BANDELIN
Ultraschall seit 1955

Operating Instructions

SONOREX SUPER

High-performance ultrasonic baths



Valid for:

RK 31, RK 31 H, RK 52, RK 52 H

RK 100, RK 100 H, RK 102 H, RK 103 H, RK 106

RK 156, RK 156 BH

RK 170 H

RK 255, RK 255 H

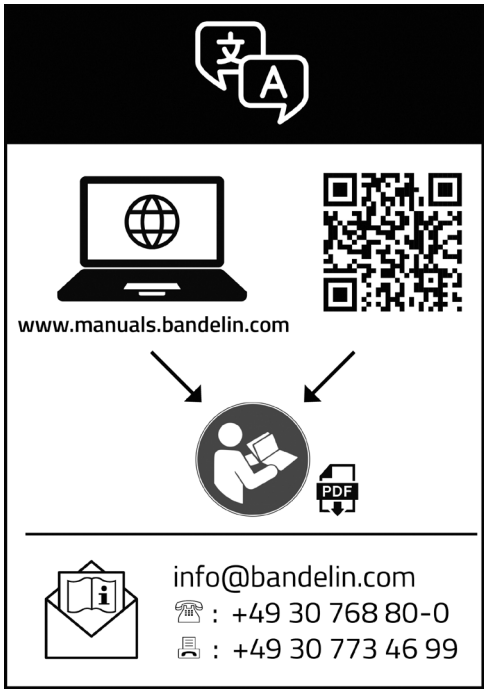
RK 510, RK 510 H, RK 512 H

RK 514, RK 514 H, RK 514 BH

RK 1028, RK 1028 H, RK 1028 C, RK 1028 CH

RK 1040, RK 1050, RK 1050 CH

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CE

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Certified to ISO 9001 and ISO 13485

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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 Chapter **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 Chapter **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.
Sonication items 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 **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

If you use the device in the medical field, clean and disinfect the device's surfaces on a regular basis with a surface disinfectant which is at least bactericidal, levurocidal and, to a limited extent, virucidal disinfection agent to avoid cross-contamination.
Prepare accessories, such as holders, carriers or baskets, in a washing and disinfecting device.

At higher temperatures, vapours and aerosols contaminated with impurities that have been introduced may rise from the device. This can lead to infections and illnesses.
When cleaning medical instruments, avoid bath temperatures above 40 °C. If necessary, use a lid, an extraction system 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 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 device's plug.

⚠ WARNING

Note for unit with type E+F jack:

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

- If you discover a defect in the device, unplug it immediately. Do not connect any defective device to the mains.
- Only have repairs carried out by qualified personnel or 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.

2.6 Damage to health due to ultrasonic noise

Ultrasound generates cavitation noises, which are typical of the process and can be perceived very differently by different individuals.
To reduce the noise, we recommend that you only operate the device with the appropriate lid.
In general, a sound level of 75 dB-AU is not exceeded.
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 earmoulds, 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.

2.7 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 sonication items 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.
- The lid used must not completely seal the oscillating tank – steam must be able to escape.

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 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.

2.11 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 tank by observing the following instructions:

- Replace the sonication liquid if it has visible 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 sonication items, 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 **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, move it further away from the device.
The device complies with the requirements for Class B devices per 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 Chapter **6.4 Repairs**.

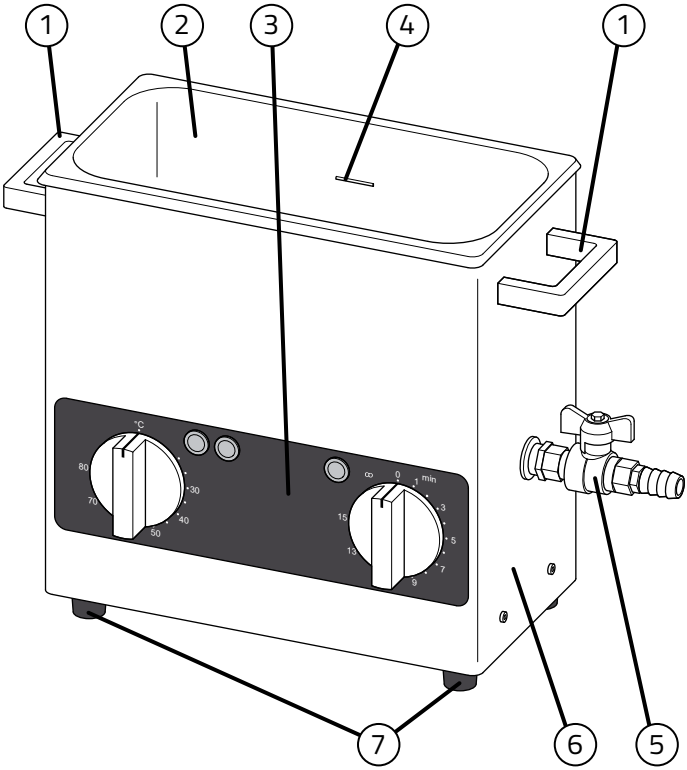
2.15 Not overloading accessories

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

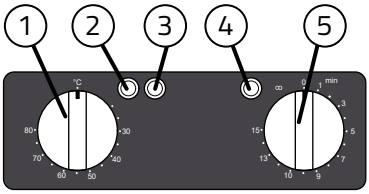
3.1 Structure



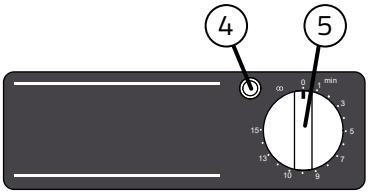
Device overview

1 Handles (depending on the model)
2 Oscillating tank
3 Control panel
4 Filling level mark
5 Outlet with ball valve (depending on the model)
6 Housing
7 Device feet

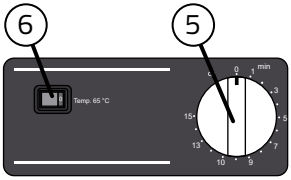
3.2 Control panel



Operating elements for all devices with heating except RK 31 H



Operating elements for all devices without heating:
RK 31, RK 52, RK 100, RK 106, RK 156, RK 255, RK 510, RK 514, RK 1028, RK 1028 C, RK 1040, RK 1050



Operating elements for type RK 31 H

1 Turning knob for adjusting the heating temperature
2 White pilot lamp:
   - For model RK 52 H, lit up means: heating is switched on
   - For models RK 100 H... RK 1050 CH, lit up means: heating control active
3 Yellow pilot lamp:
   For models RK 100 H... RK 1050 CH, lit up means: heating switched on
4 Green pilot lamp:
   Lit up means: ultrasound is switched on
5 Turning knob for adjusting the ultrasound duration
6 Toggle switch for switching the heating on/off

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 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 Chapter **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

Relevant for devices RK 102 H and later.

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

4.3 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. Make sure that the device is switched off. 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", or the toggle switch must be in the left position ("0").
2. Plug the mains cable of the device into a grounded socket.
3. Briefly switch on the ultrasound. To do this, turn the turning knob for the ultrasound duration to the right, then back to "0" after 1 to 2 seconds.

Result

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

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 a foil test**.

4.4 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.

5 Operation

5.1 Direct and indirect sonication

Objects can be sonicated directly or indirectly in the device.

Direct sonication is the standard procedure. The objects to be sonicated are placed using 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 of water and a special ultrasonic specimen is used as the sonication fluid. 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

Observe the instructions from the manufacturer of the ultrasonic agent regarding dosing. The necessary amount of ultrasonic agent and water can be found in the dosing table. See chapter **9 Dosing table**.

You can calculate the quantities yourself analogously to the following example: 10 l ready-to-use solution, 2.5%:

Agent: $\frac{10\ l \times 2{,}5\ \%}{100\ \%} = 0{,}25\ l$

Quantity of water: $10\ l - 0{,}25\ l = 9{,}75\ l$

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 duration if the result is insufficient.

5.4 Filling with sonication fluid

NOTICE

Risk of damage

– 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, condensation 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.

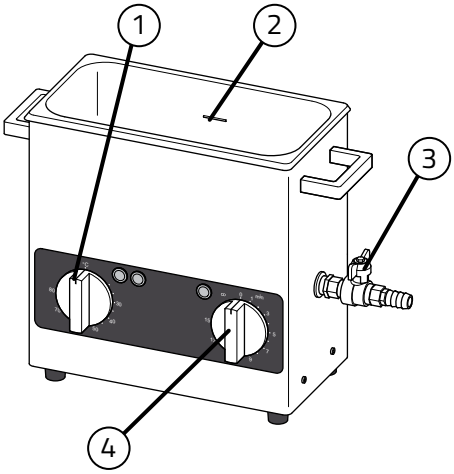
– Mix any powder agents in another container before placing them in the oscillating tank.

– Do not put the agent in 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 Turning knob for adjusting the heating temperature
2 Filling level mark
3 Outlet with ball valve (depending on the model)
4 Turning knob for adjusting the ultrasound duration

Requirements

- In the case of devices with an outlet, 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**.
3. Fill up to the filling level mark with water, avoiding foaming. For indirect sonication, take account of the displacement due to inset containers.

Result

» The device is ready to be switched on.

5.5 Switching sonication on and off

Requirements

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

Procedure

1. If there is a lid, place it on the device.
2. Rotate the turning knob for the ultrasound duration to the desired duration or to the ∞ 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 ∞, 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 is locked.

5.6 Switching the heating on and off

Relevant for the following devices:

- RK 31 H
- RK 52 H
- RK 100 H, RK 102 H, RK 103 H, RK 156 BH, RK 170 H, RK 255 H, RK 510 H, RK 512 H, RK 514 H, RK 514 BH, RK 1028 H, RK 1028 CH, RK 1050 CH

⚠ 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.

Heated 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 **5.7 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 lid used must not completely seal the oscillating tank – steam must be able to escape.

Information

- The heater is equipped with overtemperature protection. If the heating function is not working, disconnect the device from the mains and allow it to cool down to below 50 °C. Only then can the device be put back into operation.
- The heating operates independently of the ultrasound.
- A bath temperature greater than or equal to 80 °C can only be achieved with the lid on.
- To achieve a shorter heating time and homogeneous temperature distribution among the sonication liquid in the ultrasonic bath, switch on the ultrasound during the preheating phase.

RK 31 H

Switch on the heating using the toggle switch.

- The switch will light up when the heating is switched on, even if the target temperature has been reached.
- The temperature control is fixed at 65 °C.

RK 52 H

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

- The white pilot lamp will light up.
- When the target temperature has been reached, the white pilot lamp will go out.

RK 100 H, RK 102 H, RK 103 H, RK 156 BH, RK 170 H, RK 255 H, RK 510 H, RK 512 H RK 514 H, RK 514 BH, RK 1028 H, RK 1028 CH, RK 1050 CH

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.

5.7 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 lid, if available.
- To degas, switch on the ultrasound. 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.

5.8 Introducing objects to be sonicated

To achieve a good result, observe the following instructions when adding sonication items:

- Before each sonication process, check to ensure that the sonication liquid is not contaminated. If there is visible soiling contamination, replace the sonication fluid.
- The sonication fluid must be degassed. See Chapter **5.7 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 chapter **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.

5.9 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 sonication items in the sonication fluid for too long. This can damage the objects.

5.10 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. In the event of a device with an outlet, open the ball valve. If the device does not have an outlet, carefully empty the oscillating tank via its corner.
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.

5.11 Troubleshooting

Error	Possible causes	Troubleshooting
Too little ultrasound effect, loud noises	▪ Sonication liquid contains gases. ▪ There are too many objects to be sonicated in the oscillating tank.	▪ Degas the sonication fluid. See Chapter **5.7 Degassing the sonication liquid – DEGAS**. ▪ Reduce the number of objects to be sonicated.
Uneven sounds	▪ Incorrect filling level in the oscillating tank	▪ 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. ▪ Vary the position of the objects to be sonicated.
Heating is not working	▪ The heating has switched off due to excessive temperature. ▪ The heating is defective.	▪ Disconnect the device from the mains and allow it to cool down to below 50 °C;only then can it be restarted. ▪ Have the device repaired.

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.

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 device

– Only carry out checks on the device 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**.

Check the control lamps

Check the function of the pilot lamps.

All devices:

- Briefly switch on the ultrasound.
  – The green pilot lamp will remain on as long as the ultrasound is switched on.

RK 31 H:

- Briefly switch on the heating using the toggle switch.
  – The pilot lamp in the toggle switch will remain lit up as long as the heating is switched on.

RK 52 H:

- Briefly switch on the heating to above 30 °C using the turning knob.
  – The white pilot lamp will remain lit up as long as the heating is switched on.

RK 100 H, RK 102 H, RK 103 H, RK 156 BH, RK 170 H, RK 255 H, RK 510 H, RK 512 H RK 514 H, RK 514 BH, RK 1028 H, RK 1028 CH, RK 1050 CH:

- Briefly switch on the heating to above 30 °C using the turning knob.
  – The white and yellow pilot lamps will remain lit up 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 oscillating tank with water.
2. Switch on the ultrasound and, if present, the heating, one after the other. Take the power reading. Switch the heating and ultrasound off again.
3. Compare the readings for the nominal power with the technical specifications. See chapter **8.1 Technical specifications**.

The measured values may deviate from the values in the technical data by no more than ± 20%.

Checking ultrasonic effect

Check the effect of the ultrasound while putting it into service and at regular intervals. Testing is recommended every 3 months. See Chapter **11 Performing a foil test**.

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 VAH (Association of Applied Hygiene). Please

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

Download the "Certificate of Decontamination" 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 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 application is permitted under the RoHS Directive 2011/65/EU and Delegated Directive (EU) 2025/2363, Annex III, Exemption 7c.V 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 data

Mains supply	230 V~ (± 10 %) 50/60 Hz
Mains supply (optional)	115 V~ (± 10%) 50/60 Hz
Protection class	I
Degree of protection	IP 32
Ultrasonic frequency	35 kHz

Type	Ultrasonic peak power/ultrasonic nominal power	Heating power (230 V)	Heating power (115 V)	Current consumption (230 V)	Current consumption (115 V)
	[W]	[W]	[W]	[A]	[A]
RK 31	160/40	–	–	0.2	0.4
RK 31 H	160/40	70	70	0.5	0.9
RK 52	240/60	–	–	0.3	0.6
RK 52 H	240/60	140	140	0.9	1.8
RK 100	320/80	–	–	0.4	0.7
RK 100 H	320/80	140	140	1.0	2.0
RK 102 H	480/120	140	140	1.2	2.3
RK 103 H	560/140	200	200	1.5	3.0
RK 106	480/120	–	–	0.6	1.1
RK 156	640/160	–	–	0.7	1.4
RK 156 BH	860/215	600	600	3.6	7.1

Type	Ultrasonic peak power/ultrasonic nominal power	Heating power (230 V)	Heating power (115 V)	Current consumption (230 V)	Current consumption (115 V)
	[W]	[W]	[W]	[A]	[A]
RK 170 H	1520/380	1600	1300	8.7	14.7
RK 255	640/160	–	–	0.7	1.4
RK 255 H	640/160	280	280	2.0	3.9
RK 510	640/160	–	–	0.7	1.4
RK 510 H	640/160	400	400	2.5	4.9
RK 512 H	860/215	400	400	2.7	5.4
RK 514	860/215	–	–	1.0	1.9
RK 514 H	860/215	600	600	3.6	7.1
RK 514 BH	860/215	600	600	3.6	7.1
RK 1028	1200/300	–	–	1.4	2.7
RK 1028 C	2000/500	–	–	2.2	4.4
RK 1028 H	1200/300	1300	1300	7.0	14.0
RK 1028 CH	1200/300	1450	1400	7.7	15.0
RK 1040	1520/380	–	–	1.7	3.4
RK 1050	2400/600	–	–	2.7	5.3
RK 1050 CH	2400/600	1950	1050	11.1	14.4

Dimensions and weight

Type	Internal dimensions of the oscillating tank (L × W × H)	Operating volume	Connection for ball valve (outlet)	Weight
	[mm]	[l]		[kg]
RK 31	190 × 85 × 60	0.6	–	2.2
RK 31 H	190 × 85 × 60	0.6	–	2.3
RK 52	150 × 140 × 100	1.2	–	2.4
RK 52 H	150 × 140 × 100	1.2	–	2.6
RK 100	240 × 140 × 100	2.0	–	3.2
RK 100 H	240 × 140 × 100	2.0	–	3.4
RK 102 H	240 × 140 × 100	2.0	G ¼	4.1
RK 103 H	240 × 140 × 150	2.5	G ¼	4.3
RK 106	Ø 240 × 130	4.0	G ¼	5.2
RK 156	500 × 140 × 100	4.0	G ¼	6.0
RK 156 BH	500 × 140 × 150	6.0	G ¼	7.3
RK 170 H	1000 × 200 × 200	26.0	G ½	26.2
RK 255	300 × 150 × 150	3.8	G ¼	4.8
RK 255 H	300 × 150 × 150	3.8	G ¼	5.0
RK 510	300 × 240 × 150	6.6	G ½	7.2
RK 510 H	300 × 240 × 150	6.6	G ½	7.4
RK 512 H	300 × 240 × 200	8.7	G ½	8.3
RK 514	325 × 300 × 150	9.0	G ½	8.8

Type	Internal dimensions of the oscillating tank (L × W × H)	Operating volume	Connection for ball valve (outlet)	Weight
	[mm]	[l]		[kg]
RK 514 H	325 × 300 × 150	9.0	G ½	8.8
RK 514 BH	325 × 300 × 200	12.5	G ½	9.8
RK 1028	500 × 300 × 200	19.0	G ½	14.0
RK 1028 C	500 × 300 × 300	30.0	G ½	24.5
RK 1028 H	500 × 300 × 200	19.0	G ½	14.7
RK 1028 CH	500 × 300 × 300	30.0	G ½	23.4
RK 1040	Ø 500 × 195	28.0	G ½	19.4
RK 1050	600 × 500 × 200	41.0	G ½	30.0
RK 1050 CH	600 × 500 × 300	60.0	G ½	36.0

8.2 Ambient conditions

Overvoltage category:	II
Degree of contamination:	2
Permissible ambient temperature:	5... 40 °C
Permissible relative humidity to 31 °C:	80% (non-condensing)
Permissible relative humidity 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

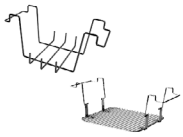
The declaration of conformity can be requested from the manufacturer, stating the serial number.

9 Dosing table

Type	Operating volume	Dosage Water + agent				
	[l]	1%	2%	3%	5 %	10%
RK 31, RK 31 H	0.6	590 ml + 10 ml	585 ml + 15 ml	580 ml + 20 ml	570 ml + 30 ml	540 ml + 60 ml
RK 52, RK 52 H	1.2	1.1 l + 15 ml	1.1 l + 25 ml	1.1 l + 40 ml	1.1 l + 60 ml	1.0 l + 120 ml
RK 100, RK 100 H, RK 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
RK 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
RK 106, RK 156	4.0	3.9 l + 40 ml	3.9 l + 80 ml	3.8 l + 120 ml	3.8 l + 200 ml	3.6 l + 400 ml
RK 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
RK 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
RK 255, RK 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
RK 510, RK 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

Type	Operating volume	Dosage Water + agent				
	[l]	1%	2%	3%	5 %	10%
RK 512 H	8.7	8.6 l **+ 90 ml**	8.5 l **+ 180 ml**	8.4 l **+ 270 ml**	8.2 l **+ 440 ml**	7.8 l **+ 870 ml**
RK 514, RK 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**
RK 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**
RK 1028, RK 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**
RK 1028 C, RK 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**
RK 1040	28.0	27.7 l **+ 280 ml**	27.4 l **+ 560 ml**	27.1 l **+ 840 ml**	26.6 l **+ 1.4 l**	25.2 l **+ 2.8 l**
RK 1050	41.0	40.5 l **+ 410 ml**	40.1 l **+ 820 ml**	39.7 l **+ 1.3 l**	38.9 l **+ 2.1 l**	36.9 l **+ 4.1 l**
RK 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**

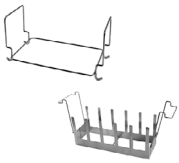
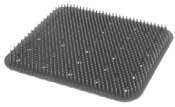
10 Approved accessories

	**Insert basket K...,** made from stainless steel, sieve cloth. Gentle on objects to be sonicated and avoids damage to the tank bottom. Optimal ultrasound transmission.
	**Utensil holder GH...,** made from stainless steel, mesh size 12 x 12 mm. For larger individual parts. GH 1 for glass flasks up to Ø 105 mm.
	**Cover D...,** made of stainless steel. For use with insert basket. Protects against external contamination. Condensation water is discharged into the oscillating tank. Sound-reducing.
	**Insert basket K... EM,** made of stainless steel. An alternative to DIN sieve trays in the medical field. Basket holder KT required.
	**Basket holder KT...,** made of stainless steel. For insert baskets K...EM or DIN sieve trays in the medical field.
	**Insert tub KW...,** 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).

Type	Insert-basket	Utensil holder	Lid	Insert basket	Basket holder	Insert tub
RK 31 /H	K 08	–	D 08	–	–	–
RK 52 /H	K 1 C	GH 1	D 52	–	–	–
RK 100 /H, RK 102 H	K 3 C	GH 1	D 100	–	–	KW 3
RK 103 H	K 3 CL	–	D 100	–	–	KW 3
RK 106	K 6	–	D 6	–	–	–
RK 156	K 6 L	–	D 156	–	–	–
RK 156 BH	K 6 BL	–	D 156	–	–	–
RK 170 H	K 7	–	D 170	–	–	–
RK 255 /H	K 5 C	–	D 255	–	–	KW 5
RK 510 /H	K 10	GH 10	D 510	–	–	KW 10-0
RK 512 H	K 10 B	–	D 510	–	–	–
RK 514 /H	K 14	GH 14	D 514	–	–	KW 14
RK 514 BH	K 14 B	–	D 514	–	–	KW 14 B
RK 1028 /H	K 28	GH 28	D 1028	K 29 EM	KT 30 /Z	KW 28-0
RK 1028 C	K 28 C	–	D 1028 C	–	–	KW 28-0
RK 1028 CH	K 28 C	–	D 1028 C	–	–	KW 28-0
RK 1040	K 40	–	D 40	–	–	–
RK 1050	K 50	–	D 1050 C	–	–	KW 50-0
RK 1050 CH	K 50 C	–	D 1050 C	–	–	KW 50 B-0

	**Insert baskets KD..., PD...,** 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.
	**Inset beakers** **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.
	**Positioning lid DE...,** made of stainless steel. For holding inset beakers. Positioning for optimal ultrasonic energy use.
	**Beaker holder ES...,** made of stainless steel. For holding 4 inset beakers in larger ultrasonic baths. Positioning for optimal ultrasonic energy use.
	**Impression tray holder LT 102,** made of stainless steel. For cleaning impression trays.
	**Insert basket PK... C,** made of plastic, perforated. For gentle cleaning of sensitive surfaces, e.g., instruments such as probes, syringes, condensers.
	**Injection nozzle holder ED...,** made of stainless steel. For hanging in the oscillating tank. Holds injection nozzles of different sizes.
	**Cassette holder KAH...,** made of stainless steel. For hanging in the oscillating tank. Holds up to three levels of cassettes.

Type	Inset basket	Inset beaker	Positioning lid/ beaker holder	Impression tray holder	Inset basket	Injection nozzle holder	Cassette holder
RK 31 /H	PD 04	KB 04, SD 05	DE 08	–	–	–	–
RK 52 /H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 52	–	–	–	–
RK 100 /H, RK 102 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 100	LT 102	PK 2 C	ED 9	–
RK 103 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 100	–	–	–	–
RK 106	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 6	–	–	–	–
RK 156	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 156	–	–	–	–
RK 156 BH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 156	–	–	–	–
RK 170 H	–	–	–	–	–	–	–
RK 255 /H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 255	–	–	–	–
RK 510 /H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 510	–	–	ED 9	–
RK 512 H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 510	–	–	–	–
RK 514 /H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 514	–	–	–	KAH 14.3
RK 514 BH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	DE 514	–	–	–	–
RK 1028 /H	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–
RK 1028 C	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–
RK 1028 CH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–
RK 1040	–	–	–	–	–	–	–
RK 1050	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–
RK 1050 CH	KD 0, PD 04	SD 06, SD 09, PD 06, EB 05	ES 4	–	–	–	–

	**Spring clamps EK...,** made of stainless steel, for laboratory flasks. Prevents floating. For screwing into hanging baskets and utensil holders. 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
	**Handle adjuster GV...,** made of stainless steel. For hanging baskets and utensil holders.
	**Test tube holder RG...,** 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.
	**Sieve holder SH 7,** made of stainless steel. For cleaning of individual sieves. **Sieve holder SH 28 C,** made of stainless steel. For simultaneous and gentle cleaning of up to 5 analysis sieves of Ø 200 mm.
	**Silicone knob mat SM...** For non-contact storage of highly sensitive instruments. Fastening in the basket prevents floating and damage to the instruments. Permeable to ultrasound.
	**Inset grid EG ...** For contactless storage of delicate instruments. Fastening in the basket prevents floating and damage to the instruments. Permeable to ultrasound.
	**Sample Holder PHS 12** Floating sample holder for micro-reaction vessels. Suitable for all device sizes. For the simultaneous sonication of up to 12 cups (Eppis) with a capacity of 1.5 and 2 ml.

Type	Spring clamps for laboratory flasks	Handle adjuster	Test tube holder	Sieve holder	Silicone base mat	Inset grid
RK 31 /H	–	–	–	–	–	EG 1
RK 52 /H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	RG 2	–	–	EG 1
RK 100 /H, RK 102 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	RG 2	–	SM 3	EG 1
RK 103 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	RG 2	–	–	EG 1
RK 106	EK 10, EK 25, EK 50, EK 100, EK 250	–	–	SH 7	–	EG 1
RK 156	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	–	–	SM 6	EG 1
RK 156 BH	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	–	–	SM 6	EG 1
RK 170 H	–	–	–	–	–	EG 2
RK 255 /H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 3	–	–	SM 5	EG 1
RK 510 /H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	–	EG 1
RK 512 H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	–	EG 1
RK 514 /H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	SM 14	EG 1
RK 514 BH	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	–	EG 1
RK 1028 /H	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	–	SM 29	EG 1
RK 1028 C	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	SH 28 C	–	EG 1
RK 1028 CH	EK 10, EK 25, EK 50, EK 100, EK 250	GV 10	–	SH 28 C	–	EG 1
RK 1040	–	–	–	–	–	EG 1
RK 1050	–	–	–	–	–	EG 1
RK 1050 CH	–	–	–	–	–	EG 1

11 Performing a foil test

Information

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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.

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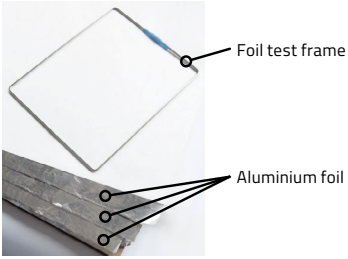
Test result and documentation

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.

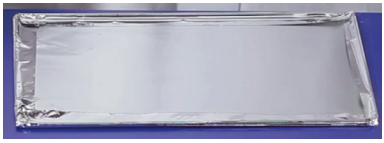
You can download a documentation template here for documenting the test results:
https://bandelin.com/folientest/
You will also find an application video there.

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

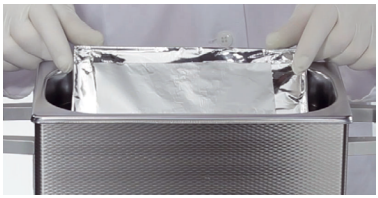


1. Fill the oscillating tank with water and a suitable ultrasound agent in the dosage specified by the manufacturer up to the filling level mark.
2. Degas the sonication liquid.
3. Clamp the aluminium foil onto the foil test frame. We recommend using our foil blanks. As a substitute, you can also use 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.

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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, DT 1048 H, 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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