

# Operating instructions

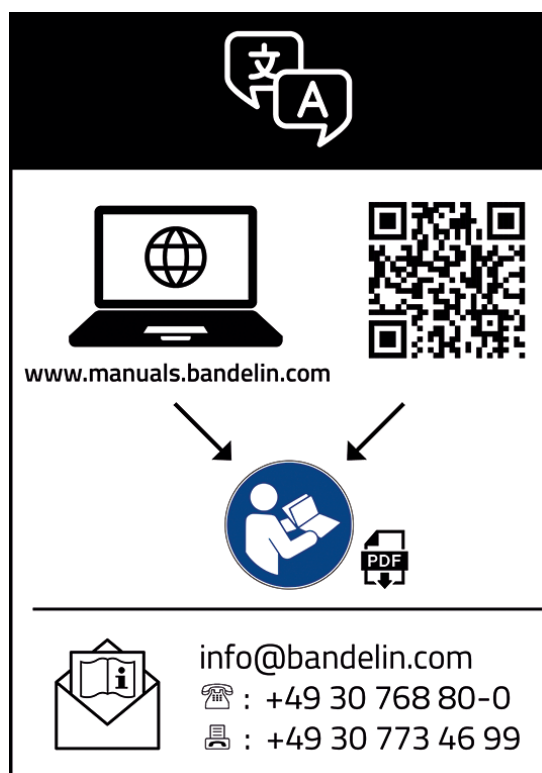
## ***SONOREX smart***

High-performance ultrasonic bath



### **Valid for:**

ST 102 H, ST 103 H  
ST 156 BH  
ST 170 H  
ST 255 H  
ST 510 H  
ST 514 H, ST 514 BH  
ST 1028 H, ST 1028 CH  
ST 1050 CH



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Certified to ISO 9001 and ISO 13485

# Contents

<b>1</b>	<b>About these operating instructions .....</b>	<b>5</b>
<b>2</b>	<b>Safety .....</b>	<b>6</b>
2.1	Using the device .....	6
2.2	Use in the medical field .....	6
2.3	Avoidance of cross-contamination and infections .....	7
2.4	Keep away from children .....	7
2.5	Risk of electric shock .....	8
2.6	Damage to health due to ultrasonic noise .....	8
2.7	Danger due to high temperatures .....	9
2.8	Danger due to ultrasound .....	9
2.9	Danger due to the agents used .....	10
2.10	Disposing of sonication fluid .....	10
2.11	Erosion of the oscillating tank .....	11
2.12	Preventing damage to the device .....	11
2.13	Interference with wireless communication .....	12
2.14	Safety stickers on the device .....	12
2.15	Not overloading accessories .....	12
<b>3</b>	<b>Construction and function .....</b>	<b>13</b>
3.1	Construction .....	13
3.2	Control panel .....	13
3.3	Symbols and buttons .....	14
3.4	Function .....	15
<b>4</b>	<b>Preparation for operation .....</b>	<b>16</b>
4.1	Installation site requirements .....	16
4.2	Installing the ball valve .....	16
4.3	Switching the ultrasonic bath on and off .....	16
4.3.1	Default settings (putting into service for the first time) .....	17
4.4	Performing a functional test .....	17
4.5	Rinsing the oscillating tank .....	18
4.6	Change settings .....	18
4.6.1	Temperature menu .....	18
4.6.2	Time menu .....	18

4.6.3	Mode menu .....	18
4.6.4	Programmes menu .....	19
4.6.5	Settings menu .....	20
4.6.6	Functions menu .....	21
<b>5</b>	<b>Operation .....</b>	<b>22</b>
5.1	Direct and indirect sonication .....	22
5.2	Sonication liquid .....	22
5.3	Sonication time .....	23
5.3.1	Pour in sonication fluid .....	24
5.4	Switching sonication on and off .....	26
5.5	Switching the heating on and off .....	26
5.6	Degassing the sonication liquid – DEGAS .....	28
5.7	Introducing objects to be sonicated .....	28
5.8	Removing objects to be sonicated .....	29
5.9	Emptying the oscillating tank .....	29
5.10	Logging function: Save Logs .....	30
5.11	Remote control .....	30
5.12	Troubleshooting .....	31
<b>6</b>	<b>Maintenance .....</b>	<b>32</b>
6.1	Servicing .....	32
6.2	Cleaning and looking after the ultrasonic bath .....	32
6.3	Tests .....	33
6.4	Repairs .....	34
<b>7</b>	<b>Disposal .....</b>	<b>35</b>
<b>8</b>	<b>Information about the device .....</b>	<b>36</b>
8.1	Technical specifications .....	36
8.2	Ambient conditions .....	39
8.3	CE conformity .....	39
<b>9</b>	<b>Dosing table .....</b>	<b>41</b>
<b>10</b>	<b>Approved accessories .....</b>	<b>42</b>
<b>11</b>	<b>Performing the foil test .....</b>	<b>48</b>

# 1 About these operating instructions

These operating instructions contain information that is necessary and useful in order to use the device safely and efficiently.

- Read these operating instructions before using the device.
- Pay particular attention to Section **2 Safety**.
- If you pass this device on to someone else, provide these operating instructions with it.
- Should these operating instructions leave any questions unanswered, please contact your specialist dealer or BANDELIN. Notes on service can be found in Section **6.4 Repairs**.

In the event that the translation cannot be understood, the German original version of BANDELIN must be followed.

BANDELIN assumes no responsibility or liability for damage caused by improper handling or use.

Illustrations are exemplary and not to scale. Decorations not included with delivery.

## 2 Safety

### 2.1 Using the device

You can use the device for the following applications:

- Ultrasonic cleaning of objects of various shapes, types and sizes
- Homogenisation, emulsification
- Rapidly degassing liquids
- Sonochemical applications, e.g., for generating radicals or for improved substance transport
- Preparing samples for analysis

A solution consisting of water and a special agent for application with ultrasound is used as the sonication liquid. Refer to Chapter **5.2 Sonication liquid** for information on the sonication liquid.

Objects to be sonicated must not be placed on the bottom of the oscillating tank. They must be placed in an insert basket or other suitable container in the sonication liquid. An overview of approved accessories can be found in Chapter **10 Approved accessories**.

In the event of stains, discolouration, rust deposits, etc., basic cleaning can be carried out using special detergents and indirect sonication.

Do not allow the unit to run without supervision.

### 2.2 Use in the medical field

The medical purpose of the device is to clean instruments. Ultrasonic cleaning is carried out as part of further necessary steps to reprocess medical devices.

Please observe hygiene requirements in accordance with the applicable regulations. The device is a Class I medical device per Regulation (EU) 2017/745.

EMDN nomenclature: Z12011302

#### Indications/areas of application

Medical instruments can be cleaned in the device as part of manual reprocessing as well as before or after machine reprocessing. The specifications from the instrument manufacturer provide information about its suitability for ultrasonic cleaning.

### **Contraindications/exclusions**

- Optical equipment, camera systems, light guides, mirrors or objects made from or with elastic materials (e.g., catheters, ventilator system functional parts, flexible endoscopes) are either not suitable or are only conditionally suitable for sonication. The specifications from the relevant manufacturer provide information about suitability for ultrasonic cleaning.
- The device is not suitable for cleaning and disinfecting contact lenses.
- Direct sonication of flammable fluids is not permitted.

### **Possible side effects/restrictions**

- Ultrasound does not disinfect. However, processes such as chemical disinfection can be accelerated in the device.
- Surfaces can be mechanically attacked by cavitation erosion and coatings can be detached.

### **Intended users**

The device may be used by persons who are qualified for their work, e.g., in reprocessing instruments, and have received instruction in it.

Being pregnant is not a contraindication to controlling the device.

Serious incidents must be reported to BANDELIN electronic GmbH & Co. KG and the competent authority.

## **2.3 Avoidance of cross-contamination and infections**

To avoid cross-contamination, regularly clean and disinfect the surfaces of the ultrasonic bath with a surface disinfectant that at least has bactericidal, levurocidal and limited virucidal properties. Regularly prepare accessories, such as basket holders and insert baskets, in a cleaning and disinfection device (CDD).

At higher temperatures, vapours and aerosols contaminated with introduced impurities can rise out of the ultrasonic bath. This can lead to infections when cleaning objects contaminated with germs. For these applications, avoid bath temperatures of more than 40 °C. If necessary, use a cover, a suction device or protective equipment.

## **2.4 Keep away from children**

Children may not detect hazards emanating from the device. Therefore, keep the device away from children.

## 2.5 Risk of electric shock

The ultrasonic bath is an electrical device. Failure to follow safety rules may result in a life-threatening electric shock.

- Do not allow the ultrasonic bath to become damp or wet. Keep the surface and touchscreen clean and dry.
- Only transport the ultrasonic bath when it is empty.
- Do not shower the ultrasonic bath, immerse it in water, or expose it to splash water.
- Only connect the device to an earthed socket whose earthing contact matches the earthing contact of the device's plug.



### **WARNING**

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**Note for unit with type E+F jack:**

Combination with K-type sockets (especially common in Denmark) is not permitted.

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- Ensure that there are no leakages.  
No moisture may enter the device.
- If you discover a defect in the ultrasonic bath, unplug it at the mains immediately. Do not connect an ultrasonic bath to the mains if it is defective.
- Only have repairs carried out by qualified, authorised personnel or by the manufacturer.  
See section **6.4 Repairs**.
- Position the ultrasonic bath so that it is possible to disconnect the mains connection without difficulty.

## 2.6 Damage to health due to ultrasonic noise

The typical ultrasonic noise produced during a procedure can be perceived as very unpleasant. Remaining within a radius of 2 m for a long period of time may cause you to suffer damage to your health.

- Wear suitable hearing protection.
- Use a cover to reduce noise. The device can also be used in a sound-proof box.



## 2.7 Danger due to high temperatures

The device, the sonication liquid and the objects to be sonicated may become hot during operation. Touching them may cause burns. The temperature can be set at up to 80 °C. Ultrasound heats the sonication fluid even without additional heating. Very high temperatures can occur during prolonged ultrasound operation. In the case of a device that has heating, the set temperature can be significantly exceeded by the energy of the ultrasound.

- Observe the treatment times recommended by the manufacturer of the ultrasound agent. Do not leave the ultrasound on for longer than necessary.
- Do not reach into the sonication fluid by hand. Remove objects to be sonicated using the insert basket or forceps.
- Allow the objects to be sonicated to cool before touching them.
- When lifting by the handles, your hands may touch the edge of the oscillating tank, which may be very hot. Allow the device to cool after operation before lifting it for emptying.

Non-aqueous fluids can heat up many times faster than water. A possible flashpoint can be reached, and exceeded, after a very short period of sonication. In the case of fluids with high boiling points, the bath temperature can rise to over 120 °C due to the energy supplied by the ultrasound. This can lead to fires and severe burns.

- Do not use combustible, explosive or non-aqueous fluids (e.g., petrol, solvent) or mixtures with combustible liquids (e.g., alcoholic solutions) directly in the stainless-steel oscillating tank.
- Small amounts of combustible liquids in sample vessels can be sonicated indirectly. Before exposing combustible liquids to sonication, familiarise yourself with the necessary safety measures and applicable regulations for when handling these liquids.

## 2.8 Danger due to ultrasound

The strong ultrasound in the unit destroys cell structures. If a body part is immersed in the sonication fluid during operation, this can lead to skin damage, but also to internal tissue damage. The fingers' periosteum can become damaged.

- Do not reach into the sonication fluid during operation.
- Never expose living things to ultrasound.

## 2.9 Danger due to the agents used

The agents used in the device can be toxic or corrosive. They can irritate eyes, skin and mucous membranes. The vapours and aerosols can also be dangerous.

- Wear gloves and goggles when handling hazardous agents.
- Do not ingest the agents, and avoid bringing them into contact with eyes or skin. Avoid bending over very close to the device in order to avoid vapours coming into contact with your eyes or inhaling the vapours.
- Place a cover on the device during operation. In the event of dangerous vapours, use an extraction system.
- Observe the information on the label and in the safety data sheet of the agent.
- Keep agents away from children and untrained persons.

## 2.10 Disposing of sonication fluid

Dispose of the sonication fluid according to the instructions of the manufacturers of the ultrasonic agents used. The recommended ultrasonic agents belonging to the TICKOPUR, TICKOMED and STAMMOPUR product series from DR. H. STAMM GmbH are biodegradable in accordance with the provisions of Regulation (EC) No. 648/2004 (Detergents Regulation). If necessary, the sonication fluid must be neutralised before disposal.

Depending on the type of contamination, substances hazardous to water, e.g., oils or heavy metal compounds, may have been introduced into the sonication fluid during cleaning. If the limit values for these substances are exceeded, the sonication fluid must be treated or disposed of as hazardous waste.

Observe local sewage regulations.

## 2.11 Erosion of the oscillating tank

The surface of the oscillating tank is subject to erosion. How quickly this erosion takes place depends on the use of the ultrasonic bath. The erosion leads to leakage points in the oscillating tank. Bath fluid can thus enter the interior of the ultrasonic bath. Moisture on electrical components can cause an electric shock or fire.

- Do not use the ultrasonic bath if you notice a leak. Disconnect the mains plug immediately. Empty the oscillating tank.

You can extend the lifespan of the oscillating tank by observing the following instructions:

- Replace sonication liquid that is visibly contaminated by particles.
- Only use demineralised water (deionised/DI water) with an ultrasound-compatible agent.
- Do not use chemicals that contain or release chloride ions in the ultrasonic oscillating tank. This is the case with some disinfectants, household cleaners and dishwashing detergents. Chloride ions cause corrosion on stainless steel.
- Only use the ultrasonic bath with accessories that are suitable for the ultrasonic bath and the instruments. Do not place instruments directly on the bottom of the oscillating tank. An overview of approved accessories can be found in Chapter **10 Approved accessories**.

## 2.12 Preventing damage to the device

- Only use aggressive agents in inset beakers or insert tubs. When working with aggressive agents, avoid splashes that get into the contact liquid or onto the stainless steel surface. Replace contaminated sonication fluid immediately. Clean surfaces and wipe them dry.
- When using strongly acidic agents, the ball of the ball valve can be affected. The ball valve will start to leak. If the use of strongly acidic detergents cannot be avoided, use a stainless steel ball valve.
- Do not operate the device without sonication fluid in the oscillating tank. Make sure that the heating is switched off when the oscillating tank is empty. The fill level must be at or just above the filling level mark.

## 2.13 Interference with wireless communication

The device may interfere with other wireless communication devices in close proximity, such as:

- Mobile phones
- Wi-Fi devices
- Bluetooth devices

If a wireless device malfunctions, increase its distance from the device.

The device complies with the requirements for Class B devices according to EN 55011.

## 2.14 Safety stickers on the device

- Observe all safety stickers on the device.
- Keep the safety stickers in a readable state. Do not remove them. Replace them when they are no longer legible. Please contact our customer service for this. See section **6.4 Repairs**.

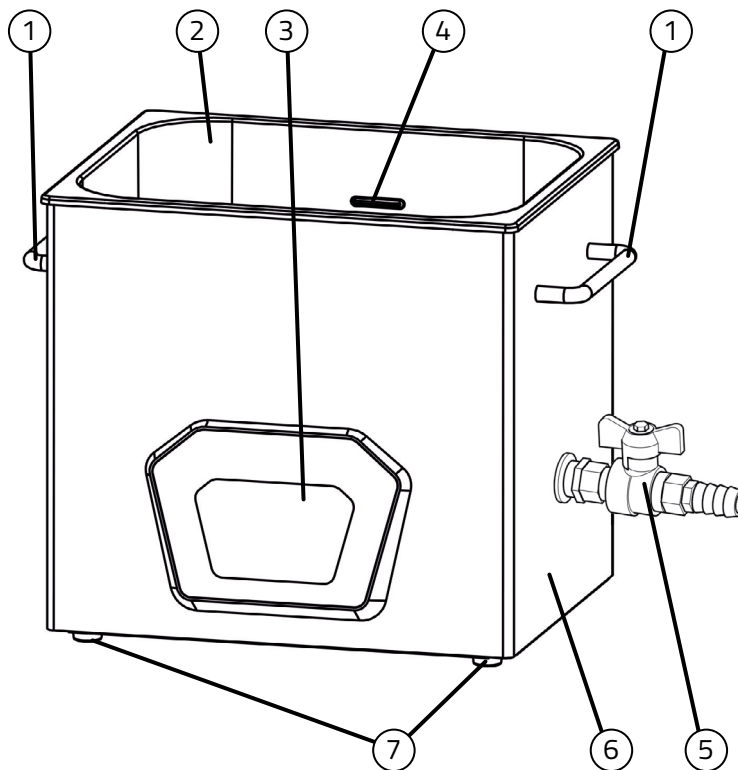
## 2.15 Not overloading accessories

Observe the specified load capacity or load capacity of the respective accessory used.

- Accessories can be baskets and receptacles.
- The corresponding information can be found in the appendix or in the dimension sheet. If you do not have this information, please contact the manufacturer.

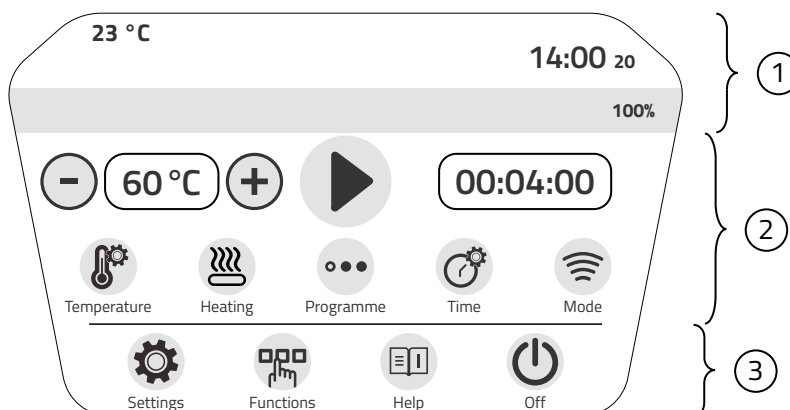
## 3 Construction and function

### 3.1 Construction








































- 1 Handles
- 2 Oscillating tank
- 3 Control panel
- 4 Filling level mark
- 5 Outlet with ball valve
- 6 Housing
- 7 Device feet

### 3.2 Control panel



- 1 Status display (temperature, time, power, etc.)
- 2 Values
- 3 Menus

### 3.3 Symbols and buttons

	Button, Minus or decrease value		Button, Home
	Button, Plus or increase value		Button, Confirm or Save
	Button, Start		Button, Cancel
	Button, Stop		Button, Back
	Temperature menu		Button, Next
	Button, Heating		Button, DEGAS (degassing)
	Programmes menu		Button, Power
	Time menu		Button, Interval
	Mode menu		Button, Foil Test
	Settings menu		Button, Dosing
	Functions menu		Button, ECO mode
	Button, Help		Button, Autostart
	Button, Off		Button, Alarm
	Button, Preheat		Button, Retardation of Boiling
	Button, Temperature Warning		Button, Documentation
	Button, Back		Button, Sleep Mode
	Button, Reset		Button, Interfaces
	Button, Information		Button, Administrator
	Button, Key Tones On/Off		

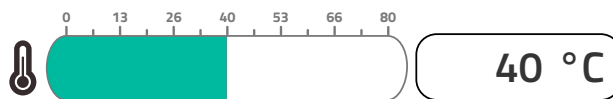
**23 °C** Current measured temperature

**14:00** 20 Current set time

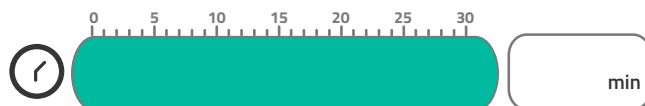
**100%** Current set power

**60 °C** Set target temperature

**00:04:00** Set sonication time



Slider, Temperature



Slider, Sonication Duration – Time  
Preselection or Process Duration

## 3.4 Function

The device uses cavitation triggered by low-frequency ultrasound. Piezoelectric transducers are located on the underside of the oscillating tank. The ultrasound generates strong pressure fluctuations in the sonication fluid. Cavitation bubbles are formed at the pressure minima. At higher ambient pressure around the bubbles, they collapse very quickly. This creates strong local micro-currents on the surfaces of the exposed items. This removes contamination from the surface of the objects. Dirt particles are transported away, and fresh sonication fluid flows in.

The device uses SweepTec®, a technology in which the ultrasonic frequency often changes by the level of the operating frequency. The optimal operating frequency depends on the load, fill level, temperature and type of sonication fluid. The operating frequency can deviate significantly from the nominal frequency. SweepTec® creates a particularly homogeneous ultrasonic field in the bath volume to ensure optimal results at all times.

## 4 Preparation for operation

### 4.1 Installation site requirements

The installation site of the device must meet the following conditions:

- The installation surface must be horizontal, firm and dry.
- The load-bearing capacity must be sufficient for the device together with the sonication liquid. For weight and operating volume, see section **8.1 Technical specifications**.
- Adequate ventilation must be ensured. The air supply under the bottom of the device must not be impeded by objects. If a sound-proof box is used, it must also allow for adequate ventilation.
- A water connection for filling the device should be located nearby. A basin for draining or pouring out the sonication fluid must be on hand.

### 4.2 Installing the ball valve

Install the supplied ball valve, the hose socket and the hose in accordance with the installation instructions enclosed with the ball valve.

### 4.3 Switching the ultrasonic bath on and off

#### Switching the ultrasonic bath on

Insert the mains plug of the device into an earthed socket.

The display will start to light up.

After a few seconds (approx. 5 seconds), the home screen will appear on the touchscreen.

If the "Off" button has previously been pressed, the touchscreen need only be touched to switch it on.

If the home screen has not appeared after a long time, see **5.12 Troubleshooting**.

#### Switching off the ultrasonic bath

Press the "Off" button on the display.

The mains plug can also be unplugged to switch the device off permanently.



### 4.3.1 Default settings (putting into service for the first time)

After switching the device on for the first time, you will be automatically guided through the menus to the default settings.

You will proceed through the following menus; click on the "Confirm" button to confirm:

- Language
  - Here, you can select one of the displayed languages for your device.
- Time/date
  - Please set the current time and date.
- Use assisted control for the first run?
- Dosage
  - Please set the values for your ultrasonic bath – concentration and operating volume. The dosage will be calculated and displayed automatically.
- Temperature
  - Please set the desired values. See section **4.6.1 Temperature menu**.
- Sonication time
  - Please set the desired values. See section **4.6.2 Time menu**.
- Mode
  - Please set the desired values. See section **4.6.3 Mode menu**.
- Start
  - Settings complete. The process can be started in the next step.

## 4.4 Performing a functional test

### Requirement

- The device must have adapted to the climatic conditions at the installation site for at least 2 hours.

### Procedure

1. Plug the mains plug of the device into an earthed socket.
2. Briefly switch on the ultrasound (Start/Stop) for 1 to 2 seconds.

If you do not hear a noise, contact servicing.

A foil test should be performed before the first application. This serves to document the effect of the ultrasound.

See Chapter **11 Performing the foil test**.

## 4.5 Rinsing the oscillating tank

Thoroughly rinse the device's oscillating tank with water before using for the first time. To protect the surfaces during transport and storage, the device is provided with a grease-containing preservative. This preservative must be removed with a suitable cleaner before putting the device into service.

## 4.6 Change settings

### 4.6.1 Temperature menu

- You can use the slider to set the desired temperature or click directly on the temperature number.  
An input screen will appear in which you can enter the temperature.  
Click the "Confirm" button to confirm.
- With the "Preheat" button, you can preheat the sonication liquid without ultrasound.  
To activate, click on the "Heating" button.
- The "Temperature monitoring" button allows you to set whether the ultrasonic bath emits a warning sound when a set temperature has been reached.  
Click on the "Confirm" button to confirm.

### 4.6.2 Time menu

- You can enter times for hours, minutes and seconds via the input screen.  
To confirm, click on the "Confirm" button.

### 4.6.3 Mode menu

- You can activate degassing with the "DEGAS" button and deactivate it by clicking again.
- If you click on the "Power" button, you can set the output power. To do this, click on the "Plus" and "Minus" buttons or directly on the number. An input screen will appear in which you can enter the power.  
Click the "Confirm" button to confirm.
- If you click on the "Interval" button, you can set the pulsation of the ultrasound output. To do this, you can select "Off" and "On" with the slider and click on the respective number below. An input screen will appear in which you can enter the seconds.  
Click the "Confirm" button to confirm.
- Select the "Next" button.
- You can activate the eco mode with the "Eco" button and deactivate it again by clicking again.

- You can activate the pulse mode with the "Pulse" button and deactivate it by clicking again.
- You can use the "Retardation of boiling" button to activate retardation of boiling and deactivate it by clicking again.



#### Information

Set the power to 100% for foil tests, degassing, and cleaning tasks. Pulsate and disable ECO.

### 4.6.4 Programmes menu

Here, you can save preset programmes as well as access and activate them if necessary.

- A list of all stored programmes is displayed. A preset programme can be selected you clicking on it, and activated with the "Start" button.

#### Create a new programme

- Select the "Plus" button.
- Enter a name.
- Select the "Next" button.
- Set the temperature – see also Temperature menu.
- Select the "Next" button.
- Set the sonication time – see also Time menu.
- Select the "Next" button.
- You can activate degassing with the "DEGAS" button and deactivate it by clicking again.
- Set the power – see also Power in the Mode menu.
- Set the interval – see also Power in the Mode menu.
- Select the "Next" button.
- You can activate the eco mode with the "Eco" button and deactivate it again by clicking again.
- You can activate the pulse mode with the "Pulse" button and deactivate it when you click again.
- Select the "Next" button.
- Finally, an overview of the values you have set will be displayed. Click on the "Confirm" button to confirm.
- The created programme will be displayed in the list.

## 4.6.5 Settings menu

Here, you can define the basic settings for your device.

- After clicking on the "DEGAS" button, you can set the duration.  
You can set the desired time with the slider or click on the minute number directly. An input screen will appear in which you can enter the minutes.  
Click the "Confirm" button to confirm.
- After clicking on the "Foil test" button, you can set the duration and reminders.  
First, click on the "Time" button to set the duration of the foil test. To do this, click on the "Plus" and "Minus" buttons or directly on the number. An input screen will appear in which you can enter the minutes.  
Click the "Confirm" button to confirm.
- If you want a reminder for regular foil tests, click the "Reminder" button to set it.  
Here, you can choose between Weekly, Monthly, Quarterly, Every Six Months, Annual or Daily.  
Activate the desired frequency by clicking on it.  
Click the "Confirm" button to confirm.
- If you want a log, click on the "Documentation" button to set it.  
To do this, you must input entries about the institution.  
In the lines shown, you can, for example, input your company or the name of the institution and the address. To do this, select a row and click "Edit". The information entered will be listed in the logs.  
Click the "Confirm" button to confirm.  
You must also enter email data.  
You can enter your email address in the lines shown. To do this, select a row and click "Edit".  
Click the "Confirm" button to confirm.  
After you have made the entries, you can activate and deactivate logging.
- Select the "Next" button.
- If you click on the "System" button, you can configure further settings.  
If you click on the "Time/Date" button, you can set the time and date. You can click on the number directly to do this. An input screen will appear in which you can enter the numbers.  
Click the "Confirm" button to confirm.  
Click the "Brightness" button to adjust the brightness of the display. To do this, click on the "Plus" and "Minus" buttons or directly on the number. An input screen will appear in which you can enter the value.  
Click the "Confirm" button to confirm.  
Click the "Language" button to set the desired language.  
Click the "Confirm" button to confirm.  
Click the "Sleep Mode" button to configure automatic shutdown. To do this, click on the "Plus" and "Minus" buttons or directly on the number. An input screen will appear in which you can enter the value.

Click the "Confirm" button to confirm.

If you click on the "Interfaces" button, you can configure further settings. Read the IP address of the device, activate email log transmission and activate remote access via TCP mode.

The USB/LAN docking station DST 01 is required to use the interfaces.

After clicking on the "Units" button, you can set the desired unit. Operate the slider accordingly to set °C or °F.

- Select the "Next" button.
- By clicking on the "Information" button, you can see the software version and operating times.
- By clicking on the "Administrator" button, you can reset the settings after entering the password "Bandelin". Click the "Factory Reset" button.

### 4.6.6 Functions menu

Here, you can run recurring programmes.

- If you click on the "Foil Test" button, you can carry out a foil test.

It is performed as follows:

- Always carry out foil tests under the same conditions!
- Fill the oscillating tank
- Check the temperature
- Degas the liquid
- Cover the frame
- Immerse the frame
- Sonicate the foil
- Evaluate the foil
- Archive with test data and serial number of the ultrasonic bath
- Rinse the tank thoroughly

## 5 Operation

### 5.1 Direct and indirect sonication

Objects can be sonicated directly in the device or indirectly.

Direct sonication is the standard procedure. The objects to be sonicated are placed with approved accessories, e.g., a basket, in the oscillating tank, where they will be in direct contact with the sonication liquid.

Indirect sonication is used in the following cases:

- Sonication of sample liquids
- Application of chemically aggressive or combustible liquids
- Application of deionised water without additives
- Removal of chemically aggressive contamination
- Removal of stains, discolouration and rust deposits with acidic agents

The objects or liquids to be sonicated are introduced, using an inset beaker, into the contact liquid for transmitting the ultrasound in the oscillating tank. The contact liquid in the oscillating tank must contain an agent that includes surfactant.

For approved accessories for direct and indirect sonication, see Chapter **10 Approved accessories**.

### 5.2 Sonication liquid

A solution made from water and a special ultrasonic agent is used as the sonication liquid. Drinking water or fully demineralised water (aqua purificata) can be used as water.

Water without any additive is unsuitable for sonication. Use of aqua purificata without an ultrasonic agent will result in increased erosion of the ultrasonic oscillating tank.

The ultrasonic agent used must be cavitation conducive, biodegradable, easy to dispose of, gentle on materials and long-lasting. BANDELIN recommends ultrasonic agents from the TICKOPUR, TICKOMED and STAMMOPUR product series from DR. H. STAMM GmbH.

- Telephone advice: +49 30 76880-280
- Website: [www.dr-stamm.de](http://www.dr-stamm.de)

Observe the instructions from the ultrasonic agent's manufacturer regarding dosing. The necessary amounts of agent and water can be easily calculated using the device's dosing calculator: -> Functions -> Dosing calculator.

Alternatively, you can use the dosing table (see section **9 Dosing table**) or calculate the quantities yourself using the following example:

9 l of ready-to-use solution, 2.5%:

Agent: 
$$\frac{9 \text{ l} \times 2,5 \%}{100 \%} = 0,23 \text{ l}$$

Quantity of water:  $9 \text{ l} - 0,23 \text{ l} = 8,77 \text{ l}$

## 5.3 Sonication time

### NOTICE

#### **Danger of damage to the objects to be sonicated**

Excessive sonication can damage the surface of objects being sonicated.

– Choose the shortest possible sonication duration.

The optimal sonication time depends on a number of factors:

- Type and concentration of the agent
- Temperature of the sonication fluid
- Type of contamination
- Type of objects to be sonicated, especially materials

Observe the specifications of the agent's manufacturer for the recommended sonication duration. At the start, choose the shortest possible sonication time to protect the goods to be treated and the ultrasonic oscillating tank. Check the result. Extend the sonication time if the result is insufficient.

### 5.3.1 Pour in sonication fluid

#### NOTICE

---

##### **Danger of damage**

- Do not fill the oscillating tank with hot water.
  - Maximum filling temperature: 50 °C.
- 

#### NOTICE

---

##### **Damage to the ultrasonic bath due to condensate**

At high humidity, condensation forms on the outside of the oscillating tank when it is filled with cold water.

- Do not fill the oscillating tank with cold water at high humidity.
- 

#### NOTICE

---

##### **Damage to the oscillating tank**

If you are using an agent in powder form, do not put it directly into the oscillating tank.

- Mix any powder agents in another container before placing them in the oscillating tank.
  - Do not put the agent in the oscillating tank until it has dissolved completely.
- 

#### NOTICE

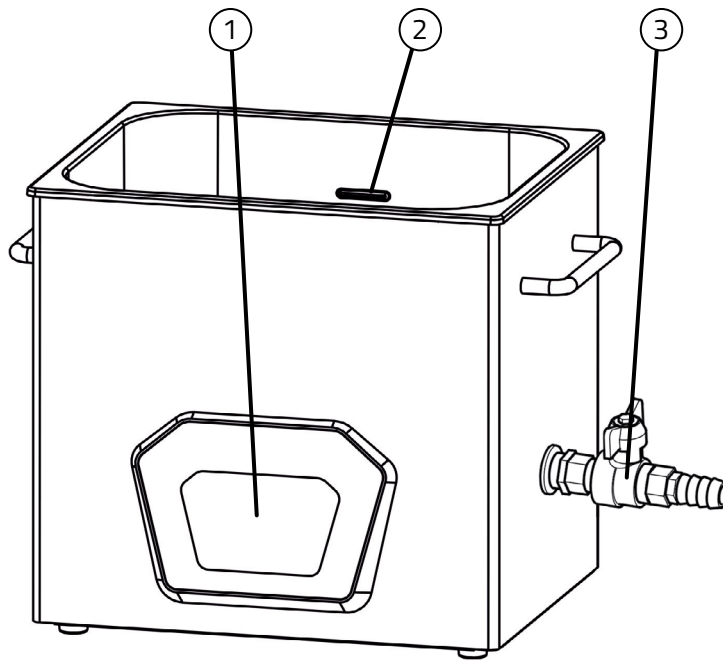
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##### **Damage to the device**

Too low a filling level leads to damage to the ultrasonic bath.

---





- 1 Control panel
- 2 Filling level mark
- 3 Outlet with ball valve

### Requirements

- The ball valve must be closed.
- The device must be switched off.

### Procedure

1. Fill 1/3 of the oscillating tank with water.
2. Dose the agent into the oscillating tank. See Chapter **9 Dosing table** or press the "Dosing" button to determine the required quantity.
3. Fill up to the filling level mark with water, avoiding foaming. For indirect sonication, take account of the displacement due to inset containers.

## 5.4 Switching sonication on and off

### Requirements

- The oscillating tank is filled.
- The mains plug is plugged into an earthed wall socket.

### Procedure

1. If present, place the cover on the device.
2. Tap the "Start" button.
  - » The ultrasound is switched on. The ultrasound noise can be heard.
3. To switch the sonication off, tap the "Stop" button.
  - » The ultrasound noise can no longer be heard.



#### Information

- 
- You can extend, shorten or switch off sonication at any time.
- 

## 5.5 Switching the heating on and off



### WARNING

#### Risk of scalding

During heating, steam bubbles can rise explosively under certain conditions (retardation of boiling).

- Occasionally stir the sonication liquid during heating, or switch on the ultrasound.
- 

Warm sonication liquid intensifies the effect of the ultrasound. Experience has shown that the best result is achieved at a temperature of 50 to 60 °C. This can reduce the duration of sonication. At higher temperatures, the effect of the ultrasound decreases again.

To reprocess medical instruments, do not heat sonication liquid above 45 °C.

Ultrasound also warms the sonication liquid. During continuous operation, especially when the oscillating tank is covered, the temperature of the sonication fluid can rise above the set value. That is why you should check the temperature during sonication of temperature-sensitive items.

- Observe the specifications of the agent's manufacturer for the optimal temperature.
- It is optimal to do preheating while degassing the sonication fluid. See section **5.6 Degassing the sonication liquid – DEGAS**.
- To preheat, remove the basket or other accessories from the oscillating tank. Put on the oscillating tank's cover, if available.

- The cover used must not completely seal the oscillating tank – steam must be able to escape.



#### Information

- The heating operates independently of the ultrasound.
- It may only be possible to reach a bath temperature greater than or equal to 80 °C with the lid on.
- To achieve a shorter heating time and homogeneous temperature distribution throughout the sonication liquid in the ultrasonic bath, switch on the ultrasound during the preheating phase.

### Requirements

- The oscillating tank is filled.
- The mains plug is plugged into an earthed wall socket.

### Procedure

1. If present, place the cover on the device.
2. Tap the "Heating" button.
  - » The temperature display in the status area begins to rise.
3. To switch off heating, tap the "Heating" button again.

## 5.6 Degassing the sonication liquid – DEGAS

Sonication liquid that has been freshly poured in or that has remained in the oscillating tank for a long time must be degassed before use. Degassing the sonication liquid increases the effect of the ultrasound. The DEGAS function allows rapid degassing of the sonication liquid.

- Put on the oscillating tank's cover, if available.
- To degas, tap the "DEGAS" button.
  - » The ultrasound is switched on with parameters for rapid degassing. The ultrasound noise can be heard.

The degassing time is:

- Sonication liquid volume up to 10 litres:  
10 minutes
- Sonication liquid volume over 10 litres:  
30 minutes



### Information

During degassing, the ultrasonic noise becomes quieter. This means that the ultrasound effect is increasing.

## 5.7 Introducing objects to be sonicated

To achieve a good result, observe the following instructions when introducing objects to be sonicated:

- Before each sonication process, check to ensure that the sonication liquid is not contaminated. If there is visible contamination, replace the sonication liquid.
- The sonication fluid must be degassed. See section **5.6 Degassing the sonication liquid – DEGAS**.
- The sonication liquid must be preheated to the desired temperature before you add items.
- Use approved accessories, such as a basket. Do not place items directly on the bottom of the oscillating tank. For sensitive objects, use a silicone base pad. See section **10 Approved accessories**.
- Spread out the items. Do not stack them. Sensitive items must not touch other items.
- The ultrasound must be switched off while inserting objects.
- Check the filling level. Objects to be sonicated must be completely covered with liquid. Inset beakers for indirect sonication must be immersed at least 2 cm below the surface of the contact liquid.
- Remove air bubbles from cavities. Rotate the objects accordingly. Remove air bubbles under inset beakers. The ultrasound is only effective where liquid is in contact with the objects to be sonicated or the inset beaker.

- Place the more contaminated side downwards. Place items with joints (e.g., scissors, tongs) in an open state so that the sonication fluid is able to optimally cover the entire surface.

## 5.8 Removing objects to be sonicated



### WARNING

#### Risk of scalding

The sonication liquid, the objects to be sonicated, the surface of the device, and the accessories can be very hot.

- Do not touch the surface of the device or accessories, such as the cover. Do not reach into the sonication liquid.
- Allow the objects to be sonicated to cool before touching them.

Switch off the ultrasound before removing objects to be sonicated.

Do not remove objects to be sonicated by hand. Carefully remove, for example, the insert basket containing the objects to be sonicated and place it on a flat surface.

Rinse the objects to be sonicated with clear water.

Do not leave objects to be sonicated in the sonication fluid for too long. This can damage the objects.

## 5.9 Emptying the oscillating tank



### WARNING

#### Danger of electric shock

- Disconnect the mains plug before lifting the device.
- Do not place the device in a sink to empty it.
- Make sure that no liquid can enter the housing.



### CAUTION

#### Hot sonication liquid and oscillating tank

There is a risk of scalding when lifting the device to empty it.

- Allow the device to cool before lifting it.

Soiling contamination on the bottom of the oscillating tank reduces the ultrasound's performance. If the sonication fluid has visible soiling contamination, empty and clean the oscillating tank.

Observe the information provided by the manufacturer of the agent on the service life of the sonication liquid.

Fully replace used sonication fluid. Do not replenish it by topping it up.

#### **Procedure**

1. Switch off the ultrasound. If present, turn off heating. If you need to move the device to empty it, disconnect the mains plug.
2. Open the ball valve.
3. Thoroughly rinse out the oscillating tank.
4. Wipe the device dry with a soft cloth.
5. If necessary, disinfect the device with a suitable surface disinfectant.

## **5.10 Logging function: Save Logs**

Docking station DST 01 required (optional accessory).

Connect DST 01 to the socket on the rear of the ultrasonic bath.

When the logging function is activated, a log containing the essential process parameters is saved after each completed ultrasonic process.

The logs can be transferred via USB or Ethernet connection or sent directly via email. A detailed manual is included with the DST 01.

When the logging function is deactivated, no logs are saved.

## **5.11 Remote control**

Smart FS required (optional accessory).

Connect smart FS to the socket on the rear of the ultrasonic bath.

After connecting smart FS to the ultrasonic bath, the device's internal display is set to standby mode.

Once connected, the internal display of the ultrasonic bath will enter standby mode.

The ultrasonic bath can now only be operated via the smart FS.

## 5.12 Troubleshooting

Error	Possible causes	Troubleshooting
Too little ultra-sound effect, loud noises	<ul style="list-style-type: none"> <li>▪ Sonication liquid contains gases.</li> <li>▪ There are too many objects to be sonicated in the oscillating tank.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Degas the sonication fluid. See section <b>5.6 Degassing the sonication liquid – DEGAS.</b></li> <li>▪ Reduce the number of objects to be sonicated.</li> </ul>
Uneven sounds	<ul style="list-style-type: none"> <li>▪ Incorrect filling level in the oscillating tank.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Slightly change the fill level of the sonication fluid in the oscillating tank Pay attention to the minimum filling level and correct dosing of the specimen.</li> <li>▪ Vary the position of the objects to be sonicated.</li> </ul>
Heating is not working	<ul style="list-style-type: none"> <li>▪ The heating has switched off due to excessive temperature.</li> <li>▪ The heating is defective.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Disconnect the device from the mains and allow it to cool down to below 50 °C; only then can it be restarted.</li> <li>▪ Have the device repaired.</li> </ul>

## 6 Maintenance

### 6.1 Servicing

The device is maintenance-free.

Functional tests can be performed for regular checks (see Chapter **6.3 Tests.**)

### 6.2 Cleaning and looking after the ultrasonic bath

#### Cleaning the housing

- Wipe the housing with a damp cloth. Wipe it dry with a soft cloth.
- Do not use abrasive cleaning agents; only use care products free from abrasive additives.
- If necessary, disinfect the housing with a suitable surface disinfectant.

#### Looking after the oscillating tank

Impurities in the oscillating tank accelerate its wear, can lead to corrosion and reduce the ultrasound effect.

Please therefore observe the following information:

- Rinse the oscillating tank thoroughly with water after each use. Wipe it dry with a soft cloth.
- Remove edges and residues with a stainless steel cleaning product free from abrasive additives.
- Do not use steel wool, scratches or scrapers to clean the oscillating tank.
- Metal parts and rust particles in the oscillating tank cause corrosion. Please therefore avoid leaving any metal parts in the oscillating tank. If rust stains are visible, remove them immediately with a soft cloth and a stainless steel cleaning product without abrasive additives.



## 6.3 Tests

### NOTICE

#### Damage to the ultrasonic bath

- Only carry out tests on the ultrasound bath when it is filled.

If one of the tests does not lead to the desired result, contact the servicing team. See section **6.4 Repairs**.

#### Checking the power of the ultrasound

The power can be checked with a wattmeter between the mains plug of the ultrasonic bath and the socket.

#### Requirement

- The oscillating tank is filled with water.
- The power is set to 100%.

#### Procedure

1. Select the "Start" button to switch on the ultrasound.
2. Take the power reading.
3. Switch off the ultrasound again.
4. Compare the readings for the rated power with the technical specifications. See section **8.1 Technical specifications**.

The measured values may deviate from the values in the technical specifications by a maximum of 20%.

#### Checking the ultrasound effect

Check the effect of the ultrasound with a foil test during initial putting into service and at regular intervals. Testing is recommended every 3 months. See section **11 Performing the foil test**.

## 6.4 Repairs

Contact the specialist dealer or the manufacturer during the warranty period.

Only have repairs carried out by qualified personnel authorised by the manufacturer or by the manufacturer itself.

The manufacturer assumes no liability for unauthorised interventions on the device.



### WARNING

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#### Health hazard due to contaminated device

- Decontaminate the device before shipping if it has come into contact with hazardous substances.
- 

If you need to send the device to the manufacturer, clean and decontaminate it and its accessories before shipping.

The "Certificate of decontamination" serves the occupational safety and health of our employees in accordance with the German "Infection Protection Act" and the Accident Insurance Regulations (UVV) of the employers' liability insurance associations.

Before returning them for inspection/repair, the equipment and accessories must be cleaned in accordance with applicable laws and regulations and, if necessary, disinfected surface disinfectant that is listed by the VAH (Association for Applied Hygiene).

Please understand that we can only start work once this certificate is fully completed.

Download the "decontamination certificate" form here:

Fill out the form and attach it so it is clearly visible on the outside of the packing. Acceptance will be refused without a completed form.



Send the unit to the following address:

BANDELIN electronic GmbH & Co. KG  
Heinrichstr. 3–4  
12207 Berlin  
Germany

+49 30 76880-2674  
service@bandelin.com

## 7 Disposal



### WARNING

#### Health hazard due to contaminated device

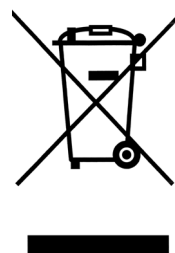
- Decontaminate the device before disposal if it has come into contact with hazardous substances.
- Also decontaminate accessories before disposal.

Dispose of the device properly as electrical waste if it can no longer be used. Do not dispose of the device in the household waste. Observe local regulations for the disposal of electrical waste.

The device contains a lithium metal battery.

The oscillating elements contain sintered ceramics made of lead zirconium titanate.

- EC no. 235-727-4
- CAS no. 12626-81-2



This use is permitted in accordance with RoHS Directive 2011/65/EU, Annex III, Exception 7c. I.

Dispose of accessories as metal scrap or as plastic waste according to the material used.

## 8 Information about the device

### 8.1 Technical specifications

#### Dimensions and weights

Type	Internal dimensions of the oscillating tank (L × W × H)	Operating volume	Connection for ball valve (outlet)	Weight
	[mm]	[l]		[kg]
ST 102 H	240 × 140 × 100	2.0	G $\frac{1}{4}$	4.4
ST 103 H	240 × 140 × 150	2.5	G $\frac{1}{4}$	4.5
ST 156 BH	500 × 140 × 150	6.0	G $\frac{1}{4}$	7.5
ST 170 H	1000 × 200 × 200	26.0	G $\frac{1}{2}$	26.5
ST 255 H	300 × 150 × 150	3.8	G $\frac{1}{4}$	5.1
ST 510 H	300 × 240 × 150	6.6	G $\frac{1}{2}$	7.9
ST 514 H	325 × 300 × 150	9.0	G $\frac{1}{2}$	8.8
ST 514 BH	325 × 300 × 200	12.5	G $\frac{1}{2}$	10.3
ST 1028 H	500 × 300 × 200	19.0	G $\frac{1}{2}$	15.1
ST 1028 CH	500 × 300 × 300	30.0	G $\frac{1}{2}$	23.8
ST 1050 CH	600 × 500 × 300	60.0	G $\frac{1}{2}$	37.5

## Electrical specifications

Protection class	I
Degree of protection	IP 32
Ultrasonic frequency	40 kHz

Mains supply 230 V~ ( $\pm 10\%$ ) 50/60 Hz

Type	Ultrasonic peak power/ultrasonic nominal power	Heating power	Current consumption	Fuses
	[W]	[W]	[A]	
ST 102 H	480/120	140	1.2	2 × F2A
ST 103 H	560/140	200	1.5	2 × F3.15A
ST 156 BH	860/215	600	3.6	2 × F6.3A
ST 170 H	1520/380	1600	8.7	2 × F10A
ST 255 H	640/160	280	2.0	2 × F3.15A
ST 510 H	640/160	400	2.5	2 × F3.15A
ST 514 H	860/215	600	3.6	2 × F6.3A
ST 514 BH	860/215	600	3.6	2 × F6.3A
ST 1028 H	1200/300	1300	7.0	2 × F10A
ST 1028 CH	1200/300	1450	7.7	2 × F10A
ST 1050 CH	2400/600	1950	11.1	4 × F10A (5 × 20 mm) 2 × F15A (6.3 × 32 mm)

Mains supply

115 V~ (± 10 %) 50/60 Hz

Type	Ultrasonic peak power/ultrasonic nominal power	Heating power	Current consumption	Fuses
	[W]	[W]	[A]	
ST 102 H	480/120	140	2.4	2 × F4A
ST 103 H	560/140	200	3.0	2 × F6.3A
ST 156 BH	860/215	600	7.2	2 × F8A
ST 170 H	1520/380	1300	14.7	2 × F15A
ST 255 H	640/160	280	4.0	2 × F6.3A
ST 510 H	640/160	400	5.0	2 × F6.3A
ST 514 H	860/215	600	7.2	2 × F8A
ST 514 BH	860/215	600	7.2	2 × F8A
ST 1028 H	1200/300	1300	14.0	2 × F15A
ST 1028 CH	1200/300	1400	15.0	2 × F15A
ST 1050 CH	2400/600	1050	14.4	4 × F15A (5 × 20 mm) 2 × F15A (6.3 × 32 mm)

## 8.2 Ambient conditions

Overvoltage category:	II
Degree of contamination:	2
Permissible ambient temperature:	5... 40 °C
Permissible relative humidity up to 31 °C:	80% (non-condensing)
Permissible relative humidity up to 40 °C:	50% (non-condensing)
Altitude:	< 2000 m above sea level
For indoor operation only	

## 8.3 CE conformity

The device is a medical device and fulfils the CE marking criteria of the European Union:

- 2017/745/EU – MDR
- 2014/35/EC – Low Voltage Directive
- 2014/30/EU – EMC Guideline
- 2011/65/EU – RoHS Directive

The declaration of conformity can be requested from the manufacturer, stating the serial number.


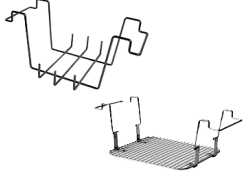
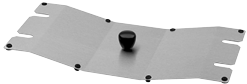









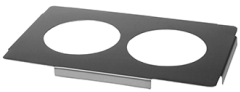




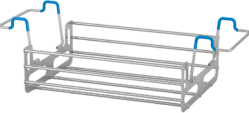
## 9 Dosing table

Type	Operating volume	Dosage				
		Water + agent				
	[l]	1%	2%	3%	5 %	10 %
ST 102 H	2.0	1.9 l + 20 ml	1.9 l + 40 ml	1.9 l + 60 ml	1.9 l + 100 ml	1.8 l + 200 ml
ST 103 H	2.7	2.6 l + 30 ml	2.6 l + 55 ml	2.6 l + 85 ml	2.5 l + 140 ml	2.4 l + 270 ml
ST 156 BH	6.0	5.9 l + 60 ml	5.8 l + 120 ml	5.8 l + 180 ml	5.7 l + 300 ml	5.4 l + 600 ml
ST 170 H	26.0	25.7 l + 260 ml	25.4 l + 520 ml	25.2 l + 780 ml	24.7 l + 1.3 l	23.4 l + 2.6 l
ST 255 H	3.8	3.7 l + 40 ml	3.7 l + 80 ml	3.6 l + 120 ml	3.6 l + 190 ml	3.4 l + 380 ml
ST 510 H	6.6	6.5 l + 70 ml	6.4 l + 140 ml	6.4 l + 200 ml	6.2 l + 330 ml	5.9 l + 660 ml
ST 514 H	9.0	8.9 l + 90 ml	8.8 l + 180 ml	8.7 l + 270 ml	8.5 l + 450 ml	8.1 l + 900 ml
ST 514 BH	12.5	12.3 l + 130 ml	12.2 l + 250 ml	12.1 l + 380 ml	11.8 l + 630 ml	11.2 l + 1.3 l
ST 1028 H	19.0	18.8 l + 190 ml	18.6 l + 380 ml	18.4 l + 570 ml	18.0 l + 950 ml	17.1 l + 1.9 l
ST 1028 CH	30.0	29.7 l + 300 ml	29.4 l + 600 ml	29.1 l + 900 ml	28.5 l + 1.5 l	27.0 l + 3.0 l
ST 1050 CH	60.0	59.4 l + 600 ml	58.8 l + 1.2 l	58.2 l + 1.8 l	57.0 l + 3.0 l	54.0 l + 6.0 l




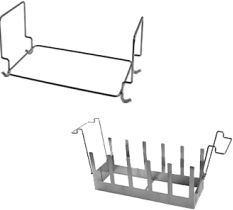
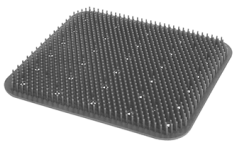
## 10 Approved accessories

	<p><b>Insert basket K...,</b> made from stainless steel, sieve cloth. Gentle on objects to be sonicated and avoids damage to the tank bottom. Optimal ultrasound transmission.</p>
	<p><b>Utensil holder GH...,</b> made from stainless steel, mesh size 12 x 12 mm. For larger individual parts. GH 1 for glass flasks up to Ø 105 mm.</p>
	<p><b>Cover D...,</b> made of stainless steel. For use with insert basket. Protects against external contamination. Condensation water is discharged into the oscillating tank. Sound-reducing.</p>
	<p><b>Insert basket K... EM,</b> made of stainless steel. An alternative to DIN sieve trays in the medical field. Basket holder KT required.</p>
	<p><b>Basket holder KT...,</b> made of stainless steel. For insert baskets K...EM or DIN sieve trays in the medical field.</p>
	<p><b>Insert tub KW...,</b> made of plastic, with cover. For use with chemicals that attack the stainless steel tank. Temperature and chemical resistance of PE (KW 3... KW 5) and PP (from KW 10-0).</p>

Type	Insertbasket	Utensil holder	Lid	Insert basket	Basket holder	Insert tub
ST 102 H	K 3 C	GH 1	D 100	–	–	KW 3
ST 103 H	K 3 CL	–	D 100	–	–	KW 3
ST 156 BH	K 6 BL	–	D 156	–	–	–
ST 170 H	K 7	–	D 170	–	–	–
ST 255 H	K 5 C	–	D 255	–	–	KW 5
ST 510 H	K 10	GH 10	D 510	–	–	KW 10-0
ST 514 H	K 14	GH 14	D 514	–	–	KW 14
ST 514 BH	K 14 B	–	D 514	–	–	KW 14 B
ST 1028 H	K 28	GH 28	D 1028	K 29 EM	KT 30 /Z	KW 28-0
ST 1028 C	K 28 C	–	D 1028 C	–	–	KW 28-0
ST 1028 CH	K 28 C	–	D 1028 C	–	–	KW 28-0
ST 1050 CH	K 50 C	–	D 1050 C	–	–	KW 50 B-0

	<p><b>Insert baskets KD..., PD...,</b>          Sieve cloth.          Suitable for inset beakers, for cleaning small parts.          KD 0: stainless steel, Ø inside 75 mm;          PD 04: plastic, Ø inside 60 mm.</p>
	<p><b>Inset beakers</b>          SD ... (glass), EB... (stainless steel), KB..., PD... (plastic).          For indirect cleaning of small parts, suitable for positioning lids          and beaker holders Ø 87 mm. With ring and cover.          KB 04, SD 04 and SD 05 Ø 76 mm, without cover.          SD 09 without cover.</p>
	<p><b>Positioning lid DE...,</b>          made of stainless steel.          For holding inset beakers. Positioning for optimal ultrasonic          energy use.</p>
	<p><b>Beaker holder ES...,</b>          made of stainless steel.          For holding 4 inset beakers in larger ultrasonic baths. Positioning          for optimal ultrasonic energy use.</p>
	<p><b>Impression tray holder LT 102,</b>          made of stainless steel.          For cleaning impression trays.</p>
	<p><b>Insert basket PK... C,</b>          made of plastic, perforated.          For gentle cleaning of sensitive surfaces, e.g., instruments such          as probes, syringes, condensers.</p>
	<p><b>Injection nozzle holder ED...,</b>          made of stainless steel.          For hanging in the oscillating tank. Holds injection nozzles of          different sizes.</p>
	<p><b>Cassette holder KAH...,</b>          made of stainless steel.          For hanging in the oscillating tank. Holds up to three levels of          cassettes.</p>

Type	Insert basket	Inset beaker	Positioning lid/beaker holder	Impression tray holder	Insert basket	Injection-nozzle-holder	Cassette holder
ST 102 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 100	LT 102	PK 2 C	ED 9	–
ST 103 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 100	–	–	–	–
ST 156 BH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 156	–	–	–	–
ST 170 H	–	–	–	–	–	–	–
ST 255 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 255	–	–	–	–
ST 510 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 510	–	–	ED 9	–
ST 514 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 514	–	–	–	KAH 14.3
ST 514 BH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 514	–	–	–	–
ST 1028 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–
ST 1028 CH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–
ST 1050 CH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–

	<p><b>Spring clamps EK...</b>, made of stainless steel, for laboratory flasks. Prevents floating. For screwing into hanging baskets and utensil holders.</p> <p>EK 10 – 10 ml, max. Ø 31 mm          EK 25 – 25 ml, max. Ø 42 mm          EK 50 – 50 ml, max. Ø 52 mm          EK 100 – 100 ml, max. Ø 65 mm          EK 250 – 250 ml, max. Ø 85 mm</p>
	<p><b>Handle adjuster GV...</b>, made of stainless steel. For hanging baskets and utensil holders.</p>
	<p><b>Test tube holder RG...</b>, made of stainless steel. For simultaneous sonication of 6 test tubes up to Ø 25 mm and 8 test tubes up to Ø 16 mm. Can also be used as a test tube stand. Test tube contents remain visible.</p>
	<p><b>Sieve holder SH 7</b>, made of stainless steel. For cleaning of individual sieves.</p> <p><b>Sieve holder SH 28 C</b>, made of stainless steel. For the simultaneous and gentle cleaning of up to 5 analysis sieves Ø 200 mm.</p>
	<p><b>Silicone base pad SM...</b> For non-contact storage of highly sensitive instruments. Fastening in the basket prevents floating and damage to the instruments. Permeable to ultrasound.</p>

Type	Spring clamps for laboratory flasks	Handle adjuster	Test tube holder	Sieve holder	Silicone knob mat
ST 102 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	RG 2	–	SM 3
ST 103 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	RG 2	–	–
ST 156 BH	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	–	–	SM 6
ST 170 H	–	–	–	–	–
ST 255 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	–	–	SM 5
ST 510 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	–
ST 514 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	SM 14
ST 514 BH	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	–
ST 1028 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	SM 29
ST 1028 CH	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	SH 28 C	–
ST 1050 CH	–	–	–	–	–

## 11 Performing the foil test

### Information

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Ultraschall seit 1955

#### Foil test

##### Functional test for an ultrasonic bath

A foil test should be carried out before the first use and at regular intervals, e.g., every 3 months. This serves to ensure that the ultrasound has a consistent effect. You are responsible for how often this test is performed.

The foil test is a simple method for displaying the intensity and distribution of the cavitation in an ultrasonic bath. It is performed by inserting aluminium foil stretched over a foil test frame; for suitable foil test frames (FT) and foils (FL), see the table on page 4. Depending on the duration of sonication, the foil will be perforated or destroyed to a certain extent by cavitation.

In order to be able to compare results, it is **important that the conditions of the foil test are always the same:**

- The oscillating tank is filled up to the filling level mark
- Temperature of the sonication liquid
- The power setting on the ultrasonic bath is 100%
- Duration of degassing
- Positioning of the foil test frame
- Foil type (brand, thickness)
- Sonication duration
- Type and concentration of the ultrasound agent

##### Liquid for the foil test

In order to obtain sufficiently strong cavitation, the boundary surface tension of the water used must also be reduced for the foil test with the help of surfactant preparations.

We recommend the following ultrasound agents:

- TICKOPUR R 33
- TICKOPUR R 30
- TICKOPUR TR 7
- TICKOMED 1
- STAMMOPUR R
- STAMMOPUR DR 8

If none of these agents is available, a neutral or mildly alkaline agent that is not destructive to aluminium should be used. The agent must be approved by the manufacturer for use in the ultrasonic bath.



## Test result and documentation

While always maintaining the same test conditions, the test result must be assessed based on the perforated area of the foils. The perforated areas of the foils should always have approximately the same extent and distribution – they are never congruent. Through regular foil tests, it is possible to perform a constant process check, e.g., for reprocessing medical devices. An alternative is to measure the cavitation noise according to IEC TS 63001:2019.

You can download a documentation template here for documenting the test results:

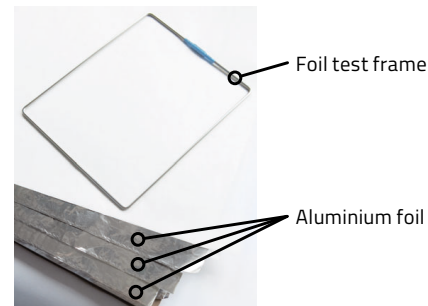
<https://bandelin.com/folientest/>

You will also find an application video there.

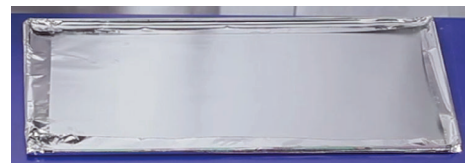
What's more, the foils can be archived in a suitable manner (scan, photo, etc.). This makes it possible to compare the foils at any time.



## Performing the foil test

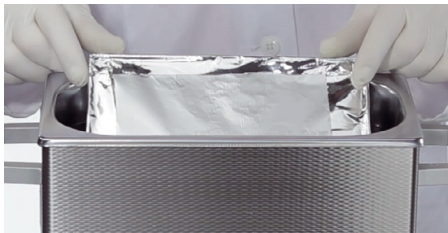


1. Fill the oscillating tank with water and a suitable ultrasound agent in the dosage specified by the manufacturer up to the filling level mark.
2. Degas the sonication liquid.
3. Clamp the aluminium foil onto the foil test frame. We recommend using our foil blanks. As a substitute, you can also use commercially available aluminium foil (thickness of 10 µm to 25 µm). Depending on the size of the tank, the foil test frame may protrude. It is sufficient to cover the part of the foil test frame that is covered by the sonication liquid.



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4. Place the covered foil test frame on a diagonal in the middle of the oscillating tank. If necessary, fix it in place.



5. Switch on the ultrasound. Sonicate the foil for at least 1 minute until visible perforation or pitting occurs. For more stable foils (thicker or coated), the duration of sonication may be up to 3 minutes. Make a note of the duration of your test.
6. Switch off the ultrasound. Take out the foil test frame. Remove the aluminium foil from the foil test frame and allow it to dry.
7. The foil must be perforated. If it is not, it is recommended that the device be checked by the service department of BANDELIN electronic GmbH & Co. KG.

8. Archive the foil with the test date and serial number of the ultrasonic bath, the previously selected conditions, and the duration. The documentation template for the foil test can additionally be filled in and archived.
9. Rinse out the oscillating tank thoroughly to remove any dissolved foil particles.

Suitable foil test frames and foils can be ordered from BANDELIN electronic GmbH & Co. KG.

The foil test frames and foils are designed for a wide range of tank dimensions; see the following table:

Foil test frames (PU = 1 piece)			Film (PU = 50 pieces)	
Type	Code no.	for	Type	Code no.
FT 1	3190	DT 31/H, DT 52/H, RK 31/H, RK 52/H	FL 4	71004
FT 4	3074	DL 102 H, DL 255 H, DT 100 / H, DT 102 H /H-RC, DT 103, DT 106, DT 255 /H /H-RC, RK 100 /H, RK 102 H, RK 103, RK 106, RK 255 /H SC 255.2 ST 102 H, ST 103 H, ST 255 H		
FT 6	3222	DL 156 BH, DT 156 /BH, ST 156 BH		
FT 14	3084	BactoSonic 14.2 DL 510 H, DL 512 H, DL 514 BH, DT 510 /H /H-RC, DT 512 H, DT 514 H /BH / BH-RC, DT 510 F, RK 510 /H, RK 512 H, RK 514 /H /BH, RM 16.2 U /UH /ST ST 510 H, ST 514 H /BH ZE 514/...DT,	FL 14	71014
FT 36	3673	DT 1028 F, ZE 1031/1032/ ...DT	FL 40	71040
FT 37	3674	DT 1058 M, ZE 1058/1059/ ...DT		
FT 38	3672	MC 1001/E		
FT 40	3094	DL 1028 H, DT 1028 /H /CH, RK 170 H, RK 1028 /H /C / CH, RK 1040, RM 40.2 U /UH /ST ST 170 H, ST 1028 H / CH	FL 45	71045
FT 42	3224	TRISON (TE 3000 / TE 4000)	FL 45	71045
FT 45	3204	DT 1050 CH, RK 1050/CH, RM 75.2 U/UH/ST ST 1050 CH		

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