

Operating Instructions

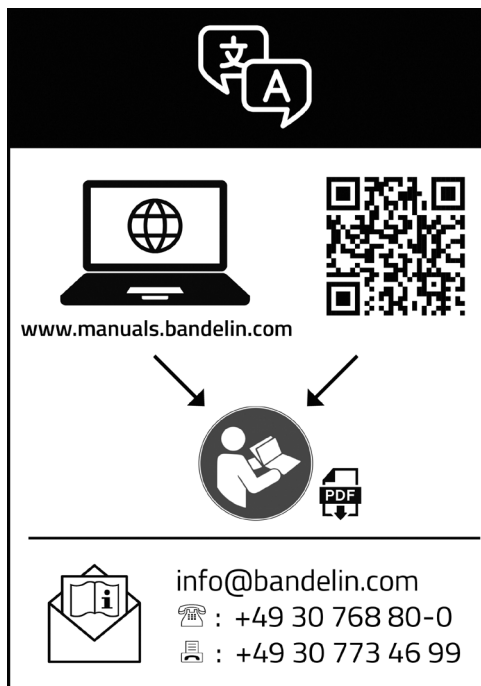
SONOREX DIGITEC Series F

High-performance ultrasonic baths for sample preparation



Valid for:

DT 510 F and DT 1028 F



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BANDELIN *electronic* GmbH & Co. KG, Heinrichstraße 3 – 4, 12207 Berlin, Germany

Tel.: +49-30-768 80 - 0, Fax: +49-30-773 46 99, info@bandelin.com

Certified in accordance with ISO 9001 and ISO 13485

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1 About these operating instructions

These operating instructions contain necessary and useful information on how to operate the device safely and efficiently.

- Read these operating instructions before using the device.
- Pay special attention to chapter **2 Safety**.
- If you pass this device on to others, please enclose these operating instructions.
- Contact your specialist dealer or BANDELIN if any of your questions are not answered in these operating instructions. Information on service can be found in chapter **6.4 Repair**.

If the translation is unclear, BANDELIN's original German version must be observed.

BANDELIN accepts no responsibility or liability for damage caused by improper handling or usage contrary to the intended purpose.

Illustrations are provided as examples and are not to scale.

2 Safety

2.1 Use of the device

With their flat tanks, the SONOREX ultrasonic baths of the F series are intended for sample preparation in laboratories as well as for indirect sonication of objects or samples in industrial or scientific research.

With the proper accessories, samples can be sonicated in laboratory flasks of different shapes and sizes. The samples can be sonicated both for a defined time and also in continuous operation. The direct sonication of objects or the reprocessing of objects to be cleaned is not permitted in these ultrasonic baths.

Application examples:

- Sample preparation
- Uniform, indirect sonication of samples
- Homogenising
- Rapid degasification of samples, e.g., in diagnostics, environmental and foodstuff analyses and in sonochemistry.

Sonication is always carried out together with a suitable preparation that is added to the bath liquid.

For correct use, the supplied insert basket or another holder is also required for storing the inset beakers with the samples during the sonication. No objects may stand or lie directly on the tank bottom – this is the only way to ensure optimal diffusion of the ultrasound.

Do not operate the device while unattended.

2.2 Keep out of reach of children

Children cannot identify hazards posed by the device. Therefore, keep the device out of the reach of children.

2.3 Danger of electric shock

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

- Protect the device from moisture and liquids. Keep the surface and controls clean and dry.
- Only transport the device when empty.
- Only drain the device once it has been switched off.
- Do not spray the device or expose it to splash water.
- Always disconnect the device from the mains before cleaning or maintenance.
- Only plug the device into a grounded mains socket that fits the ground contact on the device plug.



WARNING

For devices with type E+F plugs, please note:

Combining with type K sockets (particularly common in Denmark) is not permitted.

-
- If you notice a defect in the device, disconnect the mains plug immediately. Do not connect a defective device to the mains.
 - Repairs should only be carried out by qualified personnel or by the manufacturer. See chapter **6.4 Repair**.
 - Position the device so that it is easy to unplug the mains connection at any time and without difficulty.

2.4 Harmful to health due to ultrasound noise

The ultrasound noise typical of the process can be perceived as very unpleasant. Remaining within a radius of 2 m for an extended period of time may cause damage to health.

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

2.5 Hazards due to high temperatures

The ultrasonic bath, the sonication fluid and the sonication objects can become hot during operation. Contact with these products may cause burns.

Ultrasound energy warms up the sonication fluid even without additional heating.

Prolonged ultrasound operation can lead to very high temperatures.

- Observe the treatment times recommended by the manufacturer of the ultrasound agent. Do not leave the ultrasound switched on for longer than necessary.
- Do not reach into the sonication fluid with your hand. Remove sonication objects with the insert basket or forceps.
- Allow the sonication objects to cool before touching them.

Non-aqueous liquids can heat up many times faster than water. A possible flashpoint can be reached or exceeded after a very short sonication time.

In the case of high-boiling liquids, the bath temperature can rise to over 120 °C due to the energy input of the ultrasound. This can lead to fires and severe burns.

- Do not use combustible, explosive, non-aqueous fluids (e. g. petrol, solvents) or mixtures with combustible liquids (e. g. alcoholic solutions) directly in the stainless steel oscillating tank.
- Small quantities of combustible liquids can be sonicated indirectly in sample vessels. Before sonication of flammable liquids, familiarise yourself with the necessary safety measures and applicable regulations for handling these liquids.
- The lid may not fully seal the oscillating tank – steam must be able to escape.

2.6 Danger due to ultrasound

The strong ultrasound in the device destroys cell structures. If part of the body is immersed in the sonication fluid during operation, this can cause damage to skin and also damage to internal tissue. The periosteum of finger bones can be damaged.

- Do not reach into the sonication fluid during operation.
- Never sonicate living creatures.

2.7 Danger from agents used

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

- Wear gloves and safety goggles when handling hazardous agents.
- Do not ingest the agents and do not allow them to come into contact with the eyes or skin. Do not lean over the device, in order to avoid vapours from coming into contact with the eyes or from being inhaled.
- Place a lid on the device during operation. Use an extraction system if there are dangerous vapours.
- Observe the information on the label and in the safety data sheet for the agent.
- Keep the agents away from children and untrained persons.

2.8 Disposal of sonication fluid

Dispose of the sonication fluid in accordance with the specifications of the manufacturer of the ultrasound agent used. The recommended ultrasound agent TICKOPUR R 33 STAMMOPUR from DR. H. STAMM GmbH is biodegradable in accordance with the provisions of Regulation (EC) No. 648/2004 (Detergents Regulation). If necessary, the sonication fluid must be neutralised before disposal. Depending on the type of contamination involved, water-polluting substances like oils or heavy metal compounds may be introduced to the sonication fluid during cleaning. If the threshold values for these substances are exceeded, the sonication fluid must be processed or disposed of as special waste.

Observe local waste water 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 the usage of the device. The erosion leads to leaks in the oscillating tank. Bath liquid can thus leak into the interior of the device. Moisture on electrical components can lead to an electric shock or fire.

- Stop using 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 sonication fluid that is visibly contaminated by particles.
- Only use demineralised water (DI water) with an ultrasound-compatible agent.
- Do not use chemicals that contain or release chloride ions in the oscillating tank. This is the case with some disinfectants, household cleaners and dishwashing detergents. Chloride ions will corrode stainless steel.
- Only use the device with approved accessories that are suitable for the device and the objects to be treated, e.g. a basket. Do not place any objects to be treated directly on the bottom of the oscillating tank.

The lid may not fully seal the oscillating tank – steam must be able to escape.

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 splashing in the contact liquid or on the stainless steel surface. Replace contaminated sonication fluid immediately. Clean surfaces and wipe them dry.
- The use of highly acidic agents can corrode the ball of the ball valve. The ball valve will leak. If the use of a strongly acidic detergent cannot be avoided, use a stainless steel ball valve.
- Do not operate the device without sonication fluid in the oscillating tank. Make especially sure that the device is switched off when the oscillating tank is empty. The fill level must always be at or slightly above the filling level mark.

2.11 Interference with wireless communication

The device may interfere with other wireless communication devices in the immediate vicinity, such as:

- mobile phones,
- WLAN devices,
- Bluetooth devices.

If interference occurs with the operation of a wireless device, move it further away from the device.

The device satisfies the requirements for class B devices according to EN 55011.

2.12 Safety stickers on the device

- Observe all safety labels on the device.
- Keep the safety stickers in legible condition. Do not remove them. Replace them if they are no longer legible. To do so, please contact our Customer Service. See chapter **6.4 Repair**.

2.13 Do not overload accessories

Observe the specified load-bearing capacity or resilience of the accessory used.

- Accessories include baskets and holders.
- The relevant information can be found in the appendix or in the dimension sheet. If you do not have this data, contact the manufacturer.

3 Design and function

3.1 Structure

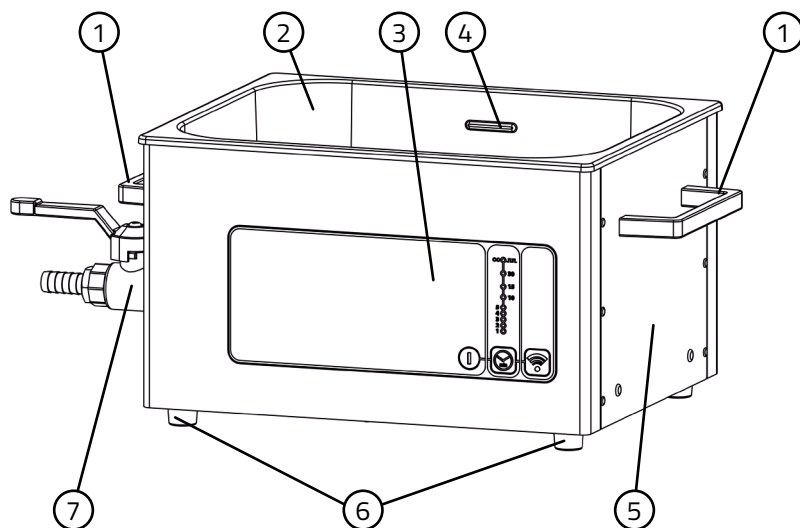


Fig. 1 Overview of the device

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

3.2 Control panel

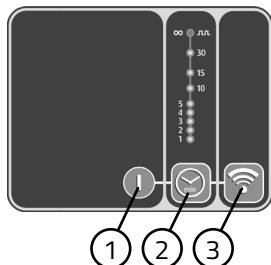


Fig. 2 Operating elements

- 1 On/Off button to switch the device on and off
- 2 Button to set the sonication time with time scale
- 3 Start/Stop button for the ultrasound

3.3 Function

The device uses cavitation triggered by low-frequency ultrasound. Piezoelectric oscillating systems 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. During their implosion, strong local microcurrents are produced on the surface of the sonicated objects. This removes dirt from the surface of the objects. Dirt particles are removed and fresh sonication fluid flows in.

The device uses SweepTec®, a technology in which the ultrasonic frequency often fluctuates around the operating frequency. The optimal operating frequency depends on the load, filling level, temperature and type of sonication fluid. The operating frequency can deviate significantly from the nominal frequency. SweepTec® creates an especially homogeneous ultrasonic field in the bath volume for consistently optimal results.

4 Preparation for operation

4.1 Installation site requirements

The installation location 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 with sonication fluid. For weight and work content, see chapter **8.1 Technical data**.
- Adequate ventilation must be ensured. The air supply under the bottom of the device must not be obstructed. If a sound proof box is used, it must also ensure sufficient ventilation.
- A water connection should be available nearby to fill the device. A basin must be available to drain or pour out the sonication fluid.

4.2 Mounting the ball valve

Mount the supplied ball valve, the hose socket and the hose according to the installation instructions enclosed with the ball valve.

4.3 Performing a function test

Requirement

- The device has adapted to the climatic conditions at the setup location for at least 2 hours.

Procedure

1. Insert the mains plug for the device into a grounded socket.
2. Press the On/Off button to switch on the device.
3. Briefly switch on the ultrasound. Do this by pressing the Start/Stop button. After 1 to 2 seconds, press the Start/Stop button again to switch off the ultrasound.

Results

- » A distinct noise can be heard when the ultrasound is switched on.

Contact our Service department if you cannot hear any noise.

A foil test should be performed before the first use. This is used to document the effectiveness of the ultrasound.

See chapter **10 Performing a foil test**.

4.4 Rinsing the oscillating tank

Thoroughly rinse the device's oscillating tank with water before first use.

In order to protect the surface during transport and storage, the device is covered with an oily preservative. Before the device is put into service, this preservative must be removed with a suitable cleaning agent.

5 Operation

5.1 Sonication

Depending on the application, the samples are sonicated indirectly in laboratory flasks or other sample vessels, which are inserted in the sonication fluid in the oscillating tank.

Examples:

- sonication of sample liquids,
- use of chemically aggressive or combustible liquids,
- use of demineralised water without additives,
- removal of chemically aggressive contamination,
- removal of stains, discolouration and rust using acidic agents.

The objects or liquids to be sonicated are introduced in the sonication fluid in an inset beaker, for transmission of the ultrasound in the oscillating tank. The sonication liquid in the oscillating tank must contain a surfactant preparation.

For approved accessories, see chapter **9 Approved Accessories**.

A direct sonication of objects in the sonication fluid in the ultrasonic baths DT ... F is not permitted.

5.2 Sonication fluid

A solution made from water and a special ultrasound agent are used as the sonication fluid. Drinking water or demineralised water can be used for the water. Water without any additives is unsuitable for sonication. Use of demineralised water without an ultrasound agent leads to increased erosion of the ultrasonic oscillating tank.

The ultrasound agent used must foster cavitation and be biodegradable, easy to dispose of, material-compatible and long-lasting. BANDELIN recommends ultrasound agents by DR. H. STAMM GmbH.

- Telephone consultation: +49 30 76880-280
- Internet: www.dr-stamm.de

We recommend TICKOPUR R 33, which is readily available from specialist laboratory supply dealers. This preparation enables very good ultrasonic transmission and has an average lifetime of 5-7 working days before it should be changed.

Type	Operating volume	Dosing with demineralised water TICKOPUR R 33 - 1% DI-Water + preparation
DT 510 F	2.5 l	2.48 l + 25 ml
DT 1028 F	5.8 l	5.74 l + 58 ml

Type	Operating volume	Dosing with drinking water TICKOPUR R 33 - 3% Drinking water + preparation
DT 510 F	2.5 l	2.4 l + 75 ml
DT 1028 F	5.8 l	5.6 l + 180 ml

For safe handling the values have been rounded mathematically.

5.3 Filling with sonication fluid

CAUTION

Risk of scalding

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

NOTICE

Damage due to condensation in the device

At high humidity, condensation forms inside the device if you fill it with cold water.

- Do not pour cold water into the oscillating tank when humidity is high.

NOTICE

If you use an agent in powder form, do not pour it directly into the ultrasonic oscillating tank.

- Mix agents in powder form in another container before pouring them into the oscillating tank.
- Only pour the agent into the oscillating tank when it has dissolved completely.

NOTICE

Damage to the device

A fill level that is too low will damage the ultrasonic bath.

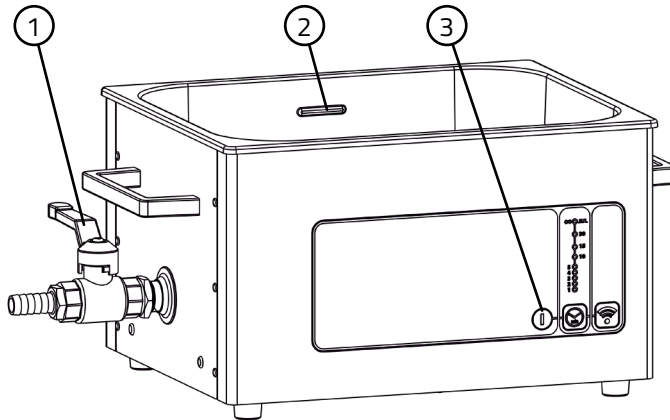


Fig. 3 Filling the oscillating tank

- 1 Outlet with ball valve
- 2 Filling level mark
- 3 On/Off button to switch the device on and off

Requirements

- The ball valve must be closed in devices with an outlet.
- The device must be switched off.

Procedure

1. Fill the oscillating tank one third full with water.
2. Dose the agent into the oscillating tank. See chapter **5.2 Sonication fluid**.
3. Fill the tank with water up to the filling level mark while avoiding foam formation. When using indirect sonication, take the displacement caused by inset vessels into consideration.

Results

- » The device is ready to switch on.

5.4 Sonication time

NOTICE

Risk of damage to the objects to be treated

Prolonged sonication can damage the surface of sonication objects.

- Select the shortest possible sonication time.
-

The optimum 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 treated, in particular the materials.

Observe the specifications of the agent manufacturer regarding the recommended sonication time. To protect the objects to be treated and the oscillating tank, select at the start the shortest possible sonication time. Check the result. Extend the sonication time if the result is inadequate.

5.5 Switching the sonication on and off

Requirements

- The oscillating tank is filled.
- The mains plug has been connected to a grounded socket.

Procedure

1. Place the lid (if present) on the device.
2. Press the On/Off button to switch on the device.
3. Press the button to set the sonication time repeatedly until the desired sonication time or the ∞ symbol for continuous operation is displayed.
4. Press the Start/Stop button.
 - » The ultrasound is switched on. You will hear the ultrasound noise.
 - » A running light visually indicates the remaining sonication time.
5. To switch off the sonication, press the Start/Stop button.

i Information

-
- The ultrasound will switch off automatically when the set sonication time has elapsed. Then only the LED with the most recently set sonication time will light up. In continuous operation, the green LED next to the ∞ symbol will be continuously lit. The ultrasound does not switch off automatically.
 - You can extend, shorten or switch off the sonication at any time.
 - If a button is not pressed for more than 12 hours, the device will switch off automatically.
-

5.6 Degassing the sonication fluid – DEGAS

Freshly-filled sonication fluid or liquid that has remained in the oscillating tank for a long period of time must be degassed prior to use. Degassing of the sonication fluid increases the ultrasound effect. The DEGAS function can be used to quickly degas the sonication fluid.

1. Press the Start/Stop button for at least 2 seconds.
 - » The ultrasound is switched on.
 - » The LEDs indicate the remaining degassing time.
2. To stop degassing prematurely, press the Start/Stop button.

Information

During degassing, the ultrasound noise becomes quieter. This means that the ultrasound effect increases.

5.7 Inserting objects to be treated

To achieve good results, observe the following instructions when inserting objects for sonication:

- Before each round of sonication, check that the sonication fluid is not contaminated. If contamination is visible, replace the sonication fluid.
- The sonication fluid must be degassed. See chapter **5.6 Degassing the sonication fluid – DEGAS**.
- The sonication fluid must be pre-heated to the desired temperature before objects are inserted.
- Use approved accessories, e. g., a basket. Do not place objects directly on the bottom of the oscillating tank. Use a silicone knob mat for delicate objects. See chapter **9 Approved Accessories**.
- Distribute the objects evenly. Do not stack them. Make sure that delicate objects do not touch other objects.
- The ultrasound must be switched off while objects are inserted.
- Check the fill level. Make sure the liquid completely covers all objects undergoing sonication. Inset beakers for indirect sonication must be immersed in the contact liquid to a depth of at least 2 cm.
- Remove air bubbles from cavities. Rotate the objects accordingly. Remove any air bubbles underneath the inset beakers. The ultrasound process will only be effective in places where the liquid comes into contact with the object undergoing sonication or the inset beaker.

- Place the more heavily soiled side facing down. Place objects with joints (e.g. scissors, forceps) into the container open so that the sonication fluid reaches the entire surface optimally.

5.8 Removing treated objects

WARNING

Risk of burns

The sonication fluid, objects to be treated, the surface of the device and accessories may be very hot.

- Do not touch the surface of the device or accessories such as the lid.
Do not reach into the sonication fluid.
- Allow the sonication objects to cool before touching them.

Switch off the ultrasound before removing the treated objects.

Do not remove sonication objects by hand. Carefully remove e.g. the inset basket with the sonication objects and place it on a level surface.

Rinse sonication objects with clean water.

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

5.9 Emptying the oscillating tank

WARNING

Danger of electric shock

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

CAUTION

Hot sonication fluid and oscillating tank

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

- Allow the device to cool down before lifting it.

Contamination on the bottom of the oscillating tank reduces the ultrasonic output. Empty and clean the oscillating tank if the sonication fluid is visibly contaminated. Also, observe the specifications of the manufacturer of the agent regarding the service life of the sonication fluid.

Replace used sonication fluid completely. Do not freshen the fluid by topping it up.

Procedure

1. Switch off the ultrasound. If you need to move the device to empty it, disconnect the mains plug.
2. If the device has an outlet, open the ball valve. If the device has no outlet, carefully pour out the oscillating tank contents over the corner.
3. Rinse the oscillating tank thoroughly.
4. Wipe the device dry with a soft cloth.
5. If necessary, disinfect the device with a suitable surface disinfectant.

5.10 Enabling and disabling the continuous operation

The function can be blocked to avoid accidentally turning on the continuous operation.

Requirement

- The mains plug is unplugged.

Procedure

Press and hold the button to set the sonication time. At the same time, plug the mains plug into the grounded socket.

- » The yellow LED "1 min" lights up.

 Information

- You can release the continuous operation in the same way. The green LED next to the ∞ symbol lights up in confirmation.

5.11 Troubleshooting a malfunction

Problem	Possible causes	Troubleshooting
Insufficient ultrasound effect, loud noises	▪ Sonication fluid contains gases. ▪ There are too many sonication objects in the oscillating tank.	▪ Degas the sonication fluid. See chapter 5.6 Degassing the sonication fluid – DEGAS. ▪ Reduce the number of objects to be treated.
Uneven noises	▪ Inadequate fill level in the oscillating tank.	▪ Slightly change the fill level of the sonication fluid in the oscillating tank. In doing so, observe the minimum fill level and correct dosing of the agent. ▪ Reposition the objects to be treated.

6 Maintenance

6.1 Maintenance

The device requires no maintenance.

For purposes of regular inspection, functional checks may be carried out, see chapter **6.3 Tests**.

6.2 Cleaning and maintenance of the device

Cleaning the housing

- Wipe the housing with a damp cloth. Wipe dry with a soft cloth.
- Do not use abrasive cleaning agents, only care products without scouring additives.
- If necessary, disinfect the housing with a suitable surface disinfectant.

Care of the oscillating tank

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

Therefore, please observe the following instructions:

- Rinse the oscillating tank thoroughly with water after each use. Wipe dry with a soft cloth.
- Clean edges and remove residues with a stainless steel cleaning product without abrasive additives.
- Do not use steel wool, scrapers or shavers to clean the oscillating tank.
- Metal parts and rust particles in the oscillating tank cause corrosion. Therefore, do not leave 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 perform tests on the device when it is filled.

If one of the checks does not lead to the desired result, contact our service department. See chapter **6.4 Repair**.

Checking indicator lights

Requirement

- Device is switched off.

Procedure

1. Press and hold the Start/Stop button and press the On/Off button.
 - » All LEDs light up briefly one after the other. Then all LEDs light up at the same time.
2. Press the Start/Stop button twice.
 - » The sonication time that was last set is displayed once again on the time scale. The "0" LED lights up on the temperature scale (if present).
 - » The device is ready for operation again.

Checking the ultrasound effect

Check the effect of the ultrasound upon commissioning and at regular intervals. We recommend a check every 3 months. See chapter **10 Performing a foil test**.

6.4 Repair

Contact the dealer or manufacturer during the warranty period.

Repairs may only be carried out by qualified personnel or by the manufacturer.

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

If you need to return it to the manufacturer, clean the device before shipping.



WARNING

Health risk due to contaminated device

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

Clean and decontaminate the device and accessories before shipping.

The "Certificate of Decontamination" is intended to protect the occupational health and safety of our employees pursuant to the German Protection against Infection Act and the trade association accident prevention regulations. Before sending the device back to us for inspection/repair, the device and accessories must be cleaned pursuant to current laws and regulations and, if necessary, must also be disinfected with a surface disinfection agent listed by the VAH (Alliance for Applied Hygiene). Please understand that we cannot start work until this Certificate is completed in full and submitted.

Download the "Certificate of Decontamination" form here:

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



Fill out the form and attach it to the outside of the packing so that it is clearly visible. We will refuse acceptance without a completed form.

Send the device 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 risk 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 appropriately as electronic waste if it can no longer be used.

Do not dispose of the device with household waste.

Observe the locally applicable regulations for the disposal of electronic waste.



The vibrating elements contain sintered ceramics made of lead titanium zirconium oxide.

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

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

Dispose of accessories as scrap metal or as plastic waste, depending on the material used.

8 Device information

8.1 Technical data

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 33
Ultrasonic frequency	35 kHz

Type	Ultrasonic peak power/ ultrasonic nominal power	Current consumption (230 V)	Current consumption (115 V)
	[W]	[A]	[A]
DT 510 F	560 / 140	0.7	-
DT 1028 F	1280 / 320	1.4	2.8

Dimensions and weights

Type	Internal dimensions of the oscillating tank (L × W × H)	Operating volume	Connection for the ball valve (outlet)	Weight
	[mm]	[l]		[kg]
DT 510 F	300 × 240 × 65	2.5	G ½	5.5
DT 1028 F	500 × 300 × 65	5.8	G ½	10

8.2 Ambient conditions

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

8.3 CE conformity

The device satisfies the CE-marking criteria of the European Union:

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

A declaration of conformity can be requested from the manufacturer by providing the serial number.

9 Approved Accessories

	Spring clamps EK ..., made of stainless steel, for laboratory flasks. Prevent items from buoying upwards. To be screwed into insert 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
	Insert basket K 10 F, made of stainless steel, for holding the EK spring clamps
	Shaking device SA 1028, for holding up to 35 EK spring clamps ...
	Lab cooler LABOCOOL LC 400 for reducing or maintaining the temperature in the ultrasonic bath

10 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:

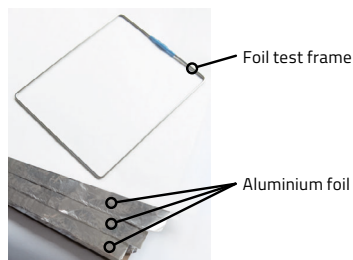
<https://bandelin.com/folientest/>

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.



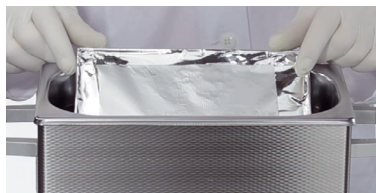
Performing the foil test



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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BANDELIN *electronic* GmbH & Co. KG

Heinrichstrasse 3-4

12207 Berlin

Germany

Tel.: +49-30-768 80 - 0

Fax: +49-30-773 46 99

info@bandelin.com

www.bandelin.com