# Technical Description

# for the

# Autoclave

# Vacuklav®24-B/L

Dear Doctor:

Thank you very much for the trust which you have shown by purchasing this autoclave.

For more than 55 years now, MELAG — a medium-sized family-owned and -operated company — has specialized in the production of sterilization equipment for medical practice. During this period, MELAG has succeeded in becoming a leading manufacturer of sterilization equipment. More than 400,000 MELAG units sold throughout the world testify to the exceptional quality of our sterilizers. — which are manufactured exclusively in Germany.

As all other MELAG products, this autoclave was manufactured and tested according to strict quality criteria. Before placing this unit into operation, please read this Technical Description carefully. The long-term functional effectiveness and the preservation of the value of your autoclave will depend on careful preparation of instruments before sterilization, and on proper care of the unit.

The staff and management of MELAG

CE 0124

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**To ensure the functional effectiveness of this unit and to preserve its value:**

1. Prepare the instruments to be sterilized carefully
2. Take proper care of the autoclave
3. Use only pure distilled or demineralised water


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## 1.1 Views of the unit

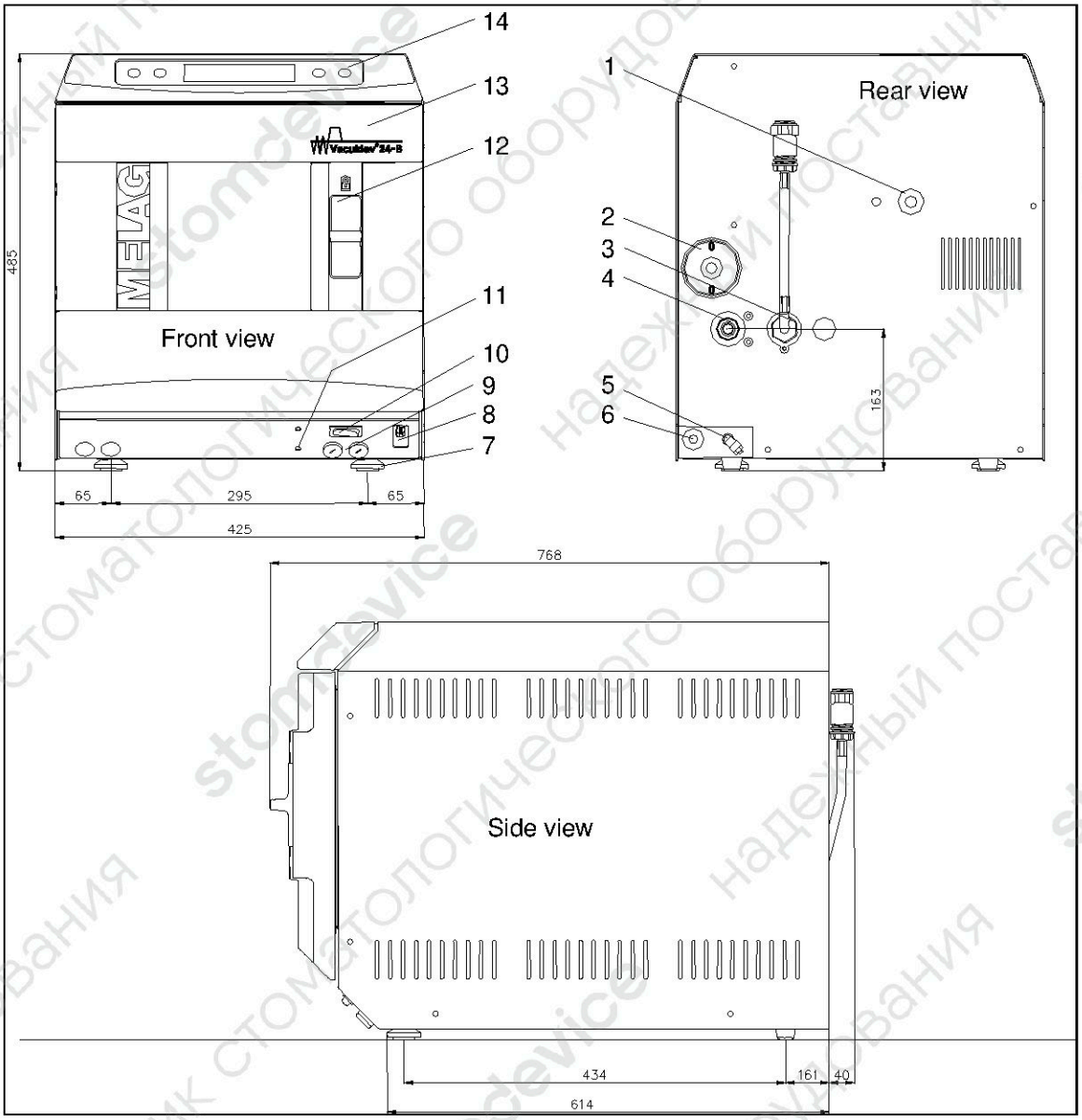



Fig. 1 Views of the Vacuklav®24-B/L

1 Safety valve
2 Sterile filter
3 Cooling water inlet (3/4" external thread)
4 Cooling water outlet (3/4" external thread)
5 Purified water inlet
(Swivel connection for 6x1 pipe)
6 Mains power cable
7 Adjustable front feet
8 Serial data and printer port
(RS 232)
9 Fuses - 2 x 16 A / FF
10 Power switch
11 Motor circuit breaker (vacuum pump)
12 Sliding door lock
13 Door (left-side hinge)
14 Control panel


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## 1.2 Control panel

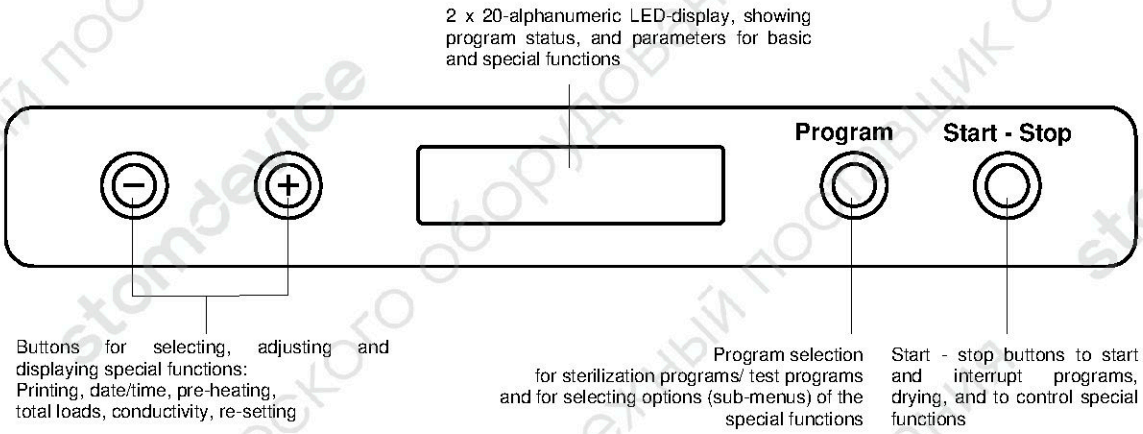



Fig. 2 Control panel Vacuklav®24-B/L

## 1.3 Technical data

| | | |
|---|---|---|
| Sterilization space (diameter x depth) | : | 25cm x 60cm |
| Electric power supply | : | 2500W / 230V AC / 10.9A / 50....60Hz |
| Sterilization pressure / temperature | : | 2bar/134°C; 1bar/121°C |
| Maximum load: | : | 7kg instruments or 2,5kg textiles |

Further technical details are included in the Annex

## 1.4 Performance features of this autoclave

### 1.4.1 Fractionating pulsed vacuum procedure

A fractionating pulsed vacuum method involved the repeated evacuation of the sterilization chamber, alternating with the introduction of steam in order to ensure the necessary penetration of the items undergoing sterilization with superheated steam.
This means that even demanding sterilization tasks, involving for example intricate instruments or large amounts of textiles can be completed quickly and reliably.
Steam penetration can be demonstrated using the established Bowie & Dick Test, for which a special test program can be implemented.

### 1.4.2 Programs for sterilization

The Vacuklav®24-B/L features three sterilization programs for temperatures at 134°C: the “Universal Program” (for wrapped objects), the “Prion Program” (a special Universal Program), the “Fast Program” for unwrapped items, and the “Gentle Program” (a sterilization program for textiles and rubber articles at 121°C). The user can at any time perform additional functional checks of the autoclave by running the Bowie & Dick Test for steam penetration, and the Vacuum Test for leak testing. The additional program "MELA*steam*®" is available as an option, and functions at a temperature of 136°C.

### 1.4.3 Separate steam generation

The generation of steam by a high-performance unit outside the sterilization chamber makes it is possible to sterilise large loads of instruments or textiles quickly. It is not necessary to have any pauses between the sterilization runs, and overheating in the sterilization chamber is impossible.

### 1.4.4 One-way system/ Conductivity measurement/ Automatic water supply

The Vacuklav®24-B/L operates with a reliable one-way system, in which all the condensate from a sterilization, including any impurities which this may contain is completely eliminated and purified water used for the next program run.
An integrated conductivity measurement system monitors the quality of the distilled or demineralised water used for the steam generation.
For frequent operations, the larger demand for purified water can be met by a water purifier, e.g. MELA*dem*®47 or MELA*dem*®40, which can be directly connected to the autoclave.
Provided the instruments to be sterilized are then also prepared carefully, stains on the load and soiling of the autoclave itself can be prevented.



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### 1.4.5 Electronic Parameter Control (EPS)

The microprocessor in the Vacuklav®24-B/L makes it possible to monitor pressure, temperature and time continuously during a program by Electronic Parameter Control The overall operating time can then be optimised according the load and the temperature of the autoclave.
The process assessment and monitoring system in the program control compare current process parameters with standard process data and monitors the process relative to limit values for temperatures, times and pressures. This makes it possible to identify faults as they occur, and provides quality assurance for the sterilization and disinfection processes.

### 1.4.6 Vacuum drying

Vacuum drying ensures the best possible drying results for packed utensils.

### 1.4.7 Pre-heating

By activating the "pre-heating" function, the cold autoclave chamber can be warmed up before sterilization, or the temperature can be maintained between sterilization runs. This reduces the duration of cycles and considerably reduces the formation of condensation, thus improving drying results.

### 1.4.8 Documentation

The electronic memory stores records of the previous 40 programs.
For effective hard-copy documentation and for checking purposes a MELA*print*®42 printer can be connected to print out a record immediately after completion of a program or to print out records from the memory.

# 2 Installation

When setting-up and installing the autoclave, please consult the separate instructions leaflet "Installing the Vacuklav®24-B/L".

## 2.1 Setting up the autoclave

The autoclave should be set up in a dry place which is protected against dust.
The base should be stable, and able to support the weight of the appliance (unloaded weight 43 kg).
The space required by the autoclave can be seen by the external dimensions (as in Section 1.1). A minimum additional space of 10 cm should be allowed on either side and above the autoclave in order to ensure that heat can escape.
The electrical power supply should be a separate 230V AC circuit with a 16 A fuse.
The cooling water should be obtained from a mains water supply, to which the autoclave is connected by means of a water tap or stop cock with a 3/4" external thread. This water supply should be accessible close to point where the autoclave is set up. (The standard connection pipe supplied is 2 m long)
The disposal of the cooling water outflow requires either a wall-outlet (NW 40) or a sink outflow, and this should also be situated close to the autoclave (the standard 16 mm connection pipe provided is 2m long). The outflow must be lower than the working surface on which the autoclave stands, so that the outflow pipe can be installed without bends and kinks, ensuring a constant downward flow. The autoclave should set-up at a level which allows easy loading and at which the display can be read clearly without bending.
The autoclave must also be supplied with purified water for steam generation. The distilled or demineralised water can come either from a storage container (MELAG Art.-No. 244) or directly from the container in which purchased water is supplied. This should also be situated close to the autoclave (length of feed pipe supplied 1.5m, maximum height difference 1.5 m). If the purified water comes directly from a water purification system MELA*dem*®47 or MELA*dem*®40 (or another purification system) then a storage container is not necessary, but space must be allowed to accommodate the water purification system.

## 2.2 Transport ribbons

Take the autoclave out of the packaging by means of the transport ribbons. The ribbons themselves are each removed by undoing the two retaining screws, which must then be screwed firmly back in place without washers.


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## Levelling the autoclave

In order to ensure that condensate can drain out of the autoclave (which is important if it is to operate properly) the appliance must have be clearly higher at the front than at the back. The autoclave should first be installed in a horizontal position (this should be checked with a spirit level at the chamber flange) and then the front feet should be extended by giving them at least seven (7) turns.

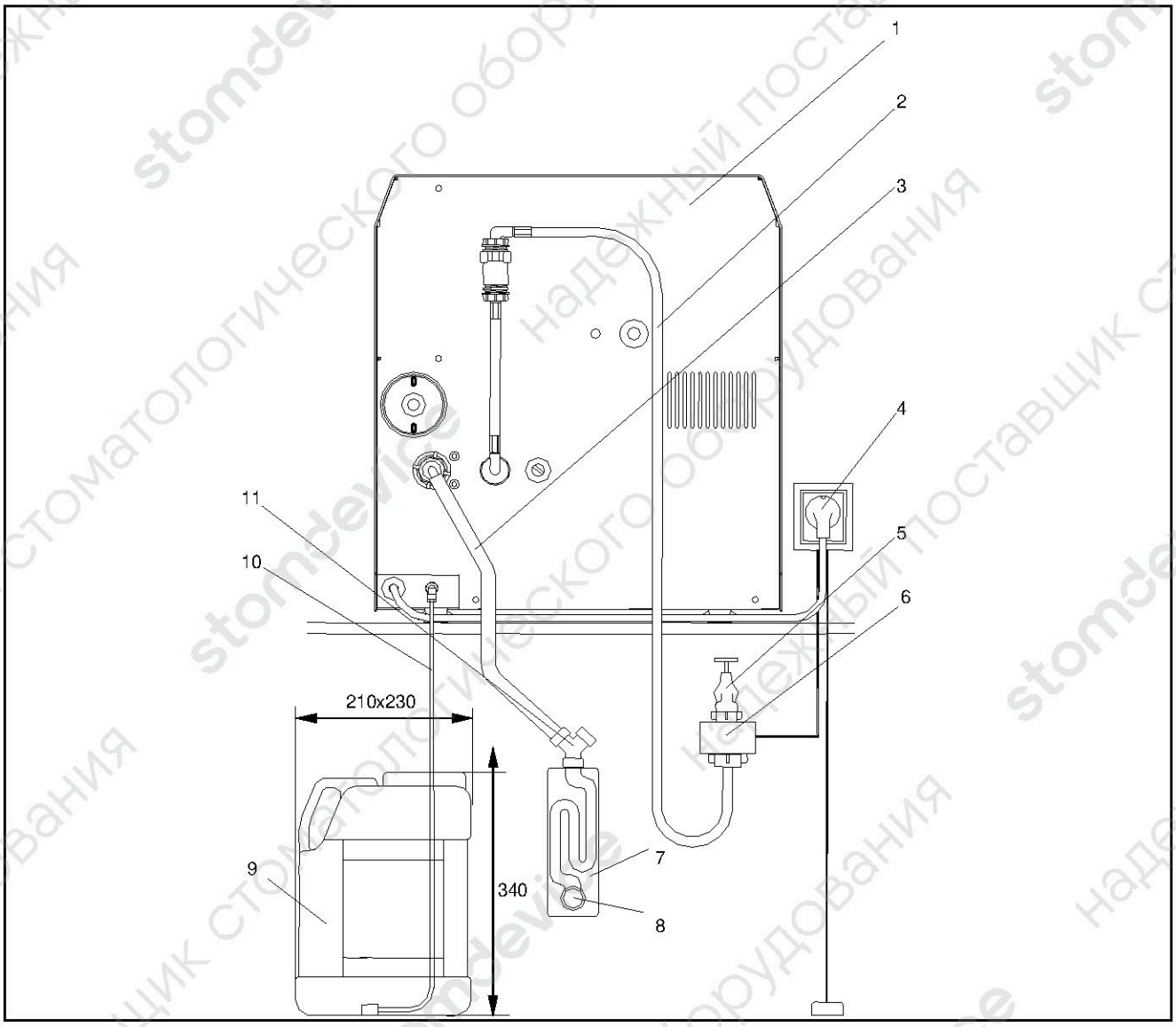



Fig. 3 Typical installation of the Vacuklav®24-B/L with storage container for distilled/demineralised water, with a wall-mounted trap

1 Vacuklav®24-B/L rear view
2 Cooling water inlet pipe (pressure pipe)
3 Cooling water outlet pipe DN16
4 Power connection
5 Water stop cock with safety combination in accordance with DIN 1988 (MELAG Art.-No.: 37310)
6 Leak detector with stop valve and sensor (MELAG Art.-No.: 1056)
7 Wall- mounted trap (MELAG- Art.- No.: 37410)
8 Wall outlet (NW 40)
9 Storage container for distilled or demineralised water (MELAG Art.-No.: 244)
10 Feed water intake with filter
11 Y-junction with non-return valve (included in (6))



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## 2.3 Power supply

The electric cable of the appliance is plugged into a mains socket rated at 230 V, 50 Hz. The power rating of the autoclave is 2500 W. In order to avoid overloading the electricity supply, we recommend using a separate electrical circuit fitted with a 16 A fuse and optionally protected with a 30mA circuit breaker.

## 2.4 Cooling water inlet connection

The connection for the cooling water inlet at the back of the appliance is connected to the mains water supply using the pressure pipe supplied (see page 7, Fig. 3.). Make sure that the washers are fitted correctly.
In order to avoid water damage in the event of leaks, we also recommend the installation of a leak detector ("Water-stop", MELAG-Art.-No.:1056).

## 2.5 Cooling water outlet connection

The connection for the cooling water outlet at the back of the appliance is connected to the drainage system of the building by means of the outlet pipe supplied (textile-reinforced transparent pipe, DN16). It is important that the pipe should have a steady downward gradient, without twists and kinks.
When connecting to an existing sink outflow, the use of the double-chamber trap supplied helps to reduce noise due to water discharging.
When connecting to a separate outflow pipe NW40, a wall-mounted trap should be used (MELAG Art.-No. 37410, see Fig. 3).

## 2.6 Connection of the feed water storage container

If the autoclave is to be supplied with distilled or demineralised water from a storage container (see Fig. 3) then this will be drawn up through the suction pipe. The one end of the pipe is attached to the inlet at the rear of the autoclave, either directly or by means of the swivel connection. The pipe is then fed into the storage container until its other end with the inlet filter reaches the bottom.
If you use the MELAG storage container (MELAG Art.-No.: 244) you will find the necessary instructions on the label. This container has a volume of 11.5 litres, enough for an average of 25 sterilization cycles.

## 2.7 Connection of a water purification system

The autoclave can be connected directly to a water purification unit which provides the demineralised or distilled water required (see page 39, Fig. 4). Instead of connecting the feed water inlet to a storage container, it is simply connected directly to the water purification unit.
The reverse-osmosis systems MELA*dem*®47 and MELA*dem*®40 are ideally suited to provide the quantity and quality of water needed for the Vacuklav®24-B/L.
Detailed instructions on the installation of these water purification units are provided in their Operating Manuals.
When connecting water purification systems from other manufacturers it is very important to ensure that they are able to provide sufficient amounts of water at the required purity. You are generally advised to consult MELAG first.

# 3 Initial start-up

## 3.1 Printer connection/ Initialisation (optional)

### 3.1.1 Connecting the MELA*print*®42

The autoclave can be connected to an external printer, the MELA*print*®42. This is not supplied as standard with the autoclave.
In order to connect the printer to the autoclave follow the description in Section 6.3.1.1.1.

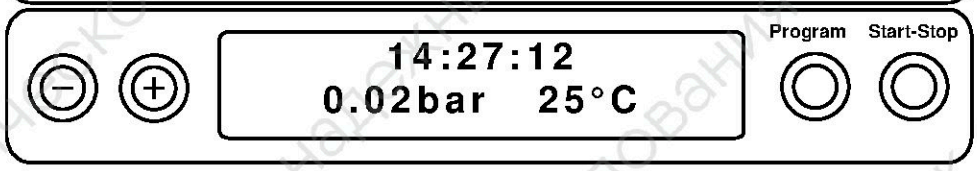
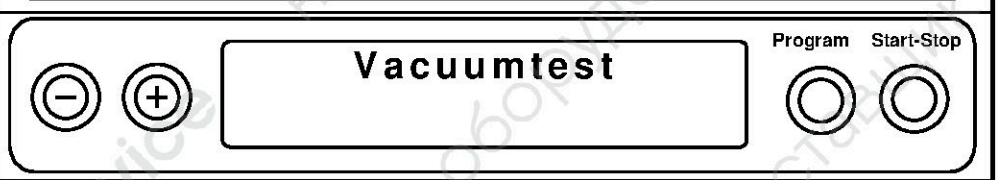
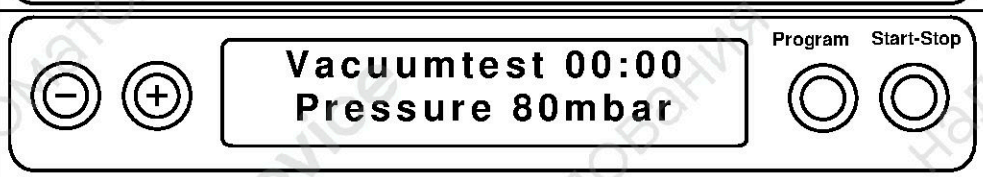
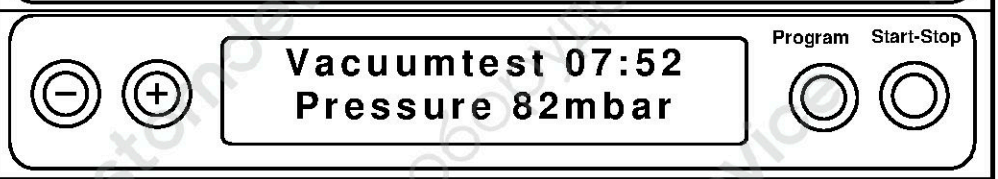
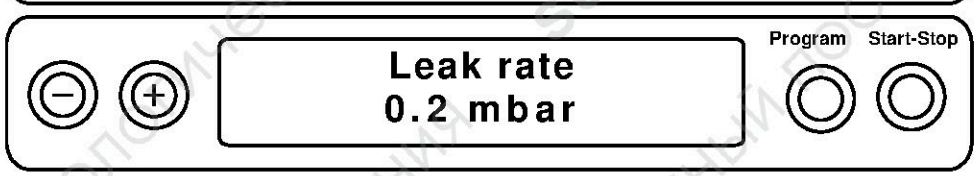
### 3.1.2 Initialisation of the printer / Setting up immediate print-out

Initialise the external printer (registering with the processing unit of the autoclave) as described in Section 6.3.1.1.2. In order to select the immediate print-out option, which means that a record of each sterilization is printed out automatically as soon as it has finished, proceed as described in Section 6.3.1.3.


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## 3.2 Vacuum test

In order to check the operation of the autoclave in the course of the initial start-up, after long periods without being used, or after moves, as well as periodically during routine use, a vacuum test should be carried out to check for leaks.
The vacuum test should be carried out as follows, preferably on the cold autoclave:

| Operation | | Display message |
|---|---|---|
| 1. | Switch on power, then after the message |  |
| | the display will show the basic parameters |  |
| 2. | Press the "Program" button several times until the display shows "Vacuum test" |  |
| 3. | Close the door |  |
| 4. | Press "Start - Stop" button |  |
| 5. | The evacuation pressure has been reached.<br>The equalisation period begins |  |
| 6. | After waiting for the equalisation (5 min) the measuring period starts (running here e.g. for 7min 52s) |  |
| 7. | After the measuring period (10 min) the chamber is ventilated and |  |
| | then the leakage rate is displayed (if the immediate printout option is selected for an attached printer then a record will also be printed) |  |
| | After the message "Please wait Door release" this alternating message will appear: |  |


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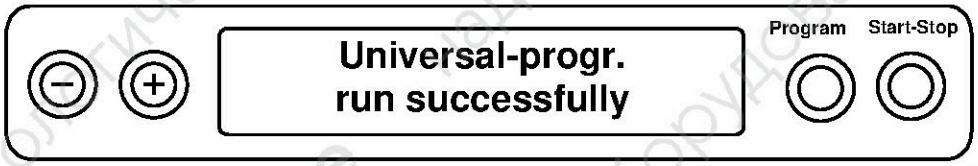
| Operation | | Display message |
|---|---|---|
| 8. | Open door |  |



If the leakage rate is above the limit value, then the display (and the print-out) will also show "Test unsuccessful". In this case, follow the instruction in Section 7.3.

## 3.3 Test run

In order to check the operation of the autoclave under realistic conditions, a test run should be carried out with the "Universal Program, 134°C wrapped" and a relevant load. After loading the autoclave and selecting the program with the "Program" button, sterilization is started by pushing the "Start/Stop" button. If the program runs correctly, the following message will appear on the display (see Section 4.6 ):




with the values for the maximum values for pressure and temperature. If the immediate printout option has been selected for an external printer a record of the program run will be printed.

## 3.4 Installation record

As documentation that the autoclave has been set-up properly, an installation record should be produced by an authorised person and a copy sent to MELAG. This is important in the event that you wish to make claims under warranty provisions.

## 3.5 Safety instructions

- When opening the door, particularly after interrupting the drying process, residual steam can escape from the autoclave chamber.
- After opening the door, do not touch any metal surfaces - these will be hot! Danger of burns. Always use the tray lifter to remove trays, or wear suitable hand protectors when taking out other items
- We recommend the installation of a water leak detector (see installation details Section 2).
- If you intend to install a water purification unit from another manufacturer, then consult MELAG before you do so.
- The appliance is not suitable for sterilising liquids.
- Under current VDE-regulations, this appliances is not suited for use in areas where there are risks of explosion.
- The appliance must only be serviced and repaired by MELAG or by its authorised representatives (specialist dealers or customer services) using only original parts and following service instructions.
- Before opening the housing always disconnect from the mains power supply!
- In order to ensure effective sterilization with the autoclave observe the instructions in this Technical Description, and in particular ensure that the loading of the autoclave is appropriate for the program selected.


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# 4 Instructions for all sterilization procedures

## 4.1 Electricity and water supplies

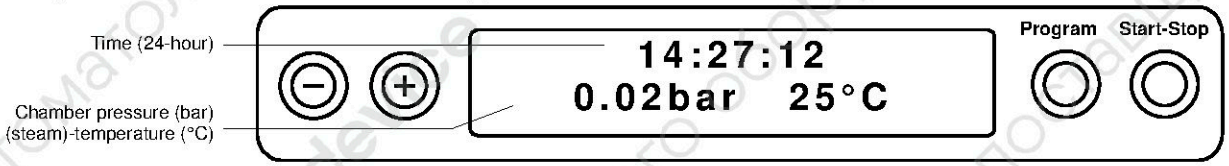
### 4.1.1 Cooling water and purified feed water

The autoclave automatically monitors the availability of cooling water and purified water, as well as the quality of the distilled / demineralised water before starting a program.
In order to allow an immediate program start and to avoid error reports or interruptions of programs (see Sections: 7.3 and 0):

- Before the first sterilization at the start of the working day, check that the water supply is turned on (stop cock)
- If purified feed water is drawn from a storage container, check the water level, and if necessary fill up with purified water of appropriate quality (see Section 8.3.2)
- If the feed water is drawn directly from a MELA*dem*®47 water purifier, check that its water supply is turned on in good time (this may be up to an hour before starting a sterilization program), if the water supply has been turned off over night, for example.

### 4.1.2 Power supply

Switch on the power using the switch on the front of the autoclave (bottom right). About 15 seconds after the message "Please wait Door release" the appliance is in the start status:




## 4.2 Loading the autoclave

It is of crucial importance for effective sterilization and good drying that the autoclave is loaded properly:

**Tray rack**

For the Vacuklav®24-B/L there are 2 types of tray rack:
Type "B" (MELAG-Art.-No.: 40224) for up to 4 trays or 4 standard tray-cassettes.
Type "C" (MELAG-Art.-No.: 40242) for up to 6 trays or 3 standard tray-cassettes.
Both types of tray rack are also suitable for the MELAG-sterilization containers Type 15K,M,G; Type 17K,M,G,R; Type 23M,G,R, Type 28 M,G.
Normally, the autoclave should be used in conjunction with a tray rack, since this ensures that steam penetration and drying are as good as. In exceptional situations (e.g. when using sterilization containers from other manufacturers), and after consultation with your specialist dealer or with MELAG, the tray rack can be removed and the container can be placed directly in the autoclave chamber.

**Trays**

Trays for objects which are to be sterilized must be perforated, in order to allow condensate to run away. MELAG-trays are recommended. If you use dishes or trays without perforations, then the objects being sterilized will not dry properly.

**Enclosed sterilization containers**

Enclosed sterilization containers must be perforated on at least one side (preferably underneath) or must have valves, in order to ensure that steam can penetrate and condensate can run out. All MELAG-sterilization containers meet these requirements with perforations on two sides and filter-cloth- inlays.
Sterilization containers which only have perforations on the top only allow limited drying.
If sterilization containers are stacked in the autoclave, it is important to ensure that the perforations are not blocked.

**Transparent sterilization packaging**

If you use transparent sterilization packaging, such as MELA*fol*® , then the items should if possible be stood vertically on the tray, or sterilized in foil holders (MELAG-Art.-No.: 22420). They should never be laid flat one on top of the other.
If seals split open during sterilization it may be necessary to increase the length of the sealing impulse or to use a double-seal.
Standard tray- cassettes sealed in MELA*fol*® (250 mm wide) must be taped and clasped additionally to ensure that the side-seals do not split open.

**Multiple wrapping**

The pulsed vacuum method means it is possible to use multiple wrapping.



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**Maximum loads**
Loads should not exceed 7kg of instruments or 2.5kg of textiles.
**Mixed loads**
If mixed loads of textiles and instruments are to be sterilized, then as far as possible the textiles should be above the instruments and direct contact with the instruments should be avoided.
Inclusion of textiles and instruments in the same sterilization container is not desirable.
Textiles should never come into direct contact with the walls of the chamber.
If different types of packaging are included in a load, then:
- Instruments and sterilization containers should be at the bottom
- Transparent and paper sterilization packaging should be at the top (but lower than textiles)

**Liquids**
The appliance is not suitable for the sterilization of liquids!
**Suitability for sterilization**
Relevant information provided by manufacturers of instruments and textiles about sterilization should be strictly observed.

## 4.3 Closing the door

The door is closed by lightly applying pressure in the direction of the chamber flange and at the same time pressing down the sliding door catch.
The display shows the message:

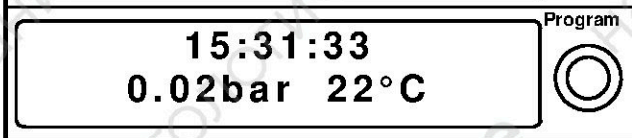



## 4.4 Program selection

A program should be selected which is appropriate for the physical properties of the items being sterilized (and in particular their heat resistance) and the type of packaging (if any part of the load is wrapped, then either the "Universal Program" or the "Gentle Program" must be used).
By pressing the "Program selection" button it is possible to review the display of the following programs for selection:

| Program name/Display message | Parameter/Application |
|---|---|
|  | **Universal-progr.** at 134°C, 2 bar, and a sterilization time of 3.5 min<br>Sterilization of all types of wrapped items, in particular instruments, or mixed loads (unwrapped/wrapped) |
|  | **Quick-program** at 134°C, 2bar and a sterilization time of 3.5 min<br>Sterilization **only of unwrapped instruments** (no textiles) for rapid re-use (drying can be interrupted manually) |
|  | **Gentle-program** at 121°C, 1bar and a sterilization time of 15min<br>Sterilization of all types of wrapped items, in particular large amounts of textiles or thermolabile materials (plastic, rubber), or mixed loads (wrapped/unwrapped) |
|  | **Prion Program** (a special Universal Program) at 134°C, 2 bar, and with sterilization time extended to 20 min, for sterilization of wrapped items, especially instruments and/or mixed loads (i.e., packed and unpacked). This program is recommended for sterilization of instruments used in situations in which the danger of infection by pathologically modified proteins is suspected: for example, Creutzfeld-Jacob and BSE). |


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| Program name/Display message | Parameter/Application |
|---|---|
|  | **MELAsteam Cleaning** at 136°C, 2.3 bar, and a maximum cleaning time of 60 min., for the steam cleaning of instruments that have **already been disinfected**. **CAUTION: Use only together with a permanently installed MELA*steam*® Pistol (otherwise the system is disabled.** See the Operator's Manual for MELA*steam*®. |
|  | **Bowie&Dick Test Program** at 134°C, 2 bar and a sterilization time of 3.5 min<br>Used to check the operation of the autoclave (Steam penetration of special indicators) |
|  | **Vacuumtest**-program<br>Used to check the autoclave for leaks,<br>from a cold start |
|  | **Basic display** (no program selected) |

## 4.5 Program start

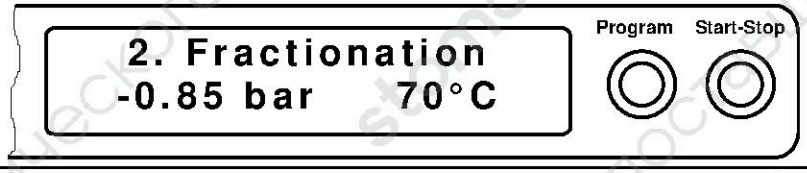
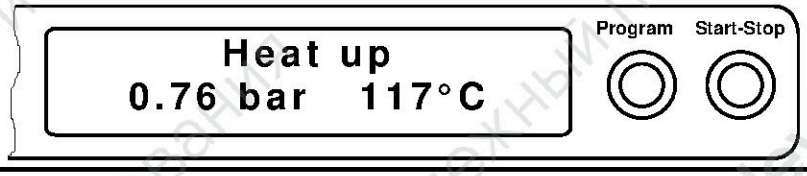
Press the "Start-Stop" button once the desired program is shown on the display. The availability of cooling water, and feed water will be checked automatically, with a conductivity measurement.



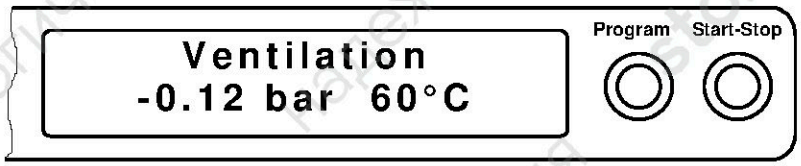
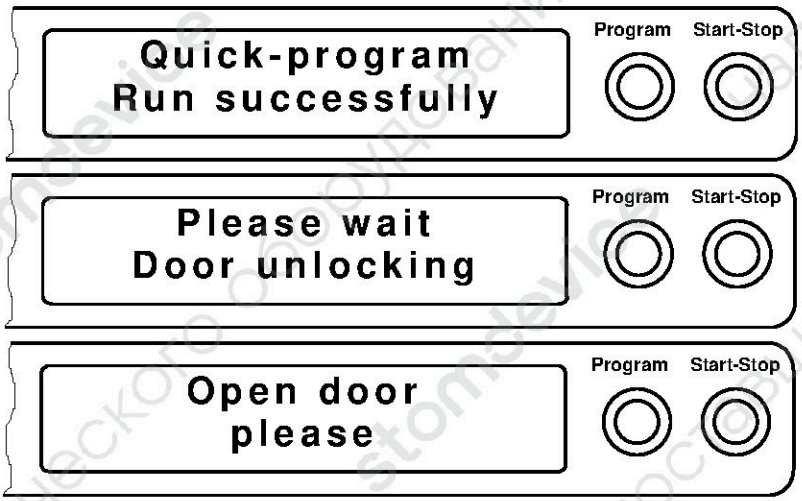

At the start of the quick program there will be an additional message "Warning: Only unwrapped instruments", at the start of the disinfection program the warning "Warning - Not sterilization". These messages must be acknowledged by pressing "Start" again.

## 4.6 Program progress

After starting the program, it will then progress automatically. The display shows the current program status as follows:

| Program status | | Display message |
|---|---|---|
| 1. | **Phase 1** consisting of evacuation (removal of air) until the appropriate evacuation pressure is reached, followed by steam introduction up to slightly above atmospheric pressure.<br>Display show pressure in chamber and steam temperature |  |
| 2. | **Phase 2 and following**<br>Depending on the program chosen and the temperature of the chamber at the start of the temperature, additional cycles may be necessary to ensure that air is evacuated and superheated steam enters the items being sterilized. |  |
| 3. | **Heating phase**<br>A heating-up phase follows. The continuous introduction of steam raises pressure and temperature in chamber to the values needed for the program |  |

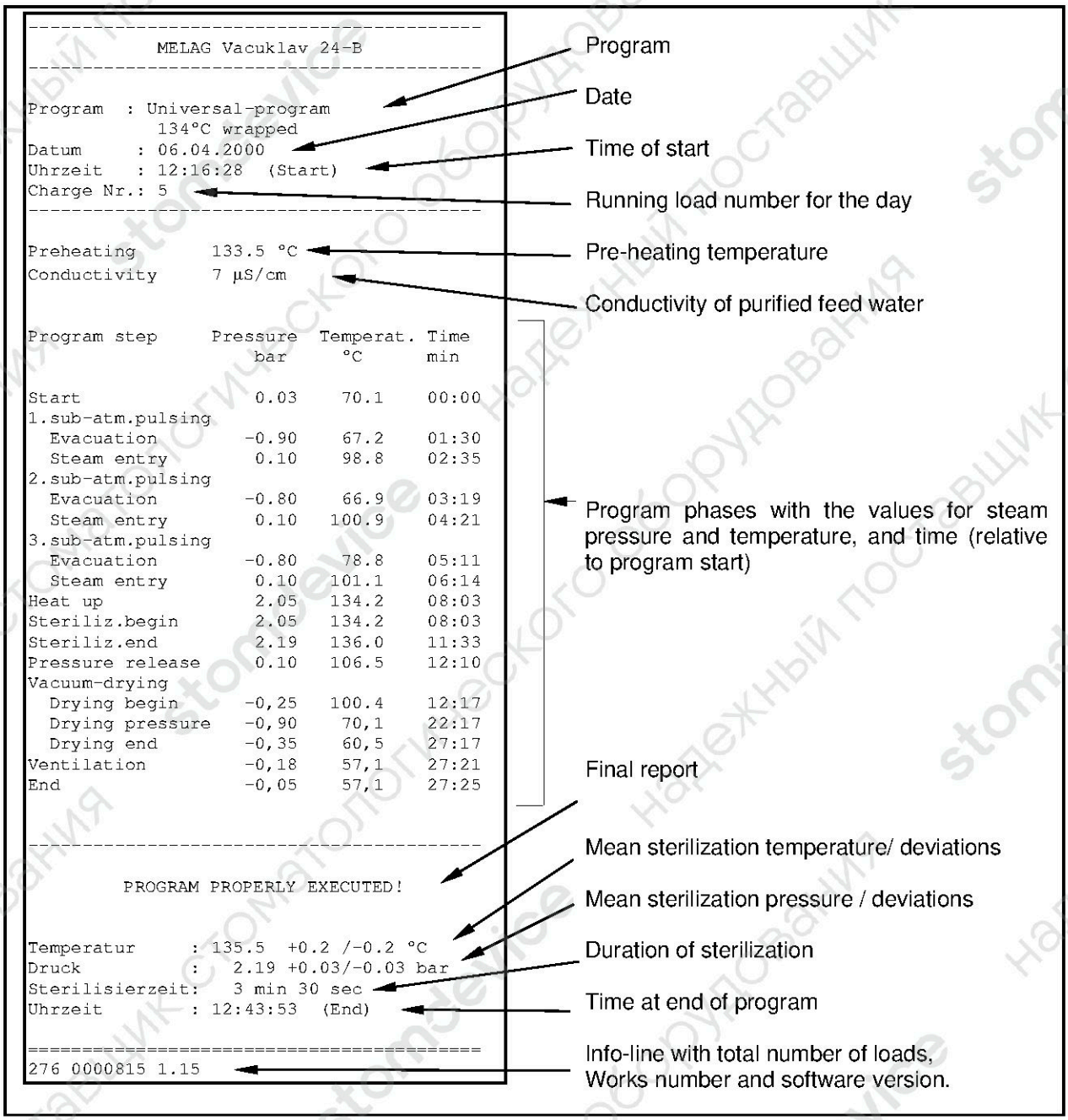

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| Program status | | Display message |
|---|---|---|
| 4. | **Sterilization phase**<br>When the required pressure and temperature have been reached the sterilization proper then begins.<br>The display shows alternately the pressure and temperature and the time remaining. |  |
| 5. | **Pressure release**<br>After completion of the sterilization time, the pressure is released and the steam generator emptied.<br>Pressure and temperature fall. |  |
| 6. | **Drying phase**<br>After pressure release the drying phase begins.<br>At this point it is possible to stop the program without this leading to a fault being reported, since the sterilization itself is now completed. However, with the exception of the "Quick Program", the drying phase should be allowed to run to completion. |  |
| 7. | **Ventilation**<br>After the drying, the chamber is ventilated, with pressure equalisation. |  |
| 8. | **Program end**<br>After ventilation of the chamber the program is completed.<br>If a printer is attached and print-out "yes" is selected, the record will be printed-out immediately.<br><br>After the door has automatically unlocked the door can be opened to remove the sterilized objects. |  |


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## 4.7 Print-out record

The print-out record contains the following information:




## 4.8 Removing the sterilized items

**Be careful** when removing the sterilized items! Touching the metal surfaces can lead to burns. Always use the appropriate aids to lift the trays or wear suitable hand protection.

## 4.9 Sterile storage

After removing wrapped sterile items, the wrapping should be checked for any signs of damage. If it is defective (e.g. split seals) then the sterilization of the items must be repeated after the items have been re-wrapped.

It is important for sterile storage that the items have been properly dried. The Vacuklav®24-B/L provides very good drying if the program has not been interrupted before its completion and the autoclave has been properly loaded (see Section 4.2). Directly after sterilization there may still be residual condensation on the items or the container. Because the items are hot on removal, this will usually evaporate quickly. The German industrial standard DIN 58953 Part 7 Section 7 contains the following comment about residual moisture on paper wrapping or transparent sterilization paper after sterilization: "...small amounts of water on the wrapping are unproblematic, provided they have evaporated within 30 minutes after removal from the steam steriliser....."


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After cooling, wrapped sterilized objects should be stored in a place where they are **protected from dust** (e.g. instrument cupboard). Given proper storage, DIN 58953 Part 7 gives the following guidelines for the maximum storage periods for sterilized objects: in basic wrapping (e.g. transparent sterilization foil) up to 6 weeks; in double-wrapping up to 6 months.

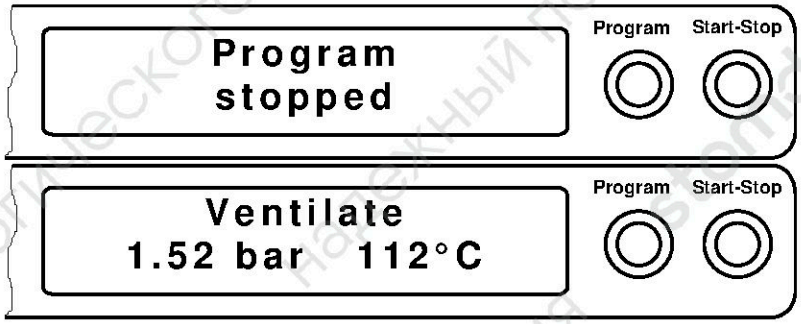
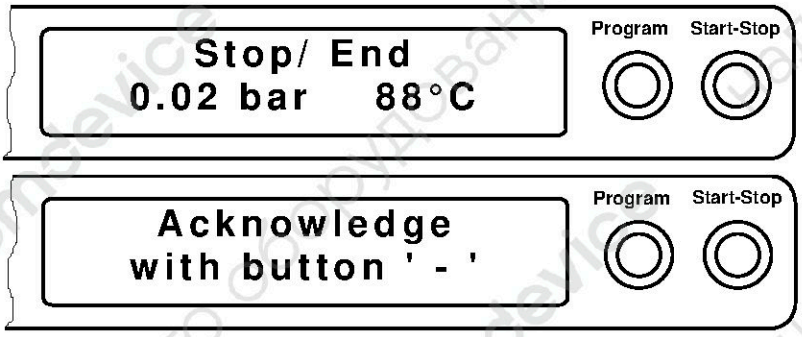
## 4.10 Sterilization frequency / pauses

After completing or terminating the drying phase, the autoclave can be reloaded and started immediately. No pauses in operation are necessary.

## 4.11 Manual termination of program

### 4.11.1 Termination of sterilization/ disinfection

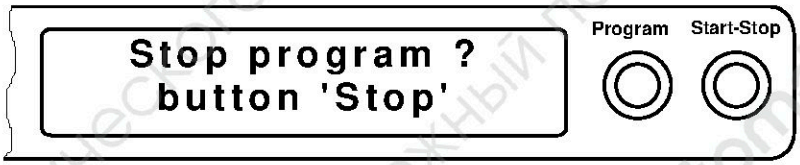
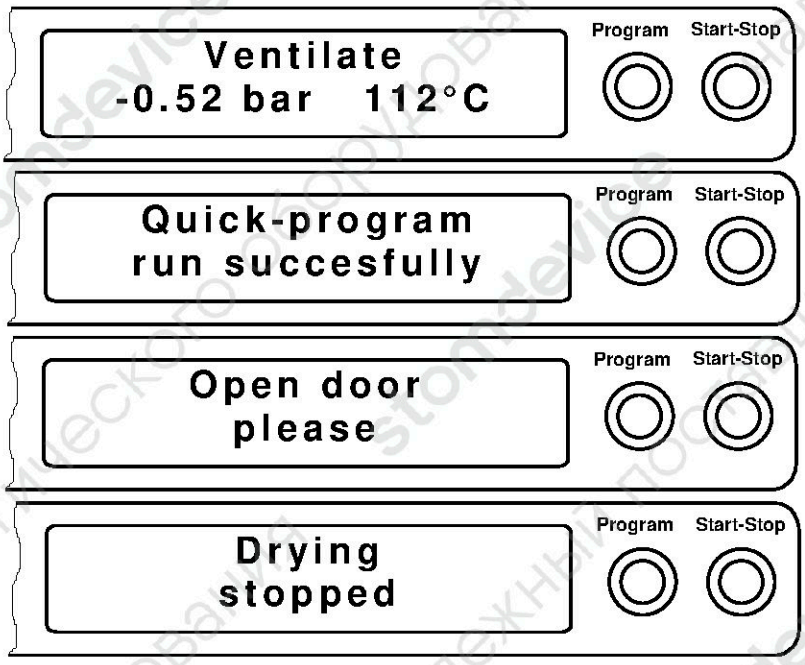
A program can be terminated at any time by pressing the "Start-Stop" button. If the program has not yet reached the drying phase then the items will be **non-sterile** (or for some programs **non-disinfected**) **!**
**Warning!** Steam may escape when the autoclave door is opened.
If the sterilization phase of the program had not been completed, then it is advisable to carry out an empty sterilization run before reusing the autoclave.

| Operation | | Display message |
|---|---|---|
| 1. | Press the "Start-Stop" button<br>To confirm, press the "Start-Stop" once again within 5 seconds.<br><br>If no confirmation is given then the program resumes normally. |  |
| 2. | If confirmation is given then the program stops.<br><br>The pressure inside the autoclave will then be equalised, either by pressure release, or by<br><br>ventilation (if vacuum inside). |  |
| 3. | After pressure equalisation, the display will alternately show the messages "Terminated" and an offer to quit the program termination. |  |
| 4. | To undo the program termination, press the " - " button.<br>- Otherwise,<br>After the message "Please wait, Door unlocking", the display for the selected program reappears. |  |


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### 4.11.2 Terminate drying

A program can also be terminated during the drying phase, Since in this case the sterilization (or disinfection) has been completed, the items in this case can be treated as sterilized or disinfected respectively.
However, depending on the stage at which the drying program is interrupted, the load may not have dried sufficiently, and wrapped items in particular may not be dry enough for sterile storage. We therefore recommend that you do not interrupt the drying process for wrapped items in the "Universal Program" and "Gentle Program".
With the "Quick Program" it may be desirable to interrupt the drying program so that items can be used again. The unwrapped items will dry as they are cooling down.
**Warning!** If the drying process is interrupted than steam may be released when the door of the autoclave is opened.

| Operation | | Display message |
|---|---|---|
| 1. | The autoclave is in the drying phase. The display shows the drying time<br><br>alternately with<br><br>the option to terminate the drying phase |  |
| 2. | Press the "Start-Stop" button<br>To confirm, press the "Start-Stop" once again within 5 secs.<br><br>If no confirmation is given then the program resumes normally. |  |
| 3. | If the "Start-Stop" button has been pressed again to confirm then the program terminates. |  |
| 4. | This is followed by ventilation of the autoclave chamber.<br><br>After the ventilation of the chamber the display shows that the program has been successfully completed:<br><br>alternately with:<br><br>If a printer is connected and an immediate report has been selected, this is printed-out, together with confirmation that the drying process has been terminated. |  |


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### 4.12 Reaction to warnings / error messages

The Vacuklav®24-B/L has a number of safety features and an extensive integrated control and monitoring system, in order to ensure the greatest possible level of safety for the sterilization process, and to eliminate risks for the patients and operators.
Various aspects of the operation of the appliance, such as pressure and temperature sensors are automatically checked when the autoclave is switched on.
The power supply, and the quantity and quality of the feed water and cooling water are checked before a program can start.
A successful program start is followed in the next stages by the monitoring of all parameters of relevance for the sterilization. If any limit values for the individual program phases are exceeded then there is a malfunction report and the program is automatically interrupted.
In addition to messages, warnings or malfunction reports on the display, if a printer is connected then a print-out will provide details of the type of malfunction and when it occurred.
If any such warning message occurs then you should consult Section 7, which provides detailed advice and possible operational errors.

### 4.13 Operational pauses

In general, the door should only be leant to during operational pauses in order to reduce wear on the door seal and to avoid premature failure or sticking.
In the event of longer breaks, such as during vacations, the cooling water supply should be turned off (and the feed water supply from the water purifier if one is connected). We recommend that you do not disconnect the power supply. You should however set the automatic preheating option to "No" (see Section 6.5). In this way, the vacuum pump will automatically turn over for a short period at midnight every day, which ensures that the pump will run smoothly even after longer periods of inoperation. The display panel has to be in the starting position. The door can also be open.

## 5 Closing down / Transport / Reinstallation

When closing down and transporting the autoclave you should proceed as follows:

- Switch of the power.
- Disconnect from the mains, allow the autoclave to cool down.
- Turn off cooling water and feed water supplies.
- Disconnect pipes at rear of autoclave.
- If transporting the autoclave with trays and tray rack assemblies in place, then protect the inside surface of the door by including a sheet of foam or similar material.
- **Warning! To avoid damage use the original packaging when transporting the autoclave.**
  **If the appliance may be exposed to frost in transit then follow the relevant service instructions!**
- When setting the appliance up for reuse after transport or repairs then proceed in accordance with Sections 2 and 3.


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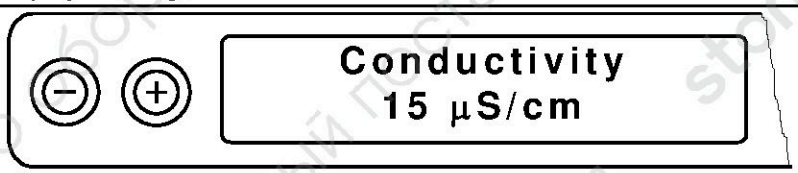
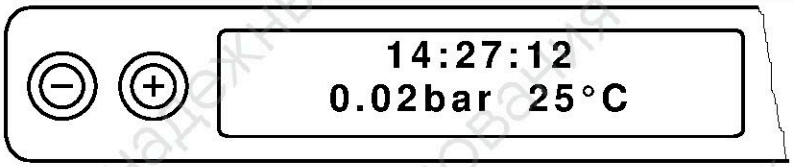
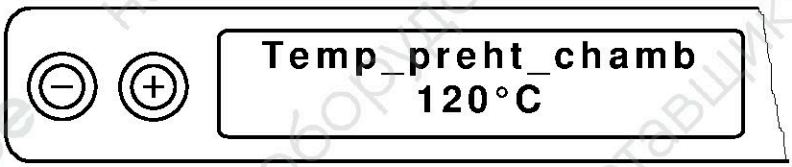
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# 6 Special functions

## 6.1 Water quality (conductivity)/ Chamber temperature

By repeatedly pressing the "-" button then the preheating temperature of the chamber and the conductivity of the purified feed water used for steam generation can be displayed alternately.

| Operation | Display message |
|---|---|
| 1. Press down the "-" button to display the conductivity of the feed water µS/cm |  |
| Release the "-" button to return to the basic display (as shown here) or the program status |  |
| Press the "-" button repeatedly and hold down:<br>Display shows the pre-heating temperature of the chamber. |  |

## 6.2 Selecting extra drying

The standard drying times for the various programs provide adequate drying if the autoclave has been loaded correctly (see Section 4.2). Nevertheless, with certain loads residual moisture may remain. By selecting the "Extra drying" function, the drying time can be extended by 50%:

| Operation | Display message |
|---|---|
| At the start of the program, press the "+" button. The display shows a message confirming the extra drying, and then the program runs as described in Section 4.6, but with 50 % longer drying time. |  |

## 6.3 Records / Load documentation

In order to document the progress of the sterilization / disinfection program, then the processor memory stores records of the last 40 programs.
These records can be downloaded at a later stage via the serial interface (RS232).
When the memory is full (40 program runs) then before the start of the next run the oldest record will automatically be overwritten. If an external printer is connected (and operable) and the option "Immed. print-out? No" has been selected, then confirmation will be requested before the oldest record is overwritten (see Section 7.3).
Hardware details and the nature of the print-out documentation is provided in the following sub-sections.

### 6.3.1 Record print-out

#### 6.3.1.1 External printer

##### 6.3.1.1.1 Connecting the external Mela*print*®42 printer

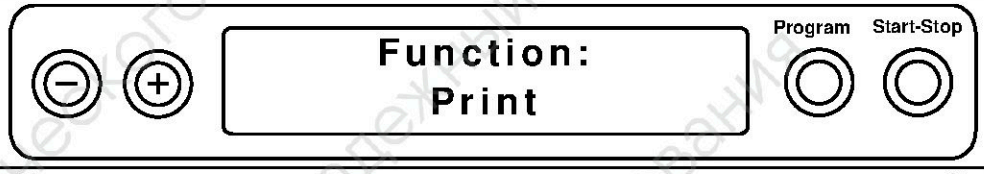
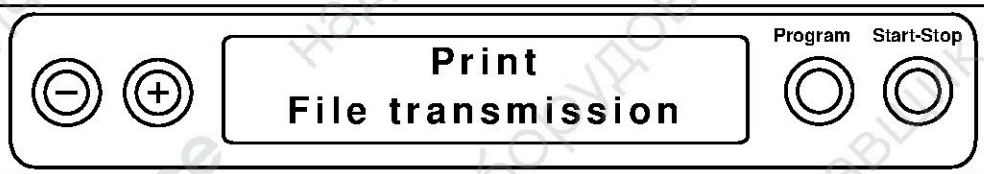
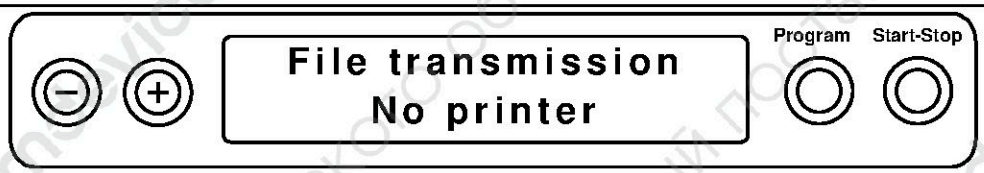
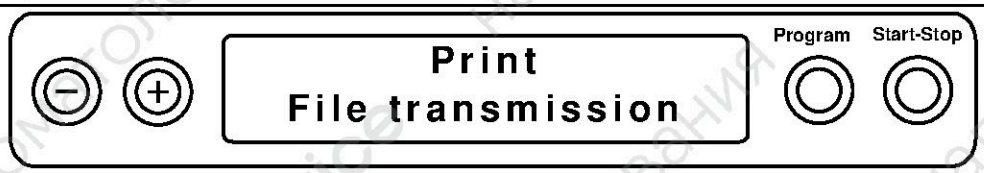
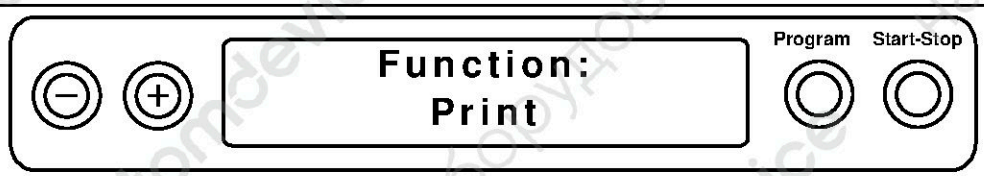
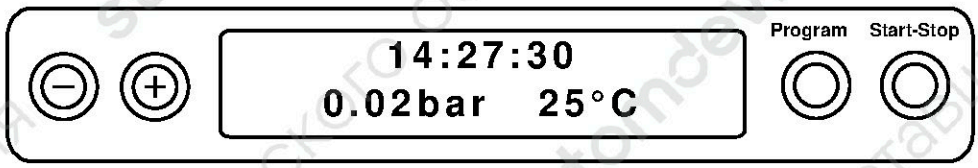
In order to connect a printer to the autoclave then a printer cable should be connected between the 9-pole socket on the front of the autoclave (see page: 4, Fig. 1, Pos. 8) s and the 25-pole on the back of the printer (ensuring a good connection and tightening the locking screws).
The power supply to the printer is provided by the power unit supplied with the printer, which connects to the socket on the rear of the printer.
The printer is ready for operation when the voltage lamp "P" shines and the status display (On line/Off line) "SEL". The operating manual of the printer includes further details, including the assembly of an external paper feed, inserting paper, and the general operation of the printer.



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#### 6.3.1.1.2 Initialising the printer

After connecting the printer to the autoclave it must be registered with the autoclave processing unit (initialised). Proceed as follows:

| Operation | | Display message |
|---|---|---|
| 1. | Switch on autoclave<br>Display shows time, pressure and temperature |  |
| 2. | Hold down "+" button and also press "-" button.<br>Select "Function" menu, sub-menu "Print" |  |
| 3. | Press "Program" button,<br>Select "Print" menu sub-menu "File transmission" |  |
| 4. | Press "Program" button,<br>Select "File transmission"<br>Display shows current status e.g. "No printer" |  |
| 5. | Press "+" (or "-") button until display shows "External printer" |  |
| 6. | Press "Program" button,<br>Confirm the setting, return to "Print" menu |  |
| 7. | Press "Start-Stop" button,<br>return to the "Function" menu |  |
| 8. | Press "Start-Stop" button,<br>Quit the "Function" menu and return to the initial display |  |



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#### 6.3.1.2 Connection to an external PC

##### 6.3.1.2.1 Installation

Records and archives can also be kept by using an external PC. This requires a suitable connection between the serial port of the PC and the printer port of the autoclave.
For data transfer and data processing you must first install the program MELA*win*® on the PC.

##### 6.3.1.2.2 Downloading to a PC

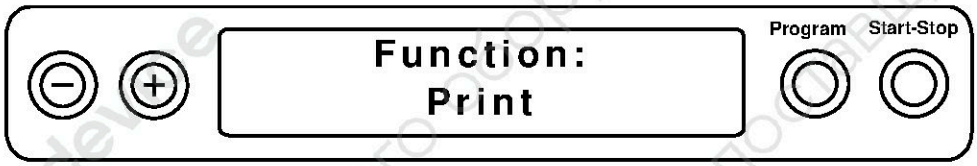
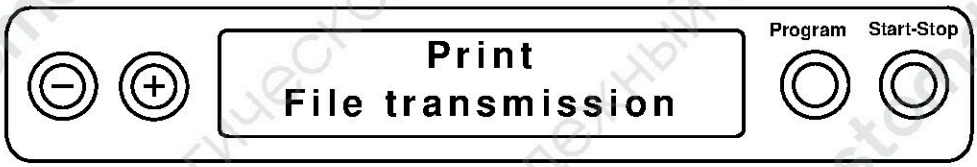
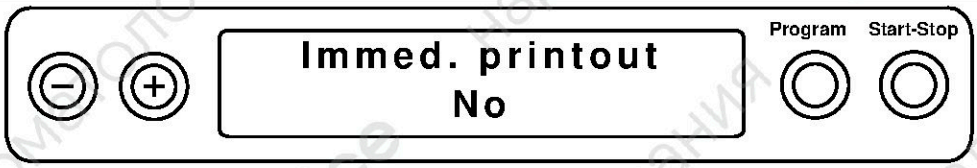
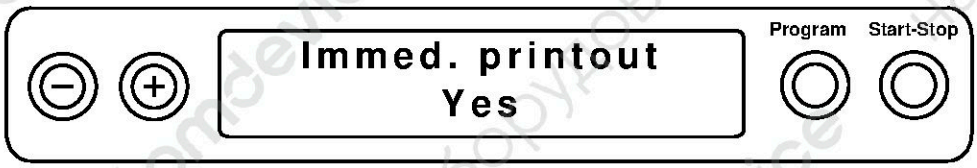
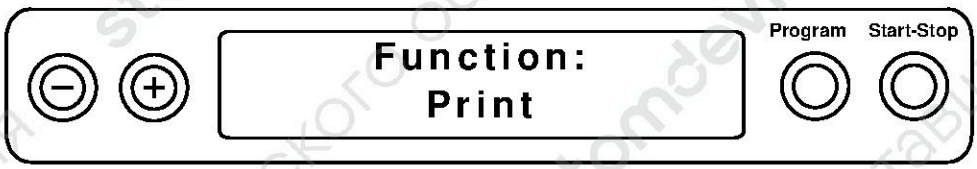
After connecting the autoclave to a PC the print-out option for "External PC" must be selected. Proceed as for an external printer (see Section 6.3.1.1.2), , but under Point 5 use the "+" or "-" button to select the "External PC" option.

#### 6.3.1.3 No printer

In order to select the option "No printer", proceed as described as in Section 6.3.1.1.2. Under Point 5, however, use the "+" or "-" button to reach the setting "No printer".

### 6.3.2 Immed. print-out? Yes/No

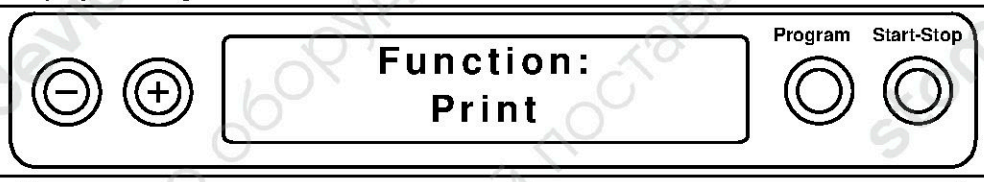
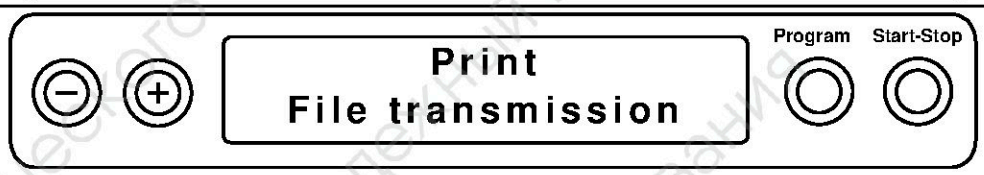
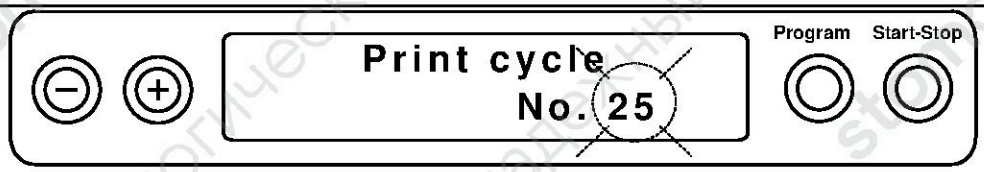
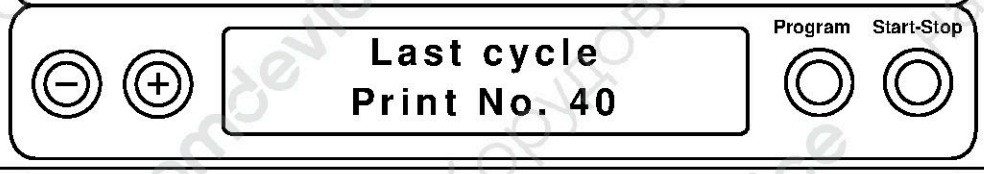
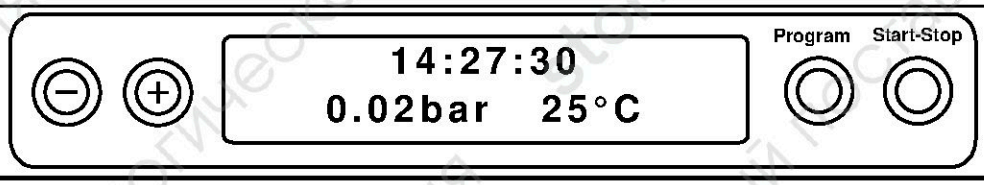
When an external printer is fully installed, a print-out can be produced automatically at the end of each program run by selecting the following options after switching on the autoclave:

| Operation | | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" button.<br>Select "Function" menu, sub-menu "Print" |  |
| 2. | Press "Program" button,<br>Select "Print" menu sub-menu "File transmission" |  |
| 3. | Press "+" button, select sub-menu "Immed. print-out?" Display shows current option, here e.g. "No" |  |
| 4. | The button "Program" can be used to switch between "Yes" and "No" Press "Program" button,<br>Select "Yes" option |  |
| 5. | Press "Start-Stop" button,<br>Confirm the setting and return to "Function" menu, sub-menu "Print" |  |
| 6. | Press "Start-Stop" button,<br>Quit the "Function" menu and return to the initial display |  |


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### 6.3.3 Printing out stored records

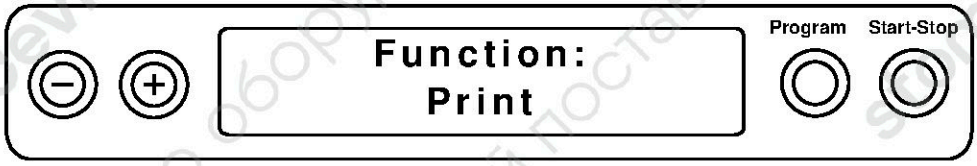
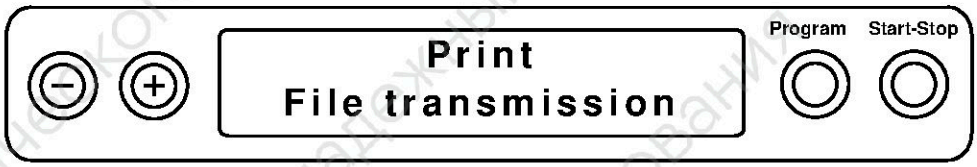
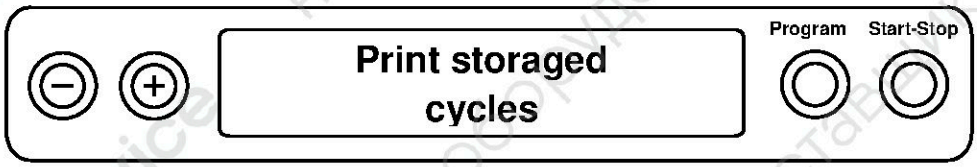
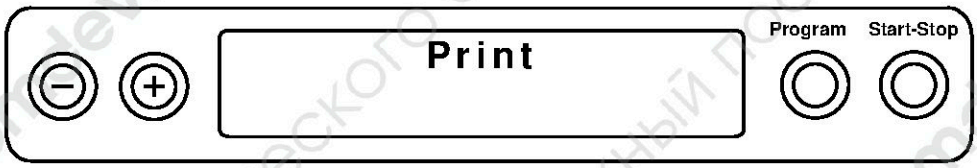
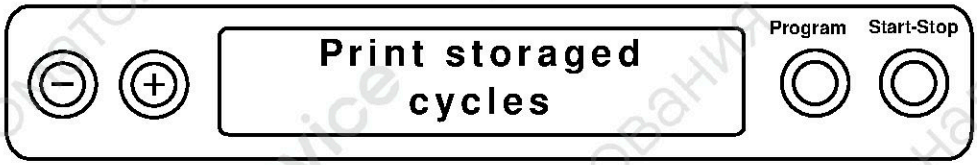
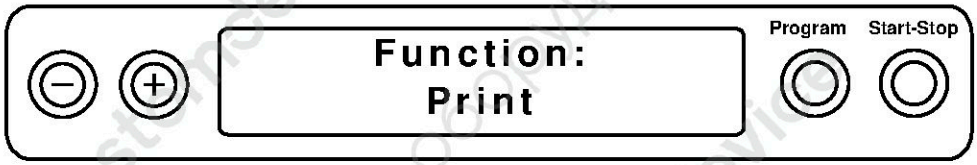
When an external printer is fully installed, a print-out of selected records from the memory can be produced by selecting the following options after switching on the autoclave:

| | Operation | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" button.<br>Select "Function" menu, submenu "Print" |  |
| 2. | Press "Program" button,<br>Select "Print" menu, submenu "File transmission" |  |
| 3. | Press "+" (or "-" ) until the submenu "Print last cycle" appears on the display |  |
| 4. | Press "Program" button, the cycle record number flashes |  |
| 5. | To select another number, press the "-" or "+" button until the right number is reached, e.g. here No. 25 |  |
| 6. | Press "Program" button to start the print-out of the selected record, (or to terminate press "Start-Stop" and return to the "Function" menu) |  |
| 7. | If you wish to print further records then return to Point 4, or... |  |
| 8. | ... to terminate press "Start-Stop" and return to the "Function" menu |  |
| 9. | Press the "Start-Stop" button to return to the initial display |  |


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### 6.3.4 Print all stored cycle records

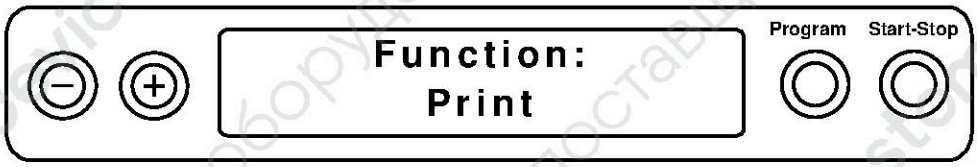
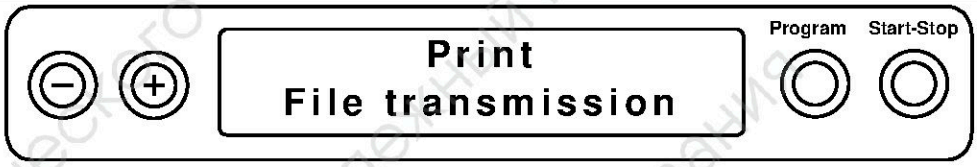
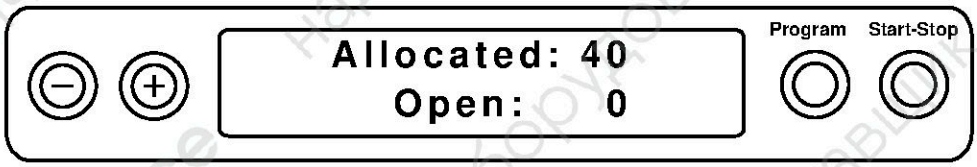
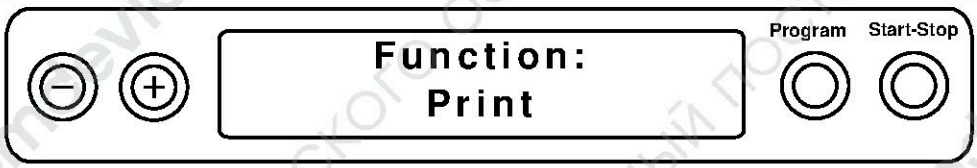
In order to print-out all stored cycle records (with a fully installed external printer) then select the following options after switching on the autoclave:

| Operation | | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" button.<br>Select "Function" menu, submenu "Print" |  |
| 2. | Press "Program" button,<br>Select "Print" menu, submenu "File transmission" |  |
| 3. | Press "+" (or "-" ) until the submenu "Print all cycles" appears on the display |  |
| 4. | Press "Program" button to start the print-out of all the stored records (up to 40!),<br>or to terminate press "Start-Stop" and return to the "Function" menu (Once printing has started termination is only possibly by switching off the power!) |  |
| 5. | When the print-out is complete, the display again shows the submenu: |  |
| 6. | Press the "Start-Stop" button to return to the "Function" menu |  |
| 7. | and then press "Start-Stop" again to return to the initial display |  |


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### 6.3.5 Display printer memory

With a fully installed external printer, the status of the printer memory can be displayed as follows:

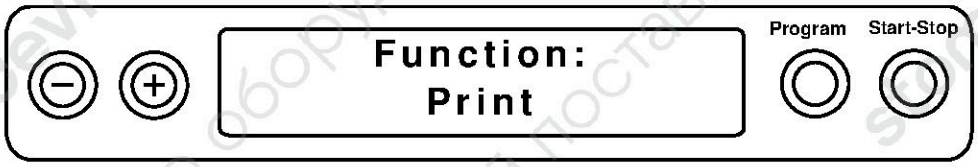
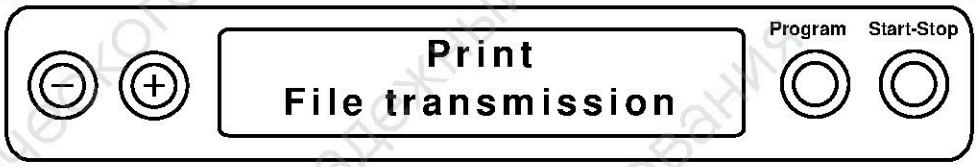
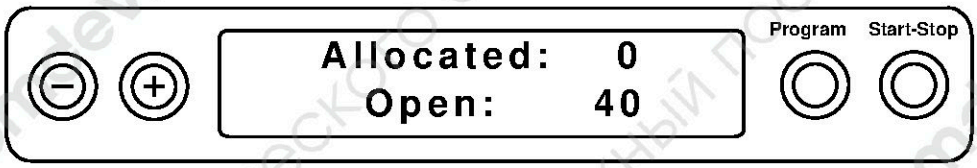
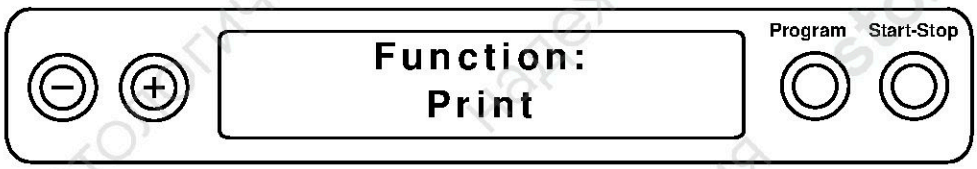
| Operation | | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" button.<br>Select "Function" menu, submenu "Print |  |
| 2. | Press "Program" button, Select "Print" menu, submenu "File transmission" |  |
| 3. | Press "+" (or "-" ) button until the display shows the memory status, e.g.: |  |
| 4. | Press the "Start-Stop" to return to the "Function" menu |  |
| 5. | and press "Start-Stop" again to return to the starting display |  |



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### 6.3.6 Deleting cycle records

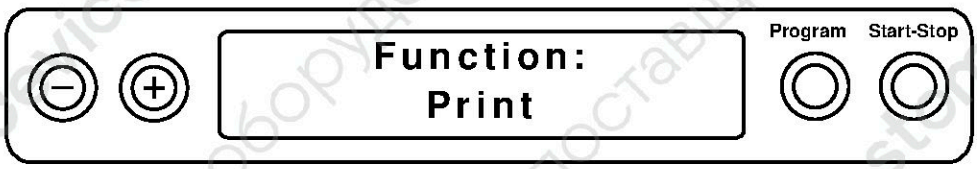
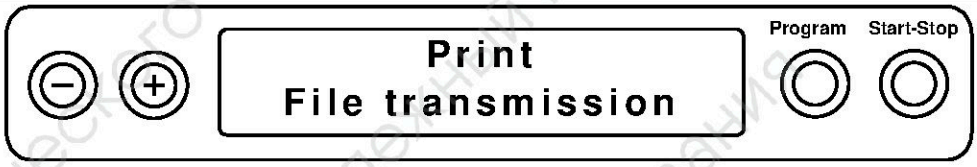
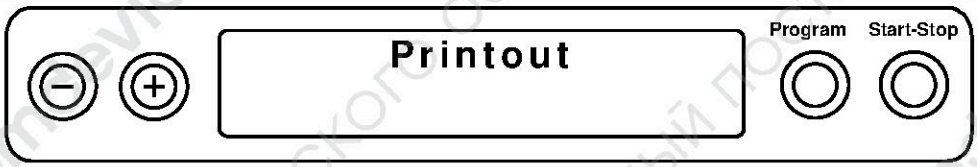
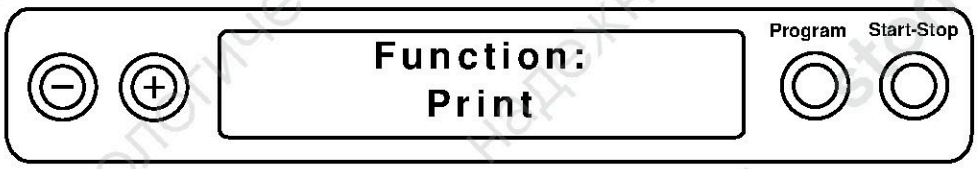
In order to delete cycle records (e.g. in the event of the warning message "Printer memory full", with the option "Immed. print-out? No", selected (see Section 7.3), then after switching on the appliance proceed as follows:

| Operation | | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" button.<br>Select "Function" menu, submenu "Print" |  |
| 2. | Press "Program" button, Select "Print" menu, submenu "File transmission" |  |
| 3. | Press "+" (or "-" ) until the display shows "Delete all cycles" |  |
| 4. | Press the "Program" button to delete all records<br>(or press "Start-Stop" to terminate) |  |
| 5. | Then press "Start-Stop" to return to "Function" menu |  |
| 6. | and press "Start-Stop" again to return to the starting point |  |


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### 6.3.7 Test print-out

In order to check the printer and its connection to the autoclave, a test print-out can be made as follows:

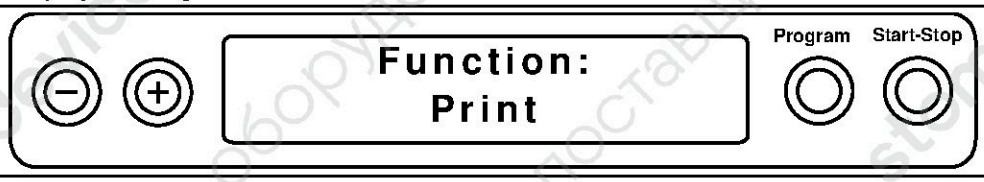
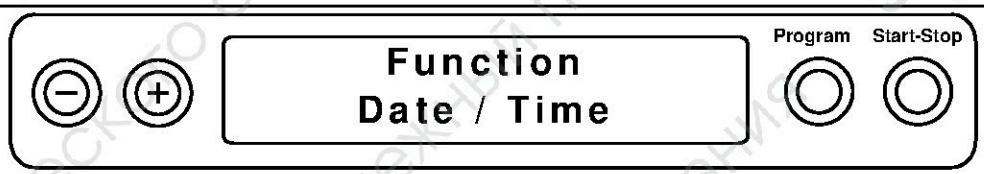
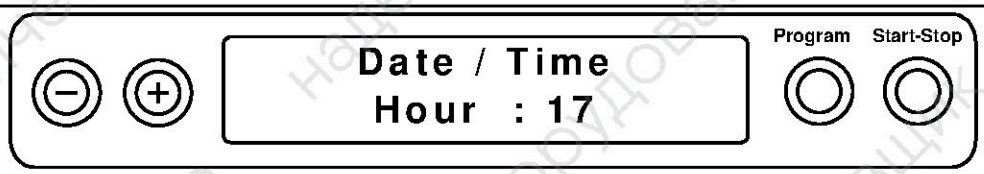
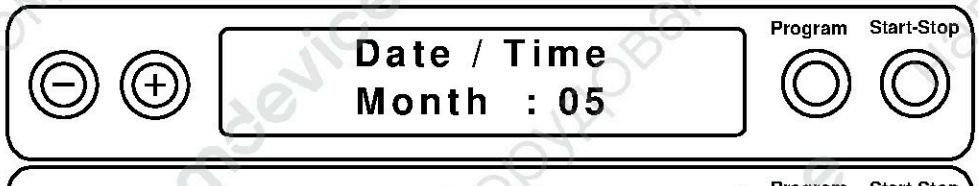
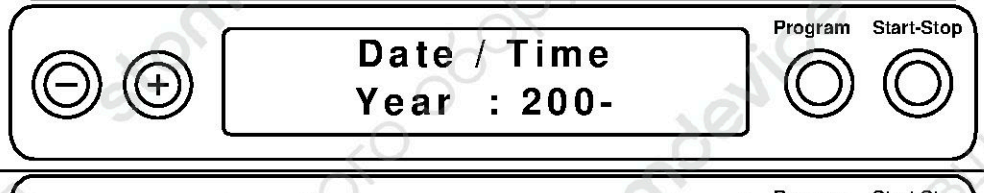
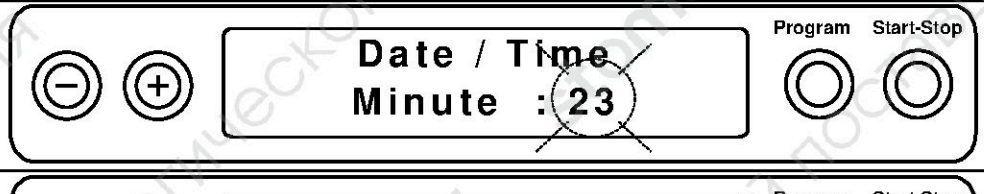
| | Operation | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" , Select "Function" menu, submenu "Print" |  |
| 2. | Press "Program" button, Select "Print" menu, submenu "File transmission" |  |
| 3. | Press "+" (or "-" ) until the display shows "Test print-out" |  |
| 4. | Then press the "Program" button for a test print-out (or press "Start-Stop" to terminate) |  |
| 5. | Then press "Start-Stop" to return to the "Function" menu |  |
| 6. | and press "Start-Stop" again to return to the starting position |  |



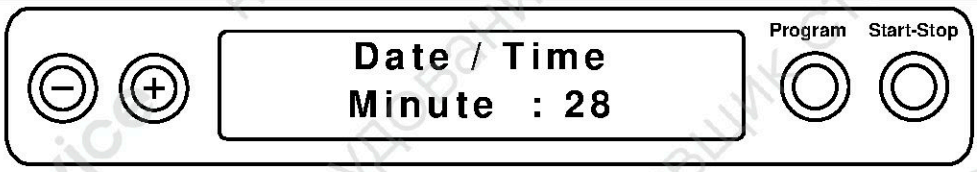
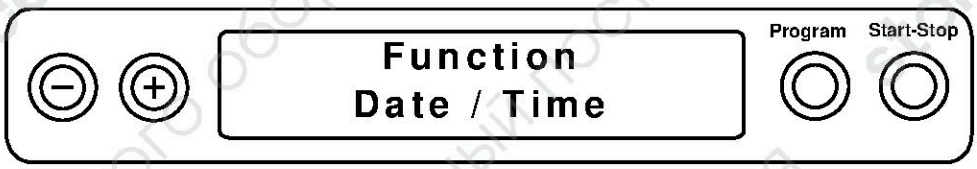
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## 6.4 Resetting date and time

The date and time can be reset if necessary (e.g. winter time/summer time) as follows:

| Operation | | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" button. Select "Function" menu, submenu "Print" |   |
| 2. | Press "+" (or "-"), until the display shows the submenu "Date/Time". |   |
| 3. | Press "Program", the display shows the current hour (24-hour clock) (here for example 17.00) |   |
| 4. | by pressing the "+" (or "-") button the following options can be selected: |           |
| 5. | After finding the required option, e.g. "Minute", press the "Program" button and the current value flashes |   |
| 6. | Press "+" or "-" to increase or reduce the value: |   |


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| Operation | | Display message |
|---|---|---|
| 7. | Press "Program" to confirm the new value, which then stops flashing<br>If more adjustment are necessary, return to Point 4 and begin again, |  |
| 8. | ...or press "Start-Stop" to return to the "Function" menu, and |  |
| 9. | Press "Start-Stop" again to return to the starting point |  |

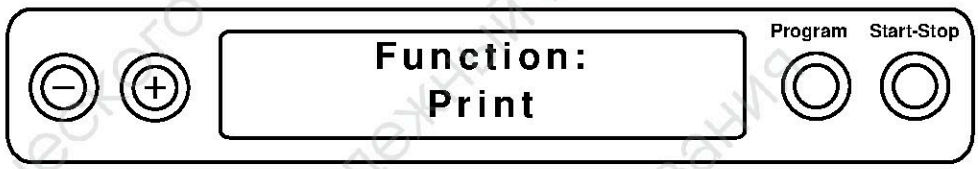
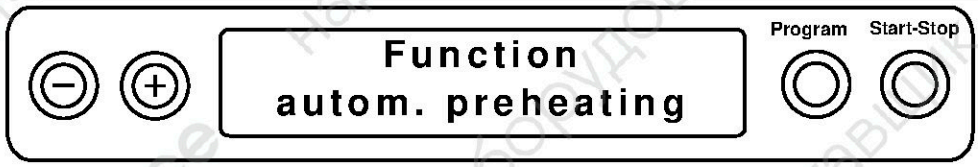
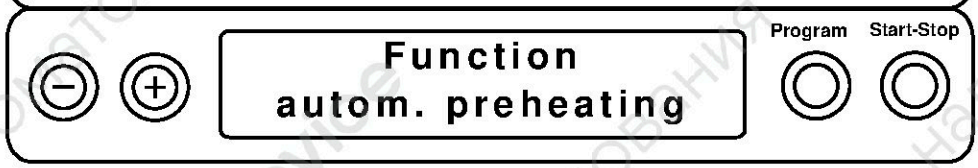

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## 6.5 Automatic preheating

The Vacuklav®24-B/L has a preheating function by means of which the autoclave chamber can be heated to the necessary temperature before a program starts, or can be maintained at this temperature between cycles. This reduces not only shortens the time for each cycle but also reduces condensation on the walls of the chamber which helps to provide very good drying performance.
If the automatic preheating is activated, then this begins as soon as the power is switched on.
In the default setting on delivery the automatic preheating is on.
The current setting for the automatic preheating can be changed as follows:

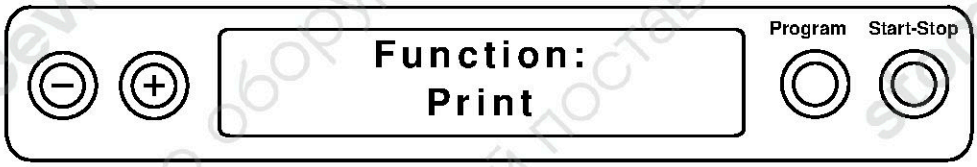
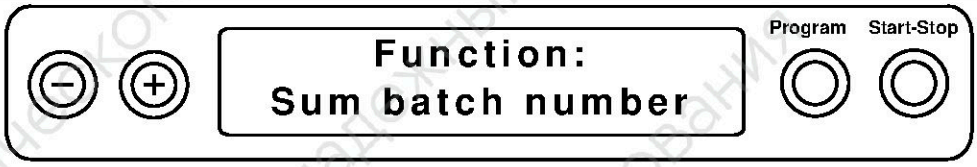
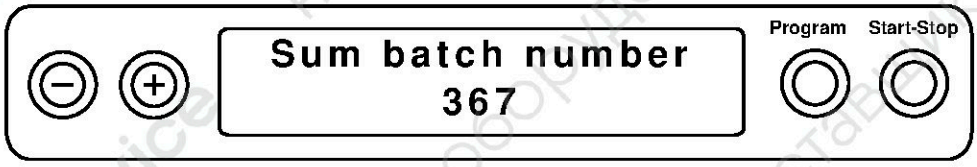
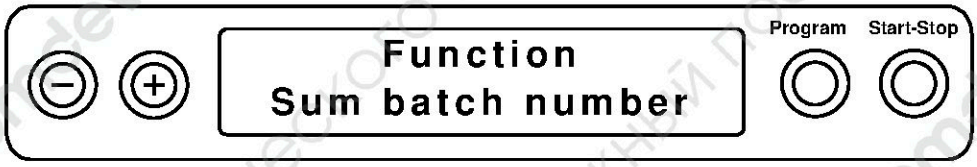
| Operation | | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-" button. Select "Function" menu, sub-menu "Print" |  |
| 2. | Press "+" (or "-") until the display shows the submenu "autom. preheating". |  |
| 3. | Press "Program", and the display shows the current option, here "Preheating Yes" |  |
| 4. | Pressing the "Program" button now alternates between the options "Preheating Yes/No", here e.g. "No" |  |
| 5. | When the desired option has been selected press "Start-Stop" and return to the "Function" menu, then |  |
| 6. | Press "Start-Stop" again to return to the starting point |  |



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## 6.6 Total load count

The Vacuklav®24-B/L keeps a running count of the total number of loads sterilized, and this be displayed as follows:

| Operation | | Display message |
|---|---|---|
| 1. | Hold down "+" button and also press "-", Select "Function" menu, submenu "Print" |   |
| 2. | Press "+" (or "-") until the display shows the submenu "Load count". |   |
| 3. | Press "Program", the display shows the current total load count, e.g.: |   |
| 4. | Close by pressing "Start-Stop", and return to the "Function" menu, then |   |
| 5. | Press "Start-Stop" again to return to the starting point |   |

## 6.7 Program modifications

The standard programs are designed to meet most practical operational needs (subatmospheric pulsing, heating, sterilization, pressure release, drying, and ventilation) and to display the parameters of most interest (pressure, temperature, time).
The operator is responsible for ensuring that the autoclave is not overloaded, and that the load is arranged properly to ensure good drying.
There are two standard options "Automatic preheating" and "Additional drying".
Any further program modification to suit specific individual requirements should only be carried out by authorised personnel, after consultation with your dealer or with the experts at MELAG.


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# 7 Operational errors / Malfunctions

## 7.1 What to do if the autoclave malfunctions

If the autoclave does not seem to be working properly (e.g. poor drying, warnings, or error reports) then follow these instructions in order to exclude possible operational errors.
Following these instructions continue to work with the autoclave. If the malfunction occurs repeatedly then contact our dealer, and authorised MELAG customer service or contact MELAG directly. You should describe the problem precisely and include the works number of your appliance.

## 7.2 Malfunctions without display messages

### 7.2.1 No display

After switching on the autoclave, the display should show the initial setting (see Section: 4.1.2).
**If there is no display: Check:**

1. Is the cable plugged into the mains?
2. Is the mains supply O.K.? (if necessary check with another appliance).
3. Exchange the two power fuses (page 4, Fig. 1, Pos.9) under the switch as follows: Disconnect the power cable and remove the screw cap over the fuses using a screwdriver or a coin. Exchange the fuses (two reserve fuses are on the inside of the door lining) then replace the screw cap and reconnect the autoclave to the power supply. If there is still no display when the autoclave is switched on, or if the display blacks out repeatedly, please inform your specialist dealer. If you exchange the fuses, order two new spare fuses through your dealer (MELAG-Art. No. 57590).

### 7.2.2 Excessive water consumption

The consumption of distilled or demineralised water will vary depending on the program and the load in the autoclave. If much more water is consumed than the amount specified in the Annex (see Section 9.2), then you should:

1. Check that the autoclave has been set up correctly, and is higher at the front, so that condensate can flow out at the back (see Section 0).
2. Check that the condensate outflow is not blocked by dropped, instruments, filter paper, etc. on the floor of the pressure chamber.
3. If neither of these measures help to reduce water consumption, please inform your specialist dealer.

### 7.2.3 Poor drying

Good drying depends only on the correct operation of the autoclave, but also on the way the autoclave is loaded. If drying is not satisfactory:

1. Check that the autoclave has been set up correctly, and is higher at the front, so that condensate can flow out at the back.
2. Check that the condensate outflow is not blocked by dropped, instruments, filter paper, etc. on the floor of the pressure chamber.
3. Check that the maximum load has not been exceeded (particularly for textiles), that the autoclave has been loaded properly (no direct contact with the walls of the pressure chamber), and that the appropriate tray-rack assembly has been used (see Section: 4.2).
4. Activate automatic pre-heating (see Section: 6.5).
5. Start with "Additional heating" (see Section: 6.2).
6. If none of these measures help to reduce water consumption, please inform your specialist dealer.



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## 7.3 Warning messages

For the following warning messages, please observe the comments made and restart the program in question. If the warning occurs repeatedly please consult your specialist dealer.

| Warning message | Cause / Remedy |
|---|---|
| **WARNING!**<br>**Doorp open**<br>**No start possible**<br>**Acknowledge with button „-“** | Door not closed properly:<br>• Press grip down until contact is made (display should then show "Door closed")! |
| **WARNING!**<br>**No water**<br>**Check Tap water**<br>**Acknowledge with button „-“**<br>**Stop/ End 0.02 bar 35°C** | Cooling water switch not opened:<br>• Check water inlet, open water tap<br>• Check pressure of mains water supply pressure (if too low it may be necessary to install a pressure booster)<br>• Check if the motor protection switch has tripped (Fig. 1, No. 11) (no sound from vacuum pump). Press button of protection switch back down. |
| **WARNING!**<br>**No feed water**<br>**Check supply aqua dest/dem**<br>**No start possible**<br>**Acknowledge with button „-“** | Flow monitor for the supply of distilled or demineralised water has not closed (when filling the steam generator):<br>• If you have a water storage container:<br>  • Check the water level in the container. If necessary refill with purified water.<br>  • Check that the intake tube reaches to the bottom of the storage container; clean the intake filter<br>  • Check that the intake tube is free from twists or kinks<br>  • Check that the height difference between autoclave and water level is not too great (max. 1.5 metres)<br>• If you have a MELA*dem*® 47 water purifier:<br>  • Check the water purification system. If necessary open the water intake tap. If the pressure water storage unit is empty wait approximately 1 hour before restarting the program. If the message reappears repeatedly, have the water purifier serviced.<br>If the autoclave is being used for the first time or is being restarted after a break then this message may simply be caused by the fact that the tubes were initially empty - just repeat the start procedure. |



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| Warning message | Cause / Remedy |
|---|---|
| **Water quality bad**<br>**Replace cartridge/ module** | Conductivity of the demineralised or distilled water is above the first limit value, a start is possible by pressing the "Start" button once more:<br>• If water is from a storage container, then empty the container, clean it thoroughly with distilled or demineralised water, and refill with water which meets the purity specifications.<br>• If water is from a MELA*dem*®47 water demineraliser: The demineralisation cartridge in the ion exchanger may be exhausted. Exchange in accordance with the operating manual.<br>• If water is from a MELA*dem*®40: The demineralisation unit may be exhausted. Exchange in accordance with the operating manual.<br>• Water from other purification equipment: Exchange the demineralisation / deionisation unit in accordance with the manufacturer's instructions.<br>After taking the appropriate steps, carry out the program start. When starting for the first time after exchanging the purified water container, or after maintenance of the water purification equipment, there may be another report because at first the supply tube and /or measuring cell will not have been washed out with fresh, pure water. |
| **Water quality insufficient**<br>**No start possible**<br>**Acknowledge with button „-“** | Conductivity of the demineralised or distilled water exceeds the second limit value - a program start is no longer possible:<br>• Proceed as above for "Water quality poor". |
| **WARNING!**<br>**Replace sterile filter**<br>**Acknowledge with button „-“** | The pressure for the ventilation drying lies outside the permitted range. The report comes at the end of the program, and as the last line of the print-out:<br>• The sterile filter may be clogged or torn. Exchange the sterile filter (MELAG Art. No.: 20160). |



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| Warning message | Cause / Remedy |
|---|---|
| **Printer is Not ready** | Communication with the printer via the serial interface has been interrupted. This message appears when a report cannot be printed out. It is displayed for 20 seconds. If the printer becomes operational during this period the cycle record prints out:<br>• The autoclave may be operated without a printer. Check under the "Data transfer" menu that the option "No printer" has been selected. (see Section:6.3.1.3)<br>• Check the cable connection between the printer and the autoclave.<br>• Check the power supply to the printer. In the MELA*print*® 42 the red light should indicate 'power on'<br>• The printer may be "Offline". Select "online" (MELA*print*® 42, press "SEL" button, green LED "SEL" should shine) |
| **Printer memory full** | The internal printer memory is full (40 cycles recorded), an external printer is registered, and in the "Print" menu the option "Immed. print-out? No" is selected. The message is displayed when a program is started. Pressing the "Start / Stop" button again deleted the message and the program starts:<br>• You can continue operations simply by pressing the "Start / Stop" button twice when you start a program.<br>• Select "Immed. print-out? Yes" (see Section : 6.3.1.3)<br>• Delete stored records (See Section 6.3.6), if necessary print-out all stored cycle records first (see Section 6.3.4)<br>In the Data transfer menu, select the "No printer" option (see Section 6.3.1.3) |
| **Execute service please** | The service message is activated after a certain number of loads or a set operating period, when a service is due. The message appears before the start of every program. If you press the "Start / Stop" button again the message is deleted and the program starts.<br>• You can continue operations, by simply pressing the "Start / Stop" button twice when you start a program.<br>• Have a service carried out as recommended by an authorised MELAG servicing company or your specialist dealer.<br>The cycle counter for servicing should be reset during the service. |
| **Test failed Leak rate: 3.2** | The leak rate during the vacuum test exceeds the limit value:<br>• Check and if necessary clean the door seal and the rim of the chamber<br>• Repeat the vacuum test with a completely cold autoclave<br>If no other error reports occur during operation, you can continue to use the autoclave until the regular service, when the cause of the leak will be identified. |


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## 7.4 Error reports

Errors are generally reported by a "Error" on the display with the number of the error and its short name.
Error reports may occur without a program start (when the power is switched on or soon after), or during a program.
If errors are reported during a program, then in addition to the error report the program will also be stopped. This may be accompanied by the equalisation of the pressure in the autoclave, and in this case the error message will alternate with the messages "Pressure release", or "Ventilation", and "End".
After the termination, the display will alternately show the error message and "Quit with "-" button" and then "Terminate End". Pressing "-" deleted the error message (if the error is not permanent). Until you have quit the error message the autoclave door cannot be opened. If a program has been prematurely terminated in this way the autoclave load must always be regarded as being **not sterilized** (or **not disinfected**). We recommend that you unload the autoclave, carry out a sterilization cycle without any load (the drying may be impaired for this first cycle) and then reload the autoclave and repeat the interrupted operation cycle.
If an external printer is connected and "Immed. print-out? Yes" is selected, a record will automatically be printed out at the end of the termination.
The print-out shows the full name of the error, and if a program has been interrupted before completion it will also show "Load not sterile". The following list gives error reports, the cause and possible remedies.

| Warning message | Cause / Remedy |
|---|---|
| **Error 1: Vacuum system** | The monitoring time for reaching the evacuation pressure for the individual pressure cycles, pressure release, or for reaching the minimum drying pressure has been exceeded:<br>• Check that the door seal and the lip of the opening to the pressure chamber are intact and clean.<br>• Check that the autoclave is standing properly (see Section: 0)<br>• Check that the outflow of condensate is not obstructed by fallen instruments, pieces of filter paper, etc. on the floor of the pressure chamber.<br>• Check for leaks using the "Vacuum test" program.<br>If this occurs repeatedly, inform your specialist dealer. |
| **Error 2: Steam generator** | The monitoring time for a heating phase or for reaching the sterilization pressure has been exceeded:<br>• maximum load exceeded<br>• voltage of mains power supply is too low; check mains supply; try autoclave on different power circuit.<br>If this occurs repeatedly, inform your specialist dealer. |
| **Error 4: Pressure release** | The monitoring time for pressure release was exceeded:<br>• Check that the cooling water outflow allows steady drainage, without kinks (see Section: 2.5)<br>If this occurs repeatedly, inform your specialist dealer. |
| **Error 6: Ventilation** | The monitoring time for the ventilation of the pressure chamber was exceeded.<br>• The sterile filter is clogged, there will have been an earlier warning message (see Section: 7.3)<br>• Exchange filter. |
| **Error 8: Timebase** | Maximum difference between the program duration and the internal clock exceeded:<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 9: Doo open** | Door not closed properly<br>• Press grip down until contact is made (display should then show "Door closed")!<br>If this occurs repeatedly, inform your specialist dealer. |


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| Warning message | Cause / Remedy |
|---|---|
| **Error 10: Overh steam gener.** | The capillary tube level regulator is open at the start of the program (error report immediately after start), or the monitoring time until refilling with demineralised or distilled water during the program (until the end of sterilization) is exceeded:<br>• This problem can arise because after stopping a program and immediately restarting - wait for two minutes and try starting again.<br>If this occurs repeatedly, inform your specialist dealer. |
| **Error 12 Door locking** | Maximum permissible time for door locking:<br>• Check the locking bolt can move freely<br>If this occurs repeatedly, inform your specialist dealer. |
| **Error 13: No cooling water** | The cooling water pressure switch has closed during the program (see message **"Warning no cooling water"** - page 31). |
| **Error 14: Water supply** | The flow monitor for the demineralised / distilled water supply does not close during the program (see message "Warning no feed water" - page 32). |
| **Error 18: Sensor defective:** | The internal testing of the sensors for temperature, pressure or conductivity showed an excessive deviation, the error can be reported on switching on the appliance or in the course of a program:<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 21: Pre-heating** | The pre-heating has not reached the necessary temperature within the specified time limit:<br>• If this occurs repeatedly select the option "Automatic preheating No" and inform your specialist dealer. (see Section 6.5) |
| **Error 22: Preheating too hot** | The maximum preheating temperature was exceeded:<br>• If this occurs repeatedly start the autoclave without preheating and inform your specialist dealer. |
| **Error 26: A/D-Converting** | The limit deviation for internal analog/digital signal conversion has been exceeded:<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 27: Temp.Sens.def 1,2** | The limit deviation between the two sensors for the steam temperature has been exceeded:<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 29: Battery-RAM** | There is a data inconsistency or a data loss in the processing unit memory. This can be the result of a major disturbance to the mains electricity supply or an insufficient battery voltage. On quitting, the clock will automatically reset to 00.00 and the load count will reset to the value from the EEPROM. At the same time all records in the memory will be deleted:<br>• After quitting the error report: Reset time and date (see Section 6.4) and restart.<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 31: System leak** | During the Vacuum test program the pressure was too high (very large leak):<br>• Repeat the vacuum test, and if there is another error report inform your specialist dealer. |


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| Warning message | Cause / Remedy |
|---|---|
| **Error 32: Power failure**<br><br>**Sterile filter sterilize** | After starting the program there was a loss of power. The error report is received when the electricity supply is restored:<br>• Check the mains power supply installation, if no errors can be found, inform the service agent.<br><br>If there is a loss of power when the chamber is under pressure, then there will be an additional reminder to sterilise the sterile filter, since this may have become moist and non-sterile:<br>• Remove the sterile filter at the rear of the autoclave.<br>• Sterilise the filter using the rapid program.<br>• Then replace the filter. |
| **Error 33: Pressure drop** | The time limit for the steam generator to reach the necessary pressure has been exceeded:<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 34: Sterilization TU** | The minimum sterilization temperature has not been reached:<br>• Reduce the size of the load.<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 35: Sterilization TO** | The maximum sterilization temperature has been exceeded:<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 36: Sterilization PU** | Sterilization pressure falls below the minimum level:<br>• Reduce the size of the load.<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 37: Sterilization PO** | The maximum sterilization pressure has been exceeded:<br>• If this occurs repeatedly, inform your specialist dealer. |
| **Error 38: Sterilization TD** | The difference between measured and theoretical temperature is too large:<br>• If this occurs repeatedly, inform your specialist dealer. |

# 8 Taking care of your autoclave

## 8.1 Preparation of instruments

**MELAG - non-rusting materials**

All parts of the Vacuklav®24-B/L which come into contact with steam are made of non-rusting material. The autoclave chamber and its door are made of stainless steel, pipes carrying steam are made of Teflon, and threaded fittings and magnet valves are made of brass.

**Drag-in rust**

The use of non-rusting materials excludes the formation of rust as a result of the components of the autoclave. Where rust forms on the autoclave or the items to be sterilized, investigations have repeatedly shown that this rust has been brought in from other sources. It should be borne in mind that rust can form even on best quality stainless steel instruments, for example as a result of improper treatment with chemical cleaning agents or disinfectant during preparation for sterilization.

**Preparations of items for sterilization**

The example of drag-in rust shows how important it is to prepare items properly for sterilization, and particularly the following points:

Handpieces and angles should be cleaned before the sterilization in accordance with the manufacturers' instructions and maintained (e.g. oiled).



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The remaining instruments should be disinfected and cleaned immediately after use in accordance with UVV/VBG 103 with a disinfectant and/or cleaning solution. The solutions should be used in the correct concentration and care should be taken to observe the immersion times precisely!
It is advisable to make use of appropriate cleaning aids such as ultrasound cleaning units, cleaning and maintenance equipment for handpieces and contra-angles, or thermo-disinfecting systems.
Cleaning the instruments before sterilization is very important in order to avoid introducing contamination which can separate from the instruments under steam pressure during sterilization and block filters, jets and valves of the autoclave. In particular, locks, joints and hinges should be thoroughly cleaned with a brush. Cleaning and disinfecting agents should be washed off the instruments thoroughly in running water, again with a brush. Residues of cleaning and disinfectant chemicals must not find their way into the autoclave, since they can lead to corrosion! Swill finally with demineralised water and then dry the instruments.
Turbines and transfer instruments should be oiled in accordance with manufacturer's instructions in order to ensure a long life for these components.

**Brand-new instruments**

The cleaning procedures described above are also necessary for brand-new instruments, since these often carry very small amounts of oil, fat and soiling from the manufacturing process.
**Note:** The instructions of the instrument manufacturers concerning first-time sterilization and re-sterilization should be followed carefully.

## 8.2 Rust formation = Drag-in rust

As already explained, the non-rusting materials used in the autoclave cannot cause rust formation in the autoclave!
Where rust forms this is "drag-in rust". This originates from instruments or other metal items carrying traces of rust, even though they are made of stainless steel, or which are made of normal steel but which have a damaged galvanic coating. Often, a single rusty instrument is enough to pass rust on to other instruments or to lead to film rust forming in the autoclave resulting to corrosion damage. Drag-in rust must be removed from the affected instruments or from the autoclave and tray assembly using a mild commercial cleaning agent for stainless steel. Do not use steel wool, a wire brush or other abrasive cleaners! Spots can be removed with a damp, lint-free cloth or a cloth with surgical spirits or alcohol.

## 8.3 Taking care of the Vacuklav®24-B/L

### 8.3.1 Cleaning

The tray assembly and the autoclave chamber including the contact area of the door gasket and the door opening should be inspected thoroughly at least once a week for signs of damage or soiling. If necessary, wipe out the autoclave chamber using a **lint-free cloth** and surgical spirits. This involves withdrawing the trays and tray guide assembly. Stubborn spots can be removed using small amounts of a mild commercial steel cleaning agent (pH-levels from 5 to 8). Care must be taken to ensure that cleaning agent does not get into the pipes attached to the autoclave chamber. The cleaning agent must not contain chlorine and should not be alkaline. Do not use abrasive cleaning pads, steel wool, or brushes.
Inspect the door seal every week for signs of damage and soiling, and if necessary clean it with a mild commercial liquid cleaning agent (pH-levels from 5 to 8) or with surgical spirits. If necessary, the seal can be removed.
The bolt of the door lock (right side) and the door hinge (left side) must be regularly lubricated with silicone grease, in order to ensure that the door can easily be locked and unlocked, without unnecessary wear.
The outer parts of the autoclave can be cleaned with a mild commercial cleaning agent or with surgical spirits.
If the feed water is not provided directly but is stored in a container then this should be inspected every time it is refilled to make sure it is clean. If necessary it should be cleaned before refilling.
If you have a MELAG storage container then please note the instruction on the label.

### 8.3.2 Use of demineralised or distilled water

**Quality requirements**

For steam sterilization it is necessary to use high quality distilled or demineralised water.
The water used should at least comply with the specifications in accordance with CEN-standard EN 285 listed in the table below.
For the operation of the Vacuklav®24-B/L, however, **battery water in accordance with VDE 510** is sufficient, as long as the VDE specifications are strictly adhered to (conductivity on production ≤ 10 µS/cm*), when used ≤ 30 µS/cm*), pH-value identical with EN 285, evaporation residues analogous).

**Where to purchase the water**

Battery water in accordance VDE 510 is widely available in large drug stores, supermarkets and do-it-yourself stores at low prices. The necessary purity standards must be expressly detailed on the label, because with insufficiently pure water calcium scaling could form in the steam lines and valves, restricting the operation of the autoclave. Aggressive water (pH < 5 or > 7) can also lead to damage in the autoclave.


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**Formation of spots on instruments**
The extent to which spots form on the instruments depends on the quality of the water used to produce the steam.

Specifications for water quality in accordance with standard EN 285:

| | |
|---|---|
| Evaporation residue | ≤ 10 mg/l |
| Silicon oxide, $SiO_2$ | ≤ 1 mg/l |
| Iron | ≤ 0.2 mg/l |
| Cadmium | ≤ 0.005 mg/l |
| Lead | ≤ 0.05 mg/l |
| Other heavy metals | ≤ 0.1 mg/l |
| Chlorides (Cl) | ≤ 2 mg/l |
| Phosphates ($P_2O_5$) | ≤ 0.5 mg/l |
| Conductivity at 20°C | ≤ 15 µS/cm * |
| pH (degree of acidity) | 5 ... 7 |
| Appearance | Colourless; clean; without sediment |
| Hardness (Σ of ions of alkaline earth) | ≤ 0.02 mmol/l |

* µS/cm = micro-Siemens per centimetre

## 8.4 Checking the operation of the autoclave

### 8.4.1 Safety with automatic monitoring

The electonic parameter control means that all relevant parameters are constantly monitored a compared with standard process data, so that error reports can be made immediately. If a program is completed without problems then on its completion there is an "End" message. The print-out contains a corresponding report.
The operator of the autoclave can check the progress of the program at any time by means of the values shown on the display (or after its completion by means of the print-out).

### 8.4.2 Periodical bacteriological testing (twice a year)

The German industrial standard DIN 58 946 Part 8 Section 3.2 recommends:
"Periodical testing shall be carried out at the place of installation, e.g. at 6 monthly intervals. They shall demonstrate that sterilization is carried out satisfactorily when the operating instruction for the small steriliser are followed."
Hygiene institutes and regional medical test centreas can supply test spores on request and document the results of sterilization on a test form.

### 8.4.3 Maintenance recommendations

Regular maintenance of the autoclave is important if it is to have a long life and remain in good working order. MELAG recommends that the Vacuklav®24-B/L be serviced annually by a trained technician in accordance with maintenance instructions for this autoclave. The annual service includes a visual inspection and a test of operational functions. As well as all essential components and electrical elements, parts are also inspected for wear and replaced as necessary.
A maintenance reminder appears on the ddisplay every two years or after 1000 sterilizations.

Consult your dealer of the MELAG Customer Service if you have any questions relating to servicing and maintenance.


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# 9 Annex

## 9.1 Installation options

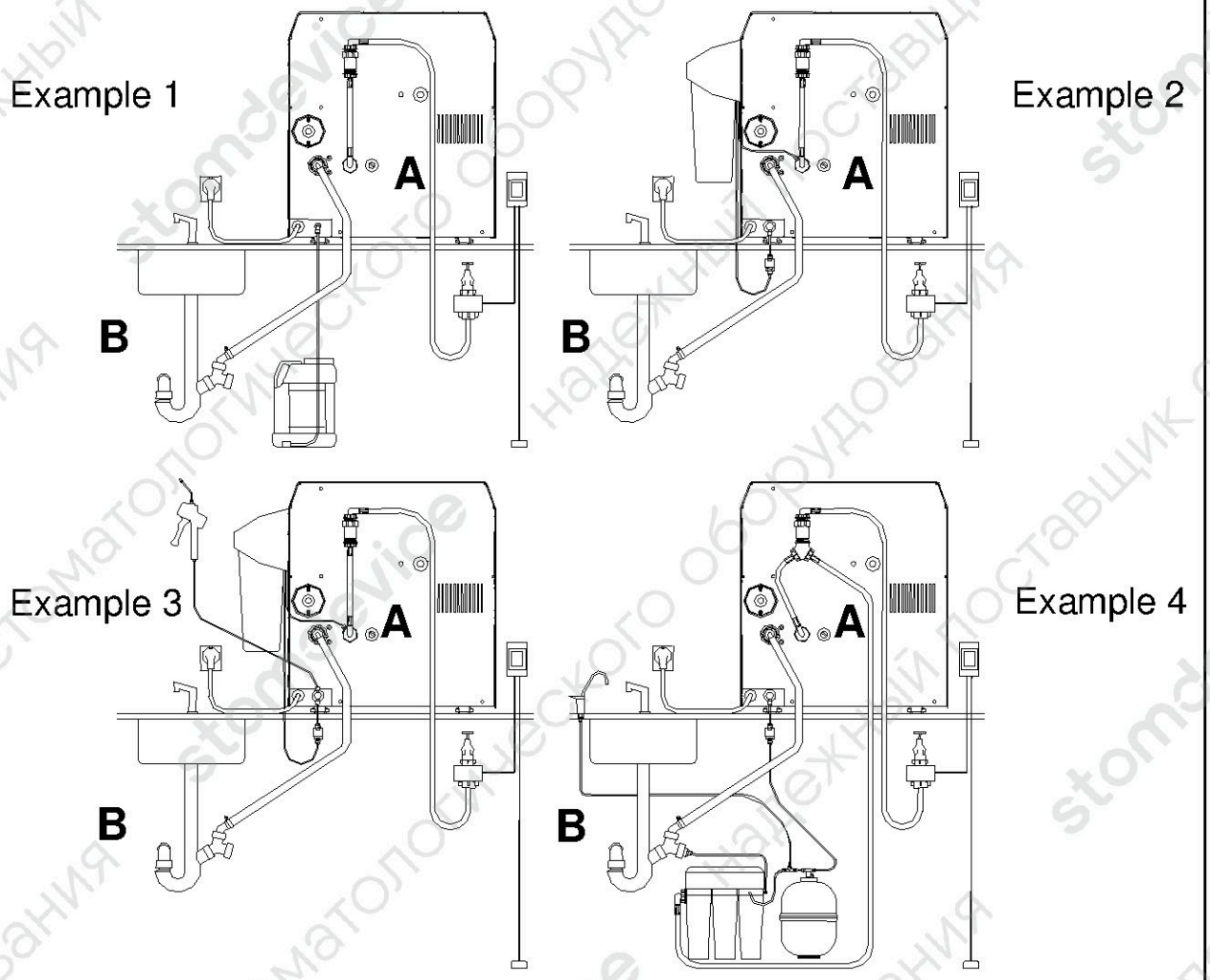



Fig. 4 Installation options for the Vacuklav®24-B/L (A) with double-chamber trap (B)[*1)]
*1) Alternatively, two separate outflow traps can be installed

**Example 1**
Vacuklav®24-B/L (rear view)
Double-chamber trap
Leak detector with stop valve (optional)
Vorratsbehälter aqua dem / aqua dest

**Example 2**
Vacuklav®24-B/L (rear view)
Double-chamber trap
Leak detector with stop valve (optional)
MELA*dem*®40 (optional)

**Example 3**
Vacuklav®24-B/L (rear view)
Double-chamber trap
Leak detector with stop valve (optional)
MELA*dem*®40 (optional)
MELA*jet*® (optional)

**Example 4**
Vacuklav®24-B/L (rear view)
Double-chamber trap
Leak detector with stop valve (optional)
MELA*dem*®47 (optional)


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## 9.2 Additional technical data

### 9.2.1 Capacity/Weight

| | |
|---|---|
| **Weight** (unloaded) | 51 kg |
| **Chamber volume** | 28.8 litre |
| **Maximum load** | 7 kg instruments or |
| | 2.5 kg textiles |
| **Loading options:** | Mount "B" with max. 4 standard tray-cassettes or<br>4 MELAG-trays<br>Mount "C" with max. 3 standard tray-cassettes or<br>6 MELAG-trays<br>MELAG- Sterilization containers: 28M,G, 23R,M,G 15K,M,G,<br>17 K,M,G,R Foil holder |

### 9.2.2 External supplies

| | |
|---|---|
| **Elektric power supply** | |
| Mains supply | 230 V AC, 10.9 A, 50...60 Hz |
| Rating | 2500 W; 16 A fuses, circuit breaker 30 mA |
| **Cooling water** | |
| Mains supply | Stop-tap with non-return valve and Rohrbelüfter, 3/4" |
| Connection | 3/4" pressure pipe |
| Cooling water pressure | Running pressure at 2.4 litre/ min > 1.2 bar |
| **Feed water** | Distilled or demineralised water in accordance VDE 0510 |

### 9.2.3 Operational parameters

#### 9.2.3.1 Programs/ Operation times

| Program | Operation time (without drying): | | Drying time: |
|---|---|---|---|
| | Warm start/ small load | Cold start/ max. load | |
| "Quick Program" (134°C, 2bar) | 15 min | 26 min | 10 min |
| "Universal program" (134°C, 2bar) | 26 min | 48 min | 15 min |
| "Gentle program" (121°C, 1bar) | 37 min | 56 min | 20 min |
| "Prion Program" (134°C, 2bar) | 43 min | 65 min | 15 min |

#### 9.2.3.2 Energy/ Water consumption

| | |
|---|---|
| **Electrical energy consumption** | |
| "Pre-heating" | |
| Warming up to pre-heating temperature (134°C) | ca. 0.15 kWh (= x € [1)]) |
| "Stand by" mode / hour | ca. 0.2 kWh (= x € [1)]) |
| Program + drying | 0.4 kWh (= x € [1)]) for "Quick program", warm start, low load to<br>1.3 kWh (= x € [1)]) for "Gentle program", cold start, full load ) |
| **Cooling water consumption** | 2.5 litre (= y € [2)]) for "Quick program" without drying to<br>28 litre (= y € [2)]) for "Gentle program" with drying |
| **Feed water consumption** | 400 ml (= 4 cent [3)])for "Quick program"),<br>500 ml (= 5 cent [3)]) for "Universal program" or “Prion-program”<br>600 ml (= 6 cent [3)]) for "Gentle program" |

1) x = energy consumption in kWh x price for one kWh in €/kWh
2) y = water consumption in l x price for 1 m³ water in €/m³ / 1000 (1 m³ = 1000 l)
3) Based on a price of € 0.10 per litre distilled water from the MELA*dest*®65

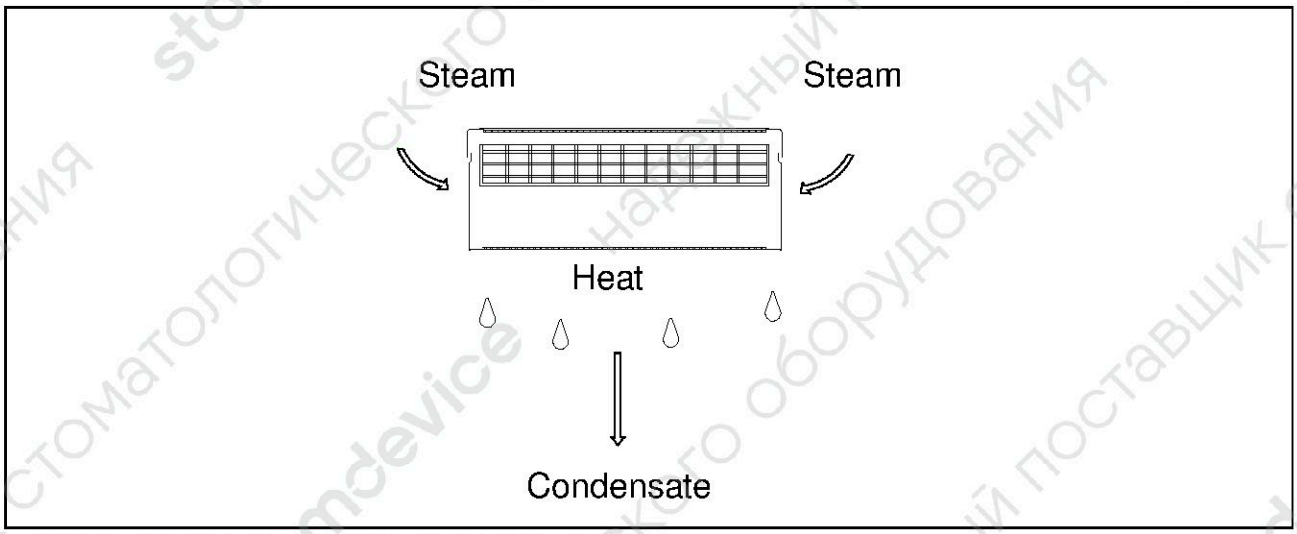

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## 9.3 Instructions on drying

The Vacuklav®24-B/L provides very good drying standards for sterilized items. Particularly difficult drying tasks (e.g. double wrapping) can also be dried to very good standards with the help of the supplementary drying function and the automatic pre-heating. Please read the following sections, which may help you to optimise your drying results.

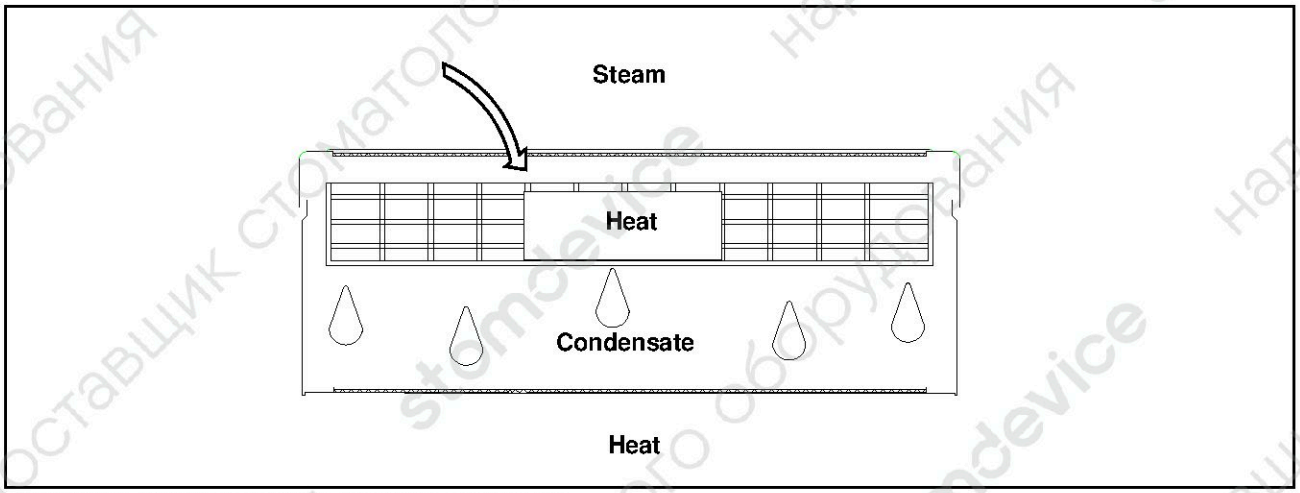
### 9.3.1 Drying in sterilization containers

In the autoclave steam is produced by heating water. The steam transfers heat to the instruments and sterilization container and warms these. This leads to steam condensing on the instruments and containers.




Formation of condensation on the sterilization container

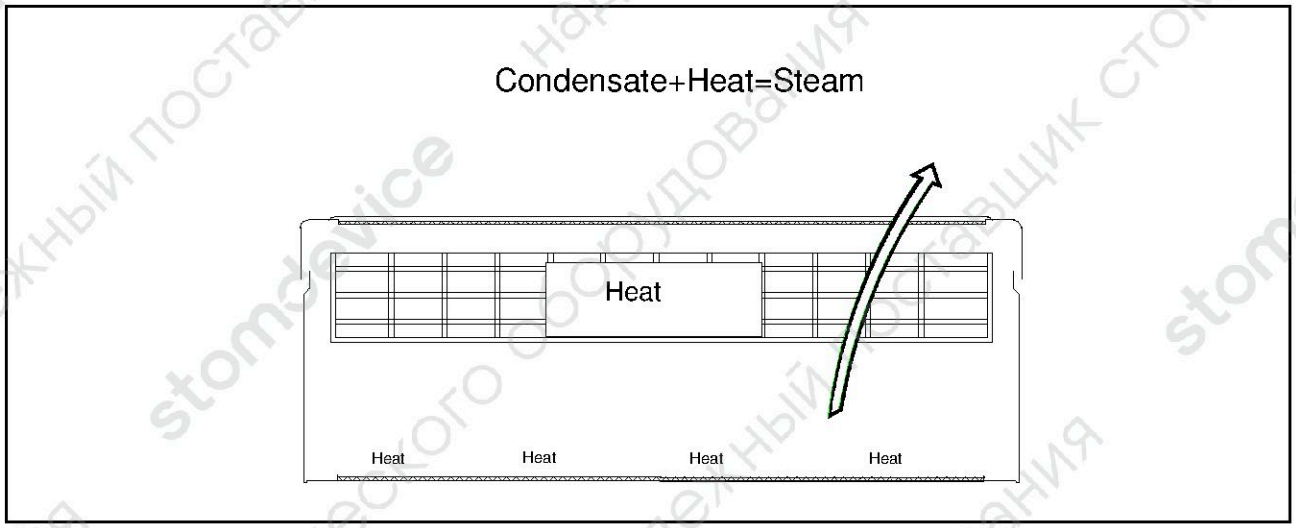
The steam also heats the objects contained in the sterilization containers. Condensate forms on the objects being sterilized, and some of the condensate drops to the bottom of the sterilization container.




Formation of condensation on sterilized objects

After sterilization, during the drying phase, all the condensation must evaporate from the sterilization container and from the sterilized items themselves. This is achieved by the transfer to the condensate of heat stored in the walls of the sterilization container and in the sterilized items themselves. It is preferable that the sterilization container be made of aluminium, as this metal stores and conducts heat well, ensuring faster drying than other materials.


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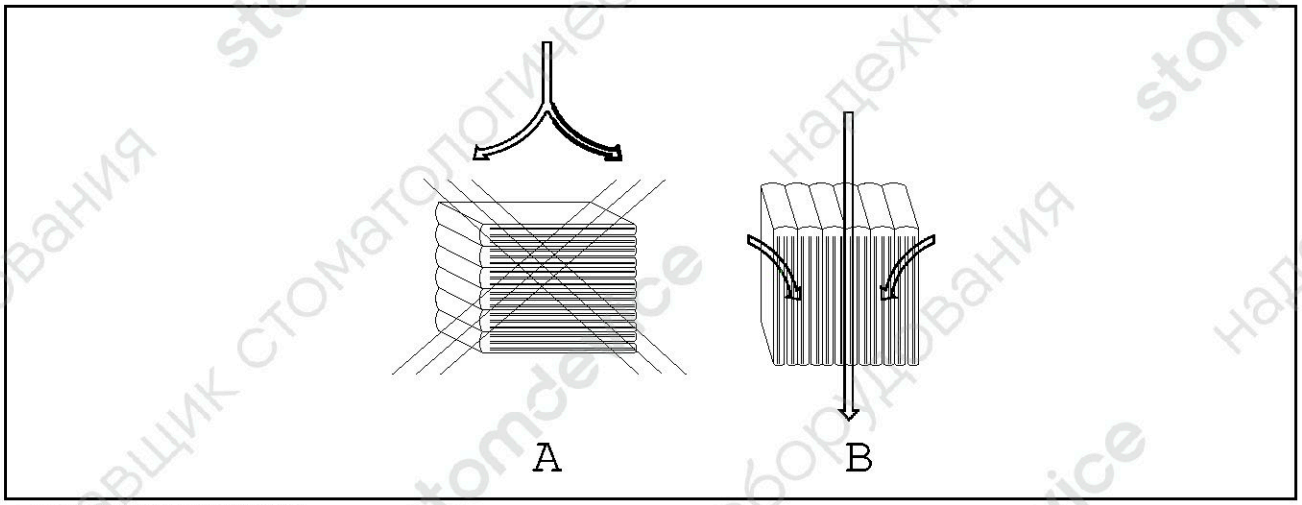



Drying

For good drying it is essential that surplus heat be transferred to the objects which have been sterilized. In addition, the condensate must be led out of the sterilization containers. The floors of the containers have channels and the lid has an arched filter area.

### 9.3.2 Textiles

When preparing textiles for treatment in the autoclave, care must be taken that the folds in the textiles are arranged in parallel, and that the items are packed side-by-side. This vertical configuration ensures that channels can form between the textile folds for the air to flow out and steam to flow in. Do not stack textiles on top of each other as this hinders the penetration of steam into the packages of textiles.




Loading textiles properly

When loading sterilization containers with textile items, care should be taken to ensure that they retain their vertical orientation, but that the items are not squashed together. This would prevent the formation of flow channels for air and steam. If the packages of textiles cannot be kept upright, then it might be advisable to wrap them in sterilization paper.
The textiles must not touch the sides or the base of the sterilization container, since they might become saturated with condensate.
For good drying results, the textiles should also be as dry as possible when they are placed in the autoclave. The heat stored in the chamber and sterilization container may not otherwise be sufficient to evaporate both the moisture and condensate.


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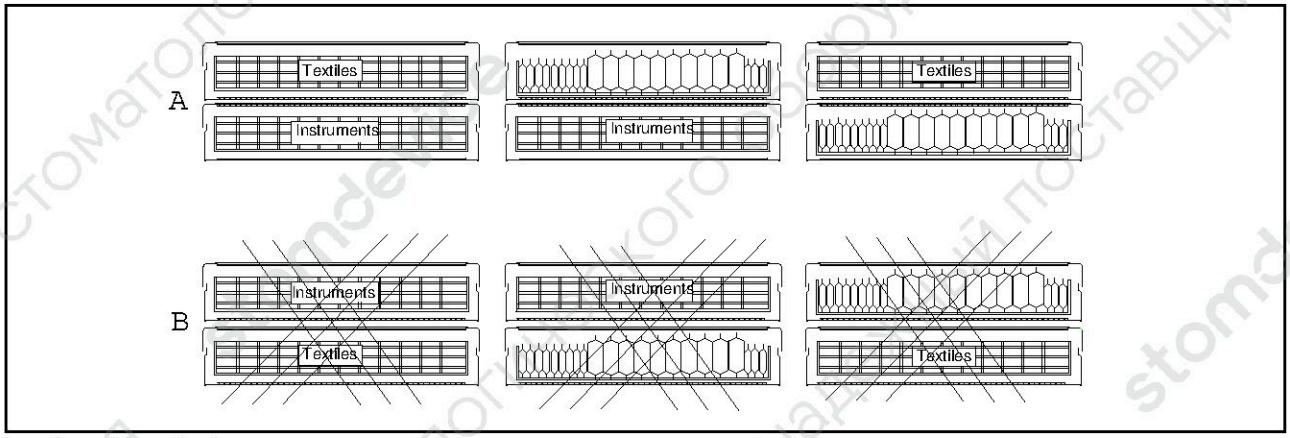
### 9.3.3 Instruments

Where appropriate, instruments should be disassembled before placing them in the autoclave, as this will improve the drying results.
The use of lubricants (such as instrument oil) should be avoided unless absolutely necessary. Prior confirmation should be obtained from the manufacturer of such agents that they are in fact suitable for steam sterilization. Substances which are hydrophobic or impenetrable for steam can not only lead to poor drying results, but may also mean that the steam sterilization is unsuccessful, since not only the instruments are protected but also micro-organisms.

### 9.3.4 Loading the autoclave

Textiles and instruments should not be sterilized together in one sterilization container. Textiles and instruments in separate sterilization containers should as far as possible not be sterilized in the same load. However, where this is unavoidable for economic or other reasons, the following rules should be observed:

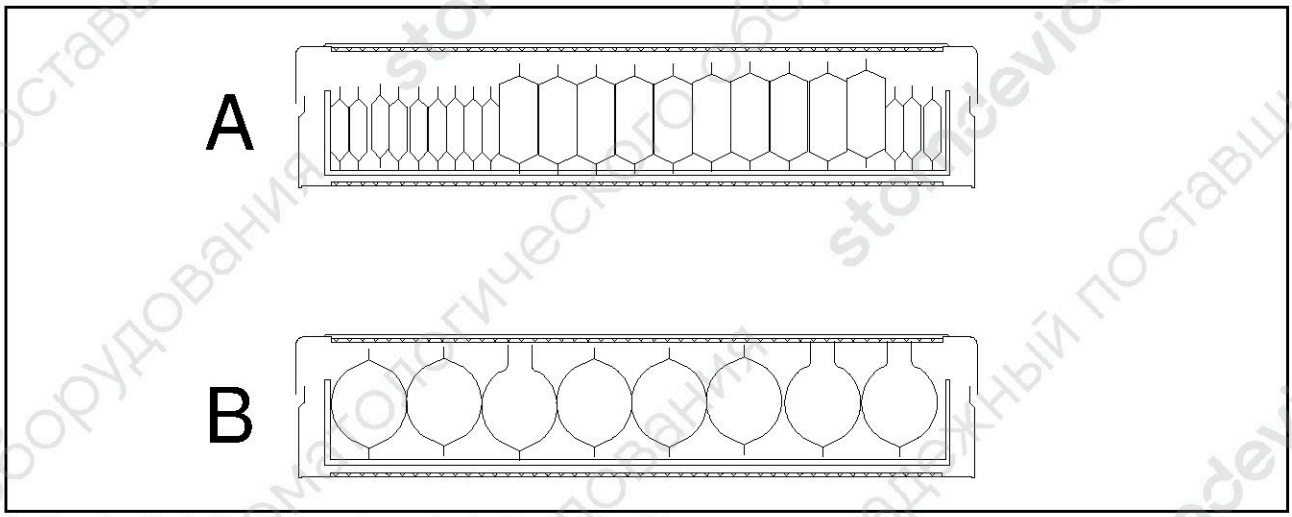
- Instruments and sterilization containers should be placed at the bottom
- Textiles should always be placed at the top
- Transparent sterilization packages and paper sterilization packages should be placed at the top (except when in combination with textiles, in which case they must be at the bottom).




Loading the autoclave

### 9.3.5 Loading containers with soft sterilization packing material

"Soft" sterilization packages such as paper bags or transparent sterilization packages can be sterilized either in sterilization containers or sterilization baskets. To enable better drying, arrange such soft sterilization packages side-by-side and close to each other. This allows condensation to run off the packages, while at the same time preventing them from expanded excessively, and possibly bursting at the seams.

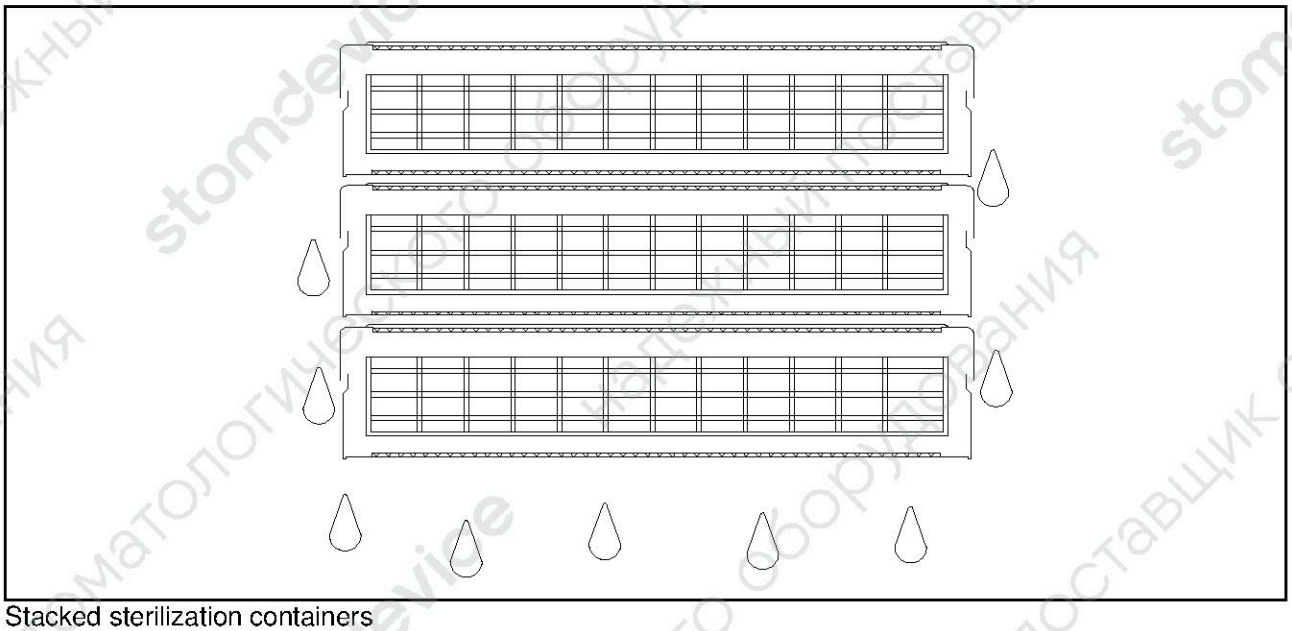



Packing "soft" sterilization packages in sterilization containers


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### 9.3.6 Stacking sterilization containers

When arranging sterilization containers, care should be taken that drops of condensate do not wet items being sterilized beneath, but can flow away to the base of the chamber. The best arrangement is a stack of sterilization containers of the same size, so that condensate can flow down the sides.



Stacked sterilization containers

### 9.3.7 Removing the sterilized items

Immediately after the sterilization process, some condensate may remain on the sterilized items. However, heat transfer from the sterilized objects can evaporate this after the sterilization process has been completed.
The German standard DIN 58953 Part 7 Section 7 comments on residual moisture on paper bags or transparent sterilization paper after sterilization:

"...Small amounts of water on the surface of packages do not represent a cause for concern if they dry completely within thirty minutes after removal from a steam sterilization system...."

### 9.3.8 Improving the drying

The drying can be improved by the following measures:

- Pre-heating the autoclave (empty sterilization)
- Arranging transparent sterilization and paper packing vertically
- Selecting the program option "Additional drying"
- Extending the drying times (please consult your MELAG customer service)


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