

Technician Manual

Electronic Laboratory Autoclaves Models 5050 and 5075 EL- MD/EL-D

This device is not a medical device and not intended for medical use.

EL-MD: standard autoclave (manual door)

EL-D: standard autoclave (automatic door)

C: optional system for fast cooling

PV: optional vacuum pump

BH: optional bio hazard filtration

F: optional fan for super-fast cooling



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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. Stickers Description

Symbol	Meaning	Part Number	Location
	Caution! Hot steam.	LAB048-0058	Near the safety valve
	Protective earth (Ground)	LAB048-0020	Near the earthing screw
	Caution! Hot surface.	LAB048-0023	On the rear cover above the water strainer
	Press & Hold Until "System Ready" is Displayed = 10 sec.	LAB048-0461 (Automatic door only)	On the door right edge
	Do not Touch Microswitches please Contact Tuttnauer Service	LAB048-0462	On the door frame behind the door cover
	Do not Touch Microswitches please Contact Tuttnauer Service	LAB048-0463	On the door frame behind the door cover
	On-Off	LAB048-0018	Near the Power switch

3. Installation Instructions

The following utilities must be connected (Refer to the drawing below 'Rear View' of the autoclave).

- ◆ Power outlet, as detailed in the table below:

Property	Value
Power	3 Ph, 400V/50/60Hz
Recommended Circuit Breaker	20A

- ◆ If the 3-phase autoclave must be connected to a one phase power network, 1 x 230V, 50/60Hz., connect the 1ph 230V power source to the supplied switch box that has a 1 phase input (from the power source) and a 3-phase output (to the autoclave). See details at the end of this manual.
- ◆ The power network must be protected by a current leakage relay.
- ◆ Mineral-free water having a conductivity lower than 15µs (microsiemens), through a 1/2" flexible hose.
To obtain water quality meeting requirements a deionization column or reverse osmosis apparatus can be installed. The water must be delivered at a pressure of 2-3bar. A pressure reducer shall be installed at the water source outlet as instructed below.
For fast cooling (if this option is provided):
- ◆ Feed water from the water network, pressure 2-3bars, connected through a 1/2" pipe. A pressure reducer shall be installed at the water source outlet as instructed below.
- ◆ Compressed air, from a mobile compressor or compressed air network at pressure 3-4 bars, will be set at 1.6-2bars at the autoclave inlet is to be connected by a flexible conduit of 3/16".
The air must be of instrumental quality filtered at 5µ and free of humidity and oil drops.
- ◆ Drain connected by 1/2" pipe, located at the rear of the unit. The chamber exhaust and coolant water are evacuated to an open waste funnel. The drainage piping must be heat resistant, to 80°C, non-continuous flow.



Attention:

Connection of water system to the autoclave must be performed through "BACK FLOW PREVENTION SYSTEM" installation as per EN 1717.

3.1 Moving the Autoclave

1. Disconnect the power supply cord.
2. Disconnect the water and drain hoses.
3. Disconnect the compressed air hoses (if applicable).
4. Drain the water from the chamber.

To avoid injuries, moving the autoclave should be done by using a forklift.



Caution:

Before moving the autoclave, verify that the electrical, air and water connections have been disconnected, and there is no pressure in the chamber.

Do not drop this device!

4. Technical Data

4.1 Introduction



Attention!

This device is not a medical device and not intended for medical use.

Models 5050 and 5075 ELPV-D/ELCPV-D are table-top sterilizers designed especially for the sterilization of instruments, liquids, medical waste, and other materials in hospital laboratories, medical laboratories, research institutes, food laboratories and pharmaceutical facilities.

A computerized control unit ensuring a fully automatic sterilization cycle controls the autoclave.

The temperature and pressure are controlled through sensors placed inside and outside the media container or bottles.

Special feature of ELCPV-D model is the vacuum pump that enables air removal prior to sterilization and during the drying stage.

The advantages of the pre-vacuum sterilizer in comparison to the regular gravity displacement steam sterilizer are as follows:

- ◆ Removal of air pockets from packs and porous loads and most kinds of tubes (rubber, plastic etc.) by vacuum at the first stage of the cycle.
- ◆ Better steam penetration into the load; resulting in effective sterilization.
- ◆ Better temperature uniformity.
- ◆ Better drying of materials with closed doors due to the vacuum achieved in the chamber at the end of the sterilization cycle.

The sterilizer is fully automatic with a choice of five programs (including the vacuum test program) eliminating any need for operator intervention during a cycle.

The sterilizer has multiple built - in safety devices, which provides adequate protection to ensure the safety of operating personnel.

On all models, a printer is an optional addition to the autoclave. The printer prints the preset and actual parameters of the cycle (temperature, time, and pressure/vacuum).

The autoclave is provided with a pressure gauge that is used as guide only. Should there be a power failure during the operation of the autoclave, the pressure gauge indicates to the operator that there is pressure in the chamber.

A deviation of +1.6% is accepted.

The pressure scale, printer option and cooling method can be set up at any time by a technician.

Note: After operating the sterilizer, brown stains might appear on the bottom of the chamber. These stains are a result of the heating elements that are located at the lower external part of the chamber. The brown color is a common phenomenon, can easily be removed, and will not have any effect on the sterilized goods.

This manual is intended to give the user a general understanding of how the autoclave works and indicates the best ways to operate and take care of it to obtain optimum results and a trouble-free operation. After reading this manual, operating the autoclave should be straightforward. However, since the autoclave is built using high technology sensitive components, no attempt should be made by the user or any other unauthorized person to repair or recalibrate it.



Only technical personnel having proper qualifications, holding technical documentation and adequate test instrumentation are authorized to undertake repair or service.

4.2 Stand – by heating mode

The autoclave provides an option of heating the chamber in stand-by mode between cycles with a very low power to reduce total cycle time (1.6% of the total power only). The autoclave turns off automatically if the **interval between the sterilization cycles is more than 2 hours.**

4.3 Operating Conditions



This device is for indoor use only!

The sterilizer should be loaded only with autoclavable material!

The environment shall not exceed an ambient temperature of 40 °C and a relative humidity of 85% respectively.

- ◆ The operation altitude shall not be over 2000 meters (6561 feet) (ambient pressure shall not be lower than 80 kPa (11.6 psi)).

- ◆ The autoclave shall not be used in a manner not specified in this manual!
 - ◆ Do not use the autoclave in the presence of dangerous gases.
 - ◆ The packed or unpacked device shall be stored in 'indoor' conditions.
- Operate the autoclave only in the manner specified in the manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



Caution!

Waste water should be brought into the public net in accordance with the local rules or requirements i.e ONLY NON-HAZARDOUS LIQUIDS SHALL BE DISPOSED IN PUBLIC SEWAGE!

4.4 Utilities

Property	Value
Compressed Air (ELC-D models only)	1/2" 2-5 Bar
Tap water (ELC-D models only)	1/2", 2-5 Bar
Drain (ELC-D models only)	Withstanding temp. of 80°C

Model	Power consumption	Supply Voltage	Line current	Protection against electrical shock
5075	6 x 1100W	3 Ph, 400V/50Hz	11A	IEC 61010-1
5050	4 x 1100W	3 Ph, 400V/50Hz	11A	IEC 61010-1



Attention:

The electrical net must be protected with a current leakage safety relay.

The electrical network must comply with local rules or regulations.

4.5 Load on counter

The counter (or shelve, etc.) on which the autoclave shall be placed must be able to withstand, at least, the following weight:

Model	5050	5075
Weight	285 kg	310 kg

4.6 Construction

The main parts of the autoclave are made of materials as indicated below:

- ◆ Chamber and door are made of stainless steel.
- ◆ Trays are made of stainless steel.
- ◆ Water reservoirs are made of stainless steel.
- ◆ Door handle is made of hard plastic material, which is safe to touch and thermo-insulated.

4.7 Environment Emission Information

1. The peak sound level generated by the autoclave is less than 70 dBa with background noise of 60 dBa.
2. The total heat per hour transmitted by the autoclave is < 100 W/h for all models.

4.8 Directives and Standards

Every autoclave meets the provisions of the following Directives and is in compliance with the following Standards:

ISO 9001:	Quality Management System
ISO 14001:	Environmental Management System
ISO 17025:	General requirements for the competence of testing and calibration autoclaves
ASME Code	Section I and section VIII. Div. I
PED	2014/68/EU
Chinese Regulations	Special Equipment Licensing Office
IEC 61010-1 / UL 61010-1:	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
IEC 61010-2-040:	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-040: Requirements for sterilizers and washer-disinfectors used to treat medical materials
EN 61326-1:	EMC Requirements for Electrical Equipment

4.9 Water Quality

The distilled or mineral-free water supply shall be according to the table below:

Suggested maximum limits of contaminants in water for steam sterilization per EN13060

Substance	Feed Water	Condensate
Evaporate residue	≤ 10 mg/l	≤ 1.0 mg/l
Silicate (SiO ₂)	≤ 1 mg/l	≤ 0.1 mg/l
Iron	≤ 0.2mg/l	≤ 0.1mg/l
Cadmium	≤ 0.005 mg/l	≤ 0.005 mg/l
Lead	≤ 0.05 mg/l	≤ 0.05 mg/l
Rest of heavy metals except iron, cadmium, lead	≤ 0.1 mg/l	≤ 0.1 mg/l
Chloride (Cl)	≤ 2 mg/l	≤ 0.1 mg/l
Phosphate	≤ 0.5 mg/l	≤ 0.1 mg/l
Conductivity (at 20°C)	15 µs/cm	≤ 3 µs/cm
pH value	5 to 7.5	5 to 7
Hardness	≤ 0.02 mmol/l	≤ 0.02 mmol/l
Appearance	Colorless, clean, without sediments	
Note: The condensate is produced from steam taken from the empty sterilizer chamber.		

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

Attention:

The use of water for autoclaves that do not comply with the table above may have severe impact on the working life of the sterilizer and can invalidate the manufacturer's guarantee.

Use only deionized water, having a maximum conductivity of 15 µs/cm. Conductivity greater than 15 µs/cm may cause failures.

Tap water supply

The range of hardness value 0.7-2.0 mmol/l (70- 200 mg/l CaCO₃)

The use of soft water is strictly forbidden!

Please consult a water specialist!

4.9.1 Reverse Osmosis

A Reverse Osmosis (RO) system may be used to improve the quality of the water used to generate steam in the autoclave chamber.

In RO, the water is forced through a semi-penetrable membrane, which filters out contaminants to a high degree of efficiency. In deionization (DI) ions and charged particles are removed either by electric fields or by ion exchange in resin beds.

Although the RO cannot normally attain the degree of purity possible with the DI methods, it is more than adequate for the feed water.

Moreover, the RO has several advantages:

1. RO is cheaper to install and to run than DI.
2. RO removes particulate matter, organic molecules, and pyrogens that DI cannot remove
3. RO water is less corrosive to steel and copper than DI water.
4. RO maintenance requirements are less demanding than those of the DI units.

Therefore, the use of mineral free water will contribute to better performance and longer life of the autoclave.

4.10 Electrical Data

230V configuration

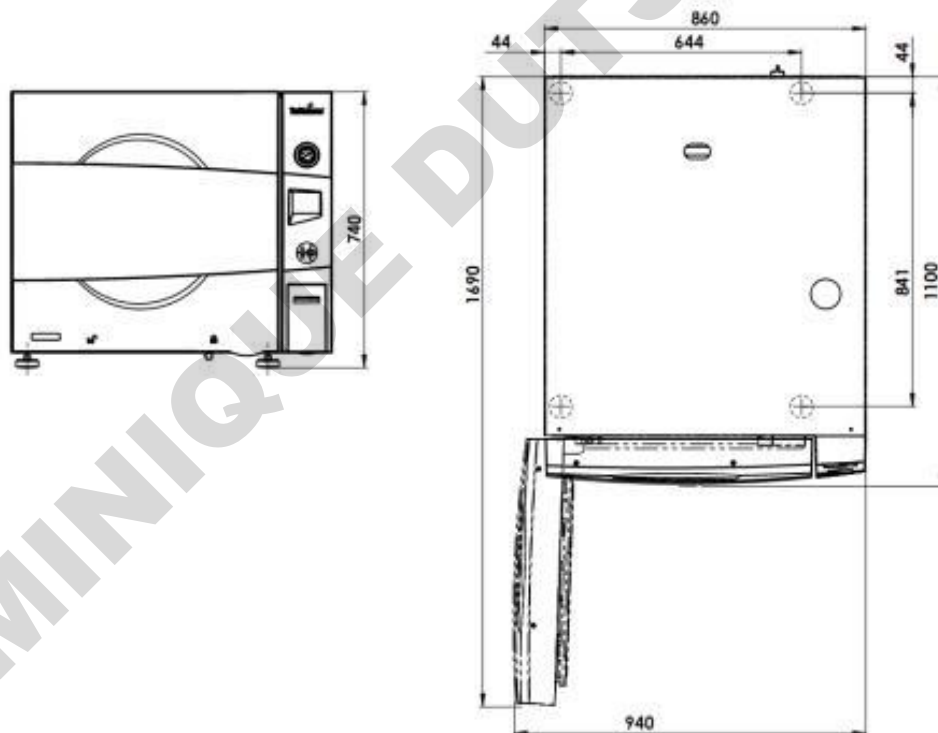
Property	Value: 5050	Value: 5075
Total Power	4400W (4*1100W)	6600W (6*1100W)
Voltage	3Ph, 230VAC	3Ph, 230VAC
Amperage	16A w/o PV, 19A with PV	16A w/o PV, 19A with PV
Protection against electrical shock	IEC 61010-1	
Mains supply fluctuation	+/- 10%	

400V configuration

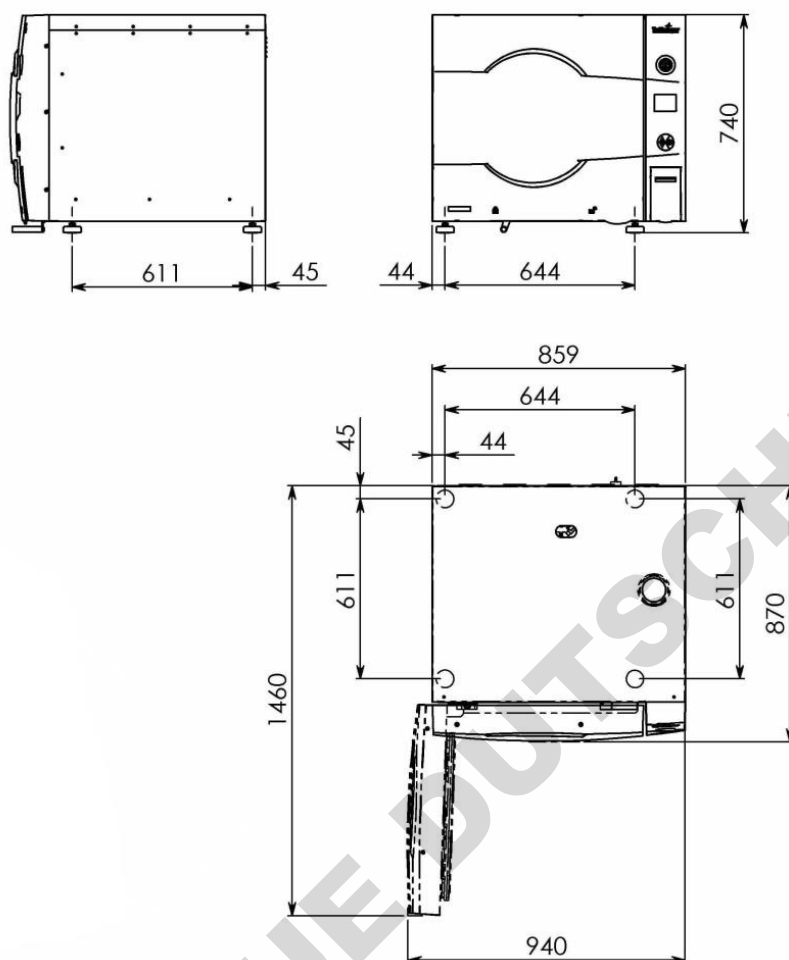
Property	Value: 5050	Value: 5075
Total Power	4400W (4*1100W)	6600W (6*1100W)
Voltage	3Ph, 400VAC	3Ph, 400VAC
Amperage	10A	10A
Protection against electrical shock	IEC 61010-1	
Mains supply fluctuation	+/- 10%	

4.11 Overall Dimensions Models 5050, 5075 EL

5075



5050



4.12 Dimensions

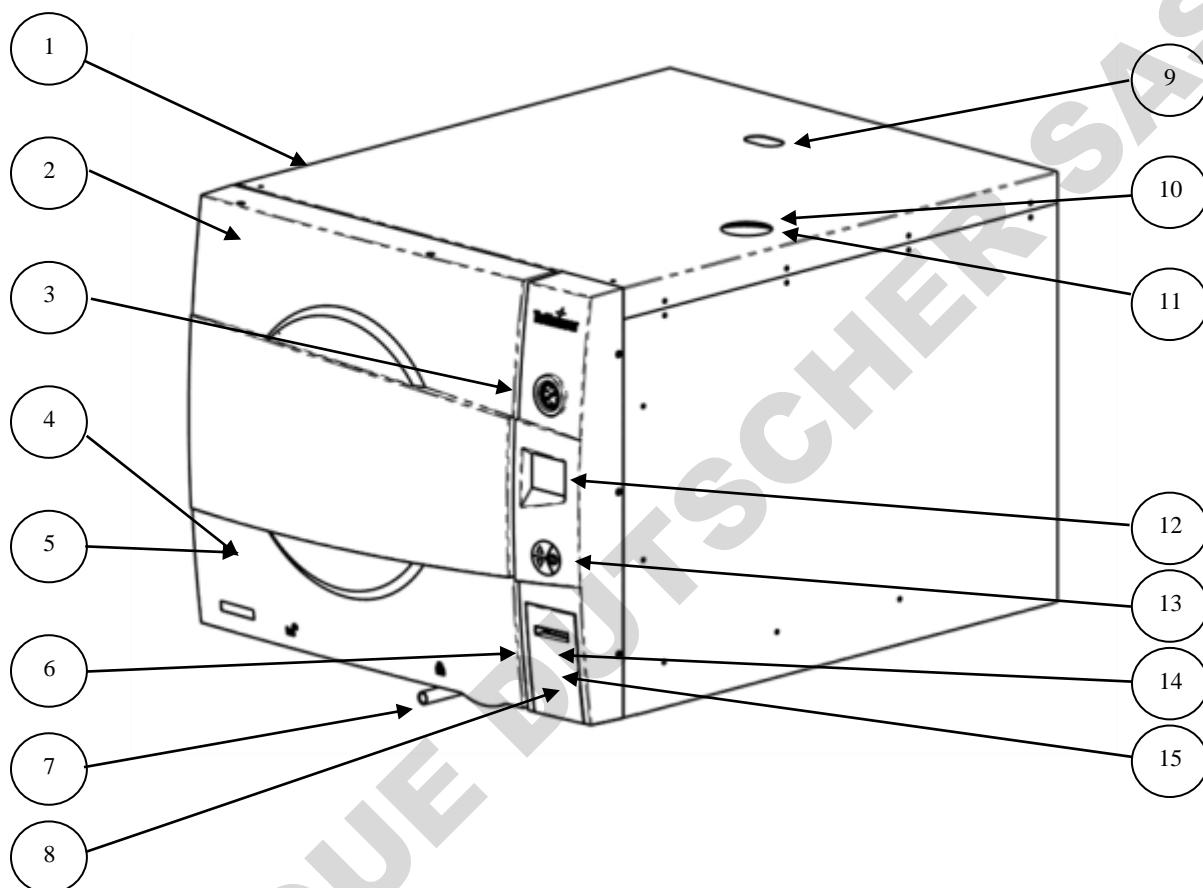
Model	5050		5075	
	mm	in	mm	in
Overall Dimensions	860	33.9	860	33.9
	740	29.1	740	29.1
	870	34.3	1100	43.3
Maximum dimensions (door open)	1460	57.5	1690	66.5
	940	37.0	940	37.0
Distance between supporting legs	644	25.4	644	25.4
	44	1.7	44	1.7

		611	24.1	841	33.1
Chamber	diameter	500	19.7	500	19.7
	Depth	500	19.7	750	29.5
Reservoir volume		20 lit.	4.4 gal	20 lit.	4.4 gal
Max. Allowable Working Pressure (MAWP)		2.76 bar (40 psi)			
Load No. counter		Counting from 0 to 3000 and nullifies.			

4.13 Specifications

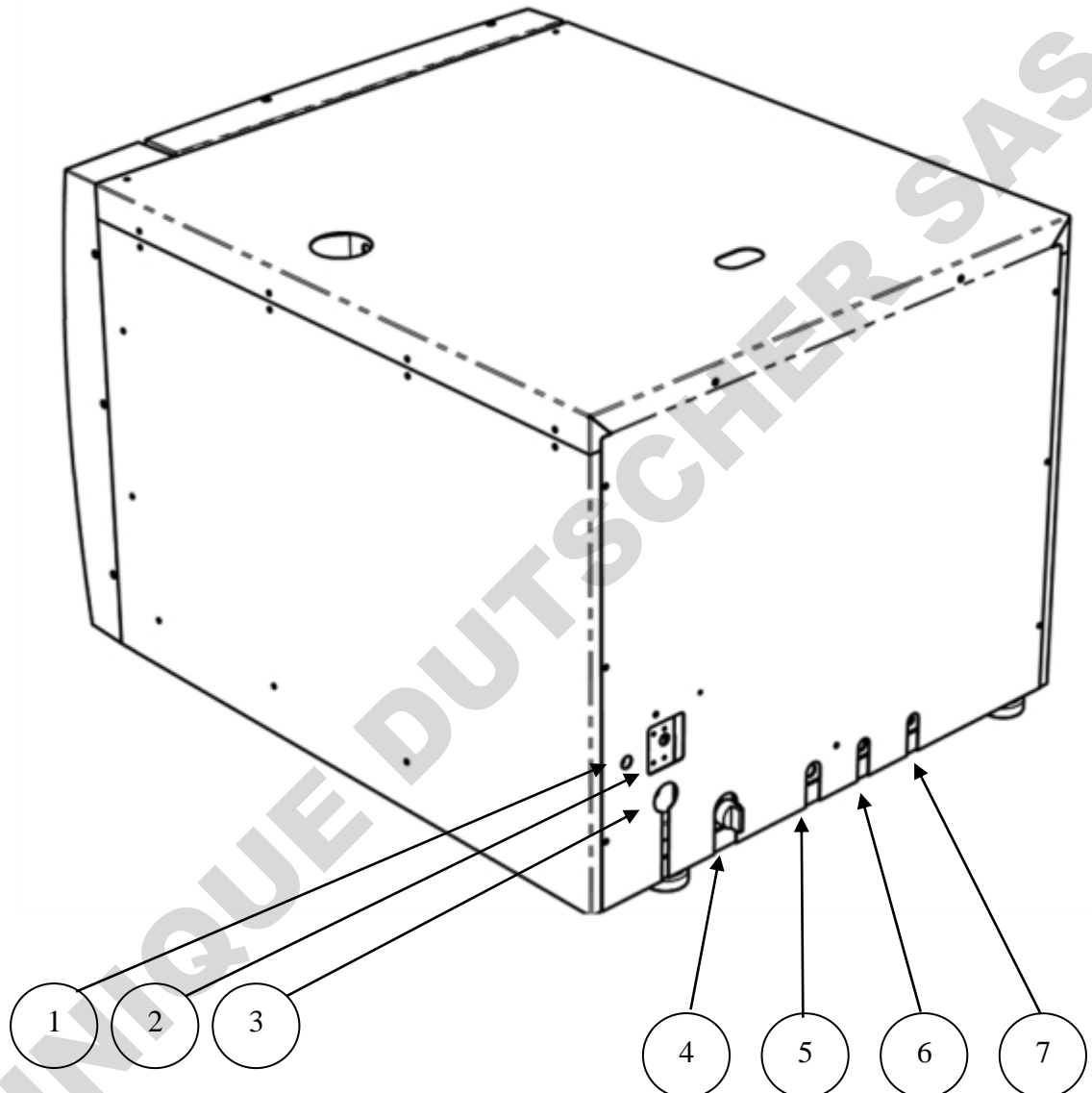
Properties	Model	
	5050 ELC	5075 ELC
Chamber diameter in mm	500	500
Chamber depth in mm	520	750
Chamber volume	110 lit. (29.1 US gal)	160 lit. (42.3 US gal)
Max. Allowable Working pressure (MAWP)	2.8 bar (40 psi)	
Shipping Volume	1.7 m ³ (60 cu.f)	1.7 m ³ (60 cu.f)
Shipping Weight	265 kg (584 lbs.)	275 kg (606 lbs.)
Autoclave's Weight	188 kg (414 lbs.)	199 kg (439 lbs.)
No. of trays	1	1
Tray dimensions W X D	32.0 x 55.0 cm (12.6" x 21.7")	32.0 x 78.0 cm (12.6" x 30.7")
Volume of mineral free water reservoir	18.5 liters. (4.9 US gal)	18.5 liters. (4.9 US gal)

4.14 Front View



No.	Description	No.	Description
1	Autoclave cover	9	Safety valve
2	Validation port (under door cover)	10	Water reservoir cover
3	Pressure gauge	11	Water reservoir – assembly
4	Reservoir water drain valve (under door cover)	12	Control panel display
5	Ring for drain valve (under door cover)	13	Control panel keyboard
6	Printer Cover	14	RJ45 Ethernet port
7	Door Closing Handle	15	USB port
8	Main switch (under the printer cover)		

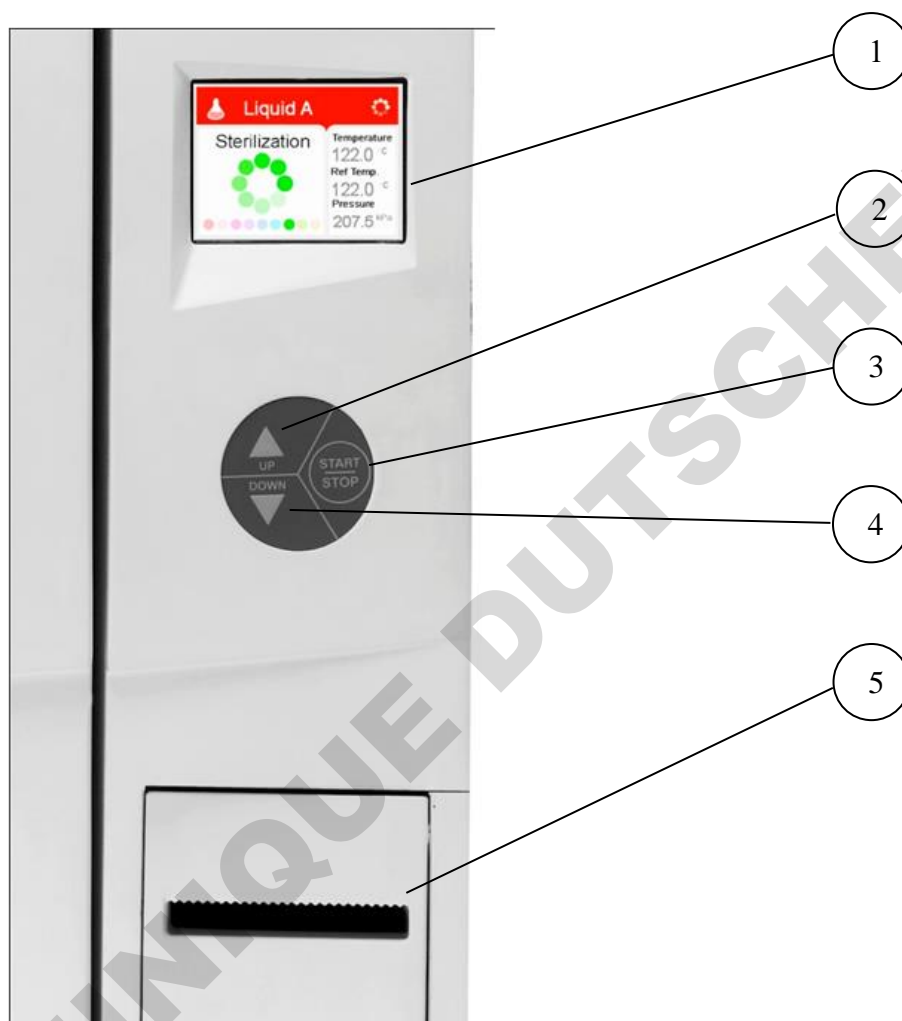
4.15 Rear View



No.	Description
1	Cut off
2	Circuit breaker
3	Electricity
4	Strainer
5	Drain
6	Tap Water
7	Air Inlet

5. Control Panel

5.1 Control Panel Drawing



No.	Description
1	Display
2	Keypad: Up Button
3	Keypad: Start/Stop Button
4	Keypad: Down Button
5	Printer

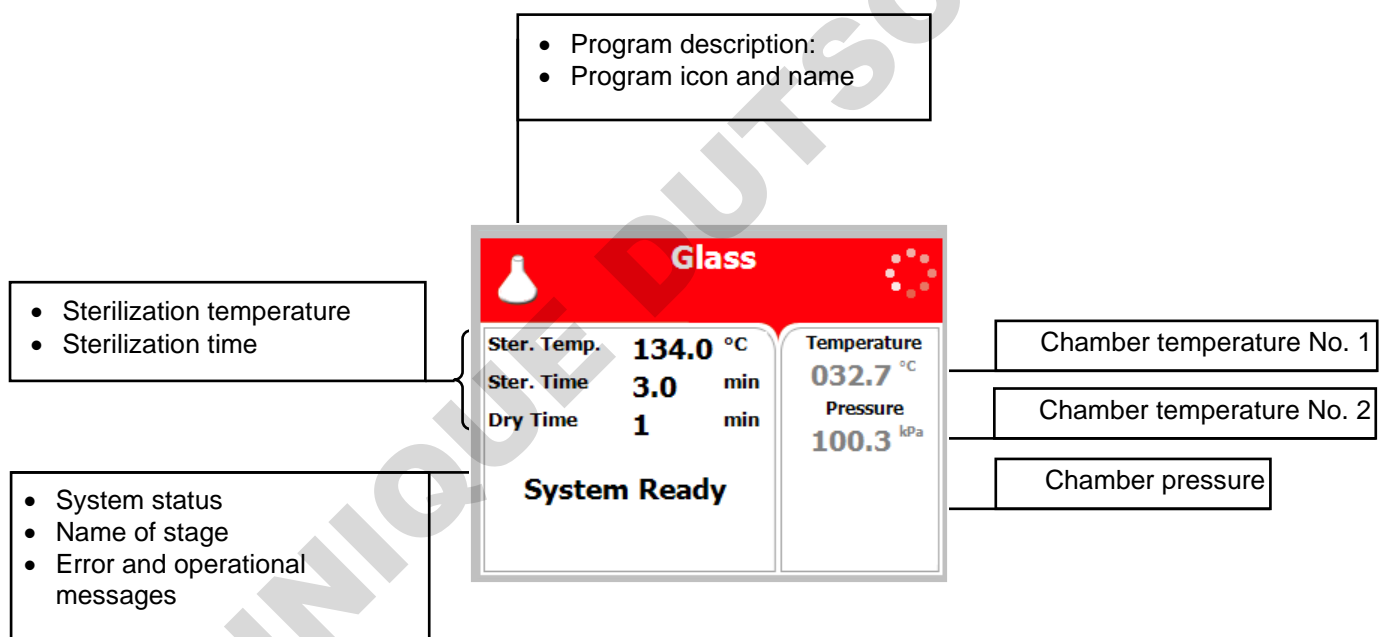
5.2 Description and Functions of the Front Panel Keyboard

The front panel is composed of 3 sections:

1. Display screen.
2. Keypad.
3. Printer

Display screen

The display is an LCD panel used to display the current status of the autoclave while using Operational Messages and Error Messages.



Keypad



The keypad consists of three keys as described below:

UP key

This key has the following functions:

- In the menu directories:
 - This key enables the operator to browse through the cycles.



<ul style="list-style-type: none"> • In the directories available: ○ When the cursor is blinking on a number, the UP ▲ key increases its value. ○ When the cursor is blinking on a menu selection, the UP ▲ key allows browsing backward through the menu. ○ When adjusting a parameter and the cursor is blinking on “SET” or “EXIT” the UP ▲ key activates that procedure.” 	
<p>DOWN key</p> <p>This key has the following functions:</p> <ul style="list-style-type: none"> • In the menu directories: ○ This key enables the operator to browse through the cycles. • In the directories available: ○ When the cursor is blinking on a number, the DOWN ▼ key decreases its value. ○ When the cursor is blinking on menu selection, the DOWN ▼ key allows browsing forward through the menu. ○ When adjusting a parameter and the cursor is blinking on “SET” or “EXIT” the DOWN ▼ key activates that procedure. 	
<p>START/STOP key</p> <p>This key has the following functions:</p> <ul style="list-style-type: none"> • In the main screen: ○ Starts the process when the required program was chosen. ○ Stops the current process. ○ Cancels the ERROR message displayed on the screen and opens the electric door lock. • In the menu directories: ○ When the cursor is blinking on a number, the START/STOP ① key enables moving to the next position. ○ When the cursor is blinking on a menu selection, the START/STOP ① key activates that selection. 	

6. Tests

6.1 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.

6.2 Periodical Tests

PERIOD	TEST
2 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 leveled.
	Check the safety elements; safety valve, safety and 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.
	Check and tighten the piping joints to avoid leakage.
	Check and tighten all screw connections in the control box, heaters and valves and instrumentation.
	Observe the closing device for excessive wear
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 authorized inspector.	

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

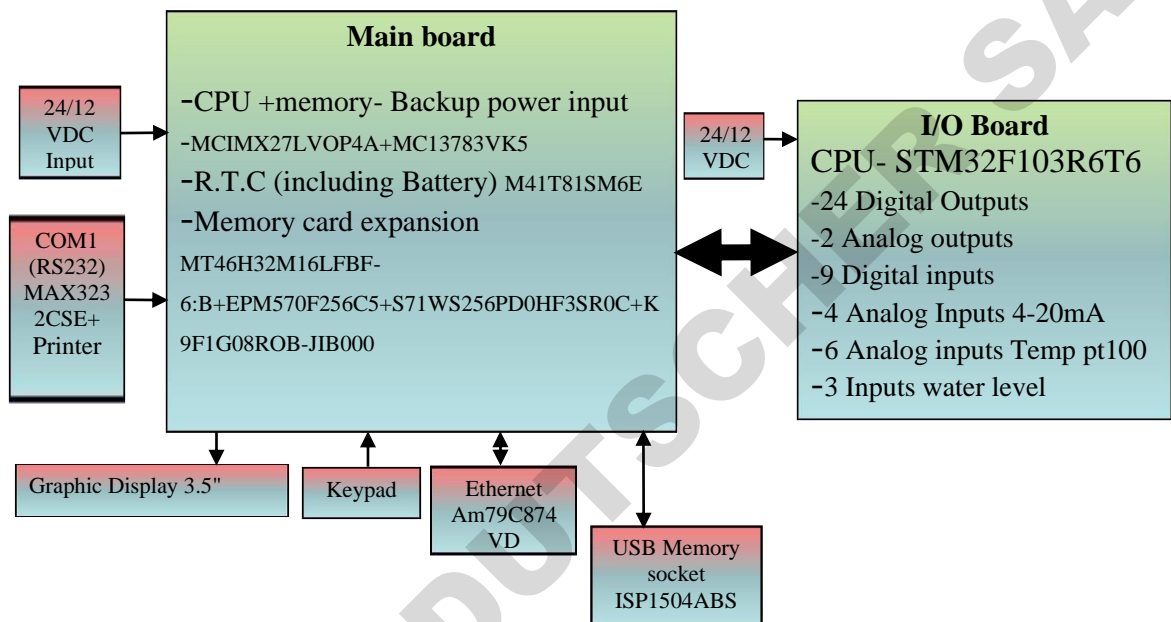
6.3 Safety Features

This autoclave includes built-in safety features such as:

- ◆ Error message display.
- ◆ Electronic pressure and temperature measurement.
- ◆ Safety relief valve to avoid build-up of excessive pressure.
- ◆ Door switches enabling operation to be started only when the door is closed.
- ◆ Water level safety device.
- ◆ Excess temperature protection.

7. Description of the Control System.

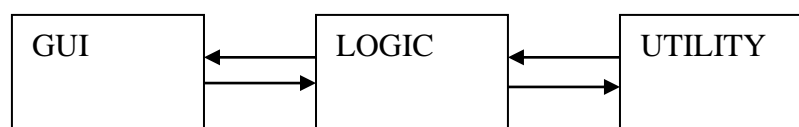
7.1 Block Diagram of Hardware Control System Components



7.2 Application system architecture

The system is divided into three main sections (dll)

1. **GUI** – holds all the Human Machine interface including the main application screen and all the configuration screens which enable the user to handle the machine.
2. **Logic** – holds all the application logic for running the machine.
3. **Utilities** – Holds general functionality which is used by the logic section and the GUI section e.g.: converting function for displaying different pressure or temperature units type, languages etc.



Mapping of the software to the hardware – see 7.5

The Hardware architecture is based on Freescale i.MX27 PDK Evaluation Board.

7.3 Description of the programmable component:

Interfaces to users

- **Keypad:** The keypad has three push buttons:
 - Down key
 - Up key
 - Start/stop key



- **Display:** The control system has a graphical display
- **USB socket:** The USB socket is intended to load cycles' history from flash a memory (disk on key). The received file is in txt format that can be loaded onto a PC.

7.4 Inputs and Outputs

Analog inputs

Analog inputs	JP
Drain temperature	J5
Chamber temperature	J2
Bio hazard filter temperature	J6
Ref temperature	J3
Chamber pressure	J7/1
Chamber water level	J11:1

Digital inputs

Digital Inputs	JP
Door closed	J12/1
Door unlocked	J12/6
Door locked	J12/8

Digital outputs

Digital Outputs	JP
Buzzer	J13/2
Chamber heat	J13/6
Water pump valve	J13/10
Vacuum pump	J13/12
Atmospheric air valve	J14/2
Compressed air to chamber	J14/4
Slow exhaust	J14/6
Fast exhaust	J14/8
Vacuum valve	J14/10
Cool Drain	J14/12
Cooling water	J14/16
Compressed air to jacket	J15/2
Close door	J15/4
Open door	J15/6
Air to door	J15/14

Actuators

The control system operates electrical valves (solenoids), Electric cylinder motors, pneumatic cylinders, electric pumps, heaters.

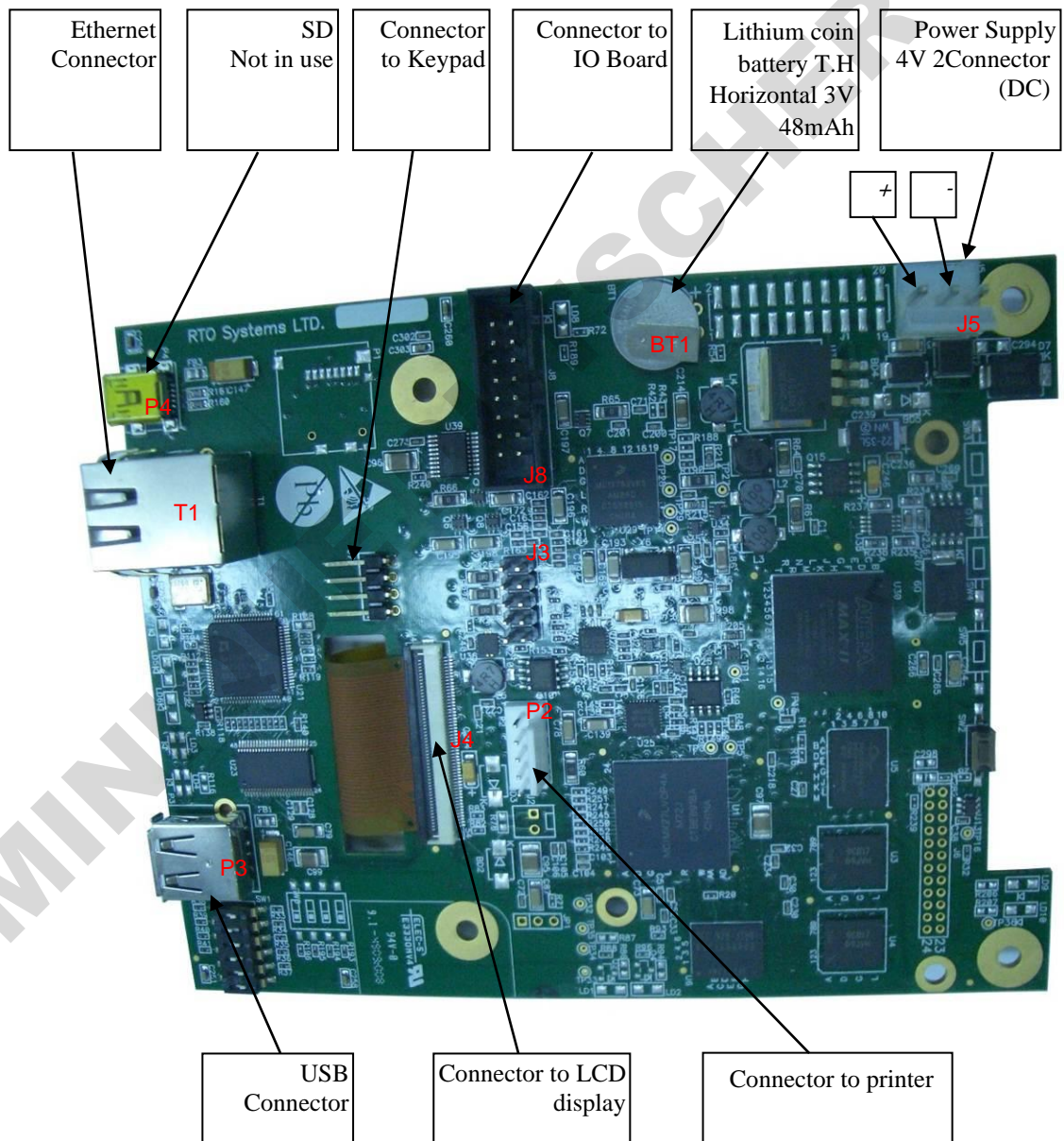
On / Off switch

A Rocker Switch 250V AC, 16A

7.5 Hardware control system components:

The hardware is consisted of cards: MAIN and IO

7.5.1 Main card



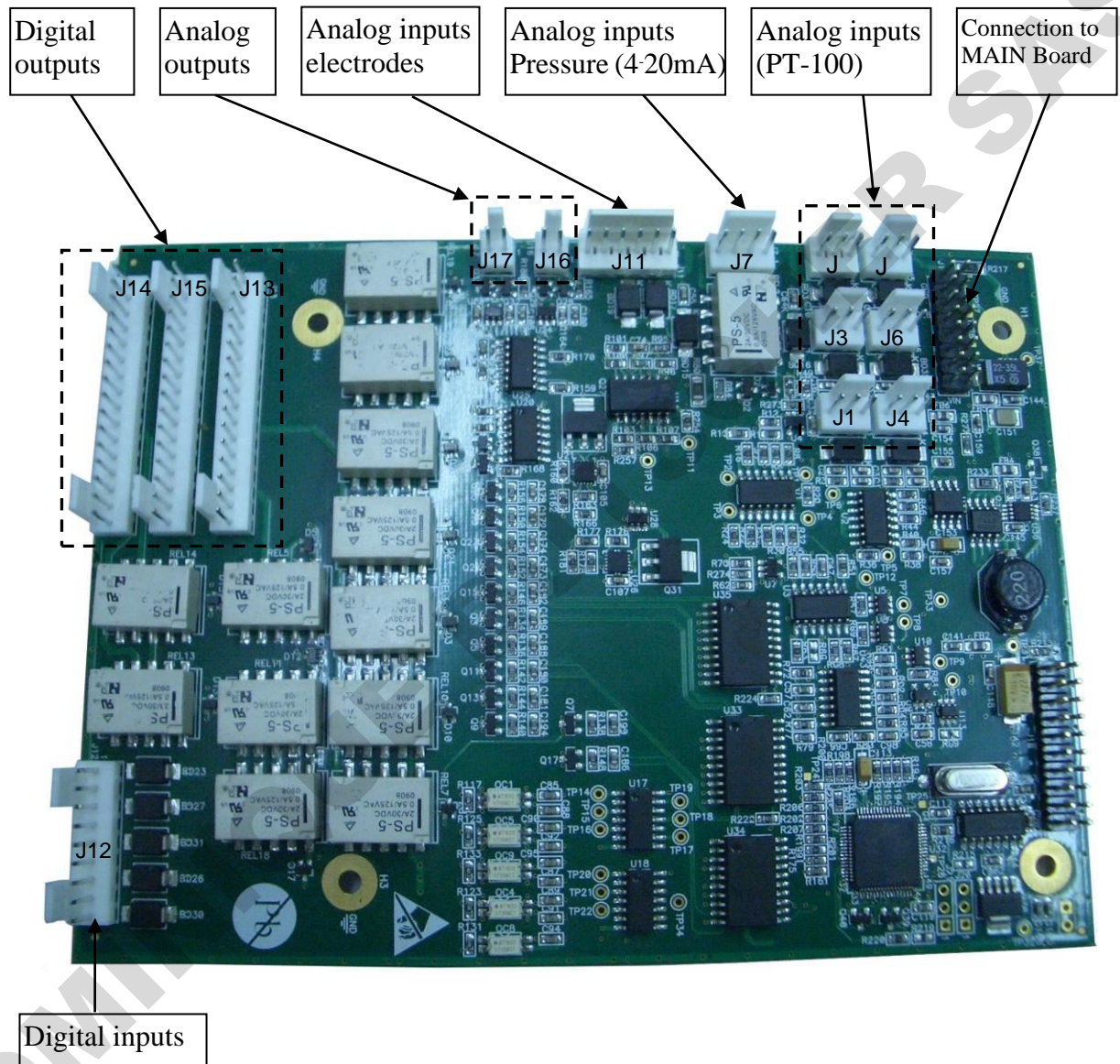
— **Operating system (MAIN card)**

The Operating system is Microsoft Windows CE version 6. The code to the Operating system is supplied by Microsoft. The connection code between the Operating system and the hardware components (BST – Board Support Package) is supplied by FreeScale. Minimum suitability for this "Tuttnauer" project is performed in this code.

— **Development tools (MAIN card)**

The software develop environment is on Microsoft Visual Studio 2005 that includes the Microsoft Platform Builder for Windows CE 6.0. The specific Tuttnauer system application is written in C Sharp.net on Microsoft Compact Framework.net

7.5.2 IO Card



IO card is an independent card. It checks the card by a method of a continuous scan of all the ports, saving the data in the memory and transporting this data according to the request in the communication channel RS-232 to the personally adapted protocol.

At the end of the check process of the digital and analog ports, the communication channel is checked, in case of receiving a request, the

request is checked and if the request is legitimate, it will be taken care of.

The IO card is controlled by the MAIN card. Only when requests are received from the MAIN, the requests will be checked and performed. The IO card will perform an electrical restart of the systems (IO card) if it does not receive requests within 5 seconds. In the next request received from the MAIN, the IO card will indicate to the requester of IO card systems restart.

The "brain" in the IO card runs on microcontroller type: STM32F103R6T6.

The Microcontroller is an electrical Integrated circuit with an actualized complete system (SoC) including a processing unit, external interfaces, memory, etc.

The Microcontroller is constructed of several main components:

1. Central processing unit – the main component in the microcontroller is a central processing unit (CPU) This unit oversees receiving the request (command) code from the memory, deciphering, receiving variable data from the memories and performing the command.
2. Memory – divided into 2 sections.
 - 2.1 software memory – in this memory the software that samples the IO card and request (command) from the user are saved. As this memory is a flash memory it is possible to burn the code many times (efficient to the development stage).
 - 2.2 information memory – in this memory the data and other variables values are saved. This memory is not flash memory but is RAM memory.
- Digital / Analog ports (in/out) – through them the microcontroller can receive data of digital/analog signs from the system, save them and pass them on respectively to the user request.
- Ports (in / out) to the communication – in the IO card there is a UART component. This component enables communication with the MAIN card through the RS-232 in suitable protocol.

7.5.3 MAIN and IO cards :communication protocol between IO board to Main Board

Communication protocol between IO to Main boards is described below. The communication managed by the Main board (master), the IO functions as slave

1. There are six communication functions.
The communication functions (to read or write) identified by number.
The communication functions listed below:

- 1.1 01 - Read – command to IO send all the information of digital analog inputs.
- 1.2 02 - Write – Command to IO to activate analog and digital outputs.
- 1.3 03 - Read version – IO software version to verify the version.
- 1.4 04 – N.A.
- 1.5 05 - Read number that identifies the ID of IO board and the software version.
- 1.6 06 - Write (only at the first time) to IO his ID and software number.
- 2. First Byte (Byte 1).

The first byte identifies ID functionality request. It can be one of the numbers in a paragraph.

- 3. The second byte will present the data size if the main board asks to write information to the IO. If the request is to read this byte will be 00.
- 4. The number of the request. This number is increased from 00-ff.
- 5. Check sum of the package – to prevent mail functionality of the board if there is interference in communication.
- 6. The information package transfer. The information contains number of the input or output and data for/from each I/O.

Bytes identify number of input or output followed by two bytes containing the data of the input or outputs.

- 7. Last byte contains a check sum of the entire package that is transferred. This is to verify that the information is not corrupted.

Example

The main board sends:

01;00;0003;0004;

01 Ask to Read inputs.

00 not transfer information.

0003 Request number 3

0004 Checksum to verify the request

8. Checking and Changing Parameters and Other Data

Bacsoft control panel allows changing parameters of the cycle and of the system, exporting various data to, and importing from, a USB device or to the printer, and some other options.

Cycle parameters are changeable for Custom programs only (see Duplicate cycles), except for the Temperature sensors, Displayed inputs, and Dry Time.

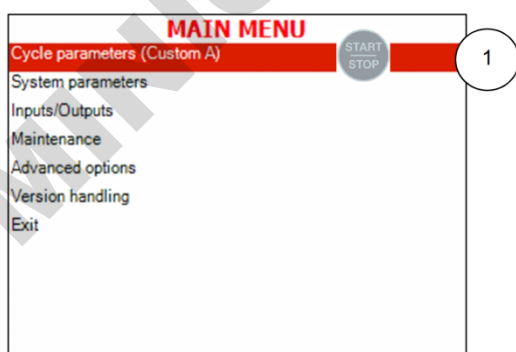
8.1 Browsing through the menus

Now you will learn how to browse through the folders. When you read the Directories and subdirectories chapter with links to specific menus, you will need to know how to browse through the folders using the autoclave control panel. Below is the instruction.

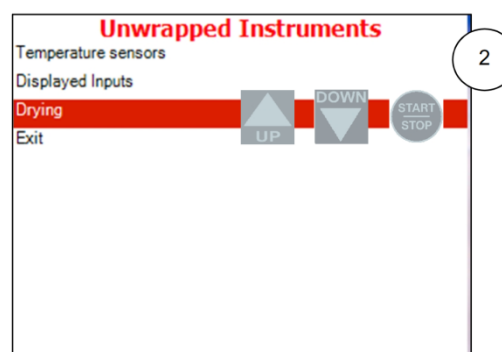
Login as Technician (see 8.4). The Main menu screen appears. To browse through the menus:

1. Press the Up and Down keys to scroll through the menus.
2. Press the Start/Stop key to enter the next screen (i.e., to get one level down).
3. Repeat steps 1 and 2 to enter the next screen until you get to required screen.

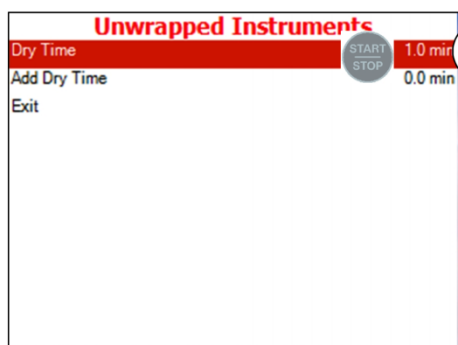
Below are the example screens for the following menu: Cycle Parameters\ Drying\ Dry Time:



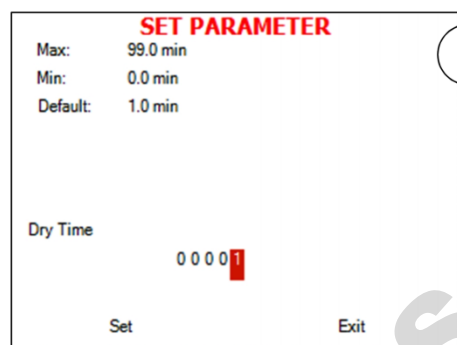
Login as Technician (see 1.4). The Main menu screen appears.
Press the Start/Stop key to enter the Cycle parameters menu.



Press the Up and Down keys to scroll through the menus until you get to Drying, then press the Start/Stop key to enter the Drying menu.



Press the Start/Stop key again to enter the Dry Time menu.



Now you have reached the required screen: Changing the dry time parameter. The path is: **Cycle** parameters\Drying\Dry Time.

Note: To exit every screen and to return to the previous screen (to get one level up):

- Move the cursor to Exit by pressing the UP or DOWN keys and then press the Start/Stop key.
- or -
- Press the UP and DOWN keys simultaneously.

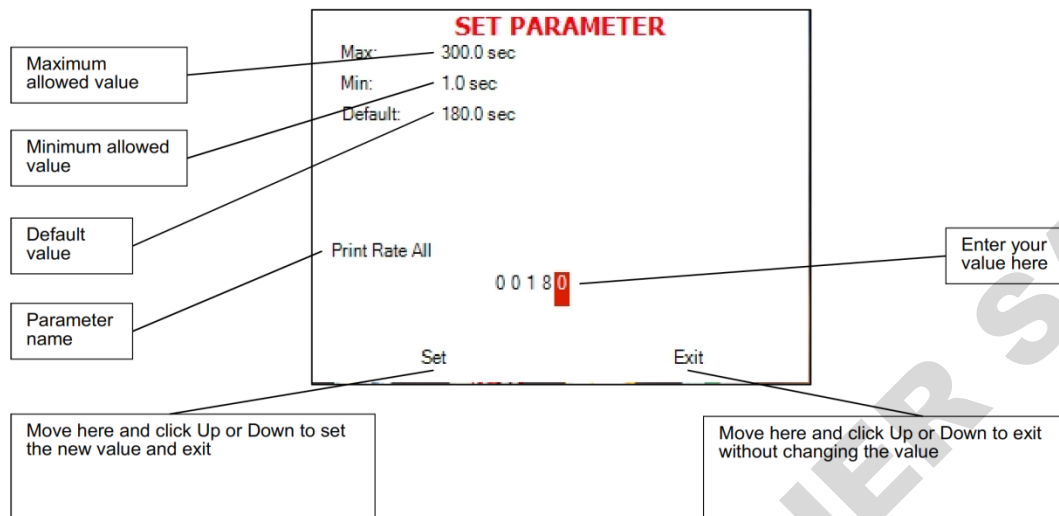
In the next chapter you will see how to change the required parameter as desired.

8.2 Changing a Parameter

You have browsed through the menus and reached the parameter changing screen as explained above. Now you can change the required parameter as desired. To do so:

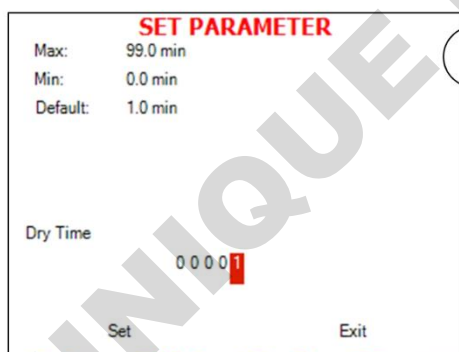
1. Enter the required value as follows:
 - Press the Up and Down keys to change the value of the digit.
 - Press the Start/Stop key to move the cursor to the next digit to the left.
2. When finished, press the Start/Stop key repeatedly until you move the cursor to Set.
3. Press the Up or Down key to confirm the new value and to exit the parameter changing screen.

Below is the typical parameter changing screen:

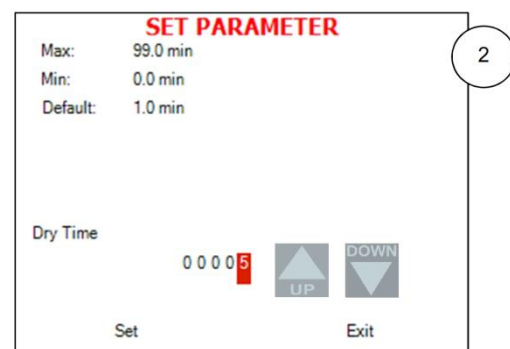


Note: Please note the maximum and minimum values for this parameter shown on the screen. Your value must be within these boundaries.

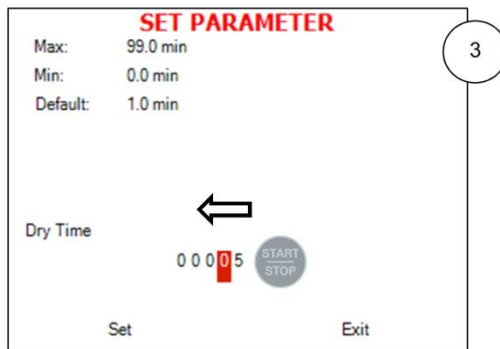
Below is the example of changing the Dry time parameter on the screen used in the previous section:



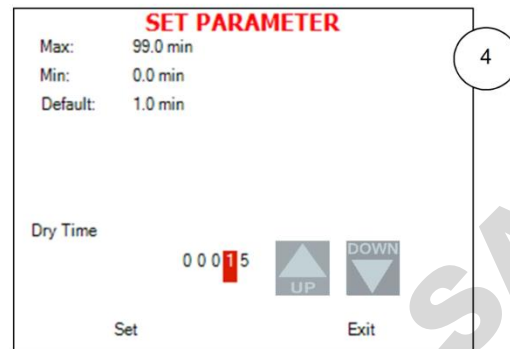
Browse to Changing dry time screen as explained in the previous chapter



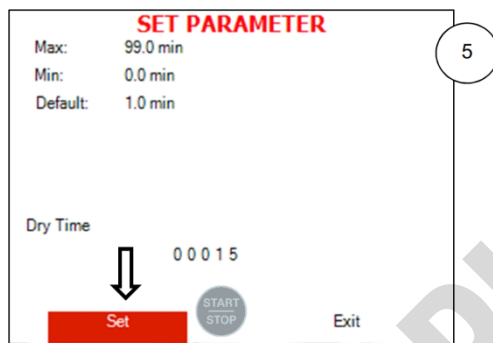
Use Up and Down keys to change the value of the digit



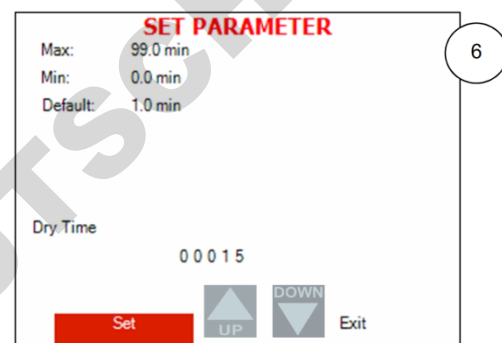
Press the Start/Stop key to move the cursor to the next digit to the left.



Press the Up and Down keys to change the value of the digit



When finished, press the Start/Stop key repeatedly until you move the cursor to Set.



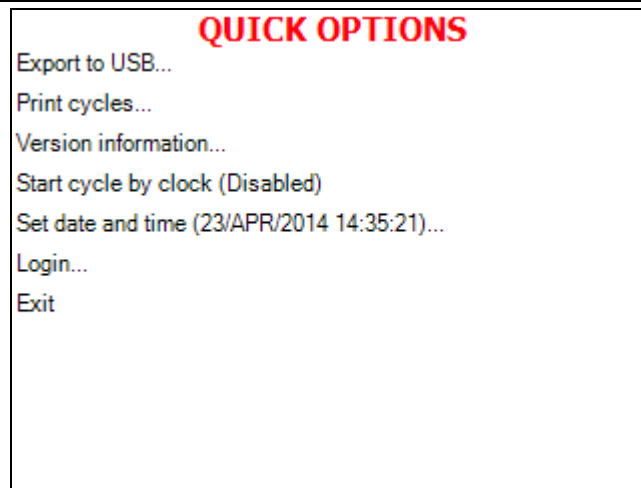
Press the Up or Down key to confirm the new value and to exit the parameter changing screen.

Note: To exit every screen and to return to the previous screen:

- Move the cursor to Exit by pressing the UP or DOWN keys and then press the Start/Stop key
- or -
- Press the UP and DOWN keys simultaneously.

8.3 Quick options screen

When the autoclave is on and no cycle is running, press Up and Down keys simultaneously to enter the Quick options screen. Most of the options require login, and their availability depends on user authority (user, or technician). Login command is the last line on this screen. Quick options are options available without login.



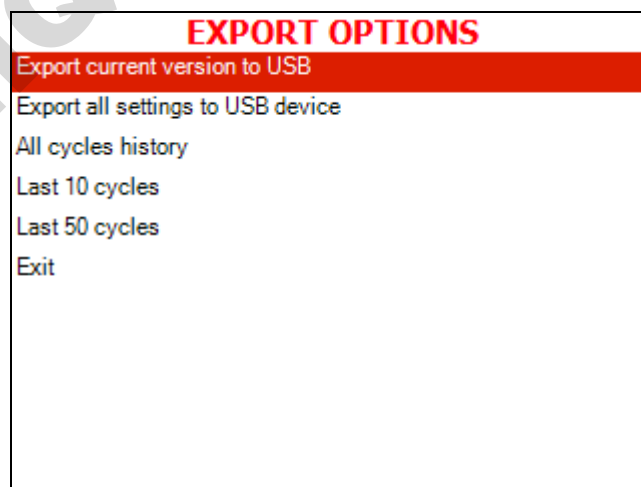
Below you can find instructions how to login and enter the Main menu. Section 8.1 above explains how to browse through the menus; section 8.2 explains how to change a parameter.

Below is the explanation of the Quick Options.

Export to USB

This subdirectory allows you to export settings and cycles history to the USB device.

1. Insert the USB device into the USB socket.
2. Enter the Export to USB screen.



To export settings:

- a. Choose Export all settings to USB device.

- b. Press the Start/Stop key. The following screen will appear:



To export cycles history:

- a. Choose All cycles history, 10 Cycles, or 50 Cycles.
b. Press the Start/Stop key. The following screen will appear:

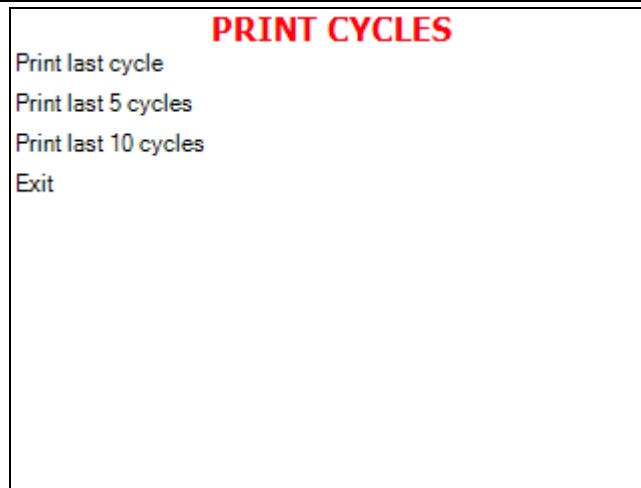


3. Remove the USB device from the USB Socket.

Print cycles

This subdirectory allows printing out cycle reports for a number of previous cycles (See the Printer handling section of the Operation and Maintenance Manual).

1. Enter the Print Cycles screen.

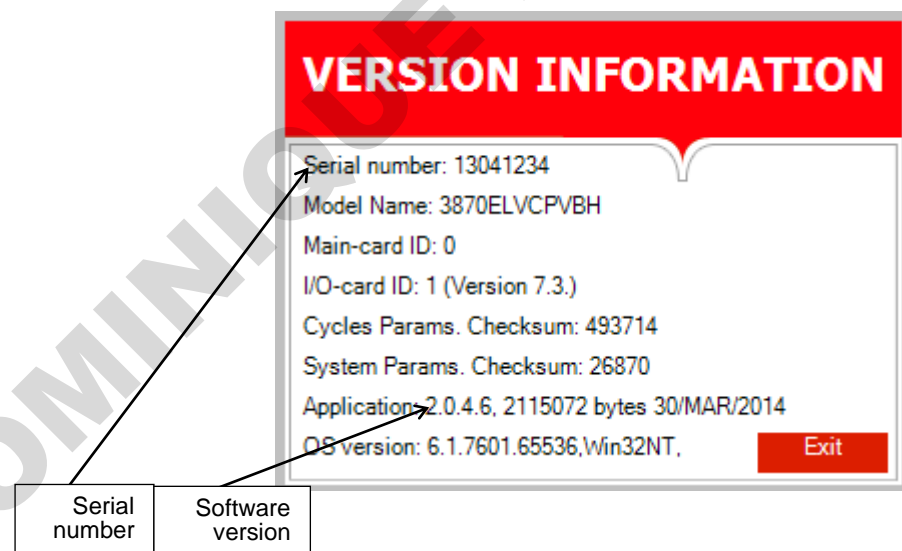


1. Choose Print last cycle, print the last 5 cycles, or print the last 10 cycles.
2. Press the Start/Stop key. The cycle reports will be printed.

Version Information

This directory allows viewing information of the current, factory default, and previous software versions.

1. Enter the Version information screen.



Start cycle by clock

This subdirectory enables the operator to start the cycle at the time set by this parameter.

1. Enter the Start cycle by clock screen. The following screen will appear:



On the Start cycle by clock screen, the time is displayed in the form "HH:MM". The hour range is 24 hours (i.e., from "0" to "24").

Setting the time to start the cycle

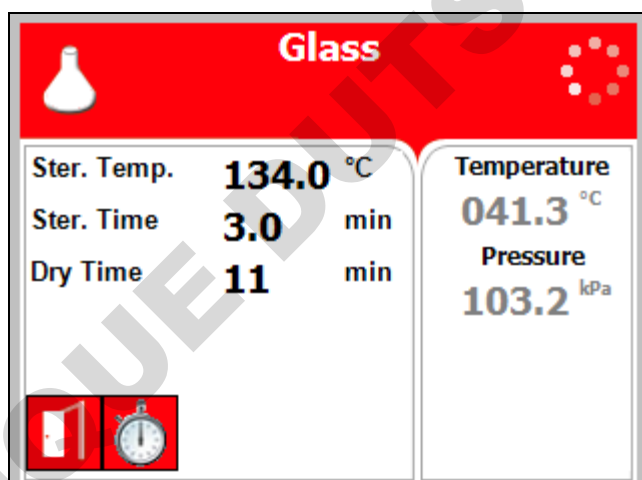
1. Move the cursor to the Time field.
2. Set the required time.

Enabling the Start Cycle by Clock

1. Set the starting time.
2. Move the cursor to Enabled. Press Up or Down key to enable starting cycle by clock.



1. Exit the Enabling the Start Cycle by Clock. The start cycle by clock icon appears on the display:



Disabling the START CYCLE BY CLOCK

2. On the Start Cycle by Clock screen, move the cursor to Disabled. Press Up or Down key to disable Starting cycle by clock.
3. Exit the Enabling the Start Cycle by Clock.

Set date and time

This subdirectory enables the operator to set date and time.

SET DATE AND TIME

Time: 15 : 42 : 28

Date: 24 / JAN / 2011

Set Exit

On the Set date and time screen, the time is displayed in the upper row in the form "HH:MM: SS". The hour range is 24 hours (i.e. from "0" to "24"). The date is displayed in the lower row in the form "DD: MMM: YYYY".

1. Set time and date.
2. Exit the Set date and time screen. The following screen will appear:

Message...

New date and time has been set

Exit



Caution!

After setting time and date, turn the autoclave off and then on again.

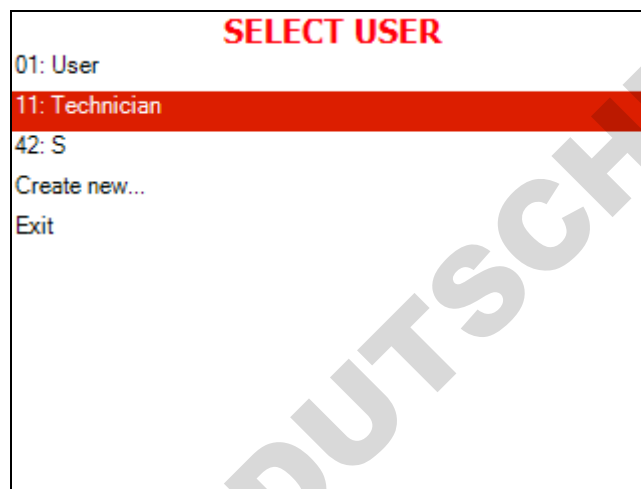
8.4 Logging in and entering the Main menu

Below you can find instructions how to login and enter the Main menu. Section 8.1 above explains how to browse through the menus, section 8.2 explains how to change a parameter.

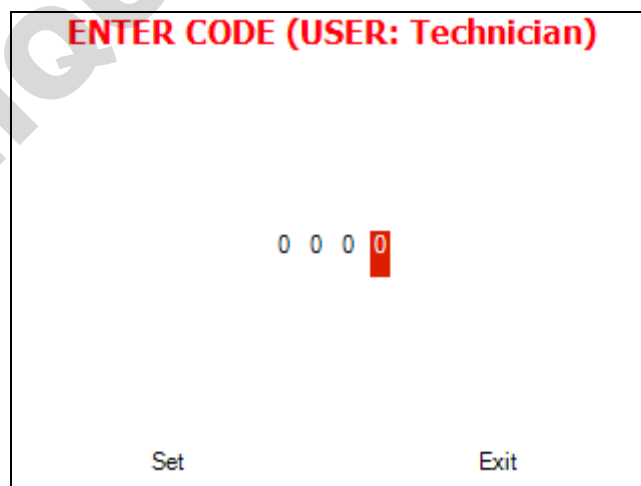
When the autoclave is on and no cycle is running, press the up and down keys simultaneously to enter the Quick Options screen (see 8.3). On this screen you can either proceed to login (see below) or choose one of the quick options available without login. To login as technician:

1. On the Quick Options screen, choose login.

Select user screen appears.

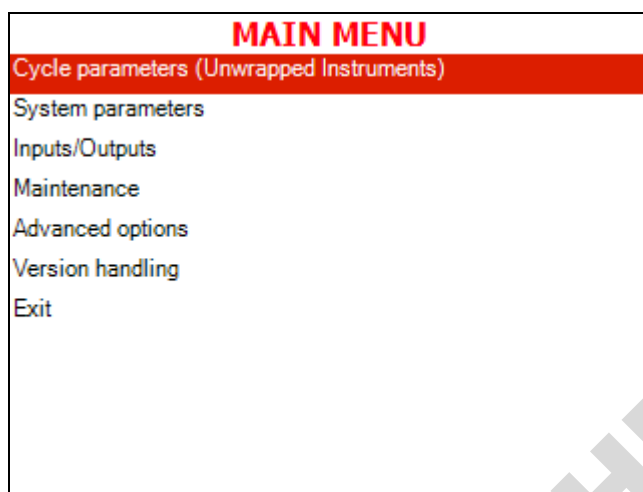


2. Choose Technician, then press the Start/Stop key to enter. The following screen will appear:



0000 is displayed on the screen with the cursor flashing on the right digit.

- Set the code to 0321. You will get to the Main menu.



Below is the list and the explanation of the options available on the Main Menu.

8.5 Directories and subdirectories

Bacsoft control panel provides an interface that consists of control screens available through an easy scrollable menu tree.

To learn how to scroll through the menus, change the parameters, and perform some other functions using our three-button keypad, see 8.1 and 8.2.

The following table lists the options that the technician may perform.

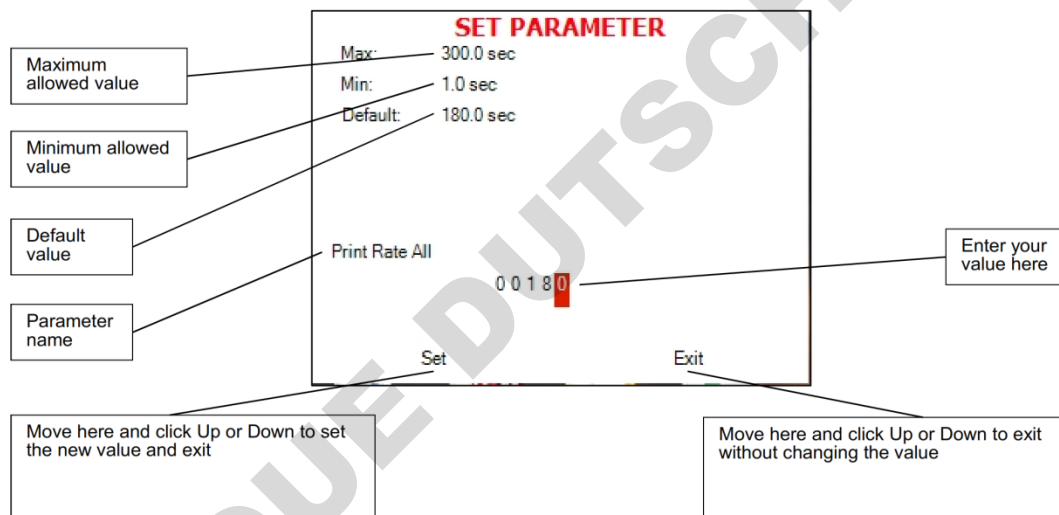
Directory	Subdirectory	
Cycle Parameters ¹	Temperature sensors	
	Displayed inputs	
	Purge (generator models only)	
	Drying	
	Create Pulse	
	Keep Heat	For custom program
	Heating	

¹ See cycle parameters in more detail in Cycle Parameters.

Directory	Subdirectory
	Sterilization
	Cooling ("C" models only)
	Exhaust
	Drying
	Ending
	Global
System Parameters	Print Rate All
	Print Rate Sterilization
	Screen Saver
	Pressure calibration high
	Pressure calibration low
	Temperature calibration high
	Temperature calibration low
	Cycle Print Gap
Inputs/Outputs	View digital inputs state
	View digital outputs state
	Test digital outputs
	View analog inputs state
	Analog inputs calibration
Maintenance	Export gain offset to USB
	Import gain and offset from USB
	Reset atmospheric pressure
	Test RTC
	Printer test
	Print all gain and offset
Advanced Options	Enable cycles
	Set Language
	Set temperature units
	Set pressure units
	Duplicate cycles

Directory	Subdirectory
Version Handling	Delete custom cycles
	Set external IP address
	Import application from USB
	Import all settings from USB device
	Import application and setting from USB
	Return to factory default settings

The following chapter explains meaning and usage of the control screens.
Below is the typical parameter changing screen:



8.6 System Parameters

This menu is listing the system parameters that are the same for all cycles. Browse to the following folder:

Main menu\System parameters

You will see the following screen:

SYSTEM PARAMETERS	
Print Rate All	180.0 sec
Print Rate Sterilization	60.0 sec
Screen Saver	90.0 min
Pressure Calibration High	300.0 kPa
Pressure Calibration Low	25.0 kPa
Temperature Calibration High	130.0 °C
Temperature Calibration Low	60.0 °C
Cycle Print Gap	2.0
Exit	

Below is the instruction for changing the system parameters.

Print Rate All

In this menu you can define the time interval for printing out the cycle status, for all the stages except sterilization: The default is 3 minutes. See the Printer handling section of the Operation and Maintenance Manual.

Browse to the following folder:

System parameters\Print Rate All

Change the parameter as desired.

Print Rate Sterilization

In this menu you can define the time interval for printing out the cycle status during the sterilization stage: The default is 1 minutes.

Browse to the following folder:

System parameters\Print Rate Sterilization

Change the parameter as desired.

Screen Saver

In this menu you can define the screensaver delay time, i. e. how long the keyboard will be untouched before the screensaver activates.

Browse to the following folder:

System parameters\Screen Saver

Change the parameter as desired.

Pressure calibration high

In this menu you can define the high calibration point for pressure.

Browse to the following folder:

System parameters\Pressure calibration high

Change the parameter as desired.

Pressure calibration low

In this menu you can define the low calibration point for pressure.

Browse to the following folder:

System parameters\Pressure calibration low

Change the parameter as desired.

Temperature calibration high

In this menu you can define the high calibration point for temperature.

Browse to the following folder:

System parameters\Temperature calibration high

Change the parameter as desired.

Temperature calibration low

In this menu you can define the low calibration point for temperature.

Browse to the following folder:

System parameters\Temperature calibration low

Change the parameter as desired.

Cycle Print Gap

This parameter defines the time interval between printing the current values of the cycle (See the printer output section).

Browse to the following folder:

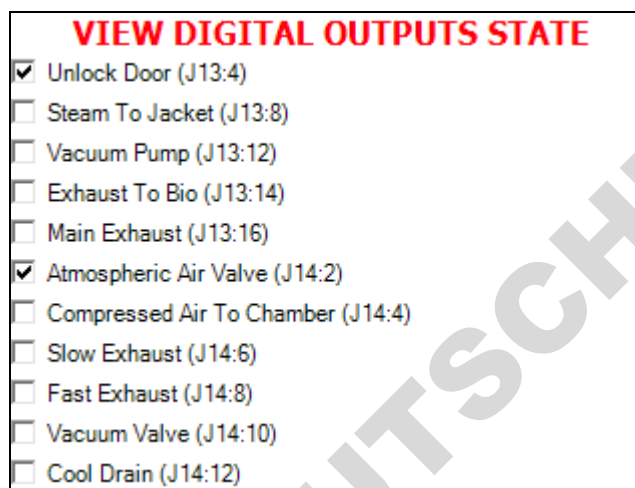
System parameters\Cycle Print Gap

Change the parameter as desired.

8.7 Inputs/Outputs

It is important for the technician to control the system down to the level of specific inputs and outputs. Viewing the outputs state at specific stages of the cycle helps you diagnose the malfunctions. You can also test and calibrate inputs and outputs.

Below is the typical screen for viewing/testing the inputs/outputs.



Below is the instruction for working with inputs/ outputs.

View digital inputs state

In this menu you can view, at any stage, which digital inputs are being controlled at the moment.

Browse to the following folder:

Inputs/Outputs\View digital inputs state

View digital outputs state

In this menu you can view, at any stage, which digital outputs are being controlled at the moment.

Browse) to the following folder:

Inputs/Outputs\View digital outputs state

Test digital outputs

In this menu you can view the normal function of all the autoclave elements: valves, heating elements, pumps, etc.

Browse to the following folder:
Inputs/Outputs\Test digital outputs

Note: on the screen that appears, scroll down for more outputs.
Check the checkboxes of the outputs you want to test.

View analog inputs state

In this menu you can view, at any stage, the values of the analog inputs at the moment.

Browse to the following folder:
Inputs/Outputs\View analog inputs state

Analog inputs calibration

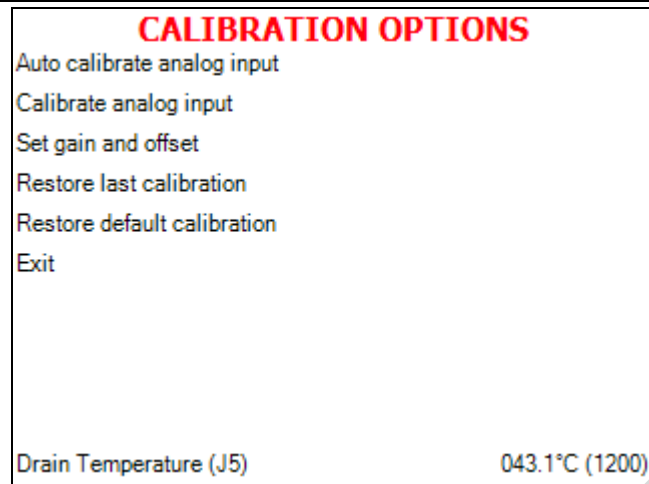
In this menu you can calibrate water level, mineral water level, pressure, and temperature sensors of the autoclave chamber.

1. Browse to the following folder:
Inputs/Outputs\Analog inputs calibration
The following screen will appear:

CALIBRATE ANALOG INPUTS	
Drain Temperature (J5)	043.2°C (1201)
Chamber Temperature (J2)	041.4°C (1201)
Bio Hazard Filter Temperature (J6)	152.0°C (3899)
Ref Temperature 1 (J3)	043.0°C (1199)
Jacket Temperature (J4)	122.3°C (2997)
Chamber Pressure (J7:1)	103.4 kPa (1601)
Exit	

2. Press Up or down key to choose the input to calibrate and press Start/Stop.

The following screen will appear:



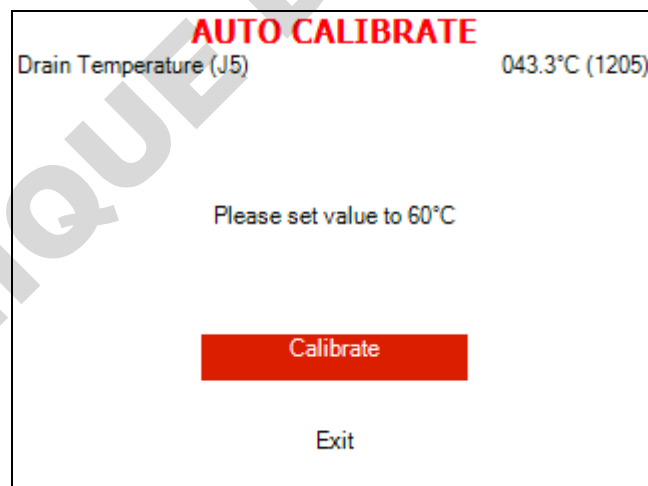
See below description of each option.

Auto calibrate

Bacsoft software has an option for automatic calibration using the PT100 simulator.

On the calibration options screen, choose Auto calibrate.

The following screen will appear:



Calibrate analog input

This menu allows calibrating analog inputs manually.

1. On the calibration options screen, choose Calibrate analog input.

The following screen will appear:

CALIBRATE ANALOG INPUT

Drain Temperature (J5) 043.1°C (1200)

Cur. Gain: 00.0386 Cur. Offset: -0003.23

Read Actual

High 0 1 3 0 .0 °C High 0 1 3 0 .0 °C

Low 0 0 6 0 .0 °C Low 0 0 6 0 .0 °C

Set Exit

2. In the Actual field, change the high and low values of the input as desired.

Set gain and offset

1. On the calibration options screen, choose Set gain and offset.
2. The following screen will appear:

SET GAIN AND OFFSET

Chamber Temperature (J2) 100.4°F (1198)

Gain: 0 0 .0 3 8 5

Offset: -0 0 0 8 .0 9

Set Exit

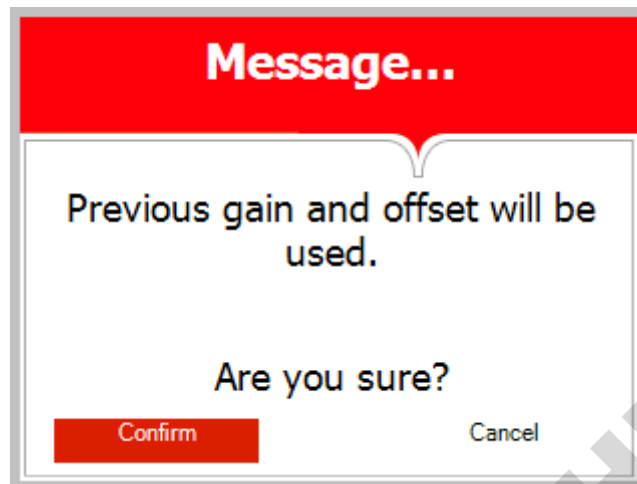
Change gain and offset as desired.

Restore last calibration

There is an option to restore the gain and offset values set at previous calibration.

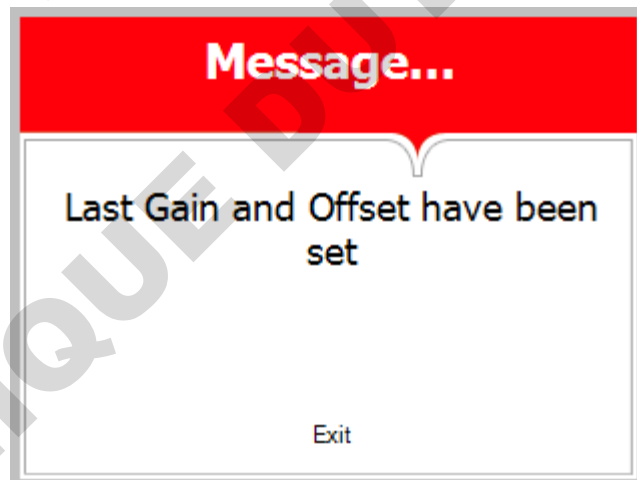
1. On the calibration options screen, choose Restore last calibration.

The following screen will appear:



2. Using the up and down keys, move your cursor to confirm and press Start/Stop.

The following screen will appear:

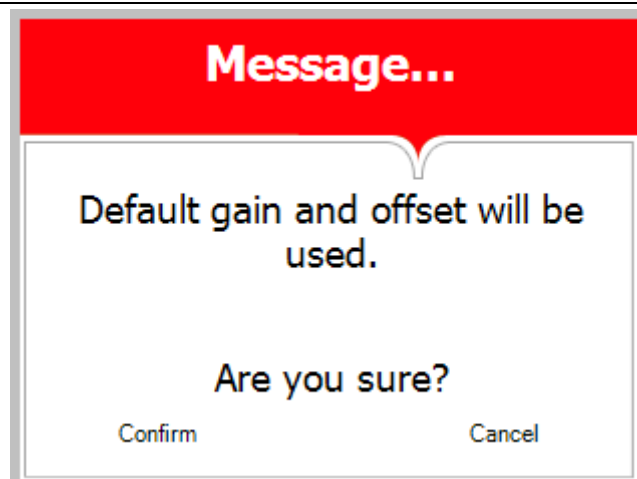


Restore default calibration

There is an option to restore the default (factory) gain and offset values.

1. On the calibration options screen, choose Restore last calibration.

The following screen will appear:



2. Using the up and down keys, move your cursor to confirm and press Start/Stop.

The following screen will appear:



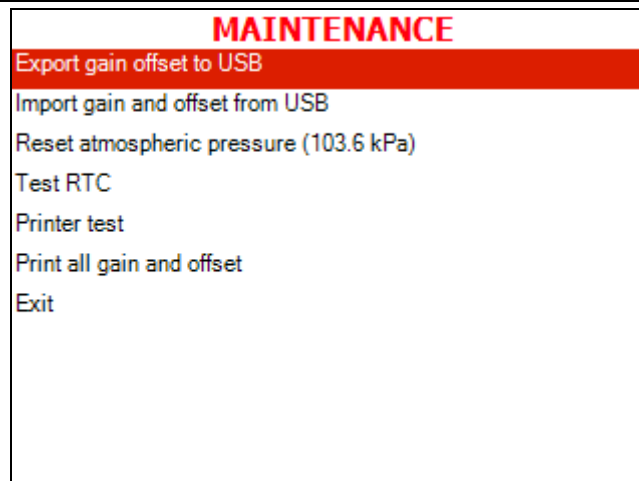
8.8 Maintenance

Maintenance procedures provided by Bacsoft software allow you additional tests and USB input/output options.

Browse to the following folder:

Main menu\Maintenance

You will see the following screen listing the maintenance options:



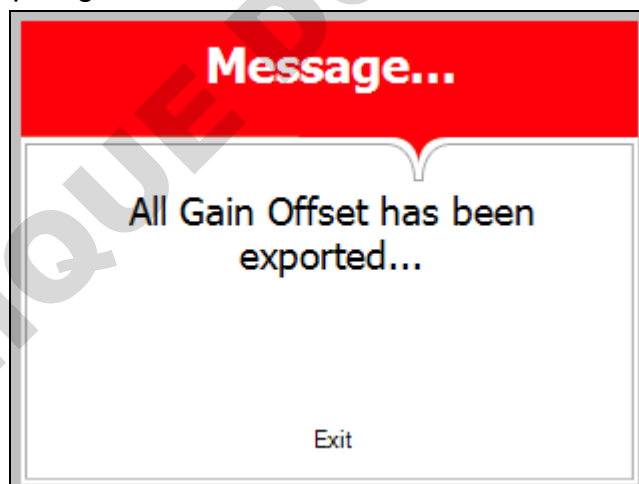
Below is the instruction for autoclave's maintenance menu.

Export gain offset to USB

In this menu you can export to USB the gain and offset you have got as a result of calibration.

Browse to the following folder:

Maintenance\ Export gain offset to USB



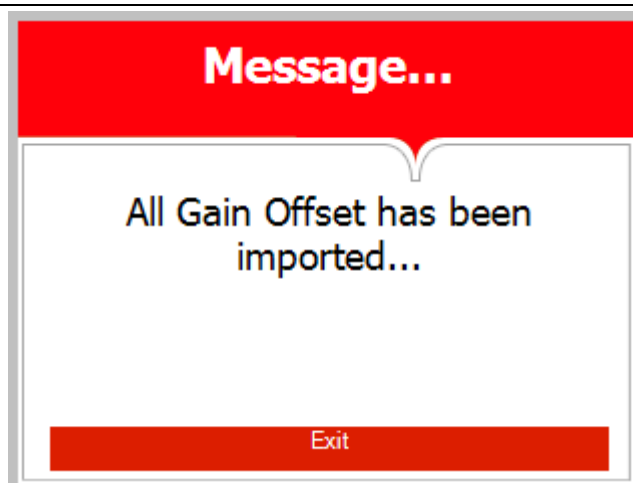
Import gain and offset from USB

In this menu you can import from the USB the gain and offset documents you have got as a result of calibration to the autoclave.

Browse to the following folder:

Maintenance\Import gain and offset from USB

Press Start/Stop. The following screen will appear:



Reset atmospheric pressure

In this menu you can reset the atmospheric pressure value. To do so:

1. Browse to the following folder:
Maintenance\Reset atmospheric pressure

The following screen will appear:



2. Leave the door open for 2 minutes at least. Ambient temperature should be less than 45°C.

Note: Please reset the atmospheric pressure when you install the autoclave for the first time, and each time you relocate or calibrate the autoclave.

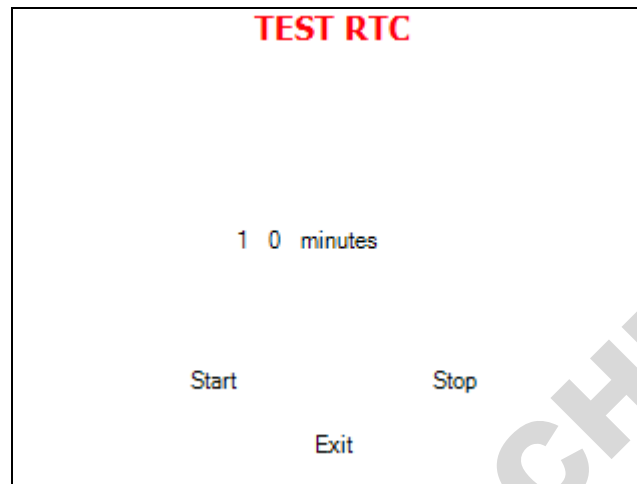
Test RTC

In this menu you can check the two clocks. The two clocks work during the interval set by the Test RTC parameter, and the results are displayed. If the results are different for more than 2 seconds, one of the clocks is faulty.

1. Browse to the following folder:

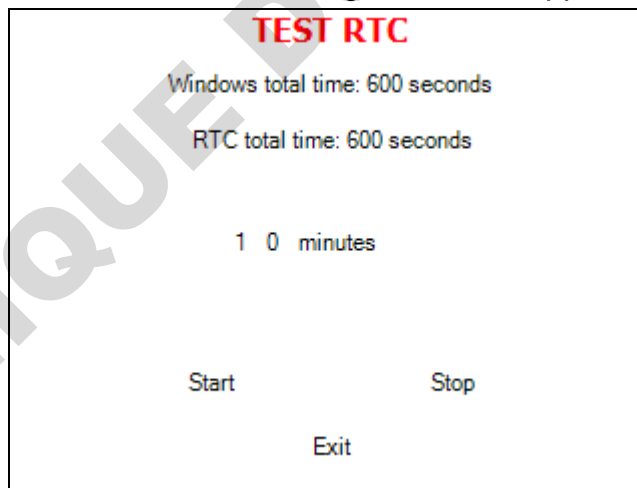
Maintenance\Test RTC

The following screen will appear:



2. Set the time interval as desired. Then move the cursor to start and press Start/Stop.

At the end of the test, the following screen will appear:



3. Using the Up and Down keys, move the cursor to Exit.

Printer test

In this menu you can check the normal function of the printer. The printer will print the list of errors.

Browse to the following folder:

Maintenance\Printer test

The following screen will appear to confirm that the test has been done.



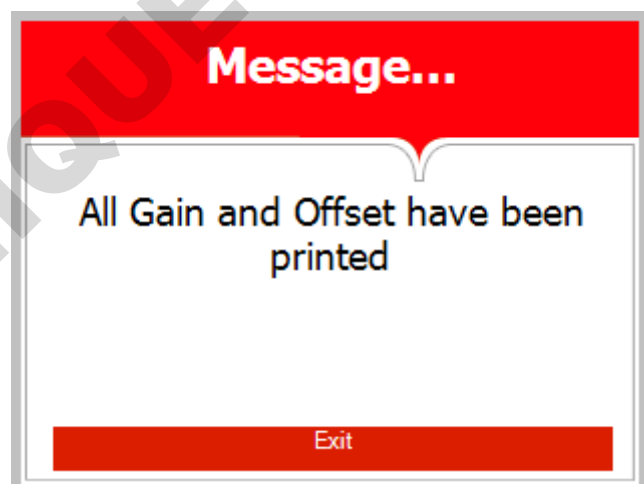
See the printout shown in the Printer handling chapter of the user manual.

Print all gain and offset

In this menu you can print all the gain and offset for all the pressures and temperatures in the autoclave (Chamber Temperature, Chamber Pressure, Chamber Water Level, Mineral Free Water Level).

Browse to the following folder:

Maintenance\Print all gain and offset



See below the example of a printout:

Chamber Temperature G:000.0385;O:-008.0976 Chamber Pressure G:000.1238;O:-098.5985

Chamber Water Level
G:001.0000;O:000.0000
Mineral Free Water Level
G:001.0000;O:000.0000

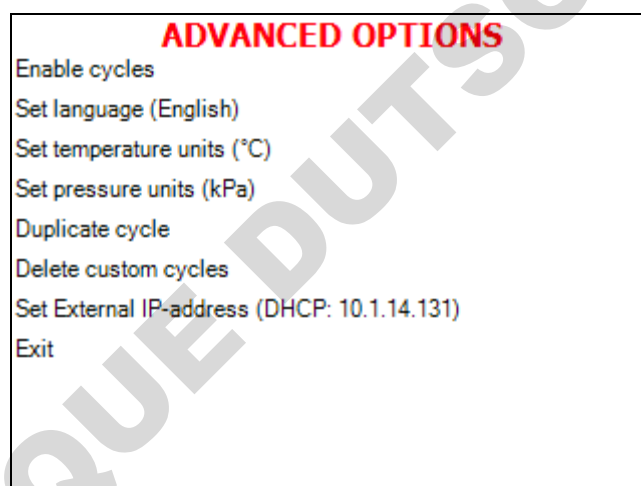
8.9 Advanced Options

Advanced options menu gives you even more possibilities, including interface customization, changing the settings, enabling, adding, and deleting cycles, etc.

Browse to the following folder:

Main menu\Advanced options

You will see the following screen listing the Advanced options:



Below is the instruction for the Advanced options menu.

Enable cycles

In this menu you can enable only the cycles you want to use. The cycles you do not want to use will not appear on the screen.

Browse to the following folder:

Advanced Options\Enable cycles

ENABLE PROGRAMS	
<input checked="" type="checkbox"/>	Glass
<input checked="" type="checkbox"/>	Plastic
<input checked="" type="checkbox"/>	Liquid A
<input checked="" type="checkbox"/>	Liquid B - Waste
<input checked="" type="checkbox"/>	Liquid A - Cooling
<input checked="" type="checkbox"/>	Liquid B Waste Cooling
<input checked="" type="checkbox"/>	Waste
<input checked="" type="checkbox"/>	Hollow Load
<input checked="" type="checkbox"/>	Bio hazard 1
<input checked="" type="checkbox"/>	Bio Hazard Liquids
<input checked="" type="checkbox"/>	Vacuum Test

Move cursor to the cycles you want to enable/disable and check/uncheck them as desired.

Set Language

In this menu you can choose the language for all the interface screens: menus, cycle information, system messages.

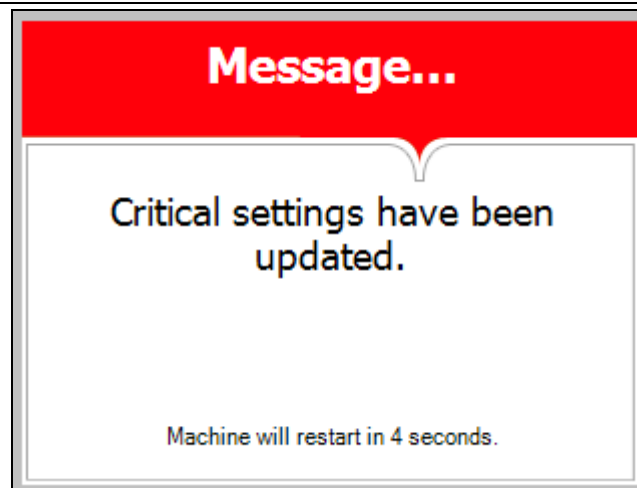
1. Browse to the following folder:

Advanced Options\Set Language

SET LANGUAGE	
<input checked="" type="radio"/>	English
<input type="radio"/>	German
<input type="radio"/>	Spanish
<input type="radio"/>	French
<input type="radio"/>	Italian
<input type="radio"/>	Chinese
<input type="radio"/>	Japanese
<input type="radio"/>	Korean
<input type="radio"/>	Dutch
<input type="radio"/>	Portuguese
<input type="radio"/>	Russian

Note: There are more languages than you see on the screen above. Just scroll down to see more.

2. Move the cursor to the desired language and check it. The following screen will appear:



The machine will restart, and the main screen (current cycle) will appear in the chosen language.

Set temperature units

In this menu you can set the temperature units (Celsius or Fahrenheit) for screens and printouts.

Browse to the following folder:

Advanced Options\Set temperature units

Change the parameter as desired.

Set pressure units

In this menu you can set the pressure units (kPa, Psia, Psig, BarA, BarG) for screens and printouts.

Browse to the following folder:

Advanced Options\Set pressure units

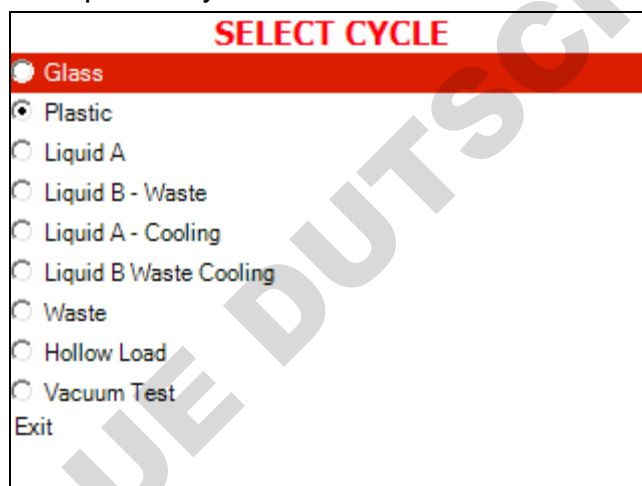
Change the parameter as desired.

Duplicate cycles

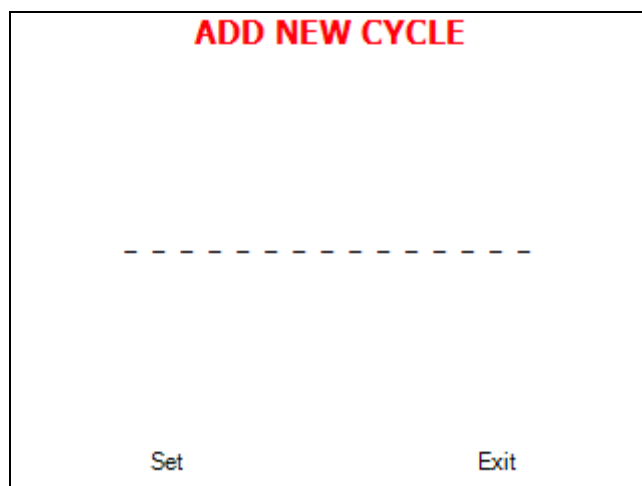
In this menu you can create a copy of one of the cycles with all its parameters (the parameters can be changed then). You can give any name to the new custom cycle.

Browse to the following folder:

Advanced Options\Duplicate cycles

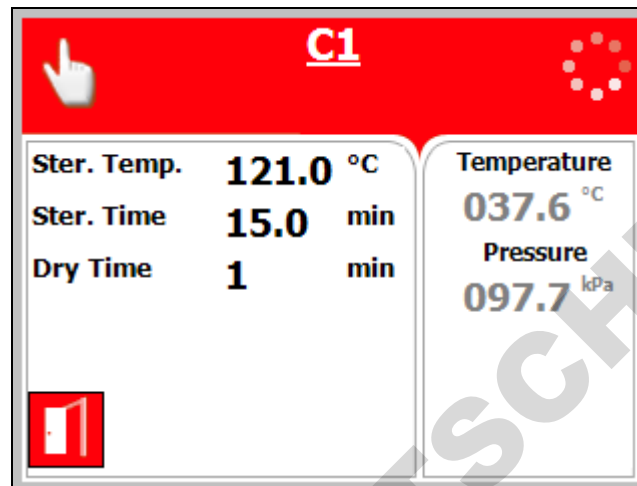


1. Using the Up and Down keys, move the cursor to the cycle you want to duplicate, then press Start/Stop to select the cycle. A custom program has been created with the same settings. You will be able to change the settings later. The following screen will appear:

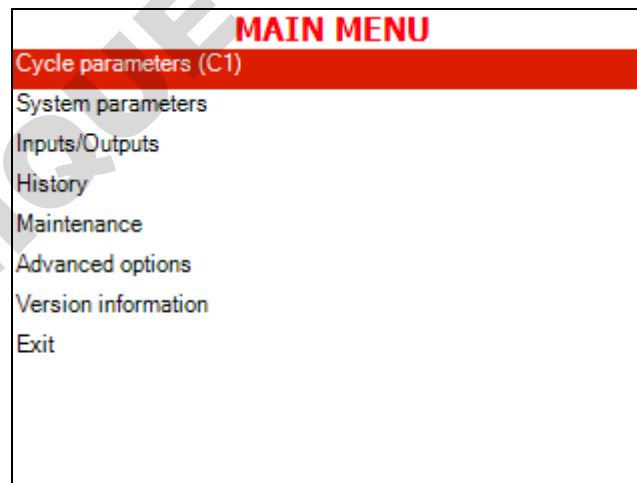


1. Give the name to your cycle.
2. Exit the menus until you get to the main screen.
3. Select your newly created program.

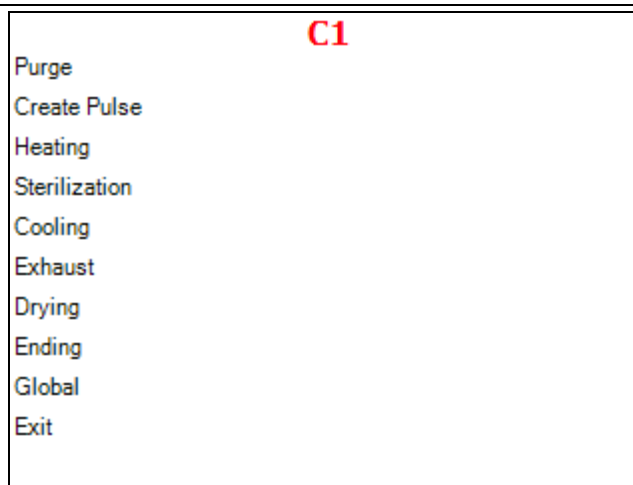
Note: you can select the program only when the autoclave door is open.



4. Login again as Technician (see 8.4).
5. In the main menu, select Cycle parameters and enter the Cycle Parameters screen.



The following screen will appear:



Now you can alter the cycle parameters as desired.

Delete custom cycles

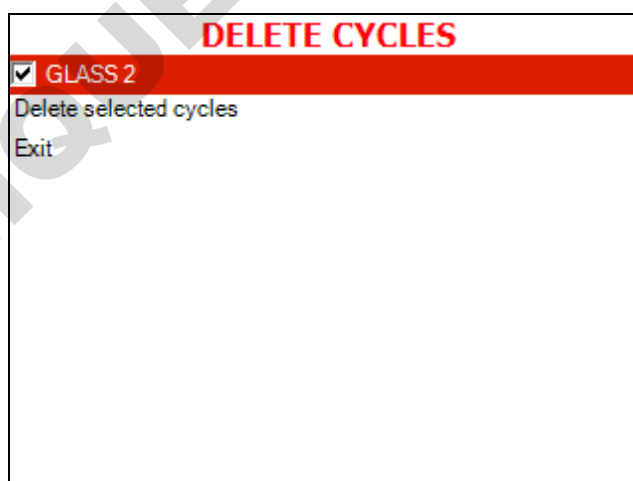
In this menu you can delete the custom cycles that were created.

Browse to the following folder:

Advanced Options>Delete custom cycles

1. Move the cursor to the cycle you wish to delete. Press Start/Stop key to select/deselect the cycles.
2. Move the cursor to Delete selected cycles and press Start/Stop key to delete.

The following screen will appear:



The selected custom cycle is now deleted.

Set external IP address

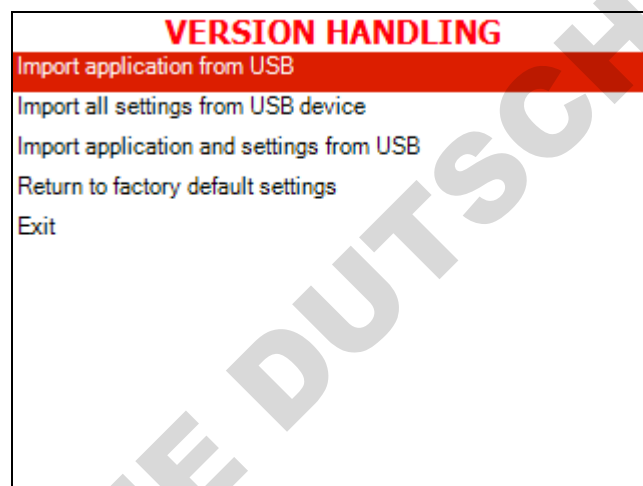
This option allows to set specific external IP address to be used for remote RCPR connection.

Browse to the following folder:
Advanced Options\Set external IP address
Set the External IP Address as desired.

8.10 Version handling

The version handling menu provides tools to import, export, and restore the autoclave software.

Browse to the following folder:
Main menu\Version Handling
You will see the following screen listing the version handling options:



Below is the instruction for version handling.

Import application from USB

In this menu you can replace the autoclave software with the application software from the USB device to the autoclave.

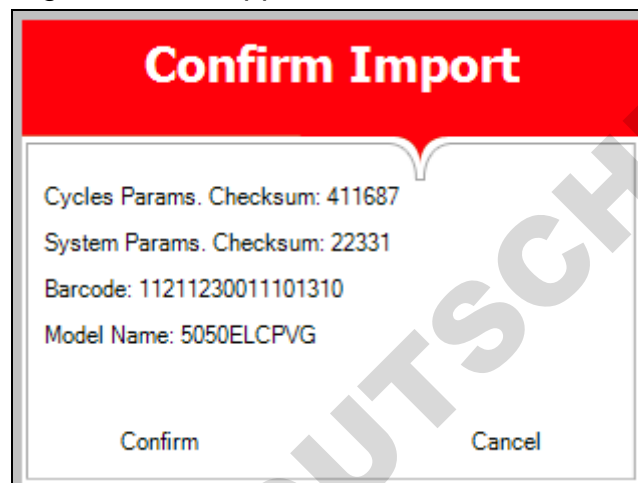
1. Browse to the following folder:
Version handling\Import application from USB
The system will prompt you to confirm import
2. Move the cursor to Confirm and press Start/Stop.
The application will be imported from the USB device.

Import all settings from USB device

In this menu you can import the autoclave's individual settings from the USB device. The settings include all the changeable parameters of the cycle and the system.

1. Browse to the following folder:
Version handling\Import all settings from USB device.

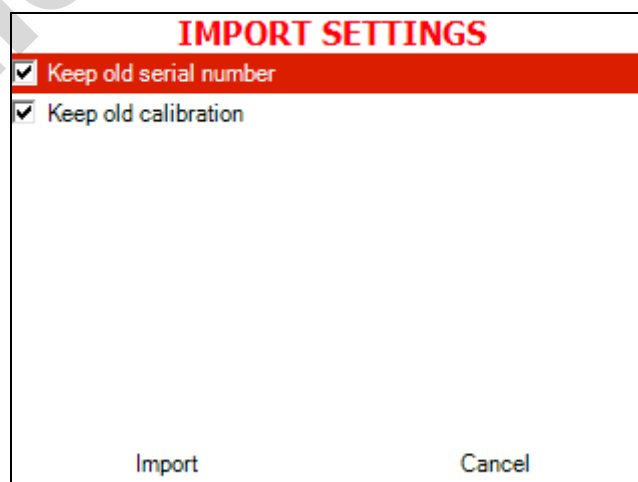
The following screen will appear:



On this screen, you will see the model name and parameters checksum of the settings saved on the USB device.

2. Move the cursor to Confirm and press Start/Stop.

The following screen will appear:



3. There is an option to keep the old serial number or calibration data while exporting all the rest from USB. Check/ uncheck respective checkboxes as desired.

All the autoclave settings will be imported from the USB device except for the screen above.

Import application and setting from USB

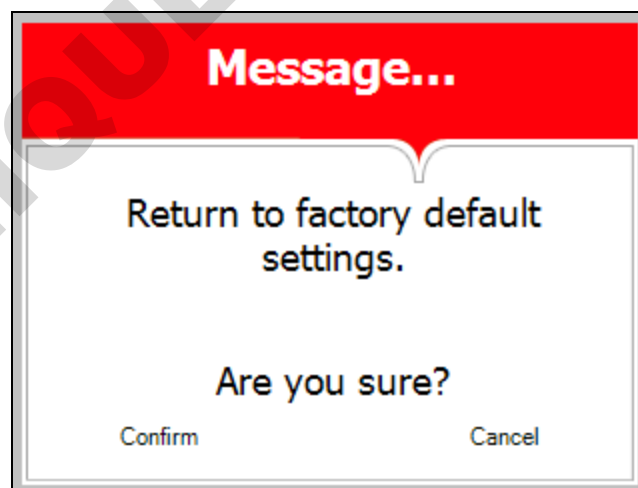
In this menu you can replace both the application software and the parameters of the autoclave with the software and parameters from the USB device.

4. Browse to the following folder:
Version handling\Import application and setting from USB
5. Move the cursor to Confirm and press Start/Stop.

Return to factory default settings

In this menu you can restore the default values of all the changeable parameters of the cycle and the system. Default settings are those your autoclave had when it left the factory.

1. Browse to the following folder:
Version handling\Return to factory default settings



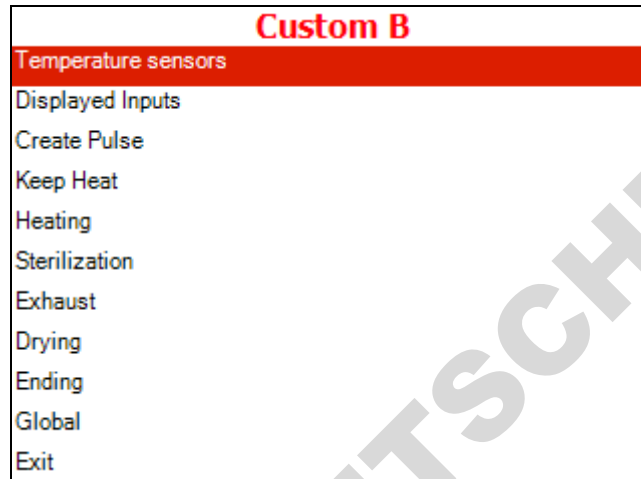
2. Move the cursor to Confirm and press Start/Stop. The default factory settings will be restored.

8.11 Cycle parameters

The Cycle parameters menu includes parameters of a specific sterilization program (cycle). Browse to the following folder:

Main menu\Cycle parameters

You will see the following screen listing the cycle parameters:



Note: For all the standard sterilization cycles, and for Bowie and Dick test, the only changeable cycle parameter is dry time (you will not see other parameters on your screen). For the custom cycles created by duplication, and for the Warm Up cycle, all the options listed in table below are changeable. Operator is not allowed to create custom cycles; only authorized technician can do this.

Subdirectory		Property
Temperature sensors		Chamber Temperature
Displayed inputs		First
		Second
		Third
Purge (generator models only)		Purge time
		Purge temperature
For custom programs only	Create Pulse	Pulse A Count
		Pulse A Stay Time
		Pulse A Low Pressure
		Pulse A High Pressure
		Pulse B Count

		Pulse B Stay Time
		Pulse B Low Pressure
		Pulse B High Pressure
	Keep Heat	Temperature 1 stay
		Temperature 1 stay time
		Temperature 2 stay
		Temperature 2 stay time
	Heating	Sterilization Temperature
	Sterilization	Sterilization Temperature
		Sterilization Time
For custom programs only	Cooling ("C" models only)	Cool Mode
		Cool End Temperature
		Cool Exhaust Rate
	Exhaust	Exhaust Mode
	Drying	Dry Time
		Dry Heat On 1
		Dry Heat Off 1
		Dry First Stage Time
		Dry Heat On 2
		Dry Heat Off 2
		Add Dry Time
	Ending	End Temperature
	Global	FO Mode
		Check RTC
		Multiple Cycles
		Multiple Cycles Gap
		Jacket Temperature

The following chapters explain meaning and usage of the control screens for the cycle parameters.

8.12 Temperature sensors

Temperature sensors \Chamber Temperature

In case a machine has a number of temperature sensors, there is an option to assign every chamber temperature sensor to be one of the following: main, reference, not in use.

1. Browse to the following folder:

Cycle parameters\Temperature sensors\Chamber Temperature

The following screen will appear:

G1 CYCLE TEMPERATURE SENSORS		
Chamber Temperature		
<input checked="" type="radio"/> Main	<input type="radio"/> Reference	<input type="radio"/> Not In Use
Bio Hazard Filter Temperature		
<input type="radio"/> Main	<input type="radio"/> Reference	<input checked="" type="radio"/> Not In Use
Ref Temperature 1		
<input type="radio"/> Main	<input type="radio"/> Reference	<input checked="" type="radio"/> Not In Use
<div>Save</div> <div>Exit</div>		

2. Using Up and Down keys, move the cursor around the screen and check the desired radio buttons by pressing Start/Stop.
3. Using Up and Down keys, move the cursor to Save and press Start/Stop.

8.13 Displayed inputs

This menu defines 2 (or 3, according to the cycle type) input values to be shown on the display.

You can choose, for each of them: chamber temperature, chamber pressure, chamber water level, and mineral free water level. Below is the example of setting the first input.

1. Browse to the following folder:

Cycle parameters\Displayed inputs\First

The following screen will appear:

CYCLE DISPLAYED INPUTS

First	Chamber Temperature
Second	Chamber Pressure
Third	None
Exit	

Using the Up and Down keys, choose first, second, or third.

2. The following screen will appear:

SET DISPLAY SEQUENCE

☐ None
☒ Chamber Temperature
☐ Chamber Pressure
☐ Chamber Water Level
☐ Mineral Free Water Level
 Exit

3. Using Up and Down keys, move the cursor to the desired radio button and choose it by pressing Start/Stop.

8.14 Purge (generator models only)

There is an option to remove the air from the chamber before sterilization. Saturated steam is introduced into the chamber and it pushes the air out through a valve. Purge is usually used for Isothermal cycle.

1. Browse to the following folder:

Cycle parameters\Purge

The following screen will appear:

G1	
Purge Time	0.0 min
Purge Temperature	121.0 °C
Exit	

2. Change the parameters as desired.

8.15 Create Pulse

This menu allows to set parameters for each pulse of the program (see below).

G1	
Pulse A Count	1.0
Pulse A Stay Time	60.0 sec
Pulse A Low Pressure	25.0 kPa
Pulse A High Pressure	110.0 kPa
Pulse B Count	0.0
Pulse B Stay Time	2.0 sec
Pulse B Low Pressure	160.0 kPa
Pulse B High Pressure	180.0 kPa
Pulse C Count	0.0
Pulse C Stay Time	2.0 sec
Pulse C Low Pressure	160.0 kPa

Pulse A Count

This parameter defines how many times the pulse of each type (A, B) is repeated. For example, if the Pulse count for pulse A (low) is 4, and the Pulse count for pulse B (high) is also 4, the cycle will have the following pulses: low-high-low-high-low-high-low-high.

1. Browse (to the following folder:
Cycle parameters\Create Pulse\Pulse A Count
Change the parameter as desired.

Note: Pulse A and B counts for standard programs equal one, except for Hollow load, Waste, and Bowie and Dick test (pre-vacuum models only), whose pulse count equals four.

Pulse A Stay Time

This parameter defines the value of delay after the required pressure for the pulse is reached.

1. Browse to the following folder:

Cycle parameters\Create Pulse\Pulse A Stay Time

Change the parameter as desired.

Note: Same parameters are available for other pulses. The following cycles have four pulses pre-vacuum models only): Hollow load, Waste, and Bowie and Dick test. Other cycles have only one pulse.

Pulse A Low Pressure

This parameter defines the lower pressure value for the A pulse.

1. Browse to the following folder:

Cycle parameters\Create Pulse\Pulse A Low Pressure

2. Change the parameter as desired.

Note: Same parameters are available for other pulses. The following cycles have four pulses pre-vacuum models only): Hollow load, Waste, and Bowie and Dick test. Other cycles have only one pulse.

Pulse A High Pressure

This parameter defines the higher-pressure value for the A pulse

Browse to the following folder:

Cycle parameters\Create Pulse\Pulse A High Pressure

Change the parameter as desired.

Note: Same parameters are available for other pulses. The following cycles have four pulses pre-vacuum models only): Hollow load, Waste, and Bowie and Dick test. Other cycles have only one pulse.

8.16 Keep Heat

There are two optional stages, within the sterilization cycle, when constant temperature (Temperature 1 or 2 stay) is maintained for certain time period (Temperature 1 or 2 stay time). Keep Heat starts before heating and is used to melt solid loads of substances such as agar. Keep Heat is needed for such loads to become completely liquid before sterilization starts.

Below is the example of changing the Temperature 1 stay/stay time.

Temperature 1 stay

This parameter allows you to set two temperatures at which the process will be paused (Keep Heat). It is possible to set the 2 values (Temp 1 stay and Temp 2 stay).

Custom B	
Temperature 1 Stay	239.0 °F
Temp 1 Stay Time	0.0 min
Temperature 2 Stay	248.0 °F
Temp 2 Stay Time	0.0 min
Exit	

Browse to the following folder:

Cycle parameters\Keep Heat\Temperature 1 stay

Change the parameter as desired.

Temperature 1 stay time

This parameter allows you to set two temperatures at which the process will be paused (Keep Heat). Pause duration is set by Temperature 1 (2) stay time parameter.

Custom B	
Temperature 1 Stay	239.0 °F
Temp 1 Stay Time	0.0 min
Temperature 2 Stay	248.0 °F
Temp 2 Stay Time	0.0 min
Exit	

1. Browse to the following folder:

Cycle parameters\Keep Heat\Temperature 1 stay time.

Note: same parameters are available for temperature 2.

2. Change the parameter as desired.

8.17 Heating

Sterilization Temperature

This parameter defines the heating temperature for the cycle. At reaching this temperature, sterilization stage starts. This parameter is equal to the sterilization temperature of the sterilization section (see below).

1. Browse to the following folder:
Cycle parameters\Heating\Sterilization Temperature
2. Change the parameter as desired.

8.18 Sterilization

Sterilization Temperature

This parameter defines the sterilization temperature for the cycle.

1. Browse to the following folder:
Cycle parameters\ Sterilization\Sterilization Temperature
2. Change the parameter as desired.

Sterilization Time

This parameter defines duration of the sterilization stage for the cycle.

3. Browse to the following folder:
Cycle parameters\ Sterilization\Sterilization Time
4. Change the parameter as desired.

8.19 Cooling ("C" models only)

This menu defines parameters for the cooling stage.

G1	
Cool Mode	0.0
Cool End Temperature	85.0 °C
Cool Exhaust Rate	5.0 kPa/min
Exit	

Cool Mode

If the setup of your model has the cooling option, and the cycle has the cooling stage, the Cool mode parameter equals 1, otherwise it equals 0. You can set this parameter as 0 or 1 therefore enabling or disabling the cooling option.

1. Browse to the following folder:
Cycle parameters\Cooling\Cool Mode
2. Change the parameter as desired.

Cool End Temperature

When the Cool end temperature is reached, the cooling stage is finished.

1. Browse to the following folder:
Cycle parameters\Cool Mode\Cool End Temperature
2. Change the parameter as desired.

Cool Exhaust Rate

This parameter defines how quickly the pressure will go down during exhaust after cooling.

1. Browse to the following folder:
Cycle parameters\Cool Mode\Cool Exhaust Rate
2. Change the parameter as desired.

8.20 Exhaust

This menu defines parameters for the exhaust stage.

Exhaust Mode

The Exhaust mode parameter equals:

- 1 for fast exhaust in the end,
- 2 for slow exhaust in the end plus opening the fast exhaust when the pressure equals 30 kPa above the ambient pressure,
- 3 for slow exhaust opened during the entire cycle,
- 4 for BH exhaust mode (see BH cycles explanation).

You can set this parameter and thereby change the exhaust mode.

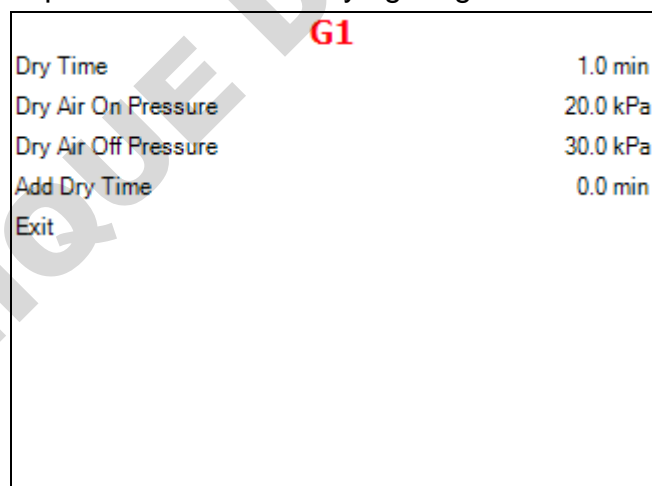
Browse to the following folder:

Cycle parameters\Exhaust\Exhaust Mode

Change the parameter as desired.

8.21 Drying

This menu defines parameters for the drying stage.



G1	
Dry Time	1.0 min
Dry Air On Pressure	20.0 kPa
Dry Air Off Pressure	30.0 kPa
Add Dry Time	0.0 min
Exit	

Dry Time

This parameter defines duration of the drying stage for the cycle.

1. Browse to the following folder:
Cycle parameters\Drying\Dry Time
2. Change the parameter as desired.

Drying stage is divided into two stages. For each stage you can set the total time, on time and off time. So, during the Dry First Stage, the heating elements are on for the time set in Dry Heat On 1, then they go off for the time set in Dry Heat Off 1, and then this sequence is repeated during the entire Dry First Stage Time. The same is true for the Dry Second Stage.

Dry Heat On 1

This parameter defines how long will the heating elements be on for the Dry First Stage.

Browse to the following folder:

Cycle parameters\Drying\Dry Heat On 1

Change the parameter as desired.

Note: There are Dry heat On 2 and Dry heat Off 2 parameters for the Dry Second Stage of the drying.

Dry Heat Off 1

This parameter defines how long will the heating elements be off for the Dry First Stage.

1. Browse to the following folder:

Cycle parameters\Drying\Dry Heat Off 1

2. Change the parameter as desired.

Note: There are Dry heat On 2 and Dry heat Off 2 parameters for the Dry Second Stage of the drying.

Dry First Stage Time

This parameter defines duration of the Dry First Stage. The Dry Second Stage time is calculated as Dry Time minus the Dry First Stage Time, that is why there is no Dry Second Stage Time menu.

1. Browse to the following folder:

Cycle parameters\Drying\Dry First Stage Time

2. Change the parameter as desired.

Add Dry Time

This subdirectory allows you to change the Dry Time parameter for the current cycle.

Browse to the following folder:
Cycle parameters\Drying\Add Dry Time
Change the parameter as desired.

8.22 Ending

This menu defines the End temperature parameter for the Ending stage.

End Temperature

This parameter defines the temperature when the cycle ends. The cycle will not end, and the door will not open unless the autoclave chamber is cooled down to this temperature.

1. Browse to the following folder:
Cycle parameters\Ending\End Temperature
2. Change the parameter as desired.

8.23 Global (for some models only)

This menu defines the global cycle parameters.

G1	
F0 Mode	0.0
Bio Hazard	0.0
Check RTC	1.0
Multiple Cycles	1.0
Multiple Cycles Gap	2.0 min
Jacket Temperature	85.0 °C
Exit	

F0 mode

This parameter checks how long has the load been in sterilization conditions (pressure, temperature) before the sterilization stage actually begins. This data helps preventing damage to the load by excessive exposure to heat and high pressure.

1. Browse to the following folder:

Cycle parameters\Global\F0 mode

2. Change the parameter as desired.

Check RTC

In this menu you can set the time interval for checking the two clocks. The two clocks work during this interval, and the results are displayed. If the results are different for more than 2 seconds, one of the clocks is faulty. For the procedure of the check itself, see Maintenance\Test RTC.

1. Browse to the following folder:
Cycle parameters\Global\Check RTC
2. Change the parameter as desired).

Multiple Cycles

This parameter allows you to repeat, for testing purposes, the same cycle several times without reloading the autoclave. The number or repetitions is defined by this parameter.

1. Browse to the following folder:
Cycle parameters\Global\Multiple Cycles
2. Set the parameter as desired.

Multiple Cycles Gap

This parameter allows you to set the time interval between the multiple cycles (see above).

1. Browse to the following folder:
Cycle parameters\Global\Multiple Cycles Gap
2. Change the parameter as desired.

Jacket Temperature

This parameter defines the temperature of the jacket (for the relevant models only). The system is not ready unless the jacket reaches this temperature.

1. Browse to the following folder:
Cycle parameters\Global\Jacket Temperature
2. Change the parameter as desired.

9. Maintenance and Replacement Procedures



Warning!

Do not touch door micro-switches in case of malfunction! Call Tuttnauer service.

9.1 Preliminary Operations for Each Technician Call

1. **To maintain efficient service, the technician must perform the following:**
 - a. Cleaning the following, if requires cleaning:
 - ◆ Chamber, trays, and trays holder.
 - ◆ Filters.
 - ◆ Bottom parts and plungers of the solenoid valves.
 - ◆ Water reservoir.
 - b. Visual inspection for leaks or corrosion in the piping elements
 - c. Fastening loose screws and piping joints.
 - d. Visual inspection of the wiring.
 - e. In case some electronic parts were replaced, calibration and logging the calibration of the temperature and pressure – see Calibration.
2. **After completing the work, the technician must perform the following cycles:**

A 134°C (273°F) cycle with full load.

9.2 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. Connect the electrical cord to the autoclave.
 2. Turn on the main switch on the right side of the autoclave.
 3. Short-circuit the L and N pins on the cord's plug.
 4. Connect the Short-circuit pins to the L pole on the electrical tester.
 5. Connect the earth pins to the earth pole on the electrical tester.
 6. 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.

9.3 Dismantling the Outer Cover of the Autoclave

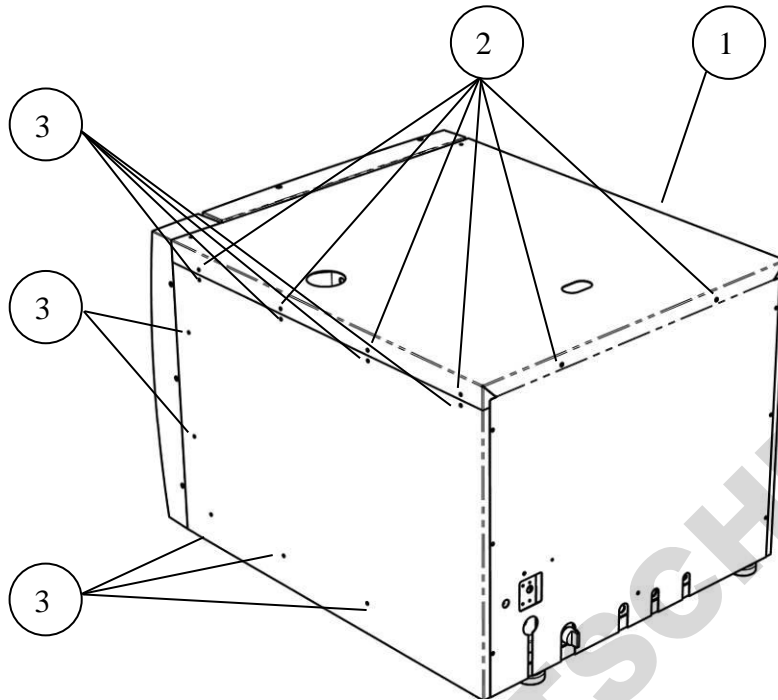


Caution!

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. Unscrew the screws (2) holding the upper cover (1).
2. Remove the upper cover (1).
3. Unscrew the screws (4) holding the outer cover (3).
4. Remove the outer cover (3).
5. Remove the grounding wires from the outer cover.



9.4 Replacing the chamber heater

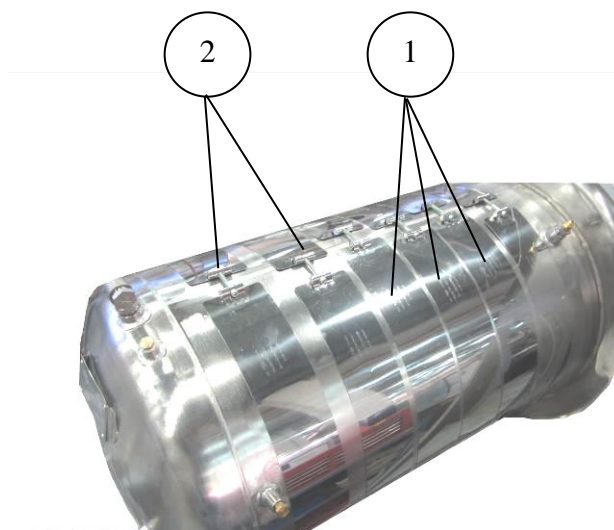


Caution:

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

Allow the autoclave to cool before removing outer cover.

1. Take off the autoclave covers.
2. Remove the insulation blanket.
3. Remove the heating element tightening bolts (2).
4. Disconnect the heating element wires from the porcelain connector.
5. Replace the heating elements.
6. Re-assemble the autoclave insulation and the cover.
7. Run a cycle and verify that it operates as required.



9.5 Checking the Safety Valve Type 1

Note: To prevent the safety valve from becoming blocked, it is necessary to allow the steam pressure to escape through it (every month).

To avoid injuries, begin this check while the autoclave is cold.

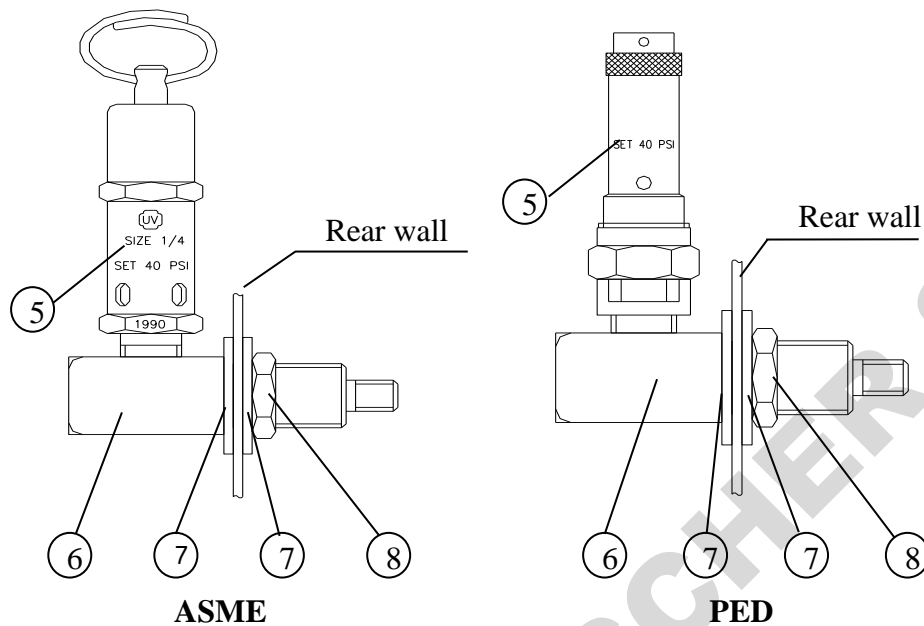
1. Operate the sterilization cycle according to the manual .
2. Allow a pressure of approx. 200 kPa to build up in the chamber.
3. To access the safety valve, see “Replacing the safety valve”.

For ASME valves:

- a. Pull the ring of the safety valve using a tool, i.e., screwdriver, hook etc. and lift the safety valve ring for 2 seconds. Be careful not to burn your hands.

For PED valves:

- a. Turn the pressure relief nut counterclockwise for 2 seconds. Verify that steam escapes from the valve.
- b. Return the nut to its original position.
4. Press the STOP key to interrupt the operation, and exhaust steam from the chamber.
5. Wait until the pressure decreases to 100 kPa, only then the door can be opened.
1. Replace it with a new safety valve (use an original only).



9.6 Replacing the Safety Valve Type 1

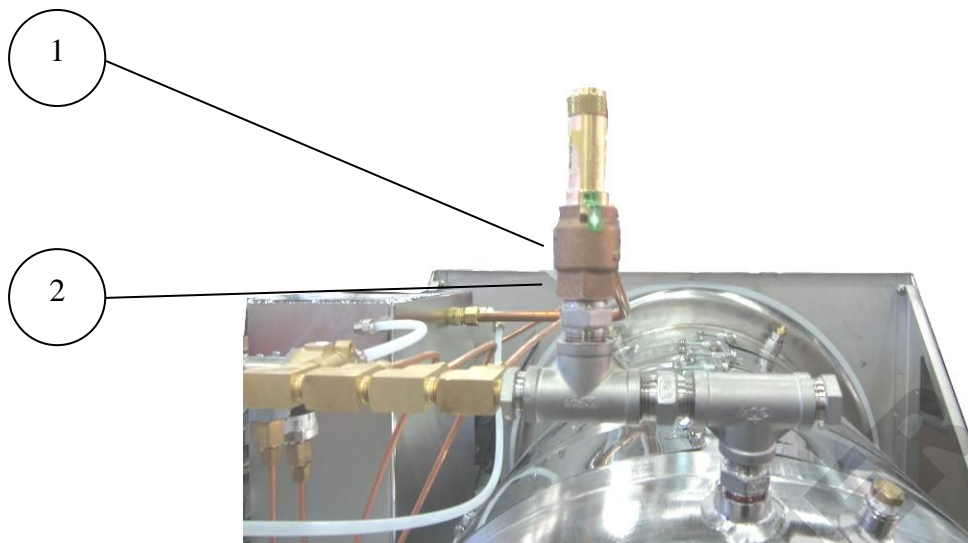


Caution!

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

Note: this instruction refers to both, PED and ASME approved safety valves

1. Remove the outer cover of the autoclave.
2. Disconnect the pipe connection.
3. Unscrew and remove the safety valve (1) with a 21 mm wrench. In order not to damage the autoclave cover, use a 20 mm wrench to apply a counter force on the base (2) of the safety valve.
4. Replace it with a new safety valve (use an original only).



5. Test autoclave cycles.

No.	Description	Cat. No.	No.	Description	Cat. No.
1	Chamber safety valve	PED 2.8 Bar SVL029-0028	6	Safety valve base	CMV100-0004
		ASME 40 psi SVL029-0090	7	Screw	BOL190-0150

10.6 Checking the Safety Valve type 2 ("Apollo")

1. Operate the sterilization cycle according to the manual.
2. Allow a pressure of approximately 200 kPa (29-psi) to build up in the chamber.
4. Operate the safety valve:
5. Pull the valve's handle and verify that steam escapes from the valve.
6. Press the STOP key to pause operation, and exhaust steam from chamber.
7. Wait until pressure goes down to zero, only then can the door be opened.

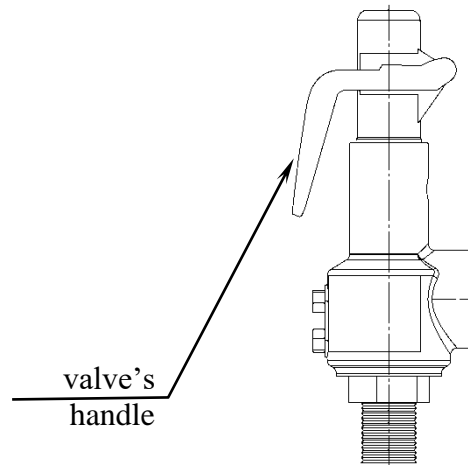


Attention:

Use protective gloves in order not to burn your hands with the hot steam.

8. Press the STOP key to interrupt the operation, and exhaust steam from the chamber.

9. Wait until the pressure decreases to zero, only then can the door be opened.



10.7 Replacing the Safety Valve type 2 ("Apollo")

1. Disconnect the pipe connection.
2. Unscrew the safety valve (including the base) and remove from the autoclave.
3. Replace it with a new safety valve (use an original only).
4. Test autoclave cycles.

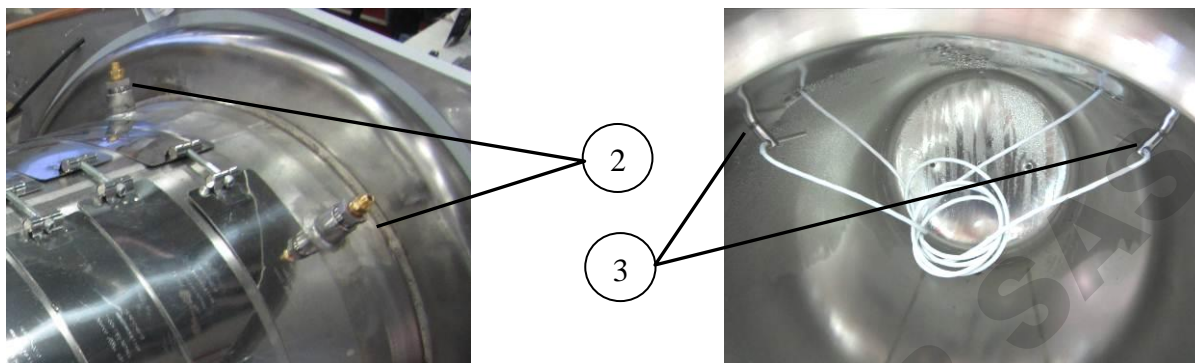
9.7 Replacing the PT100 Temperature Sensor



Caution!

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

1. Remove the autoclave outer covers.
2. Unscrew the nut of the temperature sensor (2).
3. Remove the sensor (3) from its seat and replace it with a new sensor.
4. Fasten the sensor to the seat by assembling the new nut to the sensor's seat.



9.8 Replacing the Door Cover (Automatic Door)



Caution!

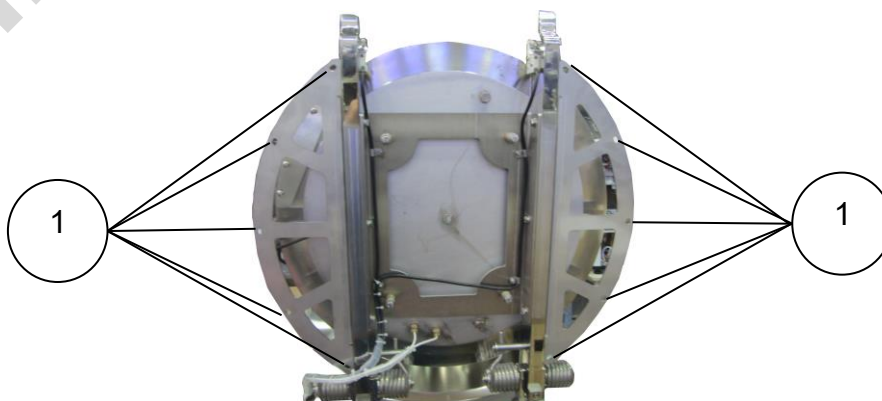
Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the chamber or the generator.

Allow the autoclave to cool before opening the service doors.

To avoid injuries, replace the gasket while the autoclave and the autoclave door are cold.

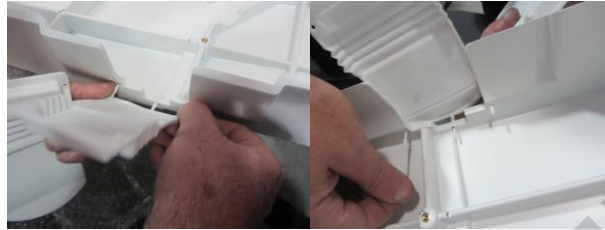
Disassembling the door cover

1. Open the door.
2. Release the 10 screws (1) assembling the door bridge to the door cover.
3. Remove the door cover.

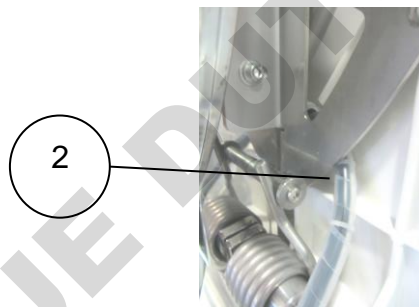


Assembling the door cover

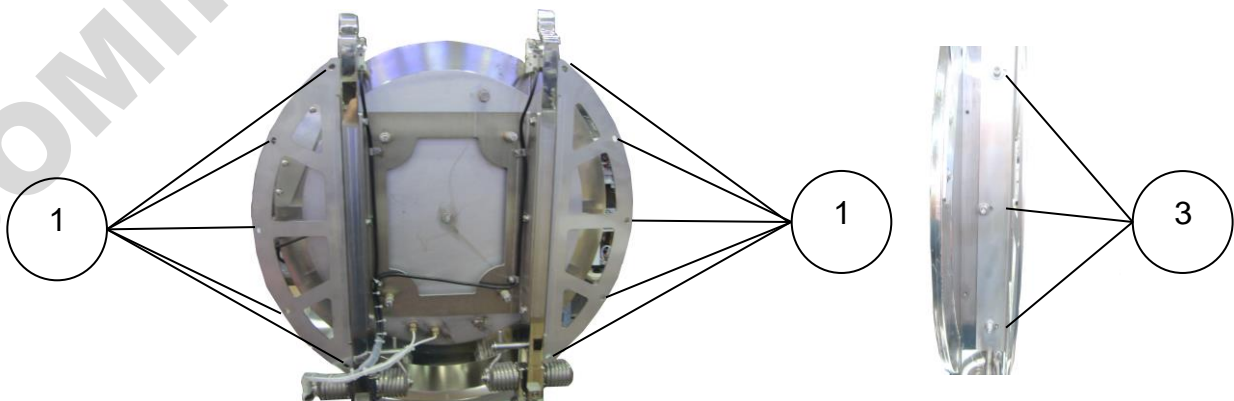
1. Take the door bolt covers and insert the 3 moulded pins into the three corresponding holes, then pull them from inside until they lock into place (see the figure below).



1. Place the cable (2) in its place behind the bridge as shown on the figure below.



2. Loosen the 3 screws (3) on the bridge side to allow the door cover final alignment.

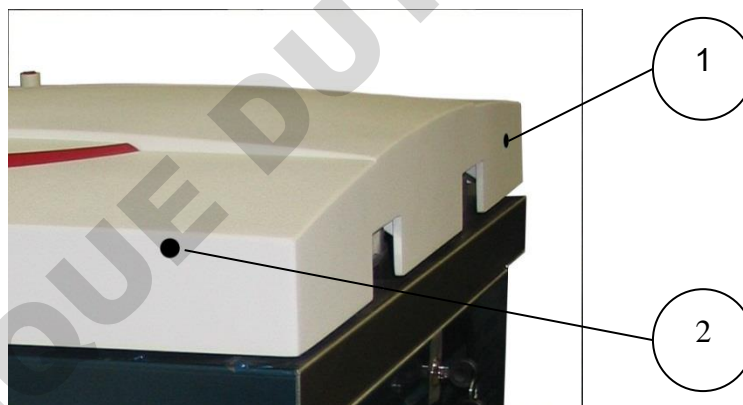


3. Use 10 screws (1) to assemble the new door cover to the bridge. Do not tighten the screws to allow the door cover final alignment.
 4. Close the door and align the cover so it is parallel to the autoclave body in all planes.
- Note:** Open and close the door slowly so as not to disturb the alignment achieved in step 6.
5. Carefully tighten all the 13 screws (1 and 3) in pairs opposite each other.
 6. Close the door and see if it is still aligned. Repeat the alignment if required.

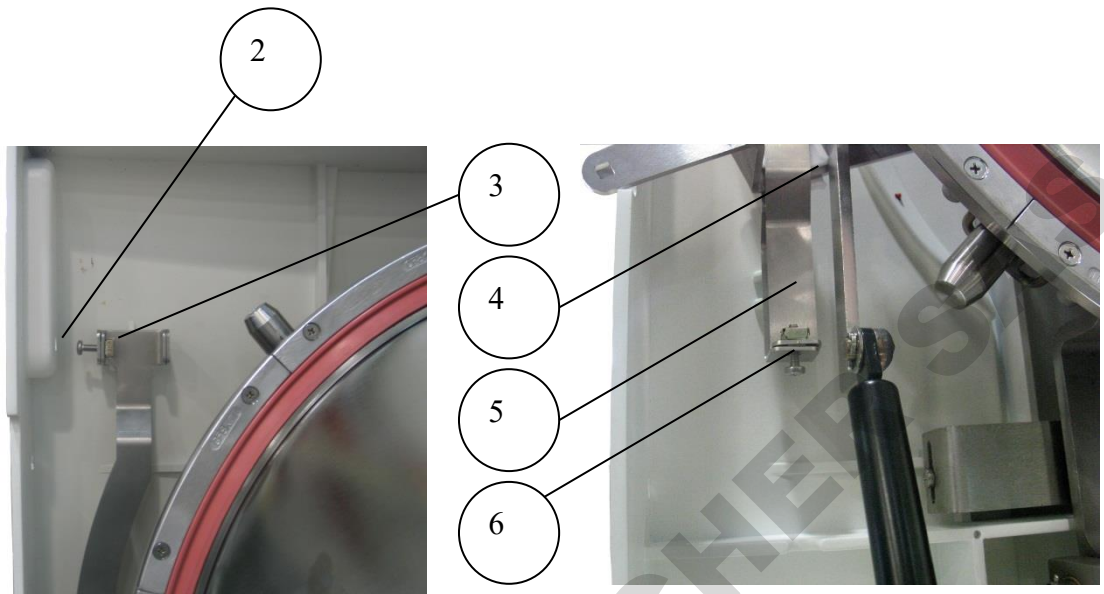
9.9 Replacing the door cover (MD -- Mechanic Door)

9.9.1 Disassembling the door cover

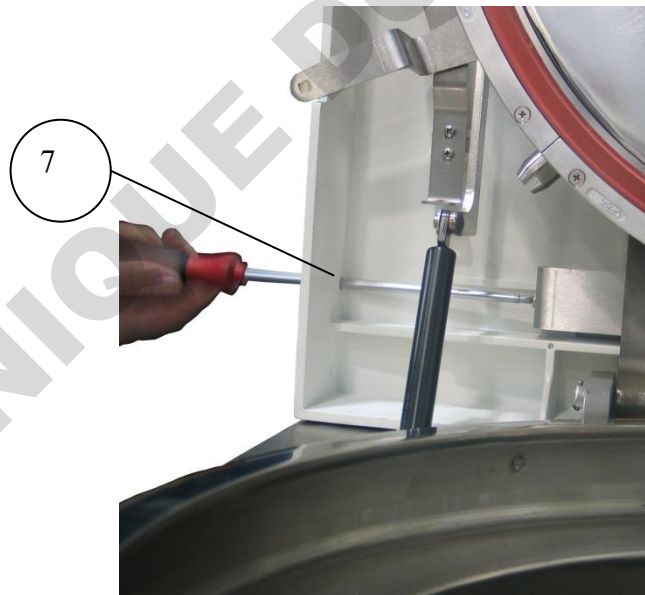
1. Remove the plugs covering the holes (1, 2) on the sides of the door cover.



2. While the door is closed, Unscrew the screw (6) attaching the bottom part of the inner (facing the chamber) closing-arm guide (5) to the door cover. Do this with a screwdriver inserted through the hole (1) in the bottom side of the door cover.
3. Open the door of the autoclave.
4. Unscrew the screw (3) attaching top part of the inner closing-arm guide (5) to the door cover. Do this with a screwdriver inserted through the hole (2) in the side of the door cover.
5. Remove the inner closing-arm guide. Be careful not to lose the Teflon sliding spacer (4).



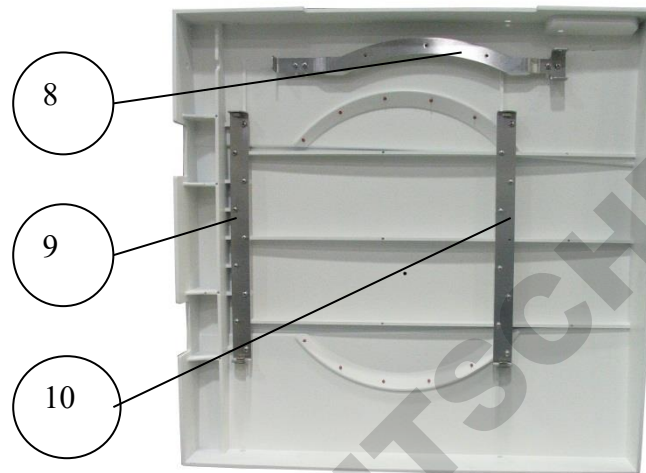
6. Insert a screwdriver in the holes on the sides of the door cover (7) and unscrew the 4 screws (14) assembling the door cover to the door.



7. Remove the door cover. Be careful not to lose the second sliding spacer (placed between the closing arm and the door cover).

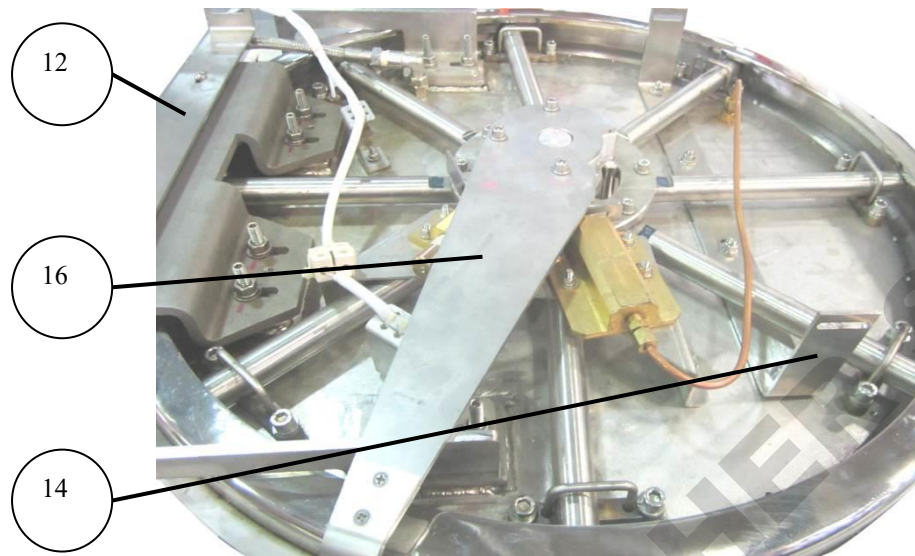
9.9.2 Assembling the door cover

1. Assemble the following items to the door cover:
 - The inner closing arm support (8).
 - The connector of the door cover to the door hinges (9).
 - The connector of the door cover to the door (10).

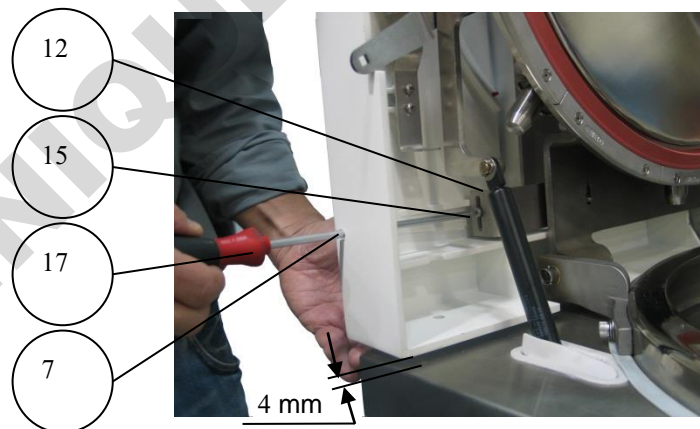


2. Open the autoclave's door.
3. Attach the door cover to the door in such a way that the connector (9) of the door cover to the door hinges will be inside the hinge bracket (12).



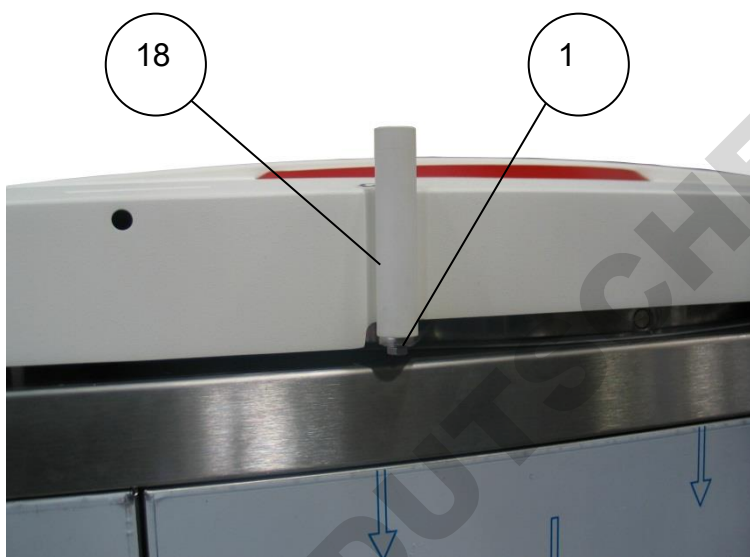


4. Insert 4 screws (15) to assemble the door cover to the door (part 9 to part 12 and part 10 to part 13)
5. Insert a screwdriver (17) in the hole (7) on the sides of the door cover and tighten the 4 screws (15). Keep a gap of approx. 4 mm between the door cover and the top of the autoclave.



6. Place a Teflon sliding spacer (4) between the closing arm (16) and the closing arm support (8).
7. Place the second Teflon sliding spacer (4) on the other side of the closing arm and put above this the inner (facing the chamber) closing-arm guide (5).
8. Insert screws on both sides of the closing-arm guide (3, 6)

9. Tighten the screw (3) attaching top part of the inner closing-arm guide (5) to the door cover. Do this with a screwdriver inserted through the hole (2) in the side of the door cover.
10. Close the door.
11. Tighten screw 6 (on bottom of closing-arm guide). Do this with a screwdriver inserted through the hole (1) in the rear of the door cover.
12. Plug the open holes (screwdriver holes).
13. Assemble closing-arm handle (18) with screw (1).



9.10 Replacing the Door Gasket – MD models (Mechanical Door)

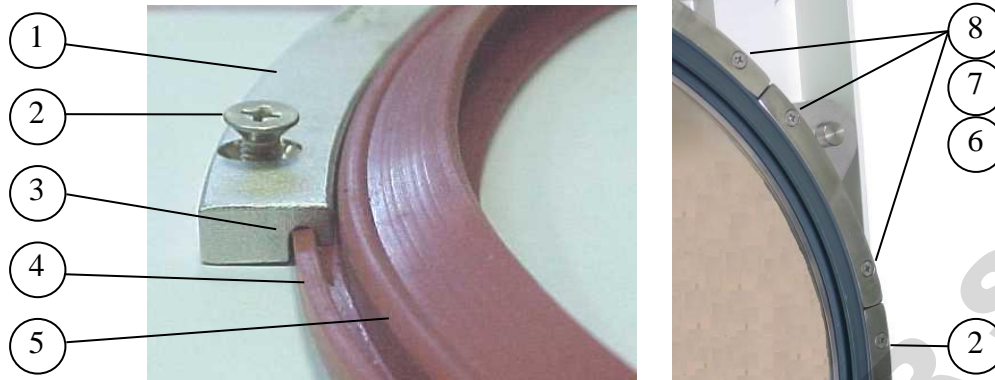


Caution!

This gasket is designed with a trapezoidal cross section. The gasket should be placed with the widest side towards the door.

1. Disassemble the 10 segments (1) attaching the gasket to the door.
2. Remove the gasket (5) from the door.
3. Clean the door surface.
4. Lay the new gasket on the door.
5. Assemble the segments loosely. Verify that the rim of the gasket (4) is in the groove in the segments (3).
6. After all the segments are assembled loosely verify that the gasket lies evenly.
7. Insert screws (2, 6). See picture below for the location of screws (6).
8. Assemble the Spring lock washers (7) and the nuts (8) to the screws (6).

9. Tighten all the screws (2, 6) of the segments.



No.	Description	Cat. No.
1	Fastener, Door Gasket, Segment, 50XX	LOK507-0042
2	Screw M5 x 16	BOL191-0162
5	Gasket, Door, Silicon, Va. Res., 50xx	GAS080-0043
6	Screw M5 x 25	BOL191-0240
7	Spring lock washer M5	NUT193-0325
8	Nut M5	NUT192-0192

9.11 Replacing the Door Gasket – D models (Automatic Door)



Caution!

Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the chamber or the generator.

Allow the autoclave to cool before opening the service doors.

To avoid injuries, replace the gasket while the autoclave and autoclave door are cold.

1. Pull off the gasket from the door groove and install the new gasket referring to the directions below.



2. Remove the door gasket and clean the groove (plain water is okay).
3. Line the inside of both sides/walls of the gasket groove with a small amount of silicon lubricant. This can be sprayed in or brushed in depending on the type lubricant you use.



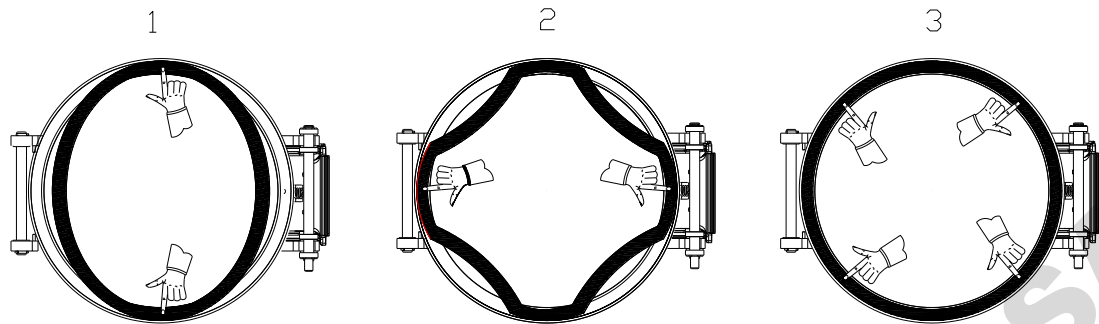
Note: It is necessary to use a silicone-based lubricant such as Würth Silicone Lubricant or Dow Corning 111, when installing the door gasket. If you had purchased a replacement door gasket, from Tuttnauer, it will have come with a small packet of Würth Silicone lubricant.



Caution!

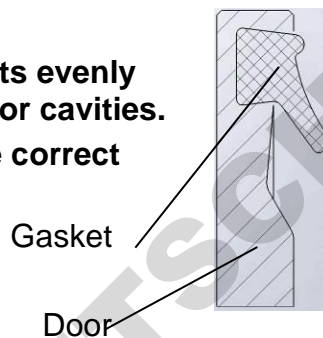
If insufficient lubricant is applied, replacing the gasket will be difficult. If excess lubricant is applied, the gasket will 'spring' out of the groove.

4. Install the new gasket referring to the drawings as below points 1, 2 and 3.



Caution!

Make sure the gasket sits evenly without waves, humps, or cavities. This drawing shows the correct direction of the gasket.



9.12 Replacing the Door Micro-Switch 1 (Automatic Door only)



Warning!

Do not touch door micro-switches in case of malfunction! Call Tuttnauer service.



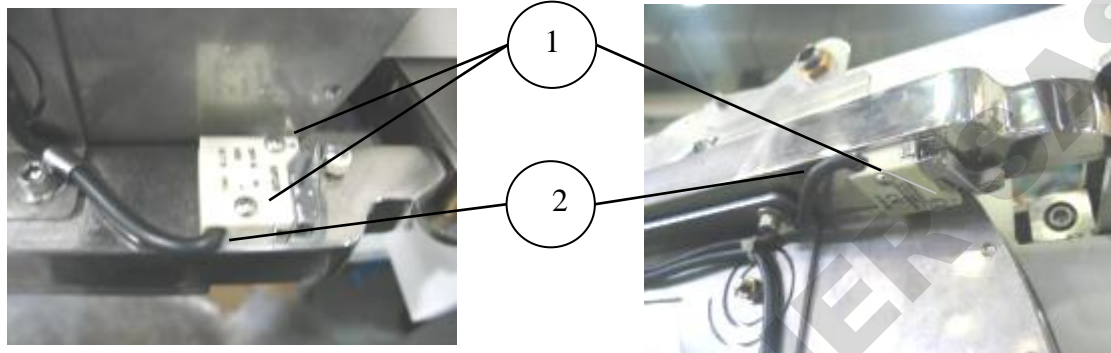
Caution!

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 replacing the Printer Door.

1. Unscrew the 2 screws (1).
2. Open the microswitch box (optional) so to release the black wires.
3. Release the black wires and disconnect the connectors.
4. Unscrew the nut and remove the microswitch.
5. Replace the microswitch with a new one.

6. Reconnect the wires (2) of the microswitch. Verify that the wire is placed on the isolating cover and does not touch the chamber.



9.13 Replacing the Door Micro-Switch 2 (Automatic Door only)



Warning!

Do not touch door micro-switches in case of malfunction! Call Tuttnauer service.



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.


Allow the autoclave to cool before removing outer covers.

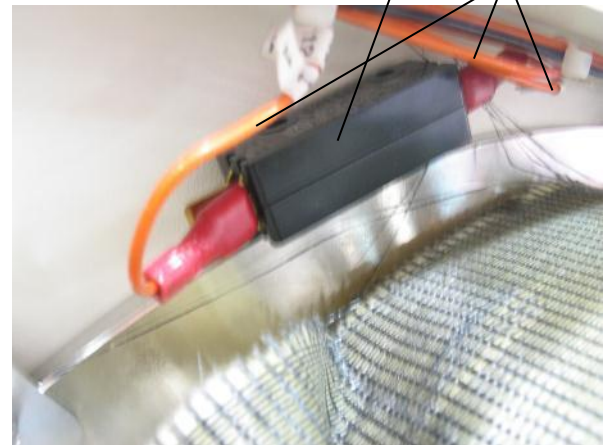
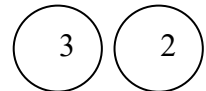
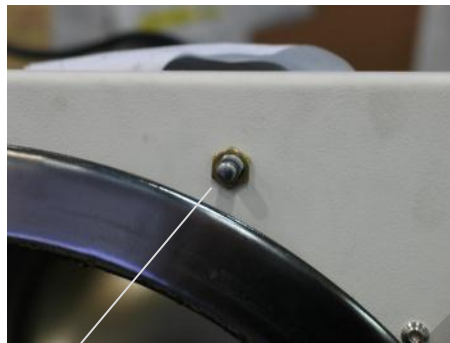
1. Remove the autoclave covers.
2. Open the door
3. Unscrew the nut (1) holding the door switch adapter on the front panel of the autoclave (1).
4. Disconnect the wires (2) from the door switch (3), located on the inner side of the autoclave's front panel.
5. Remove the door switch (4) from the autoclave.
6. Reassemble the door switch with its adapter to the front panel.



Caution:

Make sure that the door switch is installed correctly!

Check that you see the operational message “Door is Open”  on the display when you open the door and that the message disappears when you close it.



9.14 Replacing the Panel and its Components

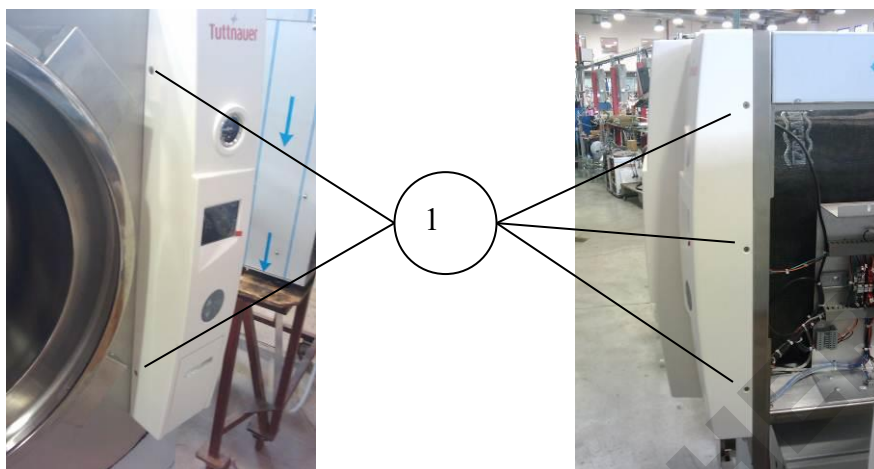


Caution!

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 replacing the Panel.

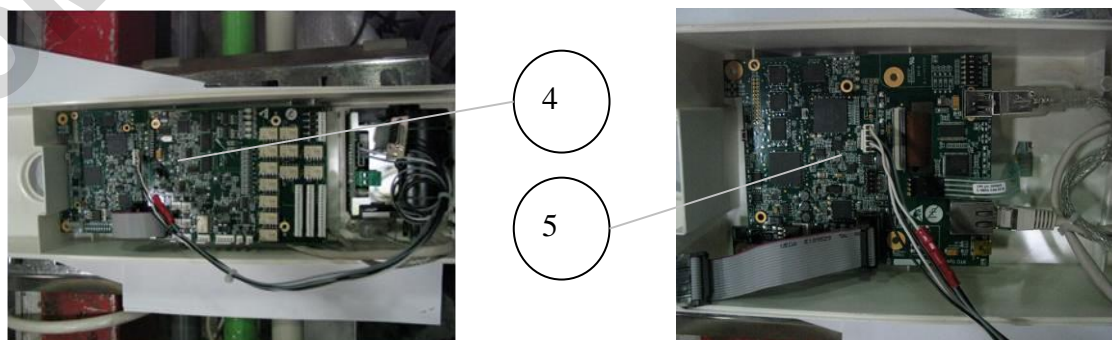
1. Unscrew the five side fastening screws (1).



2. Pull the panel out for approx. 30 centimeters.
3. Remove the protective cover (2)



4. Remove the digital I/O card (4) and the main card (5).



5. Disconnect the PCB connectors (3)



6. Remove the display (4) and the keypad (5). To do so, unscrew and disconnect the display, then pull the keypad inwards.



7. Remove the printer (3) (see sec. 9.16 "Replacing the Printer").
8. Assemble the above parts (see steps 7-10) on the new panel.
9. Assemble the panel and fasten it to the autoclave with the 4 fastening screws (see step 1).

9.15 Replacing the Printer Door

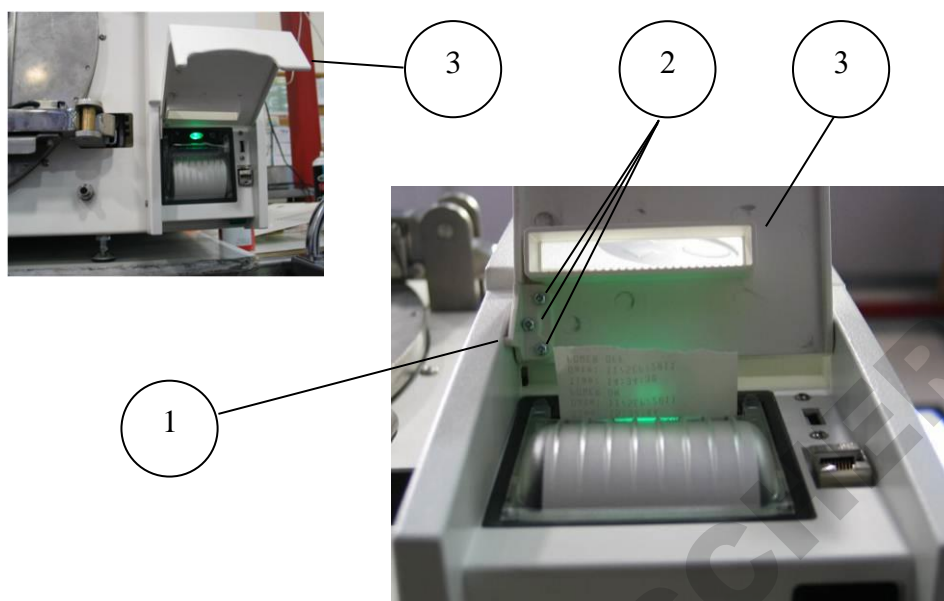


Caution!

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 replacing the Printer Door.

1. Open the printer's door (3).
2. Unscrew and remove the 3 screws (2) holding the Printer Door to the Integral Hinge (1).
3. Slide the Printer Door aside to remove it.
4. Assemble the new Printer Door to the Integral Hinge with the 3 screws (2).



9.16 Replacing the Printer

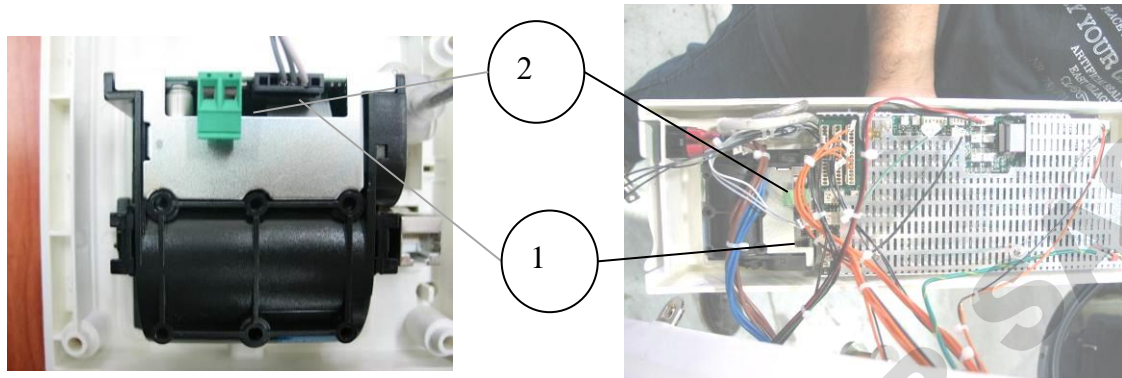


Caution

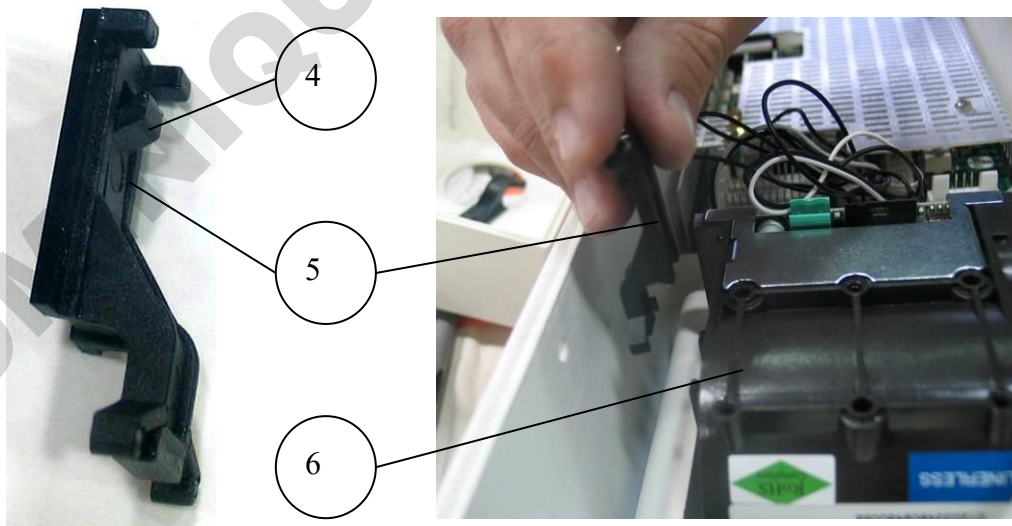
Before starting, disconnect the instrument from the power source and ensure that there is no pressure in the autoclave.

Allow the autoclave to cool before opening the service door.

1. Remove the panel (see sec. 9.14 **Replacing the Panel**) to reveal the internal part and the electrical connectors.
2. Unplug the board connectors (1) and the printer connectors (2). Verify that you know where each plug is connected.



3. The printer (6) is fastened to its seat with two fasteners (5). To release the fasteners, using a flat screwdriver, press slightly on the part marked (4) and pull the fastener upward. Repeat this with the second fastener.
4. Pull the printer out of its seat (the hole in the panel).
5. Replace the printer with a new printer.
6. Inset the fasteners. Verify that they are inserted firmly.
7. Connect the printer's connectors.
8. Connect all the connectors of the board.
9. Lay the control panel on its place.
10. Assemble the panel (see sec. 9.14).



9.17 Replacing the main switch



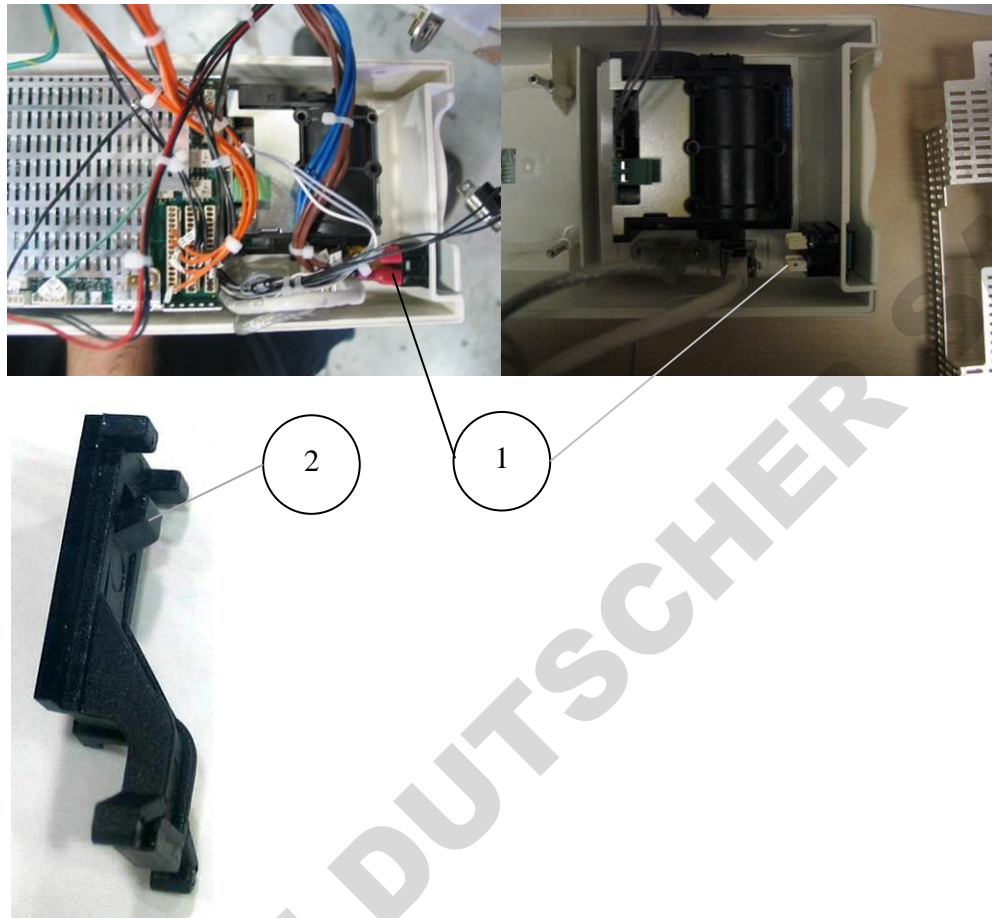
Caution!

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

Allow the autoclave to cool before dismantling the outer covers.

1. Remove the control electronic boards.
2. Disconnect all the four wires.
3. The main switch is fastened to its seat with two fasteners. To release the fasteners, using a flat screwdriver, press slightly on the part marked (2) and pull the fastener inward. Repeat this with the second fastener.
4. Pull the main switch out of its seat (the hole in the panel).
5. Replace the main switch with a new switch.
6. Pull the switch into its seat until it clicks. Verify that they are inserted firmly.
7. Connect the wires.

Note: Pull the switch in to turn the device on, out to turn it off.



9.18 Replacing the fuse of the transformer

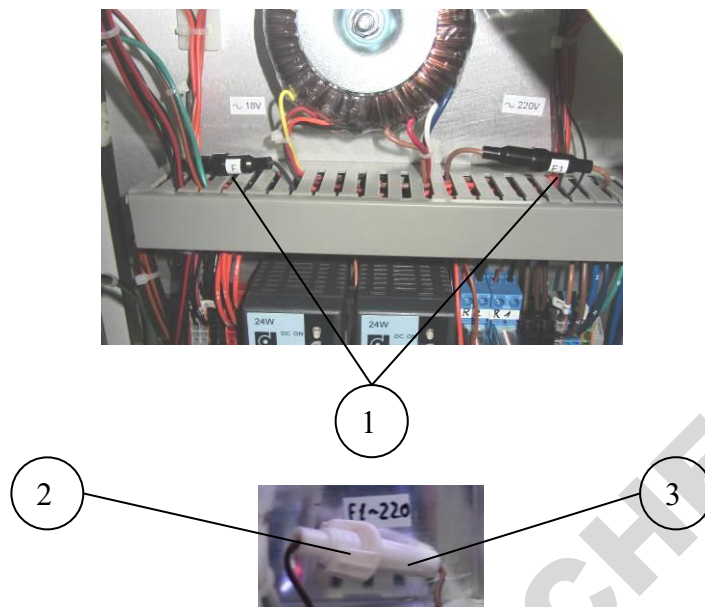


Caution!

Before starting, disconnect the instrument from the power source.

Allow the autoclave to cool before dismantling the outer covers.

1. Remove the autoclave covers (see para. 9.3 “Dismantling the Outer Covers of the Autoclave”).
2. If necessary, cut one plastic cable holder to release the fuse capsule (1).
3. Unscrew the two halves of the fuse capsule apart (2) and (3).
4. Take out the burnt fuse and replace it with a new 5A fuse (3)
5. Reassemble the fuse holder.
6. Replace the cut cable holder.
7. Re-assemble the covers.



9.19 Replacing the Plunger or Coil of the 1/4" Solenoid Valve

The solenoid valves may be out of order due to faulty plunger or coil. To repair the solenoid valve – replace the faulty plunger or solenoid.



Caution!

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

Allow the autoclave to cool before dismantling the outer covers.

1. Remove the autoclave covers (see para. 9.3 "Dismantling the Outer Covers of the Autoclave").
2. Remove nut (1).
3. Remove the coil (2).
4. Unscrew the plunger + spring (3) with the plunger housing (4) and replace it with a new one. The plunger and the spring are replaced as a kit.
5. Reassemble the coil (2) and the nut (1).
6. Reassemble the autoclave cover.



9.20 Replacing the Plunger or Coil of the BACCARA Solenoid Valve

The solenoid valves may be out of order due to faulty plunger or coil. To repair the solenoid valve – replace the faulty plunger or solenoid.



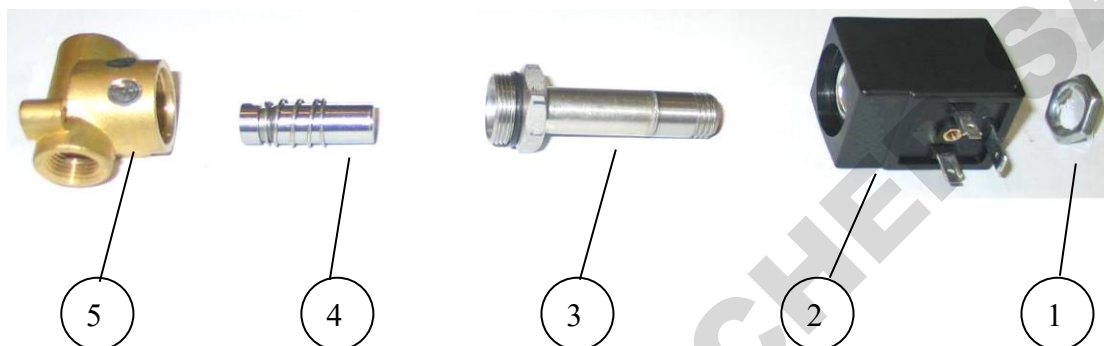
Caution!

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

Allow the autoclave to cool before dismantling the outer covers.

1. Remove the autoclave covers (see para. 9.3 “Dismantling the Outer Covers of the Autoclave”).
2. Unscrew and remove nut (1).
3. Remove the coil (2).

4. Unscrew the plunger + spring (4) with the plunger housing (3) and replace it with a new one. The plunger the spring and the housing are replaced as a kit.
5. Reassemble the coil (2) and the nut (1).
6. Re-install the autoclave cover.



9.21 Replacing the Air Filter



Caution!

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

1. Pull out the filter cover.
2. Pull the air filter out of its seat.
3. Insert a new filter by pressing it into the filter seat.
4. Replace the filter cover.

Note: Make sure that the arrow on the filter body shows inwards. Make sure that you do not bend the filter pipe.



Note: It is recommended to replace the air filter once a year.

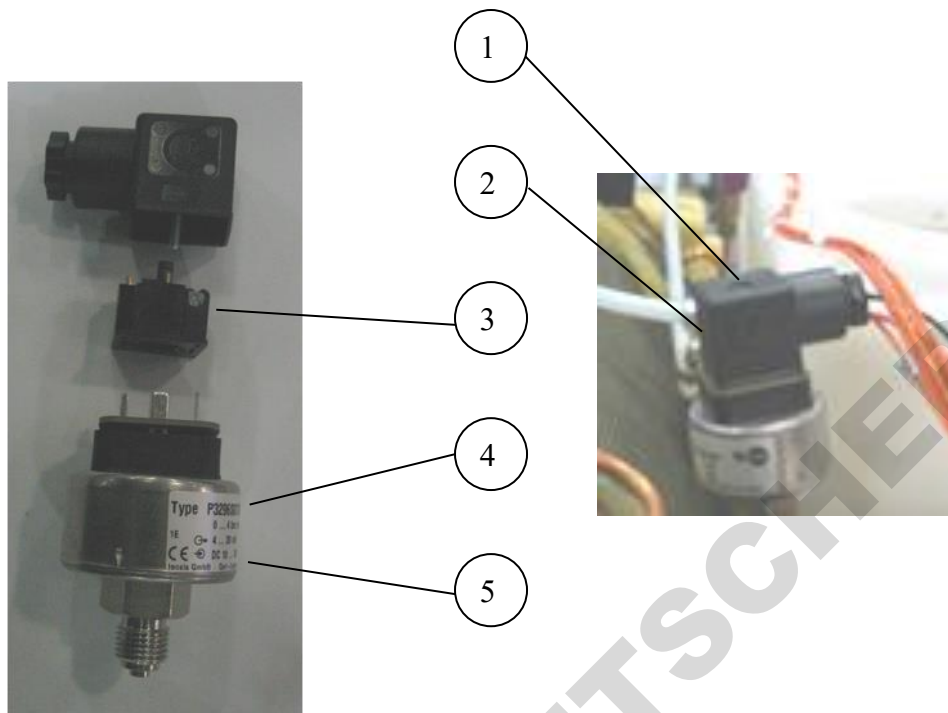
9.22 Replacing the Pressure Transducer



Caution!

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

1. Remove the autoclave outer covers.
2. Unscrew the screw (1).
3. Lift and remove the transducer's cap (2) from the transducer (4).
4. If the square gasket (3) remains on the transducer, remove it and install it on the new transducer.
5. Unscrew the faulty transducer from its seat (5).
6. Install a new transducer.
7. Assemble the cap to the new transducer and tighten it with screw (1).
8. Reassemble the autoclave cover.

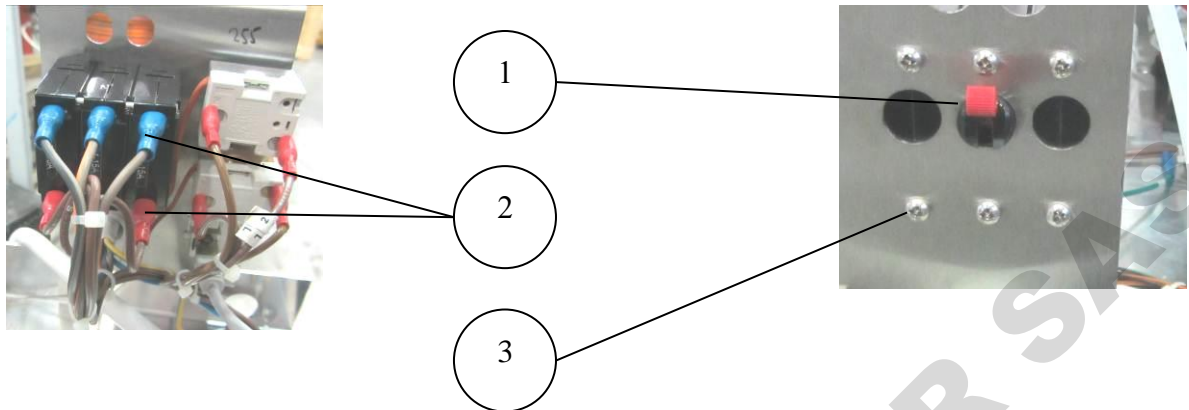


9.23 Replacing the circuit breaker

**Before starting, disconnect the instrument from the power source.
Allow the autoclave to cool before dismantling the outer covers.**

The circuit breaker (1) is located on the rear of the autoclave.

1. Remove the autoclave covers (see para. 9.3 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the electrical connections (2) of the circuit breaker. Verify that the wires are labeled and that you know which wire is connected to each pole.
3. Unscrew the 6 screws (3).
4. Remove the old circuit breaker and replace it with a new one. Use only an original circuit breaker supplied by Tuttnauer.
5. Assemble the new circuit breaker with the 6 screws (3).
6. Connect the electrical connections (3).
7. Reassemble the autoclave cover.



9.24 Replacing the power supplies, water level board and relays



Caution!

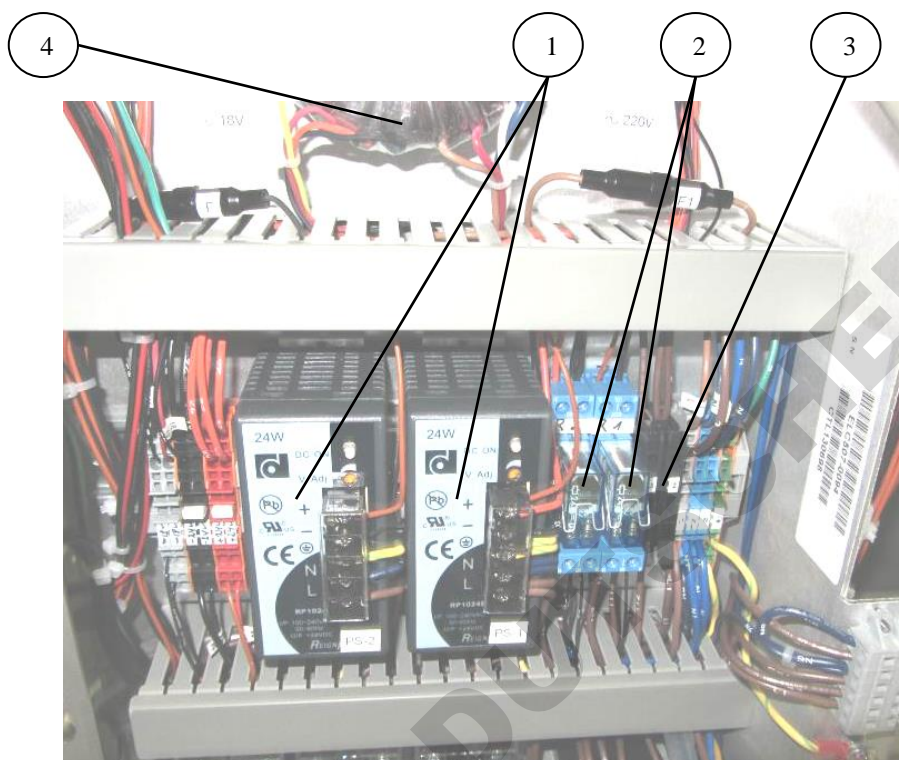
Before starting, be sure that the electric cord is disconnected from the power source and that there is no pressure in the autoclave generator.

Allow the autoclave to cool for about an hour before removing outer covers.


For description of items – see table below.

1. Open right service door.
 2. Disconnect the wires from the component.
- Note:** Mark the wires before removing them. It is essential to return the correct wire to the correct place!
3. Remove the old component. (Use a screwdriver to release it from the DIN rail if needed).
 4. Insert the new component into its place and check it is secure.
 5. Reconnect the wire to the component. Return the correct wire to the correct place.
 6. Test the unit.

The autoclave electric box



Description of Items

No.	Photo	Cat. No.	Description
1		ELE035-0144	Power Supply 24VDC (1A)

2		CTP201-0272	Miniature PCB relay (blue), coil 24VDC, contact 250VAC, 8A, 2 pole
		CTP201-0271	Relay Socket
3		THE039-0091	Terminal, Feed-Through, 2-Conductor, Fuse Disconnect 1 1/4X1/4, 4mm²
4		ELE035-0092	Transformer TDB-100T 230/115-6/12VAC
		ELC411-0048	Transformer TDB-100T 115-6/12VAC

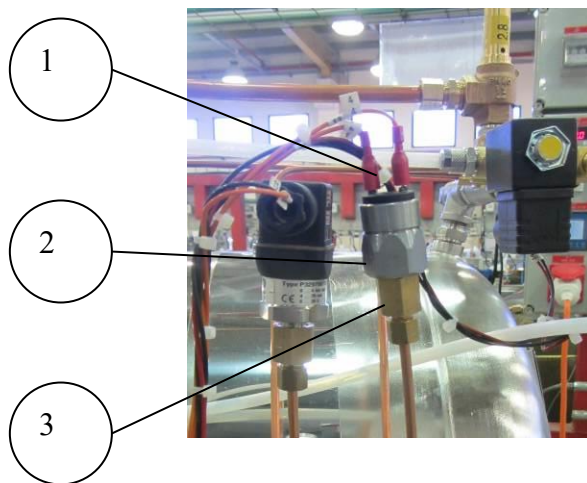
9.25 Replacing the safety pressure switch



Caution!

**Before starting, ensure that there is no pressure in the chamber.
Allow the autoclave to cool before dismantling the outer covers.**

1. Remove the autoclave covers (see para. 9.3 “Dismantling the Outer Covers of the Autoclave”).
2. Disconnect the electrical connections (1).
3. Unscrew and remove the pressure switch (2) from its seat (3).
4. Replace the pressure switch with a new one, use only an original pressure switch supplied by Tuttnauer.
5. Assemble the pressure switch (2) to its seat (3).
6. Connect the electrical connections (1).
7. Reassemble the autoclave cover.



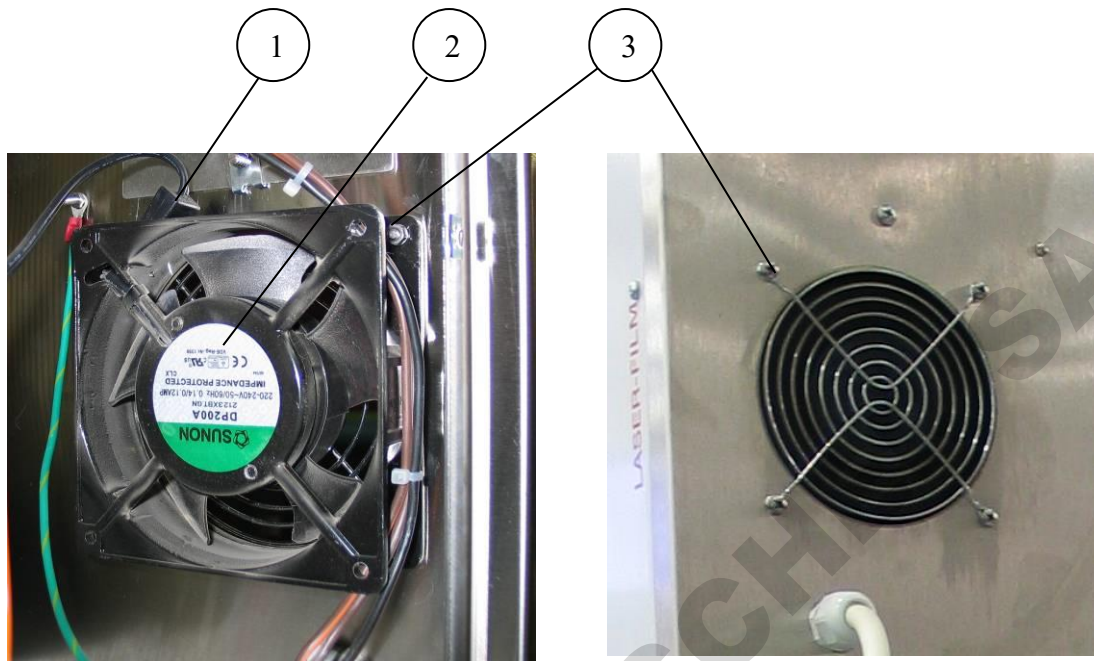
9.26 Replacing the Fan of the Electronic Unit



Caution!

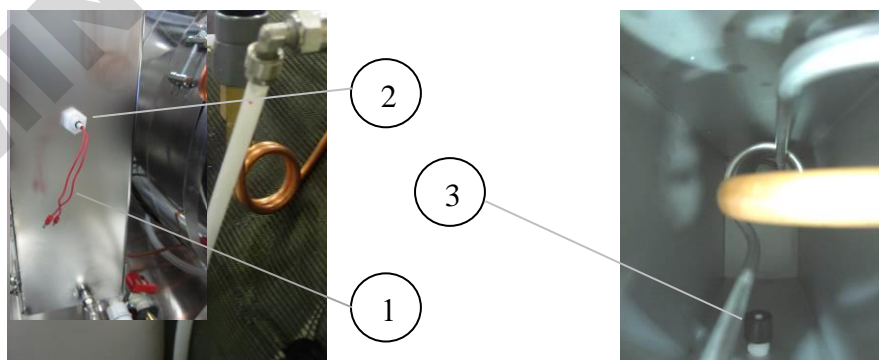
**Before starting, disconnect the autoclave from the power source.
Allow the autoclave to cool before dismantling the outer covers.**

1. Remove the autoclave covers (see para. 9.3 “Dismantling the Outer Covers of the Autoclave”).
2. Unplug the fan plug (1).
3. Unscrew and remove four screws (3).
4. Remove the fan (2) and replace it with a new fan.
5. Fasten screws (3).
6. Connect the plug (1).
7. Reassemble the autoclave cover.



9.27 Replacing the Water Reservoir Electrode /Float

1. Open the cover.
2. Disconnect the wires of the float (1)
3. Unscrew the white plastic nut (2)
4. Pull out the old float (3); insert the new float in the correct direction.
5. Apply some leakage prevention glue inside the nut and tighten it.
6. Reconnect the wires and close the cover.



9.28 Replacing the Door Switch



Caution!

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

Allow the autoclave to cool before removing outer covers.

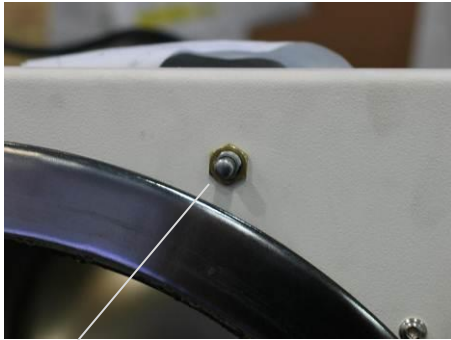
1. Remove the autoclave covers (see para. 9.3 “Dismantling the Outer Covers of the Autoclave”).
2. Open the door.
3. Unscrew the nut (1) holding the door switch adapter on the front panel of the autoclave (1).
4. Disconnect the 2 wires (2) from the door switch (3), located on the inner side of the autoclave's front panel.
5. Reassemble the door switch with its adapter to the front panel. Repeat steps...



Make sure that the door switch is installed correctly!

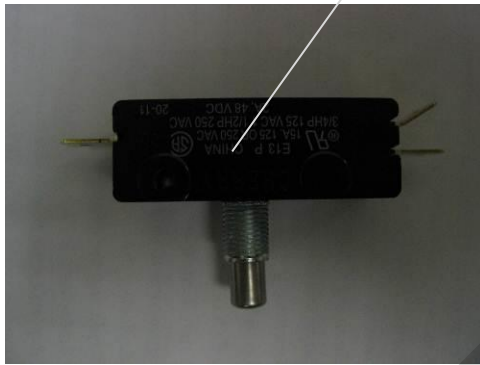
Check that you see the operational message “Door is Open” on the display when you open the door and that the message disappears when you close it.





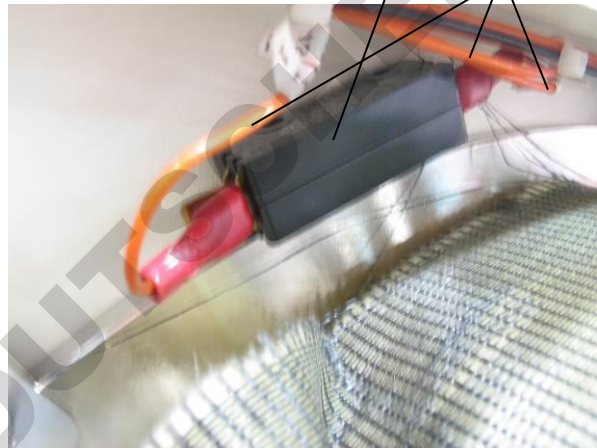
1

4



3

2



10. Troubleshooting



Warning!

Do not touch door micro-switches in case of malfunction! Call Tuttnauer service.

Only technical personnel having proper qualifications and holding technical documentation (including a technician manual) and adequate information are authorized to service the apparatus.

Symptoms	Possible causes Check-ups and tests	Corrective Action
The screen doesn't turn on.	<ol style="list-style-type: none"> 1 The main switch is in 'OFF' position. 2 The power cord is disconnected from the machine or the mains. 3 The circuit breaker has tripped. 4. Power supply faulty 	<ol style="list-style-type: none"> 1 Turn the main switch to the 'On' position. (See front view drawing). 2 Make sure the power cord is connected properly to the machine and the mains. (See rear view drawing) 3 Lift the circuit breaker lever. 4. Replace the power supply.
After Pressing Key no response	<ol style="list-style-type: none"> 1. The software has a bug, and it is stuck 2. The keypad not connecting to the main board. 	<ol style="list-style-type: none"> 1. Turn off the autoclave and restart the power. 1.1 USB import 2. Replace control system
Printer doesn't print	<ol style="list-style-type: none"> 1 If printer's LED is on, the printer is OK. 2 If printer's LED is off, – faulty printer or no power to the printer. 3 If printer's LED is blinking, no paper is inserted in the printer. (See Printer Handling in Operator's manual) 2 No obvious reason. Disconnect and connect again. 	<ol style="list-style-type: none"> 1 Make sure the paper roll is inserted in the printer. (See Printer Handling in operator's manual) 2 Switch off the machine and switch it back on for restart. 3 Replace the printer. <p>Fix discontinuity.</p> <p>Replace power supply.</p>

Symptoms	Possible causes Check-ups and tests	Corrective Action
	<p>3 Check 24V input to the printer. If none:</p> <ul style="list-style-type: none"> — Discontinuity between power supply and printer. — Faulty power supply. 	
leaking at the door	<p>1 The door gasket is dirty. (See Daily Maintenance in Operator's manual)</p> <p>2 The door gasket is damaged.</p>	<p>1 Clean the door gasket. (See Daily Maintenance in Operator's manual).</p> <p>2 Replace the door gasket.</p>
Steam leaks through the door, even though door is tightly closed.	Check if the gasket is smooth, making sure the door closes properly. Please check that both door switches are in order.	Replace the faulty gasket.
The safety valve does not release pressure when blow-off test is performed.	<p>1 Check the path of safety valve ensuring circulation is free.</p> <p>2 Safety relief valve is faulty</p>	<p>1 If circulation is not free, remove the block.</p> <p>2 Replace the faulty valve.</p>
Fast exhaust operation is too slow.	Exhaust valve is faulty, or pipe is clogged.	Replace exhaust valve or clean pipe.

Symptoms	Possible causes Check-ups and tests	Corrective Action
High temp. (ending)	<p>During the 'Ending' stage the chamber temperature does not go below the temperature defined in parameter 'End Temperature' for X minutes (as defined in parameter 'Normal Temperature Timeout')</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Heating elements go on working beyond the required time. 2. Faulty SSR or Analog board. 3. Faulty calibration of temp., pressure or faulty sensors of temp and/or pressure. 	<p>If the problem persists, perform the following with SSR, Analog board, and temp/pressure sensors:</p> <ol style="list-style-type: none"> a. Test b. If this doesn't help, recalibrate. c. If this doesn't help, replace.
High pressure (ending or exhaust)	<p>During the 'Ending' stage the chamber pressure does not go below the atmospheric pressure + 5 kpa after the time defined in parameter 'Normal Pressure Timeout'. Possible causes:</p> <ol style="list-style-type: none"> 1. Heating element is working continuously. 1 Pressure System is not calibrated. 2 Exhaust valve does not open due to mechanical or electrical malfunction (faulty I.O. board, faulty I.O. board connection). 	<p>First, perform a new cycle. If the problem persists:</p> <ol style="list-style-type: none"> 2 Calibrate System. 3 Fix connection. If this doesn't help, replace faulty I.O. board. <p>Other possible solutions are: Replace faulty valve. Replace the faulty solid state relay.</p>
Time error	<p>At the end of the 'Sterilization' stage, the gap between the 2 Main Board system clocks is more than 4 seconds.</p>	<p>Repeat the cycle. If the problem persists, replace the Main Board.</p>

Symptoms	Possible causes Check-ups and tests	Corrective Action
High temp	<p>During 'Sterilization' stage, the chamber temperature goes above the value defined in parameter 'Sterilization Temperature' + value of parameter 'Sterilization temperature Range'.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Heating elements go on working beyond the required time. 2. Faulty SSR or Analog board. 3. Faulty calibration of temp., pressure or faulty sensors of temp and/or pressure. 	<p>If the problem persists, perform the following with SSR, Analog board, and temp/pressure sensors:</p> <ol style="list-style-type: none"> a. Test b. If this doesn't help, recalibrate. c. If this doesn't help, replace.
Low Temp	<p>During 'Sterilization' stage, the temperature drops for more than 1 second below the sterilization temperature.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Door gasket is leaking. 2. Heating elements (even one of them) do not work. 3. Faulty SSR or Analog board. 4. Faulty calibration of temperature and pressure sensors. 5. Faulty temperature or pressure sensors. 6. Overloaded chamber 	<p>First, perform a new cycle (make sure not to overload the chamber). If the problem persists:</p> <ol style="list-style-type: none"> 1 Replace the door gasket. 2 Recalibrate the temperature and pressure sensors. 2 Fix connection. If this doesn't help, replace faulty temperature sensors, pressure sensors, SSR or Analog board.
High pressure	<p>During 'Sterilization' stage, the chamber pressure goes above the value of 'Sterilization Pressure' plus the value of parameter 'Sterilization pressure Range'. The 'Sterilization Pressure' value is calculated according to parameter 'Sterilization</p>	<p>If the problem persists, perform the following with SSR, Analog board, and temp/pressure sensors:</p> <ol style="list-style-type: none"> a. Test b. If this doesn't help, recalibrate. c. If this doesn't help, replace.

Symptoms	Possible causes Check-ups and tests	Corrective Action
	<p>Temperature' using a predefined lookup table. Possible causes:</p> <ol style="list-style-type: none"> 1. Heating elements go on working beyond the required time. 2. Faulty SSR or Analog board. 3. Faulty calibration of temperature or pressure sensors. 4. Faulty temperature or pressure sensors. 	
Low pressure	<p>During 'Sterilization' stage, the chamber pressure goes below the value of 'Sterilization Pressure'. The 'Sterilization Pressure' value is calculated according to parameter 'Sterilization Temperature' using a predefined lookup table. Possible causes:</p> <ol style="list-style-type: none"> 1. Door gasket is leaking. 2. Heating elements (even one of them) do not work. 3. Faulty SSR or Analog board. 4. Faulty calibration of temperature and pressure sensors. 5. Faulty temperature or pressure sensors. 6. Leakage in the pipes 	<p>Perform a new cycle.</p> <ol style="list-style-type: none"> 1. Replace the door gasket. Recalibrate the temperature and pressure sensors. 2-5. Fix connection. If this doesn't help, replace faulty temperature sensors, pressure sensors, SSR or Analog board 6. Find and replace the leaking pipes.
Heat time error/ Heat time error (keep)	<p>During 'Heat' stage, chamber temperature has not reached the requested temperature (defined by cycle parameter 'Sterilization Temperature') after X minutes as defined in parameter 'Heat Time Error' Possible causes:</p>	<p>If the problem persists, perform the following with SSR, Analog board, and temp/pressure sensors:</p> <ol style="list-style-type: none"> a. Test b. If this doesn't help, recalibrate. c. If this doesn't help, replace.

Symptoms	Possible causes Check-ups and tests	Corrective Action
	<ol style="list-style-type: none"> 1. Door gasket is leaking. 2. Heating elements (even one of them) do not work. 3. Faulty SSR or Analog board. 4. Faulty calibration of temperature and pressure sensors. 5. Faulty temperature or pressure sensors. 	
Pressure time error	<p>Chamber pressure has not reached the requested high pressure after the time defined by cycle parameter 'Pressure Time Error'</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. Door gasket is leaking. 2. Heating elements (even one of them) do not work. 3. Faulty SSR or Analog board. 4. Faulty calibration of temperature and pressure sensors. 5. Faulty temperature or pressure sensors. 	If the problem persists, replace the door gasket.
No water	<p>The 'No Water' parameter defines the maximum time to wait for water to be detected in the chamber. If no water detected in the chamber (during insert water stage) after the time defined by the parameter, a 'No Water' error will be displayed, and the cycle will fail. Possible causes:</p> <ol style="list-style-type: none"> 1. No mineral water supply. 2. Water inlet filter 	<ol style="list-style-type: none"> 1. Check and fix the mineral free water supply. 2. check and clean the water inlet filter. 3. Clean the water level electrode. 4. Fix wire of the water level

Symptoms	Possible causes Check-ups and tests	Corrective Action
	<p>clogged.</p> <p>3 Water level electrode is dirty.</p> <p>4 The wire of the water level electrode is disconnected.</p> <p>5. Faulty water pump.</p> <p>6. One of the heating elements does not work</p> <p>7. Faulty thermostat</p> <p>8. Faulty cut-off</p>	<p>electrode.</p> <p>5. Replace the water pump fuse.</p>
Power down	Power down has occurred during the cycle.	If it happened before or during the sterilization stage, repeat the cycle. If power down happened after the sterilization stage, repeating the cycle is not necessary, it is up to the operator.
i/o card failed	<p>The I/O card (connected to the main through RS232 connector) is not responding. Possible causes:</p> <p>1 Disconnection between I/O board and Main board.</p> <p>2 I/O card is faulty (both while cycle is running or not).</p>	<p>1. Check the connections.</p> <p>2. Replace the control system.</p>
Analog input error	Pressure or temperature sensor reports an out-of-range digital value.	<p>Locate the cause of the problem as displayed in Inputs/Outputs\View Analog Inputs State and check the sensor that shows the value"---".</p> <p>Check the connections. If this does not help, replace the faulty sensor.</p>
Door is open	<p>During the cycle, the door switch indicates that the door is open.</p> <p>Possible causes:</p> <p>Faulty or not adjusted door switch or faulty door switch itself.</p>	Check the door switch and its connections.
Heat I/O Pressure	Top exhaust valve doesn't open	

Symptoms	Possible causes Check-ups and tests	Corrective Action
Water I/O	Transformer Fuses	
Vacuum Time Error	Vacuum Time Error message on the yellow screens after a failed cycle means that, during a time set in the parameter "Pulse A/B Stay Time", chamber pressure has not reached the value set in "Pulse A/B low pressure".	Perform a new cycle. If the problem persists, perform vacuum test to find leakage the autoclave door or pipes.
Vacuum Pressure Error	Vacuum Pressure Error message on the yellow screens after a failed cycle means that, during a time set in the parameter "Pulse A/B Stay Time", chamber pressure has not reached the value set in "Pulse A/B high pressure".	Perform a new cycle. If the problem persists, perform vacuum test to find leakage the autoclave door or pipes.

11. List of Spare Parts

Part Number	Description
COV505-0005	
WHE070-0015	Leg, PVC ,Bolt Type 3/8", 60mm
CMT240-0003	Spacer for Drain Valve, Brass
FIT100-0309	Male Elbow 90°, Twin Ferrule, 1/4"NPTx5/16" Tube, Brass
FIT100-0297	Male Connector, Twin Ferrule, 1/4"NPTx3/8" Tube, Brass
GAS080-0010	Water, Neopren, 2x11x19 mm
BOL191-0092	Flat Head Machine Screw, Phillips, M5x12, St. St. A2, DIN965
BOL191-0061	Hex Socket Cap Screw, 1/4UNCx1, St. St. A2
BOL191-0091	Pan Head Machine Screw, Phillips, M4X20, St. St. A2, DIN7985
CMT507-0052	Bracket, safety valve support for 5050/75
LOK507-0020	Solenoid Housing for 60x60-A, 60x90-A-ALFA
LOK507-0031	Guide, door locking arm, short, assembly, 50XX
NUT192-0192	Hex Nut, M5X4, Stainless Steel A2, DIN934
NUT193-0271	Plain Washer Without Chamfer, M5 (3/16), Stainless Steel A2, DIN125
NUT193-0317	Spring Lock Washers With Square Ends, 1/4, St. St. A2, DIN127B
NUT193-0325	Spring Lock Washers With Square Ends, M5 (3/16), St. St. A2, DIN127B
GAS080-0043	Gasket, Door 50XX, Silicon
LOK507-0042	Fastener, Door Gasket, Segment, 50XX
LOK507-0021	Fastener, Door Gasket, Segment, 50XX
GAS080-0006	Silicon Disc
GAS080-0020	Membrana, Door Lock
LOK240-0023	Pin, Locking Bellow, TTA
LOK240-0024	Bushing, Bellows
LOK240-0025	Housing, Door Locking Bellows

Part Number	Description
LOK240-0026	Tightening Bolt, Door Locking Bellows
HEA012-0010	Heating Element, Band, 230V, 19-3/4"x3-1/2", 1100W, Copper, 50XX ML/EL
BOL194-0330	Blind Rivets 4x10, Head 7.5 mm, Aluminium, DIN7337 A
ARM100-0139	Steam trap, 1/4" BSP, St. St.
CMT067-0014	Strainer 1/4BSP, Complete
FIL175-0046	Screen, 400 Micron, For Strainer 1/4"
GAS082-0008	Gasket, Silicon, 4mm, OD=28mm, ID=20mm for 1/4" strainer
CMT100-0004	Nipple, Hex, 1/4"x1/4", NPTxNPT For TTA
CMT240-0085	Water Pump, 230V, 50Hz, Ulka - Assembly
FIT100-0806	Male Adapter, Elbow, 90°, 1/8"BSP For 6mm Hose
SKR203-0006	Shock Absorber, SRB, 85/90 SHORE for ULKA Pump.
FIT160-0031	Elbow, Male, Twin Ferrule, ME, 1/4"NPT*3/8" Tube, St.St.304
CMT254-0072	Washer, Brass, 20x14x2 mm
FIT100-0809	Elbow Connection O-RING -1/4" BSP M / Tube(8*6)
ARM172-0007	Check Valve, Spring Disk, 1/4"NPT, St.St.
CMT254-0072	Washer, Brass, 20x14x2 mm
FIT100-0807	Straight Male O-RING - 1/4 M / Tube(8*6)
FIT100-0809	Elbow Connection O-RING -1/4" BSP M / Tube(8*6)
GAS086-0017	Tube, Teflon, 6x8mm
SOL026-0018	Coil, Solenoid, 24VAC, 8W, 50Hz, Bac.
SOL026-0032	Valve, Solenoid, Brass, 2/2 way, 1/4"BSPx4.0, NC, GEM-A-22017, Baccara
VLV170-0022	Valve, Needle, 1/4", Bronze NPT
FIT100-0310	Male Elbow 90°, Twin Ferrule, 1/4"NPTx3/8" Tube, Brass
GAS086-0017	Tube, Teflon, 6x8mm
ARM172-0007	Check Valve, Spring Disk, 1/4"NPT, St.St.
CMT100-0004	Nipple, Hex, 1/4"x1/4", NPTxNPT For TTA
FIL175-0011	Filter, Air, 0.2M, 75mm,
FIT100-0809	Elbow Connection O-RING -1/4" BSP M / Tube(8*6)
GAS086-0017	Tube, Teflon, 6x8mm

Part Number	Description
SOL026-0018	Coil, Solenoid, 24VAC, 8W, 50Hz, Bac.
SOL026-0032	Valve, Solenoid, Brass, 2/2 way, 1/4" BSPx4.0, NC, GEM-A-22017, Baccara
ELC258-0015	Sensor, Temperature, 5x100, 54400, Sontec, Assy. (For D line)
GAS080-0022	O-Ring, ID 2.84, W=2.62, 2-104 EPDM
THE003-0002	Sensor, Temperature, PT100, 5x100, Sontec
FIL175-0087	Filter, Water, PVC Assy.
FIT100-0081	Elbow, 90, Equal, F & M, 1/4"NPT, Brass
FIT100-0310	Male Elbow 90°, Twin Ferrule, 1/4"NPTx3/8" Tube, Brass
FIT100-0807	Straight Male O-RING - 1/4 M / Tube(8*6)
FIT100-0809	Elbow Connection O-RING -1/4" BSP M / Tube(8*6)
GAS086-0017	Tube, Teflon, 6x8mm
GAU029-0009	Gauge, Pressure, Steam, -30+60 psi, 1.5"
GAU029-0021	Gauge, Pressure, Steam, 1/8 0-4 Bar, For ELV Panel
GAU029-0074	Pressure regulator, Air, 1/4", Modular Type, w/o oiling
FIT100-0217	Sleeve, Tube 5/16, Brass, 60C-5, Parker
FIT100-0227	Nut for Sleeve, Tube 5/16, Thread 1/2-24, Brass
SOL026-0032	Valve, Solenoid, Brass, 2/2 way, 1/4" BSPx4.0, NC, GEM-A-22017, Baccara
THE005-0053	Pressure Switch, Stainless Steel G1/4 factory set to 0.2bar
THE005-0039	Switch, Pressure, N.O. 1/4" BSP, Set 0.2 Bar.
THE006-0006	Transducer, Pressure, 0-4 Bar abs
VLV170-0022	Valve, Needle, 1/4", Bronze NPT
VLV170-0066	Drain Valve
CMT100-0004	Nipple, Hex, 1/4"x1/4", NPTxNPT For TTA
FIT100-0809	Elbow Connection O-RING -1/4" BSP M / Tube(8*6)
SOL026-0018	Coil, Solenoid, 24VAC, 8W, 50Hz, Bac.
SOL026-0032	Valve, Solenoid, Brass, 2/2 way, 1/4" BSPx4.0, NC, GEM-A-22017, Baccara
CMT100-0004	Nipple, Hex, 1/4"x1/4", NPTxNPT For TTA
FIT100-0081	Elbow, 90, Equal, F & M, 1/4"NPT, Brass
FIT100-0809	Elbow Connection O-RING -1/4" BSP M / Tube(8*6)

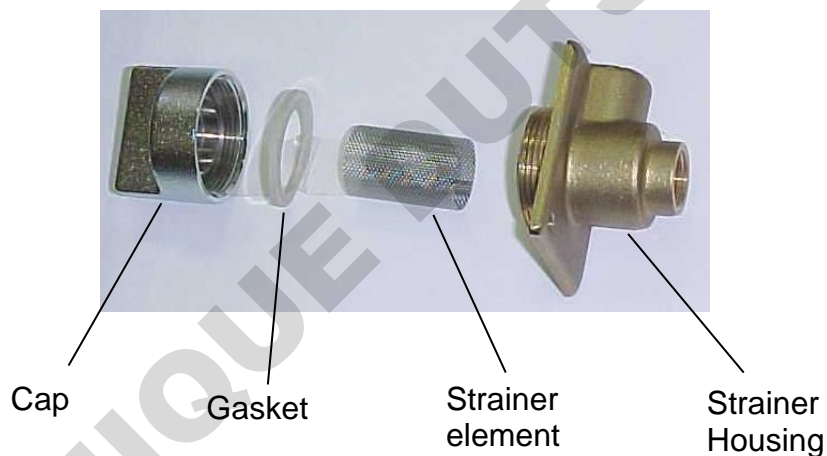
Part Number	Description
GAU029-0059	Pressure Regulator, Water, In-Line with Strainer, 1/4"BSP, 1.5 Bar
GAU029-0062	Pressure Regulator, Water, In Line with Strainer, 1/4"BSP, 0.5 Bar
SOL026-0018	Coil, Solenoid, 24VAC, 8W, 50Hz, Bac.
SOL026-0032	Valve, Solenoid, Brass, 2/2 way, 1/4"BSPx4.0, NC, GEM-A-22017, Baccara
ARM172-0007	Check Valve, Spring Disk, 1/4"NPT, St.St.
GAS086-0017	Tube, Teflon, 6x8mm
PUM057-0008	Vacuum Pump, Water Ring, 230V, 50-60HZ, CE
PNE100-0009	Fitting, push-in, straight, male 1/8, for tube 5mm
SVL029-0119	Safety Valve, PED, 1/4"NPT MPTxDisch. H., Brass Body, Brass Seat, 2.8Bar
ELC507-0061	Control Panel, Bacsoft Control System, (W/printer) 5075EL/V-D - Assy.
CPN064-0031	Keyboard, EZ 9" & 11", EZ/3870-D & Hor.-D
CTP200-0138	Board, I/O Extension, Bacsoft
CTP200-0140	Board, Main Control, Bacsoft
ELC258-0012	Shield, Control Unit Boards, Bacsoft
ELE039-0048	Terminal, male, brass, w/o isolation, PC1L18704LR, K.S. Terminals
POL064-0031	Panel, Control, Assy., 50xx-D
POL064-0024	Door, printer, 5075D
POL065-0082	Support, printer door, Hor. , 38XX-D , 50XX-D
POL067-0048	Window, Clear for Control Sys. Screen - Bacsoft
THE002-0052	Panel printer, Thermal, 24 Columns
THE002-0066	Thermal paper for CUSTOM PLUSII printer roll 57mm d=50mm
THE002-0061	Full Color graphical display 3.5"
WIR040-0170	Cable kit for PLUSII-S-0004 Printer
WIR040-0180	Cord, extension, USB 2.0 type A - panel F to M, 35 cm
BOL190-0023	Pan Head Machine Screw, Slotted, 8-32UNCx5/8, Brass, Nickel Plated
BOL191-0020	Pan Head Machine Screw, Phillips, M3x10, St. St. A2,

Part Number	Description
	DIN7985
CTP201-0065	Relay, SSR,24-280VAC,25A,Contr. 3-32VDC, SPST-NO,Screw terminals
CTP201-0271	Relay Socket
CTP201-0272	Miniature PCB relay, coil 24VDC, contact 250VAC, 8A, 2 pole
CTP201-0318	Fan, 24VDC, Dia. 80mmx20mm, 34.6CFM
ELE034-0026	Contactor, DILM12-230V, 20A
ELE035-0011	Fuse, 5x20mm, Glass tube, 250V, 6.3A, SB
ELE035-0011	Fuse, 5x20mm, Glass tube, 250V, 6.3A, SB
ELE035-0090	Fuse,5x20mm,Glass Tube,0.5A,250V,lag T
ELE035-0092	Transformer, 2x115 / 2x12, 50/60 hz, TDB-100, Jishisheng
ELE035-0144	Power Supply, 24VDC, 1A
ELE035-0144	Power Supply, 24VDC, 1A
ELE035-0170	Fuse, 5x20mm, Glass tube, 250V, 5A, SB
ELE035-0174	Fuse, 5x20mm, Glass tube, 250V, 2A, SB/Time Lag
ELE035-0192	BUZZER, PIEZO, CONTINUOUS, 85dB@30cm/3-28VDC
NUT192-0217	Hex Nut, 8-32UNC, Brass, Plain
NUT193-0291	Serrated Lock Washer External Teeth,M4(5/32),Steel,Zinc Pl.,DIN6798A
THE039-0037	Connector, Ceramic, Double, No.2
THE039-0120	Push-In Type Jumpers Bar 2-Pole Nominal
ELE035-0012	Switch, Panel, Rocker, 2-pole, ON-OFF, 250VAC, 16A
ELE039-1052	Female Connector,2 pole,5mm Pin Spacing with Coding Fingers Closed
ELE039-1055	Female Connector, 6 Pole,5mm Pin Spacing with Coding Fingers Closed
ELE039-1056	Female Connector,8 Pole,5mm Pin Spacing with Coding Fingers Closed
ELC040-0001	Cable, Electrical, 3 phase, With Plug 16A, Europe
ELC258-0015	Sensor, Temperature, 5x100, 54400, Sontec, Assy. (For D line)
GAS080-0022	O-Ring, ID 2.84, W=2.62, 2-104 EPDM
THE003-0002	Sensor, Temperature, PT100, 5x100, Sontec

Part Number	Description
BOL191-0070	Flat Head Machine Screw, Phillips, M4x10, St. St. A2, DIN965
ELE035-0052	Circuit Breaker, 3-pole, 277VAC/80VDC, 15A
NUT192-0230	Nut, Clip-On, U-Style, 4.8x20x13, 0.7 thick., Spring steel, Cadmium plated
THE005-0009	Thermostat, CUT-OFF, TY95-H, 255C, Campini
THE005-0010	Thermostat, Safety, TY95-H, 230C, Campini
WIR040-0179	Modular coupler, MH3101S-8821 Shielded Cat 5e, MH connectors
ELE039-0049	Connector, Ceramic, No.1, single
LOC507-0001	Pin, Locking Solenoid, 50XX
LOK387-0017	Washer, locking solenoid pin, 31XX, 38XX, 50XX
SOL027-0004	Solenoid, Door Safety Device, 24V, 3850/70 Brinkman
SPR177-0017	Spring, Solenoid, Door Locking, 31xx, 38XX
NUT192-0217	Hex Nut, 8-32UNC, Brass, Plain
NUT192-0233	Nut for Solenoid and Coli
NUT193-0291	Serrated Lock Washer External Teeth, M4(5/32), Steel, Zinc Pl., DIN6798A
SOL026-0018	Coil, Solenoid, 24VAC, 8W, 50Hz, Bac.
BOL191-0143	Pan Head Machine Screw, Phillips, M5x35, St. St. A2, DIN7985
BOL191-0155	Pan Head Machine Screw, Phillips, M5x20, St. St. A2, DIN7985
GAS080-0007	Gasket, Silicone, ø119mm, Water Reservoir
GAS084-0007	Drain PVC Tube 10x13
GAS084-0025	Tube, White, Reinforced PVC, 1/2"x2M, 50C, RHWW-01
GAS084-0031	Tube, Black, Reinforced Rubber, 2M long, Nut 1/2" BSP, Free next side
NUT192-0221	Nylon Insert Lock Hex Nut, M5, Stainless Steel A2, DIN985
NUT193-0283	Plain Washer, 1.2X7.45X16.1, Stainless Steel A2
POL065-0088	Cover Door for 50XX-MD - Assembly
BOL191-0140	Pan Head Machine Screw, Phillips, M4x12, St. St. A2, DIN7985
POL067-0004	Cover, Reservoir, Fill water

Part Number	Description
TRY505-0001	Shelf for ML, EL 5050
CMT196-0001	Bushing, water level electrode
GAS086-0001	Tube, Teflon, Water Level Electrode
ELE039-0048	Terminal, male, brass, w/o isolation, PC1L18704LR, K.S. Terminals
FIT100-0226	Nut for Sleeve, Tube 1/4, Thread 7/16-24, Brass
NUT192-0191	Hex Nut, M4X3.2, Stainless Steel A2, DIN934
NUT193-0292	Serrated Lock Washers External Teeth, M6, Steel, Zinc Plated, DIN6798A
ELC258-0020	Switch, Float, Mini, PT14-2A, Riko Assy.

11.1 Water Outlet Strainer



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

12. 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
psia	psig	°F	Bar	kPa	°C	17.7	3.0	221.5	1.22	122.0	105.3
14.7	0.0	212.0	1.01	101.3	100.0	17.8	3.1	221.7	1.23	122.7	105.4
14.8	0.1	212.2	1.02	101.7	100.1	17.8	3.1	221.9	1.23	122.7	105.5
14.8	0.1	212.4	1.02	102.1	100.2	17.9	3.2	222.1	1.23	123.4	105.6
14.9	0.2	212.5	1.02	102.4	100.3	18.0	3.3	222.3	1.24	124.1	105.7
14.9	0.2	212.7	1.03	102.8	100.4	18.0	3.3	222.4	1.24	124.1	105.8
15.0	0.3	212.9	1.03	103.2	100.5	18.1	3.4	222.6	1.24	124.7	105.9
15.0	0.3	213.1	1.04	103.6	100.6	18.2	3.5	222.8	1.25	125.1	106.0
15.1	0.4	213.3	1.04	104.0	100.7	18.2	3.5	223.0	1.26	125.5	106.1
15.1	0.4	213.4	1.04	104.3	100.8	18.3	3.6	223.2	1.26	126.0	106.2
15.2	0.5	213.6	1.05	104.7	100.9	18.3	3.6	223.3	1.26	126.2	106.3
15.2	0.5	213.8	1.05	105.1	101.0	18.4	3.7	223.5	1.27	126.8	106.4
15.3	0.6	214.0	1.05	105.4	101.1	18.5	3.8	223.7	1.27	127.2	106.5
15.4	0.7	214.2	1.06	105.8	101.2	18.5	3.8	223.9	1.28	127.7	106.6

psia	InHg	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
15.4	0.7	214.3	1.06	106.2	101.3	18.6	3.9	224.1	1.28	128.1	106.7
15.5	0.8	214.5	1.07	106.6	101.4	18.6	3.9	224.2	1.29	128.5	106.8
15.5	0.8	214.7	1.07	106.9	101.5	18.7	4.0	224.4	1.29	129.0	106.9
15.6	0.9	214.9	1.07	107.3	101.6	18.8	4.1	224.6	1.29	129.6	107.0
15.6	0.9	215.1	1.08	107.7	101.7	18.9	4.2	224.8	1.30	129.9	107.1
15.7	1.0	215.2	1.08	108.1	101.8	18.9	4.2	225.0	1.30	130.4	107.2
15.7	1.0	215.4	1.08	108.4	101.9	19.0	4.3	225.1	1.31	130.8	107.3
15.8	1.1	215.6	1.09	108.8	102.0	19.0	4.3	225.3	1.31	131.3	107.4
15.8	1.1	215.8	1.09	109.2	102.1	19.1	4.4	225.5	1.32	131.7	107.5
15.9	1.2	216.0	1.10	109.6	102.2	19.2	4.5	225.7	1.32	132.2	107.6
16.0	1.3	216.3	1.10	110.0	102.4	19.3	4.6	225.9	1.33	132.6	107.7
16.1	1.4	216.5	1.11	110.7	102.5	19.3	4.6	226.0	1.33	133.1	107.8
16.1	1.4	216.7	1.11	111.1	102.6	19.4	4.7	226.2	1.34	133.5	107.9
16.2	1.5	216.9	1.12	111.5	102.7	19.4	4.7	226.4	1.34	134.0	108.0
16.2	1.5	217.0	1.12	111.9	102.8	19.5	4.8	226.6	1.34	134.4	108.1
16.3	1.6	217.2	1.12	112.3	102.9	19.6	4.9	226.8	1.35	134.9	108.2
16.4	1.7	217.4	1.13	112.7	103.0	19.6	4.9	226.9	1.35	135.3	108.3
16.4	1.7	217.6	1.13	113.1	103.1	19.7	5.0	227.1	1.36	135.8	108.4
16.5	1.8	217.8	1.14	113.5	103.2	19.8	5.1	227.3	1.36	136.2	108.5
16.5	1.8	217.9	1.14	114.0	103.3	19.8	5.1	227.5	1.37	136.7	108.6
16.6	1.9	218.1	1.14	114.3	103.4	19.9	5.2	227.7	1.37	137.1	108.7
16.6	1.9	218.3	1.15	114.7	103.5	19.9	5.2	227.8	1.38	137.6	108.8
16.7	2.0	218.5	1.15	115.1	103.6	20.0	5.3	228.0	1.38	138.1	108.9
16.8	2.1	218.7	1.16	115.6	103.7	20.1	5.4	228.2	1.39	138.5	109.0
16.8	2.1	218.8	1.16	116.0	103.8	20.2	5.5	228.4	1.39	139.0	109.1
16.9	2.2	219.0	1.16	116.3	103.9	20.3	5.6	228.6	1.39	139.5	109.2
16.9	2.2	219.2	1.17	116.7	104.0	20.3	5.6	228.7	1.40	140.0	109.3
17.0	2.3	219.4	1.17	117.1	104.1	20.4	5.7	228.9	1.40	140.5	109.4

psia	InHg	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
17.1	2.4	219.6	1.18	117.5	104.2	20.4	5.7	229.1	1.41	140.9	109.5
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

psia	InHg	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
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

psia	InHg	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
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
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	247.6	127.1

psia	InHg	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
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

psia	InHg	°F	Bar	kPa	°C	psia	psig	°F	Bar	kPa	°C
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

°C	kPa	Bar	°F	psig	psia	°C	kPa	Bar	°F	psig	psia
135.2	315.0	3.15	275.4	31.2	45.7	131.2	280.0	2.80	268.2	25.9	40.6
135.3	315.9	3.16	275.5	31.3	45.8	131.3	280.9	2.81	268.3	26.0	40.7
135.4	316.8	3.17	275.7	31.5	45.9	131.4	281.7	2.82	268.5	26.2	40.9
135.5	317.7	3.18	275.9	31.6	46.1	131.5	282.6	2.83	268.7	26.3	41.0

°C	kPa	Bar	°F	psig	psia	°C	kPa	Bar	°F	psig	psia
135.6	318.6	3.19	276.1	31.7	46.2	131.6	283.4	2.83	268.9	26.4	41.1
135.7	319.5	3.20	276.2	31.9	46.3	131.7	284.3	2.84	269.1	26.5	41.2
135.8	320.5	3.20	276.4	32.0	46.5	131.8	285.1	2.85	269.2	26.7	41.4
135.9	321.4	3.21	276.6	32.1	46.6	131.9	286.0	2.86	269.4	26.8	41.5
136.0	322.4	3.22	276.8	32.3	46.8	132.0	286.8	2.87	269.6	26.9	41.6
136.1	323.3	3.23	277.0	32.4	46.9	132.1	287.7	2.88	269.8	27.0	41.7
136.2	324.3	3.24	277.2	32.6	47.0	132.2	288.5	2.89	270.0	27.1	41.8
136.3	325.2	3.25	277.3	32.7	47.2	132.3	289.4	2.89	270.1	27.3	42.0
136.4	326.2	3.26	277.5	32.8	47.3	132.4	290.2	2.90	270.3	27.4	42.1
136.5	327.1	3.27	277.7	33.0	47.4	132.5	291.1	2.91	270.5	27.5	42.2
136.6	328.1	3.28	277.9	33.1	47.6	132.6	291.9	2.92	270.7	27.6	42.3
136.7	329.0	3.29	278.1	33.2	47.7	132.7	292.8	2.93	270.9	27.8	42.5
136.8	330.0	3.30	278.2	33.3	47.9	132.8	293.6	2.94	271.0	27.9	42.6
136.9	330.9	3.31	278.4	33.3	48.0	132.9	294.5	2.94	271.2	28.0	42.7
137.0	331.9	3.32	278.6	33.4	48.1	133.0	295.4	2.95	271.4	28.1	42.8
137.1	332.8	3.33	278.8	33.6	48.3	133.1	296.2	2.96	271.6	28.3	43.0
137.2	333.8	3.34	279.0	33.7	48.4	133.2	297.1	2.97	271.8	28.4	43.1
137.3	334.7	3.35	279.1	33.8	48.5	133.3	297.9	2.98	271.9	28.5	43.2
137.4	335.6	3.36	279.3	34.0	48.7	133.4	298.8	2.99	272.1	28.6	43.3
137.5	336.6	3.37	279.5	34.1	48.8	133.5	299.7	3.00	272.3	28.8	43.5
137.6	337.5	3.38	279.7	34.3	49.0	133.6	300.6	3.01	272.5	28.9	43.6
137.7	338.5	3.38	279.9	34.4	49.1	133.7	301.5	3.01	272.7	29.0	43.7
137.8	339.4	3.39	280.0	34.5	49.2	133.8	302.4	3.02	272.8	29.2	43.9

°C	kPa	Bar	°F	psig	psia	°C	kPa	Bar	°F	psig	psia
137.9	340.4	3.40	280.2	34.7	49.4	133.9	303.3	3.03	273.0	29.3	44.0
138.0	341.4	3.41	280.4	34.8	49.5	134.0	304.2	3.04	273.2	29.4	44.1
138.1	342.4	3.42	280.6	35.0	49.7	134.1	305.1	3.05	273.4	29.5	44.2
138.2	343.4	3.43	280.8	35.1	49.8	134.2	306.0	3.06	273.6	29.7	44.4
138.3	344.4	3.44	280.9	35.2	49.9	134.3	306.9	3.07	273.7	29.8	44.5
138.4	345.4	3.45	281.1	35.4	50.1	134.4	307.8	3.08	273.9	29.9	44.6
138.5	346.4	3.46	281.3	35.5	50.2	134.5	308.7	3.09	274.1	30.1	44.8
138.6	347.4	3.47	281.5	35.7	50.4	134.6	309.6	3.10	274.3	30.2	44.9
138.7	348.4	3.48	281.7	35.9	50.6	134.7	310.5	3.10	274.5	30.3	45.0
138.8	349.4	3.49	281.8	36.0	50.7	134.8	311.4	3.11	274.6	30.5	45.2
138.9	350.4	3.50	282.0	36.1	50.8	134.9	312.3	3.12	274.8	30.6	45.3
139.0	351.4	3.51	282.2	36.3	51.0	135.0	313.2	3.13	275.0	30.7	45.4
139.1	352.4	3.52	282.4	36.4	51.1	135.1	314.1	3.14	275.2	31.1	45.6

Legend:

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

13. Valves Numbering

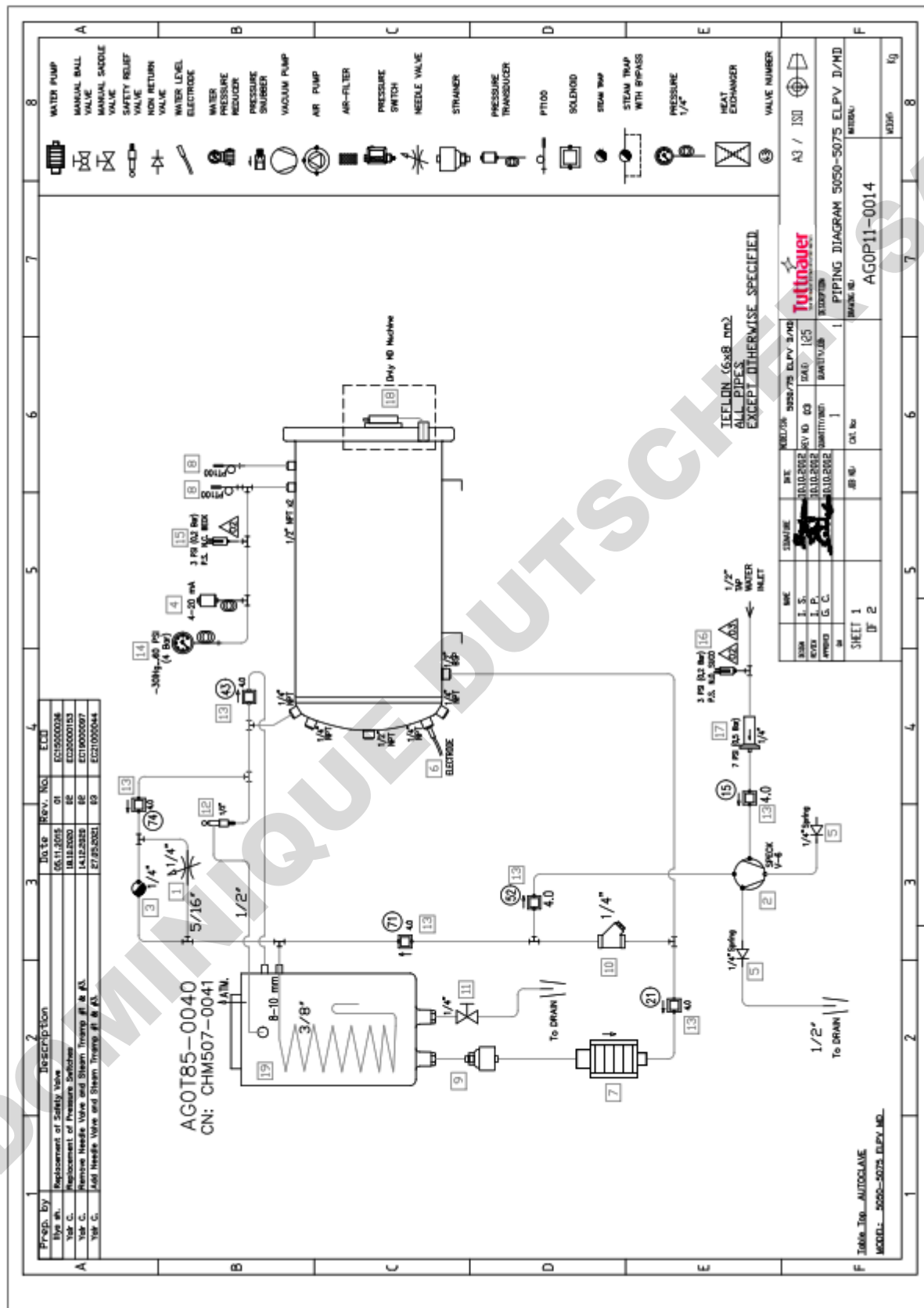
The valves in the drawing and the manual are numbered according to their function. The following list includes all the valve numbers that are in use in Tuttnauer.

0.	FUNCTION	01. Change-over : steam / electricity 02. Locking door cylinder (front door) 03. Locking door cylinder (Rear door)
1.	FEED WATER	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.	MINERAL FREE WATER	21. Mineral free water - inlet 22. Detergent 23. To spray 24. Recycling inlet 25. Recycling outlet
3.	COMPRESSED AIR	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.	AIR	41. Air release N.C. 42. Air release N.O.

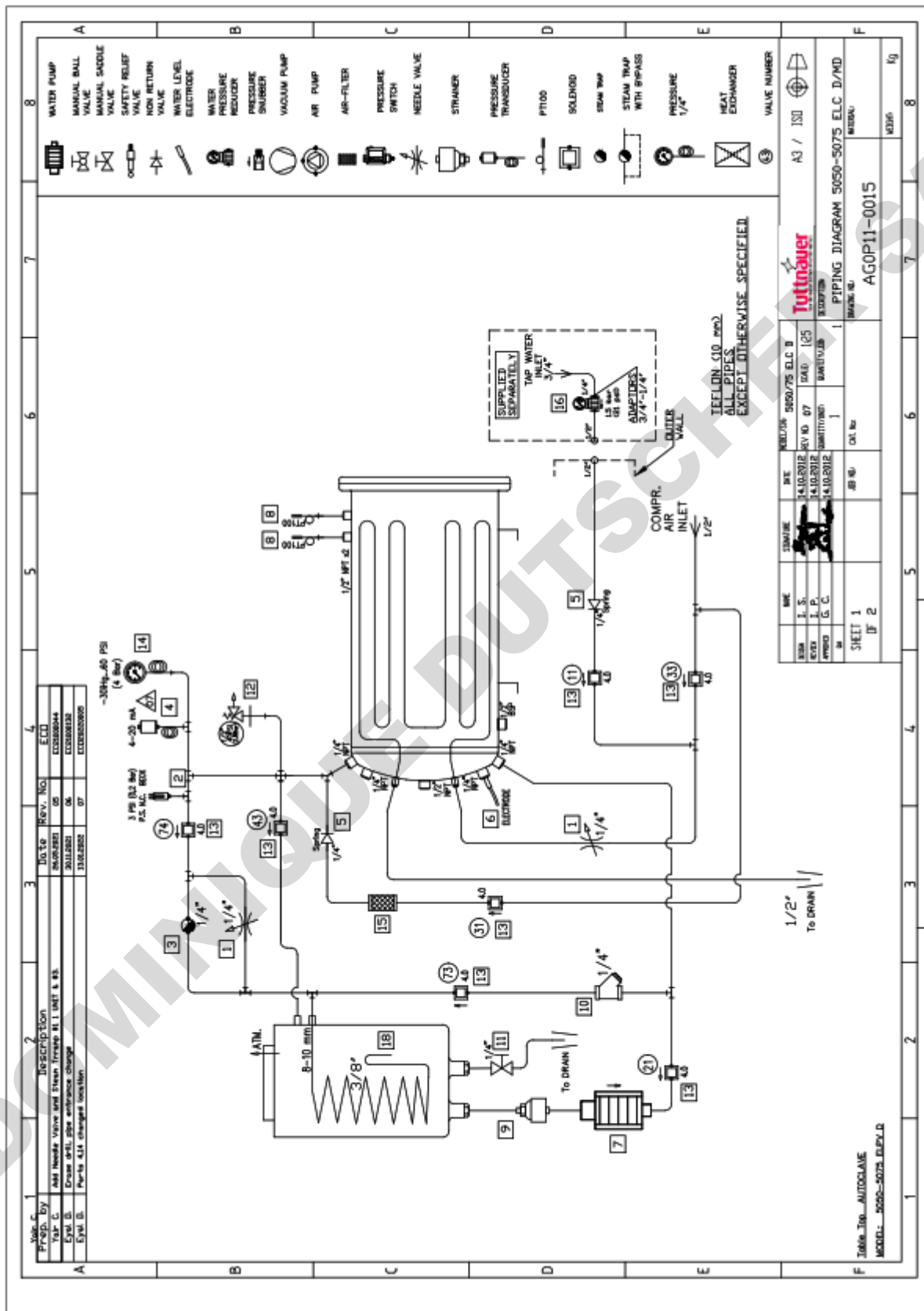
		43. Filtered air - inlet 44. Air Inlet 45. Aeration
5.	VACUUM	51. Vacuum - break 52. Vacuum - to pump 53.1 Vacuum - from door 1 seal 53-2. Vacuum - from door 2 seal
6.	DRAIN	61. Drain – from reservoir 62. Drain – from jacket overflow 63. Drain – from vacuum pump / ejector 64. Drain – from chamber 65. Drain – from cooler 66. Drain – from sanitary filter 67. Drain – from steam generator 68. Drain – jacket 69. Drain – condense from seal
7.	EXHAUST	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.	GAS	81. Inlet 82. Main inlet 83. Inlet through humidifier

9.	STEAM	<ul style="list-style-type: none"> 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
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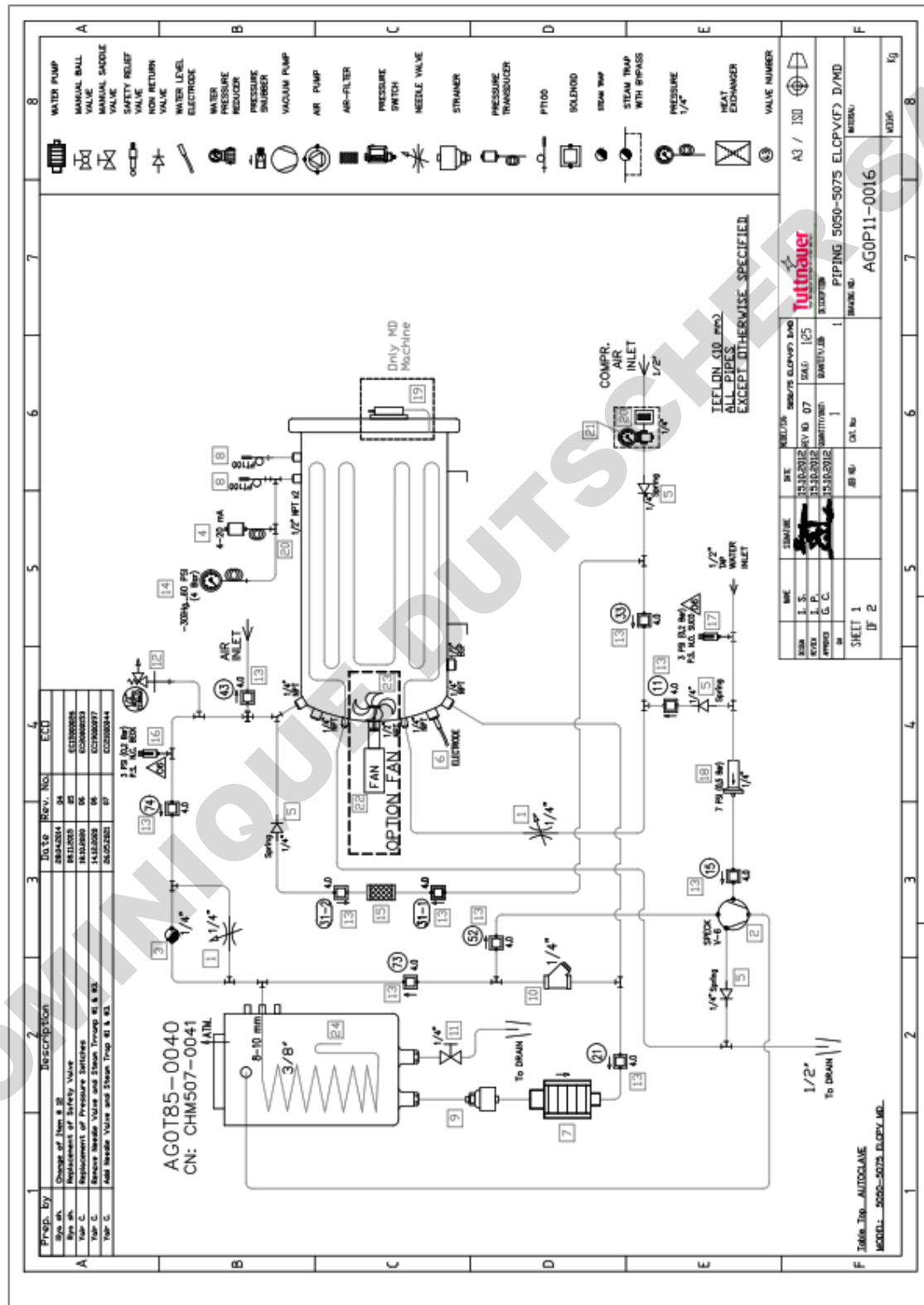
14.2 PIPING DRAWING – MODEL 5050, 5075 ELPV-MD



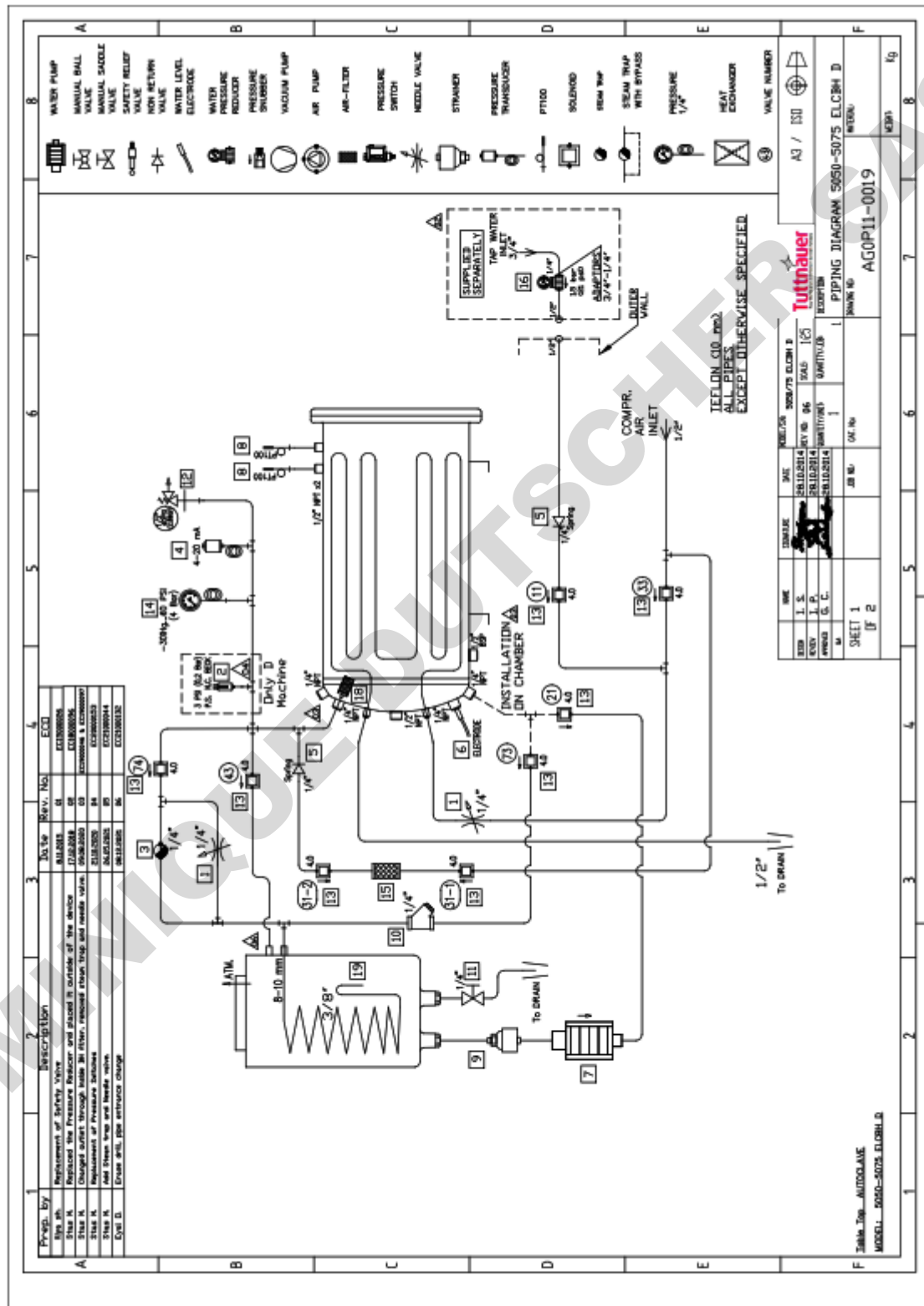
14.3 PIPING DRAWING – MODEL 5050, 5075 ELC-MD (380/400V)



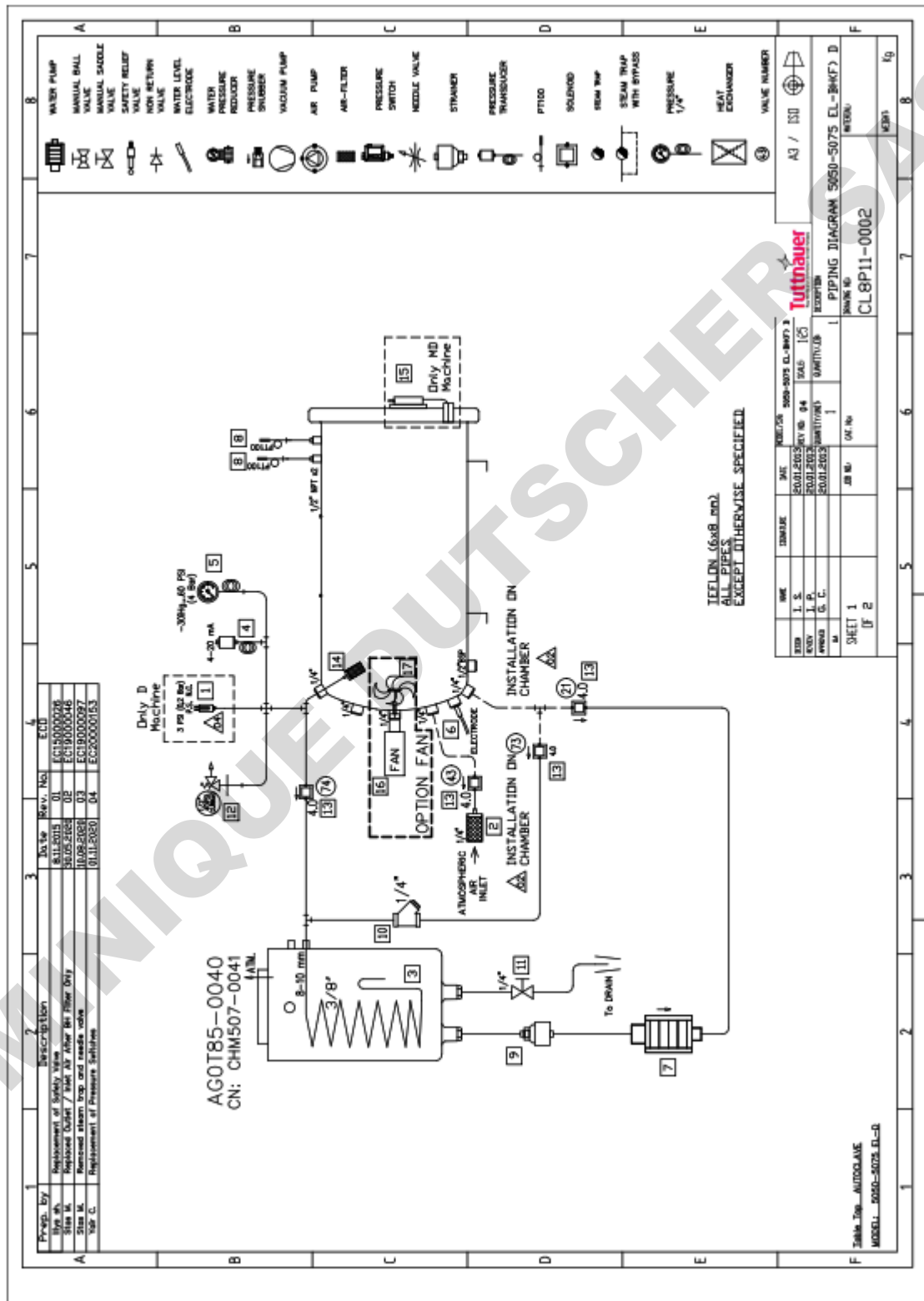
14.4 PIPING DRAWING – MODEL 5050, 5075 ELCPV(F)-MD (380/400V)



14.5 PIPING DRAWING – MODEL 5050-5075 ELCBH D



14.6 PIPING DRAWING – MODEL 5050- 5075 EL-BH (F) D

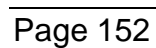


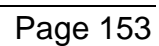
14.7 ELECTRICAL WIRING DIAGRAM – MODEL 5050/5075 EL(C)(PV)(BH)(F) (230V)

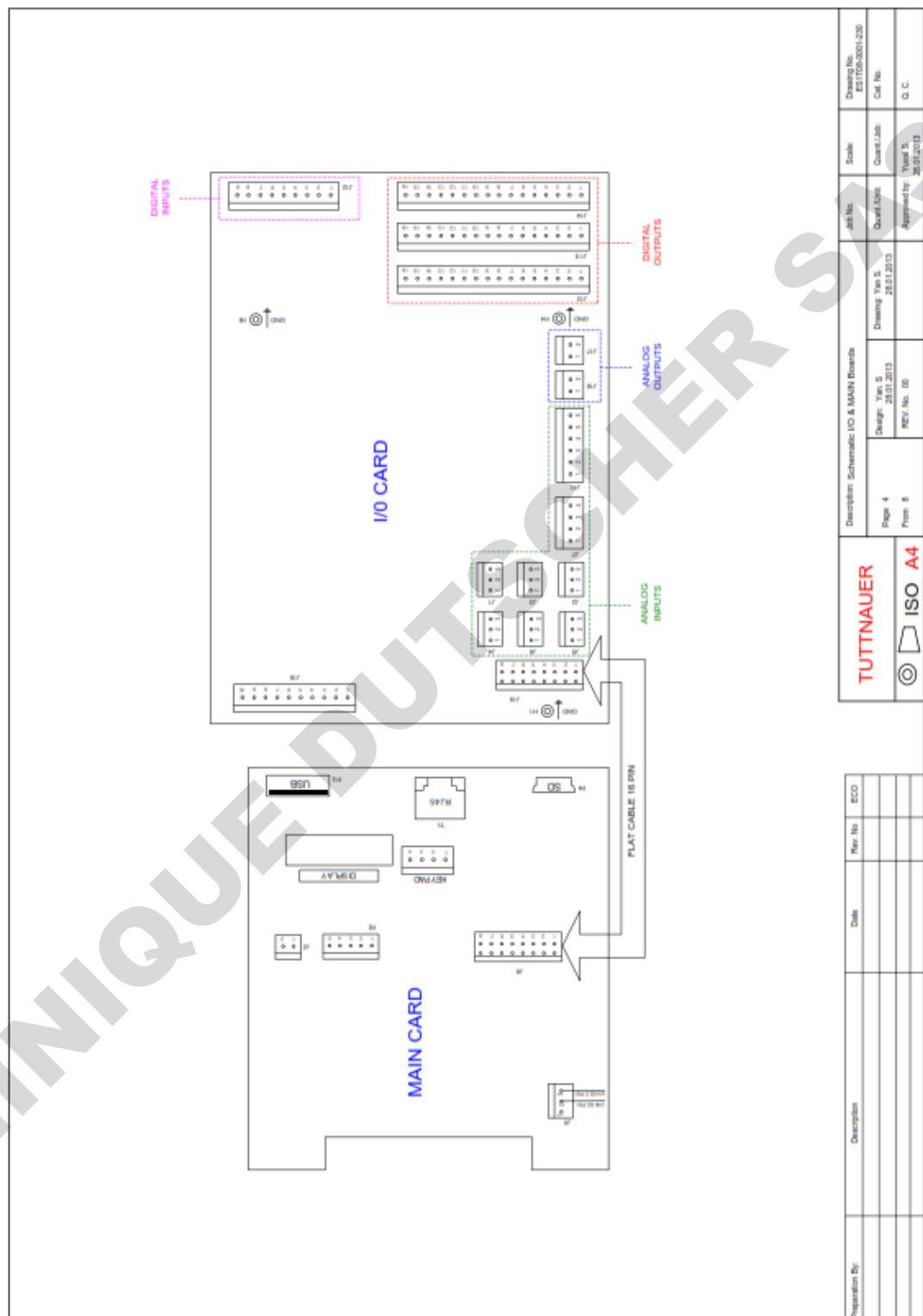
List of Drawings for autoclave model 5050-5075 EL(C)(PV)(BH) with
Tuttnauer control system (2010)

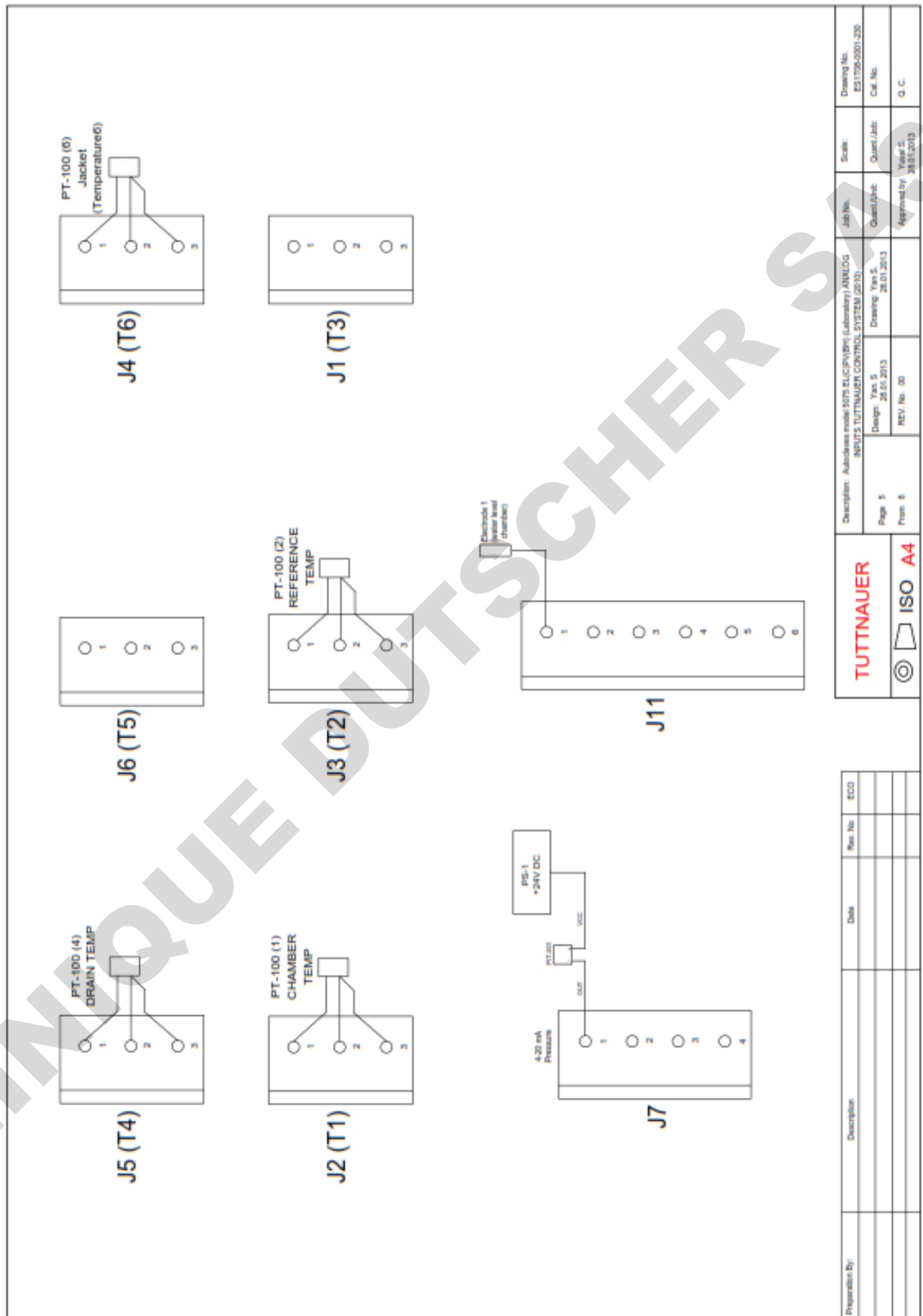
No.	Drawing No.	Description	Rev.	Quantity
1	ES1T08-0001-230	List of Drawings for autoclave model 5050-5075 EL(C)(PV)(BH) with Tuttnauer control system	00	1
2	ES1T08-0001-230	Electrical layout for for autoclave model 5050-5075 EL(C)(PV)(BH) with Tuttnauer control system	00	1
3	ES1T08-0001-230	Autoclave model 5050-5075 EL(C)(PV)(BH) electrical drawing High voltage 3 X 208V AC , 3 X 15A , 60Hz	00	1
4	ES1T08-0001-230	Schematic I/O & MAIN Boards Tuttnauer control system	00	1
5	ES1T08-0001-230	5050-5075 EL(C)(PV)(BH) - ANALOG INPUTS Tuttnauer control system	00	1
6	ES1T08-0001-230	5050-5075 EL(C)(PV)(BH) - ANALOG OUTPUTS Tuttnauer control system	00	1
7	ES1T08-0001-230	5050-5075 EL(C)(PV)(BH) - DIGITAL INPUTS Tuttnauer control system	00	1
8	ES1T08-0001-230	5050-5075 EL(C)(PV)(BH) - DIGITAL OUTPUTS Tuttnauer control system	00	1

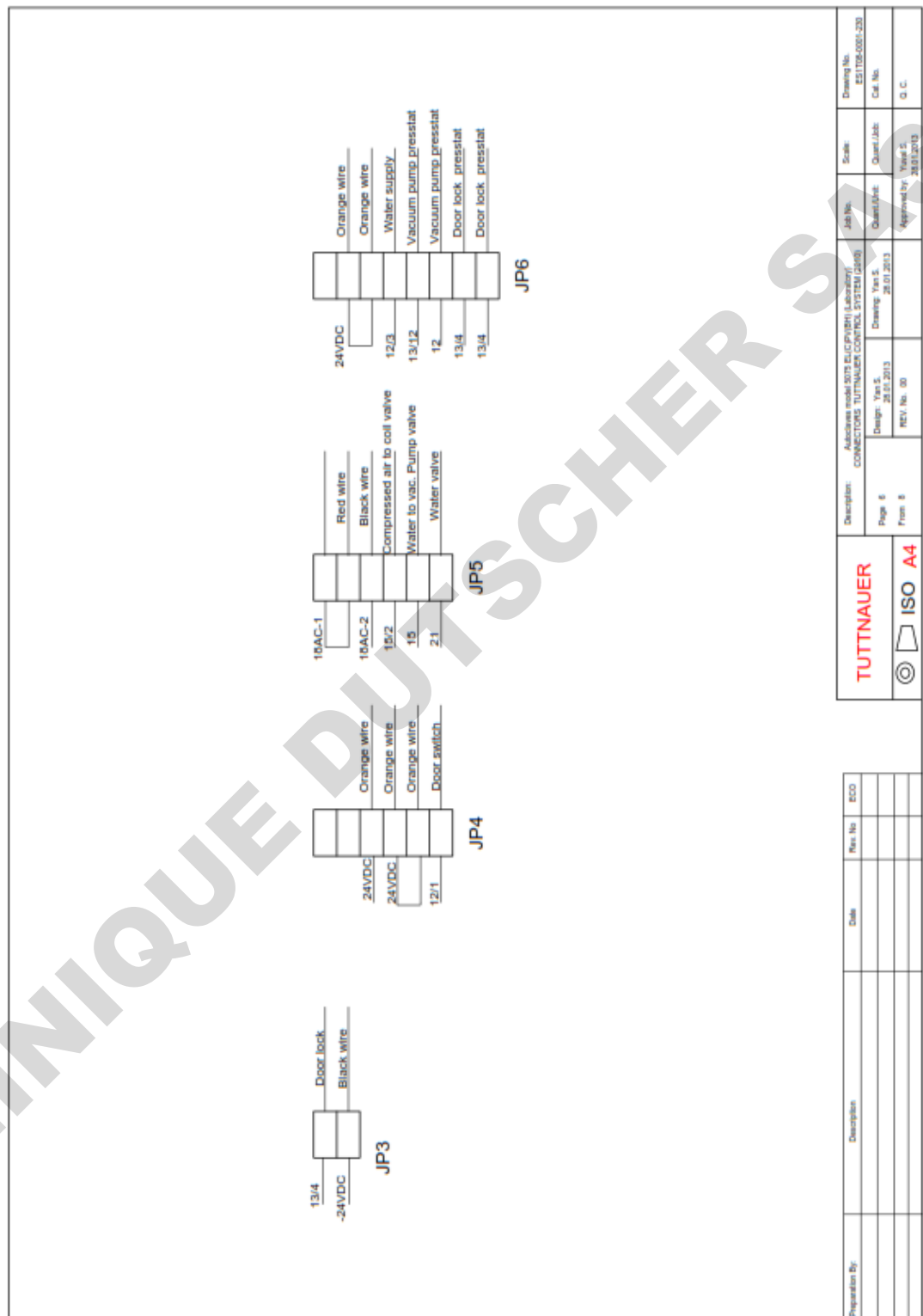
Preparation By:	Description	Date	Rev. No.	ECO	TUTTNAUER	Description: Electrical layout for autoclave model 5050-5075 EL(C)(PV)(BH) with Tuttnauer control system (2010)		Job No.	Scale	Drawing No. ES1T08-0001-230
						Page 1	Page 5			
						Design: 20.01.2013	Drawn: 20.01.2013	Quantity:	Quantity:	Call No.
						Rev. No. 00		Approved By:	Check:	Q. C.





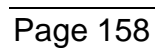






Preparation By:	Description	Date	Rev. No.	ECO

TUTTNAUER		Description: Address model 807H B (GP/PH) Laboratory CONNECTIONS TUTTNAUER CONTROL SYSTEM (2400)		Job No.	Scale:	Drawing No.
Page: 6	Design: Yes S	Drawing: Yes S	Quoted: Yes S	Quoted: Job		E51108-0005-230
From: 8	REV: No. 00	28.01.2013	28.01.2013	Approved by: Yes S	28.01.2013	Q. C.

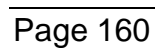


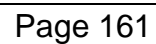
14.8 ELECTRICAL WIRING DIAGRAM – MODEL 5050/5075 EL(C)(PV)(BH)(F) (380/400V)

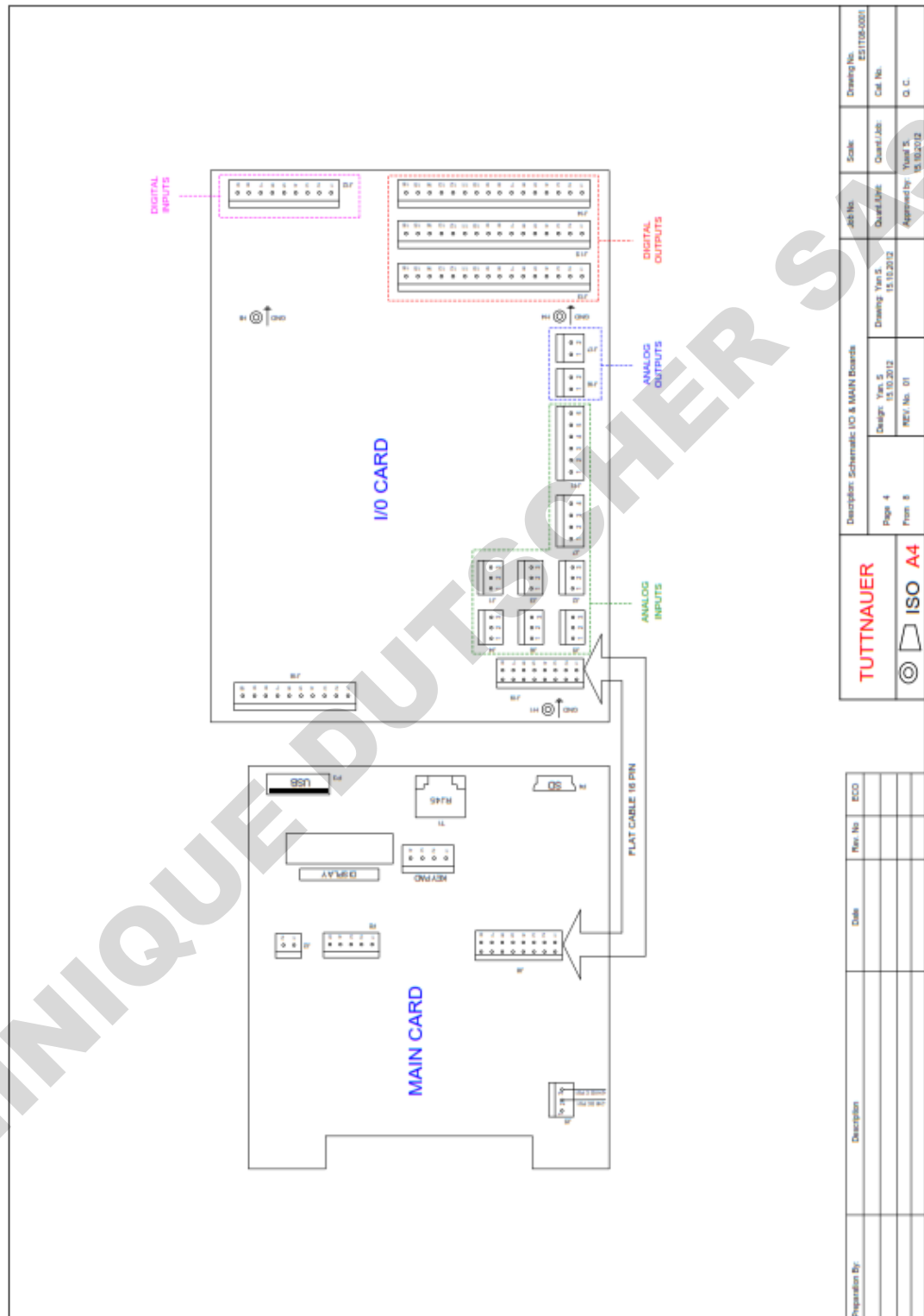
List of Drawings for autoclave model
5050-5075 EL(C)(PV)(BH)(F)

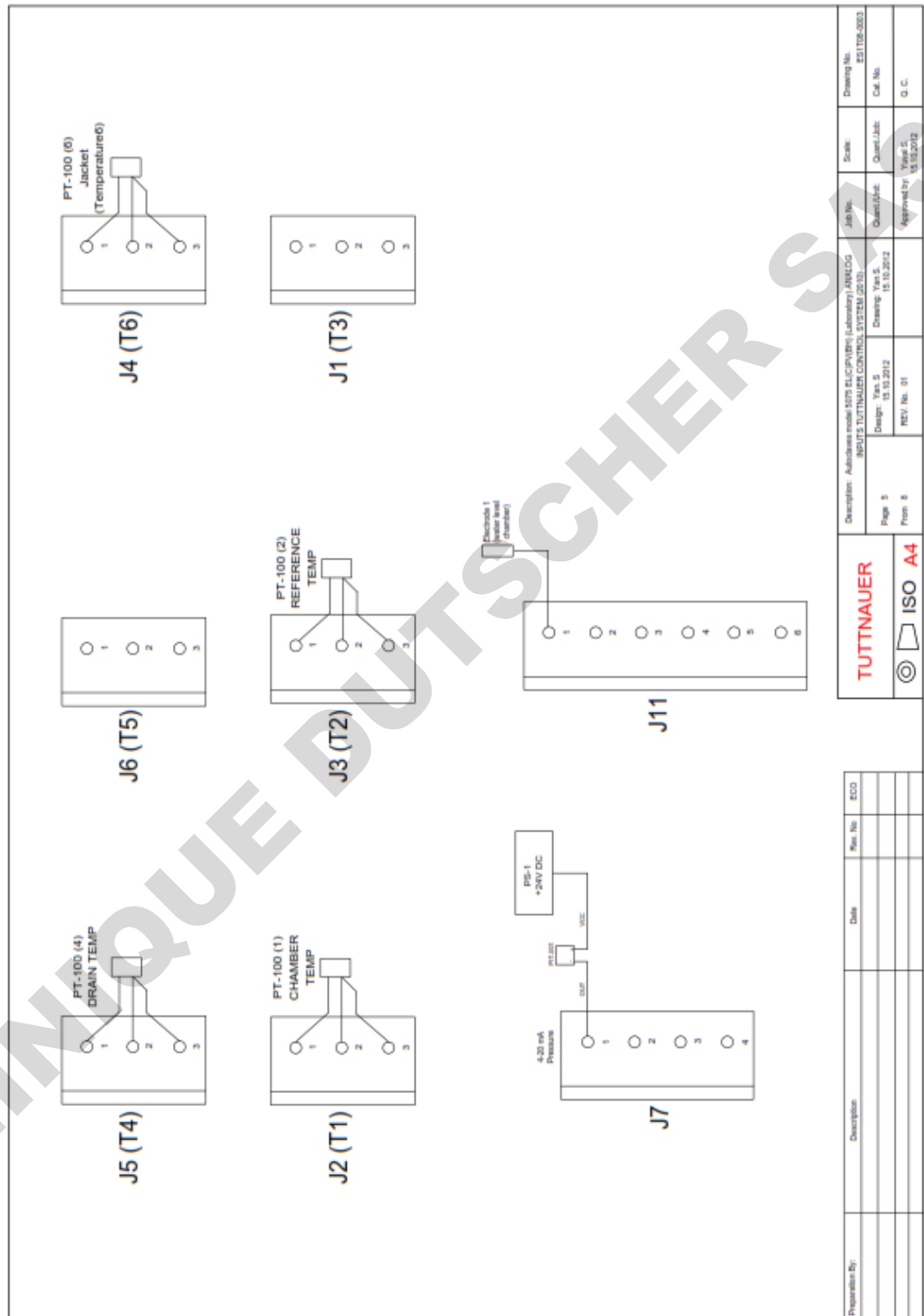
No.	Drawing No.	Description	Rev.	Quantity
1	ES1T08-0001	List of Drawings for autoclave model 5050-5075 EL(C)(PV)(BH) (F)	01	1
2	ES1T08-0001	Electrical layout for autoclave model 5050-5075 EL(C)(PV)(BH) (F)	01	1
3	ES1T08-0001	Autoclave model 5050-5075 EL(C)(PV)(BH)(F) electrical drawing High voltage 3 X 380V AC, 3 X 15A, 50/60Hz	01	1
4	ES1T08-0001	Schematic I/O & MAIN Boards Tuttnauer control system (2010)	01	1
5	ES1T08-0001	5050-5075 EL(C)(PV)(BH)(F) - ANALOG INPUTS Tuttnauer control system (2010)	01	1
6	ES1T08-0001	5050-5075 EL(C)(PV)(BH)(F) - Connectors	01	1
7	ES1T08-0001	5050-5075 EL(C)(PV)(BH)(F) - DIGITAL INPUTS	01	1
8	ES1T08-0001	5050-5075 EL(C)(PV)(BH)(F) - DIGITAL OUTPUTS	01	1

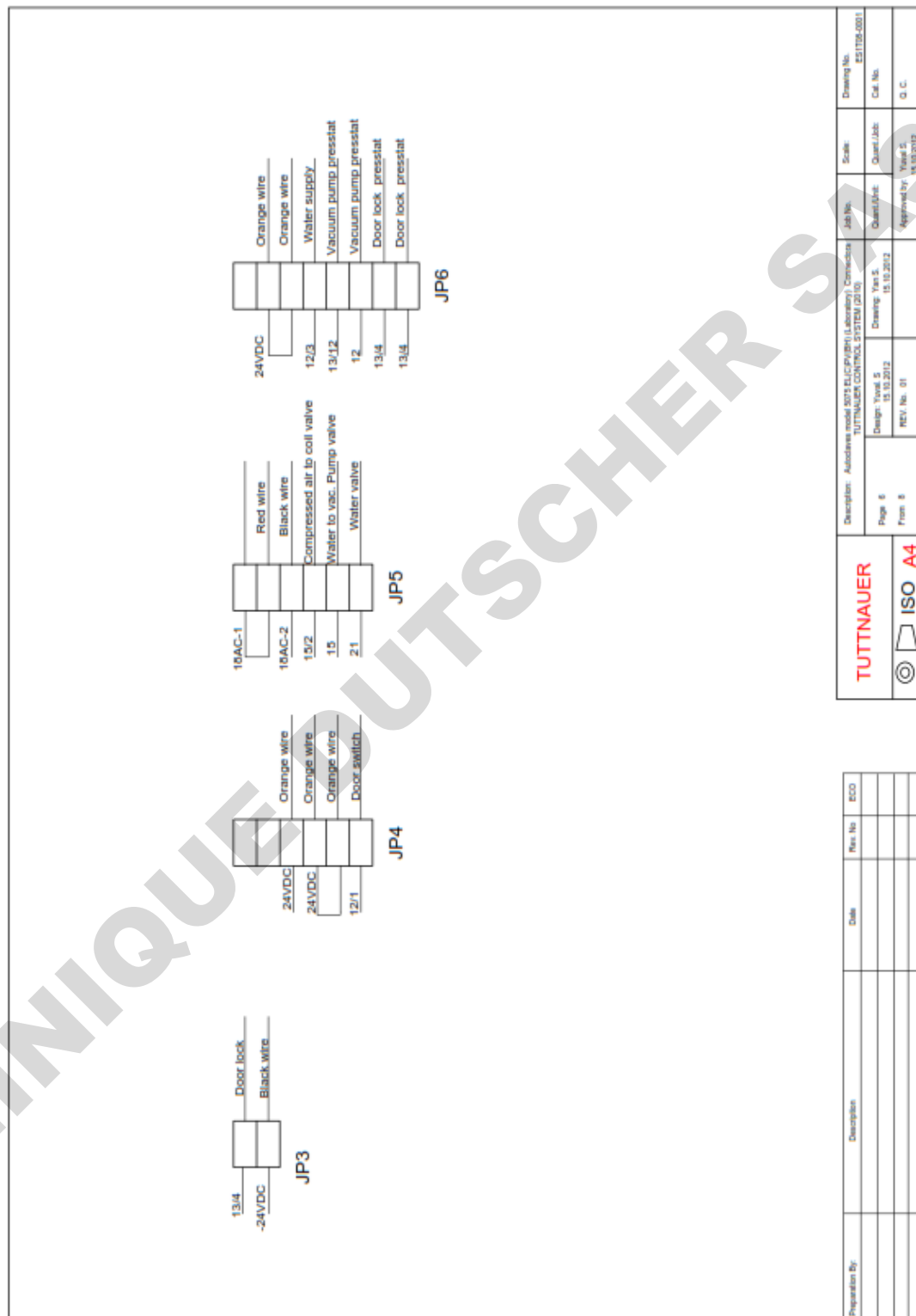
Preparation By:	Description	Date	Rev. No.	ECO	TUTTNAUER	Description: Electrical layout for autoclave model 5050-5075 EL(C)(PV)(BH)(F) Tuttnauer control system (2010)		Job No.	Scale:	Drawing No. ES1T08-0001				
						Page 1	Page 5				Drawing Date 13.10.2012	Quantity	Unit	Call No.
						From 5	MEI No. 01							



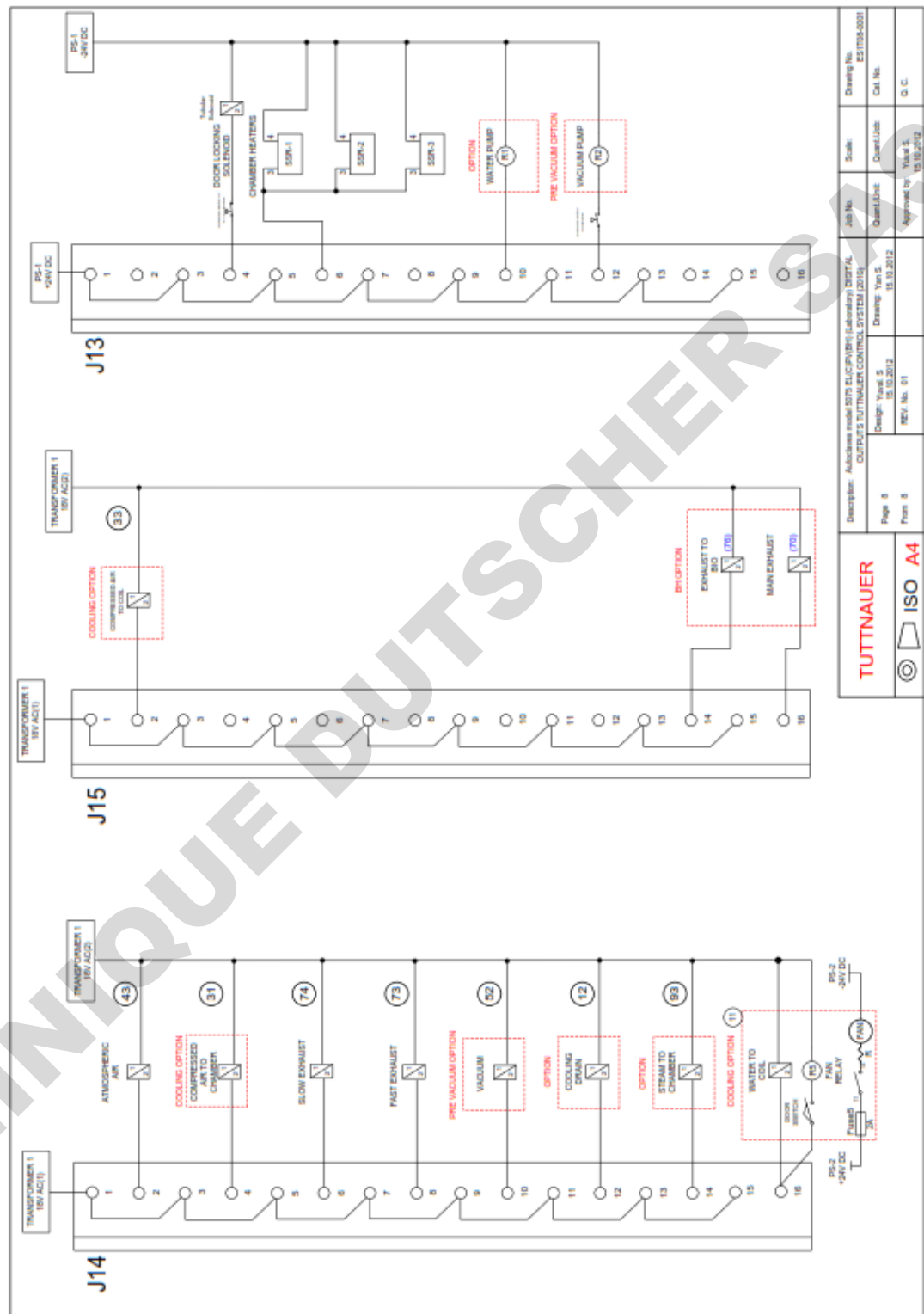






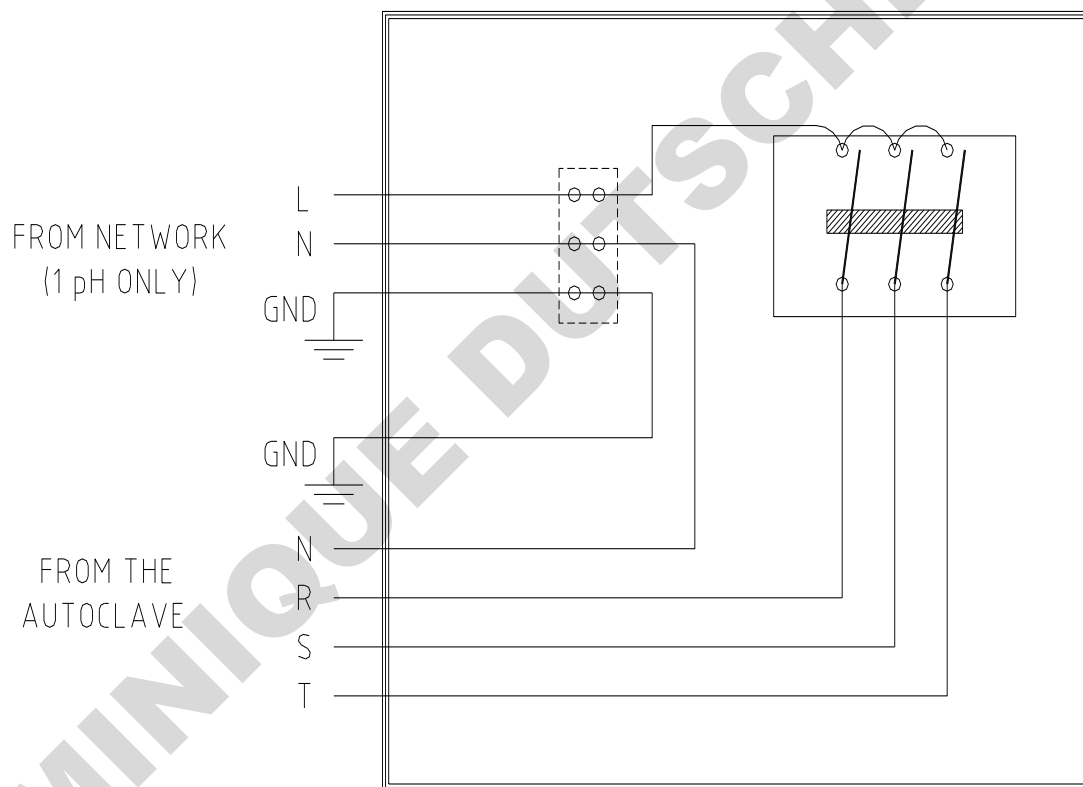


Preparation By:	Description	Date	Rev. No.	ECO
<div> <div>TUTTNAUER</div> <div> <div>©</div> <div>ISO</div> <div>A4</div> </div> </div>				
<div> <div> <div>Description: Automatic model 5075 PLC (P/BN) (Laboratory)</div> <div>TUTTNAUER CONTROL SYSTEM (2010)</div> </div> <div> <div>Page: 6</div> <div>Design: Yes 5</div> <div>Design: Yes 5</div> </div> <div> <div>REV: No. 01</div> <div>15.10.2012</div> <div>15.10.2012</div> </div> <div> <div>Approved by: Yes 5</div> <div>15.10.2012</div> </div> <div> <div>Scale:</div> <div>Job No.</div> <div>Order / Job</div> <div>Order / Job</div> <div>Order / Job</div> </div> <div> <div>Drawing No.</div> <div>251195-001</div> <div>Call. No.</div> <div>Q. C.</div> </div> </div>				

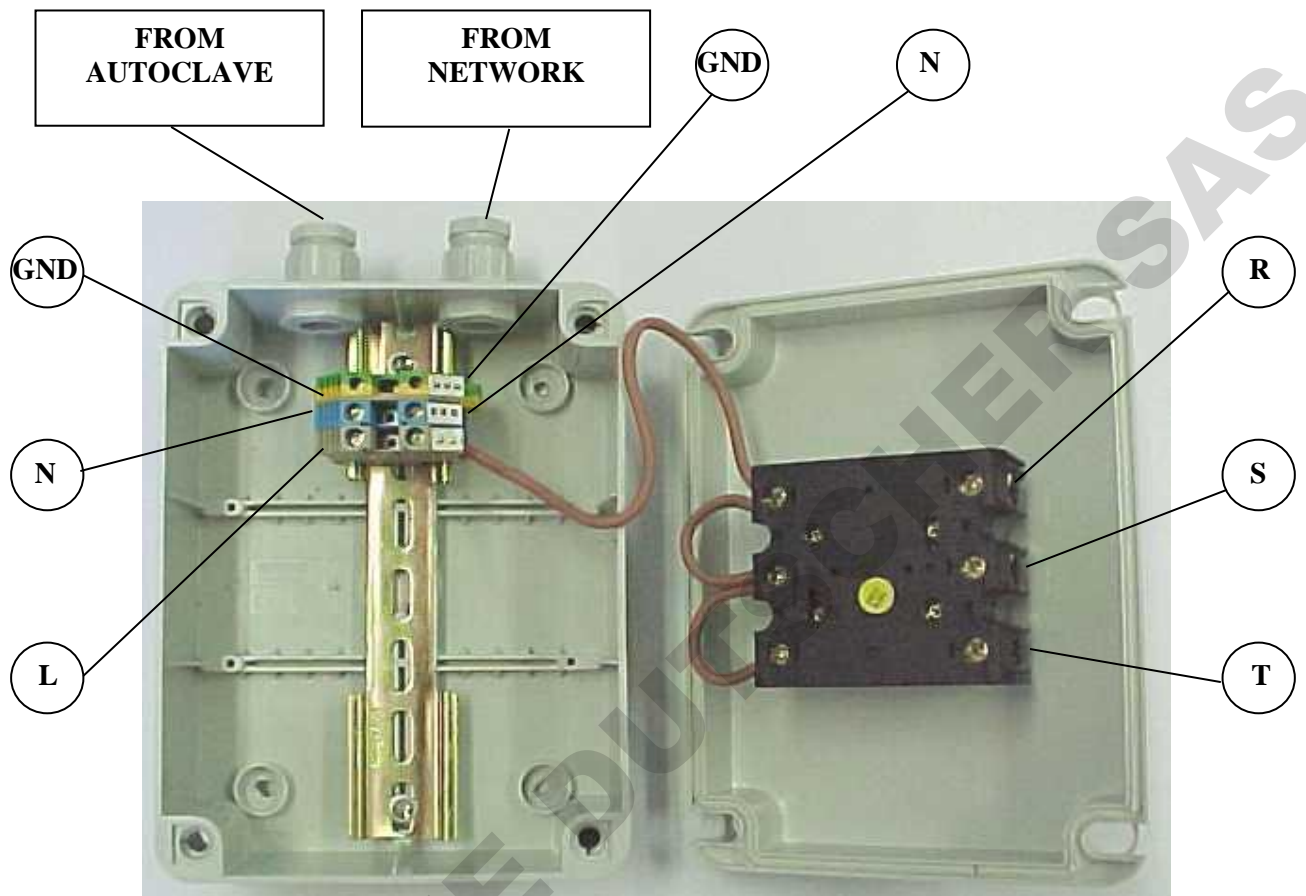


14.9 Switch Box Wiring Diagram

To enable the connection of the autoclave to the 1 phase electrical net, a special switch box is supplied with the autoclave. This switch box shall be placed on the wall and the wiring connection shall be as described below.



14.10 Open Switch Box



14.11 Closed Switch Box

