

# ***Laboklav***

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Steriltechnik AG

## **Dampfsterilisatoren Steam sterilizers**



Type 55 to 195 Liter

User manual

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Please read these user instructions before starting the use of the steam sterilizer! It is necessary to keep this user manual over the complete life cycle of the sterilizer nearby the unit.

Indications included in this manual and labeled **warning**, **important** and **attention** are very important and to draw attention to them. They are marked with the following graphical symbols.

## Warning



Failing to observe these warnings can cause injury and even death. This symbol also means that an operator must acquaint with a suitable passage in the manual.

## Important



This symbol denotes important indications for example to prevent sterilizer or load damage.

## Attention



Observing the texts marked with this symbol facilitates operation of the sterilizer.

## General Warnings:



Access to sterilizer operations manual should be restricted only to persons authorized to operate a sterilizer



During an installation of a sterilizer, after maintenance performed by technical staff and during power outlet exchange, the verification of null electric potential of the elements being touched by users should absolutely be performed by authorized staff.

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## I. General application, construction and use of Steam sterilizer line Laboklav 55 - 195

The steam sterilizer line Laboklav 55 - 195 is equipped with a chamber by 55 Liter to 195 Liter chamber volume. It is constructed for the steam sterilization of instruments, materials for non medical use and liquids. All versions contain a thermo lock acc. to IEC 61010-2-42. Different versions depending on the use of the sterilizers are available.

In Basic version (Laboklav xxx B) the sterilization of solid materials like instruments and glass ware, waste and liquids is possible. Instruments should be sterilized in unwrapped form. Please be sure that the materials to sterilize are allowed to be sterilized by steam sterilization in the correct temperature range you want to sterilize them. We suggest to do not sterilize wrapped, porous and hollow materials with basic units. The result is not defined and not possible to validate.

The version with fast liquid cooling option (Laboklav xxx M) is equipped to make the cooling process of liquids faster than self cooling process can be. The use of the cative cooling process is constructed for the use of not tightly closed flasks! Reduce of process time of cooling process is about 40 % compared with basic version! In consequence of the active cooling process happens a loss of liquids by 3 – 12 % depending of the pressure reduce speed (programmable by service). Further versions are equipped to reduce the loss of liquids and to allow the sterilization of tightly closed flasks (Laboklav xxx MS und MSL).

The vacuum version includes a water ring vacuum pump. This makes the steam sterilization process safe for wrapped, porous and hollow materials. Additionally this version includes the possibility of drying of the materials.



**The water ring pump in units with vacuum option should run minimum once per week. This prolongs the life cycle of the vacuum pump and protects against malfunctions.**

The different options are possible to combine in one unit (Laboklav xxx MV, MSV, MSLV).

For the use of the sterilizer in safety laboratories a special steam exhaust filtration is available to protect the environment against elusion of non sterilized micro organism.



**The manufacturer is not liable or responsible for defects or indefinitely results if the sterilizer is not under intended use.**

The steam sterilizer line Laboklav 55 – 195 allows a fully automatic process cycle. That includes deaeration, heating, sterilization, pressure remove and cooling or drying function (optional if included in the actual version). All steps for a automatic process are controlled by a microprocessor control board. The actual status is shown on a graphic display and includes all important information for the user to operate the device. The supported temperature range of the sterilization process is 103°C to 136°C. The typical temperatures of 121°C and 134°C are programmed for different sterilizing situations and different materials. All program positions can be reprogrammed by special trained engineers / service stuff.

The steam sterilizer line Laboklav 55 – 195 includes the following additional advantages:

- Automatic preheating to reach defined condition in the start situation in each program separately to define. This function is especially developed for fractionated prevacuum process to reduce the condensate in the chamber and on the sterilization goods
- Fully automatic deaeration of the sterilization goods by fractionated prevacuum (in vacuum option only) or pressure purge process for solids and gravity process for liquid goods.
- Use of the principle of hot stone for the steam production reduces the use of water and decreases the heating time of the device. That make the process much more economic than the typical steam generation process in a classic steam generator

- Cooling process using the feed water stored in an included feed water tank (all units with included fast cooling option). That reduces the need of expensive demineralized water and sores heating energy in the feed water. Additionally it is degassing the feed water for the next cycle so it increases the quality of the complete sterilization process.
- Protection of the drain on house installation side by using normal tape water mixing to the steam outlet. That process works temperature controlled by an PT 100 in the outlet installation. The Temperature is programmable for opening and closing the mixing valve.
- Automatic cleaning function for the steam generator in running in each cycle. It protects the unit against heater damage forced by bad water quality.
- Microprocessor controlled process for fully automatic use

### Total view of the steam sterilizer Laboklav xxx



The Laboklav should be operated while the normal laboratory working hours. If the device is not in use it should be switched off by the main power plug (5). Over night and on the weekends the central power plug (1) should be switched off. If that central power plug is missing please use the main breaker below the housing on the right side of the unit (4).

### Emergency switch off

- ◆ In case of a fatal error switch off the device by turning the central main power switch (1) or disconnect the sterilizer from power supply by using the power plug (2).

## II. Steam sterilizer Laboklav xxx technical data

### Laboklav 55

Overall dimension (free standing unit)(W x H x D).....	740 x 765 x 600 mm
Footprint (Bench top unit)(W x D).....	740 x 670 mm
Weight (net).....	ca. 125 kg
Volume Feed water tank.....	ca. 16 l
Maximum Load:	
- Instruments .....	20 kg
- Textiles .....	10 kg
- Liquids .....	15 Liter Total volume
Sterilizer chamber:	
Total volume ....	ca. 62 l
Chamber dimension (φ x D) .....	φ 410 x 460 (+50-round.) mm
usable Volume .....	ca. 60 l
Maximum allowable pressure (PS) .....	2.8 bar
Maximum allowable temperature (TS) .....	143°C
Working pressure safety valve .....	2.8 bar
Material number for chamber and double jacket.....	1.4404 (SS 316 L)
Surface roughness.....	≤ 0,8 μm
Pressure Device Directive 97/23/EG .....	CE0036, Kat. I, Module B+C1
Power supply:	
Voltage .....	3N 400V~ (±5%), 50 Hz, 16A
Working power.....	4,5 kW
Averaged power consumption per cycle .....	5 kWh
Protection class .....	I
Protection level. ....	IP24
Electromagnetic compatibility .....	DIN EN 61326 / A1
Water supply:	
Destilled or demineralized Water (acc. to annex C EN 13060:2004)	
Averaged feed water consumption per cycle.....	ca. 3,5 l .. 8 l
Storing conditions:	
Temperature .....	5 ÷ 40°C
Humidity .....	max. 85%
Heat emission .....	Approx. 12 % of total power cons.
Programs:	
10 predefined Programs in user level 1:	
The program definition depends on the available options included in the model. The programs can be individually changed.	
10 programs in user level 2 (Program P11 to P20) Code protected. Predefinition is like P1.	
2 test programs (Bowie&Dick-Test, P11, vacuum test, P12) – in vacuum versions only	
Computer interface:	
- serial interface RS 485	
Printer (optional)	

**Laboklav 80**

Overall dimension (free standing unit)(W x H x D).....	740 x 915 x 600 mm
Footprint (Bench top unit)(W x D).....	740 x 820 mm
Weight (net).....	ca. 165 kg
Volume Feed water tank.....	ca. 30 l
Maximum Load:	
- Instruments .....	30 kg
- Textiles .....	10 kg
- Liquids .....	21 Liter Total volume
Sterilizer chamber:	
Total volume ....	ca. 82 l
Chamber dimension ( $\phi$ x D) .....	$\phi$ 410 x 610 (+50-round.) mm
usable Volume .....	ca. 80 l
Maximum allowable pressure (PS) .....	2.8 bar
Maximum allowable temperature (TS) .....	143°C
Working pressure safety valve .....	2.8 bar
Material number for chamber and double jacket.....	1.4404 (SS 316 L)
Surface roughness.....	$\leq 0,8 \mu\text{m}$
Pressure Device Directive 97/23/EG.....	CE 0036, Kat. II, Module B+C1
Power supply:	
Voltage .....	3N 400V~ ( $\pm 5\%$ ), 50 Hz, 16A
Working power.....	4,5 kW
Averaged power consumption per cycle .....	5 kWh
Protection class .....	I
Protection level. ....	IP24
Electromagnetic compatibility .....	DIN EN 61326 / A1
Water supply:	
Destilled or demineralized Water (acc. to annex C EN 13060:2004)	
Averaged feed water consumption per cycle.....	ca. 3,5 l .. 10 l
Storing conditions:	
Temperature .....	5 ÷ 40°C
Humidity .....	max. 85%
Heat emission .....	Approx. 12 % of total power cons.
Programs:	
10 predefined Programs in user level 1:	
The program definition depends on the available options included in the model. The programs can be individually changed.	
10 programs in user level 2 (Program P11 to P20) Code protected. Predefinition is like P1.	
2 test programs (Bowie&Dick-Test, P11, vacuum test, P12) – in vacuum versions only	
Computer interface:	
- serial interface RS 485	
Printer (optional)	



**Laboklav 100**

Overall dimension (free standing unit)(W x H x D).....	740 x 1065 x 600 mm
Footprint (Bench top unit)(W x D).....	740 x 970 mm
Weight (net).....	ca. 195 kg
Volume Feed water tank.....	ca. 30 l
Maximum Load:	
- Instruments .....	40 kg
- Textiles .....	25 kg
- Liquids .....	30 Liter Total volume
Sterilizer chamber:	
Total volume .....	ca. 102 l
Chamber dimension ( $\phi$ x D) .....	$\phi$ 410 x 760 (+50-round.) mm
usable Volume .....	ca. 100 l
Maximum allowable pressure (PS) .....	2.8 bar
Maximum allowable temperature (TS) .....	143°C
Working pressure safety valve .....	2.8 bar
Material number for chamber and double jacket.....	1.4404 (SS 316 L)
Surface roughness.....	$\leq 0,8 \mu\text{m}$
Pressure Device Directive 97/23/EG.....	CE 0036, Kat. II, Module B+C1
Power supply:	
Voltage .....	3N 400V~ ( $\pm 5\%$ ), 50 Hz, 16A
Working power.....	6,5 kW
Averaged power consumption per cycle .....	6,5 kWh
Protection class .....	I
Protection level. ....	IP24
Electromagnetic compatibility .....	DIN EN 61326 / A1
Water supply:	
Destilled or demineralized Water (acc. to annex C EN 13060:2004)	
Averaged feed water consumption per cycle.....	ca. 4,5 l .. 12 l
Storing conditions:	
Temperature .....	5 ÷ 40°C
Humidity .....	max. 85%
Heat emission .....	Approx. 12 % of total power cons.
Programs:	
10 predefined Programs in user level 1:	
The program definition depends on the available options included in the model. The programs can be individually changed.	
10 programs in user level 2 (Program P11 to P20) Code protected. Predefinition is like P1.	
2 test programs (Bowie&Dick-Test, P11, vacuum test, P12) – in vacuum versions only	
Computer interface:	
- serial interface RS 485	
Printer (optional)	

**Laboklav 135**

Overall dimension (free standing unit)(W x H x D).....	840 x 965 x 700 mm
Footprint (Bench top unit)(W x D).....	840 x 870 mm
Weight (net).....	ca. 205 kg
Volume Feed water tank.....	ca. 40 l
Maximum Load:	
- Instruments .....	40 kg
- Textiles .....	25 kg
- Liquids .....	30 Liter Total volume
Sterilizer chamber:	
Total volume ....	ca. 135 l
Chamber dimension ( $\phi$ x D) .....	$\phi$ 500 x 660 (+50-round.) mm
usable Volume .....	ca. 130 l
Maximum allowable pressure (PS) .....	2.8 bar
Maximum allowable temperature (TS) .....	143°C
Working pressure safety valve .....	2.8 bar
Material number for chamber and double jacket.....	1.4404 (SS 316 L)
Surface roughness.....	$\leq 0,8 \mu\text{m}$
Pressure Device Directive 97/23/EG .....	CE 0036, Kat. II, Module B+C1
Power supply:	
Voltage .....	3N 400V~ ( $\pm 5\%$ ), 50 Hz, 16A
Working power.....	6,5 kW
Averaged power consumption per cycle .....	6,5 kWh
Protection class .....	I
Protection level. ....	IP24
Electromagnetic compatibility .....	DIN EN 61326 / A1
Water supply:	
Distilled or demineralised Water (acc. to annex C EN 13060:2004)	
Averaged feed water consumption per cycle.....	ca. 5,5 l .. 15 l
Storing conditions:	
Temperature .....	5 ÷ 40°C
Humidity .....	max. 85%
Heat emission .....	Approx. 12 % of total power cons.
Programs:	
10 predefined Programs in user level 1:	
The program definition depends on the available options included in the model. The programs can be individually changed.	
10 programs in user level 2 (Program P11 to P20) Code protected. Predefinition is like P1.	
2 test programs (Bowie&Dick-Test, P11, vacuum test, P12) – in vacuum versions only	
Computer interface:	
- serial interface RS 485	
Printer (optional)	

**Laboklav 160**

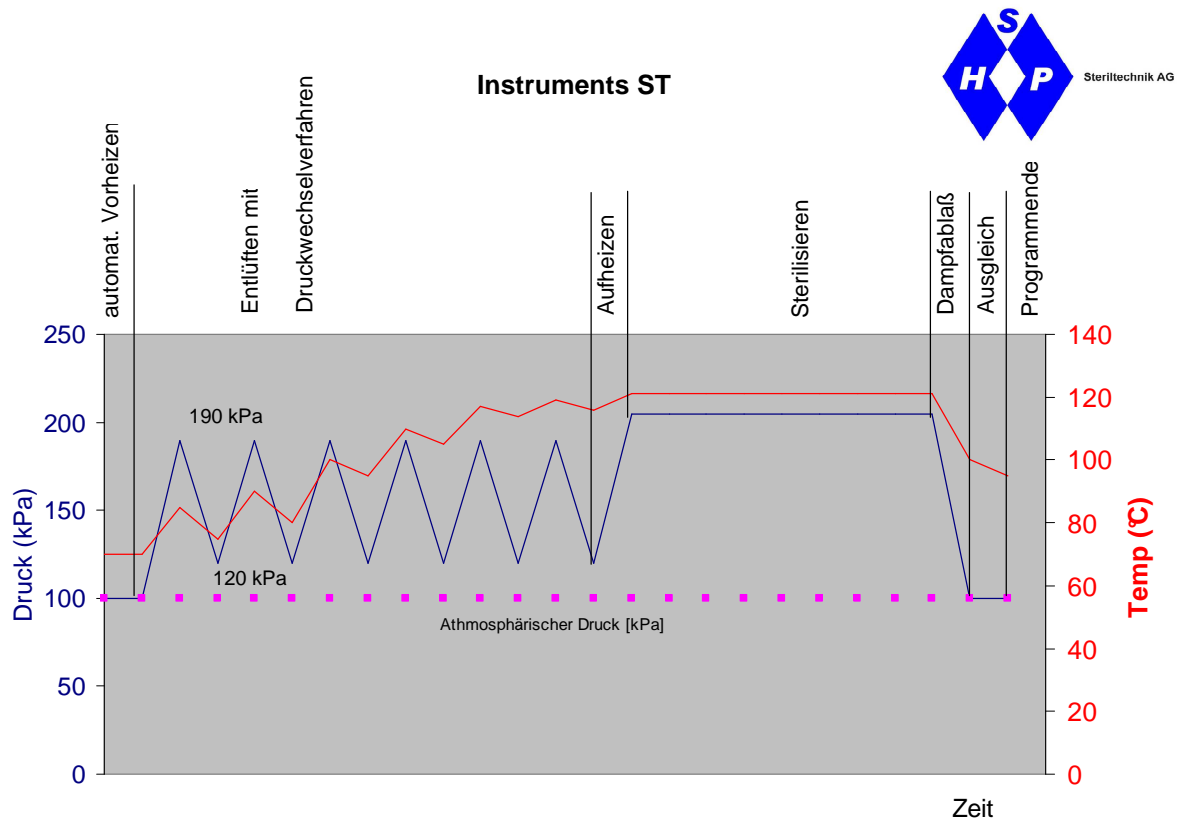
Overall dimension (free standing unit)(W x H x D).....	840 x 1065 x 700 mm
Footprint (Bench top unit)(W x D).....	840 x 975 mm
Weight (net).....	ca. 220 kg
Volume Feed water tank.....	ca. 40 l
Maximum Load:	
- Instruments .....	40 kg
- Textiles .....	25 kg
- Liquids .....	45 Liter Total volume
Sterilizer chamber:	
Total volume .....	ca. 165 l
Chamber dimension ( $\phi$ x D) .....	$\phi$ 500 x 760 (+50-round.) mm
usable Volume .....	ca. 163 l
Maximum allowable pressure (PS) .....	2.8 bar
Maximum allowable temperature (TS) .....	143°C
Working pressure safety valve .....	2.8 bar
Material number for chamber and double jacket.....	1.4404 (SS 316 L)
Surface roughness.....	$\leq 0,8 \mu\text{m}$
Pressure Device Directive 97/23/EG .....	CE 0036, Kat. II, Module B+C1
Power supply:	
Voltage .....	3N 400V~ ( $\pm 5\%$ ), 50 Hz, 16A
Working power.....	6,5 kW
Averaged power consumption per cycle .....	6,5 kWh
Protection class .....	I
Protection level. ....	IP24
Electromagnetic compatibility .....	DIN EN 61326 / A1
Water supply:	
Destilled or demineralized Water (acc. to annex C EN 13060:2004)	
Averaged feed water consumption per cycle.....	ca. 5,5 l .. 17 l
Storing conditions:	
Temperature .....	5 ÷ 40°C
Humidity .....	max. 85%
Heat emission .....	Approx. 12 % of total power cons.
Programs:	
10 predefined Programs in user level 1:	
The program definition depends on the available options included in the model. The programs can be individually changed.	
10 programs in user level 2 (Program P11 to P20) Code protected. Predefinition is like P1.	
2 test programs (Bowie&Dick-Test, P11, vacuum test, P12) – in vacuum versions only	
Computer interface:	
- serial interface RS 485	
Printer (optional)	

**Laboklav 195**

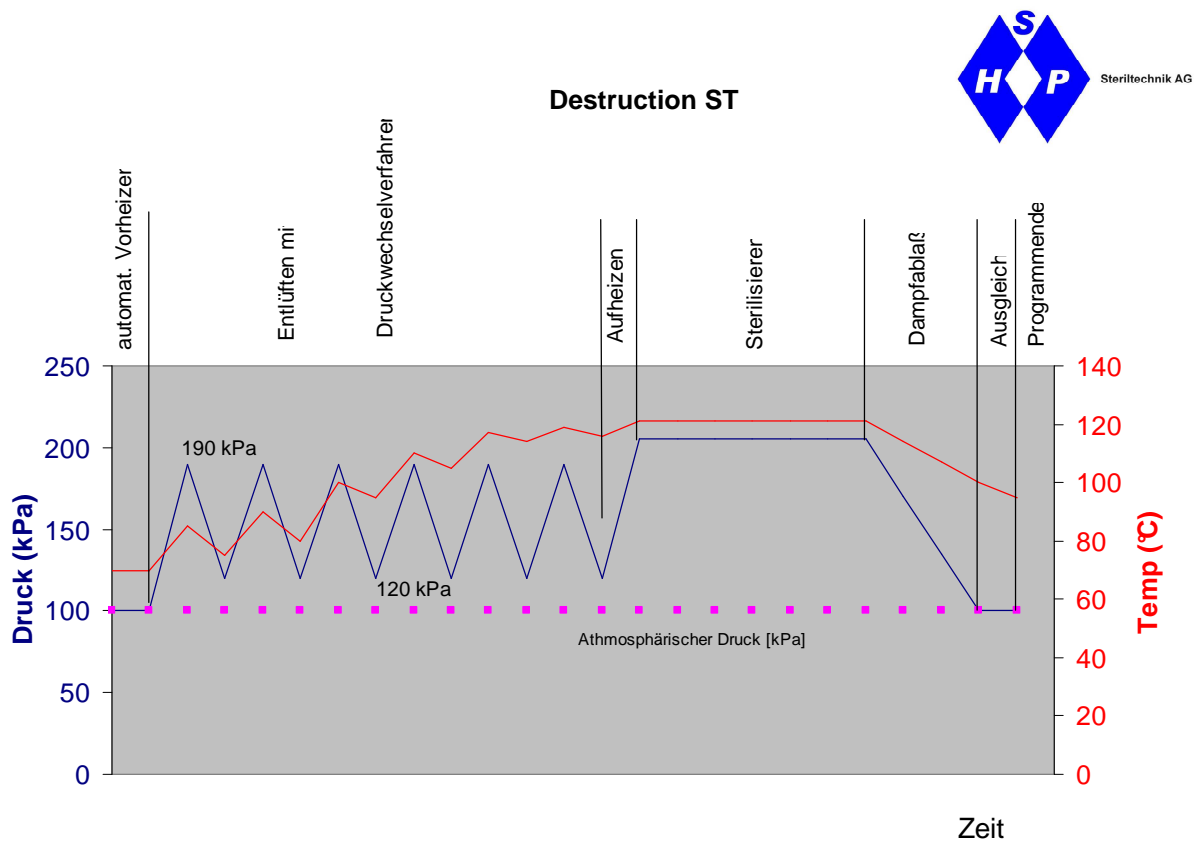
Overall dimension (free standing unit)(W x H x D).....	840 x 1215 x 700 mm
Footprint (Bench top unit)(W x D).....	840 x 1085 mm
Weight (net).....	ca. 255 kg
Volume Feed water tank.....	ca. 40 l
Maximum Load:	
- Instruments .....	40 kg
- Textiles .....	25 kg
- Liquids .....	45 Liter Total volume
Sterilizer chamber:	
Total volume ....	ca. 195 l
Chamber dimension ( $\phi$ x D) .....	$\phi$ 500 x 990 (+50-round.) mm
usable Volume .....	ca. 193 l
Maximum allowable pressure (PS) .....	2.8 bar
Maximum allowable temperature (TS) .....	143°C
Working pressure safety valve .....	2.8 bar
Material number for chamber and double jacket.....	1.4404 (SS 316 L)
Surface roughness.....	$\leq 0,8 \mu\text{m}$
Pressure Device Directive 97/23/EG .....	CE 0036, Kat. II, Module B+C1
Power supply:	
Voltage .....	3N 400V~ ( $\pm 5\%$ ), 50 Hz, 16A
Working power.....	6,5 kW
Averaged power consumption per cycle .....	6,5 kWh
Protection class .....	I
Protection level. ....	IP24
Electromagnetic compatibility .....	DIN EN 61326 / A1
Water supply:	
Distilled or demineralised Water (acc. to annex C EN 13060:2004)	
Averaged feed water consumption per cycle.....	ca. 5,5 l .. 18 l
Storing conditions:	
Temperature .....	5 ÷ 40°C
Humidity .....	max. 85%
Heat emission .....	Approx. 12 % of total power cons.
Programs:	
10 predefined Programs in user level 1:	
The program definition depends on the available options included in the model. The programs can be individually changed.	
10 programs in user level 2 (Program P11 to P20) Code protected. Predefinition is like P1.	
2 test programs (Bowie&Dick-Test, P11, vacuum test, P12) – in vacuum versions only	
Computer interface:	
- serial interface RS 485	
Printer (optional)	

### III. Programs available in steam sterilizer line Laboklav 55 - 195

- standard programs



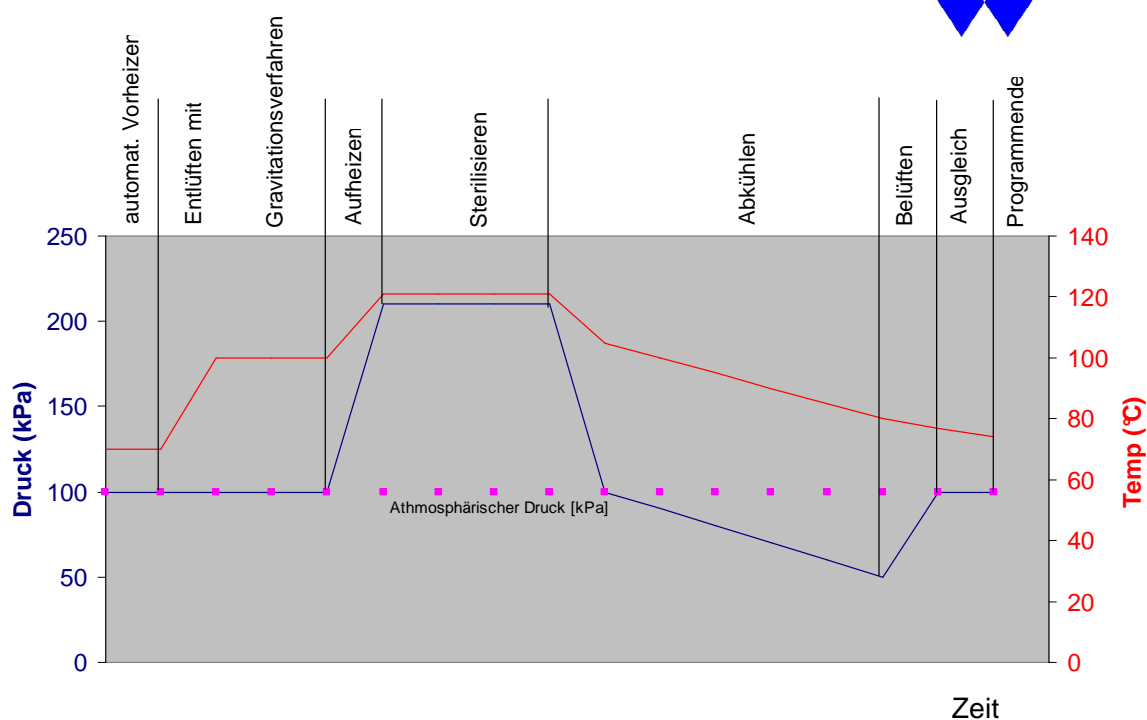
Program Instruments ST available in version Laboklav xxx B, M, MS und MSL



Program Destruction ST in version Laboklav xxx B, M, MS, MSL



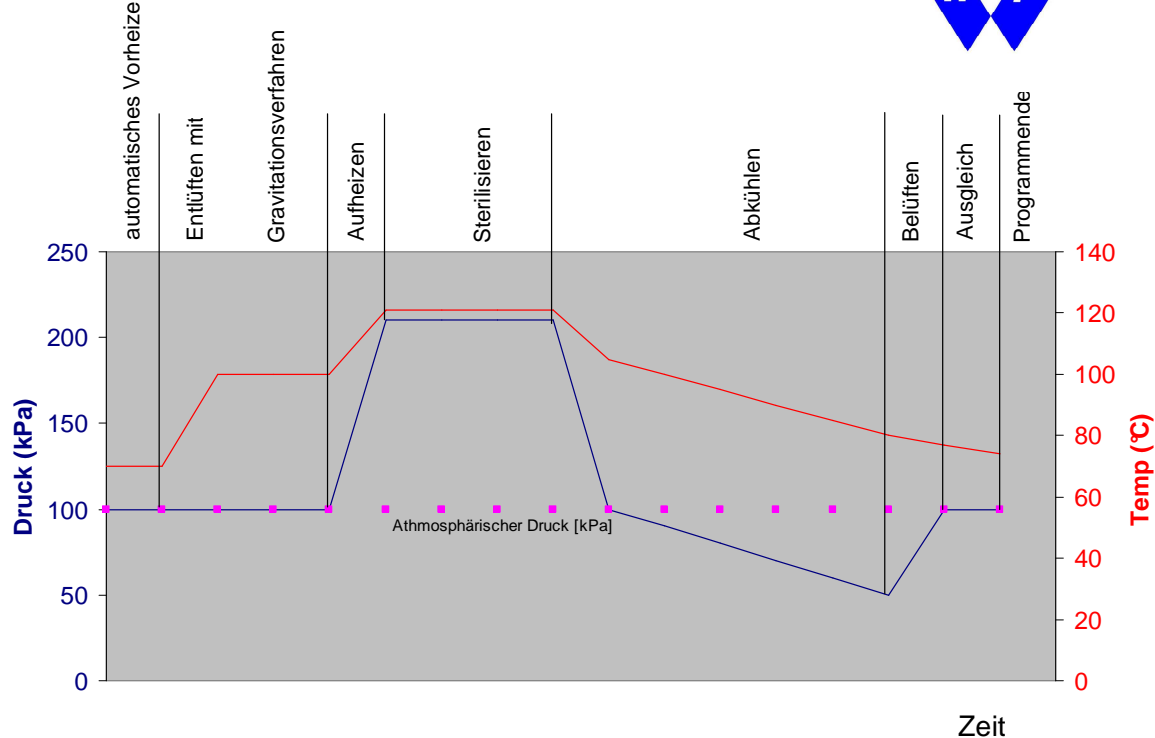
## Liquids ST



Program Liquids ST in version Laboklav xxx B und V

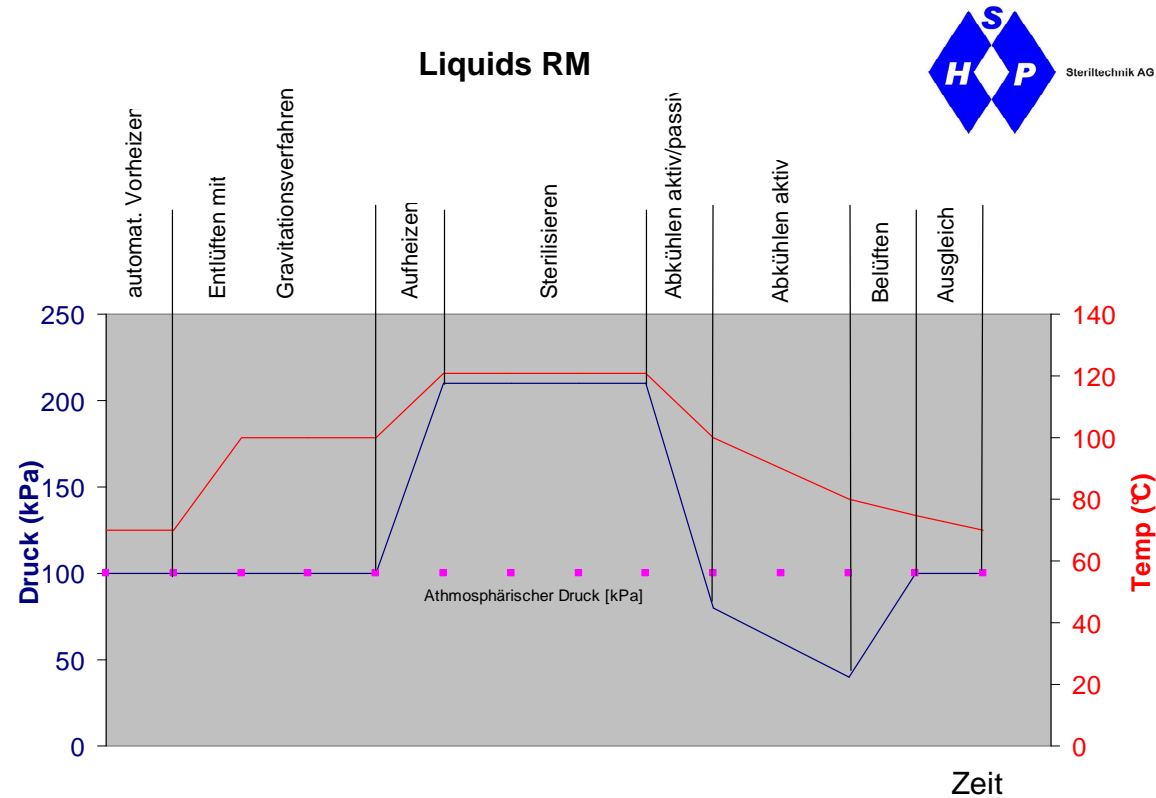


## Destruction LI

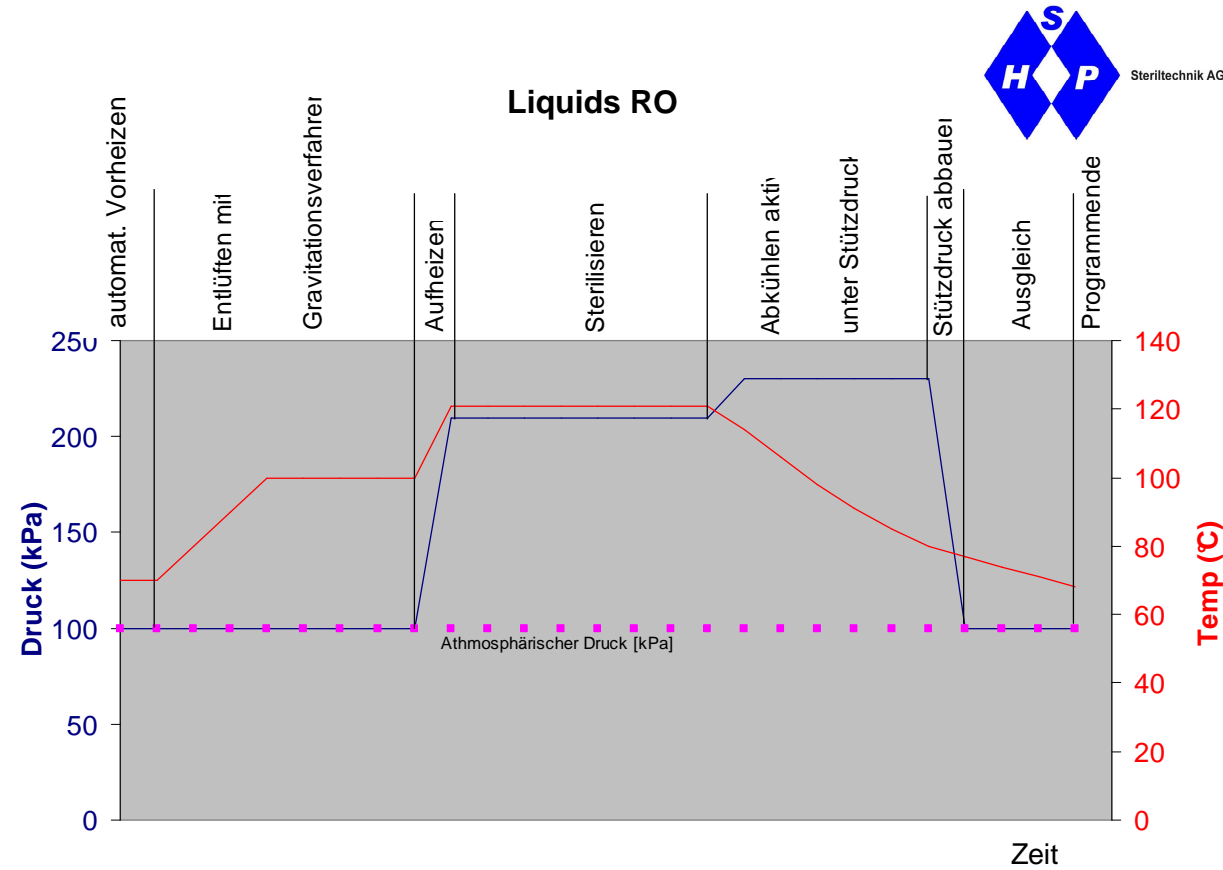


Program Destruction LI in all versions Laboklav xxx, in versions with cooling active fast cooling RM is activated (decreases the cooling time)

- Programs with fast cooling



Program Liquids RM in version Laboklav xxx M, MS,MSL, MV, MSV und MSLV

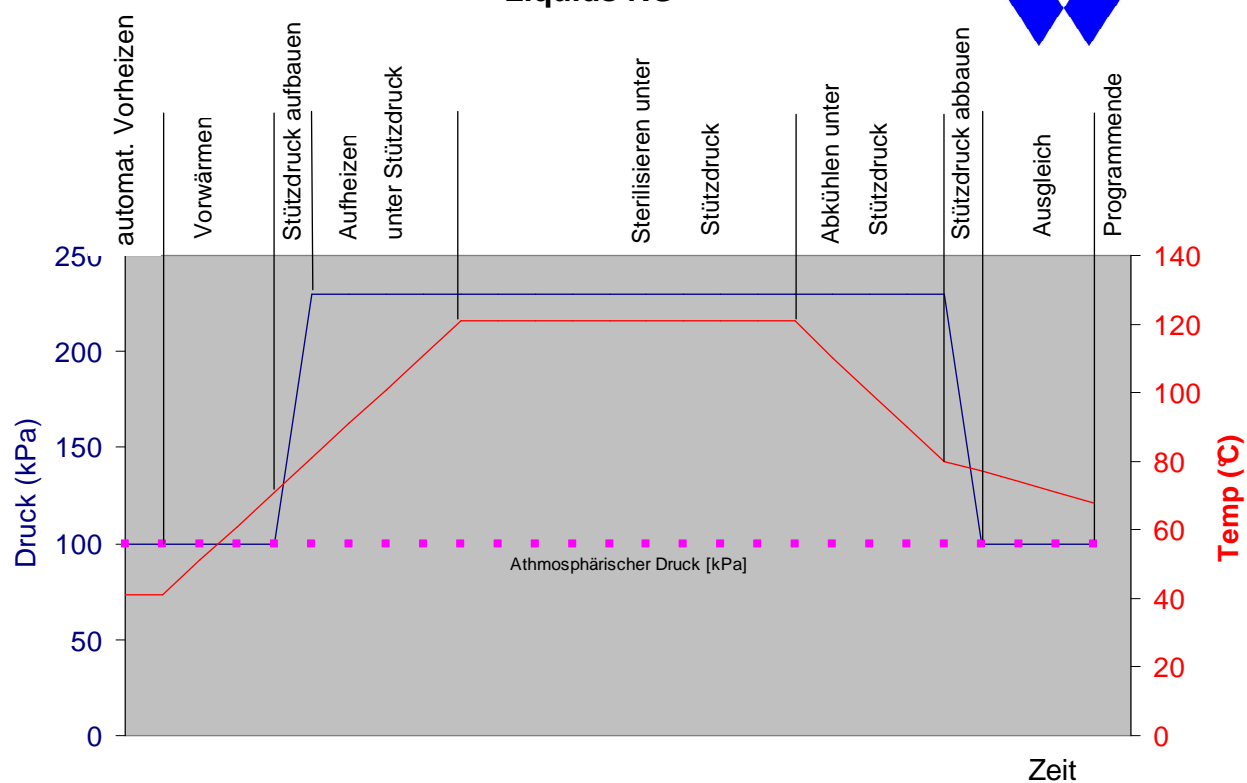


Program Liquids RO in version Laboklav xxx MS,MSL, MSV und MSLV



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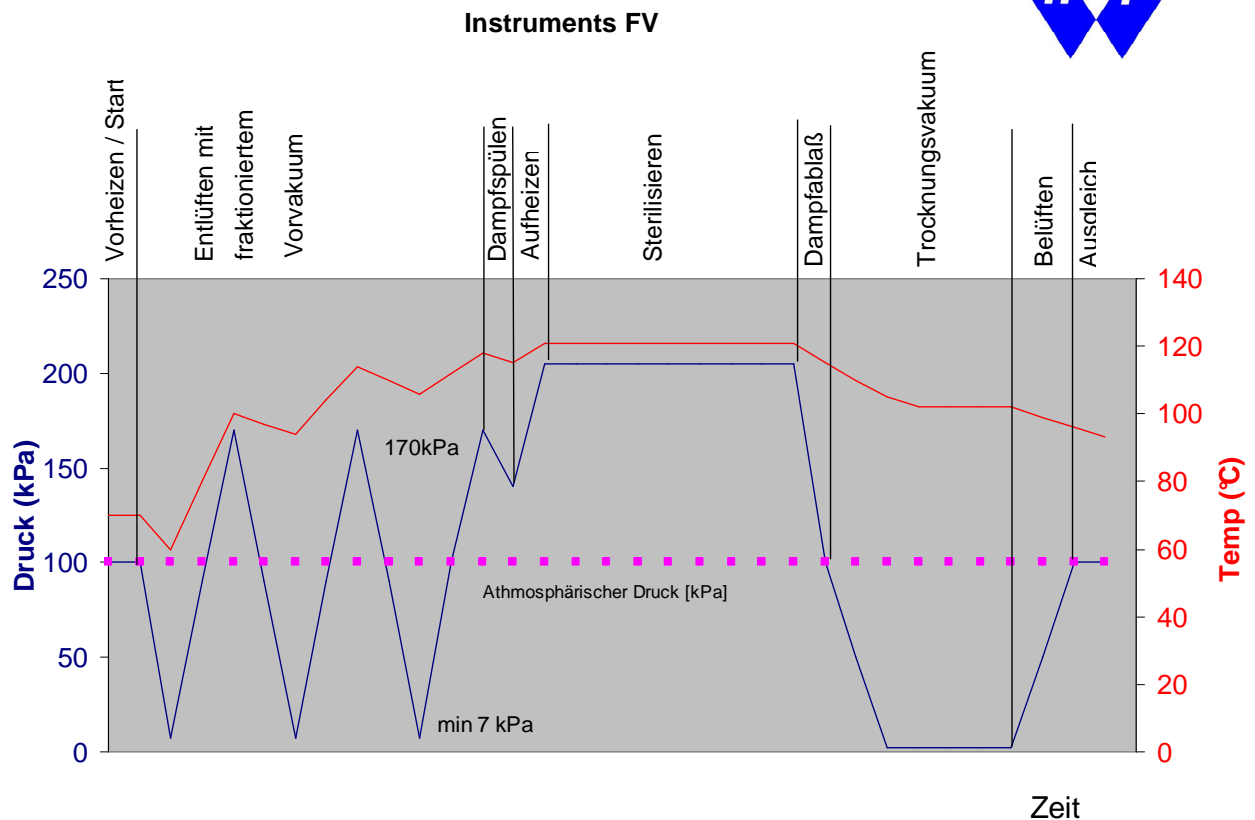
## Liquids RG



Program Liquids RG in version Laboklav xxx MSL und MSLV



- **Programs with vacuum (versions V, MV, MSV und MSLV)**



Program Instruments FV in version Laboklav xxx V, MV, MSV und MSLV

### Description of program steps

**The sterilizing process** in steam sterilizer line Laboklav xxx (see drawings above) contains the following program steps:

#### - Preheating (Vorheizen):

The steam generator and if programmed the chamber is preheated until reaching a specified temperature. It takes ca. 5 to 10 minutes. If the chamber temperature is high enough, it decreases the preheating time or preheating is switched off.

#### - Deaeration (Entlüftung):

In all Liquids programs a gravity deaeration is preselected automatically.

In versions B, M, MS and MSL - (no vacuum available) the deaeration for Instruments and Destruction is preselected as a pressure purge cycle. It works with 6 or 7 pressure purges between 170 and 120 kPa absolute pressure (number of pressure purges depends on start temperature). In versions V, MV, MSV and MSLV the deaeration for Instruments and Destruction programs works with fractionated prevacuum.

#### - Heating (Aufheizen)

While preheating the chamber is filled with steam up to the preset pressure and temperature. In preheating phase a deaeration clock is working in most of the programs.

**- Sterilizing (Sterilisieren)**

While sterilization phase the unit is keeping the set temperature over the sterilization time. In case over lower temperature that set temperature, the timer for the sterilization time is stopping.

**- pressure remove (Dapfablaß)**

The steam is removing from chamber until reaching programmed pressure in chamber

**- cooling (Kühlen)**

This is programmed for liquids only. Depending on the integrated fast cooling options different cooling versions are possible: passive or active, in active cooling slow, fast or forced is possible.

**- drying (Trocknung) (for versions V, MV, MSV and MSLV only)**

Program is drying with vacuum with a programmed drying time. Alternate an intermittent venting and vacuum cycle is possible. The venting function is automatically using the venting air filter.

**- Venting (Belüften)**

The program is using for the venting function the integrated venting air filter automatically. The function works until reaching the programmed air pressure.

**- equalizing (Ausgleich)**

For additional safety the device is waiting a few seconds after reaching the program finish to make sure that no measurement mistake has set the program to finish. Equalizing time depends on program and sterilization goods and can be different.

**• Programs for testing**

The Bowie&Dick-Test is proofing the process for steam penetration of the sterilization good (mainly for textiles or paper wrap). This test is implemented in vacuum option only. The test is normally for medical use only! The test body for this test should be a one usable test package only.

The vacuum test is implemented in vacuum option only. It can be used for testing the leakage rate of the unit. For the normal use it is not necessary to run this test (implemented for service/maintenance). The test should run if the chamber is cold! The chamber temperature should be not higher than 40°C (than it is impossible to start the test).



**If the test result is “Incorrect” the unit should get a service / maintenance! In that case you should not use the device until qualified service staff has checked the device!**

All sterilization cycles are running automatically. The duration of a single cycle depends on the load, kind of deaeration, number of vacuum fractions in fractionated prevacuum and the start conditions (warm or cold), drying time, kind of cooling etc. Even so the type of sterilization goods, and kind of loading the good inside the chamber have a enormous effect on the cycle time. In case of a validation you can define the goods and loads. When ever the same good / load with same program and same parameters is started, the time depends mainly from start temperature. The control unit is automatically adding preheating and deaeration cycles if temperature was too low!

The table gives an overview for the different preselected programs.

Prog.	Material	Deaeration	Steril. time	Steril. temp.	drying/cooling	duration [min]
P1 (B/M/MS/MSL) Instr. ST	Instruments	Pressure purge: 6x 70 kPa / 30 kPa	15 min	134°C	No drying	
P1 (V/MV/MSV/MSLV) Instr. FV	Instruments	Vacuum + steam: 3x -80 kPa / 25 kPa	15 min	134°C	5 min	
P2 (B/M/MS/MSL) Instr. ST	Instruments	Pressure purge: 6x 70 kPa / 30 kPa	20 min	134°C	No drying	
P2 (V/MV/MSV/MSLV) Instr. FV	plastics (e.g. pipets)	Vacuum + steam: 3x -80 kPa / 25 kPa	20 min	134°C	40 min	
P3 (B/M/MS/MSL) Instr. ST	Plastics and gum ware	Pressure purge: 6x 70 kPa / 30 kPa	20 min	121°C	No drying	
P3 (V/MV/MSV/MSLV) Instr. FV	Plastics and gum ware	Vacuum + steam: 2x -70 kPa / 25 kPa	20 min	121°C	15 min	
P4 (B/M/MS/MSL) Destruction ST	Waste / Trash (solid mat. only!)	Pressure purge: 6x 70 kPa / 30 kPa	15 min	134°C	No drying	
P4 (V/MV/MSV/MSLV) Destruction FV	Waste / Trash (solid mat. only!)	Vacuum + steam: 3x -80 kPa / 25 kPa	15 min	134°C	No drying	
P5 (B/M/MS/MSL) Destruction ST	Waste / Trash (solid mat. only!)	Pressure purge: 6x 70 kPa / 30 kPa	15 min	134°C	No drying	
P5 (V/MV/MSV/MSLV) Destruction FV	Waste / Trash (solid mat. only!)	Vacuum + steam: 3x -80 kPa / 25 kPa	15 min	134°C	2 min	
P6 (all) Destruction LI	Unwrapped waste /Trash with liquids	Gravitation	15 min	134°C	slow/fast RM	
P7 (all) Liquids ST	Liquids	Gravitation	20 min	121°C	Slow	
P8 (B/V) Liquids ST	Liquids	Gravitation	20 min	121°C	Slow	
P8 (all without B u.V) Liquids RM	Liquids	Gravitation	20 min	121°C	Fast	
P9 (B/V) Liquids ST	Liquids	Gravitation	20 min	121°C	Slow	
P9 (M/MV) Liquids RM	Liquids	Gravitation	20 min	121°C	Fast	
P9 (MS/MSV/MSL/MSLV) Liquids RO	Liquids	Gravitation	20 min	121°C	Forced	
P10 (B/V) Liquids ST	Liquids	Gravitation	20 min	121°C	Slow	
P10 (M/MV/MS/MSV) Liquids RM	Liquids	Gravitation	20 min	121°C	Fast	
P10 (MSL/MSLV) Liquids RG	Liquids	Gravitation	20 min	121°C	Forced Special	
P11 – P20	Same like P1	Same like P1	like P1	like P1	like P1	like P1
P21	Bowie&Dick-Test	Vacuum + steam 3x -80 kPa / 70 kPa	3:30 min	134°C		60
P22	Vacuumtest					20

## IV. Operating the steam sterilizer Laboklav 55 – 195

### 1. List of delivered parts

#### Device in ordered specification (options)

Connecting pipes for water supply steam / condensate remove

Bottom sheet

Documents including user manual, pressure vessel papers (conformity declaration), safety valve calculation, warranty declaration

Basket acc. to order

### 2. Installation

#### • Preparation of the unit

The floor in the room should be waterproof. The sterilizer require foundations (concrete foundations of load capacity 400 kg), and it should be located in close distance to a floor drain, to allow draining of condensate and water. The room dimensions should ensure comfort in operation, while ensuring the minimal distances (min. 10 cm to the Wall and next device in room).

Due to large amount of heat generated during the sterilizer operation, the room in which it is seated should be fitted with a mechanical intake and exhaust ventilation system, providing 6÷10 exchanges of air per hour. The ventilating hood should be installed above the sterilizer.

By using the turnable Leeds the chamber of the device should be adjusted to remove the condensate from chamber easily.

#### • Power supply

The steam sterilizer is equipped with a 2,5 m long net supply cable. The device is configured to be connected to an electrical system CEE 3P+N+GND with a voltage of 400V AC, 50 Hz, 16 A. For commercial use we recommend to use an additional fault current protection switch. For fast switch off a central main power switch should be installed (see page 6).



**If the device is connected to a power supply with wrong or without correct ground connection it may endanger the operator of the device by dangerous electrical voltage.**



**Connecting the device to a power supply with lower capacity than 3x16 A may cause an over load or heating up the power cable and can cause a fire!**

#### • Water supply

The steam sterilizer needs demineralized or distilled water only! Please refer to Appendix C EN 13060 about water quality. Normal tap water / drinking water is not for use as feed water! See the quality definition in chapter VII Additional Informations. The device is prepared to be connected to a central feed water supply. If this is given please use the connection. So the refill of feed water inside the tank is automatically started by the unit. Manual refill is possible but not as comfortable as automatic refilling function. Pressure on water supply should be not less than 0.5 bar. The volume of the feed water tank is between 16 and 45 Liter. Manual refilling is possible outside a program run only (lid must be open). If the unit gives an error message Water level low in feed water tank, the program is not stopping. Program tries to finish the cycle.



**Attention! Do not overfill the tank! If the maximum level is reached the control unit gives an alarm (if alarm is activated)!**

The steam sterilizer is additionally using tap water for cooling the tank and the output. Output cooling is for protection of the house side installation of the drain. It should be connected if available!

### 3. Installation and operation

#### • Switching on

After regular installation and connecting to media / power supply the device is ready for use. Standing in front of the device you will find the main switch at the right side of the key pad. Switching on the main switch the display is switched on and shows the software version and the SHP Logo short time. When switched on the device is ready for use.



**Do not manipulate the device! If the device is not going on please check the main breakers of the unit (4 – chap.1) and of power supply. If no reason can be found please inform a trained service staff to check the device internally.**



**After switching on and going into a program (without P12 – vacuum test) the device is preheating the steam generator when lid is closed!**

#### • Loading the device

We suggest to use the standard basket and drum we optionally offer for the special use in Laboklav steam sterilizers. For bench top units we suggest the use of closed loading trays to protect the chamber against too much condensate.

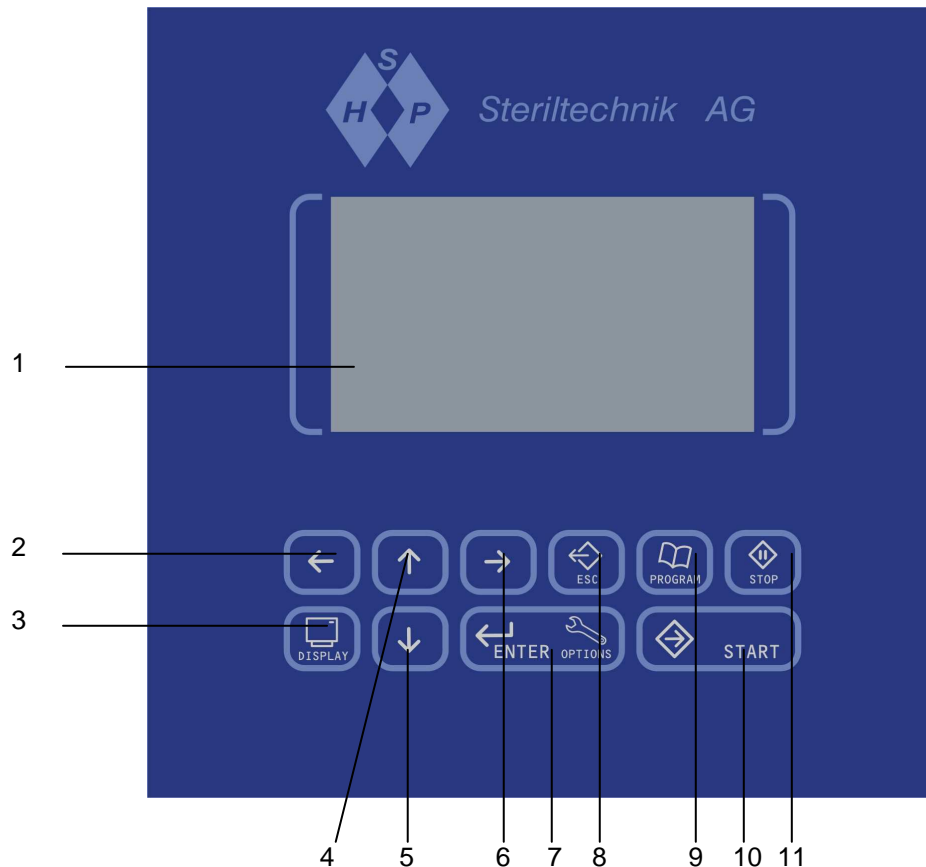


**While loading and unloading the chamber please consider the chamber and surface of the device can be hot! Even so the loading goods and loading system parts like baskets! While loading and unloading you are in danger of burning!**



**Use adequate clothes to be protected against burning like temperature stable isolating gloves etc.**

- **Touch panel**



1 Display	displays program parameter, cycle data and error messages
2 Cursor button to left	moves cursor left
3 Display button	changes display from normal program display to display of actual sensor values, information about statistic data and software version
4 Cursor button up	moves cursor up and changes value at actual cursor position, open door
5 Cursor button down	moves cursor down and changes value at actual cursor position, close door
6 Cursor button right	moves cursor right
7 Enter button	enters the input data or entry in a menu
8 Escape button	for leaving a menu position after or before changing is valid
9 Program button	for entering the program menu to change the program, by using up and down button the program is chosen and activated by pressing the enter button
10 Start button	starts the actual in display shown program
11 Stopp button	breaks a running program and quits the final signal after finishing a program regular or by manual break Opening of the lid is possible after quitting the program only

## • Program change

Activating a Program is done by pressing program button (9). It opens the program menu and with the up (4) and down button (5) the right program is chosen by pressing the enter button (7). All programs which are marked with a key symbol need entering a code before activation:

Enter access code:

<input type="text"/>		<input type="button" value="↵"/>																	
0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f	g	h	i	
j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	A	B	C
D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
X	Y	Z	!	(	)	+	-	,	.	/	%	:	;	°					

The cursor buttons navigate the cursor, up and down button changes the value, enter button must be pressed to confirm the code

## • 2. Display level

In second display level the actual value of all installed sensors is shown.

The symbols show the following sensors:

- Tk – chamber temperature,
- Tr – reference temperature,
- Pk – chamber pressure,
- Tg – temperature steam generator,
- Tf – temperature in filter cartridge (Option FA only),
- To – temperature in the steam / condensate outlet,
- Tm – temperature in the outlet of heating / cooling jacket (not in all options)
- Tcj – reference temperature on electronic board.

14:45:00 Mo 4.10.2006	
1. Tk	74.9 °C
2. Trf	79.0 °C
3. Pk	0.0 kPa
4. Tg	127.2 °C
5. Tm1	117.4 °C
6. Tm2	118.4 °C
7. Tpp	24.2 °C
8. Tcj	30.4 °C

## • Program start

After activation of a program press the start button and program starts. Depending on the program and the temperature in chamber the device starts directly or starts with preheating to realize standard start conditions.

## • STOP button

Press the Stop button to break a program or to quit the finish signal. While a program is running you can break a program, the program is asking if you really want to break the program so have to confirm this. The program is going to the next possible program phase without coming in danger for user or sterilization goods. Breaking a program is a special situation for the device. The device goes automatically in a standard program phase! For liquids does it mean that the unit is switching off the fast cooling function and waits until reaching the removal temperature and removal pressure! So that can mean the program needs longer for finish like without the program break!



**Use the program break for emergency break only! The device will try to finish the program regular even it finds an error! So breaking a program is not necessary in each case of error message. Try Escape before breaking the program!**

## • Changing program parameters

To change program parameters press the Enter button. You reach the code menu. Give the code 2000 to the menu and confirm with Enter button. To navigate through the menu use the cursor buttons.

Enter access code:

0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f	g	h	i	
j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	A	B	C
D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
X	Y	Z	!	(	)	+	-	.	/	%	:	;	°						

If the code was correct you reach the main menu. Depending on the access level defined by the code the main menu shows different submenus.

In the picture you find the maximum main menu, by giving the code 2000 you find the program parameter point only.

Main menu

Program parameters
Time and date
Device configuration
Measuring channels
Controller tests
Non-volatile memory

Enter the point program parameters. Inside the submenu go to the program you want to change.

Parameter P1

Program description
Access control
Common condition
Dearation phase
Heating phase
Sterilization phase

Inside this submenu you can choose the program phase that should be changed directly.



**Change Program parameters only if the result gives real advantage! The preprogrammed sterilization cycles are validated for empty chamber and full loaded chamber. For the normal use the 10 preprogrammed cycles should be enough.**

When all programs are configured you should run and test the program with empty chamber and full loaded chamber to be sure the program parameters do not make problems in normal cycle run. If there are doubts, you should make a full validation of the program.



## 4. Sterilization cycle progress

The program cycle is running fully automatically. The display shows the actual program cycle and gives information what is the actual situation in the running program phase.

The successful finish of sterilization cycle will be displayed. In case of an incorrect cycle additionally sounds an acoustic signal.

In the following the typical display are described:

14:45:00 Mo 4.10.2006		
<b>P1</b>	Tk =	74.9 °C
Instruments	Pk =	0.0 kPa
	Trf =	79.0 °C

The steam sterilizer is switched on, program P1 is activated but not started. The device is ready for start. If the door is closed, the device is preheating the steam generator automatically.

Dearation: vac.+ steam 2x  
 Steril.: 134 °C 00:04:00  
 Drying: no

The display shows program no. P1. Here the program type is shown, if special program name was given it will replace the program type. The main program parameters are shown for fast identification of the program cycle. In the picture display shows Program type Instruments, with dearation fractionated revacuum starting with vacuum followed by steam injection 2 times. Sterilization is programmed for 134°C, 4 min. sterilization time. Drying function is not programmed. In the sensor window the main sensor values are shown.

Er 0001 14:45:00 Mo 4.10.2006		
<b>P1</b>	Tk =	74.9 °C
Instruments	Pk =	0.0 kPa
	Trf =	79.0 °C
<b>Er 0001</b>		
<b>Door of the sterilizer is open (GS01)</b>		


The program P1 was started but lid was not completely closed. So the device generates an error message. The error message can be cleared by pressing the Escape button if the cause of the error was cleared.

14:45:00 Mo 4.10.2006		
<b>P1</b>	Tk =	74.9 °C
Instruments	Pk =	3.0 kPa
	Trf =	79.0 °C
Phase: PREAHEATING		
Tg= 37.8 °C	Tm1 =	74.9 °C
	Tm2 =	74.9 °C
		50%

The cycle was started regular, the temperature was low so unit starts with preheating. Instead of Tm1 / Tm2 the jacket temperature Tm is shown (only for option with vacuum and / or fast cooling)

14:45:00 Mo 4.10.2006		
<b>P1</b>	Tk =	74.9 °C
Instruments	Pk =	42.5 kPa
	Trf =	79.0 °C
Phase: DEAERATION [1]		
Setpoint =		85.00 kPa
		50%


The program was started regular and is now in deaeration phase step 1.

14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 110.0 °C
Instruments		Pk = 50.3 kPa
		Trf = 109.5 °C
Phase: HEATING		

Setpoint: 134.0 °C




Deaeration has finished, the program is now in heating phase. Setpoint for finish of this phase is reaching the 134°C chamber temperature.

14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 135.3 °C
Instruments		Pk = 316.8 kPa
		Trf = 134.9 °C
Phase: STERILIZATION		

To end= 00:02:00




The sterilizer is in sterilization phase, 2 minutes before finish of this phase.

14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 110.9 °C
Instruments		Pk = 67.9 kPa
		Trf = 112.7 °C
Phase: PRESSURE REDUCE		

Setpoint= 10 kPa




Sterilization phase has finished, now the chamber pressure will be reduced until reaching 10 kPa in chamber.

14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 102.9 °C
Instruments		Pk = -75.8 kPa
		Trf = 104.7 °C
Phase: DRYING		

To end= 0:02:00




Chamber pressure was reduced lower than 10 kPa, pressure reduce phase has finished, now the device is in drying phase (vacuum pump is running). Drying is not available in units without vacuum pump!

14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 99.6 °C
Instruments		Pk = -6.9 kPa
		Trf = 98.7 °C
Phase: AERATION		

Drying time is over, now the chamber is venting until reaching setpoint.




14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 99.5 °C
Instruments		Pk = -1.6 kPa
		Trf = 99.7 °C
Phase: EQUALISING		

To end= 00:02:00




Venting the chamber has finished. An additional time is running for safety.

14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 99.7 °C
Instruments		Pk = 0.0 kPa
Phase:		Trf = 99.8 °C
END OF CYCLE		
Course:	CORRECT	

The program cycle has finished successfully. The sterilizer gives the result as correct cycle. Now the program needs to be quit by pressing the Stop button. Then the lid can be opened and the sterilization good can be removed from chamber.

In case of a not successful or broken program the sterilizer shows the following message:

14:45:00 Mo 4.10.2006		
<b>P1</b>		Tk = 74.9 °C
Instruments		Pk = 0.0 kPa
Phase:		Trf = 79.0 °C
END OF CYCLE		
Interrupted by operator		
Course:	INCORRECT	

Before regular end of cycle a break was initialised. May be by hand or automatically. In case of automatic break an error message is additionally shown.

## 5. Error handling

The following simple errors will not influence a program by breaking and are not real mistakes in process control. The errors make it impossible to start a program, the reason why it was generated needs to be removed before next start.

<b>Er 0001</b>	14:45:00 Mo 4.10.2006
<b>P1</b>	Tk = 74.9 °C
Instruments	Pk = 0.0 kPa
	Trf = 79.0 °C
<b>Er 0001</b>	
Door of the sterilizer is open (GS01)	

<b>Er 0002</b>	14:45:00 Mo 4.10.2006
<b>P1</b>	Tk = 74.9 °C
Instruments	Pk = 0.0 kPa
	Trf = 79.0 °C
<b>Er 0002</b>	
Too low water level in feed water tank (LLS03)	

<b>Er 0052</b>	14:45:00 Mo 4.10.2006
<b>P1</b>	Tk = 74.9 °C
Instruments	Pk = 0.0 kPa
	Trf = 79.0 °C
<b>Er 0052</b>	
Highest water level in feed water tank (LHS03)	

## 6. Operating the sterilizer – general information

### • Preheating the chamber

After switching on the unit it is in a wait modus. After activating a program the unit changes into a standby modus and activates automatic preheating function. This function is automatically preheating the steam generator if the lid is closed. Jacket preheating starts in special programs only if it is activated.

If the door / lid is open, the automatic preheating is disabled!

### • Preparation of sterilization goods

Solid sterilization goods should be cleaned before sterilizing. Cleaning is a basic part of sterilization process. It reduces the numbers of microorganism on the surface. The sterilization is not a cleaning process! Microorganism will be killed or deactivated but the rest of material that the microorganism consists of will be on the surface after the sterilization has finished! Often these particles act as pyrogenes!



**Solid sterilization goods should be cleaned before sterilization! Only this gives warranty of a high quality sterilization cycle!**

For wrapping the sterilization goods the wrapping material should be convenient to use as wrapping material! The wrapping should be closed over the complete cycle to protect the goods against recontamination after sterilization has finished. For waste material in a waste bag the opposite is valid. Waste bags should be opened or should open under vacuum! This is necessary to make sure the steam comes in direct contact with sterilization good. If there are doubts that the sterilization process runs without complications it should be validated!



**Wrapped and porous material should be sterilized with vacuum program only! Waste bags are a kind of wrapping material! To sterilized waste in a waste bag a vacuum program is the best deaeration process. Pressure purge process may be not enough for good deaeration.**

Especially when sterilizing wrapped goods it is necessary to keep the load in the same kind it was validated. The single packages should not lay inside too close to the next. Deaeration and drying function depend on the kind of loading! If the steam can not reach the good evenly spread, the heating power will create temperature differences!

Heavy goods should lay on the ground of the chamber, lighter goods should lay upstairs. In each program cycle the loads should be from the same type. The deaeration type should respect the heaviest and complicated load! A mixture of solid and liquid loads should be avoided.

The maximum loads are defined in chap. 1 technical data. Please refer to this chapter to see the maximum load of each type of load!



**Attention please while using hot liquids! While contact with hot liquids with temperature of more than 60°C it can burn the skin!**



**Attention please while handling closed waste bags! If the unit is not equipped with vacuum the waste needs to be opened while loaded into the chamber. While opening the waste bag bio aerosols will come free and may infect the operator! Operate the device in the right protection clothes only! Protect your skin, your face especially eyes, nose, mouth!**

- **Cancellation of program cycle**

Each program is able to be broken manually by operator by pressing the STOP button. The program asks if cancellation is really necessary before breaking. After breaking the program has different possibilities to react. The reaction depends on the situation and the program in that the break shall happen. Normally the program is going into the pressure reduce phase for solid goods or into the cooling phase for liquids. The program is only using the parameters for standard programs of this sterilization good! Especially if liquids was chosen, the program break cause a very long waiting time until unlocking the lid! In or after the cooling phase of liquid programs a program cancellation is not possible!

In case of a liquid program the activated thermo lock can not disabled by using the program cancellation function!



**In case of a program cancellation before regular finish of sterilization phase the sterilization goods are not steril! The sterilization needs to be repeated!**

In case of a break while drying is running the sterilization goods may be wet! The sterilization goods are not ready for storing process! Recontamination is possible in very short time! The chamber should be dried manually before next start.

- **Draining the condensate**

To remove the condensate the unit is equipped with an outlet to connect to a drainage system. If the unit is connected with cold water supply the program is automatically protecting the condensate drain against over heating by direct draining with hot steam.

- **Documentation of sterilization cycle**

The device is prepared for 2 different kinds of cycle documentation. The first is the connection to a standard IBM compatible PC via RS485 interface in the back of the unit. For read out of data a special interface transformer is necessary (RS 485 to USB adapter). Additionally you need to install documentation software Dokumentator.

The second possibility is to built in a standard needle printer for 40 characters per line with serial interface (CBM 910). The sterilizer has a built in memory with up to 4 MB and is automatically storing the data of each cycle until memory is full. Then start program over writing the oldest data. Data readout by one of the 2 possibilities is possible later on.

The parallel use of the 2 documentation possibilities is available under special conditions too.

The DOKUMENTATOR software has different levels of functionality. In basic module the following functions are available:

- Documentation of running cycle;
- Readout of data from memory;
- Display of different analog channels;
- Printout of the data as graphic and table;
- Display and printout of archive data;
- Protection of the data against changing;

In following picture you can see the main window of the Dokumentator software.



The printer CBM-910II CITIZEN is a dot matrix printer. It is available as built in version. An interface for external connection is not available. With the printer it is possible to printout all relevant process data while the process is running. To a later time it is possible too.



**The printer should be loaded with enough paper. If the paper role is at the end the printer stops automatically.**

## V. Maintenance

The sterilizer should get regular cleaning, maintenance and service. Some parts are regular to be changed completely to protect the device against damage or mistakes in sterilization cycle. The simple cleaning and maintenance activities can be done by the operator without problems.

Special services can be done by specially trained service stuff only! All inspection activities acc. to pressure vessel regulations / local regulations for pressure vessels and electrical installations need special tranined service stuff! We recommend to order one regular safety inspection per year and to connect this with a regular maintenance for the vessel, pressure parts and electrical installations. Your distributer is authorized to tell recommend a trained service partner.



**We recommend to use a device book that helps to document all cleaning, maintenance and service repair activities at the device.**



**Maintenance or repair activities that need to open the housing are not allowed to be done by untrained personell stuff!**



**For maintenance or repair activities that need to open the housing the electrical power supply must be disconnected! Inside the housing dangerous electrical voltage can kill or hurt!**



**After work at electrical installations some electrical test are necessary to do. Please respect the local rules and regulations!**

- Regular cleaning, maintenance and service activities

activity	Recommended time					notes
	dayl y	wee kly	Mon thly	Half year	year ly	
Cleaning the surface of chamber ring	X	X	X	X	X	
Cleaning chamber inside	X	X	X	X	X	Especially after over boiling of sugar or agar solution
Cleaning baskets		X	X	X	X	
Cleaning trays and bottom sheeets		X	X	X	X	
Cleaning lid seal and check for damages	X	X	X	X	X	Change lid seal if damaged (SERVICE)
Cleaning the device outside			X			
Check the safety valve(s)				X	X	
Check the in/out connections			X	X	X	
Change the ventil air filter			X	X	X	
Function test for the valves					X	SERVICE
Cleaning the tank					X	SERVICE
Functional test of vacuum pump					X	SERVICE
Check program parameters				X	X	
Check for lid / door adjustment					X	SERVICE
Electrical test (BGVA 2/4)					X	SERVICE
Attention please! Opening the unit is allowed for authorized and trained service stuff only!						

- Cleaning



**Before starting with cleaning the device please disconnect the unit from power supply completely! Cleaning should be done if the unit was cooling down only! Danger if the chamber is hot!**

- **cleaning the surface of chamber ring** – Clean hat area regular! That area is necessary for closing and sealing the chmber completely. Use a wet towel or textile cotton material for cleaning. In case of hard waste in the surface you can use the hard side of house hold eraser. Do not use aggressive chemicals or organic solutions like alcohol, benzine or acetone.



**Do not use aggressive chemicals or rough cleaning materials for cleaning the metal surface!**



- **Cleaning the chamber inside** – for cleaning the chamber use a wet and soft towel from cotton material. Special cleaning material or chemicals are not necessary. Do not use aggressive or organic chemical for cleaning! Chemicals can damage the sealings or sensors!



**The rest of chemicals or cleaning materials will be brought forward to the sterilization goods of next sterilization cycle! Do not use aggressive or organic chemicals for cleaning!**

- **Cleaning the accessories** – Clean the baskets etc. with wet towel or under running water.

- **Cleaning the housing** – The housing needs to be cleaned by wet towel or light oil. Special cleaning chemicals like used in house hold can be used.

- **Check of the safety valve(s)**

The safety valve(s) needs to be checked once per year. This should be done by a specially trained service staff. Other safety checks are necessary so we recommend to make one safety check together with the yearly maintenance check by a trained service engineer. While testing the function of the safety valve steam is leaving the safety valve.



**Attention please! While steam is leaving the safety valve the valve is getting very hot in a very short time! Make sure that your human skin is not coming in contact with the steam! Contact with the steam can burn your skin!**



**If the valve is not closing completely after testing it needs to be changed! If there are doubts about the regular functionality of the tested valve it needs to be changed!**

- **Changing the venting air filter**

Wear and tear of the venting air filter depends on the number of cycles and the quality of the environment. We recommend to change the filter after 100 cycles or once per month.

- **List of consumables**

Part description	Drawing no.	Ordering no.
Venting air filter; 0.3 µm / 99.5% – φ 50 (1/8" NPT)		40-0719-142-014
Lid seal φ 400 mm	Laboklav 55 - 100	xx-xxxx-xxx-xxx
Lid seal φ 500 mm	Laboklav 135 – 195	xx-xxxx-xxx-xxx
Cleaning set for autoclaves		xx-xxxx-xxx-xxx
Waste bags for steam sterilization		xx-xxxx-xxx-xxx

## VI. Description of safety devices

The steam sterilizer is equipped with different safety devices. The safety devices protect the user against injury and safe the sterilization process. Mechanical and electronic safety devices are build in and realize in sum a safety concept with different safety functions.

- **protection against over pressure** – If control board is measuring a chamber pressure of more than 345 kPa absolute pressure (2,45 bar relative pressure) an alarm is generated (including error message) and the heating function is switched of. The heating function can be switched on manually again by pressing Escape button. So the program is not broken. With 360 kPa absolute pressure another error message is generated that is breaking the program automatically. With 2.8 bar relative pressure the safety valve is opening and chamber pressure is reduced mechanically! The steam is blowing into the housing contact with the steam is not very dangerous because it is saturated after blowing out.

**Attention:** To check the safety valve a special program can be implemented that is bridging the safety functions of over pressure protection. This program will be implemented on special order by the customer only! Blowing off the safety valve in the condition that the housing is not opened can damage the electronic board!

- **Protection against opening the chamber while over pressure is inside** – the device has a built in thermo locking function. The device opens the thermo lock when pressure is low only. The pressure is checked by pressure sensor and an additional pressure switch that detects normal pressure. The opening mechanism is calculated to open when chamber pressure is low. These 3 safety functions give good protection against opening while pressure in chamber is high.
- **Protection against opening the chamber while Temperature of liquids is too high** – One part of the thermo locking system is the measurement of the temperature inside liquids by the reference sensor. The device is unlocking the lid in liquid programs when temperature is lower than programmed removing temperature is reached only. The flask where the reference sensor is positioned should be from the same size, form and filled with same volume of the largest single volume of the sterilization goods.
- **Protection against steam out coming from chamber** – steam production is switched off immediately if the lid is opened. After program finish the preheating of steam generator is switched off so steam outcoming from steam inlet should be not possible. Preheating is switched on again after new program change or entering the same program again.
- **Protection against over heating the steam generator** – the steam generator is protected against over heating by 2 independent over temperature switches. One of them is self resetting when temperature is low again, the second one needs to be resetted manually by authorized service staff. Over heating protection switches break the program.
- **Protection against over heating the chamber** – The chamber is not directly heated so it can reach maximum the steam temperature that is limited by the pressure.

## VII. Additional Information

- Definition of feed water quality**

Acc. to **EN 285** – “Steam sterilizers”, app. B / EN 13060 – small size steam sterilizers App. C

	Feed water	Condensate
Residual dry matter	$\leq 10 \text{ mg/l}$	$\leq 1.0 \text{ mg/kg}$
Silica oxide, $\text{SiO}_2$	$\leq 1 \text{ mg/l}$	$\leq 0.1 \text{ mg/kg}$
Iron	$\leq 0.2 \text{ mg/l}$	$\leq 0.1 \text{ mg/kg}$
Cadmium	$\leq 0.005 \text{ mg/l}$	$\leq 0.005 \text{ mg/kg}$
Lead	$\leq 0.05 \text{ mg/l}$	$\leq 0.05 \text{ mg/kg}$
Other heavy metals, except for iron, cadmium, lead	$\leq 0.1 \text{ mg/l}$	$\leq 0.1 \text{ mg/kg}$
Chlorines	$\leq 2 \text{ mg/l}$	$\leq 0.1 \text{ mg/kg}$
Phosphates	$\leq 0.5 \text{ mg/l}$	$\leq 0.1 \text{ mg/kg}$
Conductivity (at 20°C)	$\leq 15 \text{ } \mu\text{S/cm}$	$\leq 3 \text{ } \mu\text{S/cm}$
pH	5 do 7	5 do 7
Colour	Colourless, clean, no deposit	Colourless, clean, no deposit
Hardness	$\leq 0.02 \text{ mmol/l}$	$\leq 0.02 \text{ mmol/l}$
NOTE 1: Using water of contamination greater than specified above for steam generation, can considerably reduce the sterilizer life and void the manufacturer's warranty.		
NOTE 2: The condensate should be derived out of the steam collected during sterilizing cycle with the chamber empty.		

Tests for conformance are performed with commonly used analytic methods.

- Service and maintenance**

If there are any problems in operating the sterilizer please contact your distributor first. The distributor knows the address of the next authorized service company or is able to solve your problem directly

Manufacturer Germany	SHP Steriltechnik AG, Schloss Detzel 1, 39345 Detzel Schloss	
Fax	+49 39058 97 62- 22	08:00 bis 17:00 Mo. – Fr.
Tel.	+49 39058 97 62- 0	08:00 bis 17:00 Mo. – Fr.
Mobil	+49 177 6269880	24 h
Email	<a href="mailto:info@shp-steriltechnik.de">info@shp-steriltechnik.de</a>	08:00 bis 17:00 Mo. – Fr.

You can also contact the local importer/distributor as per your invoice or the mentioned on the sticker on the instrument.