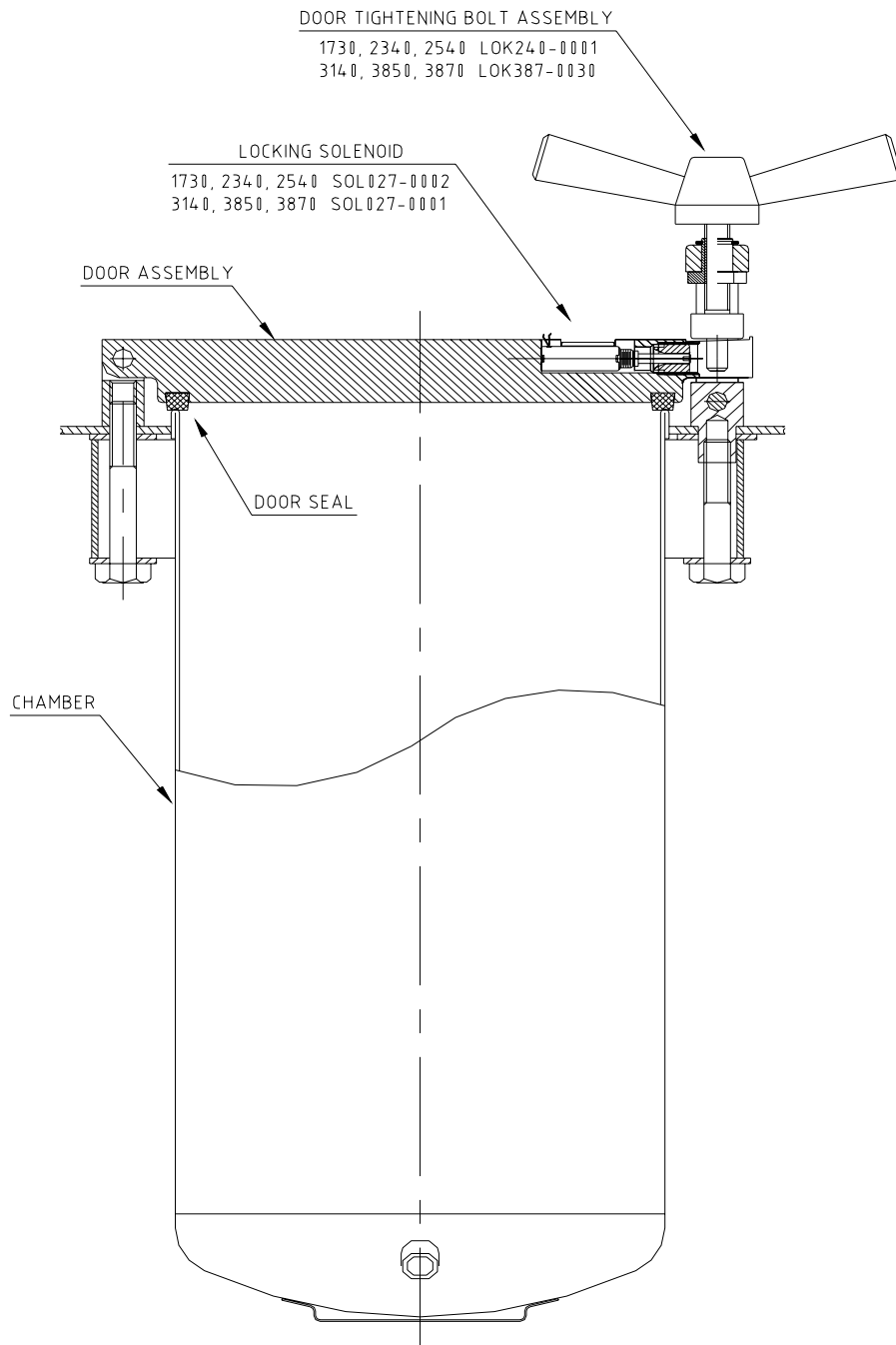
**Model 2340/2540**

## FRONT VIEW (Continue)



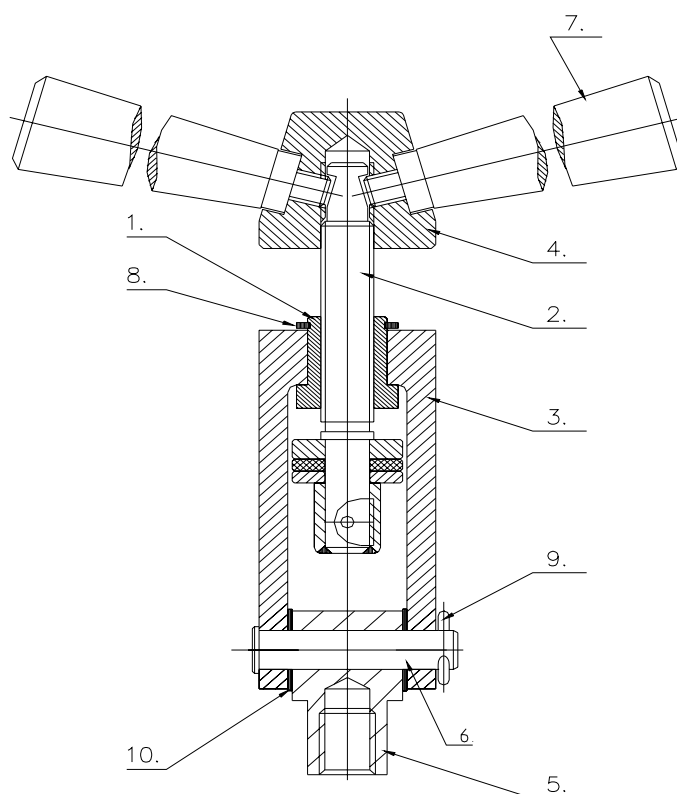
No.	Description	1730	2340/2540	3140	3850/3870
1	Reservoir water drain valve	VLV170-0066	VLV170-0066	VLV170-0066	VLV170-0066
2	Ring for drain valve	CMT240-0003	CMT240-0003	CMT240-0003	CMT240-0003
3	Door closing device	LOK240-0001	LOK240-0001	LOK387-0032	LOK387-0032
4	Door switch	ELE036-0009	ELE036-0009	ELE036-0009	ELE036-0009
5	Autoclave cover	See "Outer cabinet assembly"			
6	Water reservoir cover	POL067-0004	POL067-0004	POL067-0004	POL067-0004
7	Water reservoir air/E, EA – assembly EK, EKA	CMT173-0029	CMT254-0011	CMT314-0005	CMT387-0026
		CMT173-0030	CMT240-0047	—	—
8	Safety valve marked ASME approved	SVL029-0028	SVL029-0028	SVL029-0028	SVL029-0028
		SVL029-0004	SVL029-0004	SVL029-0004	SVL029-0004
9	Air relief valve, EK & EKA Air relief valve, E & EA	CMT100-0003	CMT100-0003	—	—
		CMT100-0006	CMT100-0006	CMT100-0006	CMT100-0006
10	Pressure gauge	—	GAU029-0009	GAU029-0009	GAU029-0009
11	Validation port cover	—	POL065-0006	POL065-0006	POL065-0006
12	Main switch	ELE035-0012	ELE035-0012	ELE035-0012	ELE035-0012
13	Printer - if installed	—	THE002-0005	THE002-0022	THE002-0022
	Cover - if w/o printer	—	POL067-0002	POL067-0007	POL067-0007
14	Front panel key board	CTP201-0061	CTP201-0061	CTP201-0061	CTP201-0061
15	Completion to panel	POL063-0004	POL063-0002	POL063-0005	POL063-0003
16	Panel base	POL062-0001	POL062-0002	—	—
			—	POL062-0013	POL062-0003
17	Flat cable ANL-T2 – RS232	—	CTP201-0084	CTP201-0084	CTP201-0084
18	RS232 port cover	—	POL067-0003	POL067-0003	POL067-0003

## VESSEL ASSEMBLY



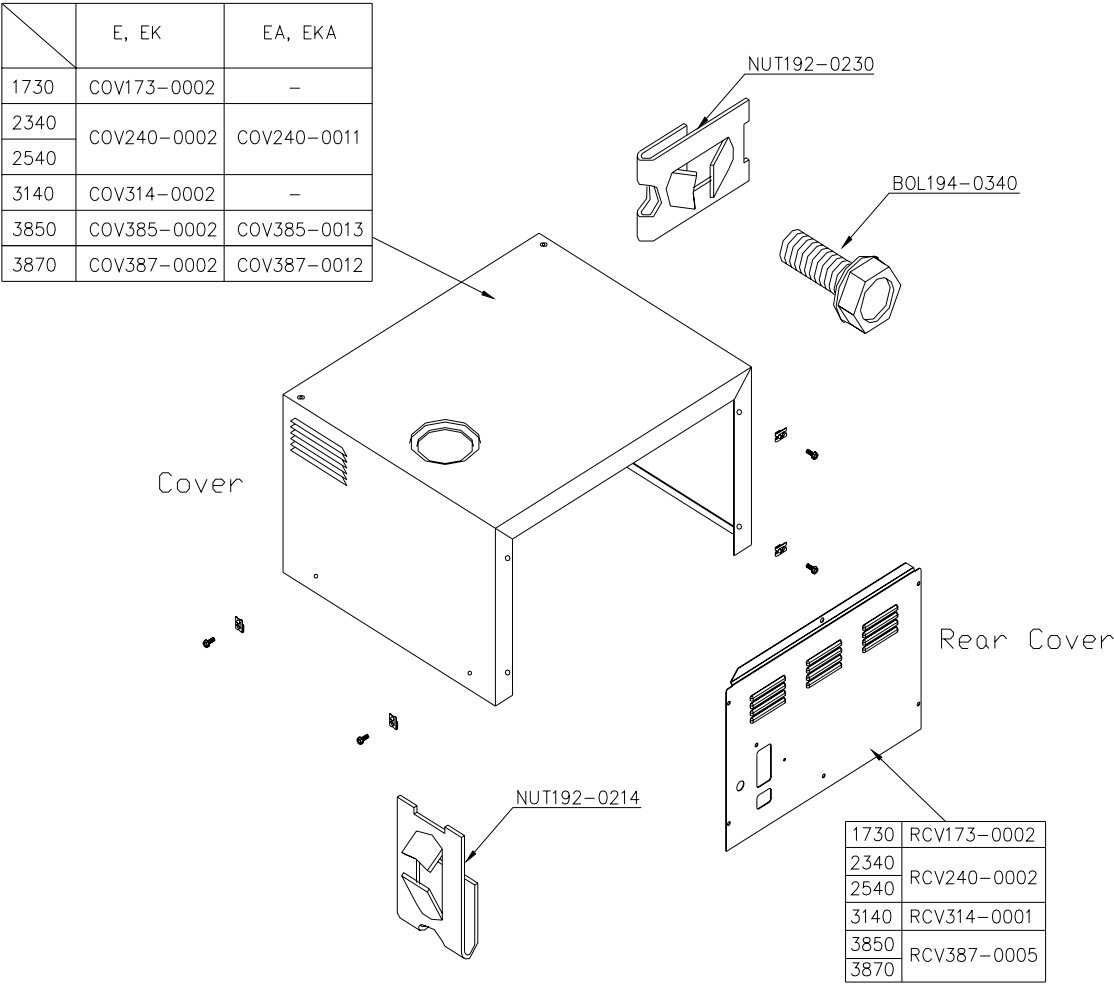


## DOOR TIGHTENING BOLT – ASSEMBLY

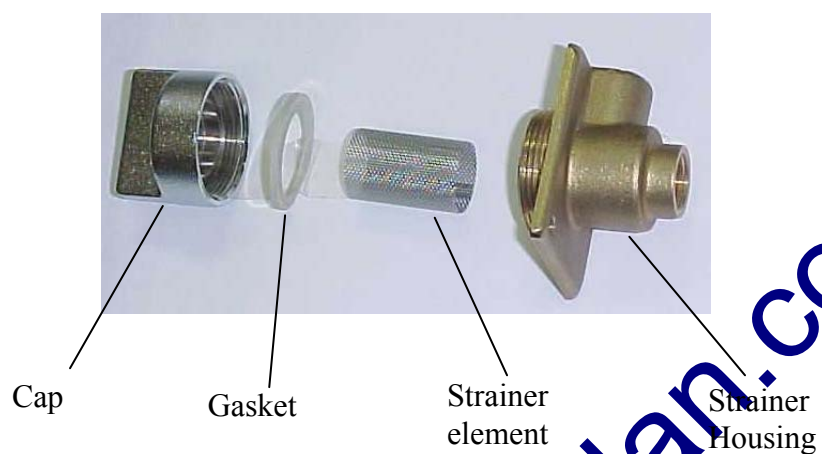


No.	Description	Cat. No.	
		1730, 2340, 2540	3140, 3850, 3870
1	Bushing	LOK240-0003	LOK387-0003
2	Door tightening bolt assembly	LOK240-0029	LOK387-0029
3	Locking screw housing	LOK240-0005	LOK387-0005
4	Locking base	LOK240-0012	LOK387-0012
5	Locking housing axle - assembly	LOK240-0013	LOK387-0036
6	Door locking device pin	LOK240-0035	LOK387-0016
7	Bakelite handle	HAN071-0003	HAN071-0006
8	Closing bridge "c" clip	NUT193-0302	NUT193-0303
9	Cotter pin	LOK692-0039	LOK692-0039
10	Okolon disc	LOK240-0017	LOK387-0017
	Door tightening bolt – assembly	LOK240-0001	LOK387-0032

OUTER CABINET - ASSEMBLY



## WATER OUTLET STRAINER



Description	Cat. No.
Cap for 1/4" strainer	FIL175-0027
Strainer element	FIL175-0046
Teflon gasket 1mm	GAS082-0008
Strainer Housing + Cap	FIL175-0051

**13. PRESSURE VS TEMPERATURE FOR SATURATED STEAM**

psia	InHg	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
1.5	2.95	114.5	0.10	10	45.8	17.1	2.4	219.7	1.18	117.9	104.3
2.2	4.44	129.3	0.15	15	54.1	17.2	2.5	219.9	1.18	118.6	104.4
2.9	5.90	140.2	0.20	20	60.1	17.2	2.5	220.1	1.19	118.6	104.5
3.6	7.39	149.1	0.25	25	65.0	17.3	2.6	220.3	1.19	119.3	104.6
4.4	8.86	156.4	0.30	30	68.9	17.4	2.7	220.5	1.20	120.0	104.7
5.1	10.34	162.9	0.35	35	72.7	17.4	2.7	220.6	1.20	120.0	104.8
5.8	11.81	168.6	0.40	40	75.9	17.5	2.8	220.8	1.20	120.4	104.9
6.5	13.30	173.8	0.45	45	78.8	17.5	2.8	221.0	1.21	120.7	105.0
7.3	14.76	178.4	0.50	50	81.3	17.6	2.9	221.2	1.21	121.3	105.1
						17.7	3.0	221.4	1.22	122.0	105.2
						17.7	3.0	221.5	1.22	122.0	105.3
						17.8	3.1	221.7	1.23	122.7	105.4
						17.8	3.1	221.9	1.23	122.7	105.5
						17.9	3.2	222.1	1.23	123.4	105.6
						18.0	3.3	222.3	1.24	124.1	105.7
						18.0	3.3	222.3	1.24	124.1	105.8
						18.1	3.4	222.5	1.24	124.7	105.9
						18.2	3.5	222.8	1.25	125.1	106.0
						18.2	3.5	223.0	1.26	125.5	106.1
						18.3	3.6	223.2	1.26	126.0	106.2
						18.3	3.6	223.3	1.26	126.2	106.3
						18.4	3.7	223.5	1.27	126.8	106.4
						18.5	3.8	223.7	1.27	127.2	106.5
						18.5	3.8	223.9	1.28	127.7	106.6
						18.6	3.9	224.1	1.28	128.1	106.7
						18.6	3.9	224.2	1.29	128.5	106.8
						18.7	4.0	224.4	1.29	129.0	106.9
						18.8	4.1	224.6	1.29	129.6	107.0
						18.9	4.2	224.8	1.30	129.9	107.1
						18.9	4.2	225.0	1.30	130.4	107.2
						19.0	4.3	225.1	1.31	130.8	107.3
						19.0	4.3	225.3	1.31	131.3	107.4
						19.1	4.4	225.5	1.32	131.7	107.5
						19.2	4.5	225.7	1.32	132.2	107.6
						19.3	4.6	225.9	1.33	132.6	107.7
						19.3	4.6	226.0	1.33	133.1	107.8
						19.4	4.7	226.2	1.34	133.5	107.9
						19.4	4.7	226.4	1.34	134.0	108.0
						19.5	4.8	226.6	1.34	134.4	108.1
						19.6	4.9	226.8	1.35	134.9	108.2
						19.6	4.9	226.9	1.35	135.3	108.3
						19.7	5.0	227.1	1.36	135.8	108.4
						19.8	5.1	227.3	1.36	136.2	108.5
						19.8	5.1	227.5	1.37	136.7	108.6
						19.9	5.2	227.7	1.37	137.1	108.7
						19.9	5.2	227.8	1.38	137.6	108.8
						20.0	5.3	228.0	1.38	138.1	108.9
						20.1	5.4	228.2	1.39	138.5	109.0
						20.2	5.5	228.4	1.39	139.0	109.1
						20.3	5.6	228.6	1.39	139.5	109.2
						20.3	5.6	228.7	1.40	140.0	109.3
						20.4	5.7	228.9	1.40	140.5	109.4
						20.4	5.7	229.1	1.41	140.9	109.5
psia	psig	°F	Bar	kPa	°C						
14.7	0.0	212.0	1.01	101.3	100.0						
14.8	0.1	212.2	1.02	101.7	100.1						
14.8	0.1	212.4	1.02	102.1	100.2						
14.9	0.2	212.5	1.02	102.4	100.3						
14.9	0.2	212.7	1.03	102.8	100.4						
15.0	0.3	212.9	1.03	103.2	100.5						
15.0	0.3	213.1	1.04	103.6	100.6						
15.1	0.4	213.3	1.04	104.0	100.7						
15.1	0.4	213.4	1.04	104.3	100.8						
15.2	0.5	213.6	1.05	104.7	100.9						
15.2	0.5	213.8	1.05	105.1	101.0						
15.3	0.6	214.0	1.05	105.4	101.1						
15.4	0.7	214.2	1.06	105.8	101.2						
15.4	0.7	214.3	1.06	106.2	101.3						
15.5	0.8	214.5	1.07	106.6	101.4						
15.5	0.8	214.7	1.07	106.9	101.5						
15.6	0.9	214.9	1.07	107.3	101.6						
15.6	0.9	215.1	1.08	107.7	101.7						
15.7	1.0	215.2	1.08	108.1	101.8						
15.7	1.0	215.4	1.08	108.4	101.9						
15.8	1.1	215.6	1.09	108.8	102.0						
15.8	1.1	215.8	1.09	109.2	102.1						
15.9	1.2	216.0	1.10	109.6	102.2						
16.0	1.3	216.3	1.10	110.0	102.4						
16.1	1.4	216.5	1.11	110.7	102.5						
16.1	1.4	216.7	1.11	111.1	102.6						
16.2	1.5	216.9	1.12	111.5	102.7						
16.2	1.5	217.0	1.12	111.9	102.8						
16.3	1.6	217.2	1.12	112.3	102.9						
16.4	1.7	217.4	1.13	112.7	103.0						
16.4	1.7	217.6	1.13	113.1	103.1						
16.5	1.8	217.8	1.14	113.5	103.2						
16.5	1.8	217.9	1.14	114.0	103.3						
16.6	1.9	218.1	1.14	114.3	103.4						
16.6	1.9	218.3	1.15	114.7	103.5						
16.7	2.0	218.5	1.15	115.1	103.6						
16.8	2.1	218.7	1.16	115.6	103.7						
16.8	2.1	218.8	1.16	116.0	103.8						
16.9	2.2	219.0	1.16	116.3	103.9						
16.9	2.2	219.2	1.17	116.7	104.0						
17.0	2.3	219.4	1.17	117.1	104.1						
17.1	2.4	219.6	1.18	117.5	104.2						

psia	psig	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
20.5	5.8	229.3	1.41	141.4	109.6	24.6	9.9	239.2	1.70	169.7	115.1
20.6	5.9	229.5	1.42	142.0	109.7	24.7	10.0	239.4	1.70	170.2	115.2
20.6	5.9	229.6	1.42	142.4	109.8	24.7	10.0	239.5	1.71	170.8	115.3
20.7	6.0	229.8	1.43	142.9	109.9	24.8	10.1	239.7	1.71	171.3	115.4
20.8	6.1	230.0	1.43	143.3	110.0	24.9	10.2	239.9	1.72	171.8	115.5
20.9	6.2	230.2	1.44	143.9	110.1	25.0	10.3	240.1	1.72	172.4	115.6
21.0	6.3	230.4	1.44	144.3	110.2	25.1	10.4	240.3	1.73	173.1	115.7
21.0	6.3	230.5	1.45	144.8	110.3	25.2	10.5	240.4	1.74	173.6	115.8
21.1	6.4	230.7	1.45	145.3	110.4	25.3	10.6	240.6	1.74	174.1	115.9
21.1	6.4	230.9	1.46	145.8	110.5	25.3	10.6	240.8	1.75	174.7	116.0
21.2	6.5	231.1	1.46	146.2	110.6	25.4	10.7	241.0	1.75	175.3	116.1
21.3	6.6	231.3	1.47	146.7	110.7	25.5	10.8	241.2	1.76	175.9	116.2
21.3	6.6	231.4	1.47	147.2	110.8	25.6	10.9	241.3	1.76	176.4	116.3
21.4	6.7	231.6	1.48	147.7	110.9	25.7	11.0	241.5	1.77	177.0	116.4
21.5	6.8	231.8	1.48	148.2	111.0	25.8	11.1	241.7	1.78	177.6	116.5
21.6	6.9	232.0	1.49	148.6	111.1	25.9	11.2	241.9	1.78	178.2	116.6
21.7	7.0	232.2	1.49	149.6	111.2	25.9	11.2	242.1	1.79	178.7	116.7
21.7	7.0	232.3	1.50	149.6	111.3	26.0	11.3	242.2	1.79	179.3	116.8
21.8	7.1	232.5	1.50	150.3	111.4	26.1	11.4	242.4	1.80	180.0	116.9
21.9	7.2	232.7	1.51	151.0	111.5	26.2	11.5	242.6	1.80	180.5	117.0
21.9	7.2	232.9	1.51	151.0	111.6	26.3	11.6	242.8	1.81	181.1	117.1
22.0	7.3	233.1	1.52	151.7	111.7	26.4	11.7	243.0	1.82	181.6	117.2
22.1	7.4	233.2	1.52	152.2	111.8	26.4	11.7	243.1	1.82	182.2	117.3
22.1	7.4	233.4	1.53	152.7	111.9	26.5	11.8	243.3	1.83	182.8	117.4
22.2	7.5	233.6	1.53	153.2	112.0	26.6	11.9	243.5	1.83	183.4	117.5
22.3	7.6	233.8	1.54	153.8	112.1	26.7	12.0	243.7	1.84	184.0	117.6
22.4	7.7	234.0	1.54	154.3	112.2	26.8	12.1	243.9	1.85	184.5	117.7
22.4	7.7	234.1	1.55	154.8	112.3	26.8	12.1	244.0	1.85	185.1	117.8
22.5	7.8	234.3	1.55	155.3	112.4	26.9	12.2	244.2	1.86	185.7	117.9
22.6	7.9	234.5	1.56	155.8	112.5	27.0	12.3	244.4	1.86	186.3	118.0
22.7	8.0	234.7	1.56	156.3	112.6	27.1	12.4	244.6	1.87	186.9	118.1
22.8	8.1	234.9	1.57	156.8	112.7	27.2	12.5	244.8	1.88	187.5	118.2
22.8	8.1	235.0	1.57	157.3	112.8	27.3	12.6	244.9	1.88	188.2	118.3
22.9	8.2	235.2	1.58	157.9	112.9	27.4	12.7	245.1	1.89	188.8	118.4
23.0	8.3	235.4	1.58	158.4	113.0	27.5	12.8	245.3	1.89	189.4	118.5
23.1	8.4	235.6	1.59	158.9	113.1	27.6	12.9	245.5	1.90	190.0	118.6
23.1	8.4	235.8	1.59	159.4	113.2	27.7	13.0	245.7	1.91	190.6	118.7
23.2	8.5	235.9	1.60	159.9	113.3	27.7	13.0	245.8	1.91	191.2	118.8
23.3	8.6	236.1	1.60	160.4	113.4	27.8	13.1	246.0	1.92	191.8	118.9
23.4	8.7	236.3	1.61	160.0	113.5	27.9	13.2	246.2	1.92	192.4	119.0
23.4	8.7	236.5	1.62	161.5	113.6	28.0	13.3	246.4	1.93	193.0	119.1
23.5	8.8	236.7	1.62	162.1	113.7	28.1	13.4	246.6	1.94	193.7	119.2
23.6	8.9	236.8	1.63	162.6	113.8	28.2	13.5	246.7	1.94	194.3	119.3
23.7	9.0	237.0	1.63	163.1	113.9	28.3	13.6	246.9	1.95	194.9	119.4
23.7	9.0	237.2	1.64	163.7	114.0	28.4	13.7	247.1	1.95	195.5	119.5
23.8	9.1	237.4	1.64	164.2	114.1	28.5	13.8	247.3	1.96	196.1	119.6
23.9	9.2	237.6	1.65	164.8	114.2	28.6	13.9	247.5	1.97	196.7	119.7
24.0	9.3	237.7	1.65	165.3	114.3	28.6	13.9	247.6	1.97	197.3	119.8
24.1	9.4	237.9	1.66	165.9	114.4	28.7	14.0	247.8	1.98	197.9	119.9
24.1	9.4	238.1	1.66	166.4	114.5	28.8	14.1	248.0	1.99	198.5	120.0
24.2	9.5	238.3	1.67	167.0	114.6	28.9	14.2	248.2	1.99	199.2	120.1
24.3	9.6	238.5	1.67	167.5	114.7	29.0	14.3	248.4	2.00	199.8	120.2
24.4	9.7	238.6	1.68	168.0	114.8	29.1	14.4	248.5	2.00	200.5	120.3
24.4	9.7	238.8	1.69	168.6	114.9	29.2	14.5	248.7	2.01	201.1	120.4
24.5	9.8	239.0	1.69	169.1	115.0	29.3	14.6	248.9	2.02	201.8	120.5

psia	psig	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
29.4	14.7	249.1	2.02	202.4	120.6	34.6	19.9	258.6	2.39	238.7	125.9
29.5	14.8	249.3	2.03	203.1	120.7	34.7	20.0	258.8	2.39	239.4	126.0
29.5	14.8	249.4	2.04	203.7	120.8	34.8	20.1	259.0	2.40	240.2	126.1
29.6	14.9	249.6	2.04	204.4	120.9	34.9	20.2	259.2	2.41	240.9	126.2
29.7	15.0	249.8	2.05	205.0	121.0	35.0	20.3	259.3	2.42	241.6	126.3
29.8	15.3	250.0	2.06	205.7	121.1	35.1	20.4	259.5	2.42	242.3	126.4
29.9	15.4	250.2	2.06	206.3	121.2	35.3	20.6	259.7	2.43	243.1	126.5
30.0	15.5	250.3	2.07	207.0	121.3	35.4	20.7	259.9	2.44	243.8	126.6
30.1	15.6	250.5	2.08	207.6	121.4	35.5	20.8	260.1	2.45	244.5	126.7
30.3	15.6	250.7	2.08	208.3	121.5	35.6	20.9	260.2	2.45	245.3	126.8
30.5	15.8	250.9	2.09	208.9	121.6	35.7	21.0	260.4	2.46	246.0	126.9
30.5	15.8	251.1	2.10	209.6	121.7	35.8	21.1	260.6	2.47	246.8	127.0
30.6	15.9	251.2	2.10	210.2	121.8	35.9	21.2	260.8	2.48	247.5	127.1
30.7	16.0	251.4	2.11	210.8	121.9	36.0	21.3	261.0	2.48	248.3	127.2
30.8	16.1	251.6	2.11	211.5	122.0	36.1	21.4	261.1	2.49	249.1	127.3
31.0	16.3	251.8	2.12	212.1	122.1	36.2	21.5	261.3	2.50	249.9	127.4
31.0	16.3	252.0	2.13	212.8	122.2	36.5	21.8	261.5	2.51	250.6	127.5
31.1	16.4	252.1	2.13	213.5	122.3	36.5	21.8	261.7	2.51	251.4	127.6
31.2	16.5	252.3	2.14	214.2	122.4	36.6	21.9	261.9	2.52	252.2	127.7
31.3	16.6	252.5	2.15	214.8	122.5	36.7	22.0	262.0	2.53	252.9	127.8
31.4	16.7	252.7	2.16	215.2	122.6	36.8	22.1	262.2	2.54	253.7	127.9
31.5	16.8	252.9	2.16	216.2	122.7	36.9	22.2	262.4	2.54	254.5	128.0
31.6	16.9	253.0	2.17	216.9	122.8	37.0	22.3	262.6	2.55	255.2	128.1
31.7	17.0	253.2	2.18	217.6	122.9	37.1	22.4	262.8	2.56	256.0	128.2
31.8	17.1	253.4	2.18	218.3	123.0	37.2	22.5	262.9	2.57	256.8	128.3
31.8	17.1	253.6	2.19	218.9	123.1	37.4	22.7	263.1	2.58	257.5	128.4
31.9	17.2	253.8	2.20	219.6	123.2	37.5	22.8	263.3	2.58	258.3	128.5
32.0	17.3	253.9	2.20	220.3	123.3	37.6	22.9	263.5	2.59	259.1	128.6
32.1	17.4	254.1	2.21	221.0	123.4	37.7	23.0	263.7	2.60	259.8	128.7
32.2	17.5	254.3	2.22	221.7	123.5	37.8	23.1	263.8	2.61	260.6	128.8
32.3	17.6	254.5	2.22	222.4	123.6	37.9	23.2	264.0	2.61	261.4	128.9
32.4	17.7	254.7	2.23	223.1	123.7	38.0	23.3	264.2	2.62	262.2	129.0
32.5	17.8	254.8	2.24	223.7	123.8	38.1	23.4	264.4	2.63	263.0	129.1
32.6	17.9	255.0	2.24	224.4	123.9	38.3	23.6	264.6	2.64	263.8	129.2
32.6	17.9	255.2	2.25	225.1	124.0	38.4	23.7	264.7	2.65	264.6	129.3
32.7	18.0	255.4	2.26	225.8	124.1	38.5	23.8	264.9	2.65	265.4	129.4
32.8	18.1	255.6	2.26	226.5	124.2	38.6	23.9	265.1	2.66	266.2	129.5
32.9	18.2	255.7	2.27	227.2	124.3	38.7	24.0	265.3	2.67	267.0	129.6
33.0	18.3	255.9	2.28	227.9	124.4	38.8	24.1	265.5	2.68	267.8	129.7
33.1	18.4	256.1	2.29	228.6	124.5	39.0	24.3	265.6	2.69	268.6	129.8
33.3	18.6	256.3	2.29	229.3	124.6	39.1	24.4	265.8	2.69	269.4	129.9
33.4	18.7	256.5	2.30	230.0	124.7	39.2	24.5	266.0	2.70	270.3	130.0
33.5	18.8	256.6	2.31	230.7	124.8	39.3	24.6	266.2	2.71	271.1	130.1
33.6	18.9	256.8	2.31	231.5	124.9	39.4	24.7	266.4	2.72	271.9	130.2
33.7	19.0	257.0	2.32	232.2	125.0	39.5	24.8	266.5	2.73	272.7	130.3
33.8	19.1	257.2	2.33	232.9	125.1	39.7	25.0	266.7	2.73	273.5	130.4
33.9	19.2	257.4	2.34	233.6	125.2	39.8	25.1	266.9	2.74	274.3	130.5
34.0	19.3	257.5	2.34	234.4	125.3	39.9	25.2	267.1	2.75	275.1	130.6
34.1	19.4	257.7	2.35	235.1	125.4	40.0	25.3	267.3	2.76	275.9	130.7
34.2	19.5	257.9	2.36	235.8	125.5	40.1	25.4	267.4	2.77	276.7	130.8
34.3	19.6	258.1	2.37	236.5	125.6	40.3	25.6	267.6	2.78	277.5	130.9
34.4	19.7	258.3	2.37	237.3	125.7	40.4	25.7	267.8	2.78	278.3	131.0
34.5	19.8	258.4	2.38	238.0	125.8	40.5	25.8	268.0	2.79	279.1	131.1

psia	psig	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
40.6	25.9	268.2	2.80	280.0	131.2	45.7	31.2	275.4	3.15	315.0	135.2
40.7	26.0	268.3	2.81	280.9	131.3	45.8	31.3	275.5	3.16	315.9	135.3
40.9	26.2	268.5	2.82	281.7	131.4	45.9	31.5	275.7	3.17	316.8	135.4
41.0	26.3	268.7	2.83	282.6	131.5	46.1	31.6	275.9	3.18	317.7	135.5
41.1	26.4	268.9	2.83	283.4	131.6	46.2	31.7	276.1	3.19	318.6	135.6
41.2	26.5	269.1	2.84	284.3	131.7	46.3	31.9	276.2	3.20	319.5	135.7
41.4	26.7	269.2	2.85	285.1	131.8	46.5	32.0	276.4	3.20	320.5	135.8
41.5	26.8	269.4	2.86	286.0	131.9	46.6	32.1	276.6	3.21	321.4	135.9
41.6	26.9	269.6	2.87	286.8	132.0	46.8	32.3	276.8	3.22	322.4	136.0
41.7	27.0	269.8	2.88	287.7	132.1	46.9	32.4	277.0	3.23	323.3	136.1
41.8	27.1	270.0	2.89	288.5	132.2	47.0	32.6	277.2	3.24	324.3	136.2
42.0	27.3	270.1	2.89	289.4	132.3	47.2	32.7	277.3	3.25	325.2	136.3
42.1	27.4	270.3	2.90	290.2	132.4	47.3	32.8	277.5	3.26	326.2	136.4
42.2	27.5	270.5	2.91	291.1	132.5	47.4	33.0	277.7	3.27	327.1	136.5
42.3	27.6	270.7	2.92	291.9	132.6	47.6	33.1	277.9	3.28	328.1	136.6
42.5	27.8	270.9	2.93	292.8	132.7	47.7	33.2	278.1	3.29	329.0	136.7
42.6	27.9	271.0	2.94	293.6	132.8	47.9	33.3	278.3	3.30	330.0	136.8
42.7	28.0	271.2	2.94	294.5	132.9	48.0	33.3	278.5	3.31	330.9	136.9
42.8	28.1	271.4	2.95	295.4	133.0	48.1	33.4	278.6	3.32	331.9	137.0
43.0	28.3	271.6	2.96	296.2	133.1	48.3	33.6	278.8	3.33	332.8	137.1
43.1	28.4	271.8	2.97	297.1	133.2	48.4	33.7	279.0	3.34	333.8	137.2
43.2	28.5	271.9	2.98	297.9	133.3	48.5	33.8	279.1	3.35	334.7	137.3
43.3	28.6	272.1	2.99	298.8	133.4	48.7	34.0	279.3	3.36	335.6	137.4
43.5	28.8	272.3	3.00	299.7	133.5	48.8	34.1	279.5	3.37	336.6	137.5
43.6	28.9	272.5	3.01	300.6	133.6	49.0	34.3	279.7	3.38	337.5	137.6
43.7	29.0	272.7	3.01	301.5	133.7	49.1	34.4	279.9	3.38	338.5	137.7
43.9	29.2	272.8	3.02	302.4	133.8	49.2	34.5	280.0	3.39	339.4	137.8
44.0	29.3	273.0	3.03	303.3	133.9	49.4	34.7	280.2	3.40	340.4	137.9
44.1	29.4	273.2	3.04	304.2	134.0	49.5	34.8	280.4	3.41	341.4	138.0
44.2	29.5	273.4	3.05	305.1	134.1	49.7	35.0	280.6	3.42	342.4	138.1
44.4	29.7	273.6	3.06	306.0	134.2	49.8	35.1	280.8	3.43	343.4	138.2
44.5	29.8	273.7	3.07	306.9	134.3	49.9	35.2	280.9	3.44	344.4	138.3
44.6	29.9	273.9	3.08	307.8	134.4	50.1	35.4	281.1	3.45	345.4	138.4
44.8	30.1	274.1	3.09	308.7	134.5	50.2	35.5	281.3	3.46	346.4	138.5
44.9	30.2	274.3	3.10	309.6	134.6	50.4	35.7	281.5	3.47	347.4	138.6
45.0	30.3	274.5	3.10	310.5	134.7	50.6	35.9	281.7	3.48	348.4	138.7
45.2	30.5	274.6	3.11	311.4	134.8	50.7	36.0	281.8	3.49	349.4	138.8
45.3	30.6	274.8	3.12	312.3	134.9	50.8	36.1	282.0	3.50	350.4	138.9
45.4	30.7	275.0	3.13	313.2	135.0	51.0	36.3	282.2	3.51	351.4	139.0
45.6	31.1	275.2	3.14	314.1	135.1	51.1	36.4	282.4	3.52	352.4	139.1

**Legend:**

psia — absolute pressure in psi  
 Psig — gauge pressure in psi  
 kPa — absolute pressure in kilo-Pascal  
 InHg — pressure (vacuum) in inch-Mercury

## 14. *XPCS Manual*

### Definitions

**PC** – Personal computer.

**Program** – a complete, self-contained set of computer instructions that you use to perform a specific task such as word processing, accounting or data management. Program is also called Application.

**PCS** – Cat Technologies LTD. code development, controlling and communication technology.

**PCS Target platform** – Cat Technologies LTD. controlling system based on PCS card.

**PCS communication** – exchange data between PCS components via RS232 or RS485, using PCS data exchange protocol.

**Download** – Send data to the hardware target platform.

**Upload** – Retrieve data from the hardware target platform.

**Calibration** - adjusting analog input presentation value by changing gain and offset values.

### Overview

XPCS is a Data exchange program that lets you perform downloading of PCS code, downloading/uploading analog inputs gain and offset values. The program using PCS communication module, to connect between target platform and PC.

### XPCS Aim

- ◆ Download PCS code data.
- ◆ Calibration.

### Minimum Requirements

- ◆ Pentium processor or equivalent.
- ◆ 32MB of RAM, 32 MB of free hard drive space.
- ◆ CD-ROM drive.
- ◆ Available serial communication port.
- ◆ Windows 9X/NT 4.

### User Requirements

To operate this program, user needs a basic knowledge of PCS.



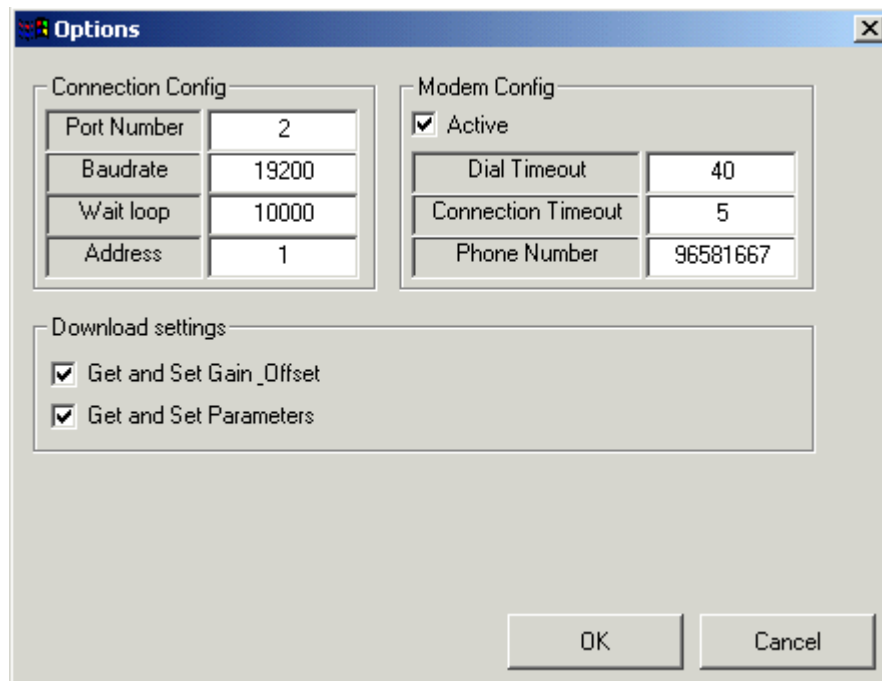
### Installation

- ◆ Select the CD drive by double click on him.
- ◆ When the window open find and double click on the file "setup.exe"
- ◆ This will launch the installer, follow the on screen instructions.

### Using XPCS

#### Configuring the program

On 'XPCS' main window, press on 'Options' button. 'Options' window will be displayed.



#### Configuring communication settings

In 'Port Number' text box type serial port number connected to the PCS Target platform, or modem port number to remotely connection.

In 'Baudrate' text box type the PCS Target platform baud rate. Usually the value is: 19200.

'Wait loop' it is a communication time error counter. To fix communication problems with remote targets via modem, try to insert greater value.

In 'Address' text box, insert the PCS Target address.

## Modem Configurations

To connect to remote target via a modem, select 'Active' check box in 'Modem Config' frame.

'Connection Timeout' it is a waiting time in seconds to requested data form the PCS target platform. If no data retrieved from the target after wait time, the program generates a communication time error.

'Dial Time Out' it is a waiting time in seconds to be used by the local modem trying to connect to the remote modem. On end of time, the program generates timeout error.

'Phone Number' is a phone number dial to.

## Download Setting configuration

If 'Get and set Gain Offset' checked, when program performing download, all gain and offset values will be stored before PCS code downloading, and restored after downloading are finished.

If 'Get and Set Parameters' checked, when program performing download, all parameters will be stored before PCS code downloading and restored after downloading are finished.

*Note: The program storing parameters only in these conditions:*

- ◆ *CAT Technologies ADMC Program Installed on PC.*
- ◆ *The Downloaded file (DWN) have same name as one of the ADMC machine types file (for example if downloaded file name is: LabTN2.DWN, this file ADMC compatible, because ADMC type file: LabTN2.mdb exist).*

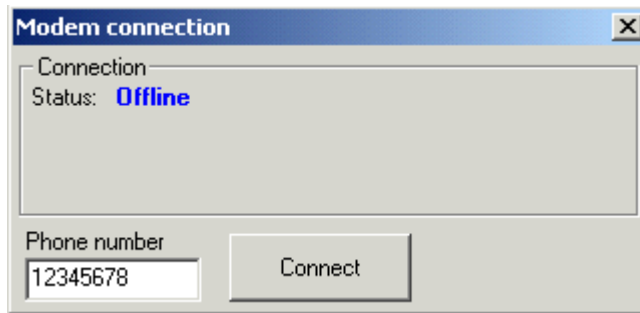
*Note: Only current selected Program (For example: 1-Instruments) parameters will be saved and restored.*

*Note: Because the PCS target platform parameters saving process are complex, restoring Parameters task takes long time (few minutes)!*

*Note: Theirs no need to edit options every time that program start running. The program saves setting on 'OK' button pressing and starting up with last settings.*

## Connecting to the PCS Target platform

The program can be connected to the PCS Target by RS232 serial cable, or via a modem. If program configured perform connection via a modem (Modem Active selected), pressing 'Go Online' button on main XPCS window will display 'Modem connection' dialog box:



By pressing on 'Connect' button, program will try to connect to remote PCS Target. Opening connection between remote PCS Target and PC, performing next tasks:

- ◆ Check If COM Port is available.
- ◆ Detect modem.
- ◆ Dial a phone number.
- ◆ Wait for connection establishment.
- ◆ Check if remote target platform are connected.

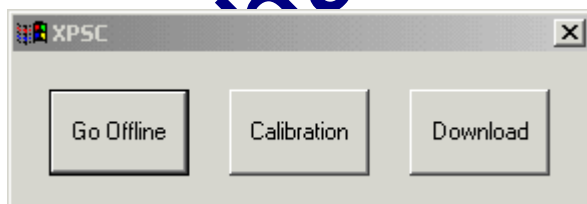
If one of the tasks fails, the program will abort connection process and will display relevant error message.

If 'Modem active' option not selected, by pressing on 'Connect' button, the program will open communication port. In this case, communication establishment tasks will be:

- ◆ Check if COM Port is available.
- ◆ Open COM Port.

**Note:** In this case the program not checking if target platform connected.

After connection was established, the main XPCS window will be displayed.



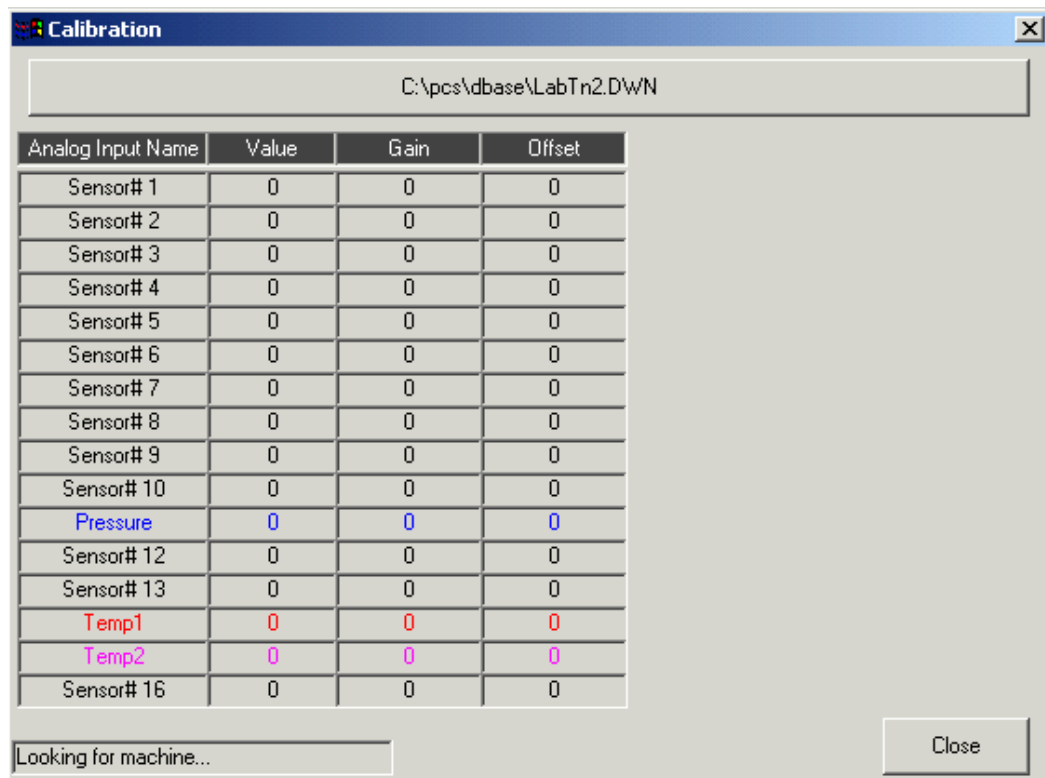
When program is online, buttons 'Go offline', 'Calibration', 'Download' will be displayed.

Pressing 'Go Offline' button will close current connection and buttons 'Go Online', 'Options' and 'Database' will be displayed on the main XPCS window:



Pressing on 'Calibration' button will display 'Calibration' window.  
Pressing on 'Download' button will display 'Download' window.

## Calibration window



The calibration window will try to connect with the PCS Target platform. The connection tasks are:

- ◆ Check if target connected. On status bar displayed: "Looking for machine...".
- ◆ Upload all 16 Analog inputs gain and offset values. On status bar displayed: "Uploading Gain & Offset...".
- ◆ Uploading analog inputs values. On Status bar displayed: "Connected". This task performing periodical every 500 milliseconds, this allow real time refreshing of the analog inputs values.

### Type File button

This button allow select target type file (in example file is: "C:\pcs\ibase\LabTn2.DWN"). Pressing this button will display 'Open file' dialog box. If program will find same file name in ADMC directory, in Inputs table, Analog inputs names will be displayed in color.

When program connected, double click on one of the inputs table rows, will display calibration tool. With this tool you can calibrate selected analog input.

Analog Input Name	Value	Gain	Offset
Sensor# 1	0	1	0
Sensor# 2	130.8	1	0
Sensor# 3	0	0	0
Sensor# 4	0	0	0
Sensor# 5	0	0	0
Sensor# 6	0	0	0
Sensor# 7	0	0	0
Sensor# 8	0	0	0
Sensor# 9	0	0	0
Sensor# 10	0	0	0
Pressure	87.1	.1192	-99
Sensor# 12	0	0	0
Sensor# 13	0	0	0
Temp1	48.9	.03321	-11
Temp2	108.8	.03	-14
Sensor# 16	18	.03	18

Gain: 0.119200, Offset: -99.000000

Min: .09, Max: .15, Offset Min: -130, Offset Max: -70

Upload, Download, Calculate buttons

Actual High: 250, Read High: 250, Actual Low: 80, Read Low: 80

Connected status bar, Close button

### Calibration tool description

Gain text box – use for manual inserting of the Gain value.

Offset text box – use for manual inserting of the Offset value.

**Min and Max** – limits for gain and offset values. If ADMC compatible type file not found, Min and Max labels will show "N/A".

**Note:** When Min and Max are N/A, you must be very careful, because the gain and offset values not limited at this case and may be inserted wrong gain or offset value.

**Upload button** – Press this button to upload gain and offset values from the target platform. All 16 analog inputs gain and offset values will be uploaded.

**Download button** – Press this button to download Gain and Offset of the current selected analog input. The values displayed in Gain and offset text boxes will be downloaded. If Inserted values are wrong, relevant error message will be displayed and download operation will be aborted.

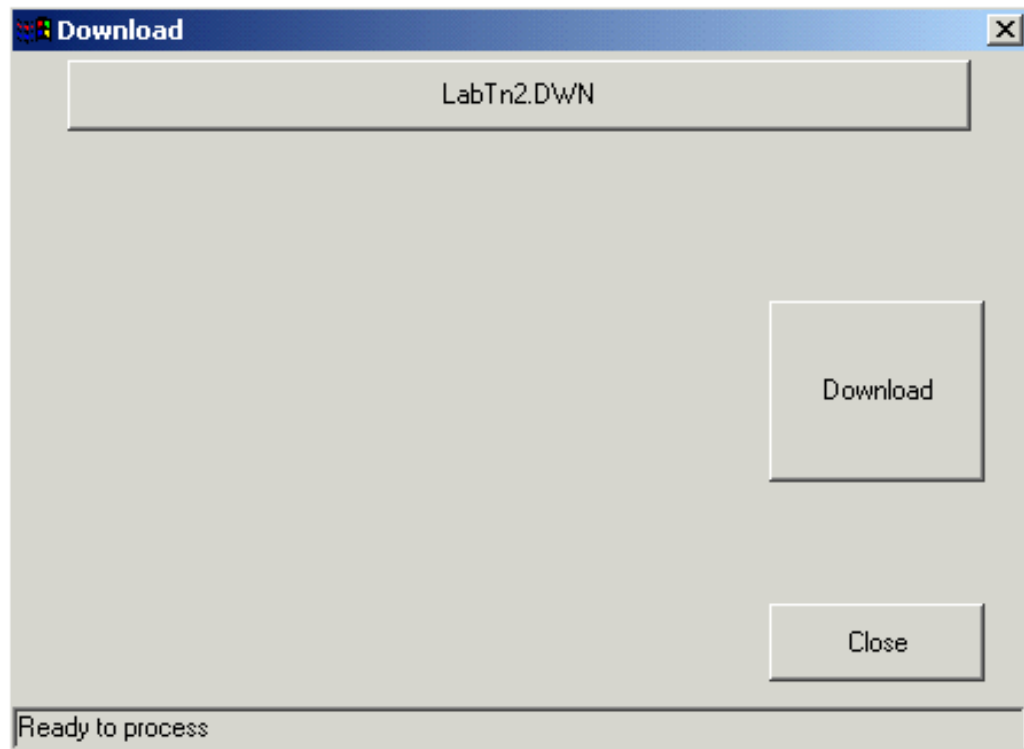
### Calculation

Calculate Gain and Offset values by inserting 4 values: Actual High, Actual Low, Read High and Read Low to the formula. For more information about Gain and offset calculation see User Manual supplied with PCS Target platform. Pressing 'Calculate' button will calculate new Gain and Offset values. The new values will be displayed in the Gain and Offset text boxes.

### Close button

Pressing this button will close 'Calibration' window and display main XPCS window.

### Download window



This window allow download PCS code file.

### Type file button

Press this button to select requested file to download. The PCS Downloadable file type is: \*.DWN. The names of the selected file are displayed on the button.

*Note: No need to select type file, if requested file name already displayed on the button (In example: "LabTn2.DWN").*

### Status Bar

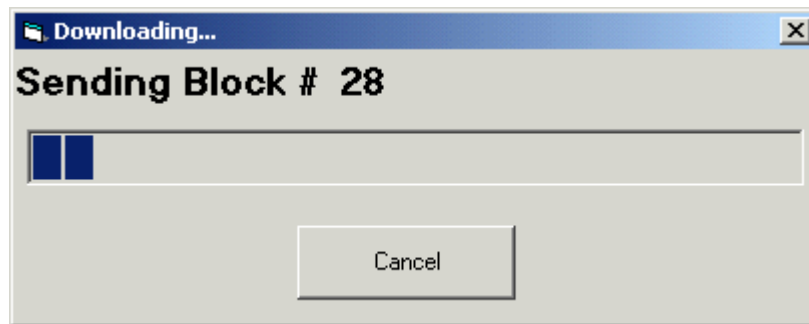
The status bar at the bottom of the window, displaying current downloading process status (In Example: "Ready to process").

### 'Download' Button

Press this button to perform download with selected file. When download performing, the program displaying on the window downloading process progress messages. After download process are finished, the status bar displaying "Download Finished".

### Download Tasks

- ◆ Check if PCS Target connected. Status message: "Looking for machine..."
- ◆ If 'Get and Set Gain & Offset' option in 'Options' window are selected, the program will upload values of all analog inputs gain and offset. Status message: "Uploading Gain and Offset..."
- ◆ If 'Get and Set Parameters' option in 'Options' window are selected, and downloaded file type is ADMC compatible, the program will upload all parameters of the current selected program (for example: 1-instruments). Status message: "Uploading Parameters..."
- ◆ Download file. The program will display 'Downloading...' dialog



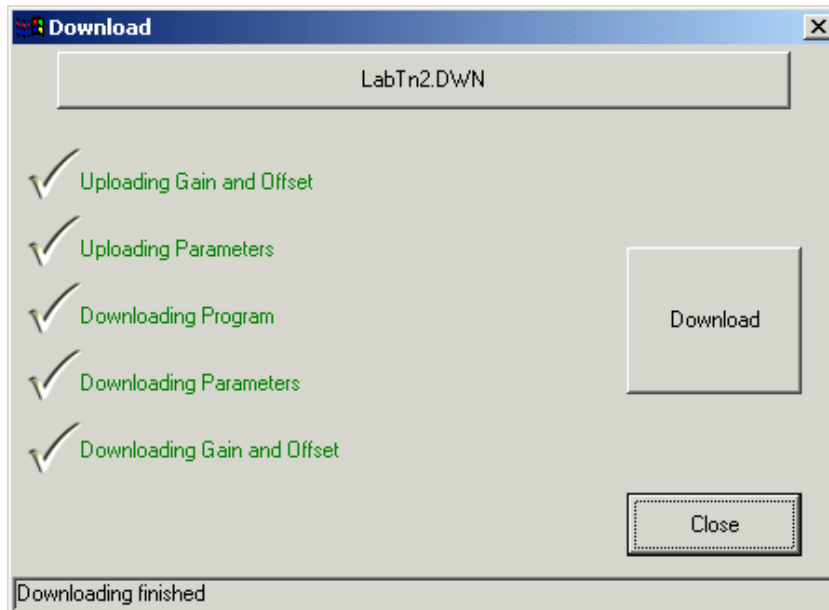
window with progress bar and counter of the downloaded packets:

- ◆ Wait for target platform startup. After downloading of the file complete, the PCS Target platform restarts. It takes several seconds to target start running with new code and before downloading parameters and gain/offset, we must wait to target will start again communicate with the PC. Status message: "Waiting for machine startup..."
- ◆ If 'Get and Set Parameters' option in 'Options' window is selected, and downloaded file type is ADMC compatible, the program will download all parameters of the current selected program (for example: 1-instruments). Status message: "Downloading Parameters..."
- ◆ If 'Get and Set Gain & Offset' option in 'Options' window is selected, the program will download values of all analog inputs gain and offset. Status message: "Downloading Gain and Offset..."

When download process finished, status bar displaying: "Download Finished"

***Note: If error occurs during download process, relevant error message will be displayed. The message box with 'Retry' option will happen.***

At the end of the download process, the window looks like in the picture:



**Note:** Upload and Download green messages of the Parameters and Gain & Offset tasks displayed only if the relevant options were selected in the 'Options' window.

#### Expectable errors list



##### **Can not upload Gain and Offset!**

**Description:** This message may be displayed during download process, when program trying to upload Gain and Offset values.

**Reason:** Probably the communication between PCS Target and PC fail.

**Tips:** Check if communication RS232 cable connected. If it is a modem connection, check if Modem cable connected, in this case it can be a remote modem cable disconnected or RS232 cable between remote modem and target platform are disconnected.



##### **Can not upload Parameters!**

**Description:** This message may be displayed during download process, when program trying to upload Parameters.

**Reason:** Probably the communication between PCS Target and PC fail.

**Tips:** Check if communication RS232 cable connected. If it is a modem connection, check if Modem cable connected, in this case it can be a remote modem cable disconnected or RS232 cable between remote modem and target platform are disconnected.



**Fail download program!**

**Description:** This message may be displayed during download process, when program trying to download code file.

**Reason:** Probably the communication between PCS Target and PC fail, or downloaded file are wrong or damaged.

**Tips:** Check if communication RS232 cable connected. If it is a modem connection, check if Modem cable connected, in this case it can be a remote modem cable disconnected or RS232 cable between remote modem and target platform are disconnected.

Try to download other file.

**Fail download Parameters!**

**Description:** This message may be displayed during download process, when program trying to download Parameters.

**Reason:** Probably the communication between PCS Target and PC fail, or PCS Target platform are damaged and can not save data on flash memory.

**Tips:** Check if communication RS232 cable connected. If it is a modem connection, check if Modem cable connected, in this case it can be a remote modem cable disconnected or RS232 cable between remote modem and target platform are disconnected.

Try to change Target electronic card.

**Fail Downloading Gain and Offset!**

**Description:** This message may be displayed during download process, when program trying to download Gain and Offset values.

**Reason:** Probably the communication between PCS Target and PC fail, or PCS Target platform are damaged and can not save data on flash memory.

**Tips:** Check if communication RS232 cable connected. If it is a modem connection, check if Modem cable connected, in this case it can be a remote modem cable disconnected or RS232 cable between remote modem and target platform are disconnected.

Try to change Target electronic card.

**Error Opening Type file: *File Name***

**Description:** This message may be displayed during download process, when program trying to open ADMC compatible type file (\*.mdb) to get from him parameters data.

**Reason:** The file may be damaged or used by another application.

**Tips:** Try to download other file. If operation success, try to find what application using the file and in the worse case, restart the PC. If the problem continues, probably the files are damaged. In this case try to replace the file with new same file from the ADMC installation CD under 'Support' directory.

**Invalid Actual High value!**

**Invalid Actual Low value!**

**Invalid Read High value!**

**Invalid Read Low value!**

**Description:** This message displayed when user trying to calculate Gain and Offset by pressing on 'Calculate' button on 'Calibration' window.

**Reason:** In one of the text boxes inserted wrong number, or not numeric data.

**Tips:** Type Numeric data type in the text box.

**The Actual High value is not in range!**

**The Actual Low value is not in range!**

**The Read High value is not in range!**

**The Read Low value is not in range!**

**Description:** This message displayed when user trying to calculate Gain and Offset by pressing on 'Calculate' button on 'Calibration' window.

**Reason:** In one of the text boxes inserted wrong number. The number must be:  $1 > \text{Number} > 1000$ .

**Tips:** Type In Range number.

**Read High must be equal or great than Read Low!**

**Description:** This message displayed when user trying to calculate Gain and Offset by pressing on 'Calculate' button on 'Calibration' window.

**Reason:** Read High value is lees than Read Low value

**Tips:** Read High value must bee great than Read Low value.



**Can not calculate. Invalid values found! ...**

**Description:** This message displayed when user trying to calculate Gain and Offset by pressing on 'Calculate' button on 'Calibration' window.

**Reason:** Read High value - Read Low value = 0

**Tips:** Read High value must be greater than Read Low value.



**The Gain value must be equal or less than ...**

**The Gain value must be equal or great than ...**

**The Offset value must be equal or less than ...**

**The Offset value must be equal or great than ...**

**Description:** This message displayed when user trying to download Gain and Offset by pressing 'Download' button on 'Calibration' window.

**Reason:** Gain or Offset value displayed in Gain or Offset text boxes are not in limits.

**Tips:** The value in the Gain or Offset boxes must be in Min/Max limits.



**Invalid Gain Value!**

**Invalid Offset Value!**

**Description:** This message displayed when user trying to download Gain and Offset by pressing 'Download' button on 'Calibration' window.

**Reason:** Probably the Gain or Offset value displayed in Gain or Offset text boxes are not numeric data.

**Tips:** Type numeric value in Gain or Offset text boxes.



**Illegal Port number: ...**

**Description:** This message displayed when user pressing on 'OK' button on 'Options' window.

**Reason:** Wrong port number is inserted.

**Tips:** Type value: 0 < VAL < 17 in 'Port Number' text box.



#### **Illegal Baudrate: ...**

**Description:** This message displayed when user pressing on 'OK' button on 'Options' window.

**Reason:** Wrong Baud rate is inserted.

**Tips:** Type values 9600 or 19200 in 'Baudrate' text box.



#### **Illegal Wait Loop value: ...**

**Description:** This message displayed when user pressing on 'OK' button on 'Options' window.

**Reason:** Wrong Wait Loop value is inserted.

**Tips:** Type numeric value in 'Wait Loop' text box.



#### **Illegal Autoclave Address:**

**Description:** This message displayed when user pressing on 'OK' button on 'Options' window.

**Reason:** Wrong Address value is inserted.

**Tips:** Type numeric value: 0<VAL>17.



#### **Illegal Dial Timeout:**

**Description:** This message displayed when user pressing on 'OK' button on 'Options' window.

**Reason:** Wrong Dial Timeout value is inserted.

**Tips:** Type numeric value.

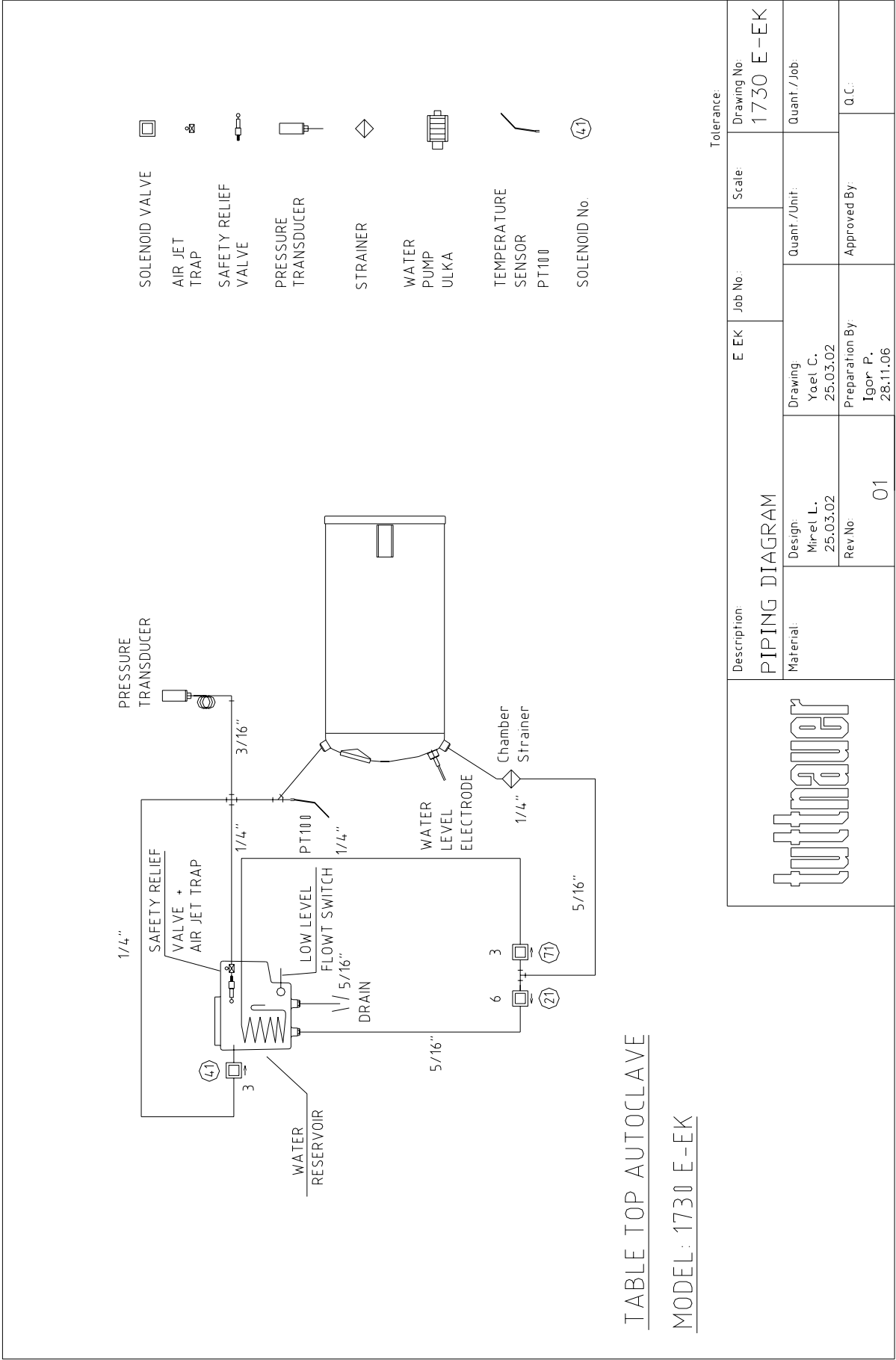
## 15. VALVES NUMBERING

The valves in the drawing and the manual are numbered according to their function. The following list includes all the valve numbers that are in use in Tuttnauer

0.	<b>FUNCTION</b>	01. Change-over : steam / electricity 02. Locking door cylinder (front door) 03. Locking door cylinder (Rear door)
1.	<b>FEED WATER</b>	11. Feed water – cool jacket 12. Feed water – cool heat exchanger 13. Feed water – cool fast exhaust 14. Feed water – to reservoir 15. feed water – to vacuum pump 16. Water outlet 17. Shut 18. Feed water – to ejector
2.	<b>MINERAL FREE WATER</b>	21. Mineral free water - inlet 22. Detergent 23. To spray 24. Recycling inlet 25. Recycling outlet
3.	<b>COMPRESSED AIR</b>	31. Air inlet 32. Air inlet - to chamber 33. To splash cooling pipe 34 – 1. To door 1 seal 34 – 2. To door 2 seal 38 – 1. Open door 1 38 – 2. Open door 2 39 – 1. Close door 1 39 – 2. Close door 2
4.	<b>AIR</b>	41. Air release N.C. 42. Air release N.O. 43. Filtered air - inlet 44. Air Inlet 45. Aeration
5.	<b>VACUUM</b>	51. Vacuum - break 52. Vacuum - to pump 53.1 Vacuum - from door 1 seal 53-2. Vacuum - from door 2 seal

6.	<b>DRAIN</b>	61. Drain – from reservoir 62. Drain – from jacket overflow 63. Drain – from vacuum pump / ejector 64. Drain – from chamber 65. Drain – from cooler 66. Drain – from sanitary filter 67. Drain – from steam generator 68. Drain – jacket 69. Drain – condense from seal
7.	<b>EXHAUST</b>	70. Exhaust – from chamber 71. Exhaust – to reservoir 72. Exhaust – to drain 73. Fast exhaust 74. Slow exhaust 75. Exhaust to ejector / to vacuum pump 76. Exhaust – from heat exchanger 77. Exhaust – from steam generator 78. Exhaust through heat exchanger (pre-vacuum stage only) 79. Jacket steam trap
8.	<b>GAS</b>	81. Inlet 82. Main inlet 83. Inlet through humidifier
9.	<b>STEAM</b>	90. Steam – from building source 91. Steam – to jacket (From outer source) 92. Steam – inlet 93. Steam – to chamber 94 – 1. Steam – to door 1 seal 94 – 2. Steam – to door 2 seal 95. Steam – to heat exchanger 96. Steam – to sanitary filter 97. Steam – from steam generator 98. Steam – to activate ejector

PIPING DIAGRAM FOR MODELS 1730 E AND EK



**PIPING DIAGRAM FOR MODELS: E AND EK EXCEPT 1730**

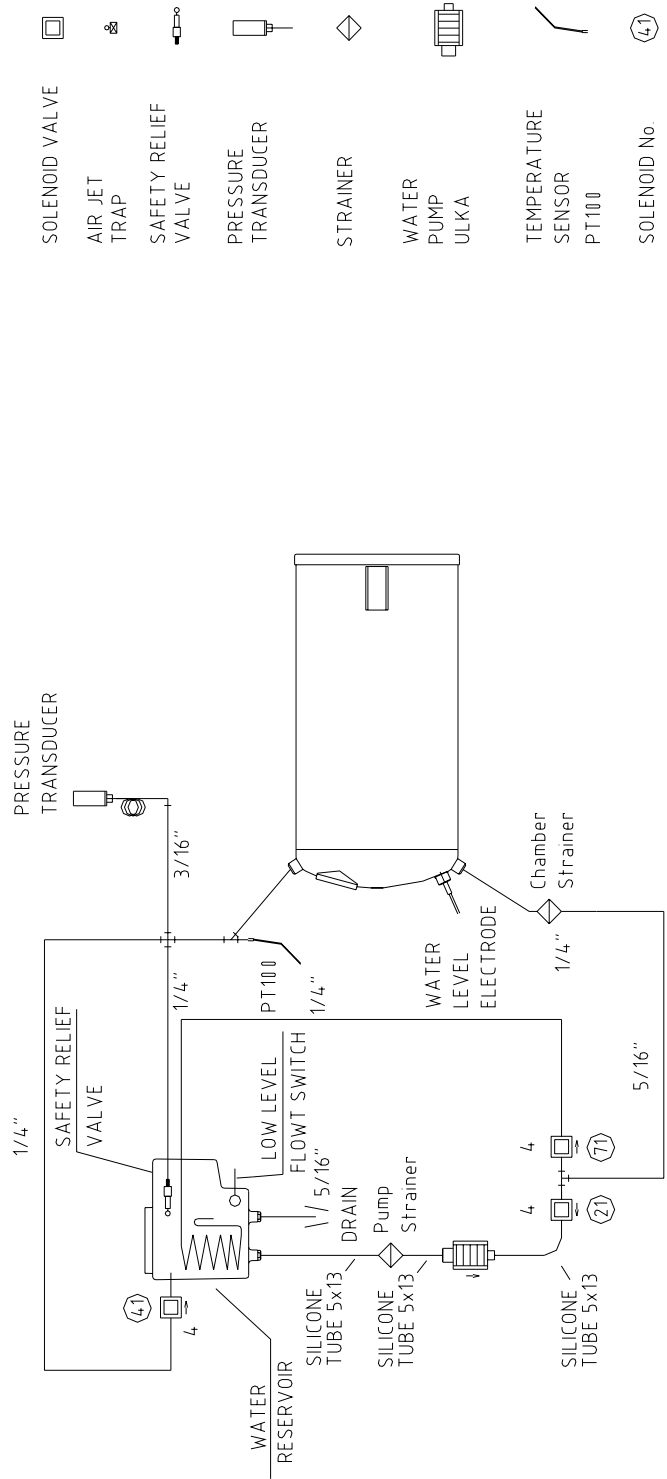


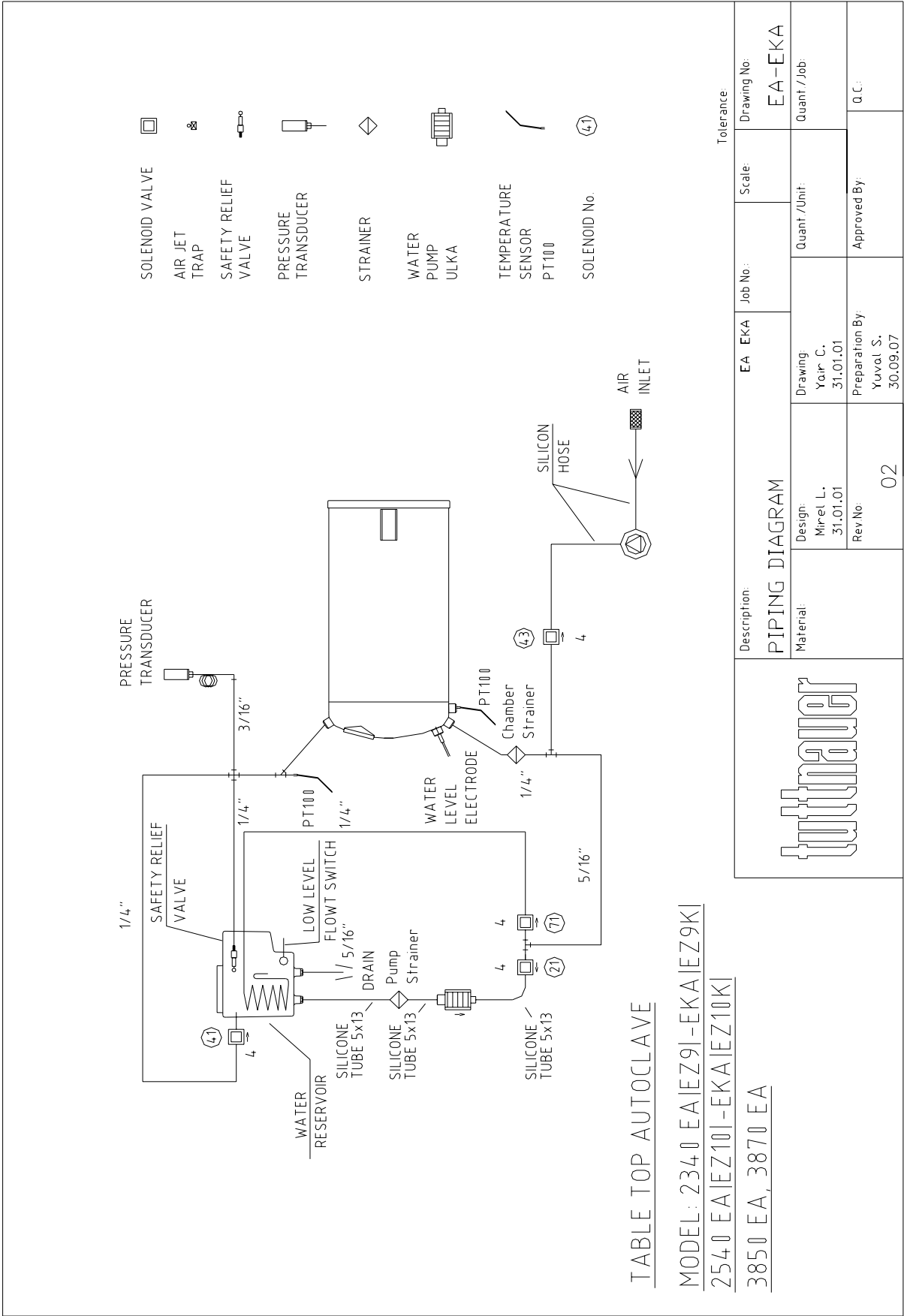
TABLE TOP AUTOCLAVE

MODEL: 2340 E-EK  
 2540 E-EK, 3140 E-EK  
 3850 E-EK, 3870 E-EK

Description:		E EK		Job No:		Scale:		Drawing No	
PIPING DIAGRAM								E - EK	
Material:	Design: Mer M. 29.11.98	Drawing: Dmitry Z. 29.11.98		Quant /Unit:		Quant /Job:			
Rev No:	05	Preparation By: Yuval S. 30.09.07		Approved By:		Q.C:			



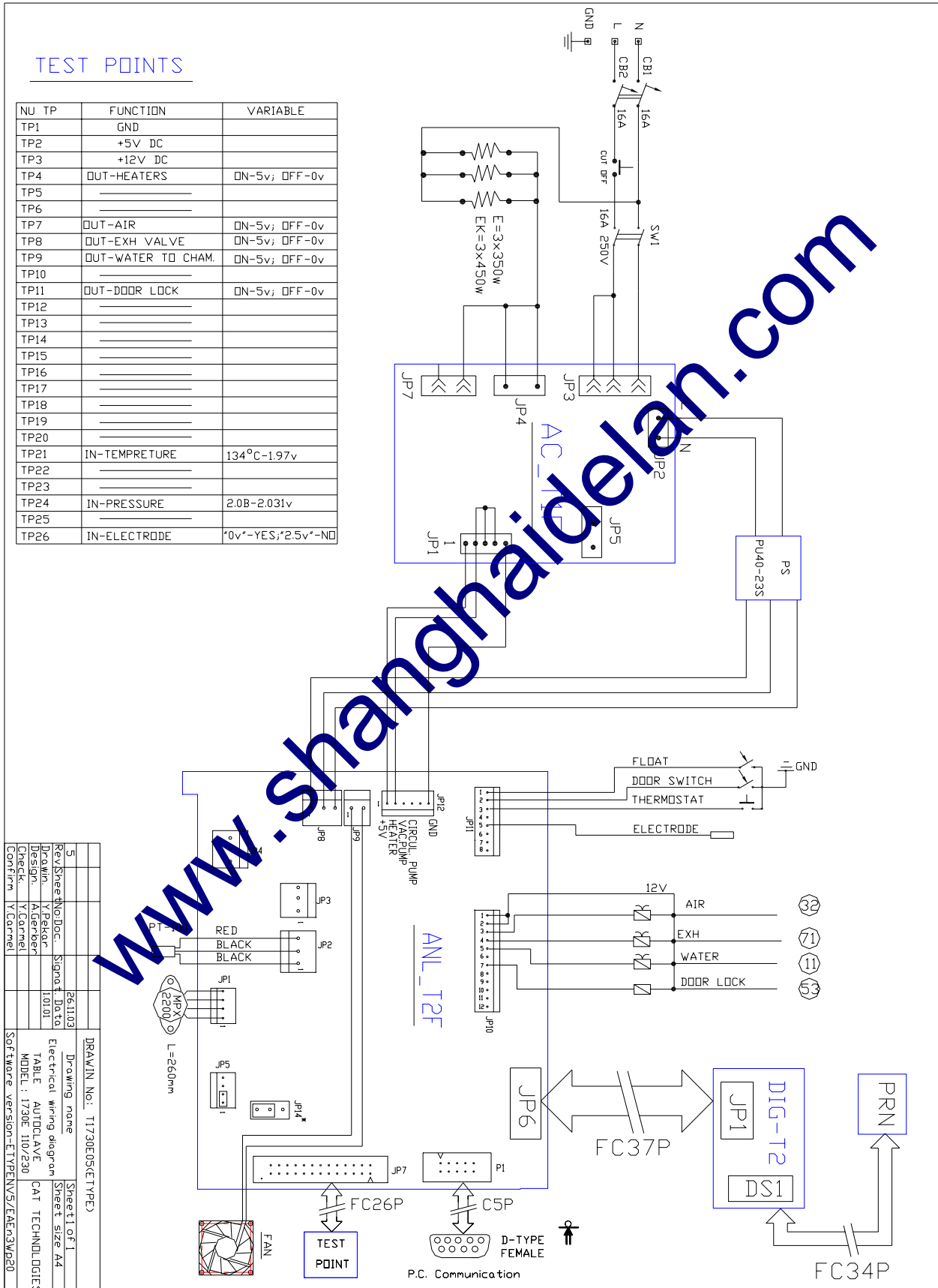
PIPING DIAGRAM FOR MODELS: EA AND EKA



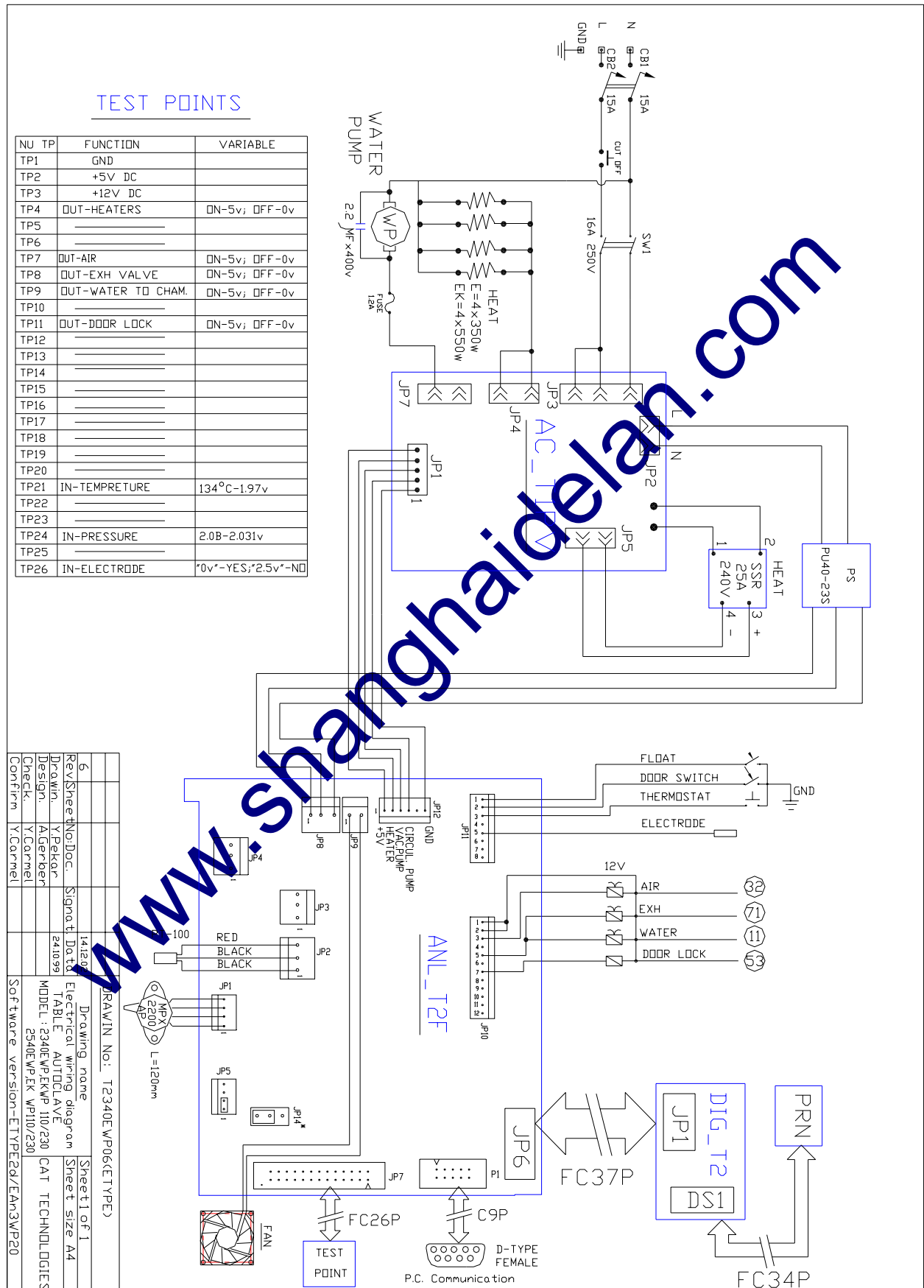
# ELECTRICAL WIRING DIAGRAM: MODELS: 1730 120/230V

## TEST POINTS

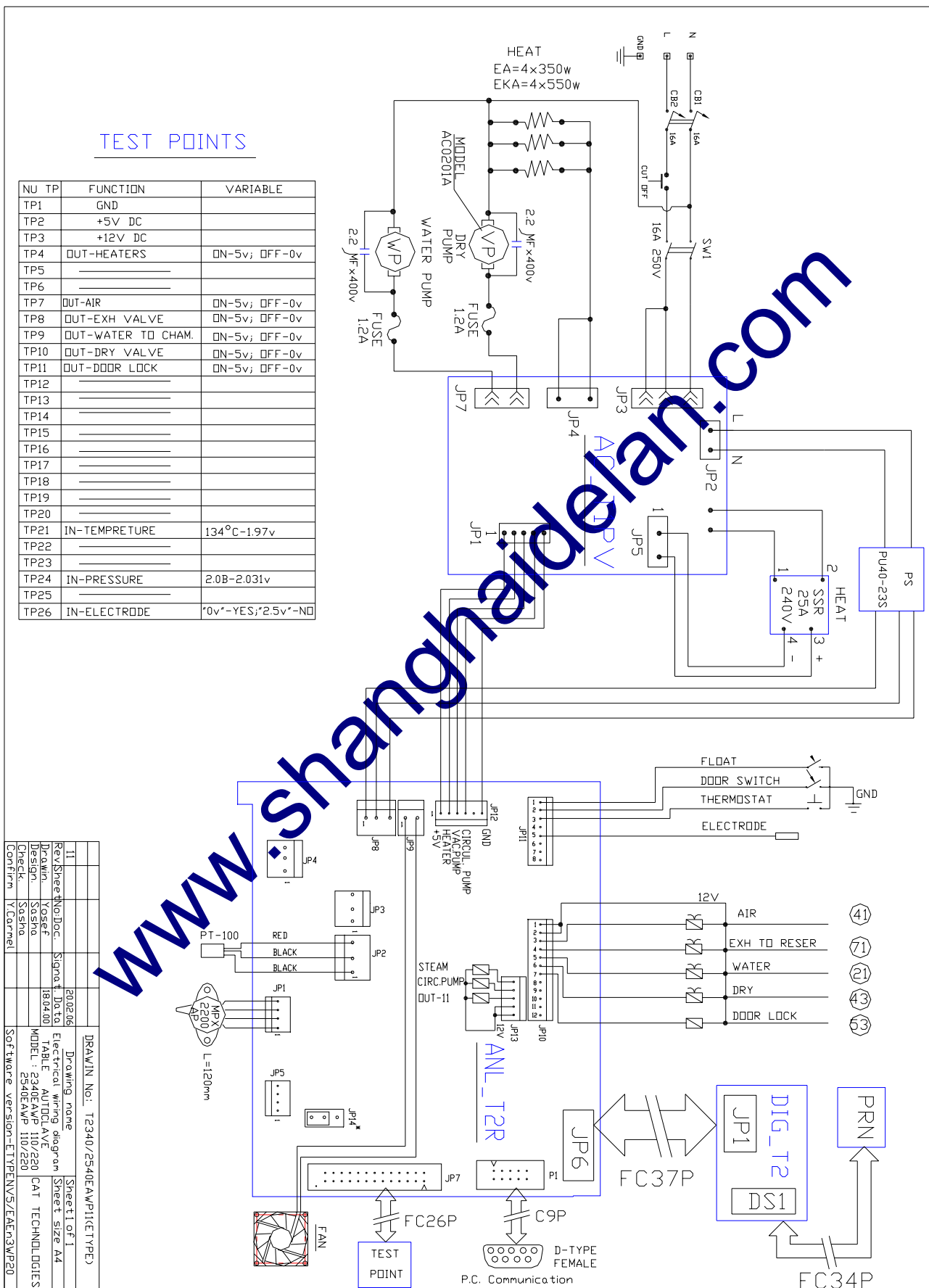
NU	TP	FUNCTION	VARIABLE
TP1		GND	
TP2		+5V DC	
TP3		+12V DC	
TP4		OUT-HEATERS	ON-5v; OFF-0v
TP5			
TP6			
TP7		OUT-AIR	ON-5v; OFF-0v
TP8		OUT-EXH VALVE	ON-5v; OFF-0v
TP9		OUT-WATER TO CHAM.	ON-5v; OFF-0v
TP10			
TP11		OUT-DOOR LOCK	ON-5v; OFF-0v
TP12			
TP13			
TP14			
TP15			
TP16			
TP17			
TP18			
TP19			
TP20			
TP21		IN-TEMPRETURE	134°C-1.97v
TP22			
TP23			
TP24		IN-PRESSURE	2.0B-2.031v
TP25			
TP26		IN-ELECTRODE	*0v*-YES;*2.5v*-NO



# ELECTRICAL WIRING DIAGRAM: MODELS: 2340/2540E 120/230V



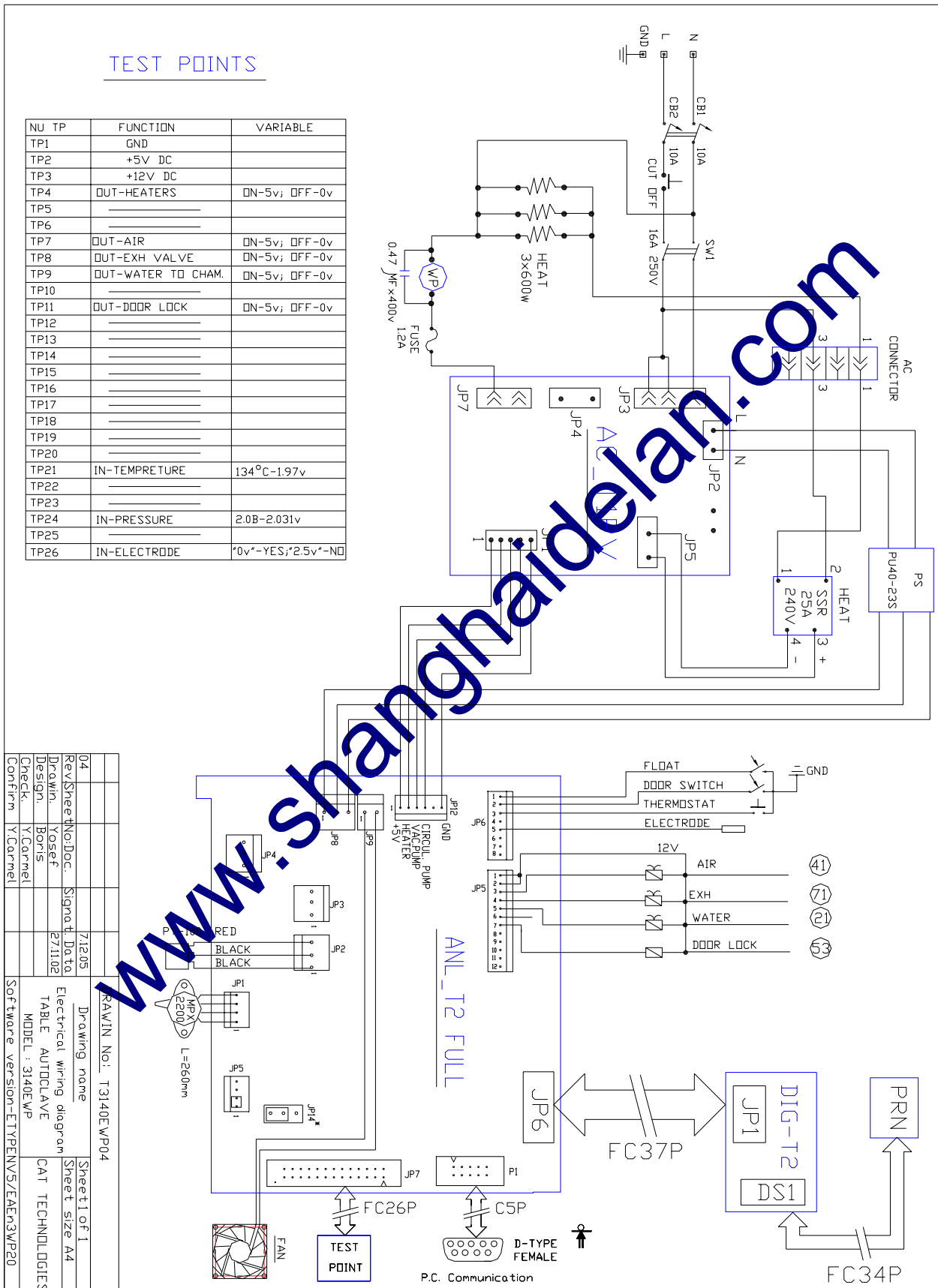
## ELECTRICAL WIRING DIAGRAM: MODELS: 2340/2540EA 120/230V



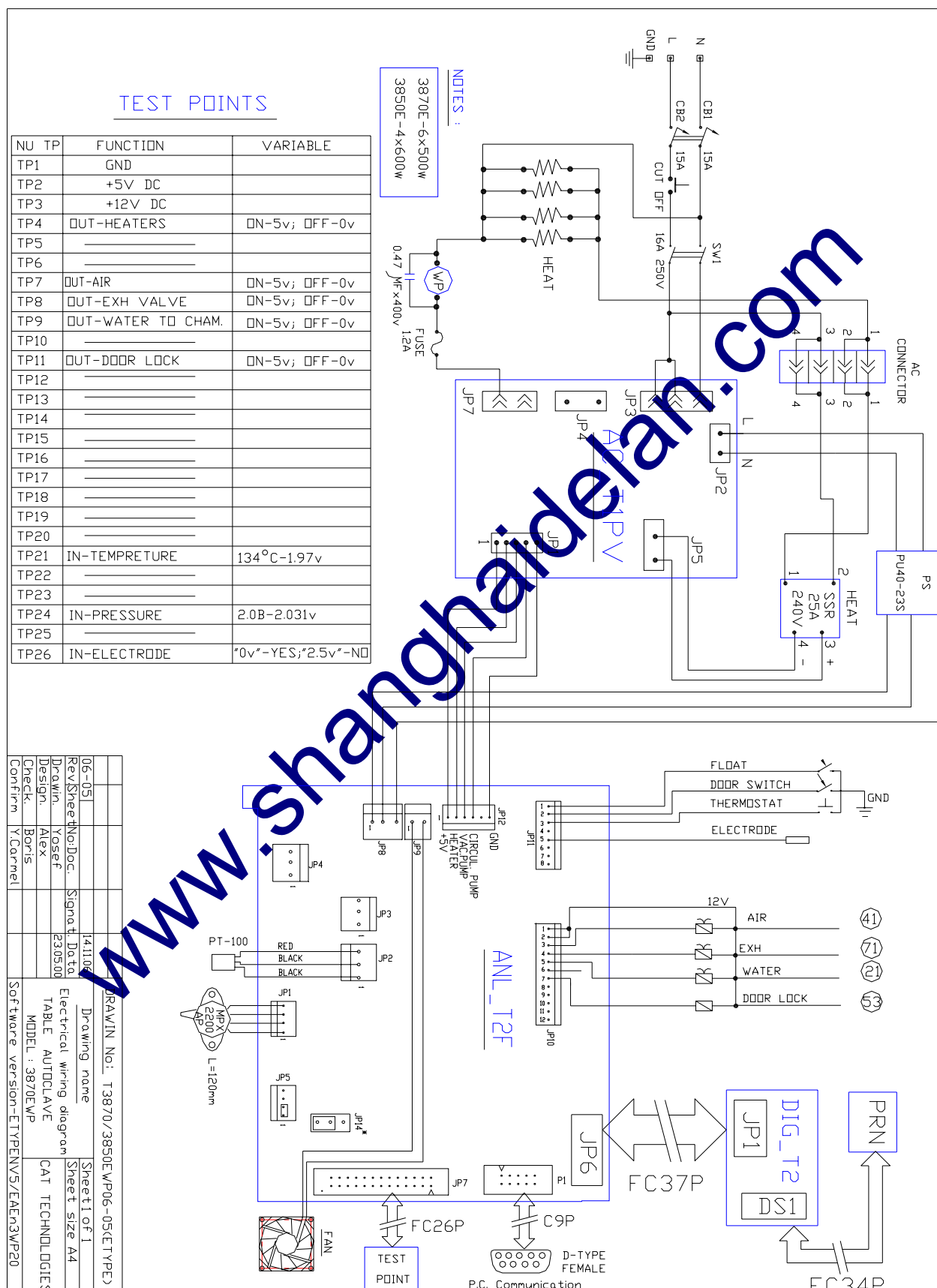
# ELECTRICAL WIRING DIAGRAM: MODELS: 3140E 230V

## TEST POINTS

NU	TP	FUNCTION	VARIABLE
TP1		GND	
TP2		+5V DC	
TP3		+12V DC	
TP4		OUT-HEATERS	ON-5v; OFF-0v
TP5			
TP6			
TP7		OUT-AIR	ON-5v; OFF-0v
TP8		OUT-EXH VALVE	ON-5v; OFF-0v
TP9		OUT-WATER TO CHAM.	ON-5v; OFF-0v
TP10			
TP11		OUT-DOOR LOCK	ON-5v; OFF-0v
TP12			
TP13			
TP14			
TP15			
TP16			
TP17			
TP18			
TP19			
TP20			
TP21		IN-TEMPRETURE	134°C-1.97v
TP22			
TP23			
TP24		IN-PRESSURE	2.0B-2.031v
TP25			
TP26		IN-ELECTRODE	*0v*-YES; *2.5v*-NO



## ELECTRICAL WIRING DIAGRAM: MODELS: 3870/3850E 120/230V

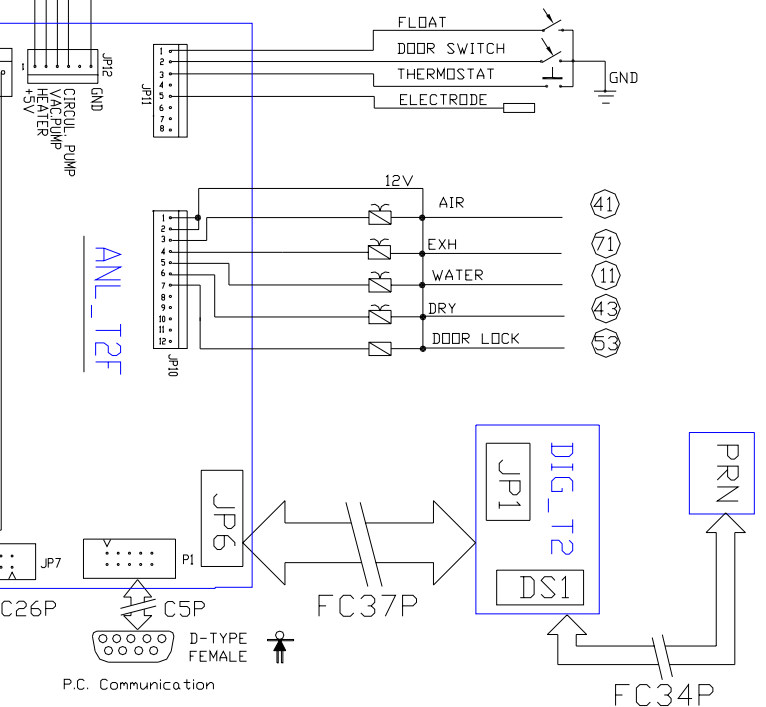
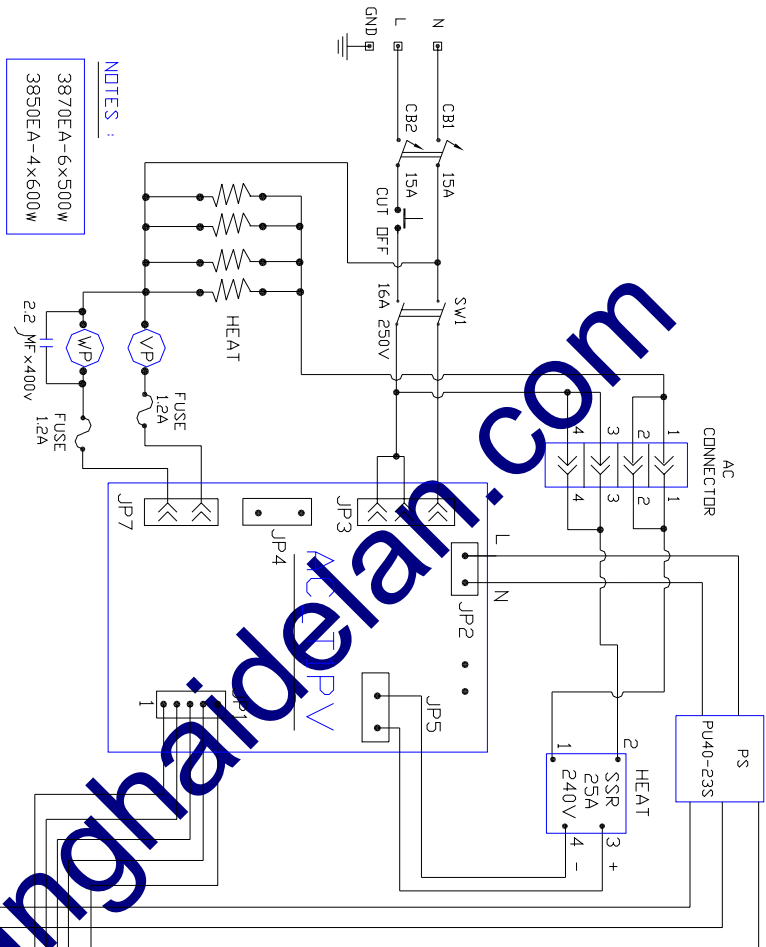


# ELECTRICAL WIRING DIAGRAM: MODELS: 3870/3850EA 120/230V

## TEST POINTS

NU TP	FUNCTION	VARIABLE
TP1	GND	
TP2	+5V DC	
TP3	+12V DC	
TP4	OUT-HEATERS	DN-5v;OFF-0v
TP5		
TP6		
TP7	OUT-AIR VALVE	DN-5v;OFF-0v
TP8	OUT-EXH VALVE	DN-5v;OFF-0v
TP9	OUT-WATER	DN-5v;OFF-0v
TP10	OUT-DRY	DN-5v;OFF-0v
TP11	OUT-DOOR LOCK	DN-5v;OFF-0v
TP12		
TP13		
TP14		
TP15		
TP16		
TP17		
TP18		
TP19		
TP20		
TP21	IN-TEMPRETURE	134°C-1.97v
TP22		
TP23		
TP24	IN-PRESSURE	2.0B-2.031v
TP25		
TP26	IN-ELECTRODE	*0v*-YES;*2.5v*-NO

NOTES :  
3870EA-6x500W  
3850EA-4x600W



7	160704	180400	TABLE AUTOCALCULATE	CAT TECHNOLOGIES
RevSheetNo:DOC	Signat Date	Design	Y.Pekar	Y.Carmel
Drawin	Y.Pekar	Design	Y.Carmel	Y.Carmel
Check	Y.Carmel	Check	Y.Carmel	Y.Carmel
Confirm	Y.Carmel	Confirm	Y.Carmel	Y.Carmel