



Pre-vacuum Steam Sterilizer with Generator

Models 3870 HSG / 3870 HSG-WS

Cat. No. MAN205-0446011EN Rev. F



Tuttnauer. Ltd., Har Tuv B Industrial Zone, P.O. Box 170, Beit Shemesh, 9910101, Israel.

☎Tel: 972 2 9904611, 📠Fax: 972 2 9904730

📠Tuttnauer U.S.A. Co, Ltd., 345 Oser Avenue Hauppauge, NY, 11788, U.S.A.

☎Tel: (631) 737-4850, (800) 624-5836, 📠Fax: (631) 737-0720

Operation and Maintenance Manual

Pre-vacuum Steam Sterilizer with Generator

Models 3870 HSG / 3870 HSG-WS



Table of Contents

Paragraph	Page No.
1. GENERAL INFORMATION	1
1.1 Manufacturer and US Official Correspondence Information	1
1.2 Directives and Standards	1
1.3 Symbols Description	2
1.4 General Description of Device	4
1.5 Indications for Use	5
1.6 Intended Users	5
1.7 Warranty Description	5
1.8 Warranty Statement	5
1.9 Incoming Inspection	6
1.10 Specification	6
1.11 Water Quality	7
1.12 Environmental Emission Information	7
2. SAFETY INSTRUCTIONS	8
2.1 Safety Features	8
2.2 Safety Notes	8
2.3 Cybersecurity	9
2.4 Operating Conditions	11
3. DEPICTION OF SYSTEM PARTS	13
3.1 Construction	13
3.2 Utilities	17
3.3 Autoclave's Electrical Data (the generator is not included)	17
3.4 Generator's Steam Data	18
3.5 Generator's Electrical Data	18
4. INSTALLATION INSTRUCTIONS	19
4.1 Placing	19
4.2 Setup	19
4.3 Utilities connection	19
4.4 Lifting and Carrying	20
4.5 Generator	20

4.6 Preparation before Sterilization	21
4.7 Packs	22
4.8 Tubing	23
4.9 Wrapped Instruments	23
5. OPERATING INSTRUCTIONS	24
5.1 Turning on the Autoclave	25
5.2 Water Supply	25
5.3 Water Filling – 3870HSG-WS	25
6. CONTROL PANEL	27
6.1 Description and Functions of the Control Panel	28
6.2 Opening the Door	35
6.3 Starting a Cycle	36
7. STERILIZATION PROGRAMS	38
7.1 Program Parameters	38
7.2 Cycle Process Description	39
7.3 Vacuum Test Process Description	39
7.4 Bowie and Dick Test Process Description	40
7.5 Ending the Cycle. Unloading	40
7.6 Stopping the Process Manually	41
7.7 Stopping the Process due to Cycle Failure	41
8. CHECKING AND CHANGING PARAMETERS	42
8.1 Quick Options Screen	42
8.2 Entering the Main Menu (Log in)	42
8.3 System Parameters	43
9. MAINTENANCE INSTRUCTIONS	44
9.1 Preventive and Scheduled Maintenance	44
9.2 Maintenance	45
9.3 Cleaning the Water Outlet Strainer	45
9.4 Replacing the HEPA Air Filter	46
10. FULL LIST OF INFORMATIVE SCREEN DISPLAY SYMBOLS, OPERATING MESSAGES, ERROR MESSAGES AND TROUBLESHOOTING	47
10.1 Displayed Operational Messages & Symbols	47
10.2 Troubleshooting	48

1. General Information

Read the Operating Instructions carefully, before beginning any operation on the autoclave!

1.1 Manufacturer and US Official Correspondence Information



The Autoclave is manufactured by Tuttnauer. Ltd. Har Tuv B Industrial Zone, P.O. Box 170, Beit Shemesh, 9910101, Israel. ☎ Tel: 972 2 9904611 📠 Fax: 972 2 9904730

The US Official Correspondence is:

📠 Tuttnauer U.S.A. Co, Ltd., 345 Oser Avenue Hauppauge, NY, 11788, U.S.A. ☎ Tel: (631) 737-4850, (800) 624-5836, 📠 Fax: (631) 737-0720

1.2 Directives and Standards

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

Regulation (EU) 2017/745 (MDR)

Medical Device Single Audit Program – (MDSAP)

ISO 9001	Quality Management System
EN ISO 13485	Quality Management System – Medical Devices
ISO 14001	Environmental management system
ISO 17025	General requirements for the competence of testing and calibration laboratories
EN ISO 14971	Medical devices – Application of risk management for medical devices
ASME Code	Section I and Section VIII. Div. I
PED	2014/68/EU
Chinese Regulations	Special Equipment Licensing Office
EN 285	Large Steam Sterilizers
ANSI / AAMI / ST8	Hospital Steam Sterilizer
ISO 17665	Sterilization of health care products – Moist heat
ANSI / AAMI / ST79	Comprehensive guide to steam sterilization and sterility assurance in health care facilities
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
IEC 62304	Medical Device Software – Software life cycle processes

1.3 Symbols Description

	Manufacturer
	Year of Manufacturing
	Country of Manufacture
	Medical Device
	Model Number
	Serial Number
	Consult the Operation and Maintenance Manual (User Manual) before use.
	Keep away from sunlight and protect from heat.
	For Indoor Use Only.
	Keep dry.
	Disposal according to electronic scrap ordinance.

	<p>This side up (during transport and shipment).</p>
	<p>Fragile (during transport and shipment).</p>
 <p>OR</p> 	<p>A warning or precaution as detailed in the Operation and Maintenance Manual (User Manual).</p>
 <p>OR</p> 	<p>Caution! Hot Surface</p>
	<p>Caution! Hot steam</p>
	<p>Protective earth (Ground)</p>

1.4 General Description of Device

The 3870 HSG / 3870 HSG-WS autoclave is a Class B steam-heated sterilizer using steam as the sterilizing agent. A computerized control unit ensures a fully automatic sterilization cycle, control and monitoring of physical parameters and clear documentation of the sterilization cycle.

The autoclave offers a choice of automatic programs designed to match the material to be sterilized. The autoclave is equipped with a vacuum pump that during the drying stage draws air through a HEPA filter (0.2µm) and pushes that air through the heated chamber to remove moisture and facilitate the drying operation. **Drying is performed with the door closed.**

This autoclave is equipped with a vacuum system. 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 load 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.

A 9kW built-in steam generator supplies the steam for the sterilization process.

The HSG series features a digital display for monitoring and control purposes. The device can display the pressure in psia, psig, or in kPa according to the operator's requirements. When the pressure is displayed in psig, the atmospheric pressure is shown (at sea level) as 0 psig. If the pressure is defined in psia or kPa the absolute zero is displayed as "0" and the atmospheric pressure is shown (at sea level) as 14.7 psia or 100 kPa respectively. The HSG can display temperature in °F or °C.

A printer is a standard addition to the autoclave. The printer prints the preset and actual parameters of the cycle (temperature, time, and pressure).

The HSG-WS features built-in memory to record up to 100 sterilization cycles. These can be reprinted on the printer or exported to a USB device to be transferred to a PC.

WS models include the option of recycling water used for the vacuum pump. To enable the pump to operate with clean water, the tap water reservoir providing water to the pump will be automatically drained every 10 cycles. For this purpose, the reservoir can be filled manually, or connected to the tap water inlet.

Note: The water used for operating the vacuum pump is not to be used in any way for the sterilization process.



Caution!

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

1.5 Indications for Use

The 3870 HSG / 3870 HSG-WS pre-vacuum steam sterilizers are intended for use in hospitals and other healthcare facilities (e.g., hospitals, nursing homes, extended care facilities, freestanding surgical centers, clinics, and medical & dental offices) for the purpose of sterilizing heat-stable medical devices such as: wrapped and unwrapped solids (IUSS), hollow and porous products.

1.6 Intended Users

The 3870 HSG / 3870 HSG-WS autoclaves are intended for use by hospital personnel and other medical personnel.

All autoclave users must receive training in proper usage from an experienced employee. Every new employee must undergo a training period under an experienced employee.

1.7 Warranty Description

This warranty does not include routine cleaning or preventive maintenance, which must be performed as described in section 9.1 – Preventive and Scheduled Maintenance.

This product is sold with a **limited two (2) year parts-only warranty**. Tuttnauer's obligation under this warranty is strictly limited to the **replacement of defective parts**. Labor, travel, and any other associated service costs are **not covered** under this warranty.

This warranty is void if the unit is not purchased from an **authorized Tuttnauer dealer**, or if the product is damaged due to misuse, neglect, improper handling or installation, unauthorized service, alteration, accident, fire, natural disasters, or static discharge.

No other warranties or obligations, whether express or implied, are provided.

The autoclave must be used strictly in accordance with the instructions in this manual!

1.8 Warranty Statement

The warranty registration must be completed and returned to our service departments; within fourteen (14) days of purchase or the warranty will be void.

Our Technical Service Department can be reached at:

✉ **Tuttnauer U.S.A. Co, Ltd.** 345 Oser Avenue Hauppauge, NY, 11788, USA.

☎ Tel (631) 737 4850, (800) 624 5836, 📠 Fax: (631) 737 0720

Note: If there is any difficulty with this autoclave, and the solution is not covered in this manual, contact our representative or Tuttnauer directly. Do not attempt to service this autoclave yourself. Describe the difficulty as clearly as possible so we may be able to diagnose the problem and provide a prompt solution.

If the autoclave is equipped with a printer, send along a copy of the last printout for our inspection.

If replacement parts are required, specify the model and serial number of the machine.

No autoclaves will be accepted for service without prior authorization from Tuttnauer. All transportation costs must be paid both ways by the owner.

This warranty will be void if the unit is not purchased from an authorized full service Tuttnauer dealer.

1.9 Incoming Inspection

Upon receiving your Tuttnauer Autoclave, carefully inspect the outside of the shipping carton for signs of damage. If any damage to the carton is found, note the location with respect to the autoclave and check that area of the autoclave carefully once it is fully unpacked. Observe packing method and retain packing materials until the unit has been inspected. Mechanical inspection involves checking for signs of physical damage such as: scratched panel surfaces, broken knobs, etc.

If any damage is found, contact your dealer as soon as possible so that they can file a claim with the shipping carrier and notify Tuttnauer.

All Tuttnauer products are carefully inspected prior to shipment and all reasonable precautions are taken in preparing them for shipment to assure safe arrival at their destination.



Caution!

Lifting and carrying should always be done by two people.

1.10 Specification

Property		3870
Chamber	Diam.	~15" (38 cm)
	Depth	~27" (68.5 cm)
Chamber Volume		22.4 gal (85 liters)
Max. Allowable Working pressure (MAWP)		~40.6 psi (2.8 bar)
Net weight		~677 lbs (307 kg)
Shipping weight		~926 lbs (420 kg)
Floor loading requirements		According to the Overall weight and floor requirements
Max load		Fabric - 2 packs Instruments - ~26.5 lbs (12 kg)
Tray dimensions	Big	~14" x ~26" x ~1" (35 x 67 x 2.5 cm)
	Small	~11" x ~26" x ~1" (28 x 67 x 2.5 cm)
No. of trays		2
Load No. Counter		Counting from 0 to 999 and nullifies.

1.11 Water Quality

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

Contaminants in feed water supplied to a dedicated steam generator per EN 285.

Determinant	Feed Water
Residue on evaporation	≤ 10 mg/l
Silicate	≤ 1 mg/l
Iron	≤ 0.2mg/l
Cadmium ^a	≤ 0.005 mg/l
Lead ^a	≤ 0.05 mg/l
Rest of heavy metals except iron, cadmium, lead	≤ 0.1 mg/l
Chloride ^b	≤ 0.5 mg/l
Phosphate	≤ 0.5 mg/l
Conductivity (at 20°C) ^c	5 µs/cm
pH (20°C) value	5 to 7.5
Appearance	Colorless clean without sediment
Hardness (Σ Ions of alkaline earth)	≤ 0.02 mmol/l
Note: Compliance can be tested in accordance with acknowledged analytical methods	
a. The limiting values meet the requirements for potable water.	
b. Maximum chloride concentration in feed water, influences corrosion in combination with high temperatures.	
c. See European Pharmacopeia.	

1.12 Environmental Emission Information

1. The peak sound level generated by the autoclave is 70dBawith background noise of 60dBa .
2. The total heat per hour transmitted by the autoclave is <300Wh .

2. Safety Instructions

The autoclave has unique characteristics. Please read and understand the operation instructions before the first operation of the autoclave. This manual includes instructions of operation, the door safety mechanism, dangers involved in circumventing safety means, how to ensure that the door is closed, and how to select a correct sterilization program.

Never use the autoclave to sterilize corrosive products, such as: acids, bases and phenols, volatile compounds, or solutions such ethanol, methanol, or chloroform nor radioactive substances.

2.1 Safety Features

The autoclave has the following features for hazard protection:

The pressure vessel chamber door has the following features protecting personnel from hazards:

1. Two door switches that indicate that the door is closed and locked. Without this indication steam is not introduced to the chamber.
2. A pressure switch that blocks door opening if the pressure is higher than 20% above the ambient pressure.

These features are implemented in the following devices (limiters):

For the chamber:

- a. Electrical door lock
- b. Mechanical membrane door lock
- c. Mechanical safety valve (1 for chamber and 1 for generator).

For the generator:

- a. Cut-off pressure switch
 - b. Cut-off thermostat
- The main power is shut off if there is lack of water or the pressure is above the safe level.

2.2 Safety Notes

1. Always operate the autoclave strictly as instructed in this manual.
2. The device is designed to carry safeguards against cybersecurity threats. If you fear the device has been compromised, immediately contact the authorized representative.
3. Always wear heat resistant gloves before unloading and avoid touching hot loads and surfaces.
4. Instruments should not be loaded into the autoclave unless Steam Sterilization is instructed in their User Manual. The instructed Steam Sterilization Program should be verified against the programs available in this autoclave.
5. When sterilizing plastic materials, make sure that the item can withstand sterilization temperature. Plastic that melts in the chamber is liable to cause a great deal of damage.
6. On closing the device door, make sure it is properly locked before activating. Verify that DOOR OPEN symbol

I is replaced by the load number.

7. Before opening the door, verify that the pressure in the chamber equals the atmospheric pressure (chamber pressure is displayed on the screen).
8. Do not place your hand or head, etc. above the door while opening, as hot steam is escaping the chamber.
9. Do not stand near the back panel of the autoclave while operating, as the pressure safety valve may release steam.
10. Do not touch hot surfaces, such as the top enclosure and area adjacent to the chamber opening!
11. Open the door the minimum required to let the residual steam to escape from the chamber. Only after there is no vapor, open the door widely and remove the load.
12. To assure proper operation of the autoclave, avoid placing in the vicinity of electrical equipment which is not certified for Electromagnetic Compatibility according to IEC/EN 61326-1.
13. Once a month, ensure that the safety valve is operating, and once a year certified inspector must perform pressure chamber safety test.
14. Once a year, or more frequently, effective tests must be performed, i.e., calibration and validation.
15. Make sure there are no leaks, breaks, blockages, whistles, or strange noises.
16. Perform maintenance operations as instructed. The owner of the autoclave is responsible for performing the maintenance operations.
17. Notify the person in charge immediately of any deviation from the proper function of the device.
18. Protective equipment and clothes and other safety instructions should be implemented in accordance with local and national regulations and/or rules!
19. The user shall report any serious incident that occurred in relation to the sterilizer, to the manufacturer and the authority having jurisdiction in their locale.
20. Disposal of the device should be done in accordance with local laws.
21. This autoclave is equipped with rear and front wheels, when moving the autoclave all utilities must be disconnected, at least 2 persons shall move the autoclave with caution. When the autoclave is located in the required place, the wheels must be locked. For further information see FRONT/REAR VIEW of the autoclave.

2.3 Cybersecurity

1. Autoclave Connectivity

Product specifications:

The autoclave includes connectivity capabilities used for:

- Exporting the autoclave's cycles data.
- Importing and exporting the device settings.
- Installing new software updates.
- Remote monitoring using Ethernet (local network).
- Printing data from the device on paper or labels.

The autoclave includes a USB, Ethernet and Wi-Fi connection, used for:

a. USB

- Printing.
- Importing and exporting settings.
- Installing a new software version.
- Exporting cycles data.

b. Ethernet

- Exporting settings by the local network.
- Exporting cycles data by the local network, or by the internet.
- Monitoring the devices from a local network or from the internet.

Recommended instructions for cybersecurity controls:

- Use known source USB for exporting data.
- Only a qualified technician is allowed to update the software version.
- Software updating requires authentication.
- Update the autoclave software to the latest version as recommended by the manufacturer.

Note: The autoclave software is stand-alone and does not require connecting to the internet.

2. Protective features

The autoclave application contains functionalities for cybersecurity such as: data integrity, data encryption and decryption, file structure checks, authentication, and authorization mechanism.

3. Backup

The following information will be displayed per each recorded event:

Username, Time and Date, machine + software details, cycle name, sensor reading during the cycle stages + time stamp, end status of the cycle. · Cycle (data *.cyc file) should be saved during cycle operation.

The device will save cycles history. The cycle files are encrypted and signed and can only be opened by a dedicated software.

4. Infrastructure requirements and secure configuration

The autoclave has Ethernet connection for remote monitoring by desktop application. If required, the autoclave shall be connected to a LAN (local network) or directly to a PC. There is no need to be connected to the internet (WAN).

The software and the operating system include a set of technologies and protocols that enable a secure remote view to the computer or network. It includes a range of features and tools that are designed to provide secure and reliable connectivity, allowing them to only read data from the machine. In addition, importing new updates to the software requires user authentication.



Network Diagram

5. Instructions for users on how to respond upon detection of a cybersecurity vulnerability or incident

If you detect a cybersecurity vulnerability or incident, it is important to take immediate action to minimize the impact and prevent further damage. Here are some steps to follow:

- Disconnect the affected device or system from the network. This will prevent the vulnerability or incident from spreading to other devices or systems.
- Inform the manufacturer and your IT or cybersecurity team as soon as possible. They will be able to assess the situation and determine the appropriate course of action.
- Follow any instructions provided. This may include running scans or performing other actions to secure the affected device or system.
- Change any passwords that may have been compromised. Use strong, unique passwords and different factory codes.
- Keep all software and devices up to date, ensuring that any known vulnerabilities are patched.
- Updates shall be done only by a qualified technician.
- Regularly back up important data to ensure that it is not lost in the event of a cybersecurity incident.

It is important to remain vigilant and take steps to prevent future vulnerabilities or incidents from occurring. This may include implementing security best practices, such as using strong passwords and factory code authentication, as well as regularly updating the software and devices to patch any known vulnerabilities.

2.4 Operating Conditions

The equipment is intended to work withing NORMAL environment conditions as follows:

Pollution:	Pollution Degree 2.
Altitude:	Maximum altitude 2000 meters (6562 feet) above sea level.
Ambient Pressure:	80 – 105 kPa (11.6 - 15.2 psi).
Room Temperature:	5 - 40 °C (41 - 104 °F).
Humidity:	Up to 80%.
Mains supply fluctuations:	Up to +/-10% of the nominal voltage.
Installation Category II.	

- This device is for indoor use only!
- The sterilizer should be loaded only with autoclavable material!
- Do not use the autoclave in the presence of dangerous gases.
- Minimum room ventilation shall be 10 cycles per hour. Insufficient space for ventilation may result in malfunction or damage due to overheating.
- 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

ONLY NON-HAZARDOUS LIQUIDS SHALL BE DISPOSED IN PUBLIC SEWAGE!

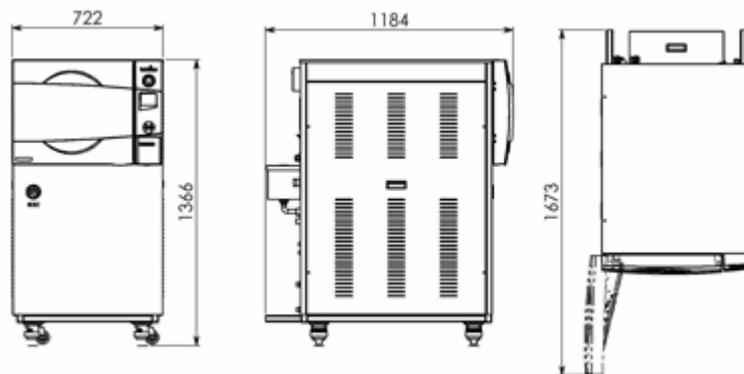
3. Depiction of System Parts

3.1 Construction

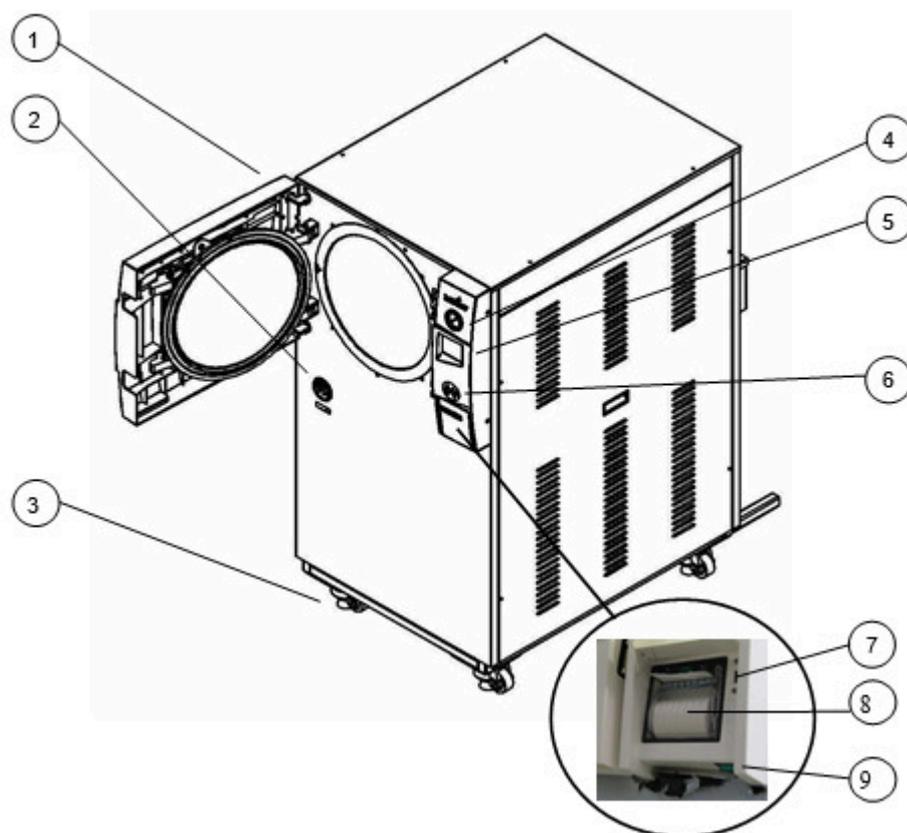
The main parts of the autoclave are made of materials as indicated below:

- Chamber is built of stainless steel 316L.
- Door is made of stainless steel 304L/316L.
- Pressure vessel is made of stainless steel 316L.
- Cabinet is made of stainless steel 304L.
- Trays are made of stainless steel 316L.
- Generator's vessel is made of stainless steel 316L.
- Door closing handle is made of aluminum material, which is safe to touch and thermo-insulated

Overall Dimensions 3870HSG-D / 3870HSG-WS-D

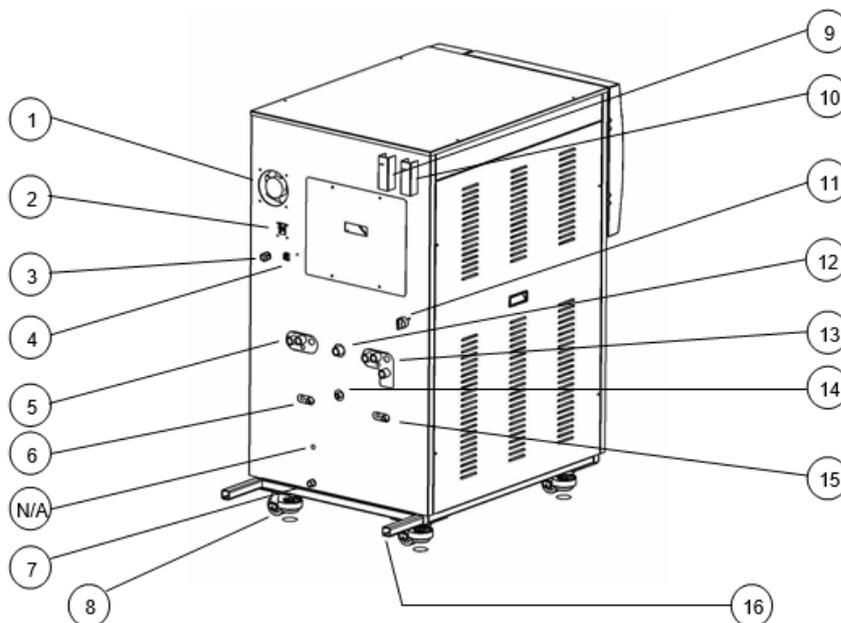


FRONT VIEW – 3870HSG-D / 3870HSG-WS-D



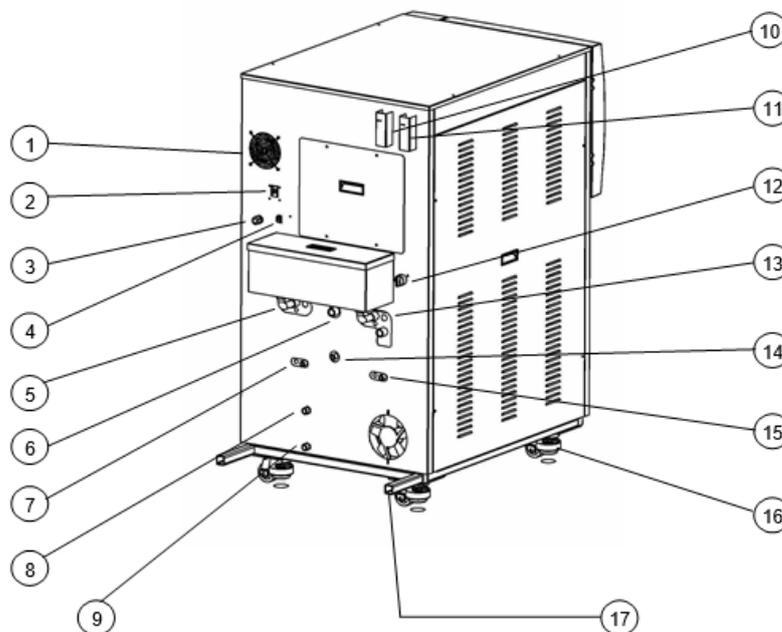
No.	Description	No.	Description
1	Autoclave door	6	Keypad
2	Generator pressure gauge	7	USB port
3	Wheel	8	Printer
4	Chamber pressure gauge	9	On / Off switch
5	Display		

REAR VIEW – 3870HSG-D



No.	Description	No.	Description
1	Fan	9	Chamber safety valve
2	Circuit breaker	10	Generator safety valve
3	Power cable socket	11	Fast exhaust strainer
4	Network port	12	Chamber drain reservoir overflow
5	Mineral-free water reservoir. left opening - overflow, leave open. right opening – inlet, to be connected.	13	Tap water reservoir. left opening - overflow, leave open. right opening – inlet, to be connected.
6	Mineral-free water reservoir drain	14	Chamber drain
7	Generator drain	15	Tap water reservoir drain
8	Wheel	16	Bumper rod

REAR VIEW – 3870HSG-WS-D



No.	Description	No.	Description
1	Fan	10	Chamber safety valve
2	Circuit breaker	11	Generator safety valve
3	Power cable socket	12	Fast exhaust strainer
4	Network port	13	Tap water reservoir. Left opening - overflow, leave open. Right opening – inlet, an optional connection.
5	Mineral-free water reservoir. Left opening - overflow, leave open. Right opening – inlet, an optional connection.	14	Chamber drain (optional)
6	Chamber drain reservoir overflow	15	Tap water reservoir drain
7	Mineral-free water reservoir drain	16	Wheel
8	Feed water automatic drain (for automatic refill)	17	Bumper rod
9	Generator drain		

3.2 Utilities

Property		3870
Electric Power Supply	Power Supply	3Ph, 208V, 60Hz
	Recommended circuit breaker	20A (9kW)
	Line current	16A (9kW)
	Protection against electrical shock	IEC 61010-1
Mineral-free water inlet		1/2", 1-3 Barg
Tap water inlet		1/2", 2-5 Bar
Drain		1/2" withstanding temp. of 80°C



Warnings!

- In order to avoid any injury by electrical hazard, it is recommended that a ground fault protection device (GFCI) be installed in the electrical panel feeding the autoclave (local codes may make this mandatory).
- The electrical network must comply with local rules and regulations.
- Verify that there is an easy access to the main power switch and to the current leakage safety relay (GFCI). The voltage supplied to the device must comply with the label $\pm 10\%$.
- Check and verify that the electrical net is protected by a current leakage safety relay.
- All water connections to autoclave must be performed through "BACK FLOW PREVENTION SYSTEM" only, as per IEC 61770.

3.3 Autoclave's Electrical Data (the generator is not included)

Property	Value
Voltage	1 ph, 120V
Frequency (Hz)	60 Hz
Consumption	3A
Total power	400W

3.4 Generator's Steam Data

Property	9kW
Max. working pressure	3 BarG
Safety relief valve	~43.5 psi (5 Bar)

3.5 Generator's Electrical Data

Property	Value
Voltage	3 ph, 208V
Frequency (Hz)	60 Hz
Generator Consumption	13A
Autoclave Consumption (the generator is not included)	3A
Heaters	9kW

4. Installation Instructions

Warnings!

- Only technical personnel having proper qualifications and holding technical documentation (including a Technical Manual), and adequate information are authorized to install and serve the apparatus.
- Before moving the autoclave, make sure that the electric cord is disconnected from the power, and there is no pressure in the chamber.
- Mind the power socket. Keep it and its vicinity dry. Danger of electrocution.
- If applicable: Before moving the autoclave, make sure that the electric cord is disconnected from the power, and there is no pressure in the chamber.
- Drain the water from the reservoir.
- Do not drop the device!
- To avoid injuries, lifting and carrying should be done with at least two persons or by using a fork-lift or any other mechanical aid.
- For devices that weigh less than 75 Kg: The device is not designed for use on any standard slide out shelf. If it is necessary to use a slide out shelf, it must be tested and / or rated for 75 Kg or more.
- Insufficient space for ventilation may result in malfunction or damage due to overheating.

4.1 Placing

Make sure while placing the autoclave, to leave space around the machine, to give the technician access to service the machine. Keep the back and the right side of the autoclave approximately 2" (50 mm) away from the wall to allow for ventilation. At the time of installation or anytime the unit is relocated the atmospheric pressure parameter needs to be reset. (See section 9.2 [Maintenance](#)).

Connect the power cord to the socket on the rear side of the autoclave; plug it into the supply outlet. The autoclave must be connected to a properly grounded outlet.

4.2 Setup

- Make sure all the feet are on the autoclave and none of them has been lost.
- Fill the reservoir with mineral-free water (see section 5.3 [Water Filling](#)).
- The unit is ready to operate.

4.3 Utilities connection

- If the autoclave is intended to operate with water inlet and drain outlet connected to the facility's utilities, connect the following:
 - a. Connect the autoclave to the source of mineral-free water through a flexible ½" hose. Mount a manual valve on the source of the water supply, to enable closing the water inlet for maintenance or servicing purposes.
Note: If the device was disconnected from the facility's utilities, the mineral-free water reservoir should be emptied and replaced at least once every 2 days in the case that the device was not operated.

- b. **(WS models only)** Connect the feed water automatic drain to the building's drainage pipe. The drainage shall be of an open type, withstanding temperature of, at least, 80°C. If you wish to use the autoclave without drain connection, put a bucket under the feed water automatic drain.
- c. Connect the feed water supply to the tap water inlet. The supplied water pressure shall be set to 2-4 bar. Mount a manual valve on the source of the water supply, to enable closing the water inlet for maintenance or servicing purposes.

4.4 Lifting and Carrying



Cautions!

Before moving the autoclave, make sure that the electric cord is disconnected from the power, and there is no pressure in the chamber.

1. Disconnect the power supply
2. Drain the water from the reservoir and the chamber (open the water drain valve (see Rear View) and pour the water to a bucket).

Do not drop the device!

4.5 Generator

After installation and prior to putting the machine into operation, the following preparing and checkout procedure for the generator is to be fulfilled:



Warning!

When servicing the autoclave, disconnect all the electrical power supplies to the unit. This is done by switching OFF the main power supply switch, or by unplugging the electrical power main supply cords

- Check the connection to local sewage. Check that the sewage pipeline is not clogged. (Pour water for this task).
- Check the connection to compressed air, pay attention to the door, set the pressure to 6-8 bar.
- Check the connection to tap water. Open the water valve. Manually test the water valves by over-riding the appropriate solenoid valve. If there are no leaks – rotate backwards the solenoid by-pass. Leave the manual inlet taps open.
- Check the connection to mineral-free water. Open the water valve. Test manually the water valves by over-riding the appropriate solenoid valve. If there are no leaks, rotate backwards the solenoid by-pass. Leave the water manual inlet taps open.
- Open the generator electric box, switch ON the 3 Phase circuit breaker with its Trip Coil and ensure all the other circuit breakers are ON.
- Check that the jacket pressure gauge, reaches 2.4 bar. Press the Test button mounted on the generator electric box to de-activate the internal steam generator.
- Switch ON the 3 Phase circuit breaker with its Trip Coil and ensure all the other circuit breakers are ON.

- Check that the Microbiological Filter Cover is removed.
- Check the connection to electricity – To be performed by an authorized electrician only!

4.6 Preparation before Sterilization



Warnings!

- **The instructed Steam Sterilization Program should be verified against the programs available in this autoclave. Verify that you have chosen the appropriate sterilization program.**
- **When sterilizing materials, make sure that the item can withstand the sterilization temperature.**
- **Only use the autoclave for products approved for sterilization in an autoclave. Never use the autoclave to sterilize corrosive products or chemicals, such as: acids, bases and phenols, volatile compounds or solutions, such as ethanol, methanol, or chloroform nor radioactive substances.**

Consult the Medical Device manufacturer relating adequate and most effective cleaning methods, cleaning agents and disinfection methods.

Disinfection:

There are various methods and means for disinfection like soaking in liquid chemical disinfectants or hot water disinfection.

- Check the instructions of the item manufacturer as to the proper procedure for cleaning, disinfecting, and sterilizing each item.
- It is recommended that instruments be ultrasonically cleaned using Tuttnauer's Clean & Simple enzymatic cleaning tablets or other suitable solutions.
- Follow the instrument manufacturer's instructions on the use of products for cleaning and lubricating instrument that have been ultrasonically cleaned.

Packaging:

The target in packing medical items is to assure that the contained goods are sterile and maintain them sterile till opening the package.

There are various methods and techniques used in preparation and packaging of surgical instruments.

- Be sure that instruments of dissimilar metal (stainless steel, carbon steel, etc.) are separated. Carbon steel instruments should be bagged or placed on autoclavable towels and not directly on stainless steel trays (mixing will result in damage to the instruments or trays from the oxidation of these materials).
- Load items within the boundaries of the tray so that they do not touch the chamber walls or fall off when the tray is moved. Items should not be allowed to touch the walls of the Chamber as the hot metal can damage the item.
- Don't overload the Sterilizer trays (see section 1.10). Overloading will cause inadequate sterilization & drying.
- Make sure that all instruments remain apart during the sterilization cycle. surfaces that are hidden because items are covering other items will not be exposed to the steam and will not be sterilized.

- Disassemble or sufficiently loosen multiple-part instruments prior to packaging to permit the sterilizing agent to come into contact with all parts of the instrument.
- Verify that packaging methods are in accordance with the good practice approach and the packaging materials used are in agreement with applicable standards.
- Tilt on edge items prone to entrap air and moisture, e.g., hollowware, so that only minimal resistance to removal of air, the passage of steam and condensate will be met.
- Wrapped instruments should be placed in material which will allow steam penetration and promote drying, such as autoclave bag, autoclave paper, or muslin towels.
- When loading pouches on the tray, put them paper side up, nylon side towards the tray.
- Tubing should be rinsed after cleaning. When placed in the tray, make sure that both ends of the tubing are open and there are no sharp bends or twists.

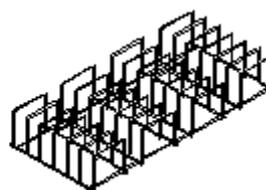
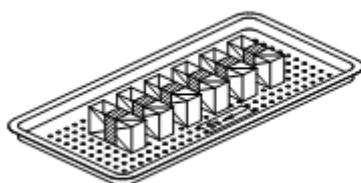


- Cassettes should be placed on the tray rack in place of the trays. They should not be touching each other or the Chamber walls. There should be about 2.5 cm between cassettes or packs for proper steam circulation.
- If spotting is detected on the instruments, it is necessary to determine if the spot is dirt or rust. The first step would be to use an ordinary eraser to remove the spot. If there is no pitting under the spot, then the spot is only dirt. Dirt spots on an instrument may be an indication that the autoclave needs to be cleaned or that the instruments were not adequately cleaned or dried prior to sterilization. If removal of the spot reveals pitting, then the spot is most likely rust. Rust spots on an instrument are not uncommon on inexpensive instruments. It may also be an indication that the instruments were rinsed in tap water with a high mineral content. These minerals, when exposed to high temperature and steam will accelerate the oxidation of the metal. One suggestion would be to final rinse the instruments in a distilled water bath and pat dry to absorb residual water and minerals.
- If the instruments exhibit a discoloration this can be due to the mixing of carbon steel and stainless steel. When these two metals come into contact with each other electrolysis occurs that breaks down the metal. The best solution is to separately wrap the carbon steel instrument to insulate it from other instruments on the tray and the tray itself.

4.7 Packs

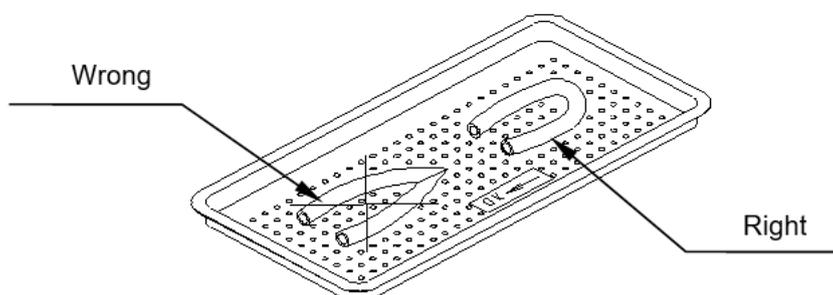
1. Place packs upright on trays, side by side.
2. Packs should not touch the chamber walls.
3. Pack instrument sets in a manner that prevents damage to delicate items.
4. Pack hollow-ware sets so that all openings face the same direction and so that the contents cannot move inside the pack.

5. Load packs of folded operating room drapes with layers vertical, allowing air to be removed from the packs rapidly.
6. Do not place packs of hollow ware and trays of instruments above textile packs or soft goods to avoid wetting caused by condensation from items above.
7. Do not stack pouches. It is recommended that a Tuttnauer™ Pouch Rack be used. This will allow the operator to place pouches on their side, which will increase capacity and provide proper spacing to ensure steam penetration and promote adequate drying.
8. Load items packed in flexible packaging materials on edge with paper to laminate, or flat with the paper surface upwards.



4.8 Tubing

Rinse tubing after cleaning with pyrogen free water. When placing in a tray, make sure that both ends are open, without sharp bends or twists.



4.9 Wrapped Instruments

1. Wrapped instruments should be packed in material that promotes drying such as autoclave bag, autoclave paper.
2. It is highly recommended to utilize the Tuttnauer™ Pouch Rack. This rack allows the operator to place pouches on their side, thus increasing the capacity of the autoclave significantly and promoting better drying of the instruments. Contact your dealer for details.
3. Verify that the packaging method is in accordance with good practice approach and the packaging materials are in accordance with the applicable standards. We recommend using plastic-paper pouches.

5. Operating Instructions



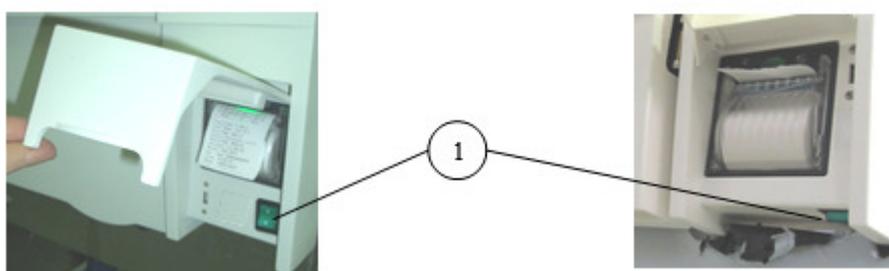
Warnings!

- The autoclave is intended for indoor use only.
- Do not operate the autoclave in the presence of dangerous gases and vapors.
- The Emergency Stop Push-Button in cooperative with key lock mounted on the front panel switches OFF the autoclave operation.
- When the emergency switch is activated, the key must be used to allow the switch to return to the operating position.
- If applicable: It is strictly forbidden for any person to enter the autoclave's chamber. If, for any reason (cleaning, maintenance, or if something falls down), it is necessary to enter the chamber, the person must shut the system by actuating the emergency switch and withdrawing the key from the system, keeping the key on him, and shut OFF all utilities (steam, water, compressed air, and electricity), to prevent accidents and injuries. It is also necessary to turn off the air supply.
- 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!**
- Never reuse waste water.
- Water droplets and visible signs of moisture on sterile packaging or the tape used to secure it, may compromise the sterility of processed loads, or be indicative of a sterilization process failure. Visually check the outside wrapper for dryness. If there are water droplets or visible moisture on the exterior package or on the tape used to secure it, the pack or instrument tray is considered unacceptable.
- The sterility of the instruments processed in unwrapped cycles cannot be maintained if exposed to non-sterile environment.
- Reset the Atmospheric Pressure prior to operating the autoclave for the first time.
- If applicable: In the beginning of each day, check the water level in the reservoir.
- If applicable: Before filling the reservoir, verify that the autoclave is idle and there is no pressure in the chamber.
- Custom programs require validation by the user!
- After the cycle, open the door slowly to allow steam to escape and wait 20 seconds before removing the load.
- For manual operating doors: Before opening the door, verify that there is no pressure in the chamber. Open the door slowly to allow steam to escape, and wait 5 minutes before removing the load.
- To avoid severe injuries from hot steam and condensed hot water that may drip out when opening the door, it is strictly forbidden to lean on the autoclave, and to place your hand or any part of your body over or under the door.
- During loading and unloading, use safety gloves and glasses in accordance with local safety regulations and good practice. If applicable: Do not remove the top cover during a running cycle. Hot water / steam may exit!
- If carts are applicable: It is strictly forbidden to load or unload the loading cart if the transfer carriage is not connected by the hooks to the autoclave and the brakes are not applied.

- On closing the autoclave door, make sure that it is properly locked before starting a cycle.
- Don't place your hand or head, etc. above/beside/below or close to the door while opening it as hot steam is escaping the chamber.
- Do not stand near the back panel of the autoclave while the device is operating as the pressure safety valve may release steam.
- Do not touch hot surfaces, such as the top enclosure and area adjacent to the chamber opening! Hot surfaces are indicated with a label.

5.1 Turning on the Autoclave

1. Plug the power cord into the back of the autoclave and into the wall outlet.
2. Turn on the rocker switch (1), located behind the printer's door.



3. When running the autoclave for the first time, set date and time (see section).

5.2 Water Supply

1. If the autoclave is connected to external water supply, open the manual valves of the tap water supply and mineral-free water supply.
2. If the autoclave is not connected to external water supply (WS models), verify that the tap-water reservoir and the mineral-free water reservoir are full (see section).

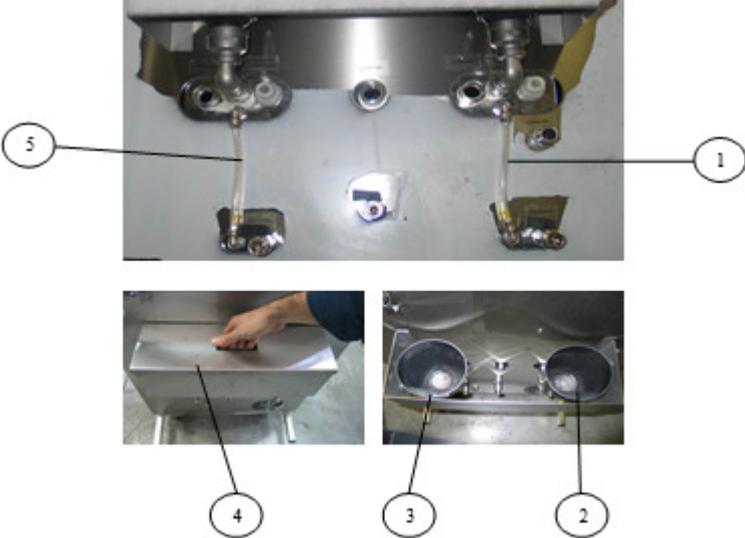
5.3 Water Filling – 3870HSG-WS

The operator must fill the tap water reservoir and the mineral-free water reservoirs before operation.

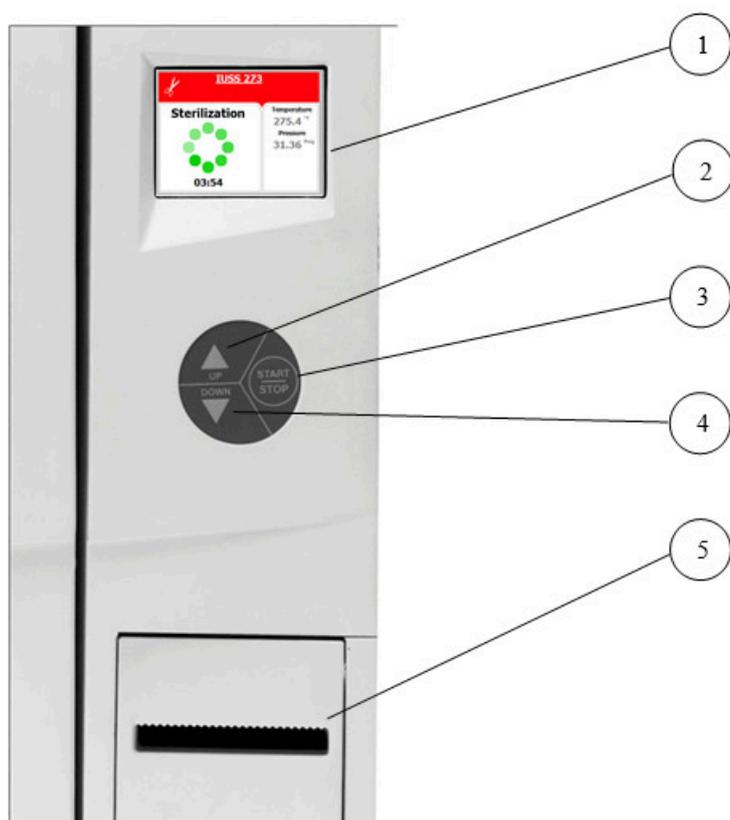
Notes:

- For proper operation of the vacuum pump, the tap water reservoir will be automatically drained every 10 cycles.
 - If the device was disconnected from the facilities utilities, the mineral-free water reservoir should be emptied and replaced **at least once every 2 days** in the case that the device was not opened.
1. Remove the cover (4) of the tap water filling funnel (2) and the mineral-free water filling funnel (3).
 2. Pour water in the appropriate funnel until the float in the water level gauge reaches the required height.
 - The float of the tap-water reservoir (1) must reach the middle of the level gauge tube.
 - The float of the mineral-free water reservoir (5) must reach the top of the level gauge tube.
 3. Return the cover of the funnels to its place.

3870HSG-WS



6. Control Panel

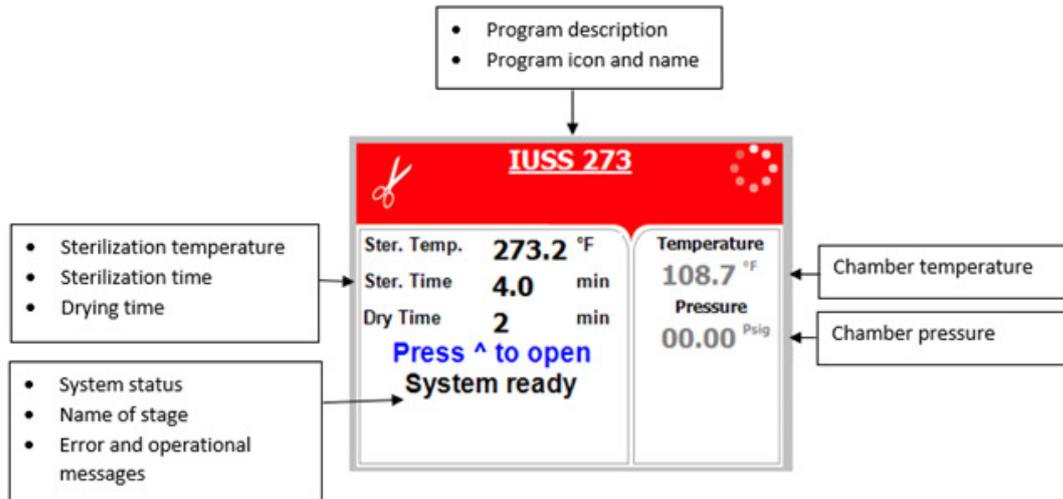


No.	Description
1	Display
2	Keypad: Up Button
3	Keypad: Start / Stop Button
4	Keypad: Down Button
5	Printer

6.1 Description and Functions of the Control Panel

Display

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



Keypad

The keypad consists of 3 keys as described below:

	<p>Up Key</p> <p>This key has the following functions:</p> <ul style="list-style-type: none"> • In the menu directories: <ul style="list-style-type: none"> • This key enables the operator to browse through the cycles. • In the directories available: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Starts the process when the required program was chosen. • Stops the current process. • Cancels the ERROR message displayed on the screen and releases the electric door lock. • In the menu directories: <ul style="list-style-type: none"> • When the cursor is blinking on a number, the START / STOP key enables moving to the next position. • When the cursor is blinking on a menu selection, the START / STOP key activates that selection.

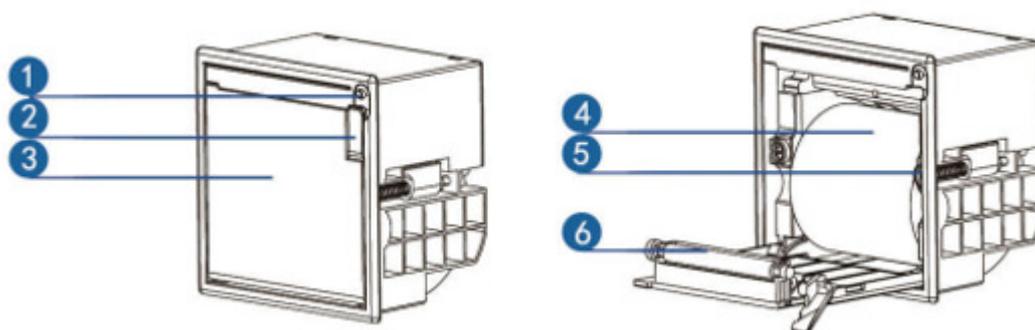
6.1.1 E28 Printer



Overview

The E28 thermal printer (P/N THE002-0115) is installed in the autoclave for automatic documentation of cycles. It replaces the previous CUSTOM2 printer model.

Printer Components



- (1) LF Button / Indicator Light – Feeds paper and shows printer status .
- (2) Lock – Opens to load a new roll.
- (3) Paper Case Cover &
- (4) Paper Roll – Standard thermal paper (P/N THE002-0066).
- (5) Fastener – Secures the roll compartment
- (6) Paper Roller – Guides the paper through the print mechanism.

Paper Specifications

- Width: 57 ± 0.5 mm
- Maximum roll diameter: 50 mm
- Type: Thermal paper (P/N THE002-0066).

Typical Printout

The printer records cycle data:

- Date and Time
- Machine Serial Number & Model
- Soft. Version
- Cycle Number and Cycle Name
- Sterilization Temperature and Sterilization Time
- Drying Time
- End Temperature
- Temperature and pressure records
- Cycle completion status

Printing starts automatically when the cycle begins and records temperature and pressure values at fixed intervals, depending on the process stage.

- For an aborted cycle, “Cycle Failed” is printed together with an error message (see Displayed Error Messages / Symbols section of the manual).
- Printout content and behavior are identical to the previous printer model, ensuring a seamless transition for users.

Example of a typical printout is provided below.

-----	A 00:05:29 104.2 086.0 103.7	
-----	A 00:05:50 106.5 167.0 106.3	
Date: 19/AUG/2025	A 00:05:50 106.5 167.0 106.3	
Time: 16:14:54	A 00:06:22 102.3 086.5 103.7	
Ser. Num: 24030014	A 00:06:43 106.7 169.2 106.6	
Model: 5596-2V	A 00:06:43 106.7 169.2 106.6	
Version: 0	A 00:07:15 102.6 085.5 104.1	
Soft. vers.: 3.0.4.1153	A 00:07:36 106.5 167.4 106.5	
Cycle Num: 000005	H 00:07:37 108.3 167.4 106.5	
Bowie and Dick	H 00:10:37 131.5 288.3 131.3	
Ster. Temp. 134.0 °C	H 00:11:49 134.8 311.2 134.7	
Ster. Time 3.5 min	CLK 1: 16:26:45	Legend
Dry Time 2 min	CLK 2: 16:26:45	A - Air removal stage (Pulse L & Pulse H)
End Temperature 134.0 °C	S 00:11:51 134.8 311.2 134.8	H - Heating stage
Time °C kPa J3:°C	S 00:12:51 135.0 312.2 135.0	S - Sterilization stage
A 00:00:06 057.3 100.0 056.9	S 00:13:51 135.1 313.0 135.0	E - Exhaust stage
A 00:00:07 057.2 100.0 056.9	S 00:14:51 135.2 313.8 135.2	W - Water Filling
A 00:01:28 074.2 017.9 073.7	S 00:15:22 135.1 312.7 135.1	D - Drying stage
A 00:01:41 076.1 098.9 075.8	CLK 1: 16:30:16	CLK1 - Real Time Clock
A 00:01:41 078.2 120.4 078.0	CLK 2: 16:30:16	CLK2 - Software clock
A 00:02:26 064.6 016.4 065.9	E 00:15:25 135.1 313.0 135.1	F - Steam Flush
A 00:02:43 076.5 103.2 076.6	E 00:16:31 106.4 103.2 106.3	
A 00:02:43 081.8 117.6 081.8	D 00:16:34 104.3 091.9 104.1	
A 00:03:28 065.7 015.3 065.5	D 00:16:37 103.0 090.1 102.9	
A 00:03:44 074.6 097.2 074.7	D 00:18:34 068.9 008.0 069.3	
A 00:03:44 079.9 111.7 079.9	D 00:18:34 068.9 008.0 069.3	
A 00:04:28 066.4 015.8 067.4	00:18:37 070.2 008.0 070.0	
A 00:04:44 073.8 091.8 074.0	00:19:06 075.7 095.8 075.7	
A 00:04:44 078.8 107.6 079.0	Status: Test Ended	
A 00:04:51 092.8 139.6 092.8	Time: 16:34:00	
A 00:04:59 106.6 169.6 106.3	Operator: _____	
A 00:05:00 108.3 169.6 106.3	-----	

Indicators & Messages

- LF Button light steady – Printer ready.
- Flashing light – Paper missing.
- No printout – Replace paper roll; if problem continues, call service.

User Maintenance

1. Replace paper when the roll ends.
2. Keep the paper compartment clean and dry.
3. Only use approved thermal paper (P/N THE002-0066).
4. If print quality fades, replace paper roll first.

Safety Instructions

- ⚠ Do not open, disassemble, or repair the printer. Contact service if issues persist.
- ⚠ Keep away from liquids, splashes, and high-humidity environments.
- ⚠ Keep fingers clear of moving parts.
- ⚠ Avoid touching the thermal head right after printing — allow it to cool.
- ⚠ Power off immediately if errors persist, smoke, noise, odor, or foreign objects are detected.

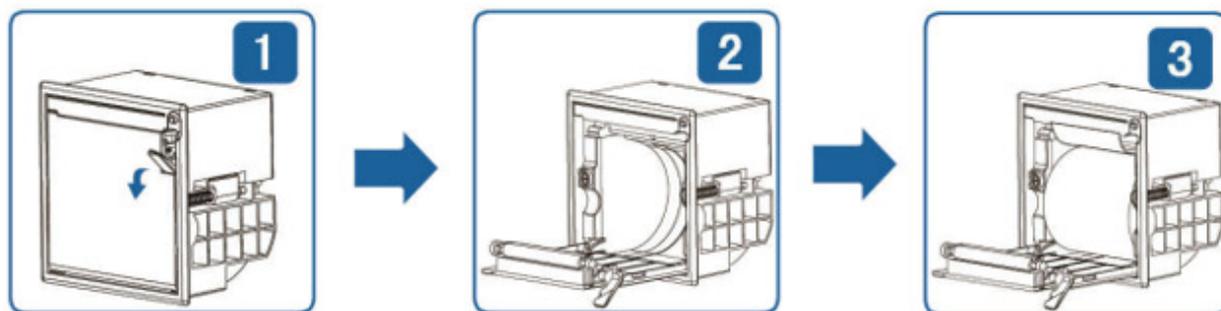
Loading Paper

⚠ Avoid touching the thermal head right after printing — allow it to cool.

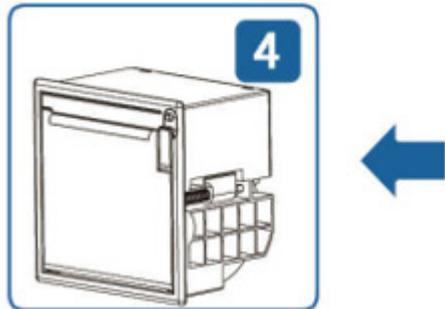
1. Unlock and open the paper case cover.
2. Place a new thermal roll inside, paper feeding from the bottom.

* The E28 uses the same thermal paper (Tuttnauer P/N THE002-0066) as the previous printer.

3. Pull the edge of the paper over the roller.



4. Close the cover and lock.



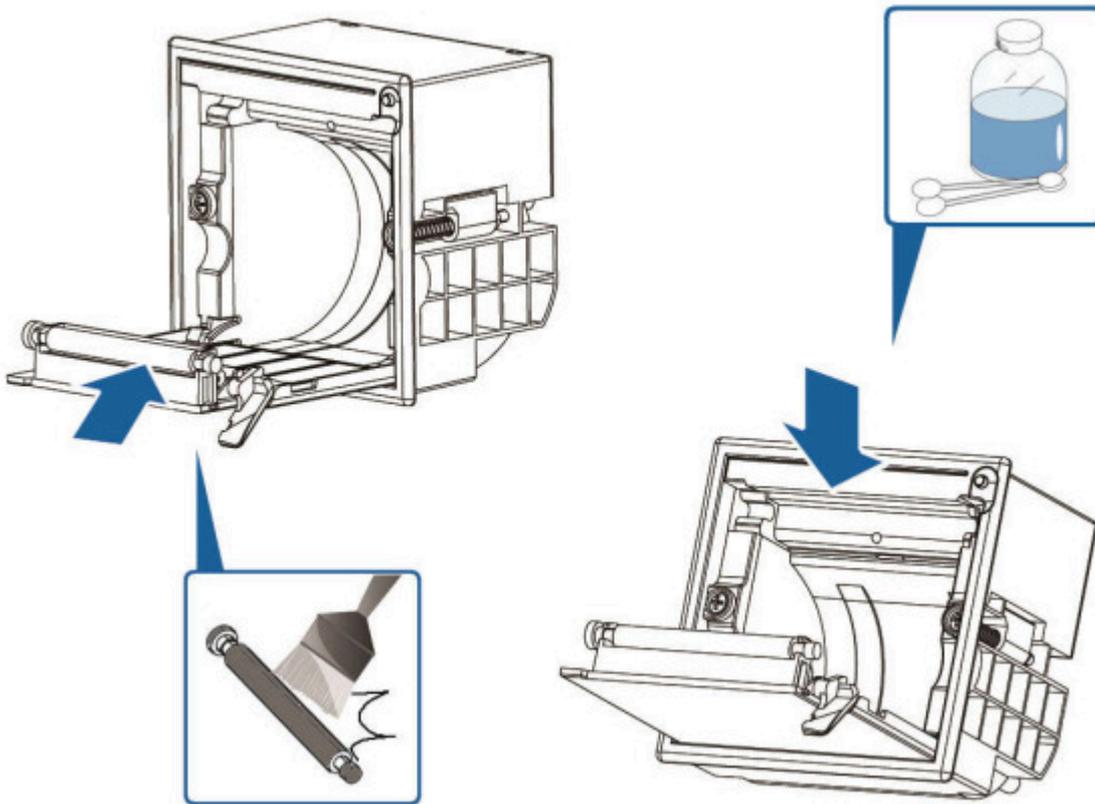
5. Power ON and press LF to feed and align the paper.

Paper storage: cool, dry place; avoid solvents, humidity, sunlight, and friction.

Printer Cleaning

⚠ Avoid touching the thermal head right after printing — allow it to cool.

If the interior of the printer is dusty, print quality can decline.



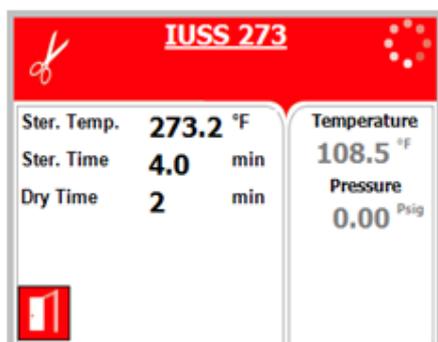
- Clean regularly to maintain print quality.
- Ensure the thermal head is cool before cleaning or loading paper.
- Use cleaning pen or alcohol-moistened cloth for the thermal head, sensor, and roller.
- Wipe external surfaces with a soft dry cloth or slightly moistened neutral detergent.
- Do not allow liquid to enter the printer.

6.2 Opening the Door

When the door is locked, the system prompts: “System Ready” Press ^ to open”:

1. Press the  Key to unlock the door. The system prompts: “Wait... Door Opening”.

If the door unlocks successfully, the following screen will be displayed:

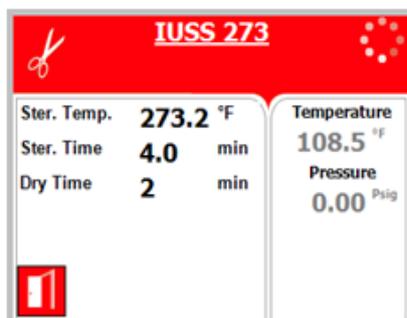


6.3 Starting a Cycle

1. Load the autoclave properly.
2. Use the UP / DOWN keys to select the program to run.
3. If the autoclave is equipped with a printer verify that a paper roll is inserted in the printer. If not insert as shown in section 6.1 [Description and Functions of the Control Panel](#).

Note: The program can only be changed when the door is open.

4. Close the door.
 - a. When the door is open, the following screen is displayed:



Warning!

To close and lock the door push the door to the wall of the autoclave chamber (for about 10 seconds) until the "System Ready" message appears as shown below!



While closing the door the system prompts: "Wait... Door Closing".

When the door is properly closed, open door symbol  is replaced by the message System Ready" Press ^ to open".

5. Start the cycle by pressing the START / STOP key.
For the cycle description, see section .

Note:For WSmodels, the tap water reservoir is automatically drained every 10 cycles (this process takes 10 minutes approx.). If you press Start during these 10 minutes, the system will inform you that the cycle will start in 10 minutes.



Caution!

Do not touch the strainer's cover, mounted on the exhaust line, during and short after operation.

Touching the hot strainer's cover may cause severe injuries.

7. Sterilization Programs

7.1 Program Parameters

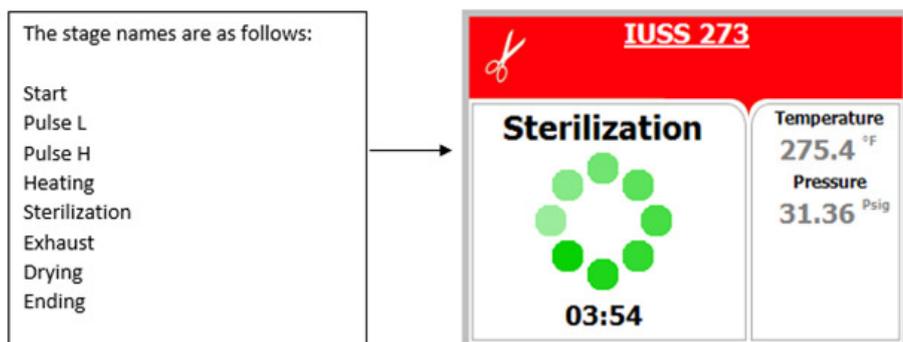
Program	Icon	Name	Temp	Sterilization time (minutes)	Dry time (minutes)
1		IUSS 273	273.2°F	4	2 (default) Range: 1-99
2		Wrapped 273	273.2°F	4	20 (default) Range: 20-99
3		IUSS 250	250°F	20	2 (default) Range: 1-99
4		Wrapped 250	250°F	20	20(default) Range: 20-30
5		Vacuum test		Vacuum test	
6		Bowie & Dick test	273.2°F	3.5	2

*IUSS - Immediate Use Steam Sterilization

Notes:

- For storage, use the 'Wrapped 273' or 'Wrapped 250' cycles.
- Water droplets and visible signs of moisture on sterile packaging or the tape used to secure it, may compromise sterility of processed loads or be indicative of a sterilization process failure. Visually check outside wrapper for dryness. If there are water droplets or visible moisture on the exterior of the package or on the tape used to secure it, the pack or instrument tray is considered unacceptable.

During the process, the stages of the cycle will be displayed on the screen:



Note: The control system incorporates a safety feature that prevents changing programs if the door is closed.

This protection is intended to prevent running an inappropriate program if the autoclave is loaded, but the cycle is not immediately started.

If the operator for example inserts the load into the chamber, closes the door and leaves the room and another operator / user tries to change the program, the operator / user will not be able to do this unless the door is opened and the type of load inside the chamber can be seen. The autoclave offers four pre-programmed sterilization programs.

Using the UP / DOWN keys enables the user to select the programs.

7.2 Cycle Process Description

- Air-removal stage; vacuum pulses are performed.
- Heating stage: steam is inserted into the chamber until the sterilization temperature is reached.
- Sterilization temperature is maintained constant during the sterilization time.
- Fast exhaust, steam is exhausted out of the chamber at a fast rate until pressure decreases to ambient pressure.
- For IUSS 273 and IUSS 250, drying by heating of chamber and air circulation to remove leftover moisture from the instruments and wraps.

7.3 Vacuum Test Process Description

- Vacuum is produced in the chamber, down to P1=7 kPa. At this stage all the valves close. The autoclave remains in this stage for 5 minutes. This period enables the condition in the chamber to reach equilibrium.
- After the 5 minutes have elapsed the printer records the pressure that is referred to as P2. At this point the test begins and lasts 10 minutes.
- At the end of the test, the printer records the results. The pressure at the end of the test is referred to as P3.

Notes: During the test period the autoclave is not heated. During the test period the screen color is purple. If the vacuum test failed, the screen color changes from purple to yellow. If the vacuum test is completed, the screen color will remain purple. Even if the vacuum test is completed, the operator shall check the test results and consider whether the test results are acceptable or not.

7.4 Bowie and Dick Test Process Description

- Air-removal stage: vacuum pulses are performed.
- Heating stage: steam is inserted into the chamber until the sterilization temperature and pressure are reached.
- Sterilization stage: temperature and pressure are maintained constant at the pre-set level for sterilization time.
- Fast exhaust stage: steam is exhausted out of the chamber at a fast rate until pressure decreases to ambient pressure.
- Drying stage: heating of chamber followed by a vacuum break (air inlet) to remove leftover moisture from the instruments and wraps. Air inlet to reach atmospheric pressure.

Notes: If the B&D test cycle failed, the screen color changed from purple to yellow. If the B&D test cycle ended successfully "Test Ended" message will display and the screen color will remain purple.

7.5 Ending the Cycle. Unloading

When the cycle has ended successfully (including the user pressing the START / STOP key after the sterilization stage has finished) the message "Cycle Ended" is displayed.

In the event of a failure, after completing the sterilization stage, the message "Cycle Ended" and the relevant failure message is displayed on the screen.

Pressing the START / STOP key will clear the "Cycle Ended" message or any error message and unlock the door.

1. Verify that there is no pressure in the chamber, according to the reading on the display, and that "System Ready" is displayed. Only then may the door be opened.
2. To release the door from locking at the end of operation, press the UP key. The same applies at power up after fail. Unlock the door properly. Open the door the minimum required to let the residual steam to escape from the chamber. Only after there is no vapor, open the door widely.



Warning! To avoid severe injuries from hot steam when opening the door, it is strictly forbidden to lean on the autoclave. It is strictly forbidden to place your hand or any part of your body over the door.

3. On completion of the cycle, the load shall be visually inspected to ascertain that the load is dry, and that sterilization indicators have made the required color change.
4. At the end of each working day close the main water valve.



Warnings!

- **The sterility of the instruments processed in unwrapped cycles cannot be maintained if exposed to non-sterile environment.**
- **Don't touch the strainer's cover mounted on the exhaust line during and shortly after operation. It will get very hot.**
- **Touching the hot strainer's cover may cause severe injuries.**

7.6 Stopping the Process Manually

It is possible to stop the program while the autoclave is operating. Pressing the START/STOP key at any stage of the process stops the operation.

If the cycle was aborted before completing the sterilization stage, it will leave the load unsterilized. If the cycle is aborted before completing the sterilization stage, a yellow caution screen is displayed with a caution symbol, the message "Cycle Failed", and an error message explaining the reason for the failure.

Pressing the START/STOP key cancels the displayed message and unlocks the door so it can be opened.



Warnings!

- **The sterility of the instruments processed in unwrapped cycles cannot be maintained if exposed to non-sterile environment.**
- **Don't touch the strainer's cover, mounted on the exhaust line, during and shortly after operation. It will get very hot.**
- **Touching the hot strainer's cover may cause severe injuries.**
- **To avoid severe injuries from hot steam when opening the door, it is strictly forbidden to lean on the autoclave or to place your hand or any part of your body over the door.**
- **The load has not completed a sterilization cycle; therefore, it is not sterile. Handle it as contaminated load.**

7.7 Stopping the Process due to Cycle Failure

- The cycle can stop itself if the unit detects a problem
- If the cycle is aborted prior to completing the sterilization stage, a yellow caution screen is displayed with a caution symbol, the message "Cycle Failed", and an error message explaining the reason for the failure.
- Pressing the START/STOP key cancels the displayed message and unlocks the door so it can be opened.



Warning! The load has not completed a sterilization cycle; therefore, it is not sterile. Handle it as contaminated load.

8. Checking and Changing Parameters

8.1 Quick Options Screen

When the system is ready, enter the QUICK OPTIONS screen by pressing the UP and DOWN keys simultaneously.

Note: To exit every screen do one of the following:

- Move the cursor to Exit by pressing UP or DOWN keys and then press START / STOP key.
- Press the UP and DOWN keys simultaneously.
On this screen you can either proceed to log in (see section 8.2) or choose one of the quick options available without log in.

Add Extra Dry Time

This quick option allows changing the Dry Time parameter for the current cycle.

1. On the Quick Options screen, move the cursor to Add extra dry time.
2. Press the START / STOP key.
3. Choose the time value to be added, and press START / STOP key.
4. The time shown on the screen will be added to the current value and you will return to the cycle main screen.
5. For example, if the dry time was 2 min., and you chose 10 minutes on the Add Dry Time screen, the dry time for the current cycle will be 12 minutes.

Note: To return to the default dry time value, enter the Add Extra Dry time screen and choose zero value.

Set Date and Time

This quick option enables the operator to set a date and time.

1. On the Quick Option screen, choose Set Date and Time. Time and date are displayed.
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".
2. To increase or decrease the time or the date use the UP or DOWN keys.
3. To move the cursor from one digit to another press the START / STOP key.
4. After changing the time and the date, by pressing the START / STOP key move the cursor to Set.
5. When the cursor is on Set, confirm the new time and date by pressing UP or DOWN keys.

8.2 Entering the Main Menu (Log in)

1. When the system is ready, enter the QUICK OPTIONS screen by pressing the UP and DOWN keys simultaneously.
2. On the Quick Options screen, choose log in.
3. Press the UP or DOWN keys to move the cursor to Admin.

4. 0000 is displayed on the screen with the cursor blinking on the right digit.
5. To increase or decrease the digits, press the UP or DOWN keys.
6. After changing the code to 0001 move the cursor to Set by pressing the START / STOP key.
7. When Set is blinking, press the UP or DOWN keys to enter the MAIN MENU of the autoclave.
8. To browse through the directories, use the UP or DOWN keys.
9. When the required directory is blinking, press the START / STOP key. The required screen will be displayed.

8.3 System Parameters

Screen Saver

This sub-directory enables the operator to set the screen saver time.

The default time value is 90 minutes. It is possible to increase or decrease the time value up to a maximum of 600 minutes or down to a minimum 0 minutes.

1. On the Main Menu, choose System Parameters \ Screen Saver.
2. When entering the Screen Saver screen, the time will be displayed. The cursor is blinking on the "minute" digit.
3. The time is displayed in the form "0000" min.
4. To increase or decrease the digits, press the UP or DOWN keys.
5. After changing the value move the cursor to Set by pressing the START / STOP.
6. When Set is blinking, press the UP or DOWN keys to confirm changes and return to the previous screen.

9. Maintenance Instructions

9.1 Preventive and Scheduled Maintenance



Warnings!

- Only technical personnel having proper qualifications and holding technical documentation (including a technician manual) and adequate information are authorized to install and serve the apparatus.
- Make sure the autoclave is not hot before cleaning it. Before proceeding, make sure that the electric power is disconnected and there is no pressure in the chamber.
- Perform maintenance operations as instructed.
- Use scissors to open the filter bag and not sharp blades or pointed instrument.
- Check that the new filter has not exceeded the maximum shelf life.
- Carefully unpack the new filter and examine it for any signs of damage.
- Remove any protective packaging before inserting the filter into place.
- Carefully Insert the new filter into the housing. Do not force.
- For equipment with RTC (CR2032) battery or rechargeable battery pack: Risk of explosion if battery is replaced by incorrect type. Dispose of used batteries according to the instructions as below.

The maintenance operations described in this chapter need to be followed as indicated to keep the device in good working condition.

Note: Technician manual describes the maintenance operations required from a qualified technician every two months and once a year.

Should the need arise, technical assistance or a service technician can be requested by either calling your dealer or Tuttnauer Europe.

Daily

- Clean door gasket with a mild detergent, water and a soft cloth or sponge. The gasket should be clean and smooth.
- For 5075 WS models only: To prevent contamination of the water, the tap water reservoir must be emptied and refilled every 10 cycles (or once a day if you make less than 10 cycles a day -- See section 5.3 [Water Filling](#)). To do so, open the feed water reservoir drain valve (see Rear View) and pour the water into a bucket, then refill the reservoir manually. In 3870HSG-WS-D model, the reservoir is automatically drained every 10 cycles.

Weekly by the operator

- Empty and refill the vacuum pump reservoir.
- Put a few oil drops on the 2 door pins and door tightening bolt.
- Clean the outer parts of the autoclave with a soft cloth.
- Clean and descale the chamber.

Periodically by the operator

- Once per month clean the water outlet strainer (see section 9.3 [Cleaning the Water Outlet Strainer](#)). Cleaning frequency may be reduced according to experience.
- Check the door gasket every 12 months and replace it if required (see Technician manual).
- Replace the air filter, every 6 months or after 1000 cycles (whichever comes first) according to sec. 9.4 [Replacing the HEPA Air Filter](#).

9.2 Maintenance

Reset Atmospheric Pressure

1. This sub-directory allows to reset the atmospheric pressure.
2. On the Main Menu, choose Maintenance \ Reset Atmospheric Pressure.
3. The following message appears on the screen: "Reset done! New value will be set after door is open for 2 minutes and the temperature is less than 045.0°C".

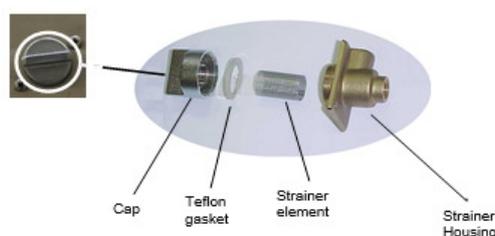
9.3 Cleaning the Water Outlet Strainer



Cautions!

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

- **The strainer's cover is HOT**
 - **Do not touch the strainer's cap, mounted on the exhaust line, during and shortly after operation. Touching the hot strainer's cap may cause severe injuries.**
 - **If maintenance operation is performed while strainer cap is hot, use heat resistant gloves to avoid injuries.**
1. Open the strainer cap.
 2. Remove the strainer element.
 3. Rinse the strainer with water, using a brush if necessary.
 4. Reinstall the strainer element.
 5. Close the strainer cap.



9.4 Replacing the HEPA Air Filter



Caution!

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

The HEPA filter is located on the back of the autoclave. (See Rear View)

1. Pull out the filter cover. The filter cover is held in place by plastic tabs. Rotate the cover until the tabs release, the cover will come off and the filter will come out.
2. The filter and cover are pressed together. Place two fingers between the filter and the cover and while supporting the cover pull the filter and cover apart.
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 points inwards, toward the chamber. Make sure that you don't bend the filter pipe when reattaching the cover.



Note: It is recommended to replace the HEPA filter every 6 months or after 1000 cycles (whichever is the shorter period).

10. Full List of Informative Screen Display Symbols, Operating Messages, Error Messages and Troubleshooting

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

The failures are divided into two categories:

- Failures that occur before completing the sterilization stage, which in this case will leave the load unsterilized.
- Failures that occur after completing the sterilization stage, which in this case will leave the load sterilized.

10.1 Displayed Operational Messages & Symbols

Message / Symbol Name	Message / Symbol Description	Required Action
	This symbol is displayed when the door is open.	Close the door.
"Door is open"	This message is displayed when the door is opened: In stand-by, if start key is pressed.	Close the door to perform a new cycle. If the problem persists, call the technician.
"Cycle Ended"	This message is displayed when the cycle ended successfully.	Press START / STOP to perform a new cycle.
"Test Ended "	This message is displayed when the test ended.	Press START / STOP to perform a new test
	This symbol is displayed when Cycle by Clock mode is active.	Enter the main menu as described in this manual to change the time or to cancel this option.
	This symbol is displayed when the temperature in the jacket did not reach the preset value.	Wait until the temperature in the jacket reaches the preset value
"System is not ready to run a cycle. Cycle by clock is active"	This message is displayed if the user presses START / STOP key while the "start cycle by clock" mode is active. Starting another cycle is not allowed.	Enter the main menu as described in this manual to change the time or to cancel this option.

Message / Symbol Name	Message / Symbol Description	Required Action
"Atmospheric pressure not set"	This message is displayed to set the atmospheric pressure by opening the door for 2 minutes.	Open the door for 2 minutes to set the Atmospheric pressure.
"Please restart machine in order for changes to be updated"	Changes to the system software require that the autoclave be restarted.	Restart the autoclave for changes to be updated.

10.2 Troubleshooting

Problem/ Error Message	Message / Symbol Description	Corrective Action
Display is not activated	The main switch is in the off position. The power cord is not connected properly to the machine and the power source. There is no electrical power in the main source.	Turn the main switch on. Make sure the power cord is properly connected to the machine and the power source. Fix the electrical power supply.
The printer does not print, or it prints, but nothing is printed on the paper	The paper is not inserted correctly in the printer.	Make sure the paper is inserted in the printer correctly. See Printer handling [SA1]. Switch the machine off then back on. If the printer prints the date and time, the printer is OK.
"Chamber temperature not in range"	This message is displayed if the temperature in the chamber is too high or too low from the normal range.	Wait until the chamber reaches the normal range temperature.
"Chamber pressure not in range"	This message is displayed if the pressure in the chamber is too high or too low from the normal range.	Wait until the chamber reaches the normal range pressure.
"RTC Error - Please Set Current Date and Time"	This message is displayed , only for the first time when the autoclave is turned on, in order to set the date and the time.	Set Current Date and Time. If the problem persists, call the technician.

Problem/ Error Message	Message / Symbol Description	Corrective Action
"Door is open (During the cycle)"	This message is displayed when the door is open: During the cycle.	Close the door to perform a new cycle.
"Canceled By User"	This message is displayed after the START / STOP key is pressed and cycle aborted.	Wait until "cycle failed – canceled by user" or "cycle end – canceled by user" is displayed. Perform a new cycle.
"Air Error"	This message is displayed at the end of the cycle if the autoclave does not reach the atmospheric pressure after 10 minutes.	Wait until the autoclave reaches the atmospheric pressure and perform a new cycle.
"Power Down"	This message is displayed if power down has occurred during the cycle. (this message will print out in the printer after the autoclave will turn on).	Turn on the autoclave and wait until the autoclave is ready (reaches the safe condition) and perform a new cycle.
"System is not ready to run cycle: Cleaning reservoir vacuum pump. Please wait 10 minutes.	This message is displayed, in autoclaves with WS option only, when, after every 10 cycles, the water pump reservoir is automatically drained and, if you use a water inlet connection, refilled. This process may take up to 10 minutes.	Wait until the message disappears, then run the cycle.

The following messages require you to check that your autoclave is not overloaded:

- "Heat Time Error"
- "Heat Time Error (Keep)"
- "Pressure Time Error"

The following messages require you to perform a new cycle:

- "Low Temp"
- "High Temp"
- "Low Pressure"
- "High Pressure"

- "High Pressure (Ending)"
- "High Pressure (Exhaust)"
- "High Pressure (Dry)"
- "Pressure Time Error"
- "Cycle Failed"

The following messages require you to call for service:

- "Analog Input Error"
- "Time Error"
- "Periodical check time exceeded - Please call for service."
- "Cycle counter exceeded - Please call for service."
The following messages require you to turn the autoclave off and on again, and if the problem persists, to call for service.
- "I/O Card Failed"
- "I/O card is not connected."

