

# Operating Instructions

## ***SONOREX TECHNIK***

High-performance ultrasonic baths and rinsing baths



Valid for:

RM 16.2 /U /H /UH

RM 40.2 /U /H /UH

RM 75.2 /U /H /UH

RM 16.2 U-ST /H-ST /UH-ST

RM 40.2 U-ST /H-ST /UH-ST

RM 75.2 U-ST /H-ST /UH-ST



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# 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 unit

The devices are intended for the sonication of aqueous liquids. The sonication of non-aqueous or flammable liquids is not permitted. The devices work on the basis of low-frequency ultrasound and are versatile. The main application is the gentle intensive cleaning of items of various shapes, types and sizes.

A solution of water and a special preparation for ultrasound application is used as the sonication liquid. Refer to Section **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 the sonication liquid in an insert basket or other suitable container. An overview of approved accessories can be found in chapter **9 Approved accessories**.

Do not allow the unit to run without supervision.

### 2.2 Keep out of reach of children.

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

### 2.3 Risk of electric shock

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

- Never let the device become wet. Keep the surface and operating elements clean and dry.
- Only transport the device when it is empty.
- Only empty the device when it is switched off.
- Do not shower the device or expose it to splash water.
- Disconnect the device from the mains before any cleaning or maintenance.
- Only connect the device to a socket with an earthed protective contact that matches the protective contact of the mains connector.



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

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

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- If you discover a defect in the device, unplug it immediately. Do not connect a faulty device to the mains.

- Only have repairs carried out by the manufacturer. See chapter **6.4 Repairs**.
- Position the device in such a way that it is possible to disconnect the mains connection at any time without difficulty.

## 2.4 Damage to health due to ultrasonic noise

Ultrasound generates cavitation noises that are typical of the process, and which can be perceived very differently by different individuals.

To reduce the noise, we recommend that you only operate the device with the appropriate lid.

If no other noise protection is available, we recommend wearing hearing protection in the event of prolonged exposure in the immediate vicinity (acoustic earmuffs, for example, or equivalent earplugs or ear moulds, are suitable).

The exposure for the user depends on factors such as the installation site, the detergent, and the degree of loading with items to be treated. Whether hearing protection is required in any particular case can only be determined by qualified personnel at the location of use.

The responsibility for evaluating and implementing appropriate protective measures lies with the operator.

## 2.5 Dangers 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 liquid even without additional heating. Very high temperatures can occur during prolonged operation of ultrasound. 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 ultrasonic specimen. Do not leave the ultrasound on for longer than necessary.
- Do not reach into the sonication liquid by hand. Remove objects to be sonicated using the insert basket or forceps.
- Allow the items being treated to cool before touching them.
- When lifting by the handles, your hands may touch the edge of the tank, which can be very hot.

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.

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

## 2.6 Danger due to ultrasound

The strong ultrasound in the unit destroys cell structures. If a body part is immersed in the sonication liquid 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 liquid during operation.
- Never expose living things to ultrasound.

## 2.7 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.

## 2.8 Disposing of sonication liquid

Dispose of the sonication liquid according to the instructions of the manufacturers of the ultrasonic specimens used. The recommended ultrasonic specimens of the TICKOPUR 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 liquid 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 liquid during cleaning. If the limit values for these substances are exceeded, the sonication liquid must be treated or disposed of as hazardous waste.

Observe local sewage regulations.



## 2.9 Erosion of the oscillating tank

The surface of the oscillating tank is subject to erosion. How quickly this erosion takes place depends on how the device is used. The erosion leads to leakage points in the oscillating tray. This allows bath liquid to enter the interior of the device. Moisture on electrical components can cause an electric shock or fire.

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

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

- Replace sonication liquid which has visible soiling contamination from particles.
- Only use demineralised water (aqua purificata) with an ultrasound-compatible specimen.
- 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 device with accessories that are suitable for the device and the objects to be sonicated, e.g., a basket. Do not place any objects to be sonicated directly on the bottom of the oscillating tank. An overview of approved accessories can be found in chapter **9 Approved accessories**.

## 2.10 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 liquid 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 liquid 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.

## 2.11 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.

## 2.12 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 chapter **6.4 Repairs**.

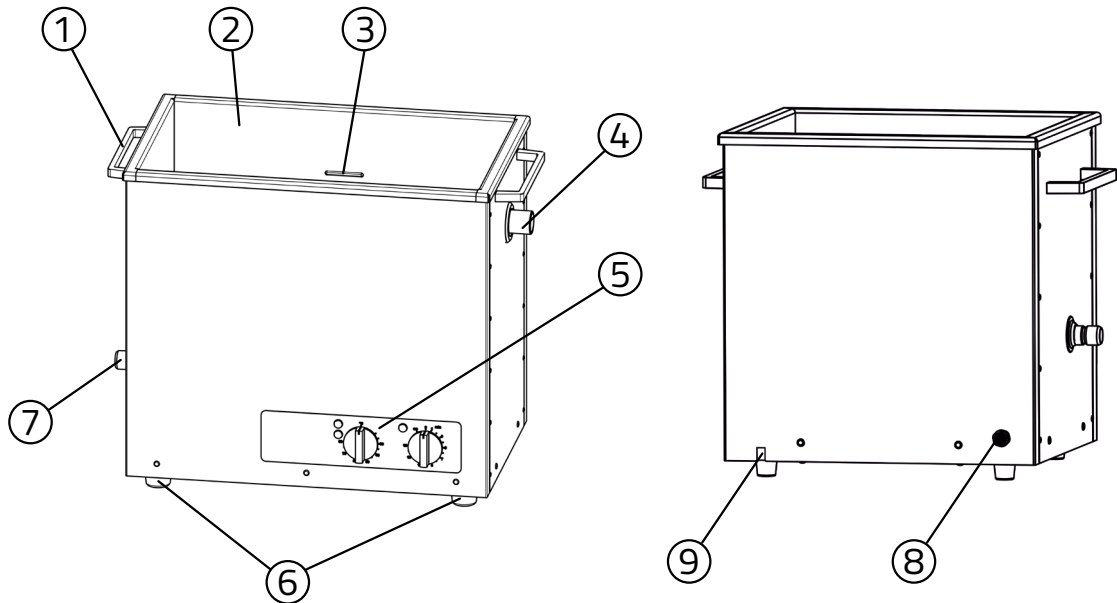
## 2.13 Not overloading accessories

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.

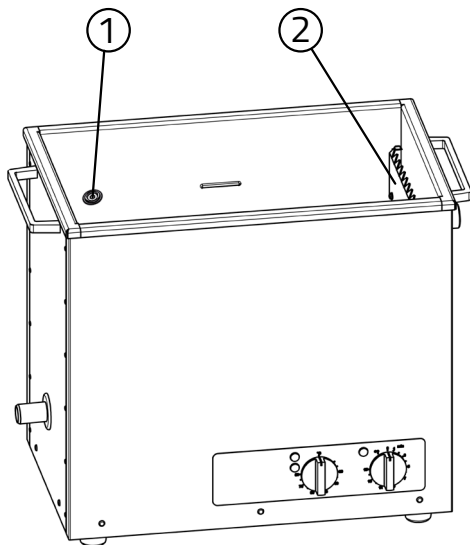
## 3 Construction and function

### 3.1 Structure



Device overview

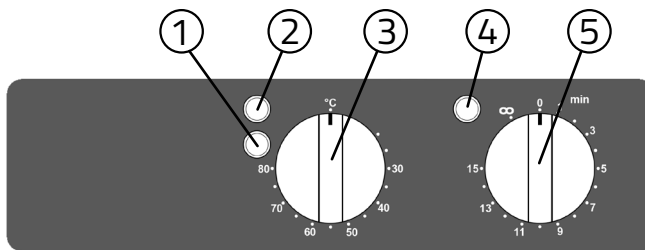
- 1 Handles
- 2 Tank
- 3 Filling level mark
- 4 Connector socket – overflow
- 5 Control panel
- 6 Device feet
- 7 Connection socket – outlet
- 8 Connection for ST interface for ...-ST devices
- 9 Mains cable



Device overview

- 1 Level sensor for ...-ST devices
- 2 Overflow gutter

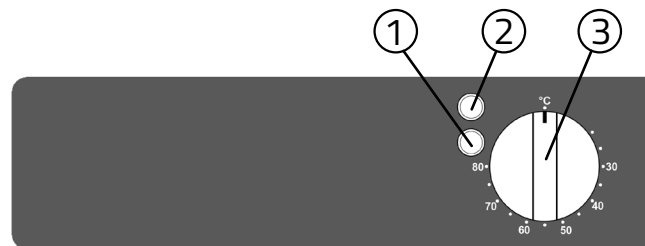
## 3.2 Control panel



Operating elements for all devices with ultrasound (U) and heating (H)  
 Types: RM... UH



Operating elements for all devices only with ultrasound (U)  
 Types: RM... U



Operating elements for all devices only with heating (H) or devices with interface (ST) and heating (H)  
 Types: RM... H or RM... UH-ST or RM... H-ST



The operating elements for all devices without ultrasound and without heating as well as devices with ultrasound only and with interface (ST) are omitted  
 Types: RM... or RM... U-ST

- 1 Yellow indicator lamp, for models with heating (H)  
Lit up means: heating is switched on
- 2 White indicator lamp, for models with heating (H)
  - Lit up means: heating is switched on
  - Lit up means: heating control active
- 3 Turning knob for adjusting the heating temperature
- 4 Green indicator lamp, for models with ultrasound (U)  
Lit up means: ultrasound is switched on
- 5 Turning knob for adjusting the ultrasound duration

## 3.3 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 liquid. 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 soiling contamination from the surface of the items. Dirt particles are transported away, and fresh sonication liquid flows in.

The device uses SweepTec®, a technology in which the ultrasonic frequency often changes with the operating frequency. The optimal operating frequency depends on the load, fill level, temperature and type of sonication liquid. 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 device floor must not be impeded by objects.
- A water connection for filling the device should be located nearby. A basin for draining or pouring out the sonication liquid must be on hand.

### 4.2 Installing the ball valve

Install the supplied 3-way ball valve, the hose sockets and the hoses in accordance with the enclosed installation instructions.

### 4.3 Performing a function test

The following function test can only be performed on devices without an interface.

For a device with an interface, you first must have connected the interface. To do this, use the supplied control cable.

A test is then performed via the controller connected to the interface.

#### Requirement

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



#### Information

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The built-in fan runs as soon as the jack is inserted.

#### Procedure

1. Make sure that the device is switched off.  
If present, the turning knob for adjusting the ultrasound duration must be at "0".  
If present, the turning knob for adjusting the heating temperature must be at "°C".
2. Only connect the mains cable to a socket with an earthed protective contact that matches the protective contact of the device plug.

3. Briefly switch on the ultrasound. To do this, turn the turning knob for the ultrasound duration to the right and, after 1 to 2 seconds, back to "0".
4. For ...-ST devices, a function test can only be performed when the device is full due to the level sensor.

### **Result**

» When the ultrasound is switched on, you will clearly hear a noise.

If you do not hear a noise, contact servicing.

## **4.4 Rinsing the tank**

Thoroughly rinse the device's tank with water before using it 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.

## 5 Operation

### 5.1 Ultrasonic operation

The items to be treated are placed using suitable accessories, e.g., a basket, in the oscillating tank, where they will be in direct contact with the sonication liquid.

For approved accessories for sonication, see chapter **9 Approved accessories**.

### 5.2 Sonication liquid

A solution made of water and a special ultrasonic specimen 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 specimen used must be cavitation conducive, biodegradable, easy to dispose of, gentle on materials, and long-lasting. BANDELIN recommends ultrasonic specimens from the TICKOPUR, TICKOMED and STAMMOPUR product series from DR. H. STAMM GmbH, see chapter **10 Appendix**.

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

Observe the instructions of the ultrasonic specimen's manufacturer regarding dosing. You can calculate the necessary amount of ultrasound specimen and water yourself:

31 l ready-to-use solution, 2%

Calculation of the specimen:

$$\frac{31 \text{ l} \times 2 \%}{100 \%} = 0,62 \text{ l}$$

Calculation of the water quantity:

$$31 \text{ l} - 0,62 \text{ l} = 30,38 \text{ l}$$



## 5.3 Sonication duration

### NOTICE

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

Excessive sonication can damage the surface of items being treated.

- Choose the shortest possible sonication duration.

The optimal sonication duration depends on a number of factors:

- Type and concentration of the specimen
- Temperature of the sonication liquid
- Type of soiling contamination
- Type of items to be treated, especially materials

Observe the specifications of the agent's manufacturer for the recommended sonication duration.

At the start, choose the shortest possible sonication duration to protect the items to be treated and the oscillating tank. Check the result. Extend the sonication duration if the result is insufficient.

## 5.4 Filling with sonication liquid



### CAUTION

#### **Risk of scalding**

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

### NOTICE

#### **Damage due to condensate in the device**

At high humidity, condensate forms inside the device when cold water is poured in.

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

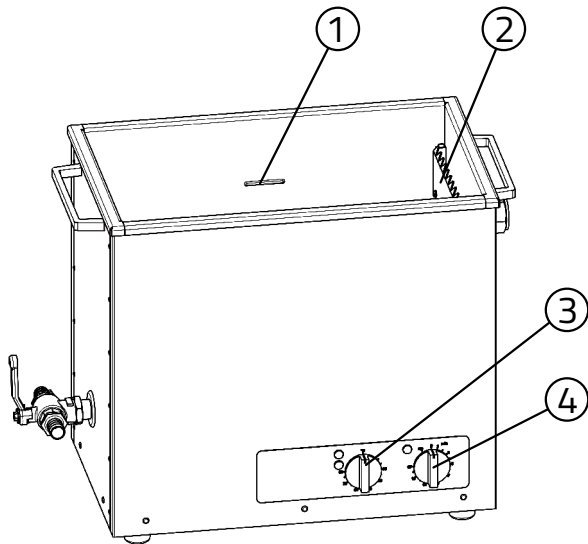
### NOTICE

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 into the oscillating tank until it has dissolved completely.

**NOTICE****Damage to the device**

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



Filling the oscillating tank

- 1 fill level mark
- 2 Overflow gutter
- 3 Turning knob for adjusting the heating temperature
- 4 Turning knob for adjusting the ultrasound duration

**Requirements**

- The 3-way ball valve must be closed.
- The ultrasound and heating must be switched off.

**Procedure**

1. Fill 1/3 of the oscillating tank with water.
2. Dose the specimen into the oscillating tank.
3. Fill up to the filling level mark with water, avoiding foaming.

**Result**

- » The device is ready to be switched on.

## 5.5 Switching the 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. Rotate the turning knob for the ultrasound duration to the desired duration or to the  $\infty$  symbol for continuous operation.
  - » The ultrasound is switched on. The ultrasonic noise can be heard.
  - » The green indicator lamp lights up.
  - » If the turning knob is not set to  $\infty$ , it will move slowly in the anti-clockwise direction, indicating the remaining sonication duration. As soon as it reaches "0", the ultrasound will switch off.
3. To switch off sonication, rotate the turning knob for the ultrasound duration to "0".
  - » The green indicator lamp will go out.



### Information

- You can rotate the turning knob in both directions.
- You can extend, shorten or switch off sonication at any time.
- The time switch only works when the device is connected to the mains voltage. Without mains voltage, it is difficult to feel when the turning knob locks into place.

## 5.6 Switching the heating on and off



### WARNING

#### Risk of scalding

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

- Stir the sonication liquid every now and then during heating, or switch on the ultrasound.
- The lid used must not completely seal the oscillating tank – steam must be able to escape.

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 the sonication. At higher temperatures, the effect of the ultrasound again decreases. Ultrasound also warms the sonication liquid. During continuous operation, especially when the oscillating tank is covered, the temperature of the sonication liquid 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 liquid. See chapter **5.7 Degassing the sonication liquid**.
- To preheat, remove the basket or other accessories from the oscillating tank. Put on the oscillating tank's cover, if available.

Switch on the heating by adjusting the turning knob to the desired temperature.

- The yellow and white pilot lamps will light up.
- Once the target temperature has been reached, the yellow pilot lamp will go out.



### Information

To achieve a shorter heating time and a homogeneous temperature distribution of the sonication liquid in the ultrasonic bath, switch on the ultrasound during the preheating phase. See section **5.5 Switching the sonication on and off**.



### Information

The heating operates independently of the ultrasound.

## 5.7 Degassing the sonication liquid

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.

- Put on the oscillating tank's cover, if available.
- To degas, switch on the ultrasound. The degassing time is 30 minutes.



### Information

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

## 5.8 Adding items to be treated

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

- Before each sonication process, check to ensure that the sonication liquid is not contaminated. If there is visible soiling contamination, replace the sonication liquid.
- The sonication liquid must be degassed. See chapter **5.7 Degassing the sonication liquid**.
- The sonication liquid must be preheated to the desired temperature before you introduce items.
- Use approved accessories, such as a basket. Do not place items directly on the bottom of the oscillating tank. See chapter **9 Approved accessories**.
- Spread out the items. Do not stack them. Sensitive items must not touch other items.
- The ultrasound must be switched off while adding items.
- Check the filling level. Items to be treated must be completely covered with liquid.
- Remove air bubbles from cavities. Rotate the objects accordingly. The ultrasound only will only have an effect where the liquid is in contact with the item to be treated.
- Place the more contaminated side downwards. Place items with joints (e.g., scissors, tongs) in an open state so that the sonication liquid is able to optimally cover the entire surface.

## 5.9 Removing objects to be sonicated



### WARNING

#### Risk of burns

The sonication liquid, the objects to be treated, 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 items being treated by hand. Carefully remove, e.g., the insert basket containing the items being treated, and place it on a flat surface.

Rinse the items being treated with clear water.

Do not leave objects to be sonicated in the sonication liquid for too long. That can damage the items.

## 5.10 Emptying the oscillating tank



### WARNING

#### Danger of electric shock

- 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 liquid 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 liquid. Do not replenish it by topping it up.

**Procedure**

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

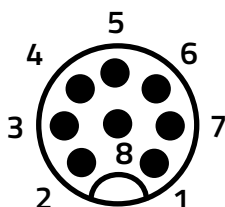
**Information**

- Rinsing trays with heating can also become hot.

## 5.11 Remote control

The ultrasonic/rinsing baths with the additional designation "...-ST" are equipped with an interface (potential-free contacts) for control and monitoring by an external controller. A level sensor enables remote monitoring of the ultrasonic bath. The internal technology is protected from excess temperature via an internal fan.

The connection is made via an M12 socket using an M12 sensor-actuator cable connection. All inputs are PNP (negative reference terminal) connected and galvanically isolated from the ultrasonic generator.



M12 socket, 8-pin

**The prerequisite for using the remote control is that:**

- the control cable is connected to the remote control socket of the ultrasonic/rinsing bath;
- the interface is connected to the external controller;
- desired temperature is set (only for models with heating).

The ultrasound will be continuously switched on when a contact is activated. When the contact for the heating function is activated, the liquid in the tank will be heated until the temperature set on the thermostat of the ultrasonic bath has been reached. The activity of the heating and the state of the level sensor are output as a potential-free contact at the interface.

Note:  
Conductivity sensor only suitable for liquids with a conductivity > 20 µS/cm, not for deionised water.

Assignment of connections:

Contact no.	Designation	Function	Features
1	24 V supply voltage	24 V supply	Output 24 VDC max. 0.4 A, overload protected
2	Ground	Earth	-
3	Heating activation	Activates heating until the temperature set on the device is reached	Input 24 V approx. 30 mA
4	Ultrasound activation	Activates the ultrasound	Input 24 V approx. 30 mA
5	Input message: heating active	Closes contact with no. 6 when heating is active	Max. 24 VDC / 2 A
6	Output message: heating active	Closes contact with no. 5 when heating is active	Max. 24 VDC / 2 A
7	Input message, filling level available	Closes contact with 8 if filling level is available.	Max. 24 VDC / 2 A
8	Output message: filling level available	Closes contact with 7 if filling level is available.	Max. 24 VDC / 2 A

Contact number/colour:

Contact no.	Colour
1	WH
2	BN
3	GN
4	YE
5	GY
6	PK
7	BU
8	RD





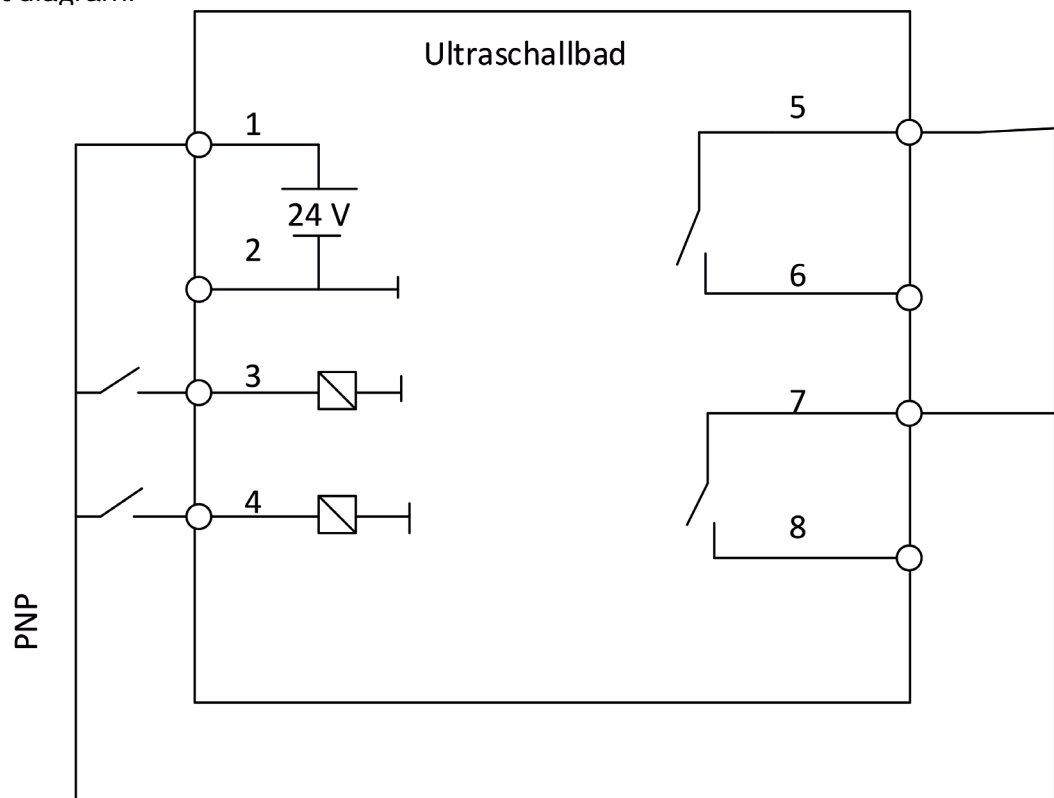
## 5.12 Examples

### Control via relay of a PLC or robot controller

With this connection variant, the internal 24-V supply of the ultrasonic bath is used to activate the ultrasound and the heating. The activity of the heating and the minimum filling level are output with 24-V signals.

Contact no.	Designation	Connection to the controller
1	24 V supply voltage	Connection at the input of relay 1 and relay 2
2	Ground	Connection to the negative pole of the controller
3	Heating activation	Connection to the output of relay 1
4	Ultrasound activation	Connection to the output of relay 2
5	Input message: heating active	Connection to contact no. 2 of the ultrasound bath
6	Output message, heating active	Connection to the 24 V digital input of the controller
7	Input message, filling level available	Connection to contact no. 1 of the ultrasound bath
8	Output message, filling level available	Connection to the 24 V digital input of the controller

Circuit diagram:

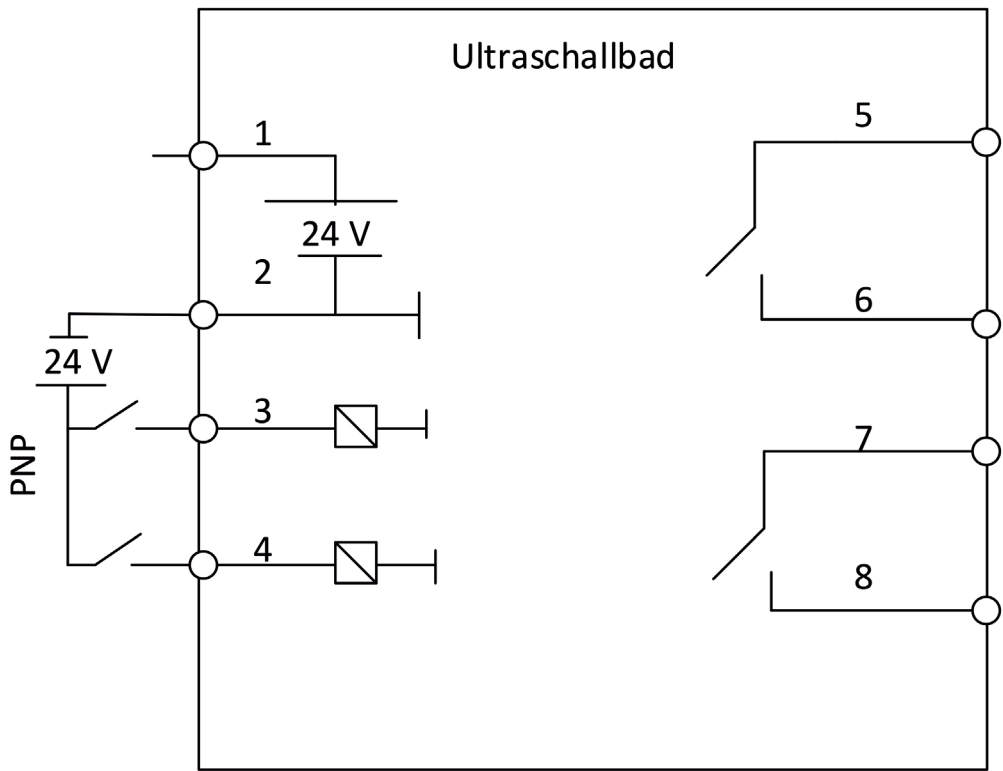


**Activation via control voltage from a PLC or robot controller**

With this connection variant, an external 24 V supply to the control unit is used to activate the ultrasound and the heating. The activity of the heating and the minimum filling level are signalled with relay contacts.

Contact no.	Designation	Connection to the controller
1	24-V supply voltage	-
2	Ground	Connection to the negative pole of the controller
3	Heating activation	Connection to the 24 V output of relay 1
4	Ultrasound activation	Connection to 24 V output of relay 2
5	Input message: heating active	Connection to the positive pole of the controller
6	Output message, heating active	Connection to the digital input of the controller
7	Input message: filling level available	Connection to the positive pole of the controller
8	Output message, filling level available	Connection to the digital input of the controller

Circuit diagram:

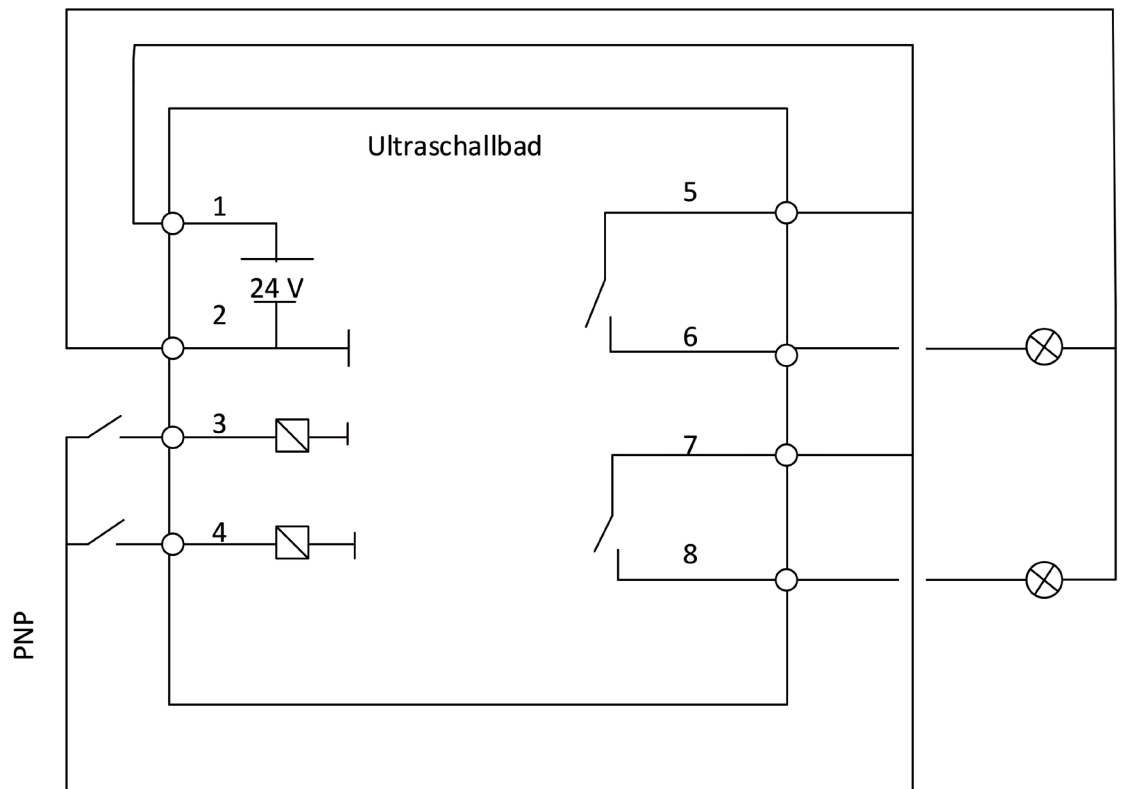


### Activation via manual switch and display via signal lamp

With this connection variant, the control voltage of the ultrasonic bath is used to activate the ultrasound and the heating. If the minimum filling level is not reached, the heating and the ultrasound are automatically switched off.

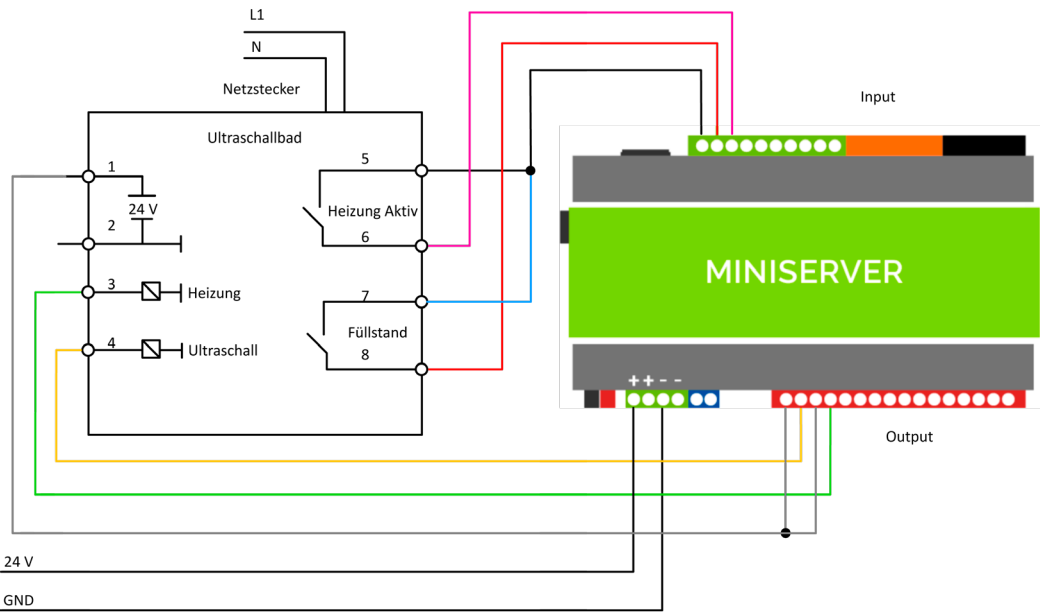
Contact no.	Designation	Connection to the controller
1	24-V supply voltage	Connection to no. 5 and no. 7
2	Ground	Connection to the negative poles of the signal lamps
3	Heating activation	Connection to the output of manual switch 1
4	Ultrasound activation	Connection to the output of manual switch 2
5	Input message: heating active	Connection to no. 1
6	Output message, heating active	Connection to the positive pole of the signal lamp for the heater
7	Input message: filling level available	Connection to no. 1
8	Output message, filling level available	Connection to the positive pole of the signal lamp for the filling level

Circuit diagram:

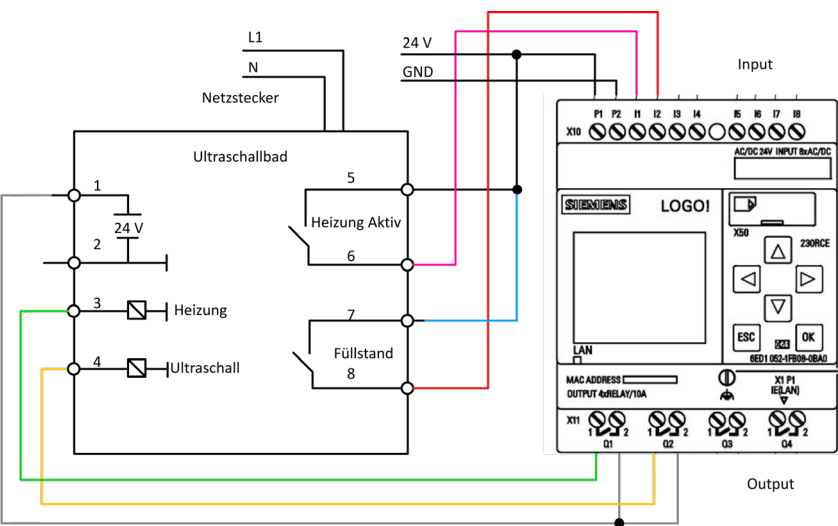


Wiring examples with standard controllers

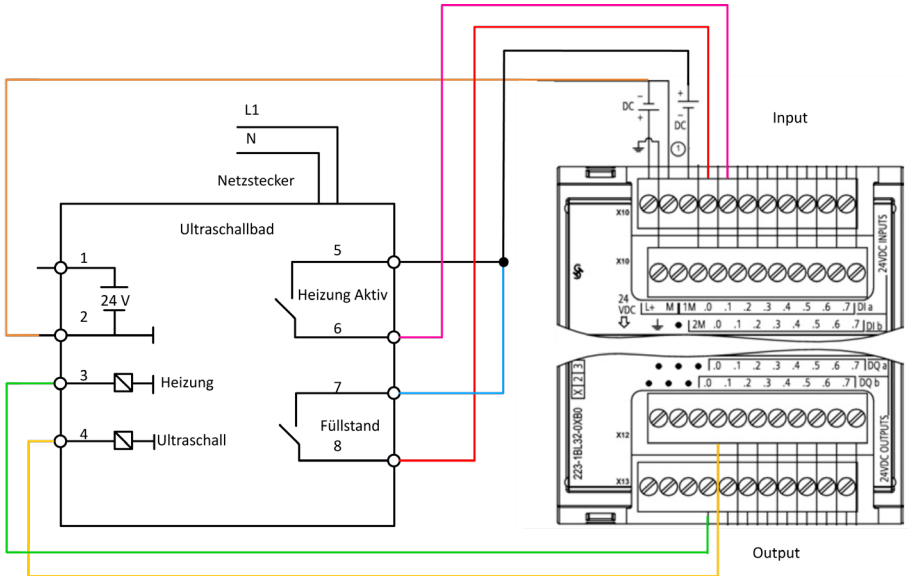
Loxone Miniserver



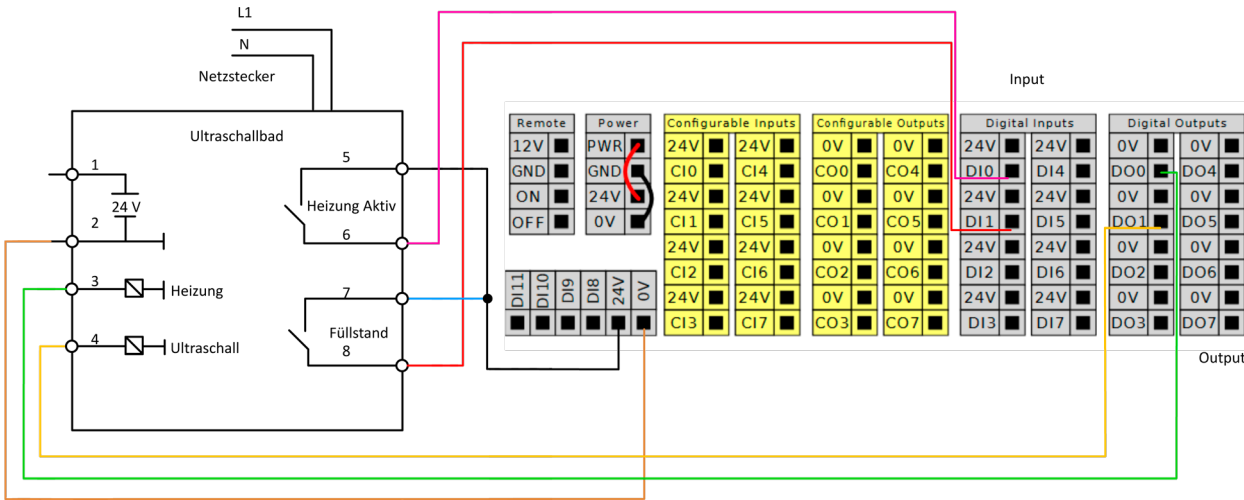
Siemens LOGO



**SIMATIC S7-1200 module**



**UNIVERSAL ROBOTS**



## 5.13 Troubleshooting

Error	Possible causes	Troubleshooting
Too little ultrasound effect, loud noises	<ul style="list-style-type: none"> <li>▪ Sonication liquid contains gases</li> </ul>	<ul style="list-style-type: none"> <li>▪ Degas the sonication liquid. See chapter <b>5.7 Degassing the sonication liquid</b></li> </ul>
	<ul style="list-style-type: none"> <li>▪ There are too many objects to be treated in the oscillating tank</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reduce the number of objects to be treated</li> </ul>
Irregular 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 filling level of the sonication liquid in the oscillating tank. Pay attention to the minimum filling level and to correct dosing of the agent</li> </ul>
		<ul style="list-style-type: none"> <li>▪ Vary the position of the objects to be treated</li> </ul>
Heating is not working	<ul style="list-style-type: none"> <li>▪ The heating is defective</li> </ul>	<ul style="list-style-type: none"> <li>▪ Repair the heating or send to the manufacturer for repair</li> </ul>

### for ST devices

Error	Possible causes	Troubleshooting
Heating cannot be controlled	Thermostat is set too low on the device	Switch on the thermostat
	Jack not inserted	Check the jack connection
Ultrasound cannot be controlled	Jack not inserted	Check the jack connection
Ultrasound and heating cannot be controlled	Filling level too low	Fill up the filling level of the sonication liquid
	Level sensor is soiled	Cleaning the level sensor
	Level sensor is defective	Repair the level sensor or send to the manufacturer for repair
	Conductivity of the liquid < 20 µS/cm	Use liquid with a conductivity > 20 µS/cm

## 6 Maintenance

### 6.1 Servicing

The device is maintenance-free.

Function tests can be performed for regular checks (see section **6.3 Tests.**)

### 6.2 Cleaning and care of the device

#### 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.

#### Caring for 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 device

- Only carry out the tests listed in the following section on the filled device.

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

#### Check the control lamps

Check the function of the control lamps.

- Briefly switch on the ultrasound.
  - » The green indicator lamp will remain on as long as the ultrasound is switched on.
- Briefly switch on the heater with the turning knob to above 30 °C.
  - » The white and yellow indicator lamps will remain on as long as the heating is switched on.

#### Check the power of the ultrasound and the heating

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

#### Procedure

1. Fill the tank with water.
2. Switch on and off the ultrasound and, if available, the heating, one after the other. Take the power reading.
3. Compare the readings with the technical specifications. See chapter **8.1 Technical specifications**.

The measured values may deviate from the values in the technical specifications by no more than  $\pm 20\%$ .

#### Check the level sensor

Check the function of the level sensor.

- Fill the device with water.

The switching contact for the level sensor must close when the minimum filling level has been reached.



## 6.4 Repairs

During the warranty period, contact your specialist dealer or the manufacturer.  
Only have repairs carried out by qualified personnel or by the manufacturer.  
The manufacturer assumes no liability for unauthorised interventions on the device.



### **WARNING**

#### **Health hazard due to contaminated device**

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

If the device needs to be repaired, send it to the manufacturer.  
Clean and decontaminate the device and the accessories before shipment.  
The "Certificate of decontamination" serves the occupational safety and health of our employees in accordance with the German "Infection Protection Act" (Infektionsschutzgesetz) and the Accident Insurance Regulations (UVV) of the employers' liability insurance associations.  
Before being returned for inspection/repair, the device and accessories must be cleaned in accordance with the applicable laws and regulations and, if necessary, disinfected with a surface disinfectant that is listed by the Association of Applied Hygiene (VAH).  
Please understand that we can only start the work if this certificate is available and completed in full. Download the "Certificate of decontamination" form here:

<https://www.bandelin.com/downloads>

Fill out the form and attach it so as to be clearly visible on the outside of the packaging. 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](mailto: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 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

#### Electrical specifications, general

Mains supply	230 V~ (± 10 %) 50/60 Hz
Protection class	I
Degree of protection	IP 32
Ultrasonic frequency	40 kHz

#### Remote control connection, ...-ST devices:

Interface	potential-free contact, 8-pin M12 socket
Cable	5 m
Level sensor	conductivity sensor
(no deionised water, conductivity of the liquid > 20 µS/cm)	

#### Electrical specifications and weights for bath size RM 16.2

Type	Ultrasonic peak power/ ultrasonic nominal power	Heating power	Heating system fuses	Generator fuses	Weight
	[W]	[W]			[kg]
RM 16.2 UH	1200/300	800	F8A	F2A	16
RM 16.2 H	–	800	F8A	–	15
RM 16.2 U	1200/300	–	–	F2A	15
RM 16.2	–	–	–	–	14

#### Dimensions for bath size RM 16.2

Type	Internal dimensions (L × W × H)	Contents	Filling- volume	Operating- volume	Inlet and outlet	Overflow gutter out- let
	[mm]	[l]	[l]	[l]		
RM 16.2 UH	325×275×200/210	20	14	13	G 1/2	G 1
RM 16.2 H	325×275×200/210	20	14	13	G 1/2	G 1
RM 16.2 U	325×275×200/210	20	14	13	G 1/2	G 1
RM 16.2	325×275×200/210	20	14	13	G 1/2	G 1

**Electrical specifications and weights for bath size RM 40.2**

Type	Ultrasonic peak power/ ultrasonic nominal power	Heating power	Heating system fuses	Generator fuses	Weight
	[W]	[W]			[kg]
RM 40.2 UH	2000/500	1250	F10A	F2A/F4A	26
RM 40.2 H	–	1250	F10A	–	23
RM 40.2 U	2000/500	–	–	F2A/F4A	25
RM 40.2	–	–	–	–	22

**Dimensions for bath size RM 40.2**

Type	Internal dimensions (L × W × H)	Contents	Filling volume	Operat- ing vol- ume	Inlet and outlet	Overflow gutter outlet
	[mm]	[l]	[l]	[l]		
RM 40.2 UH	475×300×300/315	46	36	31	G 3/4	G 1
RM 40.2 H	475×300×300/315	46	36	31	G 3/4	G 1
RM 40.2 U	475×300×300/315	46	36	31	G 3/4	G 1
RM 40.2	475×300×300/315	46	36	31	G 3/4	G 1

### Electrical specifications and weights for bath size RM 75.2

Type	Ultrasonic peak power/ ultrasonic nominal power	Heating power	Heating system fuses	Generator fuses	Weight
	[W]	[W]			[kg]
RM 75.2 UH	4000/1000	1950	T12.5A	F8A	42
RM 75.2 H	–	1950	T12.5A	–	37
RM 75.2 U	4000/1000	–	–	F8A	41
RM 75.2	–	–	–	–	36

### Dimensions for bath size RM 75.2

Type	Internal dimensions (L × W × H)	Contents	Filling volume	Operat- ing vol- ume	Inlet and outlet	Overflow gutter outlet
	[mm]	[l]	[l]	[l]		
RM 75.2 UH	575×500×300/315	92	72	62	G 3/4	G 1
RM 75.2 H	575×500×300/315	92	72	62	G 3/4	G 1
RM 75.2 U	575×500×300/315	92	72	62	G 3/4	G 1
RM 75.2	575×500×300/315	92	72	62	G 3/4	G 1

## 8.2 Environmental conditions

Overvoltage category:	II
Degree of soiling/contamination:	1
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	




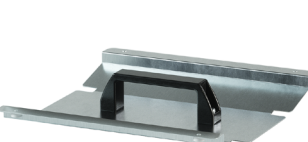

## 8.3 CE conformity

The device meets the CE marking criteria of the European Union:





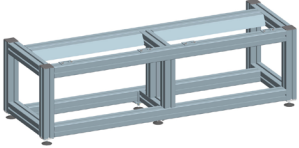

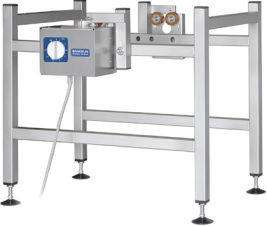
- 2014/35/EC – Low Voltage Directive
- 2014/30/EU – EMC Guideline
- 2011/65/EU – RoHS Directive

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

## 9 Approved accessories




	<p><b>Insert baskets MK ... B</b> Made from stainless steel Takes loads of up to 10 kg</p>
	<p><b>Insert baskets MK ... S</b> Made from stainless steel Takes loads of up to 40 kg  For the RM 40.2 and RM 75.2 series</p>
	<p><b>Hanging baskets MK ... MB</b> Made from stainless steel Takes loads of up to 10 kg  For use with lifting device MB from version MB 16.2, MB 40.2 and MB 75.2</p>
	<p><b>Hanging baskets MK ... BS</b> Made from stainless steel Takes loads of up to 40 kg  For use with lifting device MB For the RM 40.2 and RM 75.2 series</p>
	<p><b>Cover MD...</b> Made from stainless steel</p>
	<p><b>Drop plate TB ...</b> Made from stainless steel between 2 tanks</p>

### Additional features

	<p><b>Undercarriage UG...</b>          To adjust the working height          With height-adjustable feet</p> <p>For the RM 40.2 and RM 75.2 series</p>
	<p><b>Transport trolley TW...</b>          To adjust the working height and to facilitate transport of the device.          With lockable castors</p> <p>For the RM 40.2 and RM 75.2 series</p>
	<p><b>Oscillation MO...</b>          The oscillating movement increases the cleaning effect and rinses away soiling contamination.</p> <p>For the RM 16.2 and RM 40.2 series</p>
	<p><b>Lifting device MB...</b>          The electrically operated lifting device with oscillation makes it easier to lower and lift out the items basket. The cleaning effect is increased and dissolved soiling contamination is rinsed off.</p>
	<p><b>Tank rack WG...</b>          The tank racks for moving the lifting device are designed for 2 to 4 tanks.</p>
	<p><b>Cascade pipes KV...</b>          To improve the rinsing process, two rinsing tanks are connected to each other with the cascade pipes.</p>
	<p><b>Planing head holder HA...</b>          For efficient cleaning of planing heads and saw blades.</p> <p>For the RM 40.2 series</p>



## Peripheral equipment

	<p><b>Filtration FA...</b> By continuously filtering out the cleaned particles, the bath service life is extended, and the cleaning power is retained.</p>
	<p><b>Oil separator OX...</b> Contaminants floating on the surface of the bath are passed via the overflow gutter into the oil separator and separated there via gravity.</p>
	<p><b>Air circulation dryer UT...</b> The objects to be cleaned are dried after rinsing to quickly remove the residual moisture.</p>

## 10 Appendix

### Recommended specimens

The choice of one of the following concentrates will depend on the cleaning task in question and the degree of soiling.



#### **TICKOPUR R 33**

**Universal cleaner with corrosion protection for the service, industry, technology and laboratory sectors, material protecting, mildly alkaline, pH 9.9 (1%), application 3–5%**

Removes general soiling, drilling, grinding, polishing and lapping residues, oil- and grease-containing residues, soot, ink, etc.

From metal, glass, ceramic, plastic, rubber, windows, glasses, e-filters, respiratory masks (EXAM report no.: 5734/06), etc. Caution with tin and zinc.

#### **TICKOPUR R 30**

**Neutral cleaner with corrosion protection, material protecting, neutral, pH 7, application 1–5%**

Removes light drilling, grinding, polishing and lapping residues, dust, soot, oil- and grease-containing impurities, etc.

From metal, glass, ceramic, plastic, rubber, etc.

#### **TICKOPUR TR 3**

**Special cleaner based on citric acid, material protecting, phosphate-free, with corrosion protection, mildly acidic, pH 3.0 (1%), application 5%**

Removes mineral residues, flash rust, greases, oils, waxes, pigments, drilling, grinding, polishing and lapping residues, etc.

From metal, glass, ceramic, plastic, rubber, etc.

#### **TICKOPUR R27**

**Special cleaner based on phosphoric acid, for decalcification and rust removal with corrosion protection, acidic, pH 1.9 (1%), application 5%**

Removes strong mineral residues (lime, silicates, phosphates, cements, etc.), rust, temper colours, metal oxides, grease and oil films, etc.

From steel, stainless steel, precious metal, glass, ceramic, plastic, rubber. Not intended for light and non-ferrous metals, tin, zinc.

#### **TICKOPUR TR 2**

**Special cleaner, demulsifying, based on phosphoric acid, material protecting, with corrosion protection, mildly acidic, pH 3.6 (1%), application 0.1–5%**

Removes mineral residues, flash rust, greases, oils, waxes, pigments, drilling, grinding, polishing and lapping residues, etc.

From metal, glass, ceramic, plastic, rubber, etc. Caution with light metal, tin and zinc.

#### **TICKOPUR TR 14**

**Flux remover, surfactant-free, non-foaming, material protecting, phosphate-free, alkaline, pH 10.7 (1%), application 10%**

Removes resinous flux, solder pastes, ionic and non-ionic residues, drilling, grinding, polishing and lapping residues, fingerprints, greases, oils, etc.

From non-ferrous and light metals, steel, stainless steel, glass, ceramic, plastic, rubber, assembled and non-assembled PC boards, soldering frames, electronic components, assemblies, etc.

#### **TICKOPUR R 32**

**Special cleaner, free of complexing agents, material protecting, with corrosion protection, mildly alkaline, pH 11.1 (1% in demineralised water), application 0.25–5 %**

Removes distillation residues, organic and inorganic residues, oily and greasy soiling, etc.

From metal, including burnished metal, glass, ceramic, plastic, rubber, etc. Specially for electroplating, lasers, analytics. Prepare with demineralised water.

#### **TICKOPUR R 36**

**Special cleaner, surfactant-free, for analysis and laser technology, for cleaning lamellae, material-protecting, non-foaming, mildly alkaline, pH 10 (1%), application 0.25–5%**

Removes general soiling, oils, greases, distillation residues, organic and inorganic residues.

From steel, precious and light metal, ceramic, plastic, rubber, glass, optical glasses, vertical and horizontal lamellae. Caution with tin and zinc.

**TICKOPUR TR 7**

**Universal cleaner, demulsifying, for rapid separation of oil and fat, mildly alkaline, pH 8.9 (1%), application 0.1–5%**

Removes oils, greases, waxes, pigments, fluxes, solder pastes, drilling, grinding, polishing and lapping residues.

From steel, stainless steel, non-ferrous, precious and light metal, glass, ceramic, plastic, rubber, soldering frames.

**TICKOPUR TR 13**

**Intensive cleaner, demulsifying against stubborn residues/contamination, phosphate and silicate-free, alkaline, pH 11.9 (1%), application 0.1–10%**

Removes gumming, coking residues, soot, oils, greases, waxes, pigments, coloured coating, drilling, grinding, polishing and lapping residues, etc.

From steel, stainless steel, glass, ceramic, plastic, rubber. Not intended for light metal, tin, zinc. Non-ferrous metals can be weakened.

**TICKOPUR RW 77**

**Special cleaner with ammonia, phosphate-free, mildly alkaline, pH 9.9 (1%), application 5–10%**

Removes gumming, soot, greases, oils, waxes, pigments, coloured coating, silicone oil, flux, oxides on non-ferrous and precious metals.

Non-ferrous and precious metal, iron, steel, glass, ceramic, plastic, rubber, analysis sieves, PC boards in the service sector. Caution with light metals.

**TICKOPUR R 60**

**Intensive cleaner, phosphate-free, strongly alkaline, pH 12.3 (1%), application 2–20%**

Removes coking residues, gumming, soot, pigments, greases, oils, waxes, silicone oil, coating, drilling, grinding, polishing and lapping residues, etc.

From steel, stainless steel, glass, ceramic, plastic, rubber. Not intended for light metal, tin, zinc.

**TICKOPUR KS 1**

**Universal corrosion protection for all ferrous metals, solvent-free, neutral, pH 7.4 (1%), application 0.2–2%**

Suitable for all ferrous metals, e.g., grey cast iron, unprotected steels of different alloys.

Effective corrosion protection for indoor storage after cleaning with TICKOPUR products and subsequent aqueous rinsing. No oil or grease film is formed.



## 11 Performing a foil test

### Information

**BANDELIN**  
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:

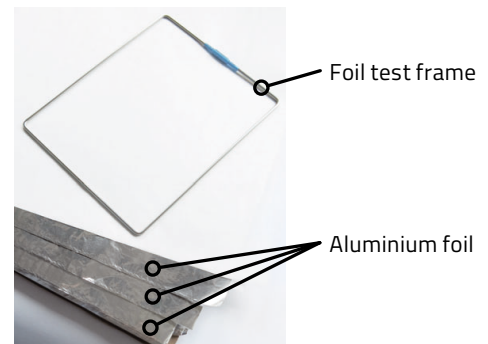
<https://bandelin.com/folientest/>

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.



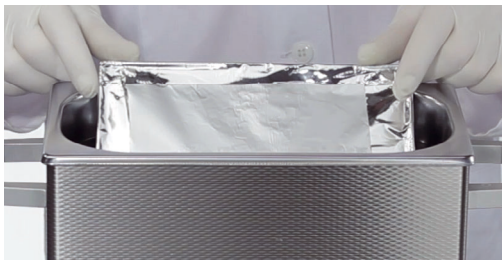
## Performing the foil test



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.



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		
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	FL 4	71004
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		
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 40	71040
FT 42	3224	TRISON (TE 3000 / TE 4000)		
FT 45	3204	DT 1050 CH, RK 1050/CH, RM 75.2 U/UH/ST ST 1050 CH	FL 45	71045

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