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User Manual

Fast-action Autoclave

MELA*quick*®12

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 business — 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 420,000 MELAG units sold throughout the world testify to the exceptional quality of our sterilizers.

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

The management and staff of MELAG

CE

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The functional effectiveness and the preservation of value of this unit depend on:

1. Proper preparation of the instruments to be sterilized
2. Proper care of the autoclave
3. The use of sufficiently pure distilled / demineralized water

IMPORTANT! Be sure to observe the safety instructions on page 13!
In the event that your autoclave should not function properly, first read the instructions beginning on page 22 before you notify the MELAG Customer Service Department.

Please note down here the factories number of your device in case you need to identify it for our Customer Service Department. This number is on the rear side of the unit. Type 12 factory no. .....

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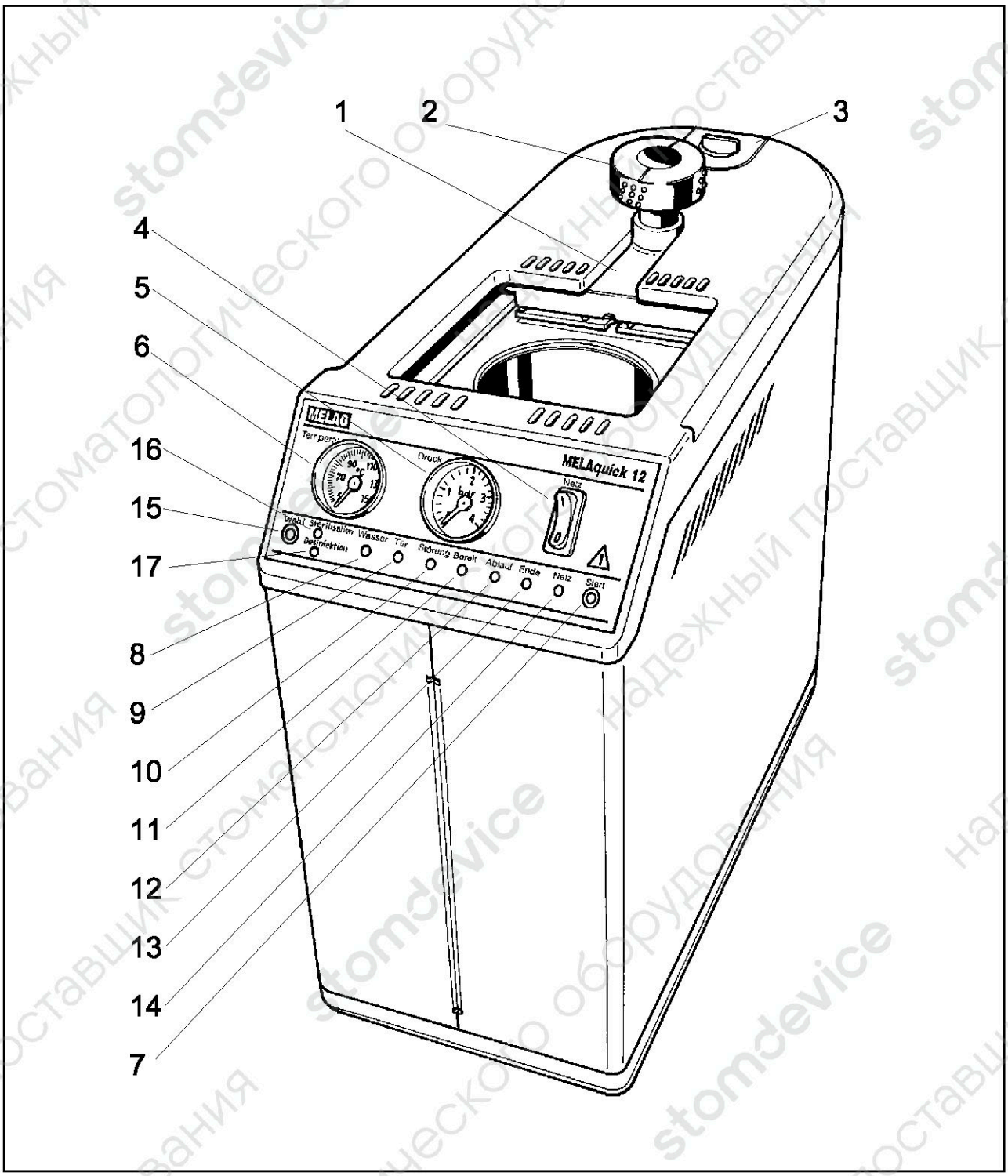
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1 Description of the autoclave

1.1 View of the apparatus

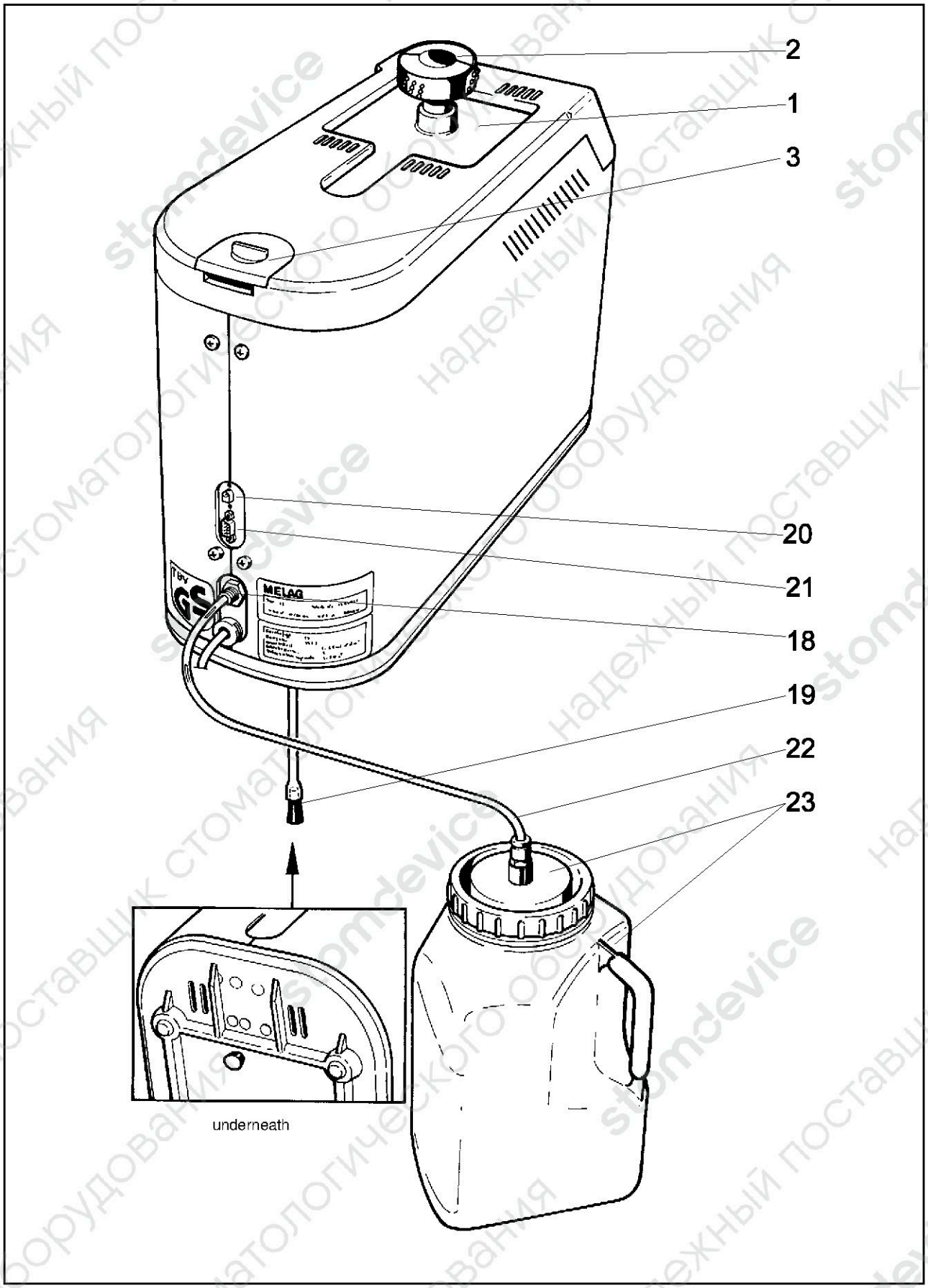
1.1.1 Front view



1	Sliding door	9	Door is open	16	Sterilization mode
2	Locking handle	10	"Fault"	17	Disinfection mode
3	Water reservoir	11	"Ready"	18	Hose connector
4	"Main" switch	12	"Running" cycle	19	Water tank drain
5	Pressure gauge	13	"End" of cycle	20	Power Supply for MELA*print*® 40
6	Thermometer	14	"Main" on	21	Interface for MELA*print*® 40
7	Start button	15	Program selector switch Sterilization/Disinfection	22	Waste water hose
8	Insufficient water			23	Condenser container

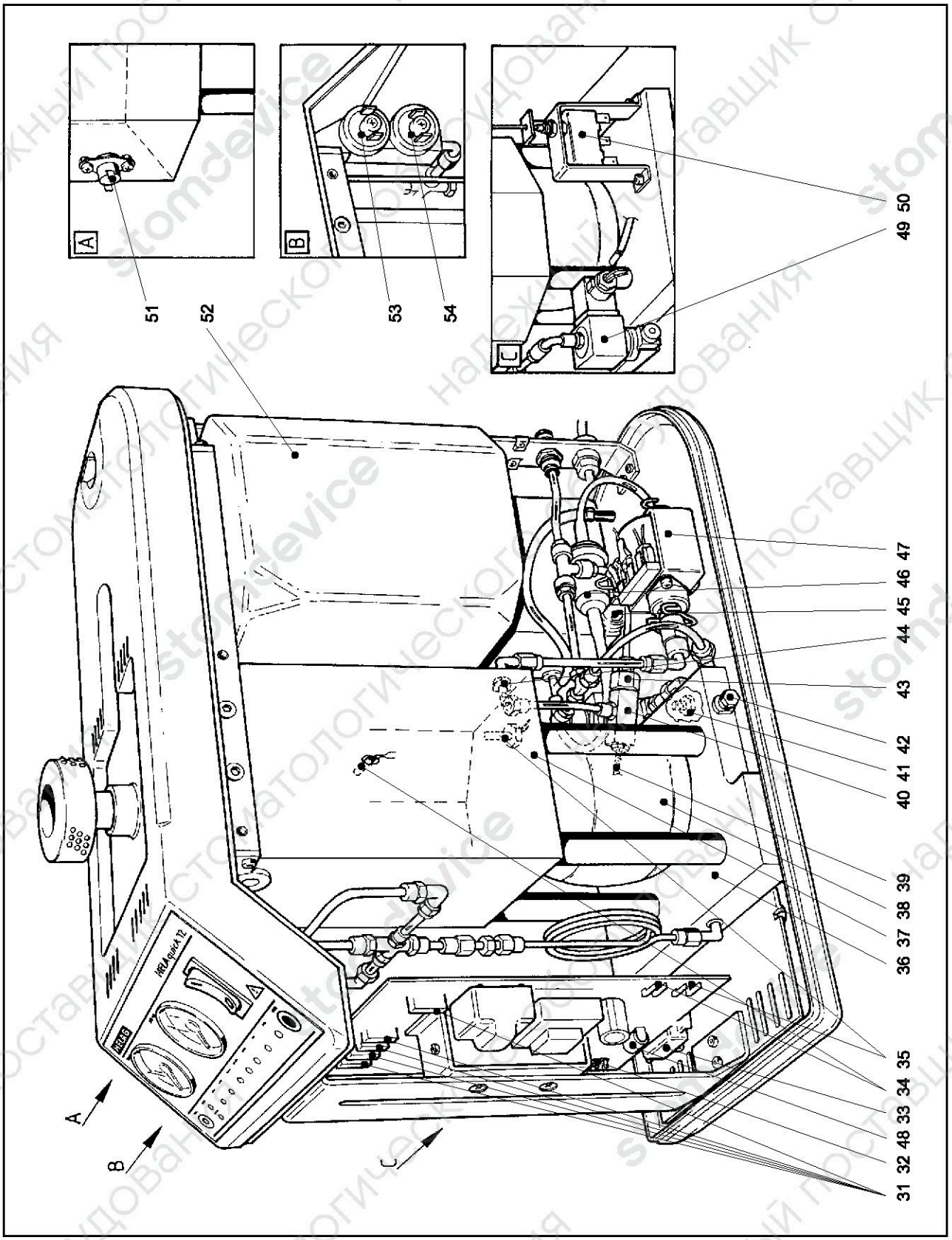
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1.1.2 Rear View



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1.1.3 Sectional view - for service only



31	Fuses	39	Temperature sensor thermometer	47	Feed pump with thermal protection
32	Output test button (and others)	40	Measuring block with fine filter	48	Lithium battery
33	Overheat protection for steam generator	41	Steam filter in front of solenoid valve	49	Solenoid valve for pressure release
34	Temperature sensor pre-heating	42	Safety valve	50	Micro switch for door lock
35	Temperature sensor steam	43	Current jet (below hose connector)	51	Overheat protection for pre-heating
36	Base plate	44	Steam filter in front of measuring block	52	Water reservoir
37	Vessel-block	45	Water level switch	53	Pressure-switch for sterilization
38	Steam generator	46	Water filter	54	Pressure-switch for disinfection

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1.2 Technical data

Type 12

Sterilization chamber (diameter x height)	9 cm × 16 cm
Required power-connection ratings:	1100 W, 230 V, AC
Average consumption	400 W with 4 Sterilizations per hour
Power costs per sterilization cycle (at y €/kWh)	= y €/kWh x 0,1 kWh (incl. preheating phase, on basis of 8-hour operation with 4 sterilization cycles/h)
Power costs per disinfection cycle (at y €/kWh)	= y €/kWh x 0,068 kWh (incl. preheating phase, on basis of 8-hour operation with 4 disinfection cycles/h)
Sterilization: pressure / temperature	2 bar (134°C) -2.1 bar (135°C)
maximum load	1 kg (incl. basket etc., no textiles)
Disinfection: pressure / temperature	0.2 bar (105 °C) - 0.3 bar (107°C)
maximum load (only unpacked)	1 kg (incl. basket etc., no textiles)

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1.3 Operating scope for sterilization and disinfection

This autoclave is designed for quick sterilization. All instruments must be sterilized if the possibility has existed that it could possibly have come into contact with even the smallest amount of blood during its use. **There is only one case a disinfection should substitutely be used and that is if the composition of the material does not allow a sterilization**. Especially older hand pieces and turbines whose light conductors can be damaged by repeated sterilization, **can be disinfected under steam pressure** to ensure at least the disinfection of inner parts.
The "SELECT" button (15) is located on the control panel. The operator uses this button to select the sterilization or disinfection program. Signal lamps (16 and 17) indicate the program. Before leaving the factory, the autoclave is set to "sterilization".
The operator should select the desired program as soon as possible after switching on the electrical power switch "MAIN" (4). If the autoclave **has been already preheated** (the "READY" lamp (11) glows), and **if the program is only then switched from "Disinfection" to "Sterilization",** the autoclave will run through a brief **reheating phase** of about 5 minutes. If the program is switched from "Sterilization" to "Disinfection" after preheating, then the autoclave will run through a **cool-down phase** for the pressure vessel, of up to 45 minutes (see Section 4.2.). during this reheating or cool-down phase, the "READY" lamp (11) will flash, and the autoclave cannot be put into operation.

Important!

- Items for sterilization can also be sealed into transparent sterilization packages.
- Steam pressure disinfection is permissible only for instruments which are **unpacked**.
- This autoclave cannot disinfect or sterilize liquids or textiles.
- Observe the instructions above on the reheating and cool-down phase if the program is changed between sterilization and disinfection after the autoclave has been preheated.

1.4 Electronic-parametric regulation

All autoclaves of type 12 are equipped with an electronic regulator. With the implement of microprocessors it is now possible to control the parameters pressure and temperature and keep their values constant during sterilization or disinfection. This control is called electronic-parametric regulation.
The ideal processing time can be adapted according to load and temperature of the vessel. The systems which control the sterilization and disinfection processes with respect to limit temperatures and pressure, and the timed sequences associated with these variables, consequently ensure as well the reliability of the sterilization and disinfection results.

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1.5 Printout of the log

The autoclave has a serial interface jack (21) for connection of the logging printer MELA*print 40*® (order no. 289). Power is also provided to the MELA*print 40*® through another connection (20) from the autoclave.
When the printer is connected, a log containing the process-relevant parameters will be automatically printed out after each sterilization or disinfection cycle (see example of log at the right).
It is normal here that time metering will be briefly interrupted once or several times during the first seconds after beginning of the sterilization period, during heating of the pressure vessel up to sterilization temperature.
At the bottom of the printout there is a line without explain text with service information.
In addition, the last log to be printed out is always permanently stored in the system memory (even if power fails). To print out the last log again, press the "SELECT" button (15) and hold it down for at least 3 seconds.
In the case of a fault, a log will also be printed out to indicate the time, the temperature, and the cause of the fault. Section 8 below contains a list of the fault numbers and their meanings.

```
----------------------------------------
        MELAquick  12
----------------------------------------
Date       :                 23.09.1994
Time       :                 10:37
Charge No.:                  4
----------------------------------------
Program  :
Sterilization    134°C
----------------------------------------
Program step              Temp.     Time
                          [°C]    hh:mm:ss
Preheat Temperaure        132     10:37:39
Start                     122     10:37:39
Sterilization start       134     10:39:25
Sterilization stop        134     10:39:27
Sterilization runs        134     10:39:27
Sterilization end         135     10:43:26
End of program            127     10:43:56
----------------------------------------
     Program has run
     succesfully !
----------------------------------------
Sterilization time :     04 min 00 s
Sterilization temp.:  MIN 134°C, MAX 135°C
total Time         :     06 min 17 s
----------------------------------------
8  2 09940933 3.22 C1 V1 DS1 PS0
```

1.6 Water-one-way system

A normal circulating water system, used in most autoclaves where the steam is condensed in the water reservoir again, has an important disadvantage. The instruments must be absolutely free from dirt and chemicals before sterilization/disinfection, otherwise not only the autoclave but also the instruments will be damaged and become dirty. However, in daily practice, the instruments are prepared insufficiently. This is critical especially for the sterilization of turbines and contra-angles which have to be oiled before sterilization. Oil, dirt and other chemicals are getting into the apparatus and will stay there because of the circulating system. This can lead to spotty corrosive instruments and often to a failure of the autoclave.
For this reason the MELA*quick 12*® uses the one-way system: all water and steam used for the process, is discharged into a waste water container (23).

1.7 No start of program if water quality is inadequate

You have purchased a high-quality German autoclave product. It is designed to ensure a long life of service, even if the operator makes certain mistakes. For this reason, the MELA*quick 12*® has an automatic warning system which prevents it from being operated if, for example, the operator forgets to use distilled water and fills it with normal tap water (which would damage it by the formation of boiler scale). The MELA*quick 12*® must be filled with distilled or demineralized water (aqua dest / dem) in accordance with DIN/EN 13060 or VDE 0510. Please see Section **5.3** on details on **water quality** and on the **suppliers of the required water**.
In order to prevent the instruments or the autoclave from being damaged from formation of boiler scale or corrosion, the autoclave has an integrated system for testing of the quality of the water in the tank (conductivity):
During the first 2 seconds after start of the cycle, the autoclave automatically tests the quality of the water in the water storage tank (52). If the water quality is somewhat poorer than specified in DIN EN 13060, but is still sufficiently good, then **the lamp "WATER" (9) will flash** to warn the operator. The program continues to run, however. If the water quality is not adequate, the lamp "WATER" (9) will flash, and **the lamp "FAULT" (10) will glow**. In such case, in order to protect the instruments and the autoclave, the program will not start. The operator must replace the water in the tank by better (for example, demineralzed) water and press the "START" (7) button again.

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2 Introduction

2.1 Preparation of instruments

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All parts of the MELA*quick 12*® autoclave which come into contact with steam are made of rustproof materials: the pressure vessel of coated aluminium, the pressure vessel door and steam generator of stainless steel, pressure lines of Teflon, and threaded connectors and valves of brass.

Foreign rust

The use of non-corrosive materials prevents rust in the autoclave. It is proven that the possible appearance of rust is caused by rust of foreign instruments. Formation of rust can even appear on stainless steel by inappropriate treatment of the instruments with chemicals and disinfection methods during preparation.

Preparation of instruments to be sterilized

You see the importance of correct and careful preparation before sterilization, which shall be stressed here once again.

Turbines and contra-angles must be cleaned and oiled according to the manufacturer´s instructions.

Immediately after use, all other instruments must be disinfected by being placed in a disinfectant solution, and must be cleaned, according to UVV/VBG 103.

Therefore take care on correct dose of cleaning agent and correct soaking time of exposure!

We recommend the use of ultrasonic devices, cleaning devices, and equipment-care systems especially designed for the cleaning of handpieces and angular instruments.

The proper cleaning of the instruments is highly important, in order to prevent debris from separating from the instruments under steam pressure during sterilization, and from clogging the filters, nozzles, and valves of the autoclave. Joints and hinges must be cleaned thoroughly with a brush. Rinse off all cleaning and disinfecting agents under running water by using the brush before the instruments are loaded in the autoclave. These agents can otherwise cause corrosion. Make a final rinse with distilled water and dry the instruments.

Turbines and contra-angles must be oiled according to manufacturer's instructions to preserve their long life.

New instruments

The cleaning process as described above has to be undertaken with new instruments too because they often are covered with residues of oil, dirt or grease coming form the production.

2.2 Formation of rust = foreign rust

It has already been said that the materials used for the autoclave prevent any formation of rust.

The appearance of rust marks are caused by outside sources. It comes from instruments or other metal objects made of ordinary or stainless steel where the galvanic coating is damaged. In many cases, only one faulty instrument can contaminate many other and finally cause rust corrosion of the autoclave. With alloy cleaning materials, foreign rust has to be removed from instruments and from the basket in which they are loaded. Do not use any kind of steel wool or brushes. Dirt can be cleaned with a fluff-free damp cloth. The cloth can also be soaked with surgical spirit.

2.3 Cleaning and care of the autoclave

Autoclave vessel

The vessel should be inspected at least once a week to check for dirt and deposits. Dirt should be wiped by using a soft fluff-free cloth soaked in alcohol. If stubborn spots are difficult to remove, we recommend the use of mild stainless steel cleaning product such as **Sidol** or an equivalent (with a pH range of 5...8). Be sure that no particles of dirt or other residue remain in the pressure vessel.

Finally wipe the vessel with a damp cloth and run at least one empty sterilization process.

Do not use paper towels, pot cleaners or brushes for cleaning the vessel.

Sieve insert for the pressure vessel

The pressure vessel (37) is provided at its bottom with a sieve insert which can be inserted and removed. It prevents particles of dirt and debris from entering the lines which branch off from the bottom of the pressure vessel. This sieve should be removed only if there is a great amount off coarse residue in the sieve.

IMPORTANT: Before removing the sieve to clean or replace it, the rest of the autoclave must be thoroughly cleaned. By no means should particles of debris be allowed to enter the openings located under the sieve insert, use a suitable hook to reach down under its frame and lift it out.

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Door gasket

Check the door gasket every week for damage. If it is dirty, clean it with commercially available mild liquid cleansers (with a pH between 5 and 8), or with methylated alcohol (C_2H_6O). Do not use cleansers which contain vinegar for complete cleaning. The gasket can be pulled out of the mounting groove and then later pressed back into place.
Replace damaged gaskets immediately.

Sliding door

Pull out the door gasket. Spread out a non-ravelling (non-lint, non-fuzzy) cloth which has been soaked in methylated alcohol, onto the rectangular autoclave pressure vessel. Then carefully use gentle pressure to wipe off the sliding door on the cloth. After cleaning, press the door gasket back into its mounting groove.

Outer-casing parts

In order to clean the outer parts of the autoclave, also use mild cleansers or alcohol.

2.4 Testing the function of the autoclave

Regular

As an user of the autoclave, you are able to control the effectiveness of sterilization with the control instruments and the sterilizing time. A successful sterilization is achieved if the pressure gauge indicator shows a value between 2 and 2.1 bar and the temperature is within a range from 134°C to 135°C for at least 3½ minutes. For detailed information concerning the control instruments, see chapter 5.2.
The parameter-control system automatically monitors these conditions at all times. If the monitored values exceed the established limits, a fault will be reported on the autoclave itself, and in the printout.

Periodic (twice yearly)

The German norm DIN 58 946, part 8, chapter 3.2 recommends:
"A periodic test is performed at place of installation in intervals of, for example 6 months. The test should confirm that the sterilizing apparatus sterilizes by following the manufacturer's instructions."
German medical and hygienic institutes are sending spores in order to test the sterilizing apparatus. They evaluate the sample and confirm the solution on a form.
DIN 58 946, Part 4, and the German Pharmacopoeia (DAB 10) stipulate that special test strips must be used to check steam autoclaves with spores of **Bacillus stearothermophilus** (for example, the product ATTC 7953, paper Spore Strips, made by the Oxoid company, Cd. no. BR 23).
For MELA*quick 12*® (i.e., chamber volumes of 1...3 dm³), DIN 58 946, Part 8 stipulates that three bio-indicators (plus a positive sample) must be used.
A spore test can in any case be used to successfully verify the sterilisation effectiveness of the autoclave **only in conjunction with the sterilization program.**

Test spores which are already packed (for example, spore strips in paper packing, test tubes, or the product Attest) **may not be again placed into the autoclave in a packed state.**
It is necessary to make the spore test under sterile conditions. This means, for example, that it is not possible after sterilization to put the spore sample in the same package in which it was sent to you, or to touch the sample with the same tweezers used before. Otherwise, recontamination will take place. We recommend sterilizing the tweezers with the sample. The positive sample which is not sterilized must be kept separate from the sterilized samples.
IMPORTANT:
If the spore sample is contained in an tube which is perforated only on one size (for example, the product Attest made by company 3M), then follow the following instructions:
Never place such tubes into the autoclave with the perforation upward (with the product Attest, the perforation is in the brown closure cap).
Since our autoclave operates in accordance with the gravitation principle, in which the required air venting takes place downward, the perforation must face the bottom for best results. At the very least, the perforation must face toward the side, as is the case for inserted tubes.

If you receive custom-made spore preparations which are directly sealed in paper / plastic packages, then make sure that the steam has unrestricted contact with all paper sides of the package. Here, it is also necessary that the paper side of the package face downward or to the side.

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3 Installation

3.1 Positioning the autoclave

Side gap
The autoclave must have a distance of at least 10 cm to a wall and 20 cm of free space above.

Setting up
For error-free function, the autoclave must be placed on a nearly horizontal surface.

Installing the autoclave during winter period
If the autoclave is very cold, it is necessary to wait with the sterilization/disinfection for some hours in order to make drying of condensation water in the inner parts possible.

3.2 Connection of water discharge

The autoclave works with the one-way system. While processing, water vapour flows with pressure into the MELAG condensation container No. 120 (23). The steam is condensed in the container via a cooling tube.

Installation of the condensation container
The container should be placed directly under the apparatus and enable easy access, but in every case in a lower position than the autoclave. The hose can be lead to the autoclave through a hole in a table with 7 mm in diameter and should have the shortest length, but not more than 1.5 m. A higher length does not spoil the function or effectiveness of the autoclave. The effect of a longer hose is that the lamp which indicates the "End" of a process, lights (in combination with a beep) although the pressure in the vessel has not been completely reduced. The sliding door can only be opened if the pressure is 0 bar. This is indicated on the pressure gauge (6).

Connecting the condenser container
The Teflon hose you have obtained with the delivery of the MELA*quick12*® has to be shortened to the correct length so that a constant fall is achieved. Use a sharp knife. If the hose is too long it may occur a "sack" of water that leads waste water back to the apparatus.
Please put the hose in a position where it cannot be touched unintentionally because the hot hose may cause injuries.

To connect the condenser container, insert the pressure-safe Teflon hose into the connector (18) at the back of the autoclave **as far as possible**. Therefore you have to overcome a first resistance to get to the end of the connector. The other end of the hose is already attached to the lid of the condenser container (23).
Make sure that the hose is fully inserted, otherwise this will lead to an escape of steam.

Filling the condenser to the MIN-mark
To prevent the formation of bacteria in the condenser, the container should be filled with approximately 150 ml of normal disinfection liquid and then filled up with tap water to the MIN-mark.
This procedure has to be fulfilled at the first time of installation and after each time the container was emptied.

Emptying the condenser container
The condenser (23) should be placed for easy access in order to check the water level in the container. If the water reaches the MAX-mark, the container must be emptied immediately.
We recommend to empty the condenser container each time purified water is added to the reservoir in the autoclave. Thus you ensure a regular working procedure without an overflow of the condenser container.
Never operate the autoclave without connecting the required condensate tank.

IMPORTANT: Never empty the condensate tank while the autoclave is in operation, owing to the danger of burning the operating personal. DANGER OF SCALDING!

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3.3 Filling the water reservoir

When turning on the autoclave for the first time (where the reservoir is empty) or when the reservoir is not filled with enough water, the light **"WATER"** lights on. On lack of water the autoclave will not work.
For the first filling or refilling of the reservoir the black lid (3) at the back of the apparatus must be removed and the reservoir underneath has to be filled up with distilled water until the lower corner of the trapeziform filling nozzle is reached. This is done while the sliding door of the autoclave is closed. Use a funnel if you want to fill from a large water container.

Total capacity of tank: 4.50 l
Re-filling with water: approx. 4.25 l

Attention:
- Make sure that the water quality is adequate, in accordance with chapter 5.3.
- do not move or tilt the autoclave when filled with water.
- Drain water before transport or if the autoclave is not used for more than 14 days (see Section 5.3.2.).

3.4 Connection of the logging printer

The MELA*quick12*® autoclave is equipped on the equipment side with a serial printer interface (21). When the MELA*print40*® dot matrix printer (order no. 298) is connected, a log is printed out for every cycle program.
The interfacing cables included in the normal order for the printer are for power supply and data transmission, they must be connected between the printer and the jacks 20 and 21 on the rear side of the autoclave. When connecting the 24-pole plug of the cable (to the printer) and the 9-pole plug of the cable (to the autoclave)use also the attached screws. When installing the printer, it is also necessary to load the paper in accordance with the instructions supplied with the printer.
When the power switch on the autoclave has been switched on, and when paper has been loaded into the printer, the operating-voltage signal lamp "P" and the status indication ON/OFF Line "SEL" will glow.

3.5 Setting the time of day and the date

The internal clock of the autoclave has been correctly set before it leaves the factory. It continues to run, powered by its battery, even when the autoclave is switched off. The installed battery has a service life of 7...10 years.
It is necessary to set time and date only if a printer is in use, because it will appear only on the printout.
If it becomes necessary to set the internal clock (for example, for a change between winter and summer time), then proceed as follows:

- First hold the "SELECT" button (15) pressed, and then briefly press the button "START" (7). Then release both buttons. The device is now in the SET mode, and "Set time and date" is output on the printer, followed by a table with the current settings for time and date.
- The "WATER" lamp (8) will also flash slowly, and the current value for "hours" will be printed out by the printer.
- By pressing the "SELECT" button (15), it is then possible to switch consecutively forward throughout the following sequence:
  - To "**minutes**" -- the lamp for "DOOR" (9) will then flash
  - Then to "**seconds**" -- the lamp for "FAULT" (10) will flash
  - Then to "**day**" -- the "READY" lamp (11) will flash
  - Then to "**month**" -- the lamp "RUNNING" (12) will flash, and then finally
  - To "**year**" -- the lamp "END" (13) will flash

  After each switching operation, the printer will output the current setting.
- Use the button "START" (7) to change each of the values selected. You can briefly press the "START" button (7) several times in a row, which will increase the current setting by 1 unit for each pressing. Or, you can hold down the "START" button (7) longer, which will cause a rapid increase in settings. You will hear a short beep every time the setting increases by one increment. When the "START" button (7) is not pressed for more then 2 seconds, the current setting will be output by the printer.
- If the "SELECT" button (15) is pressed again after the setting opportunity for the "**year**", the date and time of day will printed out again in tabular form, and the device will leave the SET mode.

3.6 Empty sterilization process

When the MELA*quick12*® is put into operation for the first time, it is absolutely necessary to run two consecutive sterilization cycles with no instruments in the autoclave. This is necessary to remove the air from tubing system of the autoclave, as well as any antifreeze agent which may have been installed in the factory, and which must be removed from the waterfeed system. **During this first (empty) sterilization cycle, it is normal that the autoclave will switch to fault no. 4 (see Section 8) to indicate a lack of water.** Should this situation arise, switch off the autoclave for at least 10 seconds, then switch on and start a cycle again.

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3.7 VDE-requirements

Due to the valid VDE-requirements, this autoclave is not suitable in areas with danger of explosion.
It may be repaired only by the manufacturer or a licensed service unit.

Electrically powered devices of this nature should not be operated unless they are under constant supervision.

3.8 Safety precautions

1. **Never use the autoclave without the connected waste water hose (22) and the condenser container.**
   DANGER OF SCALDING!
2. **The hose must be fully inserted into the hose coupling at the back of the autoclave. It also has to be kept straight and with a drop to the condenser container!**
3. **During use the hose and the condenser container get hot. DO NOT TOUCH!**
4. **Empty the condenser container (23)each time the water reservoir is refilled!**
5. **When opening the sliding door (1), keep your arm to the side. Small quantities of remaining steam could rise out of the opened door!**
6. **When the sliding door is open, do not touch the exposed hot metal parts. DANGER OF BURNING! To take out the basket/instrument carrier, always use the handle provided!**
7. **Empty water reservoir (3) before transport!**
8. **Do not tilt the autoclave when filled with water!**
9. **Do not use the LOCKING HANDLE (2) to lift or transport the autoclave.**
10. **Do not open the enclosure of the autoclave. The components on the inside of the device can be serviced only by a trained specialist.**
    WARNING: It is necessary to remove the power plug of the autoclave from mains power socket in order to diconnect the device from all poles of the AC power supply.

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4 For every sterilization / disinfection cycle

4.1 Main switch, pre-heating of the vessel

At the beginning of one working day, press the main switch to turn on the autoclave and select the program if necessary. The autoclave's chamber will automatically pre-heat. During this heating period (about 10...15 min. for sterilzation, and less than 10 min. for disinfection), the lamp "READY" (11) will flash. When the pre-heat temperature is reached, the blinking sign changes to a continuous light. Now the specified program can be started.

Once the pre-heat process has been finished, the pre-heat temperature will be kept on a constant level so that the autoclave can be used without interruption until it is turned off.
It is recommended to keep the sliding door closed during the pre-heat period. Thus the autoclave can be used earlier due to less heat loss.
At the end of a working day, the main switch should be pressed to turn the autoclave off.

4.2 Selection of program

The "SELECT" button (15) on the control panel of the autoclave is used to choose the desired program. The program selected is then signalled on the corresponding signal lamps (16, 17).
Before leaving the factory, the autoclave is set to sterilization.
Each time that the autoclave is switched on by the power switch "MAIN" (4), the program selection is the same as that selected when the device was switched off.
The operator should select the desired program as soon as possible after switching on the electrical power. If the autoclave **has been already preheated** (the "READY" lamp (11) glows), and **if the program is only then switched from "Disinfection" to "Sterilization",** the autoclave will run through a brief **reheating phase** of about 5 minutes. If the program is switched from "Sterilization" to "Disinfection" after preheating, then the autoclave will run through a **cool-down** phase for the pressure vessel, of up to 45 minutes (see Section 4.1). During this reheating or cool-down phase, the "READY" (11) lamp will flash, and the autoclave cannot be put into operation.

IMPORTANT:
- Items for sterilization can also be sealed into transparent sterilzation packages.
- Steam pressure disinfection is permissible only for instruments which are **unpacked**.
- This autoclave cannot disinfect or sterilze liquids or textiles.
- Observe the instructions above on the reheating and cool-down phase if the program is changed between sterilization and disinfection after the autoclave has been preheated.

4.3 Items to be sterilized

Carrier basket, instrument carrier
Never use the autoclave without one of the specifically provided carriers. Otherwise a malfunction may occur due to lack of ventilation or blockage of a steam tube. For universal use of your MELA*quick12*®, you have 3 possibilities:
- For general purposes use the **insert basket** (part No. 121). It provides a sterilization of 12 turbines and contra-angles. Other instruments with a maximum length of 16cm can be sterilized in this basket, too. If you want to sterilize instruments with very small size, e.g. endodonic instruments, the basket has a half-rounded container which can be hung either in a higher or lower position.
- The **instrument carrier** (part No. 122) is fitted with 7 ISO adapters that can be used with instruments with ISO connectors. These instruments can easily be sterilized in the MELA*quick12*®.
- The **instrument carrier** (part No. 123) is fitted with 7 round holders which can be used with instruments whose manufacturers recommend a sterilization with the instrument's head pointing down.

Sterilization packages
The items to be sterilized can be sealed in a transparent sterilization package like MELA*fol* ® (one side paper, one side film). For sealed items only use the basket, order no. 121. It is important that you do not place too many instruments in the basket. They must be placed in a position where the incoming steam can reach all paper sides of the sterilization packages. When sealing the objects inside the sterilization packages, make sure that the sealing seam has a width of at least 8 mm in accordance with DIN 58953, part. 7. The MELAG package sealing device MELA*seal* ® seals such plastic bags with a sealing seam of 10 mm.

Temperature sensitive items
Especially plastic articles and turbines or instruments with fibre optics are very sensitive to high temperature. So look for the maximum temperature to which the instruments can be exposed, according to the manufacturer's recommendations. Please refer to their specific instructions. The regulation with microprocessors in combination with highly sensitive sensors ensure that the temperature in the chamber and its wall never exceeds the maximum temperature of 135°C for sterilization and 107°C for disinfection.

Liquids and textiles
The autoclave is not suitable for sterilization of liquids or textiles!

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4.4 Preparation of instruments

The instruments have to be cleaned and cared for very thoroughly as described in chapter 2.1. In addition, clean and oil hand pieces according to the manufacturer's instructions.

4.5 Loading

The closed and locked sliding door (1) is opened by turning the knob (2) for 90° counter clockwise. Shortly before the end of this quarter-turn, the turning becomes slightly more difficult while the sliding door is raised. When 90° turn is complete, the marking on the knob will then point along the axis of the autoclave. To open the door, push it toward the rear by using the knob. **Do not press down with the knob:** this would apply pressure to the door gasket and would cause the door gasket to jam.
Put the loaded basket (No. 121) or instrument carrier (No. 122/123) into the sterilization chamber by using the supplied handle.

Never sterilize instruments without using a basket or carrier.
Now pull the sliding door forward, again by taking the knob without pressing down, until the end is reached. For locking the door, turn the knob with 90° clockwise.
The red lamp **"Door"** (8) must go out.
If you move the knob with pressure, it may happen that the door's seal will be shifted or even damaged which causes a malfunction of the autoclave (see also chapter 7.7 and 8.2.6).

4.6 Starting the sterilization / disinfection

To start the desired program, press the start button (7). This is followed by a short beep which confirms your request.
During the following 2 seconds, the autoclave automatically tests the quality of the distilled or demineralized water in the tank. If the water quality is not adequate, a warning signal will follow, or in the worst case a malfunction will be registered. **In both cases, the lamp "WATER" (9) will flash.** See Section 1.7.
Water will then be automatically pumped into the steam generator (for 16 seconds); this function is clearly audible.
At the same time, the steam generator starts and the air in the chamber is pushed out through a current jet.
Pressure and temperature are built up under control of microprocessors. A blinking sign of the lamp "'RUNNING" (12) indicates the momentary heating-up phase.
When the required pressure (2 bar) and temperature (134°C) for sterilization (0.2 bar and 105°C for disinfection) is reached, the lamp "RUNNING" shows a continuous light which announces that the actual sterilization time is now in action.
During the whole process, first air and, after a while, steam flows via a pressure safe hose from the vessel to the condenser container.
Attention: hose is getting hot!
Remember that the running program can only be stopped by pressing the main switch or by trying to open the sliding door. In the last case, a fault reaction will be triggered (lamp "FAULT" (10) lights) which automatically reduces the pressure. The door can only be unlocked and opened if the pressure has fallen down to 0 bar (see gauge (5)).
Conditions for ability to start:
The process **cannot** be commenced, if:

- there is lack of water
- the sliding door is not closed and locked
- the pre-heat process has not finished yet and the lamp "READY" does not light without interruption
- the quality of the distilled or demineralized water is not adequate.
- there is a fault
- a program is in progress

If in any cases above the start button is pressed, you will hear a beep for 2 seconds as a mistake in operating.

4.7 Automatic pressure release

At the end of a sterilization process, the autoclave will automatically let the steam out. Then the lamp "RUNNING" goes out an the lamp "END" (13) comes on. The end of each process is confirmed by 4 short and 1 long beep.

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4.8 Automatic printout of the log

After the lamp "END" (13) glows, and the acoustic signal sounds five times, the log will be printed out automatically if the printer has been connected and is ready for operation. See Section 1.5.

4.9 Successful end of a process

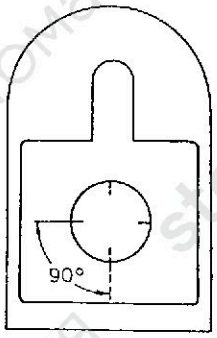
The acoustic signal and the light of lamp "END" indicate the completion of a successful sterilization/disinfection process.
This result says that the autoclave's vessel was sufficiently ventilated and the minimum values for pressure and temperature were definitely fulfilled during the whole process. This is also documented in the log if the printer has been connected.

However, if the autoclave indicates a fault, the minimum values were not achieved, even if you open the door and the lamp "FAULT" does not shine any more. **In this case, you cannot assume a successful process. The instruments have to be regarded as unsterile.**
The required log will also be printed out in this case. See Section 1.5.

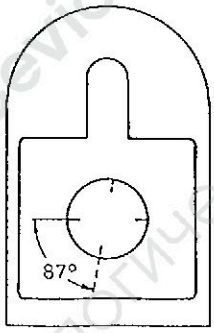
4.10 Removal of instruments

When the pressure is 0 bar and the lamp "END" lights, the vessel can be opened. To unlock the sliding door turn the knob 90° anti-clockwise. Shortly before the end of the turn, you have to overcome a slight resistance before the door is completely unlocked.

CORRECT



INCORRECT



You can see the lamp "END" (13) go out while lamp "READY" (11) is lighting again. The autoclave is now ready for a new start.
If the sliding door cannot be completely unlocked, there is still pressure in the vessel which is produced by post-vaporization. Then the pressure operated safety lock is still in operation. In this case, lock the door once again and wait for a few seconds until the pressure on the gauge (5) has fallen to 0 bar. Now unlock the door and pull the knob (2) **without pressing it down.**

4.11 Drying

After sterilization, **unsealed sterilization items** are dry and can be taken out immediately.
Sealed items or items to be disinfected should be left in the hot vessel for a few minutes with the sliding door open. This is recommended for complete drying.

4.12 Particuliarities of the disinfection

Packing
Items must not be wrapped.

Selection of the program
The operator must use the "SELECT" button (15) on the control panel to switch from sterilization to the disinfection program. Then the signal lamp for "sterilization" (16) will go out, and the lamp for "disinfection" (17) will glow.

Cool-down phase
If the autoclave is set to the sterilization program, if it is fully heated up, and if it is then switched to the disinfection program, the "READY" (11) lamp will flash up to 45 minutes, until the autoclave cools down to the preheating temperature for disinfection. Also see section 1.3. During this period, it is not possible to start the disinfection program.

4.13 Overheat protection

Overheat excluded
Overheat during error-free process is generally excluded due to the concept of separate steam generation in combination with electronic-parametric regulation. The limit of 135°C (107°C) cannot be exceeded.

Steam temperature control
Additionally, the temperature of steam is electronically controlled. If the limit temperature of 140°C (112°C) is exceeded owing to a defect, the running program will also be interrupted, and the "FAULT" lamp (10) will glow.

Temperature limitation
To avoid (e.g. complete failure of electronic / heater cut-out) possible overheats and thus endangering the items to be sterilized even under unusual conditions, the autoclave has two separate temperature limitors, one for the vessel and one for the steam generator. These two work independently from the safety system described above and will directly cut

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power if temperature exceeds the limit. If the temperature monitor system triggers, the respective heating system will be switched off, and the water pump will simulanteously start to cool the steam generator. If the electronic system is functional, the lamp "FAULT" (10) will also glow, indicating a fault.

Interruption of the sterilization

The light of lamp "FAULT" shows in every case that the sterilization/disinfection program was not fully completed. The items have to be considered as unsterile.

When the fault light blinks (time is beyond limit) and goes out if the door is opened, the sterilizing conditions were not achieved fast enough or did not remain long enough. The autoclave returns to ready state after having opened the door. After having checked the apparatus and removed the cause of fault (too much load / ventilation holes blocked by load / sliding door not tight because of improper closing), you are able to continue your work immediately with the autoclave.

If the fault message cannot be removed by opening the sliding door, you either have tried to open the door during the process or there is a defect in the apparatus (heating elements / temperature sensors). After switching off the main switch briefly (at least 10 seconds), the autoclave should be ready again.

For repeated fault messages, the cause of failure must be found and removed by a service technician; also pay attention to chapter 8.

4.14 Process control

The autoclave offers the following possibilities for controlling a safe sterilization/disinfection process:

Successful conclusion of a process

As soon as a sterilization/disinfection is completed successfully, i.e. keeping the required parameters for pressure and temperature in the prescribed time, the lamp "END" lights and an acoustic signal can be heard. If the log printer is connected, the successful end of the cycle will be documented on the printout.

Pressure-temperature correlation

During process, the correlation of temperature with pressure can be controlled by observing the thermometer (6) and the pressure gauge (5), according to the curve for saturated steam (e.g. 2-2.1 bar with 134-135°C). The precision of the indicator instruments must be taken into account here: see Section 5.2.

Electronic monitoring of parameters

During running of the program, the following parameters will be automatically monitored under microprocessor control:

Heat-up time

The maximum heat-up time is normally 3 minutes.

If overloading, insufficient venting, or fault in operation prevent the autoclave from achieving the values required by the selected program for pressure and temperature within 5 min., then the program will interrupt owing to time overrun, and the lamps for "FAULT" (10) and "RUNNING" (12) will flash.

Sterilization/disinfection time

During sterilization/disinfection process, the parameters pressure and temperature are constantly controlled. The sterilization/disinfection time of 4 / 6 minutes will only run if both parameters reach the required values (lamp "RUNNING" lights). If the autoclave exceeds the control time of 5.5 minutes for sterilization / 7.5 minutes for disinfection due to faulty run, the program will also be stopped because of exceeding time. The lamps for "FAULT" (10) and "RUNNING" (12) will flash in this case.

Exceeding steam temperature

If the autoclave exceeds the steam temperature of 140°C during sterilization or 112°C during disinfection due to a fault, the program will also interrupt in such case, and the lamp for "FAULT" (10) will glow. The lamps for "READY" (11) and "RUNNING" (12) will flash.

Temperature limitation

The automatic temperature limitation has already been described (See Section 4.13).

4.15 Sterilizing frequency

Because of its parameters control system and its optimised heating, the MELAG-autoclave MELA*quick12*® can be used for sterilization / disinfection without interruption. So 8-10 sterilizations per hour are possible.

5 Further informations about sterilization

5.1 Total operating time

Operating time

"The operating time is the time needed for sterilization without taking account of loading and emptying." (DIN 58900)

Due to the parameter regulation of the autoclave, the operating time is optimised mainly depending on the number of items to be sterilized and the temperature of the apparatus. The minimum operating time (small load, immediate sterilization before) needed for sterilization is about 5.5 minutes and about 7.5 minutes for disinfection. The maximum time (maximum load, first process after complete pre-heat) is about 8 minutes for sterilization and 9 minutes for disinfection.

Included times

The operating time includes times for pressure generation, ventilation and heat-up of instruments and vessel as well as for sterilization which consists of

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equalization time, killing time and an extra charge for safety.

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5.2 Accuracy of process regulation

The analogue instruments for pressure and temperature of the MELA*quick12*® work completely independently from the microprocessor regulation and are only for additional information about the run state of the autoclave.
Because of their small size, the accuracy of these instruments is only ± 0,1 bar (pressure gauge) and ± 2°C (thermometer).
Owing to the time delay of the temperature sensor, it can happen that the indication of the temperature reaches the correct value only after beginning of the sterilization or disinfection time: i.e., while the lamp "RUNNING" (12) is glowing, and after the required temperature has already been reaches in the pressure vessel.
It may also happen during continuous operation, as a result of constant high temperature of the autoclave, that the temperature indicates on the thermometer is 2°C higher than the temperature shown for the first sterilization or disinfection cycle. In the actual sterilization compartment, however, there will be no temperature deviation.

Microprocessor control

The electronic control system, on the other hand, operates with an absolute precision of 0.5°C and controls the sterilization or disinfection temperature with a maximum deviation of ± 0.3°C.
The microprocessor regulation in combination with separate steam generation excludes an overheat of instruments and of the vessel, too.

5.3 Use of aqua dest / aqua dem

Quality requirements

It is important to use distilled water (aqua dest) or demineralized water (aqua dem) for steam sterilization.
As directions for water quality, refer to the values in the nearby table according to CEN-standard DIN EN 13060.

For the operation of the MELA*quick12*® and for all other MELAG autoclaves, however, **battery water in accordance with VDE 0510** is also adequate. The stipulations of VDE must be strictly observed here, however: conductivity upon processing of the water ≤ 10 µS/cm*), and upon use ≤ 30 µS/cm*), pH identical to stipulations of DIN EN 13060, and residue of evaporation comparable.

Automatic testing of conductivity

Immediately after start of he program, the autoclave tests the water conductivity in the water storage tank (see Section 1.7).
If the water quality is adequate, the program will run normally. If the water conductivity is between approx. 25 and 40 µS/cm*) , the **lamp "WATER" (9) will** flash to warn the operator. The program will, however, continue to run normally. If the water conductivity is greater than approx. 40 µS/cm*) , the **lamp "WATER" (9) will flash,** a fault message will be triggered, and the **lamp "FAULT" (10) will glow.** In such case, in order to protect the instruments and the autoclave, the program will not start. The operator must replace the water in the tank by better (for example demineralized) water and press the "START" button (7) again.

Suppliers of adequate water

Battery water in accordance with VDE 0510 is economically supplied by all major drug stores, supermarkets, home-construction marts, as well as from wholesalers. In Germany, however, the seal for VDE 0510 must be expressly displayed on the label.

Functional effectiveness

If you do not pay attention to the directions above, deposits of lime in steam pipes, valves and current jet can impair the autoclave's functional effectiveness. Aggressive water (pH <5 or >7) can also damage the apparatus.
It is only for high values of **conductivity** that the autoclave triggers a warning or fault alarm. See Section 1.7.

Steam formation

The extent of stain formation on instruments depends on the quality of water used for steam generation.

vapour residues	≤	10	mg/l
silica, SiO_2	≤	1	mg/l
iron	≤	0,2	mg/l
cadmium	≤	0,005	mg/l
lead	≤	0,05	mg/l
heavy metals expect the ones above	≤	0,1	mg/l
chlorides	≤	2	mg/l
phosphates	≤	0,5	mg/l
conductivity	**≤**	**15**	**µS/cm*)**
pH - value	5 to 7		
colour	colourless, clear without residues		
hardness	≤	0,02	mmol/l

*) µS/cm = Micro Siemens per centimetre

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5.3.1 Amount of consumption

Water in the reservoir decreases each process with the amount needed for one sterilization/disinfection (one-way system).
The MELA*quick12*® requires approx. 150 ml of distilled or demineralized water per sterilization or disinfection cycle.
When the water reservoir is full, it is possible to conduct approx. 28 sterilization cycles until the lamp "WATER" (9) glows. Then the operator must refill the water tank.

5.3.2 Emptying the reservoir

If the autoclave must be transported, or if it will remain out of operation for a lengthy period of time (over about 14 days, depending on the water quality and temperature), then it is necessary to empty the water storage tank to prevent soiling due to growth of algae, etc.
For emptying the water storage tank, it is necessary to turn the autoclave so that the rear part protrudes about 12...15 cm over the edge of the table. You can now see a rubber bung (19) under the autoclave. Pull out the bung and the hose to which the bung is connected until you can feel a definite resistance. Then put a container underneath, pull the bung out of the hose and wait until the reservoir is completely empty. Stick the bung back into the hose and the hose back into the autoclave.

5.3.3 Refilling / Replacement

Lamp "WATER", indicating lack of water

The light of lamp "WATER" shows that the amount of water in the reservoir is not sufficient any more. With this lamp on, there is no possibility to start a program. The reservoir has to be refilled with aqua dest/aqua dem until the lamp goes out. The maximum level is reached with the lower edge of the trapezi-form filling nozzle.
If lamp "WATER" comes on after a start of a process and during pumping, it has no influence on running the program.
The remaining amount of water in the water storage tank is in any case sufficient for the started sterilisation or disinfection cycle to run to completion.

Replacement in case of pollution

If dirt has come into the water reservoir because of misoperation, the reservoir has to be rinsed and cleaned, e.g. with a bottle brush. In every case, let off the water as described above and refill the reservoir.

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6 Putting out of operation / Transport

- Switch off main switch.
- Pull out main plug, let autoclave cool down.
- Remove hose to condenser container from autoclave by pressing hard against the black ring of the connector (16) and pulling the hose out of the connector at the same time.
- Empty water reservoir as described in chapter 5.3.2.
- If possible, **use the original packing** to transport the autoclave. Be sure in any case to additionally seal the autoclave inside plastic wrapping, in order to prevent packing material from entering the water storage tank, etc.

6.1 Transport under danger of frost

If freezing temperatures are possible during transport, any water which may remain in the feed-water system must be removed in order to prevent damage to the pump and the water lines. A service technician is required for this work, which includes the following steps:

- The autoclave must be switched on and preheated.
- Empty the water storage tank as described in Section 5.3.2.
- Remove the metal side-enclosure panels from the autoclave.
- At the bottom left on the electronic circuit board there are four wire-clasp buttons / switches (22). The second from the bottom is the Test Button, which sets all outputs of the control system. Press this Test Button for the electronic control system until no more water is pumped on the output side of the water pump (through the thin, transparent hose).
- Open and close the sliding door several times until all the water remaining in the steam generator is expelled. This action will heat the air contained in the preheated pressure vessel, which will cause the air to expand and expel any water remaining into the condensor container.
- Switch off the power switch and unplug the power cable.
- Replace the metal side-enclosure panels on the autoclave.
- Disconnect hose to condenser container from the autoclave by pressing hard against the black ring of the autoclave's connector; at the same time pull the hose.
- Let the autoclave cool down.

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7 Breakdowns without warning light

The following instructions for breakdowns are provided to help the user resolve minor trouble himself, or to allow him a more accurate description of malfunctions to his authorized dealer, warehouse agent, or customer-service representative.

Bigger faults or damages are repaired only by appointed service engineers or by the manufacturer.

7.1 No Indication or false indication of the operating state

After having switched on the main switch (4), the autoclave shows its state of process by the following indicators:
Door closed and locked:
Lamp "MAIN" lights,
Lamp "READY" blinks (if apparatus is still cold),
Lamp "READY" lights (if apparatus is pre-heated),
Lamp "WATER" lights (if there is lack of water).
Door unlocked:
Lamp "MAIN" lights,
Lamp "DOOR" lights,
Lamp "READY" blinks (if apparatus is still cold),
Lamp "READY" lights (if apparatus is pre-heated),
Lamp "WATER" lights (if there is lack of water).

If no indication of any light:
Is the autoclave plugged in?
Is there current in the socket? When switching the main switch of the autoclave, lamp "MAIN" must come on.

If power is available to the autoclave, and if the "MAIN" power switch (4) is switched on, but if no signal is provided, then it is possible that the main fuse in the autoclave is defective.

You must notify the MELAG Customer Service Department.

In case of different indication:
Switch off main switch and switch it on again after 10 seconds.
If -- despite attempting the measures described above -- the autoclave is still not in proper operational status, as would be indicated by the proper lamp signals given above, there is probably an electrical defect within the autoclave. You must notify the MELAG Customer Service Department. If the electronic circuit board becomes dirty -- for example, if disinfecting agent enters the device through the forward vent slots -- then it may be cleaned with methylated alcohol (C_2H_6O).

7.2 Lamp "READY" does not light continuously

If lamp "READY" blinks more than 20 minutes after having turned on the main switch, **and the autoclave's vessel is still hot**, you have previously changed from sterilization to disinfection program so that the autoclave is still cooling down to pre-heat temperature for disinfection (see 1.3). This can take up to 45 minutes.
If the "READY" lamp (11) flashes more than 20 minutes **while the pressure vessel is cold** and no fault has been signalled, the temperature sensor of the preheating system is defective. You must notify the MELAG Customer Service Department.

7.3 Impossible to start a program

Preheat phase / cool-down phase
During the following phases, it is not possible to start a program:

- During the approx. 10...15-min. **preheating phase** (only once, after first switching on the autoclave)
- During the 5-minute **reheating phase** when switching from the disinfection to the sterilization program
- During the **cool-down phase** when switching from the sterilzation to the disinfection program.

During one of these phases, the lamp "READY" will glow. The operator must wait until the end of the preheat, reheating or cool-down phase.

Door contact
A program start is only possible with the sliding door closed and locked. Lamp "DOOR" will go out when the sliding door is in closed position and completely locked.
Check that door has been pushed to the end.
If the lamp "DOOR" (8) does not go out through the door has been correctly locked by a quarter turn, then the contact has not been correctly set, or it has been damaged by violent sliding of the door in its locked position (the pushing rod has been bent in the door guide).

You must notify the MELAG Service Department

The contact must probably be adjusted by removing the nut of the microswitch and readjusting the contact position inside the apparatus (while the autoclave is hot).
If the door contact rod is bent, the microswitch must first be removed, and then the contact rod must be straightened. Then the microswitch must be installed again (with the round side upward), and the door contact must be adjusted again (see above).

Lack of water
If lamp "WATER" lights, there is not enough water in the reservoir so that it is not possible to start a program.
Water reservoir has to be filled (see chapter 3.3).
If the lamp does not go out when the reservoir is filled to the lower edge of its trapezi-form inlet, a service engineer must check the water level switch of the container.
It may be possible to trigger the switching process for the water-level indicator switch by tapping lightly against the autoclave or against the water storage

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Program still running

When a process is running (lamp "RUNNING" lights or blinks) or the sliding door has not been opened yet after a completed process (lamp "END" is still on), it is not possible to start a new process. Wait until the process is over and open the sliding door.

Note:

If the "START"-button is operated in one of the above cases, you will hear a beep for 2 seconds because of misoperation.

Faulty operation

If lamp "FAULT" lights, it is not possible to start a program.

7.4 The water pump does not start when the program begins

It can happen that the water pump (47) starts with a delay: i.e., only within 30...60 seconds after pressing the "START" button (7), and not within two seconds as normal. Under such conditions, the program may, however, run normally through to the end, with the lamp "END" (13) signalling the proper end of cycle. In such case, it may be assumed that the sterilization or disinfection program has successfully run through to the end, but that the fuse for the pump output is defective.

You must notify the MELAG Customer Service Department.

In such case, the pump (47) has not been properly activated by it's output in the electronics system, but instead via the steam-generator output after triggering of the overheating protection system for the steam generator (33). The fuse for the pump output (33) must be replaced.

7.5 Too small indication of pressure and/or temperature

If the autoclave does not register the prescribed values for temperature and / or pressure because of an operator's mistake, a malfunction will reported in all cases (see Section 8).

If the pressure gauge or thermometer indicates excessively low values although the program has been normally completed (lamp "END" (13) lights at conclusion of process), you must notify the MELAG Customer Service Department, and an engineer must check the instrument involved.

However, if the values for temperature and pressure are slightly too low but do correspond, the temperature sensor for steam (screwed into the steam channel of the vessel block from the bottom) has to be checked for resistances on plugs, and contacts may have to be cleaned or the sensor to be replaced.

For questions about the precision of pressure gauge or thermometer refer to chapter 5.2.

7.6 Excessive indication of pressure and/or temperature

A short rise of pressure up to 2.3 bar, shortly before the beginning of a sterilization, that is just before the "Running" light changes from blinking to constant lighting, serves for a minimization of the equalization time and for a proper ventilation of the instruments' inner parts. When regulation starts, pressure falls down to approximately 2.1 bar. On principle, the thermometer should indicate values not higher than 137°C.

If pressure rises to over 2.4/0.4 bar for a short time, but falls down again to values of 2 and 2.1 bar (0.2 and 0.3 bar), call for a service engineer who has to adjust the pressure switch inside of the autoclave.

7.7 Hissing during run / foggy instruments

If you can clearly hear a hissing noise at the sliding door after a program was started, either the seal is dirty, damaged or the sliding door was pressed down during locking which causes an overturn of the vessel's lip. For this reason, steam can escape through the resulting gap.

A damaged seal has to be replaced (seal is in a ring groove) and in case of overturned seal, the sterilization process can be stopped by switching off the main switch. After pressure drop, open sliding door and once again close it correctly (do not press down while closing).

A dirty seal can be cleaned with alcohol on a fluff free cloth. If the sliding door itself is dirty, put a thin cloth on top of the vessel, close the sliding door and open it again. See also chapter 2.3.

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7.8 Sliding door cannot be unlocked

Pressure operated lock of sliding door (1)

As soon as the autoclave has reached a pressure of 0.2 bar, a bolt enters the locking mechanism of the sliding door and prevents its opening during process. After the pressure drops to "0", this bolt releases the locking mechanism so that the sliding door can be unlocked by a 90° turn counter-clockwise and be pushed back (marking on knob is now along with the apparatus' axis), see also chapter 4.5.
If you try to open the door before pressure is 0 bar, you will not succeed because the bolt is still locked in. Thus, the sliding door cannot be completely unlocked and opened.
In this case, lock the door once again (marking is now crosswise with the apparatus' axis), wait until pressure drops to "0" and then unlock and open the door.
If the sliding door still cannot be opened, then it is jammed by long instruments which protrude too far upward -- or the mechanical system of the door is defective. Try to slide the door backward by applying slightly more force.

You must notify the MELAG Customer Service Department.

Pressure release takes too long

During normal operations, the pressure indication has fallen to ”0“ by the time the lamp ”END“ (13) glows and the acoustic signal sounds. If, however, an extremely great number of unpacked metal instruments are sterilized together, then re-evaporation of the resulting condensate can cause a situation in which the operator must wait a few seconds after the acoustic signal before the pressure has completely fallen and the door allows itself to be opened (as described above).
When the pressure gauge shows a value of 0.2 bar or more at the end of a cycle (light ”END“ (13) glows, with a beep), there is dirt inside the apparatus which has settled down to the steam filter in front of the solenoid valve of the pressure release (41).
This filter can be reached from the lower side of the autoclave without dismantling it (use a spanner with 14 mm).
The filter must be cleaned by a service engineer or replaced. During this service work, the adjacent openings should be rinsed and blown out before the autoclave is reassembled. To perform this, first remove the filter, then close off the outgoing-water hose to prevent water from flowing through it. Then pour demineralized or distilled water into the pressure vessel and allow it to run through. Then close the sliding door, and blow through the outgoing waste water hose.

7.9 The sliding door cannot be easily moved

Normally, the sliding door (1), when unlocked -- see Section 4.5 -- can be very easily moved: for example, with 2 fingers. This is because of the following: the actual metal closure floats over the door gasket, the door slides on PTFE bearings, and the door moves into a recess at the rear area of the autoclave. If the door, however, is difficult to move, please consider the following possibilities:

Transport damage

If the autoclave has been subjected to violent impact from the side during transport, it is possible that the suspension of the upper autoclave plastic cladding has been bent. In this case, it is possible that the collar of the cladding of the sliding door (under the locking handle) collides toward the rear with a corner of the opening in the upper part of the autoclave cladding. You must notify the MELAG Customer Service Department. The technician must adjust the suspension of the upper autoclave plastic cladding in order that the collar runs properly in the centre of the opening.

The metal closure cover does not completely lift during unlocking.

If the actual metal closure cover (5 mm thick) does not lift, or completely lift, although the door is fully unlocked, then the closure will not float over the gasket and its upper side will not lie flush at the upper corner of the guide slot. The operator can then provisionally lift the closure by pressing on the plastic cladding of the sliding door, and by pulling on the locking handle, and can then open the autoclave. You must notify the MELAG Customer Service Department.
The problem may be that a technician has forgotten to reinstall the PTFE bearing pieces between the closure cladding and the slide rails after a repair job. Or, the 4 spring-loaded hexagon socket-heat screws have jammed because of soiling, debris from paint, or a crooked position in the guides of the closure cladding. In such case, unscrew the screws, clean the guides, and screw the screws back in tight by hand, using the springs and a thread-locking adhesive.

7.10 Water reservoir goes empty

If the water gets from the reservoir to the condenser container and thus gets empty (over night), there is a leak in the non-return valve of the pump.
Inform the service engineer who will clean or replace the pump.
The autoclave can be used in the meantime, if the cycle successfully runs the end: i.e., if the lamp ”END“ (13) lights up.

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8 Fault with warning light

The following hints should give you the possibility to correct small faults or to give an exact description of the fault to the service engineer. Because the MELA*quick12*® indicates the cause of fault in a special way, it is possible to treat faults according to the table below.

In any case, you must report the following data to the MELAG Customer Service Department:

- The point in time when the malfunction was reported (for example, during the preheat phase, during pressure generation, or during the sterilization period).
- The LED signal which reported the malfunction.
- The values for pressure and temperature indicated at this time.
- Any unusual developments (for example, repeated starting of the water pump).

The MELAG Customer Service Department requires this information in order to quickly repair the autoclave at a cost economical to you.

Fault No.	LED Fault	LED Door	LED Water	LED Ready	LED Run	Cause and time of fault
1	blinks			off		Supervision time for pre-heat exceeded, happens during pre-heat phase ("Ready" blinks)
4	blinks			off	blinks	Supervision time for pressure generation exceeded, happens during pressure generation ("Running" blinks)
5	blinks			off	blinks	Supervision time for sterilization time exceeded, happens during sterilization ("Running" lights)
9	on	blinks				Attempt to unlock sliding door during process
11	on			blinks	blinks	Maximum steam temperature exceeded after autoclave was once "Ready"
15	on	blinks		off	blinks	Power failure during the last cycle

In every of the above cases and in case of "normal" misoperation (pressing "start" button when autoclave not "READY" or process already running), you will hear a beep for 2 seconds. **On principle, you should observe type and time of the fault (e.g. during pre-heat phase or during pressure generation or during sterilization) and inform the service engineer** in order to make a quick and low-priced repair possible.

The autoclave has to be repaired only by the manufacturer or by an authorized engineer.

8.1 Fault No. 1

Cause of the fault:

The autoclave's vessel has not reached the necessary pre-heat temperature within the supervision time of 25 minutes (sterilization), 15 minutes (disinfection) respectively.

Time of fault:

During pre-heat phase (lamp "READY" blinks)

Call for a service engineer.

Diagnosis of fault:

1. If the vessel is warm during fault indication and the apparatus indicates "READY" after you have switched off "main" switch and on again shortly and waited for a few minutes, there is at least one heating cartridge of the pre-heating defective.
2. If the vessel does not get warm, a fuse has failed or a plug contact is defective.
3. If the vessel heats up to approximately 150°C (temperature of the overheat protection), there is a short circuit in the temperature sensor of pre-heating.

Fault correction:

1. Measure and replace heating elements.
2. Measure pre-heat output of the electronic and replace defective elements. In case of defective fuse, you must also check the function of electronic exits. The semiconductor-relay should only switch if output was directed (e.g. by test knob, lower left side of the electronic plate). This can be noticed by the respective lamp of the output. Otherwise, the relay is defective and the electronic print has to be replaced.
   If somebody had been working on the autoclave before, you should check whether the cable shoes of the temperature sensors are sitting on the right connector (pre-heat sensor to upper connectors). Measure resistance values.
3. If there is a short circuit in the temperature entry of the pre-heating, the vessel will heat up to 150°C until overheat protection is released, without a light of lamp "READY" because the resistance for pre-heat temperature cannot be reached. Replace sensor.

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8.2 Fault No. 4

Cause of fault:
The autoclave did not achieve its parameter for pressure and/or temperature within the supervision time of 5.5 minutes.

Time of fault:
After program start, during pressure generation (lamp "READY" blinks).
The following reasons can be given:

8.2.1 Autoclave insufficiently ventilated

In this case, the water pump runs only once after the start of the program.
For proper function of the autoclave (death of germs), it is necessary to extract air, respectively air/steam-mixture, out of the vessel. After a program start or during pressure generation, air is extracted through a current channel which branches off in the rear part of the vessel, leads to the measuring block and then thron a fine filter to the inside current jet (43). In this channel the steam-temperature sensor for the electronic system (35) (visable from above in the rear opening of the pressure-vessel bottom, under the sieve insert for the pressure vessel), as well as the temperature sensor of the thermometer (39), are contacted by the flowing steam. In front of the hose connection to the measuring block is an additional steam filter screwed inside the vessel block (44).

Fault diagnosis:
The autoclave will not properly vent if any of the following components are clogged: the sieve insert for the pressure vessel, the fine filter installed upstream of the nozzle (43), or the steam filter (44). The autoclave does achieve a pressure of approx. 2.2 bar (for sterilization), or 0.3--0.4 bar for disinfection within a period of 1.5...3 min. after the start of the program. Although it maintains this pressure, an excessively low temperature (or no temperature at all) is indicated on the thermometer. The autoclave then switches over to fault no. 4 after program start, since the partial pressure of the air is added to that of the steam, which prevents the saturated-steam temperature from being achieved at the prescribed pressure.
Call for a service engineer.
Beyond, every blockage in this area can be recognised with the transparent Teflon hose which leads from the measuring block to a T-junction. In this hose (and thus in the water discharge hose), you can normally see small amounts of flowing steam/condensat. The presence of prescribed temperature (134°C/105°C) will additionally be indicated by an internal LED of the electronic regulation unit.
Fault correction:
Remove the sieve insert. Optical control of ventilation hole in the vessel (bottom of vessel at rear rim). This hole should not be covered or blocked. Check whether somebody has worked without sieve insert so that instruments have covered the ventilation hole.
Check jet (43) and filters (40) and (44), if necessary also steam filter (34), probably clean or replace them. Before complete re-assembly it might be useful to run the autoclave once without fine filter (40) and jet (43) to flush the tubing system and remove any residues.

8.2.2 Pressure switch is wrongly adjusted/defective

In this case, the water pump runs only once after the start of the program.
Diagnosis of fault:
If the autoclave achieves a pressure for sterilization of less than 2.1 bar (or 0.2 bar for disinfection) within 1.5 ... 3 min., if it remains at this insufficient pressure, and if the thermometer reaches the corresponding saturated-steam temperature, then the pressure switch for sterilization (53) or for disinfection (54) is not properly set -- or, it is defective.
The autoclave indicates fault no. 4 without a repeated start of the pump because the prescribed supervision temperature cannot be achieved.
Call for a service engineer.

Fault correction:
Adjust the respective pressure switch by turning the justification screw clockwise so that during pressure generation, a pressure of 2.25...2.3 bar (0.3...0.4 bar) will be reached. If the adjustment has no success, replace the pressure switch.
The autoclave must be placed in the pure pressure-control mode in order to adjust the pressure switch. To make this adjustment, first switch off the power switch (4). Then hook in the two upper wire-clasp switches (A and B) of the 4 wire-clasp buttons / switches (32) on the electronic circuit board, at the lower left on the circuit board (on a blue plastic base). The second switch from the top has already been hooked in at the factory. After adjustment work is completed, make sure that the power switch is off, and unhook the upper wire-clasp switch (A). If adjustment is not possible, the pressure switch must be replaced, and the new switch must be properly adjusted.

8.2.3 Failure of the heating for steam generation

In this case, the water pump runs only once after the start of the program.
Fault diagnosis:
If the autoclave does not build up any pressure while lamp "RUNNING" is blinking and the steam generator under the vessel does not get warm, a fuse has failed or a contact or the electronic regulation unit is defective.

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Call for a service engineer.
Check output of steam generator, fuse and steam generator itself.
Fault correction:
Replace defective element. In case of defective fuse, check the output of the electronic. The semiconductor relay should only operate when the exit is directed (e.g. by test knob). You can observe its operation by the light of the respective LED of output on the electronic circuit. Otherwise, the relay is defective and the electronic must be replaced.

8.2.4 Short circuit of the temperature sensor for steam

In this case, the water pump only once after the start of the program.

Fault diagnosis:
The autoclave reaches a pressure of approximately 2.2 bar (sterilization), respectively 0.3-0.4 bar (disinfection) within 1.5 to 3 minutes after a program start and keeps the pressure constant, but indicates fault No. 4 after 5.5 minutes. The thermometer monitors a temperature of 135°C (105°C) which means that the current jet is clear.
Call for a service engineer.
Fault correction:
Check temperature sensor for steam (screwed into the current channel of the vessel block from underneath) and replace it.

8.2.5 Too small dose of water

In this case, the water pump runs several times after the start of the program.
After a program start, the pump must get into action and, in the required pumping time of 16 seconds, about 150 ml of aqua dest/aqua dem must be raised from water reservoir to the steam generator.
Fault diagnosis:
If this water dose is too small, the pump will start again at release of the steam generator's overheat protection and after the end of the real pumping time. Thus, the correct supervision times for pressure generation and killing may be exceeded.
You must notify the MELAG Customer Service Department.
To check the amount of raised water, loosen the hose connection from pump to vessel block at the vessel block, put the hose's end into a measuring beaker and start the pre-warmed apparatus. After 16 seconds, the pump must stop with an amount of water in the beaker between 130 and 170 ml. After this pumping time, immediately switch off the autoclave, otherwise the pump will start again due to overheat of the steam generator (in order to avoid this during the test, you can remove a cable shoe of the steam generator).
If there are deposits of scale on the top side of the disassembled hose, then it is necessary to clean both this hose as well as the steam generator. See Section 8.2.7.
Fault correction:
1. If the water pump (47) does not start, then the following must be checked: the fuse for the output for the pump, the cable connections, the thermalprotection element installed on the pump (a bimetallic trip), and the pump itself if required.
2. When the amount of water is too small, loosen silicone hose on the suction side of the pump and look if water runs out freely.
   If insufficient water runs out, or no water at all, check to see if the hose is clogged (clogging can perhaps take place in the water storage tank), and /or change the water filter if required.
   Finally, check to make sure that a sufficient amount of water is being pumped.
3. If there is no blockage on the suction side of the pump and the amount of raised water is too small, the pump should be replaced.
4. If the water reservoir is empty, but the autoclave indicates no lack of water, check all cables and the pressure switch for level control, perhaps replace them.

8.2.6 Too much loss of water

In this case, the water pump runs several times after the start of the program.
Fault diagnosis:
After a program start, the autoclave ventilates the vessel through the current jet which is screwed into the measuring block (see also chapter 8.2.1). Then steam constantly flows through this jet into the condenser container. The resulting loss of water is equalized by the amount of water supplied to the steam generator at the beginning of a process. If water gets lost beyond, this can happen due to enlarged current jet, leak in the vessel seal (see also 7.9) or at the solenoid valve, the safety valve or due to a loose coupling.
If the steam generator is calcificated due to bad water quality, the pump will also start again because the overheat protection of the steam generator releases before heat reaches the water inside.
The pump will start again at release of the steam generator's overheat protection and after the end of the real pumping time. Thus, the correct supervision times for pressure generation and killing may be exceeded.
Call for a service engineer.
1. If a loud hissing sound can be heard at the sliding door while the autoclave is under pressure, or if the indicator instruments are fogged, then the cause is one of the following: either the gasket lip has been turned over by improper closing of the sliding door, or the gasket for the pressure vessel is defective.
2. Otherwise, loosen the connection of the hose from the pump to the vessel block, bend hose into a measuring beaker without kinking it and start the pre-warmed apparatus. After

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16 seconds, the pump must stop with an amount of raised water between 130 and 170 ml. Alternatively, you can measure the weight of the condenser container before and after sterilization. The increase of weight must be 130-170g.
If there are deposits of scale on the top side of the disassembled hose, then it is necessary to clean both this hose as well as the steam generator. See Section 8.2.7.

Fault correction:

1. The gasket of the autoclave pressure vessel must be cleaned or replaced (see Section 2.3).
2. If the amount of water is too small, refer to Section 1.1.1.
   If the amount is correct, optically check all joints for leakage when they are under pressure. Watch the water discharge hose of the solenoid valve (short and straight Teflon hose from solenoid valve to a hose-T-junction, left side of the apparatus). Here, no steam should flow. Observe discharge hose of the safety valve (bent Teflon hose from ground plate to hose-T-junction, right side of the apparatus). Here, no steam should flow.
   Tighten all joints, clean or replace magnetic valve or clean safety valve / replace inner parts.
   If there are no such leakages, check the current jet and perhaps replace it. The diameter of the orifice should not be much larger than 0.5 mm.
   If the problem is still not solved (but water supply is okay, no water loss) and the pressure generation operates slower than usual, check the steam generator for calcification. It must be cleaned or changed.

8.2.7 Steam generator is clogged with boiler scale

In this case, the water pump runs several times after the start of the program.

Fault diagnosis:

The water pump (47) starts several times, although amount of the water is sufficient (see Section 1.1.1), and although there are no leaks (see 8.2.6). In addition, the upper side of the hose from the water pump (47) to the pressure vessel unit (37) is covered with scale.
You must notify the MELAG Customer Service Department.

Correction of the fault:

The hose and the steam generator must be cleaned or replaced if required.

8.3 Fault No. 5

Cause of the fault:

After the autoclave has once achieved the sterilization or disinfection parameter for pressure and temperature (as signalled by the lamp "RUNNING" (12)shining continusly), the system is not able to maintain these parameters for the required period of 4 minutes for sterilization, or 6 minutes for disinfection, throughout the monitoring period of 5.5 minutes for sterilization, or 7.5 minutes for disinfection.

Time when the malfunction occurs:

After the start, and after 5.5 minutes (for sterilization) or after 7.5 minutes (for disinfection) after once achieving the sterilization or disinfection parameters for pressure and temperature (as signalled by the lamp "RUNNING" (12) shining continuously).
The cause here can be as follows:

8.3.1 The amount of water measured out is not sufficient / loss of water

In this case, the pump will start during the RUNNING phase but will later switch off again automatically.

This malfunction will cause the pressure and the temperature to fall, which will in turn cause the lamp "RUNNING" (12) to flash and the metering of the sterilization time to stop. See Section 8.2.2 and 8.2.6 for the cause of this malfunction and for ist correction.

8.3.2 Interchange the temperature sensors

Cause of fault:

In this case, the parameters for pressure and temperature are reached after the program start but then, after a short time, pressure considerably falls down to less than 2 bar, without lamp "RUNNING" starts blinking again.
You must notify the MELAG Customer Service Department.

Correction of the fault:

Exchange connection cables of the temperature sensor on the electronic plate (temperature sensor for pre-heating, built in on the side of the vessel block, must be connected to the upper two small connectors; temperature sensor for steam temperature, screwed into the current channel of the vessel block from underneath, must be connected to the lower small connectors).

8.4 Fault No. 9

Cause of the fault:

The autoclave releases a fault too, if you have tried to open the sliding door after the program started (indicated first by a blinking light of lamp "RUNNING" and then by a constant light).
If this fault release happens independently, the justification of the door contact may be incorrect.

Time of fault:

After the program started and before lamp "END" lights.
If this fault repeatedly occurs, although the autoclave is being correctly operated, then you must notify the MELAG Customer Service Department.

Fault correction:

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The setting of the door-contact rod must be checked after the autoclave has been preheated. If necessary, the lock nut on the mircoswitch (50) must be unscrewed, and the position of the switch on the inside of the autoclave must be readjusted. After the readjustment has been made, the lock nut must be tightened again, and the switchpoint (the clickpoint) must be checked. The correct clickpoint is as follows: when the autoclave is preheated, and when the sliding door is locked, the microswitch should click approximately halfway through the travel of the door-contact rod. The total travel should be 2 mm. If the rod which activates the door contact has been damaged by violent pushing of the door while it is locked (i.e., the contact rod is bent in the guide), then this can also lead to malfunction. If the contact rod is bent, the microswitch must be removed, and the contact rod must be straightened. Then reinstall the switch, with the round side facing up, and properly adjust the door contact (see instructions above).

8.5 Fault No. 11

Cause of the fault:

The autoclave registers a steam temperature of 140°C (sterilization), respectively 112°C (disinfection) which is too high.

Time of fault:

1. After the pre-heat phase is over when lamp "READY" normally should change form blinking to a constant light.
2. During operational readiness (the "READY" lamp (11) is already lit).
3. During pressure generation, above 2 bar (sterilization) / 0.3 bar (disinfection), just before lamp "RUNNING" (12) lights constantly.
4. After program started and before lamp "END" lights.

You must notify the MELAG Customer Service Department.

Fault diagnosis:

1. If the fault already appears after the pre-heat phase, either the sensor for steam temperature is defective (resistance is too high or infinite) or the transfer resistance at the connecting places is too high or there is a loose sensor contact (infinite resistance).
2. In this case, the semiconductor relay of the output for the preheating system is defective. The preheating system continues to heat, although the output has not been activated. As a result of thermal coupling (i.e., the temerature sensor is screwed into the preheated pressure-vessel unit), a steam temperature of 140°C is registrated in this case.
3. If the pressure develops normally increase up to a maximum of 2.3 bar for sterilization or 0.4 bar for disinfection), then the temperature sensor has a loose contact, or there is poor contact at the terminal.
4. The electronic circuit board has become moist as a result of a leak in the door gasket, because of the condensate (see Section 3.1), or because of the moisture which has entered the autoclave by another route. As a result, the contact resistance values have changed.

Fault correction:

1. Clean sensor contacts, i.e. replace steam sensors (screwed into the current channel of the vessel block from underneath).
2. Replace the semiconductors relay for the preheating system, or replace the entire electronic circuit board.
3. Clean sensor contacts, i.e. replace steam sensors (screwed into the current channel of the vessel block from underneath).
4. Allow the electronic control system to dry, or clean it with methylated alcohol (C_2H_6O). Replace if necessary.

8.6 Fault No. 12

Cause of the fault:

The autoclave will go into the malfunction mode when the quality (conductivity) of the demineralized or distilled water is so poor that the autoclave and the instruments could be damaged. (also see Section 1.7).

Time of the fault:

Two seconds after pressing the "START" button (7).

Correction of the fault:

Drain the water out of the water reservoir (see Section 5.3.2). Rinse out the water storage tank with demineralized or distilled water as described in Section 5.3. Then fill again with adequate water (see Section 3.3).

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8.7 Fault No. 15

Cause of the fault:
The power switch was turned off during a program cycle, or there was an interruption of power to the autoclave. This fault will be printed out on the log only if the last log is printed out again (see Section 1.5).

Correction of the fault:
Start the program and sterilize / disinfect the batch of the instruments again.

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9 Spare parts

Article	Description	Article	Description
30570	waste water hose 1.5 m (22)	31970	Sieve for steam filter (41)
alternative 39310	waste water hose (give length) (22)	31160	Fine filter in the measuring unit (44)
12550	vessel seal (below sliding door)	31465	water pump (47)
34115	current jet (43)	38705	pressure switch sterilization (53)
30720	ball for safety valve (42)	39695	pressure switch disinfection (54)
31825	water filter (46)	40812	pressure switch water level (45) (since fabr no 94 12 213)
31175	solenoid valve for pressure release (49)	30360	electronic regulation unit (since fabr. no. 94 12 5000)
29570	coil for solenoid valve	30470	front panel w. electr. indication (since fabr.no. 94 12 5000)
39100	rectifier plug for solenoid valve	31140	plug for water discharge hose (19)
31095	pressure gauge (5)	31530	lid for water reservoir (3)
30640	thermometer (6)	30480	cover caps for door face

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