BANDELIN
Ultraschall seit 1955

SONOREX
Ultrasonic baths
Use and application

Laboratory and process engineering

BANDELIN - Ultrasound specialist in the laboratory

SONOREX ultrasonic baths are part of every laboratory's equipment and are practically irreplaceable for cleaning laboratory glassware and other laboratory equipment, for sample preparation for subsequent analysis or for degassing, homogenising and dissolving samples.

BANDELIN offers a wide range of products. An extensive range of accessories supports a wide variety of applications and simplifies the daily routine in the laboratory. The cleaning and disinfection - concentrates TICKOPUR and STAMMOPUR have been specially developed for the needs of ultrasonic cleaning and have a cavitation-accelerating effect and have a positive influence on the material-friendly process.

More than 60 years of product knowledge and experience go into our quality products, which you can rely on. A team of engineers develops the products at our Berlin site and supervises production from start to finish. We can react quickly to special customer requests. BANDELIN products fulfil high standards of reliability and safety. Areas of application include routine laboratory, pharmaceutical research, biotechnology, medical analysis, environmental analysis, mineral oil analysis and many other areas.

At the suggestion of our customers from a wide range of application areas and, above all, through years of cooperation with them, we have been able to acquire extensive application expertise. Would you like to utilise the full functionality of our ultrasonic baths? In the application section you will find information to help you find the right solution for your application. We are also happy to offer devices with suitable accessories for a test set-up.

BANDELIN - Ultrasound since 1955

Company portrait

We are a Berlin-based family business in its third generation and specialised in the development, manufacture and sale of ultrasonic devices, corresponding accessories and application-specific cleaning and disinfection products.

A high level of vertical integration, a modern production facility and motivated employees characterise us and are a guarantee for constantly new quality products. Our devices contribute to the success of our customers in the laboratory, medical, dental, pharmaceutical, industrial, trade and service sectors.

Our company began developing and manufacturing high-performance ultrasonic devices back in 1955. The constant expansion of the product range and the sharp rise in sales figures led to an expansion of the production area in 1985. In 1992, ultrasonic homogenisers and adjustable, power-stabilised ultrasonic generators were introduced to the market.

The period from 1996 to 2004 was characterised by the development and production of innovative ultrasonic cleaning baths and immersible transducers as well as tube reactors for industrial applications.

In the years that followed, BANDELIN's product range was expanded to include new laboratory ultrasonic devices. Following the introduction of the ultrasonic bath for the simultaneous cleaning and rinsing of MIS instruments, its further development for robotic instruments followed in 2016.

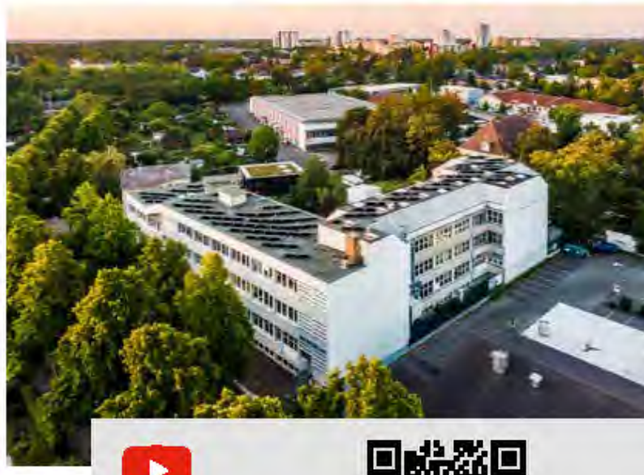
Today, the reputation of our brands SONOREX, SONOPULS, SONOMIC and TRISON stands for the high quality awareness of our employees and is equated with ultrasound in professional circles.

The most important product groups include

SONOREX	- Ultrasonic baths and reactors
SONOPULS	- Ultrasonic homogenisers
SONOMIC	- Ultrasonic bath for rinsable MIS and standard instruments
TRISON	- Ultrasonic bath for robotic, rinsable MIS and standard instruments
TICKOPUR	- Cleaning agents
STAMMOPUR	- Cleaning agents and disinfectants

We are innovators in the development of new ultrasonic devices and new areas of application. In the past we have registered 79 patents / utility models and 68 trade marks. Our involvement in various committees in the development of new standards and guidelines serves to ensure the highest standards for ultrasonic applications.

BANDELIN is the only full-range supplier of ultrasonic devices, accessories and disinfection and cleaning agents with approvals and certifications in accordance with ISO 9001 and ISO 13485. BANDELIN is the market leader. Over one million devices have already been delivered to our customers.



Our company portrait laboratory
youtube.com/bandelin

1955

SONOREX E 250-12
Production of high-performance ultrasonic cleaning devices

1971

SONOREX TRANSISTOR RK
Ultrasonic baths with transistor technology

1990

SONOREX DIGITAL DK
Digital ultrasonic baths

2008

SONOSHAKE
for sample preparation

2010

BactoSonic
Special ultrasonic bath for biofilm removal

SONOCOOL
Ultrasonic bath with cooling

2013

SONOREX DIGIPLUS DL
Digital ultrasonic baths with power control

2022

LABOCOOL LC
Laboratory chiller

2024

SONOREX smart ST
Ultrasonic baths with modern touch screen operation

Contents

Ultrasound in the laboratory and in process engineering

01

What is ultrasound? How does it work?

Brief introduction to the basics and effec of ultrasound.

page 10

Effective factors of the ultrasonic process

The most important aspects for a perfect result.

page 11

Advantages of ultrasonic cleaning

The intensive cleaning effect is not the only strength.

page 11

Quick Start - for device use in the laboratory

The most important steps for a quick start with the SONOREX ultrasonic bath.

from page 12

Structure of an ultrasonic bath

Basic structure including explanation of individual components.

from page 14

Power density in the ultrasonic bath

Explanations of the decisive parameters.

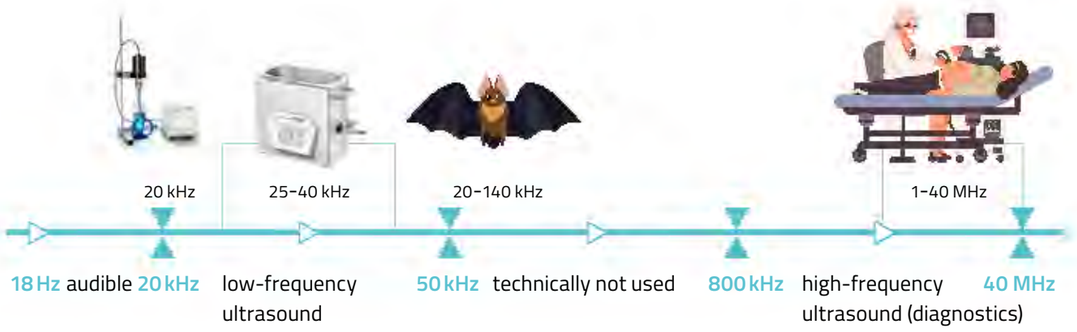
page 16

Selection criteria for an ultrasonic bath

A small guide to finding the perfect ultrasonic bath.

from page 17

What is ultrasound? How does it work?



What is ultrasound and how does it work?

Vibrations with frequencies above 18 kHz (18.000 oscillations per second) are referred to as ultrasound. The low-frequency ultrasound range is used in laboratories, while a higher frequency range is used in medical diagnostics.

The low-frequency ultrasonic vibrations generate millions of tiny vacuum bubbles in all liquids, which immediately implode again, creating highly effective pressure surges. This process is called cavitation. Low frequencies around 20 kHz generate bubbles of larger diameter with more intense pressure surges than higher frequencies around 35 kHz. The low-frequency ultrasound range has been used for decades in a wide variety of ultrasonic baths.

The cavitation process ensures that impurities are blown off the surfaces of the parts in the liquid very effectively and gently, even from recesses and holes. Other applications include degassing or the mixing of liquids.

Cleaning with a SONOREX ultrasonic bath from BANDELIN
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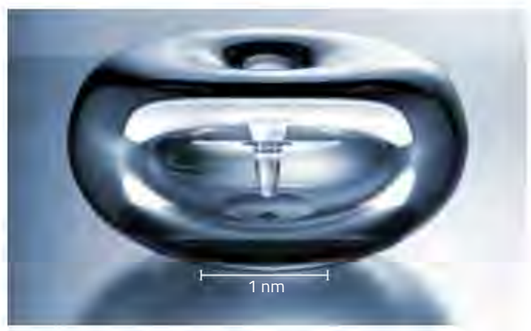
Cavitation

Ultrasound generates an intensive pressure-alternation in aqueous liquids, creating extremely fine cavitation bubbles that grow over several cycles and subsequently implode intensively. The resulting high shear forces and microjets of the implosion blast off all adhering impurities from the surface in a short time.



Cavitation bubble

Effective factors of the ultrasound process

Ultrasonic cavitation in liquids removes impurities during cleaning or homogenises/ degasses during sample preparation.

Acceleration of processes through increased bath temperature.

Agent binds or separates impurities during cleaning or ensures a homogeneous ultrasound field.

Process time reduced by up to 90% compared to conventional methods.

Advantages of ultrasonic cleaning

The use of ultrasonic baths for cleaning in a wide range of applications has become so widespread because they combine a number of advantages.

Cleaning effect
- Efficient
- Gentle

Environment
- No use of organic solvents
- Surfactants contained in the TICKOPUR/ STAMMOPUR agents are biodegradable in accordance with the Detergents Regulation

Time
- Up to 90% shorter cleaning time
- Reduction of costs

User friendliness
- Easy to install
- Maintenance-free

Quick Start -
for using devices in the laboratory

Correct handling and regular care can counteract rapid wear and thus extend the life time of the ultrasonic bath.

1

Preparation for operation of the ultrasonic bath

- See instructions for use.

2

Selection of accessories to suit the application

- The choice of accessories depends on the object to be processed and the application.
- Choice of method: direct or indirect sonication

Note: The object to be sonicated must not be placed directly on the bottom of the bath!

3

- **Selection of the agent**
  Adapted to the application: cleaning and/or disinfection or contact liquid for indirect sonication
- Determine the correct concentration. Use our dosagetable and our dosage calculator (bandelin.com/en/service/dosing-calculator) and observe the product information of the agent.

Note: BANDELIN offers a wide range of TICKOPUR and STAMMOPUR products specially developed for ultrasonic cleaning**.**

4

Filling the ultrasonic bath

- Filling the bath with drinking water or demineralised water with the liquid corresponding to.

Notes: Observe the fill level mark. The fill level must not fall below the mark. Please note that the inserted object or insert vessel may displace bath liquid and the bath may overflow.

Filling an ultrasonic bath
youtube.com/bandelin

5

Degas bath liquid
Remove the dissolved gases by switching on the ultrasound or using the DEGAS function (for SONOREX DIGITEC DT/smart). Degassing is necessary for freshly prepared bath liquid or for bath liquid that has not been used for a long time.
Guide values for degassing times:
Bath volume up to 10 litres: approx. 10 min
Bath volume > 10 litres: approx. 30 min

Degassing of a SONOREX DIGITEC DT 102 H ultrasonic bath
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6

Inserting objects to be processed

- Insert the sonication object into the basket, the holder, the insert container

Note: Cleaning objects must not overlap. Parts with joints must always be inserted open. No air-filled cavities may form. The cleaning object must be completely covered with the cleaning liquid.

7

Setting the process parameters
Sonication time, temperature (only for devices with heating) and ultrasonic power, ECO, pulse and process logging (SONOREX smart ST only)

- according to own experience or
- in accordance with the instructions for use or the product information of the agent

Notes: Temperature - Cooling
Some processes, such as the homogenisation of samples in the pharmaceutical sector, require a constant temperature. In this case, an external cooler is always required to reduce the heat generated. We recommend our LABOCOOL LC 400.

8

Optional: Process logging (SONOREX smart ST only)
via USB/LAN DST 01 docking station, transferable to other media.

9

Starting the application
Notes: The bath temperature should always be checked for temperature-sensitive cleaning items, as this will increase even without additional heating. The energy introduced by the ultrasound heats the cleaning liquid.

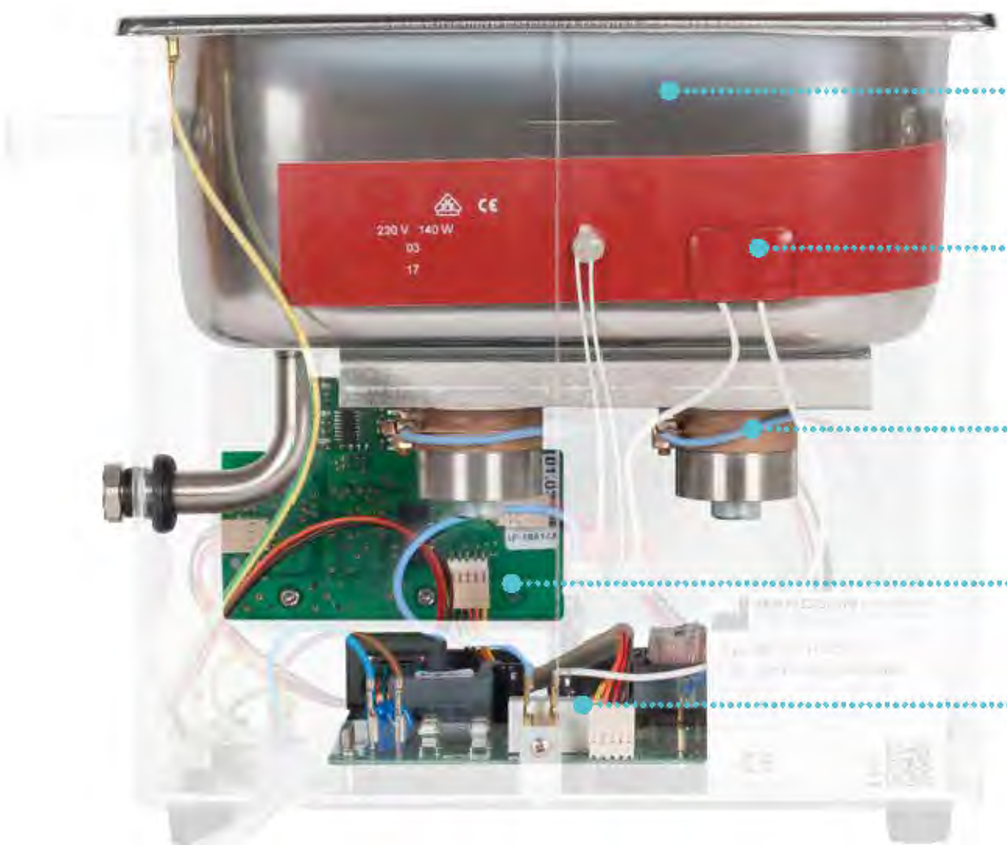
10

Completion of the cleaning process

- Thoroughly rinse cleaning items and carry out further reprocessing steps if necessary
- Care of the ultrasonic bath (follow the instructions for use)

Structure of an ultrasonic bath

Ultrasonic baths perform a variety of tasks in everyday laboratory work. The range of devices on offer is correspondingly diverse. Understanding the basic structure of an ultrasonic bath and the resulting application-related selection of equipment features and application parameters is the basis for successful use.



Oscillating tank
Made of stainless steel 1.4301 (drawn) as standard, SONOREX RK/DT/smart 102 H: additionally hard chrome-plated. Some models alternatively made of stainless steel 1.4404 (welded), 2 mm material thickness

Heating
Surface heating elements; automatic switch-off to prevent overheating.

Oscillating systems
Conversion of the high-frequency voltage supplied by the generator into mechanical resonant vibrations of the same frequency using piezoelectric transducers. The connection between the oscillating systems and the stainless steel tank is realised using a high-strength glueing process.
It is crucial to understand that the dimensions of the oscillating elements determine the operating frequency.
Once the dimensions have been defined, the operating frequency can no longer be varied. The number of oscillating elements determines the power in the bath.

25 kHz 35 kHz

Control unit
Preselection of the process parameters time and/or temperature or DEGAS or power.

Ultrasonic generator
Conversion of the low-frequency mains voltage of 50/60 Hz into a high-frequency voltage of 35 or 40 kHz.

Decisive parameters for the power density in ultrasonic baths

The power density in W/cm2 can only be determined based on the active sound-radiating surface, i. e., the area of the oscillating systems. However, as the entire tank vibrates, there is no reference value for the calculation. Therefore, the power density is always given in W/l. The power density is determined from the nominal power and the filling volume:

$$\text{Power density [W/l]} = \frac{\text{Nominal power [W]}}{\text{Filling volume [litres]}}$$

The ratio of power to filling volume is often not the same in different baths. In large baths in particular, a large filling volume generally results in lower power densities. This means that the results in a small bath are not necessarily transferable to a large bath. This is an important information for laboratory applications because baths are often used for basically the same applications, but with changing volumes.

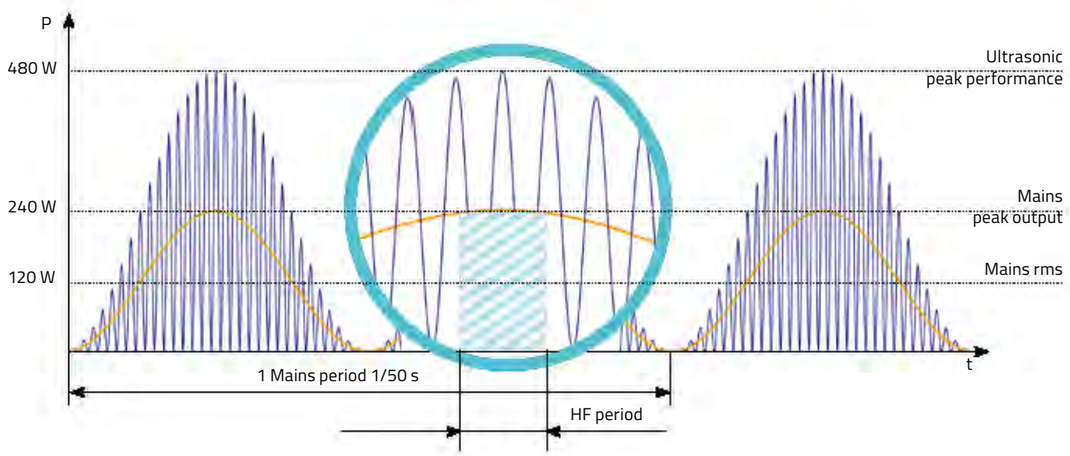
What do the following statements mean?

- Ultrasonic power - 100 W effective
- Nominal power - 100 W
- 2 x 200 W continuous peak power
- 400 W peak ultrasonic power

Most manufacturers state the peak value in the technical data. However, this value is not very meaningful as the ultrasonic baths usually operate in so-called double half-wave mode. Therefore, both continuous peak power and ultrasonic peak power are based on the same nominal/effective value. This value should therefore be used to select the most suitable ultrasonic bath.

Important!
Only the nominal/effective value in relation to the filling volume of the oscillating tank is decisive! If the nominal/effective value is missing, ask for it!

Ultrasonic peak power with double half-wave operation



Selection criteria for the ultrasonic bath

Optimum sonication results are achieved by selecting the right ultrasonic bath for the application with the right accessories for holding the objects. However, the optimum selection of the agent is just as important, whether for the cleaning effect or to generate a homogeneous sound field in the bath. With TICKOPUR and STAMMOPUR, BANDELIN offers a comprehensive range of cleaning and disinfecting products.

Bath size

The choice of the right size of bath depends on the application and the items to be cleaned or the size of the sonication vessels. First and foremost, it is crucial that the objects to be sonicated fit into the corresponding accessories, e.g. insert basket, utensil holder. The choice of ultrasonic bath depends on this. BANDELIN manufactures ultrasonic baths for the laboratory sector from 0.9 to 90 litres.

It is not the specified volume [litres] that is decisive, but the space requirements of the object. For example, an ultrasonic bath with a small footprint and greater bath depth can have the same bath volume as a flat ultrasonic bath with a larger footprint.

During cleaning, the objects must be completely covered with the liquid. Their overlapping should be avoided so that the effect of the cleaning liquid in combination with the ultrasound can fully unfold.

For indirect sonication, the vessels must be immersed at least 2 cm into the contact liquid so that the ultrasound is transmitted into the cleaning liquid of the vessels.

If various ultrasonic applications are to be carried out with the bath, make sure that the ultrasonic bath is suitable for each application. It can certainly save time to carry out several applications in one operation.

Other aspects include the space required for the appliance on the work surface and the installation conditions.

From front to back: ST 102 H, ST 255 H, ST 510 H and ST 1028 H

Type of sonication

Direct sonication
This method enables simple and effective sonication of the parts (e.g. during cleaning). The cleaning solution is dosed directly into the oscillating tank, while the parts are either placed into the insert basket or hung in the oscillating tank using a device without touching the bottom of the tank. In the latter case, the entire capacity of the oscillating tank can be utilised. The detached dirt collects at the bottom. Metal chips, for example, accelerate the erosion process on the tank bottom. The impurities should be removed regularly to protect the oscillating tank.

Drinking water with a cleaning additive should always be used. If the surface tension is otherwise high, the surface of the parts will not be sufficiently wetted and the contamination can only be removed inadequately.

Ensure correct dosing. Use the fill level markings in the bath, the dosing table and dosing aids (taps and pumps) for the agents.

The first rinse can be carried out with drinking water. For the second and third rinse after cleaning to remove the cleaner and soiling residues, distilled/deionised-water is recommended to prevent staining. Any salt residue is also rinsed off. This is important when cleaning printed circuit boards.

Indirect on the tank bottom
The oscillating tank is filled with water and a cleaning agent suitable for ultrasound (= contact liquid) to promote cavitation. The ultrasound is transmitted via the contact liquid into the liquid in the vessel.

For liquids that cannot be used directly (e.g. acids, solvents), plastic tubs or insert beakers made of glass, stainless steel or plastic are used.

Indirect application is also recommended if different cleaning solutions are to be used in the insert vessels. This means that the cleaning liquid does not have to be discarded immediately when changing to a different agent. Different types of parts can also be cleaned at the same time. The contamination remains in the insert vessel. During sample preparation, the sample vessels are placed in the insert basket for homogenisation, extraction or dissolution and sonicated via the contact liquid.

Accessories

Choosing the right accessories is crucial to the success of the application. BANDELIN offers a wide range of accessories, which are optimally adapted to the requirements and can be used flexibly.
The object determines the type of sonication (direct or indirect) and the choice of accessories. The items to be cleaned or the sonication vessel must never be placed directly on the tank bottom to avoid damaging it and the object.

Gentle cleaning in a beaker is recommended for small parts. Special accessories also make the application process and success easier. A larger number of objects can often be sonicated in this way. This ensures a higher throughput rate and therefore an efficient working day.

Ultrasonic baths with heating

For all ultrasonic baths with heating, the heating function is switchable. This allows the bath liquid to be heated or left unheated, depending on the specific application.

Cleaning processes or the dissolving of substances etc. can often be accelerated by an increased temperature. This is essential for removing greasy or oily contaminants. To accommodate these applications, ultrasonic baths equipped with heater are utilized.

The heating power is matched to the bath size. However, it is important to keep in mind that ultrasonic activity leads to additional heat generation, as cavitation increases the temperature of the liquid being sonicated.

Ultrasonic baths with heating are equipped with temperature monitoring. The user does not need an external temperature measuring device and can intervene in the process in good time.

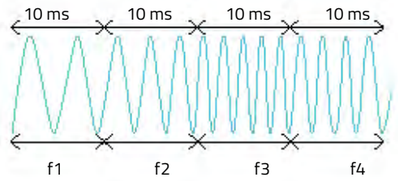
Quick degassing function

For ultrasonic baths with digital operation, the "DEGAS = rapid degassing" mode can be selected separately. A pulsed sound, a continuous ON/OFF mode, is started. In OFF mode, the gas bubbles are given time to rise more easily, allowing degassing to be achieved at a much higher speed.

Ultrasonic modes

Sweep

SweepTec is a special frequency modulation (sweep) around an optimally set operating point that prevents load-dependent oscillations. This results in very rapid frequency changes of approx. ±1 kHz after every 10 ms. This leads to a reduction of standing waves in the ultrasonic bath and thus to a homogenous sound field.
A particularly homogeneous ultrasonic field prevents damage to very sensitive parts.

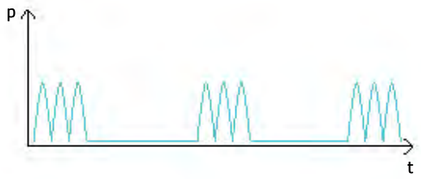


PULSE Mode (exclusive to SONOREX smart ST)

Special operating mode in which the ultrasound is emitted at short, powerful intervals. This enables more intensive cleaning by abruptly dissolving the impurities or dissolving the sediment during sample homogenization.

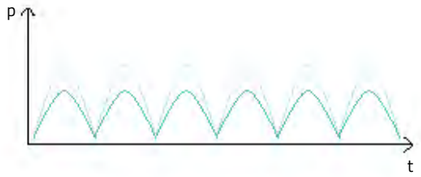
Interval Mode

An enhanced variation of PULSE Mode, where ultrasound is not emitted in fixed pulses but is activated and deactivated at freely adjustable time intervals.



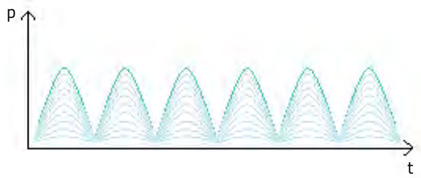
ECO Mode (exclusive to SONOREX smart ST)

- Reduces ultrasonic power, resulting in lower energy consumption
- Minimizes noise levels during operation
- Enables gentle cleaning of sensitive materials



Power setting 10 - 100 % (exclusive to SONOREX smart ST)

The adjustable power setting allows users to fine-tune ultrasonic intensity for gentle cleaning of sensitive components with delicate surfaces. Full ultrasonic power is essential for a wide range of routine laboratory tasks, such as mixing and homogenizing samples or performing intensive cleaning processes.



SONOREX ultrasonic baths - Applications

02

Application overview

Presentation of various processes and branches for ultrasonic applications.

from page 24

Application overview

The number of possible applications is very large and the areas of application are extremely broad: **environmental analysis, toxicology, food and beverages, cosmetics, chemistry and pharmacy, building materials industry, biology, microbiology, life science, human medicine**.

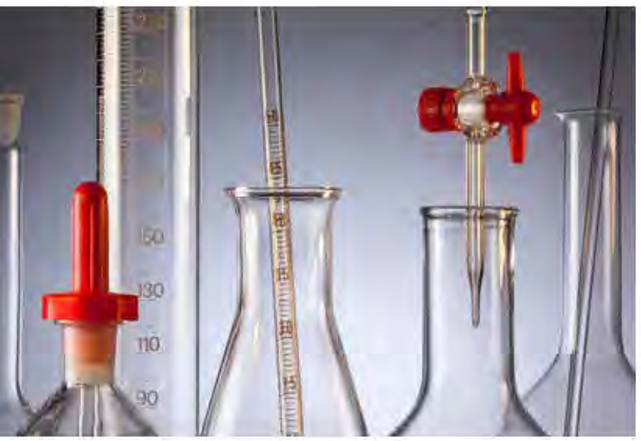
New applications are constantly being added. There is hardly a laboratory that does not use an ultrasonic bath. The most common applications and sectors in which ultrasonic baths are used in the laboratory are listed here. See it as a suggestion for your individualvidual situation in which ultrasonic baths can provide a solution.

Cleaning

By far the largest area of application for ultrasonic baths is the cleaning of parts, instruments and the like. Due to the cavitation effect, impurities are blasted off the parts in the liquid and even removed from recesses and holes. Ultrasound in conjunction with the appropriate cleaning agent cleans in just a few minutes and is more effective than any manual cleaning method. At the same time, it is gentler, as mechanical damage such as scratches is avoided.

Cleaning glass equipment and other small parts
Glass, components of machines or devices etc. can be cleaned excellently using ultrasound. The selection of the right agent additive is particularly important for this.

In the past, solvents were often used for detailed cleaning in trace analysis, for example. Today, ultrasonic baths and a suitable aqueous cleaner are the alternative and also help to improve the environmental balance.



There are no limits to the imagination when it comes to which cleaning tasks can be successfully completed with the ultrasonic bath.

Examples are
- Cleaning glass vessels for trace analysis
- Cleaning glass pipettes and burettes (see chapter 04)
- Cleaning capillaries, electrodes, etc.
- Cleaning of glass fermenter parts for the complete removal of biofilms, including firmly seated material after autoclaving, e.g. on reactor agitator shafts
- Cleaning loops for the crystallisation of proteines in the life science crystallisation laboratory
- Cleaning of quartz glass or PTFE parts for trace analysis to remove saw residues
- Cleaning clogged small parts in paper machines

Purification of mass spectroscopy sources etc.
Many laboratories today are equipped with devices for carrying out liquid chromatography with mass spectrometry coupling (LC-MS for short) in order to separate and determine molecules. The combination of liquid chromatography and mass spectrometry offers a common analytical method for this. Parts of it require regular cleaning to ensure trouble-free operation and reproducible analysis results. This can be easily achieved with an ultrasonic bath and is also used in almost all relevant laboratories. In some cases, several cleaning steps are carried out indirectly - i.e. in the insert vessel - one after the other, e.g.:
1. Water/methanol/1-3 % formic acid
2. Methanol
3. Isopropanol
In other cases, purify in water for 30 minutes at 60-70 °C.

Cleaning of test sieves
Sieve analyses are carried out in numerous application-fields, often for sample preparation for analyses such as grain size determination. Analysing sieves are measuring instruments and should therefore be handled carefully before, during and after use. In particular, sieves with mesh sizes < 500 µm should generally only be cleaned in an ultrasonic bath.

Areas of application:
- Quality assurance and monitoring of dispersed bulk solids, generally as sample preparation for analysis
- Sieve analysis of silver powder in metal processing
- Sieving of precious metal-containing ash in metal processing
- Sieving of sediments and soil material
- Sieving of subsoil samples (soil, clays)
  Sieving of baking agents and Chocolate in the food industry

Degassing and defoaming

The removal of air or other gases from liquids is often essential for further use, for example for HPLC liquids, for analysing carbonated beverages, for degassing or defoaming emulsions, paints or similar. Degassing or defoaming can be carried out very quickly, effectively and easily using an ultrasonic bath. A special degassing mode (DEGAS) can be selected for the digital ultrasonic baths, which enables significantly faster degassing of the liquid.

Example applications are
- Degassing of HPLC running agents to avoid analysis problems caused by air bubbles in the chromatography column and to extend the shelf life of the running agents - less algae growth after oxygen removal, etc.
- Degassing of mineral water, beer, cola, sparkling wine, etc. for analysis, e.g.for the determination of oligosaccharides in beer using HPLC, the determination of potassium in mineral water using AAS, for heavy metal ion analysis using ICP
- Degassing/deaerating lotions, shampoos, hair conditioners, etc. in analytics
- Degassing of molasses samples in analytics

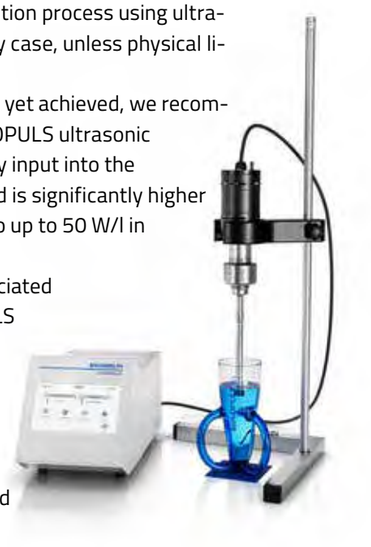
Degassing beer
with a
SONOREX ultrasonic bath
youtube.com/bandelin

Dissolving substances

Dissolution processes of solids can also be significantly influenced by ultrasound. They are accelerated and in some cases make it possible to significantly dissolve a solid until the solubility product is reached. Ultrasound is used to support the analysis of substances from a wide range of areas and media (food, environment, materials, life science, etc.) and other processes in the laboratory environment.
The following applications are particularly often the subject of ultrasound treatment:

- Dissolving salts or bases such as sodium hydroxide for buffers or other applications
- Dissolving standard and reference substances for a variety of analytical methods
- Dissolving sample material in extraction agent or similar for sample preparation for analysis
- Dissolving/homogenising liquid creams, lotions, shampoos, hair conditioners or similar as sample preparation for analysis
- Dissolving tablets without mortars (prevention of carryover in the case of confiscated tablets)
- Dissolving poorly soluble natural substances, active pharmaceutical ingredients, poorly soluble chemicals, both organic and inorganic, such as Cu-glycine complex or similar.
- Dissolving reference substances from PCBs, PAHs, etc.
- Dissolving small molecules or biopeptides for solubility and stability studies in the pharmaceutical sector
- Dissolving lipids or poorly soluble peptides for HPLC analysis
- Dissolve saccharin standards, preservatives, etc.
- Resolubilisation of dry extracts or similar for analysis, e.g. reabsorption in MS-capable solvent for LC-MS analysis
- Recovery of dried extracts after solid phase extraction for the analysis of active pharmaceutical ingredients in water

In addition, there are a large number of special applications for supporting the solution process using ultrasound. It is worth a try in any case, unless physical limits are insurmountable.
If the desired results are not yet achieved, we recommend testing with the SONOPULS ultrasonic homogenisers, as the energy input into the sample matrix with the liquid is significantly higher (up to 3000 W/l compared to up to 50 W/l in the ultrasonic bath).
Find out more at in the associated application guide "SONOPULS Ultrasonic homogenisers - use and application" or contact us for advice and a free three-week trial. For example, the ultrasonic homogeniser has established itself in the dissolution of poorly soluble nanomaterials.



Extraction of solid substances in the liquid medium

Another extremely interesting area of application is supporting the extraction of ingredients from solid particles into the liquid phase. This is often a necessary step in sample preparation for the analysis of ingredients from foodstuffs, environmental media, materials, consumer goods, plants, etc.
The advantages that can be achieved in many applications compared to other extraction methods are as follows:

- Higher yield
- Reduced extraction time
- Lower required temperature
- Lower proportion of solvent or complete switch to aqueous phases

In some cases, a combination of ultrasound and other extraction methods makes sense. The application can be highly customised to the requirements , and upscaling to production processes is very easy.

In the environmental sector, the extraction of organics (PAHs, PCBs) from soil and waste has become established in recent years as a substitute for Soxhlet extraction. In parallel tests with Soxhlet extraction and in interlaboratory tests conducted by the BAM (Federal Institute for Materialsresearch and testing), the equivalence of the extraction results was ensured. The method is now well established in the branch. As a result, considerable amounts of solvents can be saved and extraction with ultrasound is possible in a much shorter time, max. 1 hour.

Some examples of applications that have been established for years:

- Extraction of drugs from hair for hair analysis for cocaine
- Extraction of cheese for the analysis of water-soluble substances
- Extraction for enzymatic sugar analysis in water/methanol
- Extraction of PAHs from strawberries in preparation for the determination of the pollutant load
- Dissolving the analyte-matrix bond in milk for monitoring penicillin levels
- Extraction for sample preparation for screening for pesticides and other residues in food for analysis using LC-MS etc.
- Extraction of analytes from soil and waste in various solvents for analysis using GC and HPLC
- Extraction from soil, water, asphalt, drill cores, tar, paint and varnish residues in various solvents for the residue analysis of PAHs, PCBs, MKWs
- Extraction of compounds typical of explosives from the soil
- Extraction of PCBs from wood preservatives
- Extraction of analytes from wipes used to remove environmental pollutants from surfaces at
- Rapid elution of pollutants from soil and waste - parallel to, for example, the determination of extractable organically bound halogens in accordance with DIN 38414
- Extraction of pollutants from plaster, wallpaper, joint materials, etc. in the area of building pollutants in various solvents such as hexane, hexane-acetone, dichloromethane
- Extraction of quaternary ammonium compounds from treated wood (wood preservation component)
- Extraction of analytes from heart muscle tissue, animal tissue, etc.
- Extraction of analytes from dried blood matrix for LC-MS in clinical chemistry
- Extraction of analytes from seeds, flour, baked goods
- Extraction of plant ingredients from dried, pulverised plants
- Homogenisation of ointments and pharmaceutical raw materials etc. as sample preparation for HPLC
- Homogenisation of stomach contents for the analysis of tablet residues in toxicology

Deagglomeration

Agglomerates of substance particles can be effectively destroyed using ultrasound. This is used, for example, in sample preparation for particle size analysis.
Application example:

- Deagglomeration of particles in subsoil samples (soil, clays) or other sample matrices from the environmental and pharmaceutical sector; for analysis using AAS, ICP, NMR, IC to prevent analytical influences due to aggregate formation

Alternative acid digestion methods

Conventional digestions often take place at increased pressure and temperatures above 100 °C in order to realise the necessary energy input. Alternative methods are often possible in which the energy input can be realised using ultrasound, which saves time. The process is also safer because high pressures are avoided.
Application example:

- Digestion for mercury determination in water and wastewater using AAS in accordance with DIN EN ISO 12846:2012-08

Cell disruption - deagglomeration of cells, etc.

Agglomerates can be effectively destroyed using ultrasound. This applies not only to solid substances, but also to cell agglomerates, for example as preparation for cell counting in microbiology.
The ultrasonic bath often supports the process of lysis (cell disruption through the addition of chemical detergents).

Application examples:

- Isolation of DNA from soil samples using chemical lysis (according to Porteous et al., 1994)
- Disruption of eukaryotic cells from mammals with chemical detergents (lysis)
- Dispersing/deagglomerating cells from fermentation for correct cell counting

The complete disruption of cells can be achieved with a higher energy input. The SONOPULS ultrasonic homogeniser has established itself for this purpose.

Other laboratory applications

In addition to these main applications, ultrasonic baths are used for a variety of special tasks in which the special effect of ultrasound can always be utilised to achieve the desired result. Here, too, are a few examples that illustrate the wide range of possibilities:

Chemical-physical area

- In the context of air analysis - desorption of analytes from adsorption materials - silica gel in acetonitrile
- Washing/decontamination of hair samples before the actual extraction of hair ingredients for drug analysis
- Support for the derivatisation of high-boiling substance samples for analysis using GC-MS (previously very widespread and important, now less so due to the widespread replacement of analysis using LC-MS)
- Removal of salts applied to paper as part of paper tests
- Splitting of W/O emulsions

Life science sector

- Resolubilisation of samples after PCR for MS
- Detachment of proteins and peptides from the gel using electrophoresis

Building materials industry

- Determination of the freeze-thaw resistance of concrete according to DIN 4246: Ultrasonic treatment of the test specimens as sample preparation

Practical application tips from our laboratory partners can be found at summarised in detailed application examples in a tabular overview at from page 98 to 108.

SONOREX
Compact ultrasonic baths

03

Advantages of SONOREX compact devices

Solid arguments in favour of an ultrasonic bath from BANDELIN.

from page 32

SONOREX smart ST

The most important features of the operation and functions.

page 34

SONOREX SUPER RK

The most important features of the operation and functions.

page 36

SONOREX DIGITEC DT

The most important features of the operation and functions.

page 37

SONOREX model variants - in comparison

Practical overviews of all key data for our three versions.

page 38

SONOREX bath sizes and technical data

Overview of the device series smart ST/SUPER RK/DIGITEC DT.

from page 39

SONOREX accessories and configuration examples

Combine our accessories precisely for your applications.

from page 42

Advantages of the ***SONOREX*** compact devices at a glance

SONOREX smart ST 102 H

SONOREX SUPER RK 102 H

SONOREX DIGITEC DT 102 H

Durable Design

- Compact, easy-care stainless steel housing
- Oscillating tank:
  made of stainless steel AISI 304 (drawn), 1 mm or partially stainless steel AISI 316L (welded), 2 mm
- ST/DT/RK 102 H: Stainless steel AISI 304 (drawn), 1 mm, additionally hard chrome-plated
- High-performance oscillating systems manufactured with highly stable ceramic piezoelectric materials
- Made in Germany

MADE IN **GERMANY**

Rounded bath corners

On the sides and at the bottom; facilitate cleaning of the oscillating tank. For hygienic handling of the ultrasonic bath.

Fill level marking

Easily recognisable mark for the minimum fill level of the cleaning liquid; facilitates filling.

Welded drain

With ball valve for draining the ultrasonic bath (from RK/DT 102 H, ST all).

The bent outlet is welded to the tank bottom and not screwed on. This prevents leaks in the appliance and makes cleaning easier.

Fixed mains cable

In contrast to the usual plugged-in mains cables, these are fixed to SONOREX ultrasonic baths. This prevents liquid from penetrating this connection and the associated risk of a short circuit or electric shock.

Device feet (plastic)

For a secure stand on any surface.

Handles

For easy and safe handling
(except RK/DT 31, RK/DT 52, RK/DT 100, RK/DT 103 H, RK/DT 106, RK/DT 156, RK 170 H, RK 1040; smart ST: all with handles).

Heating

With integrated heating, depending on model.
Adjustable temperature ranges:

- RK: 30-80 °C, except RK 31 H: 65 °C fixed
- ST/DT: 20-80 °C

Dry-running protection for the heating

Automatic switch-off in the event of overtemperature, e.g. triggered by a low fill level.

SONOREX - Operation
Ultrasonic baths in three versions

SONOREX *smart* **ST**

Touch screen with intuitive operation

Bath sizes:

3.0-90.0 litres

Ultrasonic bathes with high-tech features and intuitive controls thanks to a user-friendly interface.

Product features

- Clear display of the most important parameters during operation (time, temperature, power)
- Continuous time setting 1 s - 8 h
- 10 individual programmes can be stored for reproducible processes
- Power 10-100 %, also for cleaning more sensitive parts
- Process logging (via optional USB/LAN DST 01 docking station, transferable to other media)
- Acoustic feedback
- Rapid degassing function
- Sweep function for a homogeneous sound field
- Pulse: Alternating ultrasonic pulses - for powerful cleaning for powerful cleaning or targeted removal of residues

  Precise impulses - for powerful cleaning or targeted removal of residues
- ECO programme with reduced energy consumption
- Drip-proof touch display (IP32) - easy to clean
- Safety shut-down after 8 h
- Heating with protection against' dry running
- Protection against boiling delay
- Default language selection: de, en, fr, it, es Other languages optional
- Help menu for each function
- Dosing calculator for detergent

MD Class 1 medical device, MDR-compliant

SONOREX smart ST 514 H

SONOREX SUPER RK

Classic rotary knob operation

Bath sizes:

0.9-90.0 litres

Ultrasonic baths with rotating knobs including user-friendly crossbar, with selectable time and temperature.

Product features

- Time setting: 1-15 min and continuous operation
- Adjustable temperature range: for H version 30-80 °C, adjustable in 5 K steps, with indicator lamps for RK 31 H: 65 °C fixed setting
- Simple and intuitive operation
- Ultrasound
- Automatic sweep frequency control for a homogeneous sound field

SONOREX SUPER RK 510 H

SONOREX DIGITEC DT

Foil keypad, with rapid degassing

Bath sizes:

0.9-90.0 litres

Ultrasonic baths with digital control elements, where temperature and/or time can be set and rapid degassing can be activated.

Product features

- Time setting: 1, 2, 3, 4, 5, 10, 15, 30 min and continuous operation, display of the preset time and the remaining time by LED
- Adjustable temperature range: for H version 20-80 °C, adjustable in 5 K steps, display of set/actual temperature via LED
- Overtemperature warning if the set temperature is exceeded, warning LED
- Simple and intuitive operation
- Foil keypad, particularly hygienic
- Automatic safety switch-off after 12 hours
- Programme memory for 1 programme
- Protection against boiling delay
- DEGAS function, rapid degassing
- Ultrasound
- Sweep - automatic frequency control for a homogeneous sound field

SONOREX DIGITEC DT 510 H

SONOREX
Model variants - in comparison


	smart ST ...	SUPER RK ...	DIGITEC DT ...
Capacity [l]	3.0-90.0	0.9-90.0	0.9-90.0
Time setting [min]	continuous time setting 1 s - 8 h	1-15, ±5 % continuous operation (∞)	1, 2, 3, 4, 5, 10, 15, 30, ±5 % continuous operation (∞)
Automatic safety switch-off	Safety shut-down after 8 h	-	after 12 h
Heating	✓	optional, H-version	optional, H-version
Adjustable temperature range [°C]	20-80	30-80 RK 31 H: 65 fixed	20-80
Overtemperature warning	✓	-	✓
Protection against boiling delay	✓	-	✓
Setting accuracy of the bath temperature	in 5 K steps	in 5 K steps	in 5 K steps
Tank thickness [mm]/material C version	0.8/AISI 304 2.0/ AISI 316L	0.8/AISI 304 2.0/ AISI 316L	0.8/AISI 304 2.0/ AISI 316L
Fill level marking for safe dosing	✓	✓	✓
Hard chromium-plated	ST 102 H	RK 102 H	DT 102 H
One-piece drain, welded	✓	✓, from RK 102 H	✓, from DT 102 H
Degree of protection	IP 32	IP 32	IP 33
Ultrasonic frequency [kHz]	40	35	35
SweepTec	✓	✓	✓
Pulse mode	✓	-	-
Power setting	10–100 %, in 1 % steps	-	-
Rapid degassing DEGAS	✓	-	✓
ECO-Mode	✓	-	-
Operating voltage: **230 V~ (±10 %) 50/60 Hz** **115 V~ (±10 %) 50/60 Hz**	✓ optional	✓ optional	✓ optional
Data memory	10	-	1
Class I medical device	✓	✓	✓

SONOREX *smart*
Ultrasonic baths with modern touch screen

Type	Code no.	Internal dimensions Oscillating tank l × w × d [mm]	Capacity [l]	External dimensions l × b × h [mm]	Ultrasonic peak power* [W]	Ultrasonic nominal power [W]	Heating power [W]	Outlet ball valve
ST 102 H	7100	240 × 140 × 100	3,0	260 × 160 × 250	480	120	140	G ¼, right side
ST 103 H	7101	240 × 140 × 150	4,0	325 × 160 × 300	560	140	200	G ¼, right side
ST 156 BH	7102	500 × 140 × 150	9,0	530 × 165 × 300	860	215	600	G ¼, right side
ST 170 H	7103	1000 × 200 × 200	39,0	1050 × 250 × 400	1520	380	1600	G ½, left side
ST 255 H	7104	300 × 150 × 150	5,5	325 × 175 × 300	640	160	280	G ¼, right side
ST 510 H	7105	300 × 240 × 150	9,7	325 × 265 × 300	640	160	400	G ½, left side
ST 514 H	7106	325 × 300 × 150	13,5	355 × 325 × 300	860	215	600	G ½, left side
ST 514 BH	7107	325 × 300 × 200	18,7	355 × 325 × 350	860	215	600	G ½, left side
ST 1028 H	7108	500 × 300 × 200	28,0	355 × 325 × 350	1200	300	1300	G ½, left side
ST 1028 CH	7109	500 × 300 × 300	45,0	540 × 340 × 500	1200	300	1450	G ½, left side
ST 1050 CH	7110	600 × 500 × 300	90,0	640 × 540 × 500	2400	600	1950	G ½, left side

*corresponds to 4 times ultrasonic nominal power

DST 01
USB/LAN docking station, SONOREX smart ST only with USB connection for transmission of logs and Ethernet connection for remote control of the device.
Cable length: approx. 2 m
Code no. 7120

SONOREX SUPER RK

Ultrasonic baths with classic operating elements

Type	Code No.	Internal dimensions oscillating tank l × w × d [mm]	Capacity [l]	External dimensions l × w × d [mm]	Ultrasonic peak power* [W]	Ultrasonic nominal power [W]	Heating power [W]	Outlet ball valve
RK 31	329				160	40	-	-
RK 31 H	7523	190 × 85 × 60	0.9	205 × 100 × 180	160	40	70	-
RK 52	311				240	60	-	-
RK 52 H	164	150 × 140 × 100	1.8	175 × 165 × 225	240	60	140	-
RK 100	301				320	80	-	-
RK 100 H	312				320	80	140	–
RK 102 H	303	240 × 140 × 100	3.0	260 × 160 × 250	480	120	140	G ¼
RK 103 H	326	240 × 140 × 150	4.0	260 × 160 × 310	560	140	200	G ¼
RK 106	306	dia. 240 × 130	5.6	dia. 265 × 270	480	120	-	G ¼
RK 156	305	500 × 140 × 100	6.0	530 × 165 × 245	640	160	-	G ¼
RK 156 BH	646	500 × 140 × 150	9.0	530 × 165 × 300	860	215	600	G ¼
RK 170 H	7506	1000 × 200 × 200	39.0	1050 × 250 × 385	1520	380	1600	G ½
RK 255	3066				640	160	-	G ¼
RK 255 H	316	300 × 150 × 150	5.5	325 × 175 × 295	640	160	280	G ¼
RK 510	327				640	160	-	G ½
RK 510 H	321	300 × 240 × 150	9.7	325 × 265 × 300	640	160	400	G ½
RK 512 H	795	300 × 240 × 200	13.0	325 × 265 × 350	860	215	400	G ½
RK 514	277				860	215	-	G ½
RK 514 H	207	325 × 300 × 150	13.5	355 × 325 × 305	860	215	600	G ½
RK 514 BH	263	325 × 300 × 200	18.7	355 × 325 × 385	860	215	600	G ½
RK 1028	322				1200	300	-	G ½
RK 1028 H	324	500 × 300 × 200	28.0	535 × 325 × 400	1200	300	1300	G ½
RK 1028 C	661	500 × 300 × 300	45.0	540 × 340 × 500	2000	500	-	G ½
RK 1028 CH	143	500 × 300 × 300	45.0	540 × 340 × 500	1200	300	1450	G ½
RK 1040	319	dia. 500 × 195	39.5	dia. 540 × 500	1520	380	-	G ½
RK 1050	323	600 × 500 × 200	58.0	640 × 540 × 425	2400	600	-	G ½
RK 1050 CH	184	600 × 500 × 300	90.0	640 × 540 × 530	2400	600	1950	G ½

*corresponds to 4 times ultrasonic nominal power

SONOREX DIGITEC DT

Ultrasonic baths with rapid degassing

Type	Code No.	Internal dimensions Oscillating tank l × w × d [mm]	Capacity [l]	External dimensions l × w × d [mm]	Ultrasonic peak power* [W]	Ultrasonic nominal power [W]	Heating-power [W]	Outlet ball valve
DT 31	3200				160	40	-	-
DT 31 H	3220	190 × 85 × 60	0.9	205 × 100 × 180	160	40	70	-
DT 52	3205				240	60	-	
DT 52 H	3225	150 × 140 × 100	1.8	175 × 165 × 230	240	60	140	–
DT 100	3210				320	80	-	-
DT 100 H	3230				320	80	140	-
DT 102 H	3235	240 × 140 × 100	3.0	260 × 160 × 250	480	120	140	G ¼
DT 103 H	3201	240 × 140 × 150	4.0	260 × 160 × 310	560	140	200	G ¼
DT 106	3270	dia. 240 × 130	5.6	dia. 265 × 270	480	120	-	G ¼
DT 156	3275	500 × 140 × 100	6.0	530 × 165 × 245	640	160	-	G ¼
DT 156 BH	3221	500 × 140 × 150	9.0	530 × 165 × 300	860	215	600	G ¼
DT 255	3215				640	160	-	G ¼
DT 255 H	3240	300 × 150 × 150	5.5	325 × 175 × 295	640	160	280	G ¼
DT 510	3245				640	160	-	G ½
DT 510 H	3206	300 × 240 × 150	9.7	325 × 265 × 300	640	160	400	G ½
DT 512 H	3226	300 × 240 × 200	13.0	325 × 265 × 350	860	215	400	G ½
DT 514	3250				860	215	-	G ½
DT 514 H	3211	325 × 300 × 150	13.5	355 × 325 × 305	860	215	600	G ½
DT 514 BH	3216	325 × 300 × 200	18.7	355 × 325 × 385	860	215	600	G ½
DT 1028	3255				1200	300	-	G ½
DT 1028 H	3231	500 × 300 × 200	28.0	535 × 325 × 400	1200	300	1300	G ½
DT 1028 CH	3266	500 × 300 × 300	45.0	540 × 340 × 500	1200	300	1450	G ½
DT 1050 CH	3271	600 × 500 × 300	90.0	640 × 540 × 530	2400	600	1950	G ½

*corresponds to 4 times ultrasonic nominal power

SONOREX
Application-specific accessories

This is an important message to start with:
Containers or items to be cleaned must not be placed on the tank bottom, as this may result in damage to the tank bottom, the containers or the items to be cleaned. There should be a distance of approx. 1-2 cm below the object to be treated for the formation of the ultrasonic waves. Furthermore, the direct friction of the vessels/objects on the tank bottom would accelerate cavitation erosion and thus also wear. Choosing the right accessories facilitates the ultrasonic application and protects the oscillating tank and laboratory equipment.
The following explains which accessories are best used for which purpose at.
Please contact us at any time for advice on which accessories are recommended for both your application or special application.

An overview of the accessories for the respective ultrasonic bath and their combination options can be found on pages 48-51.

Insert basket K

The insert basket is generally the first choice for holding the item to be treated at.
There is the classic stainless steel basket for optimum ultrasonic permeability, but also a variant made of plastic for sensitive surfaces or particularly small parts.
Some of the basket handles are fitted with shrinking hoses. This protects against damage caused by friction on the edge of the tank and ensures for noise reduction during operation.
The dimensions of the insert basket must be taken into account when selecting the ultrasonic bath.

K 14

Insert basket PK 2 C

Use for cleaning parts with sensitive surfaces. Material: Polyethylene, the bottom is perforated.

PK 2 C

The basket handles are fitted with shrinking hoses to protect the edge of the tank.

Utensil holder GH

The stainless steel utensil holder is specially designed to hold larger laboratory flasks or individual parts. Some of the handles brackets are fitted with shrinking hoses. This protects against damage to the edge of the tank and ensures noise reduction during operation.

GH 28

Lid D

All lids D are made of stainless steel. The condensation water is drained into the oscillating tank. The slots on the sides are used to guide the basket handles during operation. Compared to plastic lids, stainless steel lids do not become brittle or bend when exposed to high heat. The smooth surface is easy to clean. It serves as protection against external contamination.

D 514

Accessories for indirect sonication

Certain media cannot be used directly in the oscillating tank, e.g. acids or solutions of halogen-containing salts (e.g. sodium chloride NaCl, fluoride salts). These are "corrosive substances" whose effect is further increased by ultrasound. The result is increased pitting at the bottom of the tank.

When using distilled/deionised water without additives, erosion occurs more quickly at the bottom of the tank - are missing ions as cavitation nuclei. Plastic tanks and inset beakers allow these media to be used indirectly in the ultrasonic bath.

Insert tubs KW

With lid. KW 3/5 made of polyethylene, other KW made of polypropylene, temperature-resistant in water up to 80 °C, in case of using acids up to 60 °C. Lid of KW 14 made of polycarbonate.

KW 3

Positioning lid DE and beaker holder ES 4

The positioning lid DE and the beaker holder ES 4 made of stainless steel are used to hold inset beakers and enable optimum utilisation of the ultrasonic energy.

DE 100

ES 4

Inset beaker EB / KB / PD / SD

The inset beakers are used for indirect cleaning of small parts and fit into the positioning lid DE and the beaker holder ES 4. The immersion depth can be varied using the rubber ring.
Cleaning in beakers enables the cleaning liquid to be changed quickly. From device size RK 100, can be cleaned simultaneously in two or more beakers filled with different cleaning solutions.

EB 05 PD 06 SD 06

Inset basket KD 0 / PD 04

The inset basket is placed into the inset beaker and is therefore optimally centred. Small parts to be cleaned can therefore be easily placed in or removed from the inset beaker.

KD 0

KD 0
Stainless steel, inner diameter 75 mm,
Sieve cloth, mesh size 1 × 1 mm

PD 04

PD 04
Polyethylene, inner diameter 60 mm,
Bottom: sieve cloth,
Mesh size1 × 1 mm

SONOREX

Accessories for process technology

Holders for laboratory vessels

Samples should be quickly and reliably homogenised, extracted or degassed in an ultrasonic bath for subsequent analysis in laboratory vessels of various sizes and shapes.

Fixing the laboratory flasks in the insert basket is often a problem. The laboratory flasks should not tip over, be flooded or be moved by the ultrasound and knocked against each other.

Spring clamps EK

Spring clamps are fastened in the insert basket or utensil holder with a mesh size of 12.5 × 12.5 mm and securely hold the laboratory flasks in place. This prevents the laboratory flasks from floating or tilting. They specify the size of the laboratory vessels to be fixed from 10-250 ml.

Spring clamp EK

Type	Code no.	For volume [ml]	Min. flask diameter [mm]	Max. flask diameter [mm]	Max. number of flask per K 10 F [pcs.]
EK 10	7521	10	23	31	18
EK 25	7519	25	30	42	18
EK 50	7518	50	35	52	9
EK 100	7516	100	40	65	6
EK 250	3259	250	55	85	5

Laboratory flask holder ZF, mounted in the insert basket

Laboratory flask holder ZF

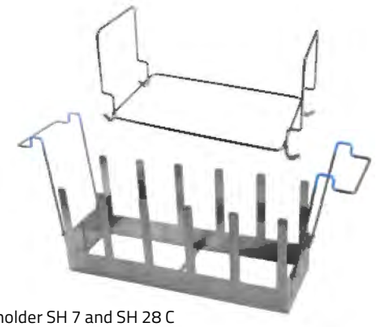
Tension springs offer a simple solution. These can be quickly and easily attached as longitudinal and transverse dividers at any position on the edge of the insert basket using small hooks. This allows the user to determine the subdivision individually depending on the shape and size of the flask. This guarantees the stability of the flasks. The subdivision size can be easily adjusted in a matter of seconds. Ultrasound transmission without losses into the sample to be sonicated is ensured.

Handle adjustment GV

To ensure that the two-thirds fill level is maintained in deeper ultrasonic baths and to prevent the laboratory flasks from flooding, a **handle adjustment** is recommended. This enables continuous adjustment of the immersion depth of the insert basket with the included laboratory flasks.

Ultrasound transmission without losses into the sample to be sonicated is ensured.

Handle adjustment GV



Sieve holder SH 7 and SH 28 C

Sieve holder SH

The SH sieve holders are used to hold test sieves with a diameter of up to 215 mm.

SH 7: Holding one sieve; for RK/DT 106

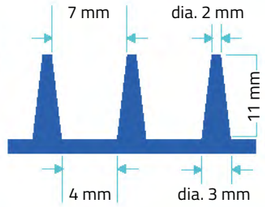
SH 28 C: Holds up to five sieves;
for smart ST/RK 1028 C/CH, DT 1028 CH
The sieves are placed vertically in the bath.

Test tube holder RG 2.2

The stainless steel test tube holder is designed for the simultaneous sonication of six test tubes/centrifuge tubes dia. = 30 mm and six reagenttubes/centrifuge tubes dia. = 17 mm.

Test tube holder RG 2.2

Silicone knob mat SM



Silicone knob mat

Easy to attach to the bottom of the insert basket using the plastic knobs supplied. Sensitive items to be cleaned can be placed securely and cleaned gently.

Inset grid EG

Inset grids prevent sensitive parts from resting directly on the bottom of the stainless steel basket, touching each other or being damaged.

1 polypropylene (PP) inset grid for cutting to size, 10 fastening knobs

Inset grid EG

..fixed in the basket with plastic knobs.

Configuration examples

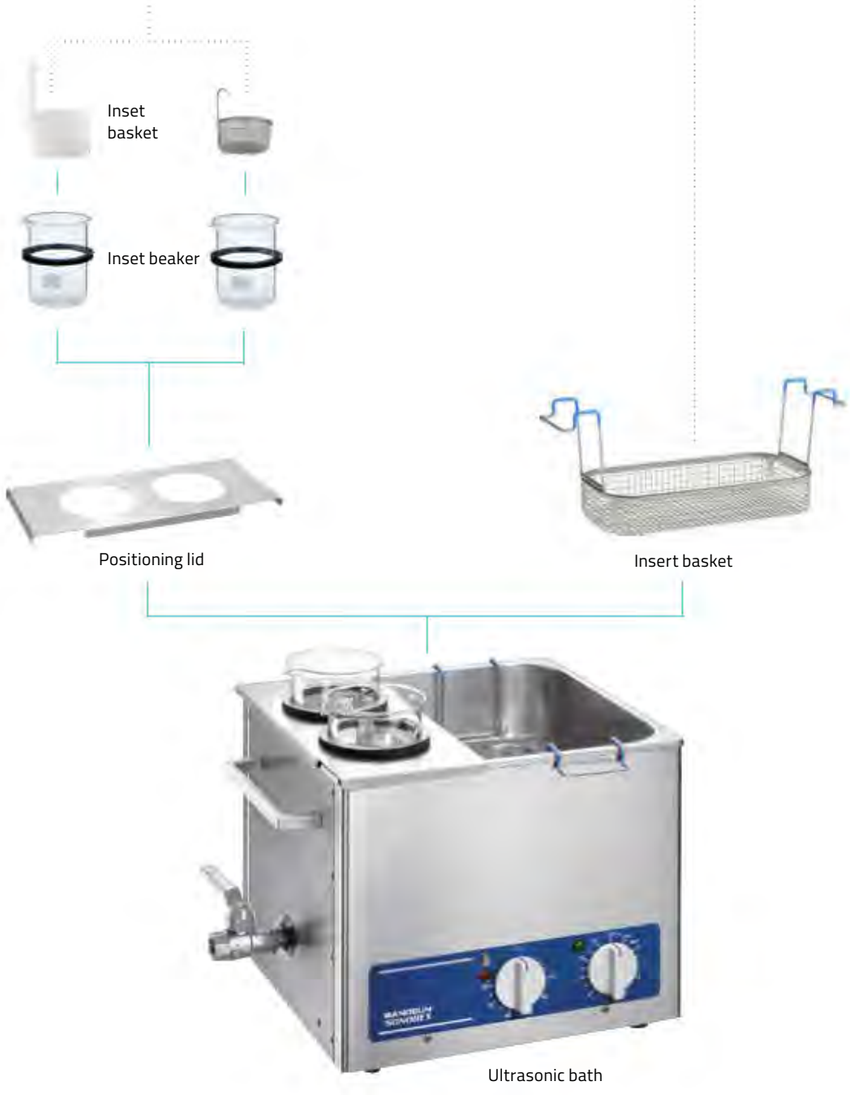
An ultrasonic bath, direct and indirect sonication in one work step

In larger ultrasonic baths, direct sonication and indirect sonication can be carried out simultaneously. This enables the use of different cleaners.

A insert basket K for cleaning larger parts and a positioning lid DE with inset beakers for simultaneous cleaning of small parts are used.

Indirect sonication
of small parts in inset beakers, even when using solvents or acids

Direct sonication
of parts in the insert **basket** in the oscillating tank



One ultrasonic bath, three configuration options

Various applications can be carried out in an ultrasonic bath by using different accessories.

Depending on the application, an insert basket, a plastic tub or a positioning lid with inset beakers can be used.

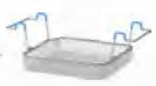
1 **Direct sonication**
of parts in the insert **basket** in the oscillating tank

2 **Indirect sonication of** parts in the plastic tub when using solvents, acids or distilled water

3 **Indirect sonication**
of small parts in inset beakers, even when using solvents or acids

SONOREX Accessories

In this overview you will find the matching accessories for our ultrasonic baths (continued on the next pages).







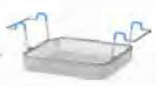




Ultrasonic bath	Lid (Code No.)	Insert basket stainless steel l × w × d [mm] (Code No.)	Insert basket plastic l × w × d [mm] (Code No.)	Utensil holder floor dimensions l × w [mm] (Code No.)	Plastic tub l × w × d [mm] (Code No.)	Positioning lid beaker holder (Code No.)	Inset beaker (Code No.)	Inset basket (Code No.)	Inset grid (Code No.)	Handle adjustment (Code No.)	Spring clamp (Code No.)	Laboratory flask holder (Code No.)	Sieve holder (Code No.)	Test tube holder (Code No.)
RK 31/H **DT 31/H**	D 08 (218)	K 08 170 × 65 × 50 (209)	-	-	-	DE 08 2 holes (278)	SD 04 (168) SD 05 (575) KB 04 (3000)	PD 04 (126)	EG 1 (71015)	-	1 × EK 10 (7521) or 1 × EK 25 (7519) or 1 × EK 50 (7518) or 1 × EK 100 (7516)	-	-	
RK 52/H **DT 52/H**	D 52 (3002)	K 1 C 120 × 110 × 40 (3024)	-	GH 1 129 × 117 (129)	-	DE 52 1 Loch (3016)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 3 (7509) not suitable for GH 1	1 × EK 10 (7521) or 1 × EK 25 (7519) or 1 × EK 50 (7518) or 1 × EK 100 (7516) or 1 × EK 250 (3259)	-	-	RG 2.2 (279)
RK 100/H **DT 100/H**	D 100 (3003)	K 3 C 200 × 110 × 40 (3025)	PK 2 C 187 × 90 × 56 (3082)	GH 1 129 × 117 (129)	KW 3 195 × 115 × 88 (715)	DE 100 2 holes (3017)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 3 (7509) not suitable for GH 1	8 × EK 10 (7521) or 5 × EK 25 (7519) or 4 × EK 50 (7518) or 2 × EK 100 (7516) or 2 × EK 250 (3259)	-	-	RG 2.2 (279)
RK 102 H **DT 102 H/H-RC** **DL 102 H**	D 100 (3003)	K 3 C 200 × 110 × 40 (3025)	PK 2 C 187 × 90 × 56 (3082)	GH 1 129 × 117 (129)	KW 3 195 × 115 × 88 (715)	DE 100 2 holes (3017)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 3 (7509) not suitable for GH 1	8 × EK 10 (7521) or 5 × EK 25 (7519) or 4 × EK 50 (7518) or 2 × EK 100 (7516) or 2 × EK 250 (3259)	-	-	RG 2.2 (279)
RK 103 H **DT 103 H**	D 100 (3003)	K 3 CL 200 × 110 × 40 (3026)	-	GH 1 129 × 117 (129)	KW 3 195 × 115 × 88 (715)	DE 100 2 holes (3017)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 3 (7509) not suitable for GH 1	8 × EK 10 (7521) or 5 × EK 25 (7519) or 4 × EK 50 (7518) or 2 × EK 100 (7516) or 2 × EK 250 (3259)	-	-	RG 2.2 (279)
RK 106 **DT 106**	D 6 (346)	K 6 dia. 215 x 50 (356)	-	-	-	DE 100 2 holes (3017)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	-	-	-	SH 7 (314)	-
RK 156 **DT 156**	D 156 (3004)	K 6 L 460 × 100 × 50 (202)	-	3 × GH 1 129 × 117 (129)	-	DE 156 4 holes (3040)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	-	-	-	-	-
RK 156 BH **DT 156 BH** **DL 156 BH**	D 156 (3004)	K 6 BL 460 × 100 × 50 (629)	-	-	-	DE 156 4 holes (3040)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 3 (7509)	-	-	-	-
RK 170 H	D 170 (3006)	K 7 950 × 150 × 50 (577)	-	-	-	-	-	-	EG 1 (71015)	-	-	-	-	-
RK/DT 255/H **DT 255 H-RC** **DL 255 H**	D 255 (3007)	K 5 C 260 × 110 × 40 (3027)	-	-	KW 5 254 × 96 × 130 (240)	DE 255 2 holes (3028)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	-	10 × EK 10 (7521) or 7 × EK 25 (7519) or 5 × EK 50 (7518) or 3 × EK 100 (7516) or 3 × EK 250 (3259)	-	-	-
RK/DT 510/H **DT 510 H-RC** **DL 510 H**	D 510 (3008)	K 10 250 × 195 × 50 (359) or 1 × K 5 C 260 × 110 × 40 (3027) or 2 × K 3 CL 200 × 110 × 40 (3026)	-	GH 10 260 × 200 (292)	KW 10-0 242 × 182 × 136 (3053) or 1× KW 5 254 × 96 × 130 (240) or 1× KW 3 195 × 115 × 88 (715)	DE 510 4 holes (3038) or 1 × DE 100 2 holes (3017) or 1 × DE 255 2 holes (3028)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 10 (7512)	15 × EK 10 (7521) or 11 × EK 25 (7519) or 8 × EK 50 (7518) or 5 × EK 100 (7516) or 6 × EK 250 (3259)	ZF 10 (3524)	-	-

SONOREX Accessories

In this overview you will find the matching accessories for our ultrasonic baths (continued from the previous pages).











Ultrasonic bath	Lid (Code No.)	Insert basket stainless steel l × w × d [mm] (Code No.)	Insert basket plastic l × w × d [mm] (Code No.)	Utensil holder floor dimensions l × w [mm] (Code No.)	Plastic tub l × w × d [mm] (Code No.)	Positioning lid beaker holder (Code No.)	Inset beaker (Code No.)	Inset basket (Code No.)	Inset grid (Code No.)	Handle-adjustment (Code No.)	Spring Clamp (Code No.)	Laboratory flask holder (Code No.)	Sieve holder (Code No.)	Test tube holder (Code No.)
DT 510 F	D 510 (3008)	K 10 F 250 × 195 × 35 (35902)	-	-	-	-	-	-	EG 1 (71015)	-	15 × EK 10 (7521) or 11 × EK 25 (7519) or 8 × EK 50 (7518) or 5 × EK 100 (7516) or 6 × EK 250 (3259)	ZF 10 (3524)	-	-
RK 512 H **DT 512 H** **DL 512 H**	D 510 (3008)	K 10 B 250 × 195 × 50 (230)	-	-	-	DE 510 4 holes (3038)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 10 (7512)	15 × EK 10 (7521) or 11 × EK 25 (7519) or 8 × EK 50 (7518) or 5 × EK 100 (7516) or 6 × EK 250 (3259)	ZF 10 (3524)	-	-
RK 514/H **DT 514/H**	D 514 (3010)	K 14 275 × 245 × 50 (354) or 2 × K 5 C 260 × 110 × 40 (3027)	-	GH 14 280 × 250 (291)	KW 14 280 × 215 × 145 (613) or 1× KW 5 254 × 96 × 130 (240)	DE 514 4 holes (3039) or 1 × DE 255 2 holes (3028	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 10 (7512)	20 × EK 10 (7521) or 15 × EK 25 (7519) or 10 × EK 50 (7518) or 8 × EK 100 (7516) or 8 × EK 250 (3259)	-	-	-
RK/DT 514 BH **DT 514 BH-RC** **DL 514 BH**	D 514 (3010)	K 14 B 275 × 245 × 50 (205)	-	-	KW 14 B 275 × 210 × 195 (648)	DE 514 4 holes (3039)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 10 (7512)	20 × EK 10 (7521) or 15 × EK 25 (7519) or 10 × EK 50 (7518) or 8 × EK 100 (7516) or 8 × EK 250 (3259)	-	-	-
RK 1028/H **DT 1028/H** **DL 1028 H**	D 1028 (3011)	K 28 455 × 245 × 50 (358) or × 2 K 10 B 250 × 195 × 50 (230)	-	GH 28 455 × 250 (290)	KW 28-0 437 × 230 × 155 (717) or 2x KW 10-0 242 × 182 × 136 (3053)	2 × ES 4 4 holes (382)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 10 (7512)	32 × EK 10 (7521) or 28 × EK 25 (7519) or 18 × EK 50 (7518) or 13 × EK 100 (7516) or 14 × EK 250 (3259)	ZF 28 (3525)	-	-
RK 1028 C **RK 1028 CH** **DT 1028 CH**	D 1028 C (3012)	K 28 C 455 × 245 × 50 (181)	-	-	KW 28-0 437 × 230 × 155 (717)	2 × ES 4 4 holes (382)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	GV 10 (7512)	32 × EK 10 (7521) or 28 × EK 25 (7519) or 18 × EK 50 (7518) or 13 × EK 100 (7516) or 14 × EK 250 (3259)	ZF 28 (3525)	SH 28 (307)	-
DT 1028 F	-	2 × K 10 F 250 × 195 × 35 (35902)	-	-	-	-	-	-	EG 1 (71015)	-	32 × EK 10 (7521) or 28 × EK 25 (7519) or 18 × EK 50 (7518) or 13 × EK 100 (7516) or 14 × EK 250 (3259)	2 × ZF 10 (3524	-	-
RK 1040	D 40 (603)	K 40 dia. 480 × 50 (123)	-	GH 28 455 × 250 (290)	-	-	-	-	EG 1 (71015)	-	-	-	-	-
RK 1050	D 1050 C (3013)	K 50 545 × 450 × 50 (357) or 2 × K 28 455 × 245 × 50 (189)	-	-	KW 50 B-0 520 × 445 × 284 (568)	4 × ES 4 4 holes (382)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	-	-	-	-	-
RK 1050 CH **DT 1050 CH**	D 1050 C (3013)	K 50 C 545 × 450 × 50 (138) or 2 × K 28 C 455 × 245 × 50 (194)	-	-	KW 50 B-0 520 × 445 × 284 (568) or × 1 KW 28-0 437 × 230 × 155 (717)	4 × ES 4 4 holes (382)	EB 05 (340) SD 06 (330) PD 06 (299) SD 09 (579)	KD 0 (370) PD 04 (126)	EG 1 (71015)	-	-	-	-	-

Ultrasonic baths for special requirements

04

SONOREX DIGITEC DT ... F - Ultrasonic baths with flat oscillating tanks

Particularly practical for homogenisation, sample preparation and rapid degassing of samples.

from page 54

SONOSHAKE - Ultrasonic bath with shaking device for sample preparation

Ideally equipped for the field of analytics and medical diagnostics.

from page 56

Chiller LABOCOOL LC 400

Now every ultrasonic bath can be extended with a cooling device.

from page 58

SONOREX PR 140 DH - Ultrasonic bath for cleaning volumetric glassware

For clean and, above all, grease-free volumetric glassware up to 755 mm in length.

page 60

SONOREX ultrasonic baths for cleaning test sieves

Remove impurities from even the finest mesh and ensure reproducible results.

from page 62

SONOCOOL - Ultrasonic bath with cooling

For a constant temperature for heat-sensitive samples in analysis laboratories and pathologies.

from page 64

BactoSonic - Ultrasonic bath for gentle removal of biofilms

Reliably removes infectious micro-organism from medical implants.

from page 68

SONOREX DIGITEC DT...

Ultrasonic baths with flat oscillating tanks

Expandable with separate chiller LABOCOOL LC 400 (see p. 56-57)

Flat baths are specially designed for the homogenisation or sample preparation and rapid degassing of samples in laboratory vessels. All samples are sonicated uniformly, regardless of their size and arrangement, at a higher power density [W/l] than in a standard ultrasonic bath. This guarantees reproducible results. The lower bath depth also means that less contact liquid is required. Clamps for the vessels prevent them from tipping over or floating.

Advantages

- Uniform sonication of all samples regardless of their size and arrangement
- Reproducible results
- Homogenisation or rapid degassing of the samples
- Laboratory flask holder ZF and spring clamps EK prevent laboratory flasks from tipping or floating.

Type	Code No.	Internal dimensions oscillating tank l × w × d [mm]	Capacity [l]	External dimensions l × w × d [mm]	Ultrasonic peak power* [W]	Ultrasonic nominal power [W]	Outlet ball valve
DT 510 F	3242	300 × 240 × 65	4.3	325 × 265 × 195	560	140	G ½
DT 1028 F	3243	500 × 300 × 65	9.5	535× 325 × 205	1280	320	G ½

*corresponds to 4 times ultrasonic nominal power

SONOREX DT 510 F (left) with laboratory flask holders and DT 1028 F (right) with spring clamps

Sets consisting of:
SONOREX DIGITEC DT 510 F, 1 insert basket K 10 F, 1 bottle of TICKOPUR R 33
Code No. 13242

SONOREX DIGITEC DT 1028 F, 2 insert baskets K 10 F, 1 bottle of TICKOPUR R 33
Code No. 13243

Spring clamp EK for laboratory flasks

Stainless steel clamps prevent the laboratory flasks from floating or tipping over.

Type	Code No.	For volume [ml]	Min. flask diameter [mm]	Max. flask diameter [mm]	Max. number of flask per K 10 F [pcs.]
EK 10	7521	10	23	31	18
EK 25	7519	25	30	42	18
EK 50	7518	50	35	52	9
EK 100	7516	100	40	65	6
EK 250	3259	250	55	85	5

Laboratory flask holder ZF for laboratory flasks

Laboratory flask holders prevent theflasks from floating or tilting in the K 10 F hanging basket.

Type	Code No.	Quantity
ZF 10	3524	5 x 155 mm 3 x 215 mm

SONOSHAKE Set

Ultrasonic bath with shaking device for sample preparation

Expandable with separate chiller LABOCOOL LC 400 (see p. 56-57)

The SONOSHAKE offers a wide range of applications for sample preparation in many areas of analysis, e.g in environmental and food analysis as well as in medical diagnostics. The samples can be sonicated both in a defined time and in continuous operation. Rapid degassing via the DEGAS function is also possible. The shaking device allows gentle to strong horizontal movement up to a maximum of 20 mm thanks to four different shaking frequencies. Both processes can be carried out simultaneously or separately. For example, pre-homogenisation can be achieved with a defined shaking frequency and final homogenisation with ultrasound in a significantly shorter time.

Any sediment in the sample can be dissolved by defined shaking. The additional ultrasound results in homogenisation.

- Analogue setting of time and shaking frequency
- Horizontal movement: adjustable in four stages
- Constant amplitude 20 mm, independent of the load
- Easy removal of the shaker platform
- Quick assembly of the spring clamps EK 10 - 250 for laboratory flasks (order separately)
- Footprint for laboratory flasks approx. 410 x 280 mm (l× w)
- Total footprint approx. 850 x 360 mm (l × w)

The SONOREX DIGITEC DT 1028 F ultrasonic bath can easily be retrofitted with the SA 1028 shaking device. In order to cool temperature-sensitive samples during sonication and dissipate the process heat, the LC 400 laboratory chiller can be connected to the SA 1028 shaking device using the optional extension kit ELC 2.

SONOSHAKE - combination of flat ultrasonic bath and shaking attachment

SONOSHAKE Set
Code No. 3257
consisting of ultrasonic bath DT 1028 F and shaking device SA 1028

Shaking device SA 1028
Code No. 3249

DT 1028 F

Spring clamp EK for laboratory flasks

Stainless steel clamps prevent the laboratory flasks from floating or tilting.

Type	Code No.	For volume [ml]	Min. flask diameter [mm]	Max. flask diameter [mm]	Max. number of flasks [pcs.]
EK 10	7521	10	23	31	36
EK 25	7519	25	30	42	36
EK 50	7518	50	35	52	18
EK 100	7516	100	40	65	12
EK 250	3259	250	55	85	10

LABOCOOL LC 400 Laboratory chiller

The LABOCOOL LC 400 laboratory chiller is used to dissipate process heat or to cool samples during sonication in the ultrasonic bath and, compared to conventional circulation coolers, the LC 400 is particularly efficient and climate-friendly.

For applications with SONOPULS homogeniser: LABOCOOL LC 200

Applications with cooling

The sonication of biological samples shortens the preparation time for the subsequent analysis and enables more reproducible results. Due to the high ultrasonic power applied, frictional heat is generated, which heats the sonication liquid in a short time. To protect the sample from excessive heat input, many applications therefore require the connection of a separate cooling system.

The LABOCOOL LC 400 offers a complete, ready-to-connect solution for this application, always providing the right cooling at the touch of a button.

For all SONOREX ultrasonic baths up to a volume of 30 litres and for SONOSHAKE

The LABOCOOL LC 400 laboratory chiller is suitable for all SONOREX ultrasonic baths with drain. The connection is made via the supplied hoses. Two ultrasonic baths can be connected with extension kit ELC 1.

The ELC 2 extension kit is required to connect the SONOSHAKE.
The 3-way ball valve supplied maintains the function of the tank drain.

Note: Ultrasonic baths may only be cooled to such an extent that condensation does not occur. This depends, among other things, on the humidity and temperature in the vicinity of the ultrasonic bath.

Code No. 3851 for ELC 1

Code No. 3852 for ELC 2

Connection terminal

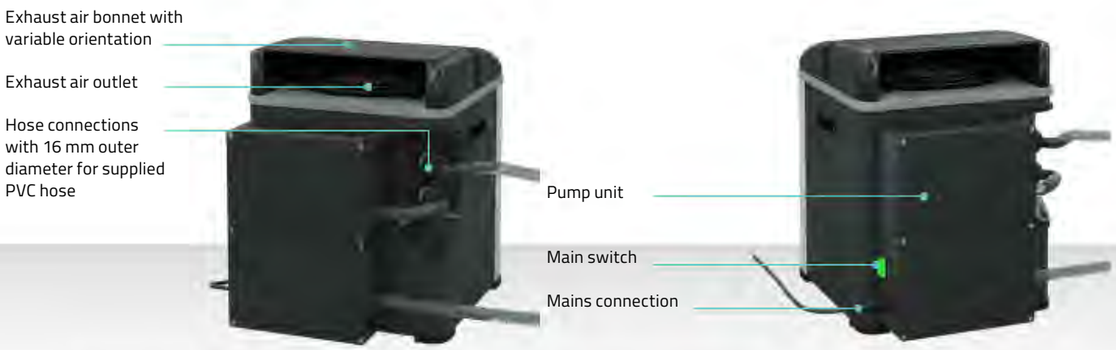
The connection terminal is suitable for all SONOREX ultrasonic baths up to 30 litres and is attached to the ultrasonic bath without tools. The use of baskets is not affected by the connection terminal.

Front side

The display on the front shows the status of the cooling function and the water temperature in the device. The desired water temperature can be set within a range of 5-30 °C using the buttons on the side.

Back side

The pump unit and the main switch are located on the back side of the device.



Type	Code No.	For baths	External dimensions l × w × d [mm]	Cool-performance [W]	Refrigerant-type	Refrigerant quantity [g]	Pump type	Pump output [W]	Max. flow rate [l/h]
LC 400	3850	SONOREX	410 × 320 × 420	400	R-290	90	Centrifugal pump	10	600

SONOREX PR 140 DH

Ultrasonic bath for cleanin volumetric glassware with lengths up to 755 mm

Clean and, above all, grease-free glass surfaces are a prerequisite for correct volume measurement: The liquid to be measured must run off the glass wall well and must not form droplets.

Features

- For volumetric glassware and long parts up to 755 mm in length
- With heating to help remove greasy residues
- Frequency modulation "Sweep" for a very homogeneous ultrasonic field; surfaces of the glassware are protected; attack of the graduation and glass abrasion are virtually avoided, the process of a volume change of the glassware, compared to manual cleaning with rough sponges or brushes, is greatly reduced.
- Can be placed on the floor near a drain
- Simultaneous cleaning and disinfection with STAMMOPUR 24 if contaminated with infectious samples
- Biodegradable cleaning agents TICKOPUR for the gentle removal of stubborn grease residues (R 33) or mineral impurities (TR 3)
- Cleaning liquids can be used several times.
- Stainless steel tank made of 1.4301 (1.5 mm material thickness)
- Handles for easier transport
- Control panel - foil keypad - easy wipe-cleaning of the device surface
- Time, DEGAS and optional temperature can be selected at the touch of a button - even with a glove.
- Drain with ball valve for quick and easy emptying

Ready-to-use set:

- Pipette cleaner PR 140 DH
- Pipette basket K 140 B
- Cover D 140 D
- Cleaning concentrates
  TICKOPUR R 33 - 5 l
  TICKOPUR TR 3 - 1 l

PR 140 DH with K 140 B and D 140 D

Type	Code No.	Internal dimensions oscillating tank l × w × d [mm]	Capacity [l]	External dimensions l × w × d [mm]	Ultrasonic peak power* [W]	Ultrasonic nominal power [W]	Heating power [W]	Outlet ball valve
PR 140 DH	2070	150 × 150 × 895	min. 9 max. 18	330 × 330 × 1003	860	215	700	G ½

*corresponds to 4 times ultrasonic nominal power

SONOREX
Ultrasonic baths for cleaning test sieves

Test sieves are test equipment with very high accuracy. These test sieves are used especially in the areas of quality control, research and production monitoring. Careful cleaning of test sieves is a prerequisite for accurate and reproducible results.
Results, which is why all sieve manufacturers recommend the use of ultrasonic baths to clean these sieves thoroughly. By cleaning in an ultrasonic bath, the impurities are removed even from finest meshes (< 500 µm), any jammed particles are loosened and a material carryover into the next sample is prevented. The mesh size and fabric tension of the sieves remain unchanged.

In addition to test sieves, grinding sets can also be cleaned effectively and thoroughly.

The sieves used for analysis in sieve shakers are intensively and intensively gently cleaned.
The sieves are ready for use again within a short time for a new analysis available.

We recommend the universal cleaning concentrate TICKOPUR R 33 and a matching sieve holder SH.

Test sieve before and after cleaning

Clean single sieves with ultrasound in the SONOREX DT 106 ultrasonic bath
youtube.com/bandelin

Clean up to five sieves with ultrasound in the SONOREX ultrasonic bath RK 1028 C
youtube.com/bandelin

DT 106 with SH 7

RK 1028 C with SH 28 C

For cleaning a single sieve:

Type	Internal dimensions oscillating tank [mm]	Capacity [l]	Code No.	For test sieves up to dia. [mm]	Ultrasound peak power* [W]	Ultrasound nominal power [W]	Accessories [mm]	Code No.
DT 106	dia. 240, 130	5,6	3270	200	480	120	SH 7	314
RK 106	dia. 240, 130	5,6	326	200	480	120	SH 7	314
RK 1040	dia. 500, 195	39,5	319	500	1520	380	GH 28	290

*corresponds to 4 times ultrasonic nominal power

SONOREX SUPER RK 106 and SONOREX DIGITEC DT 106 with SH 7

SONOREX SUPER RK 1040 with GH 28

For simultaneous cleaning of up to five sieves:

Type	Internal dimensions oscillating tank [mm]	Capacity [l]	Code No.	For test sieves up to dia. [mm]	Ultrasound peak power* [W]	Ultrasound nominal power [W]	Accessories [mm]	Code No.
RK 1028 C	500 × 300 × 300	45,0	661	200	2000	500	SH 28 C	307

*corresponds to 4 times ultrasonic nominal power

SONOREX SUPER RK 1028 C with SH 28 C

SONOCOOL

Ultrasonic bath with cooling for use in analysis laboratories and pathologies

The SONOCOOL ultrasonic bath is ideal for use wherever temperature stability is required in the ultrasonic bath, e.g. in quality control in the pharmaceutical sector, the food and beverage industry, but also in pathology. The range of functions concentrates on the essentials: Ultrasound intensity - sonication time and temperature.
A wide range of accessories extends the possible applications. The bath makes it possible to utilise the catalytic effect of ultrasound in processes that require simultaneous cooling. Heat-sensitive samples are protected by the cooling function , and process sequences can be designed faster and more effectively than with conventional methods.

Control unit of the SONOCOOL ultrasonic bath

Welded tray (stainless steel 1.4404)

Stopcock and drain nozzle

Advantages of the SONOCOOL SC 255.2

- Compact and powerful - Ultrasound and cooling in one device
- The only ultrasonic bath that can be cooled to temperatures below the ambient air's dew point
- Air-cooled cooling unit climate-friendly refrigerant R-290
- Dissipation of process heat due to the ultrasound
- Adjustable bath temperature: 4-40 °C at 20 °C ambient temperature
- Individual parameter variation (time, temperature, power) and thus adaptation to the respective specimen
- Long life time - welded, AISI 316L, material thickness 2 mm
- monitoring the fill level
- Glass lid: sample observation, easy cleaning

Glass lid, integrated holder

Examples of applications in the laboratory

(Constant temperature conditions required)

- Sample preparation for subsequent analysis, e.g determination of chemical and biological agents (in particular chromium (VI) analysis)
- Dissolution of solids in solvents and degassing of eluents

Advantage: Temperature-sensitive materials are not destroyed/attacked.

Examples of applications in pathology

- Acceleration of decalcification of femoral head specimen, tibial shaft specimen, osteosarcomas
- Acceleration of decalcification of dental hard tissue for histopathologic preparation

Advantages: Significant reduction in decalcification times without any negative impact on the quality of the specimen and improvement in cutting quality.

Ready-to-use laboratory set:

- Ultrasonic bath SC 255.2
- Insert basket K 5 SC
- Lid D 255 G
- 1 bottle of TICKOPUR TR 3 (concentrate for preparing the contact liquid)

Code No. 3500032 - 230 V EU plug CEE 7/7
3500032-GB - 230 V GB plug BS 1363
3500032-CH - 230 V CH plug T 12 type J

Ready-to-use pathology set:

- Ultrasonic bath SC 255.2
- Sample holder PH 255-11
- Lid D 255 G
- Inset beaker SD 01.2 - 20 pieces
- 1 bottle of TICKOPUR TR 3 (concentrate for preparing the contact liquid)

Code No. 3500031 - 230 V EU plug CEE 7/7
3500031-GB - 230 V GB plug BS 1363
3500031-CH - 230 V CH plug T 12 type J

Type	Internal dimensions oscillating tank l × w × d [mm]	Capacity [l]	External dimensions l × w × d [mm]	Ultrasound peak power* [W]	Ultrasound nominal power [W]	Cooling capacity [W]	Procedure
SONOCOOL	280 × 150 × 150	6,3	60 × 605 × 385	720	180	200	Hose, front left, concealed

*corresponds to 4 times ultrasonic nominal power

Available accessories for the laboratory

BANDELIN offers the right accessories for various applications in the laboratory.

Suspension basket K 5 SC
Stainless steel
260 × 110 × 40 mm, l × w × d
Mesh size 5 × 5 mm
Capacity max. 5 kg
Code No. 302701

Stainless steel clamps EK prevent the laboratory flasks from floating or tilting. Easy to attach to the bottom of the insert basket K.

Type	Code No.	For flask [ml]	Min. flask diameter [mm]	Max. flask diameter [mm]	Max. number of flasks [pcs.]
EK 10	7521	10	23	31	17
EK 25	7519	25	30	42	10
EK 50	7518	50	35	52	7
EK 100	7516	100	40	65	4
EK 250	3259	250	55	85	2

Available accessories for pathology

BANDELIN offers the right accessories for various applications in pathology.

Sample holder PH 255-1
For 1 Box IB 18
Code No. 3519

Box IB 18
Material: Polypropylene
PU = 5 pcs.
Code No. 3283

Sample holder PH 255-11
For 11 inset beakers SD 01.2
Code No. 3512

Inset beaker SD 01.2
PU = 10 pcs.
Glass, without spout
Inside diam. 44 mm,
height 80 mm
Code No. 3517

Sample holder PH 255-2
For 2 inset beakers SD 06
Code No. 3518

Inset beaker SD 06
Glass, 600 mm
Inside diam. 84 mm, height 125 mm
With lid
Inserting without black ring
Code No. 330

Sample holder PH-2W
For 2 x 24-well plates
Code No. 3521

Detailed application examples in pathology for the SONOCOOL

Kind	No.	Application
Decalcification	PT-101	Checking the descaling process with different ultrasonic power in a subjective comparison (test of cuttability, microscopic assessment)
Decalcification	PT-102	Objective comparison of the descaling process with different ultrasonic power and different descaling solution (contact radiography)
Decalcification	PT-103	Result of decalcification in osteosarcoma
Decalcification	PT-104	Result of the molecular biological processing of a bone preparation
Decalcification	PT-105	Acceleration of the decalcification process of hard dental tissue in the SONOCOOL ultrasonic bath

BactoSonic

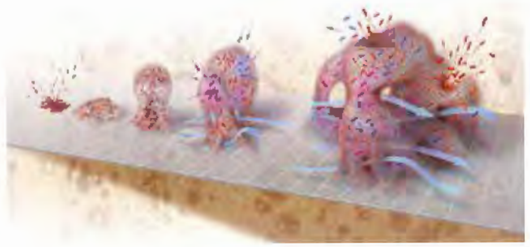
Ultrasonic bath for the gentle removal of biofilms

With the increasing use of medical implants, we are also increasingly confronted with infectious biofilms on them. The most common implants include joint prostheses, osteosyntheses, vascular prostheses, pacemakers and defibrillators, dental implants, neurosurgical shunts and breast implants.

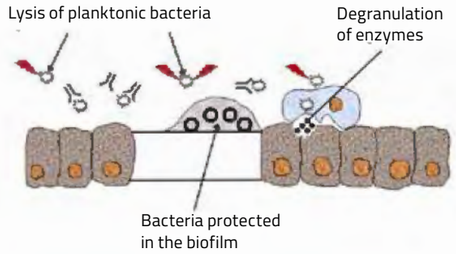
Successful treatment of implant infections depends on a precise microbiological diagnosis. Because microorganisms form biofilms on non-body parts, they are often difficult to detect in surrounding tissue.

Sonication (ultrasound) can be used to gently remove microorganisms from the surface of an infected implant. The implant is immersed in liquid so that the ultrasound waves can affect the entire implant surface. After sonication, the liquid (the sonicate) is prepared for cultures and can then be used immediately for subsequent analysis (e.g. PCR). Sonication thus enables rapid diagnosis of the site of infection if implant removal is necessary.

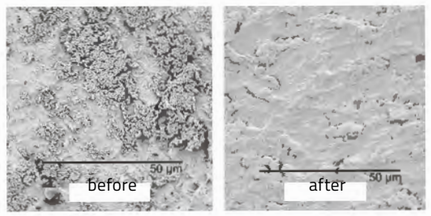
The BactoSonic was developed in collaboration with a research institute.



Planktonic and biofilm forms from bacteria



Biofilm on the implant surface



Success of biofilm removal

Comparison of cultures of tissue biopsy and soniction liquid (sonicate)

Operating principle of the BactoSonic

The implants are placed into the airtight implant boxes and sonicated in the specially designed ultrasonic bath BactoSonic. Compared to other ultrasonic baths, BactoSonic works with a very **low intensity and high homogeneity**.

The aim is to remove the biofilm without destroying the bacteria , a quantitative assessment is possible. The resulting liquid is processed microbiologically and the amount of bacteria is quantified.

Up to 10 000 times more bacteria can be detected than with conventional methods, such as biopsies from peri prosthetic tissue at. Mixed infections and different bacterial morphotypes can be better detected. Sensitivity is particularly high in patients with pre-existing infections improved after antibiotic therapy.

The following implants can be examined using the sonication method:

- Orthopaedic implants (joint prostheses, osteosyntheses)
- Breast prostheses
- Internal neurosurgical shunts
- Pacemakers and ICDs (implantable cardioverter/defibrillator devices)
- similar implants that can be removed aseptically from the body

The following materials cannot be analysed with sonication:

- Bone fragments (e.g. Sequester)
- Soft tissue

The following materials can only be analysed with sonication to a limited extent:
Implants taken from primarily non-sterile areas (e.g. VAC sponges, vascular catheters, external cerebrospinal liquid drainage etc.) can be examined using the sonication method, but the microorganism limits cannot be applied.

BactoSonic BS 14.2

Type	Internal dimensions Oscillating tank l × w × d [mm]	Capacity [l]	External dimensions l × w × d [mm]	Ultrasound peak power* [W]	Ultrasound nominal power [W]	Heat output [W]	Outlet ball valve
BactoSonic	325 × 300 × 150	13,5	355 × 325 × 305	800	200	-	G ½

*corresponds to 4 times ultrasonic nominal power

BactoSonic 14.2, consisting of:

- Ultrasonic bath BS 14.2
  CE-IVDR class A
- Frame for foil test FT 14
- Procedural instruction
- 1 bottle of TICKOPUR R 33
  (concentrate for preparing the contact liquid)
- Implant boxes made of polypropylene
  (CE conformity: in vitro diagnostic medical devices 2017 / 746 / EU)
  CE-IVDR class A
- 2 pcs. IB 5, 0,52 l, inner dimensions 125 × 85 × 50 mm
  2 pcs. IB 6, 0,6 l, inner dimensions dia. 120 × 55 mm
  1 pcs. IB 10, 1,0 l, inner dimensions 255 × 95 × 43 mm
  1 pcs. IB 18, 1,8 l, inner dimensions 185 × 120 × 80 mm
  1 pcs. IB 20, 2,0 l, inner dimensions 112 × 80 × 265 mm
- Box carrier BT 5, BT 6, BT 10, BT 18
  made of polycarbonate
- Stainless steel utensil holder GH 14

Code No. 3291

BS 14.2

BT 5 box carrier,
IB 5 implant box

BT 6 box carrier,
IB 6 implant box

TICKOPUR R 33 – 1 l

BT 10 box carrier,
IB 10 implant box

BT 18 box carrier,
IB 18 and IB 20 implant boxes

Utensil holder GH 14

Frame for foil test FT 14

Consumables

Type	Code No.	[pcs.]	suitable for
Implant boxes IB			
IB 5	3280	5	-
IB 6	3281	5	-
IB 10	3282	5	-
IB 18	3283	5	-
IB 20	3284	3	-
Silicone seals DI for implant boxes			
DI 5	32800	5	IB 5
DI 6	32810	6	IB 6
DI 10	32820	10	IB 10
DI 18	32830	18	IB 18
DI 20	32840	20	IB 20

Cleaning and disinfecting agents

05

TICKOPUR and STAMMOPUR

Cleaning and disinfecting agents
for universal use
and as special agents.

from page 74

Shelf life of disinfectant and cleaning products

Information on long-term
usability and storage
of the agents.

Page 88

Dosing calculator

Avoid over- or underdosing
with our convenient dosing
calculator.

Page 88

FAQ - agents

The most frequently asked
questions about our products and
their application.

Page 89

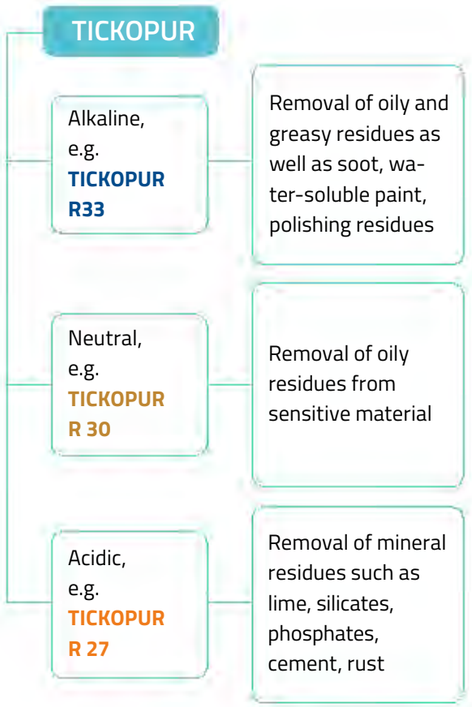
TICKOPUR and **STAMMOPUR** - cleaning and disinfectant agents for universal use and as special agents

For ultrasonic cleaning applications, BANDELIN offers a range of effective **TICKOPUR cleaning products** for a variety of cleaning requirements in the laboratory. Regardless of whether a mild or intensive cleaning agent is required, the high-quality agents achieve reliable results, save resources and make effective use of valuable time and labour in daily laboratoryoperations.

The certified **STAMMOPUR** cleaning and disinfectant agents are used in areas where contamination is cleaned and germs are inactivated.

The agents are formulated to promote cavitation - the optimum interaction of ultrasound and agent - expertise for the benefit of the user.

Like the ultrasonic devices, all agents are made in Germany.



All agents are available in several container sizes, here 2, 5 and 10 litres

More information
bandelin.com/en/products/preparations/

MD
bandelin.com/en/products/preparations/stammopur/
eIFU

Demulsifying cleaners

Greases and oils float on the surface and are thus easy to separate.

Special feature of TICKOPUR R 33:
It is a cleaning agent with predominantly emulsifying properties. If the solution is left to stand for a longer period of time without ultrasound exposure, a demulsifying effect occurs in the cleaning solution, which can be utilised when using oil separation devices.

Emulsifying cleaners

Grease and oil removed from the surface of the parts are bound by the cleaner and kept in suspension. There is no recontamination when the cleaned parts are removed from the bath liquid.

Note for STAMMOPUR 24, STAMMOPUR R and STAMMOPUR DR 8:
As these are cleaning and disinfecting agents, they do not need to be categorised with regard to emulsifying and demulsifying properties.

The right cleaning agent for optimum cleaning success

Inaddition to ultrasonic power, dosing, sonication durationand temperature, specially formulated cleaning and disinfection agents are required to achieve optimum cleaning results in the ultrasonic bath.

Specially adapted means that the agents support the ultrasonic effect through their cavitation-promoting formulations. The usual indication that agents are also suitable for ultrasound does not cover the same performance.

The choice of agent is always a connection between the item to be cleaned (material) and the contamination. Specific details can be found in the descriptions of the agents on the following pages.

Important note: Only drinking water without the addition of cleaning agents does not clean! Household detergents are also unsuitable due to their ingredients and can even damage the items to be cleaned and the ultrasonic cleaner.

Dosing aids

Dosing pump

This makes it easy to remove cleaning and disinfectant agents from the canisters, spillage is reliably prevented.

Measuring cup

For precise dosing of the volumes of cleaning or disinfectant agents taken from the dosing table.

	Suitable for	Code No.
Dosing pump ①	5 litre canister	268
Dosing pump ①	10 l canister	2660
Measuring cup ②	100 ml	294


① ②

TICKOPUR - from gentle to demanding cleaning tasks

The application parameters specified for the agents apply to a large number of applications. Even within the specified values, the items to be cleaned may be exposed to stresses that can be avoided by customising the parameters.

We always recommend preliminary tests to determine the application parameters.

The use of the agents outside the specified areas requires a prior material compatibility test of the cleaning material.

The dosage of the agents

The specified dosage for the agents applies to a large number of applications, but can also be exceeded. The undiluted use of the agents (without dosing in water) is not intended.

For **TICKOPUR** agents, a higher dosage can lead to a shorter sonication time. The saving of agent can be compensated by a longer sonication time. This must be checked for the specific application.

The dosing calculator on the page bandelin.com/en/service/dosing-calculator/ supports the exact calculation of the dosage.

In terms of economic efficiency and sustainability, the basic principle is: as little as possible, as much as necessary.

The duration of use

The sonication duration applies to the majority of applications. Extending the sonication time beyond this may be necessary for individual applications to achieve the desired cleaning result. As a general rule, always select the shortest effective exposure time.

The exposure time without an ultrasonic bath is usually significantly shorter than twelve hours. The user is responsible for determining the necessary exposure time and should be as short as possible.

The temperature during application

Higher application temperatures can shorten the cleaning process or are necessary for successful cleaning.

TICKOPUR cleaning solutions can be used at 20 - 60 °C / 80 °C. The temperature of the bath must be selected depending on the material of the items to be cleaned, the type and strength of the contamination and the information on the agent.
A cleaning solution temperature of between 30 - 50 °C is generally recommended.

Rinsing after use

Rinse thoroughly with tap water, rinse with deionised water for stainless drying.
Rinsing in the temperature range of the application can support the drying of the items to be cleaned.

Temporary corrosion protection

The temporary corrosion protection is effective during application and is removed by rinsing after application. If corrosion protection is required after application, it must be applied afterwards.

STAMMOPUR - effective cleaning and disinfection

The application parameters are defined as part of the cleaning and disinfection process by the declaration of efficacy and must not be varied.

The disinfectant agents **STAMMOPUR DR 8** and **STAMMOPUR 24** are always prepared cold. The parameters dosage and exposure time are determined from the information for the required disinfection spectrum in the instructions for use on the label and must be adhered to for full effectiveness.

To clean with **STAMMOPUR R**, the solution can be heated up to 60 °C if the soiling is stubborn. Fresh blood or protein-containing residues coagulate at this temperature, which is why cleaning items with this type of contamination should only be cleaned cold.

TICKOPUR R 33

Universal Cleaner - mildly alkaline

Concentrate for mildly alkaline ultrasonic cleaning, enables intensive cleaning and degreasing and universal, fast, thorough and gentle cleaning, with high effectiveness and a wide range of applications. Can also be used for light metals, with corrosion protection.

- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- Gentle on materials, very high material compatibility
- Caution with aluminium, tin and zinc
- With temporary corrosion protection
- Residue-free rinsing
- To be used as a contact liquid for indirect sonication
- Emulsifying and demulsifying, see information p. 75
- Mildly alkaline
- Biodegradable
- EXAM-certified for ultrasonic application

TICKOPUR R 33 is a concentrate for cleaning and degreasing in ultrasonic baths as well as in immersion baths and for wipe cleaning.

Removes general soiling, organic and inorganic residues, residues from sample preparation, oil- and grease-like residues, soot, pigments, resin and waxes, light combustion and coking residues, distillation residues
from
laboratory instruments, laboratory glassware, optical glassware, laboratory equipment and their components, workpieces and tools, occupational safety equipment (PPE)
made of
metal (including light metal), glass, laboratory glassware, ceramics, porcelain, plastic and rubber.

Examples of applications for **TICKOPUR R 33**: Analytical sieves, filters, tableting stamps, microtitre plates, laboratory glassware, optical glasses, goggles, respiratory masks, safety goggles, parts and tools from sample preparation, components of devices.

Litres	1	2	5	10	200
Code No.	830	883	831	6023	837

Application in an ultrasonic bath
(dosage · treatment time):
3 - 5 % · 1 - 10 min

Application without ultrasound
(dosage · treatment time):
3 - 10 % · max. 12 h

For heavy soiling, heat up to 80 °C.
Observe the notes on the temperature / treatment time of the solutions on page 76.

The material compatibility of **TICKOPUR R 33** in the ultrasonic bath on breathing connections of MSA Auer GmbH has been confirmed by the expert opinion of the EXAM specialist centre for respiratory protection.

Parts made of aluminium, tin and zinc should initially be sonicated/inserted at max. 50 °C for no longer than 3 minutes, then continue treatment under visual inspection (change in material of the items to be cleaned). Brass and copper parts may discolour.

Active ingredient base: tensides, phosphates, silicates mildly alkaline, pH 11.1 at 1 % in deionised water, biodegradable.

TICKOPUR R 30

Neutral Cleaner

Concentrate for neutral, gentle ultrasonic cleaning, effective against light soiling and for degreasing, with corrosion protection.

- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- Gentle on materials, very high material compatibility
- With temporary corrosion protection
- To be used as a contact liquid for indirect sonication at
- Residue-free rinsing
- Emulsifying
- Neutral
- Biodegradable

TICKOPUR R 30 is a concentrate for the particularly gentle removal of light soiling and for degreasing in ultrasonic baths as well as in immersion baths and for wipe cleaning.

Removes light residues from sample preparation, light grinding-, polishing- and drilling residues, grease and oil films as well as light sooting
from
laboratory instruments, laboratory equipment and their components, workpieces and tools
made of
metal (including light metal), glass, laboratory glassware, ceramics, porcelain, plastic and rubber.

Application examples for **TICKOPUR R 30**:
Optical glassware, laboratory glassware, pipettes, sieves, spindles, workpieces and tools from sample preparation, devices and their components.

Litres	1	2	5	10	200
Code No.	810	879	811	6021	814

Application in an ultrasonic bath
(dosage · treatment time):
1-5% · 1-10 min

Application without ultrasound
(dosage · treatment time):
1-10% · max. 12 h

For heavy soiling, heat up to 60 °C.
Observe the notes on the temperature / treatment time of the solutions on page 76.

TICKOPUR R 30 is suitable for all materials commonly used in laboratories and has a very high material compatibility. Preliminary tests on the resistance of highly sensitive materials are recommended.

Active ingredient base: Surfactants
neutral, pH 7 at 1% in deionised water, biodegradable.

TICKOPUR R 27

Special Cleaner - based on phosphoric acid

Concentrate for acidic ultrasonic cleaning, highly effective against heavy strong residues, rust and metal oxides, grease and oil films.

- Based on phosphoric acid
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- Suitable for acid-resistant materials
- Not for tin, zinc, light metals, unprotected steel, damaged chrome plating
- Residue-free rinsing
- Emulsifying
- Acidic
- Biodegradable

TICKOPUR R 27 is a concentrate for descaling, rust removal and grease film removal in ultrasonic baths as well as in immersion baths and wipe cleaning.

Removes heavy mineral residues such as lime, silicates, phosphates, cements as well as rust, tarnish, metal oxides, grease and oil films
from
laboratory instruments, laboratory equipment and their components, workpieces and tools
made of
steel, stainless steel, precious metals, glass, laboratory glassware, ceramics, porcelain, plastic and rubber.

Application examples for **TICKOPUR R 27**:
Fittings, nozzles, filters, laboratory glassware, pipettes, aerators, pump housings, valves, water baths.

Litres	1	2	5	10	200
Code No.	815	874	816	6020	-

Application in an ultrasonic bath
(dosage · treatment time) :
5% · 2-10 min

Application without ultrasound
(dosage · treatment time):
10-20% · max. 12 h

For heavy soiling, heat up to 60 °C.
Observe the notes on the temperature / treatment time of the solutions on page 76.

Not for light metals, tin, zinc, unprotected steel and damaged chrome plating.

With steel: depending on the alloy, material changes are possible.

Active ingredient base: phosphoric acid, tendisdes acidic, pH 1.9 at 1% in deionised water, biodegradable.

TICKOPUR RW 77

Special Cleaner - with ammonia

Concentrate for mildly alkaline ultrasonic cleaning and degreasing, highly effective for more stubborn soiling.

- Based on tensides and ammonia
- Phosphate-free
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- High material compatibility
- Alkali-sensitive materials canbe attacked.Take care with light metals, especially aluminium. Reduce the sonication / exposure time to a minimum (< 3min).
- Residue-free rinsing
- Emulsifying
- Mildly alkaline
- Biodegradable

TICKOPUR RW 77 is a concentrate for the powerful removal of strongly adhering soiling and for degreasing in ultrasonic baths as well as in immersion baths and wipe cleaning.

Removes resinification, combustion residues as well as soot, pigments and colour haze, impurities from grease, oils, waxes, oxides, fluxes and heavy residues from sample preparation
from
laboratory instruments, laboratory equipment and their components, workpieces and tools
made of
steel, stainless steel, non-ferrous metals (slightly deoxidising effect on brass and copper), glass, laboratory glassware, ceramics, porcelain, plastic and rubber.

Examples of applications for **TICKOPUR RW 77**: Test sieves, devices and their components, workpieces and tools used in sample preparation.

Litres	1	2	5	10	200
Code No.	870	898	871	6026	-

Application in an ultrasonic bath
(dosage · treatment time):
5 - 10 % · 1 - 10 min

Application without ultrasound
(dosage · treatment time):
10 % · max. 12 h

For heavy soiling, heat up to 80 °C.
Observe the notes on the temperature / treatment time of the solutions on page 76.

TICKOPUR RW 77 is formulated for heavier soiling. We recommend testing materials (the material resistance of the cleaning material) by means of preliminary tests.

Alkali-sensitive materials may be attacked. Take care with light metals, especially aluminium. Reduce the sonication / exposure time to a minimum (< 3 min).

Active ingredient base: tensides, ammonia
mildly alkaline, pH 10.2 at 1 % in deionised water, biodegradable.

TICKOPUR R 60

Intensive Cleaner - phosphate-free

Concentrate for intensive, highly alkaline ultrasonic cleaning, formulated free of phosphate and silicate, for high cleaning requirements, with sodium hydroxide.

- Phosphate and silicate-free formulation
- Free from organic solvents
- Saponifying
- With temporary corrosion protection
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- High material compatibility
- Not for alkali-sensitive materials such as light metals, tin, zinc and non-ferrous metals.
- Residue-free rinsing
- Emulsifying
- Strongly alkaline
- Biodegradable

TICKOPUR R 60 is a concentrate for the intensive removal of heavy soiling and degreasing in ultrasonic baths as well as in immersion baths and wipe cleaning.

Removes coking residues, resinification, soot, grease, oils, waxes, pigments, colour haze, certain varnish and paint residues, residues from sample preparation, support materials from 3D printing, ashed glue and plastic residues
from
laboratory instruments, laboratory glassware, laboratory equipment and their components, workpieces and tools and their components
made of
steel, stainless steel, precious metals, glass, laboratory glassware, ceramics, porcelain, plastic and rubber.

Application examples for **TICKOPUR R 60**: 3D prints, laboratory glass, filters, doctor blades, nozzles, vulcanisation moulds.

Litres	1	2	5	10	200
Code No.	820	896	818	6025	-

Application in the ultrasonic bath
(dosage · treatment time):
2 - 20 % · 1 - 10 min

Application without ultrasound
(dosage · treatment time):
10 - 30 % · max. 12 h

For heavy soiling, heat up to 80 °C.
Observe the notes on the temperature / treatment time of the solutions on page 76.

Not for alkali-sensitive materials such as lightmetals, tin, zinc and non-ferrous metals.

Active ingredient base: sodium hydroxide, tensides strongly alkaline, pH 12.3 at 1 % in deionised water, biodegradable.

TICKOPUR TR 3

Special Cleaner - citric acid base

Concentrate for mildly acidic ultrasonic cleaning based on citric acid, particularly gentle on materials, with corrosion protection.

- Based on citric acid
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- Gentle on materials, very high material compatibility
- Caution with tin, zinc, aluminium
- Brass and copper are slightly brightened
- With temporary corrosion protection
- Residue-free rinsing
- To be used as a contact liquid for indirect sonication
- Emulsifying
- Mildly acidic
- Biodegradable

TICKOPUR TR 3 is a concentrate for the removal of general soiling, descaling, rust film removal and degreasing in ultrasonic baths as well as in immersion baths and wipe cleaning.

Removes mineral residues, flash rust, oxides, waxes, pigments, residues from sample preparation, oily and greasy impurities, light combustion and coking residues, distillation residues, organic and inorganic residues
from
laboratory instruments, laboratory equipment and their components, workpieces and tools
made of
metal (including non-ferrous and light metals), glass, laboratory glassware, ceramics, porcelain, plastic and rubber.

Examples of applications for **TICKOPUR TR 3**: filters, laboratory glassware, optical glassware, appliance components.

Litres	1	2	5	10	200
Code No.	913	923	935	6016	973

Application in an ultrasonic bath (dosage · treatment time):
5 % · 1-10 min

Application without ultrasound (dosage · treatment time):
1-20 % · max. 12 h

For heavy soiling, heat up to 50 °C.
Observe the notes on the temperature / treatment time of the solutions on page 76.

Parts made of aluminium, tin and zinc should initially be sonicated / soaked at max. 50 °C for no longer than 3 minutes, then continue to treat under visual inspection (change in material of the items to be cleaned). Brass and copper parts are slightly brightened.

Preliminary tests on the resistance of sensitive materials of the cleaning goods are recommended.

Active ingredient base: citric acid, tensides mildly acidic, pH 2.8 at 1 % in deionised water, biodegradable.

TICKOPUR TR 13

Intensive Cleanser - demulsifying

Concentrate for intensive alkaline ultrasonic cleaning, demulsifying formulation.

- Intensive cleaning
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- High material compatibility
- Not for alkali-sensitive materials such as light metals, tin, zinc, non-ferrous metals
- With temporary corrosion protection
- Residue-free rinsing
- Demulsifying
- Extension of the bath life time when using oil separation
- Silicate-free
- Alkaline
- Biodegradable

TICKOPUR TR 13 is a concentrate for cleaning and degreasing in ultrasonic baths as well as in immersion baths and for wipe cleaning.

Removes resinification, combustion and coking residues, residues from sample preparation, soot, grease, oils, waxes, pigments and colour haze
from
laboratory instruments, laboratory glassware, laboratory equipment and their components, workpieces and tools from sample preparation
made of
steel, stainless steel, precious metals, glass, laboratory glassware, ceramics, porcelain, plastic and rubber.

Application examples for **TICKOPUR TR 13**: Test sieves, laboratory glassware, devices and their components.

Litres	1	2	5	10	200
Code No.	844	872	848	6018	-

Application in an ultrasonic bath (dosage · treatment time):
0.1-10 % · 1-10 min

Application without ultrasound (dosage · treatment time):
1-20 % · max. 12 h

For heavy soiling, heat up to 80 °C.
Observe the notes on the temperature / treatment time of the solutions on page 76.

Not for alkali-sensitive materials such as lightmetals, tin, zinc, non-ferrous metals.

Active ingredient base: tensides, alkalis alkaline, pH 12.1 at 1 % in deionised water, biodegradable.

TICKOPUR R 36

Special Cleaner - surfactant-free

Concentrate for mildly alkaline ultrasonic cleaning, formulated free of tensides for the cleaning requirements in analytics.

- Tensides-free formulation
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Economical due to low application concentration
- High material compatibility
- Residue-free rinsing
- Demulsifying
- Non-foaming
- Mildly alkaline
- Biodegradable

TICKOPUR R 36 is a concentrate for cleaning and degreasing in ultrasonic baths as well as in immersion baths, wipe cleaning and high-pressure cleaning. It is used in processes that would be impaired by tensides and are not desirable there.

Removes organic and inorganic residues, oily and greasy impurities and distillation residues
from
laboratory instruments in analytics, laboratorydevices and their components, workpieces and tools
made of
metal, glass, laboratory glassware, optical glassware, ceramics, porcelain, plastic and rubber.

Application examples for **TICKOPUR R 36**:
Cuvettes, optics.

Application in an ultrasonic bath (dosage · treatment time):
0.25 - 5 % · 1 - 10 min

Application without ultrasound (dosage · treatment time):
1 - 10 % · max. 12 h

For heavy soiling, heat up to 80 °C. Observe the notes on temperature / treatment time of the solutions on page 76.

Active ingredient base: phosphate, silicate
mildly alkaline, pH 11.1 at 1 % in deionised water, biodegradable.

Litres	1	2	5	10	200
Code No.	6024	854	884	852	-

STAMMOPUR 24

Intensive Cleaning and Disinfection

Intensive cleaning and chemical disinfection of laboratory equipment, laboratory instruments and medical instruments and accessories.

- Biocide according to Regulation (EU) No. 528/2012. N-No.: N-69946
- Bactericidal, levurocidal, limited virucidal
- Effective against avian influenza virus H5N1 and SARS-CoV-2
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Very high material compatibility
- Residue-free rinsing
- Mildly alkaline
- Economical due to low application concentration
- Free from aldehydes, chlorine and phenols
- VAH certification, CE 0483, EXAM-assessed

STAMMOPUR 24 is a concentrate for manual chemical disinfection and disinfecting, non-fixing intensive cleaning in ultrasonic baths as well as in immersion baths
from
laboratory equipment and instruments, respiratory masks, industrial safety equipment
made of
metal, including light metal, titanium, glass, ceramics, porcelain, plastic and rubber.

It is **used** in the reprocessing process for cleaning and inactivating germs in the laboratory in accordance with the spectrum of efficacy reports.

The use of **STAMMOPUR 24** does not impair the life time of respiratory masks.

Use disinfectant with care. Always read the label and product information before use. Biocide according to Regulation (EU) No. 528/2012.
N-No.: N-69946

Application in an ultrasonic bath (dosage · treatment time):
1 % · 15 min or
2 % · 5 min:
bactericidal [1], yeasticidal[2], limited virucidal[3] incl. H5N1 and SARS-CoV-2

Application without ultrasound (dosage · treatment time):
1 % · 60 min: *bactericidal[1], yeasticidal[2]*
2 % · 30 min or
3 % · 15 min *bactericidal[1], yeasticidal[2], limited virucidal[3] incl. H5N1 and SARS-CoV-2*

[1] EN13727, EN 14561, DGHM, high load; [2] EN13624, EN 14562, DGHM, high load; [3] EN14476, high load

Efficacy reports are available and can be requested.

MD **Can also be used for the reprocessing of medical devices such as medical instruments and accessories.**

Active ingredients: amines, propionates
mildly alkaline, pH 9.4 at 1 % in deionised water, biodegradable.

Litres	1	2	5	10	200
Code No.	-	977	978	6037	-

STAMMOPUR R

Instrument Cleaner

Cleaning and pre-cleaning of medical instruments and accessories

- Very high cleaning effect in the ultrasonic bath
- High blood dissolving capacity
- Removes even stubborn, dried-on soiling
- Very short ultrasonic treatment times with economical, low application concentration
- Very high material compatibility
- Mildly alkaline
- Pleasant odour
- Also recommended for pre-cleaning
- Can be used as a contact liquid

STAMMOPUR R is a concentrate for manual cleaning and pre-cleaning in ultrasonic baths as well as in immersion baths,
from
medical instruments, accessories and components of devices
made of
metal, including light metal, titanium, glass, ceramics, porcelain, plastic and rubber.

It is **used** in the reprocessing process in the medical laboratory as well as in the laboratory in the clinic and the doctor's surgery.

Litres	1	2	5	10
Code No.	988	934	989	6029

MD

Application in an ultrasonic bath (dosage · treatment time):
2 % · 3 - 10 min

Application without ultrasound (dosage · treatment time):
3 - 5 % · max. 12 h

For heavy soiling, heat up to 60 °C. Observe the notes on the temperature / treatment time of the solutions on page 76.

Active ingredients: tensides
mildly alkaline pH 9.5 at 1 % in deionised water, biodegradable

STAMMOPUR DR 8

Instrument disinfection and intensive cleaning

Intensive cleaning and chemical disinfection of medical instruments and accessories

- VAH certification, CE 0483
- Bactericidal, yeasticidal, limited virucidal
- Effective against avian influenza virus H5N1 and SARS-CoV-2
- Very high cleaning effect in the ultrasonic bath
- Very short ultrasonic treatment times with low application concentration
- Very high material compatibility
- Mildly alkaline
- Economical due to low application concentration
- Free from aldehydes, chlorine and phenols

STAMMOPUR DR 8 is a concentrate for manual chemical disinfection and disinfecting, non-fixing intensive cleaning in ultrasonic baths as well as in immersion baths from
medical instruments and accessories
made of
metal, including light metal, titanium, glass, ceramics, porcelain, plastic and rubber.

It is **used** in the reprocessing process in the medical laboratory as well as in the laboratory in the clinic and the doctor's surgery.

Litres	1	2	5	10
Code No.	-	972	974	6028

MD

Application in an ultrasonic bath (dosage · treatment time):
2 · 5 min: *bactericidal[1], yeasticidal[2], limited virucidal[3] incl. H5N1 and SARS-CoV-2*
2 % · 10 min: *SV40[3]*
3 % · 15 min: *Adeno[3] virus*

Application without ultrasound (dosage · treatment time):
1 % · 60 min: *bactericidal[1], yeasticidal[2]*
2 % · 30 min or
3 % · 15 min: *bactericidal[1], levurocidal[2], limited virucidal[3] incl. H5N1 and SARS-Cov-2; additionally SV40[3]*

[1]EN13727, EN 14561, DGHM, high load; [2]EN13624, EN 14562, DGHM, high load; [3]EN14476, high load

Effectiveness reports are available and can be requested.

Active ingredients: amines, propionates
mildly alkaline, pH 9.4 at 1 % in deionised water, biodegradable.

Shelf life of disinfectants and cleaning products

Disinfectant agents

The shelf life of originally sealed agents from DR.H.STAMM GmbH is three years from the date of manufacture of if the generally accepted storage conditions are observed. The expiry date is indicated on the label at with year/month.

Cleaning and deoxidising agents

The shelf life of originally sealed cleaning and deoxidising agents from DR.H.STAMM GmbH is at least six years from the date of manufacture, which is indicated in the form YYMMDD after the designation LOT, provided that the generally accepted storage conditions are observed.

Storage conditions

The packaging layers should be stored well closed, upright , dry and clean at room temperature.

A change due to frost is not to be expected. The packaging layers must be sealed after product removal. A slight change in colour during prolonged storage of some products is due to the raw material and has no influence on the effectiveness.

As compliance with the storage conditions is beyond our control, we cannot guarantee the minimum storage time of the individual products.

Dosing calculator

The cleaning and/or disinfectant used is crucial for a successful ultrasonicapplication. The correct dosage of the concentrate is crucial.

Too low a dosage has a negative effect on the effectiveness of the product. Therefore, never underdose, especially for medical applications.

However, an overdose means an unnecessary waste of the agent.

With the dosing calculator at
bandelin.com/en/service/dosing-calculator/
you can avoid both and ultrasonically clean effectively, economically and environmentally friendly.

After entering the desired concentration and the amount of working solution to be prepared, the concentrate calculator shows how much concentrate and water are required.

The concentration required depends on the application to be carried out. You will find precise information in the instructions for use of the respective agent.

The amount of working solution refers to the working capacity of the existing appliance. The working capacity refers to the filling quantity of the tray up to the fill level mark. You can find this in the respective instructions for use.

SONOREX smart ST ultrasonic baths - Intelligent dosing aid directly on the display

The SONOREX smart ultrasonic baths have an integrated dosing calculator that can be operated directly via the display. Simply enter the desired working filling quantity and the concentration of the cleaning and disinfection product - the system automatically calculates the exact proportions:

- How many parts water
- How many parts of cleaning/ disinfectant must be added, to achieve the optimum cleaning performance

FAQ - agents

Should I rinse off the cleaning solution?
Rinsing is necessary in almost all cases of application, as the cleaning solution with the impurities it contains can dry up on the parts in spots and possibly react further with the surface (material attack, discolouration).

When does the cleaning liquid become cloudy?
This can occur if the drinking water is too hard and/or the dosage is too low.

When do cleaning solutions flocculate?
When preparing the cleaning solutions, ensure manual mixing after adding the concentrate. Ultrasound alone does not lead to sufficient circulation in the solution, so that precipitation or flocculation or even gel formation can occur at the water/concentrate phase boundaries. A simple method of mixing can already be used when preparing the working solution: half of the required water is placed in the ultrasonic bath and then the concentrate is added. When subsequently topping up with the remaining amount of water, sufficient mixing takes place automatically.

Cleaning solutions can also flocculate during certain cleaningprocesses if the contamination reacts with the components of the cleaning solution. A long life time of a solution can also lead to precipitation. Therefore, check the solution regularly and replace it earlyif necessary.

What does temporary corrosion protection mean for our cleaning products at ?
The corrosion protection is active during sonication in the bath, but is removed from the surface of the parts by a subsequent thorough aqueous rinse.

Am I allowed to add/re-add?
Additional or subsequent dosing should be avoided, as the components of the cleaning solution are bound differently, which can lead to a shift in the concentration of the ingredients with undesirable effects in the event of subsequent dosing.

Contact liquid for indirect sonication
When indirectly sonicating samples for the bath liquid, use a cleaning agent suitable for ultrasound to reduce the surface tension. This contributes to the even propagation of the ultrasonic waves, leads to reproducible results and extends the life time of the stainless steel tank.

As an additive for the contact liquid, we recommend TICKOPUR R 33 - 3 %, TICKOPUR R 30 - 3 % or TICKOPUR TR 3 - 1 %.
Further information on indirect sonication can be found on page 18.

Can it be used in the food sector?
Yes, all disinfectants and cleaning products, provided that proper rinsing of the parts is guaranteed.
All products can be rinsed off without leaving any residue due to the ingredients (tensides).

Service

We are the specialists for ultrasound
in the laboratory.

06

Ultrasonic baths for rent

Rent one of our ultrasonic baths for a specific period only.

from page 84

Knowledge

Basic knowledge for the use of ultrasound and ultrasonic baths.

from page 86

Detailed application examples

Application notes of our customers.

from page 90

FAQ - Ultrasonic baths

The most important questions, briefly answered.

page 101

Your contact in the laboratory area

Get competent and personal advice from our expert.

page 102

Ultrasonic baths for rent

Do you need an ultrasonic bath for a specific period for parts cleaning or to test whether ultrasound is the right choice for your process?
We rent out ultrasonic baths from 0.9 to 90 litres working volume with suitable accessories for your application. Are you interested?

Note: Hire is only possible within Germany. The hire of ultrasonic baths is only offered to commercial customers. The minimum hire period is one week.

Rental equipment in just a few steps

1 Device type from the table (right) or on on the website and download the corresponding rental agreement. Alternatively, can be requested by phone or email.

Specially formulated cleaning agents are required for optimum cleaning results.
We will be happy to advise you on your choice!

2 Fill out the rental agreement and send it back to.
We will get back to you!

3 Then it starts: the ultrasonic bath is delivered at the agreed time and place.

4 After use, send the device back to us **including a completed decontamination certificate**.

For more information:
bandelin.com/service/#miete

Download the decontamination certificate:
bandelin.com/fragebogen/Dekontamination_GB_BANDELIN.pdf

Type	Internal dimensions oscillating tank l × w × d [mm]	Capacity [l]	Code No.	External dimensions l × w × d [mm]	Ultrasonic peak power* [W]	Ultrasonic nominal power [W]	Heating power [W]	Outlet ball valve
SONOREX smart ST								
ST 102 H	240 × 140 × 100	3.0	7100	260 × 160 × 250	480	120	140	G ¼
ST 510 H	300 × 240 × 150	9.7	7105	325 × 265 × 300	640	160	400	G ½
ST 514 BH	325 × 300 × 200	18.7	7107	355 × 325 × 350	860	215	600	G ½
ST 1028 H	500 × 300 × 200	28.0	7108	535 × 325 × 400	1200	300	1300	G ½
SONOREX SUPER RK								
RK 52 **RK 52 H**	150 × 140 × 100	1.8	311 164	175 × 165 × 225	240 240	60 60	– 140	– –
RK 100 **RK 100 H** **RK 102 H**	240 × 140 × 100	3.0	301 312 303	260 × 160 × 250	320 320 480	80 80 120	– 140 140	– – G ¼
RK 510 **RK 510 H**	300 × 240 × 150	9.7	327 321	350 × 265 × 300	640 640	160 160	– 400	G ½ G ½
RK 514 **RK 514 H**	325 × 300 × 150	13.5	277 207	355 × 325 × 305	860 860	215 215	– 600	G ½ G ½
RK 1028 **RK 1028 H**	500 × 300 × 200	28.0	322 324	535 × 325 × 400	1200 1200	300 300	– 1300	G ½ G ½
SONOREX DIGITEC DT								
DT 52 **DT 52 H**	150 × 140 × 100	1.8	3205 3225	175 × 165 × 230	240 240	60 60	– 140	– –
DT 100 **DT 100 H** **DT 102 H**	240 × 140 × 100	3.0	3210 3230 3235	260 × 160 × 250	320 320 480	80 80 120	– 140 140	– – G ¼
DT 510 **DT 510 H**	300 × 240 × 150	9.7	3245 3206	350 × 265 × 300	640 640	160 160	– 400	G ½ G ½
DT 510 F	300 × 240 × 65	4.3	3242	325 × 265 × 195	560	140	–	G ½
DT 514 **DT 514 H**	325 × 300 × 150	13.5	3250 3211	355 × 325 × 305	860 860	215 215	– 600	G ½ G ½
DT 1028 **DT 1028 H**	500 × 300 × 200	28.0	3255 3231	535 × 325 × 400	1200 1200	300 300	– 1300	G ½ G ½
DT 1028 F	500 × 300 × 65	9.5	3243	535× 325 × 205	1280	320	–	G ½

*corresponds to 4 times ultrasonic nominal power

SONOREX PR 140 DH
Ultrasonic bath for cleaning volumetric glassware up to a length of 755 mm
Code No. 2070

SONOSHAKE
Ultrasonic bath with shaking device for sample preparation
SONOSHAKE Set (DT 1028 F ultrasonic bath and SA 1028 shaking device) **Code No. 3257**
Shaking device SA 1028
Code No. 3249

SONOCOOL
Ultrasonic bath with cooling for use in analysis laboratories and pathologies
Lab set
Code No. 3500032

KNOWLEDGE

Basic instructions for use

Medium in the ultrasonic bath

Ultrasonic waves do not penetrate the air; a liquid contact medium is always required.
For improved transmission of the ultrasound, it is necessary to add an ultrasound-suitable cleaning agent to the tap/demineralised water for the preparation of the contact liquid (e.g. TICKOPUR R 33-1 %).

Filling an ultrasonic bath and dosing the cleaning agent
youtube.com/watch?v=GCkQtJxJ5wo&t=7s

Degassing the ultrasonic liquid

After filling the ultrasonic bath with tap/fully demineralised water and adding the dosed amount of agent or after a longer standing time, e.g. overnight, the ultrasound must be switched on for a few minutes to half an hour. This removes dissolved air bubbles that impair the effectiveness.

Ultrasound can only develop its full effect after the transition from gas to vapour cavitation. This can be recognised by the noise of the ultrasonic bath notice: It gets quieter.

Gas cavitation: Dissolved gases in the liquid fill the cavitation bubbles and reduce the implosion. In this case, the cavitation effect is greatly reduced. The noise in the ultrasonic bath is very unpleasant. Gas bubbles concentrate and rise to the surface.

Vapour cavitation: More cavitation bubbles are suddenly formed by vapour, resulting in increased implosion. The noise is greatly reduced by the shift to higher frequencies.

NOT to be used directly in the ultrasonic bath

Caution! Unsuitable media can attack parts and the ultrasonic bath itself! Solvents (petrol, alcohol, acetone, etc.) must **not be** used directly in the ultrasonic bath. If used, there is a risk of flammability and explosion!

Never use household cleaners, acids or acidic cleaners directly in the ultrasonic bath. The stainless steel of the oscillating tank will be attacked. It leads to pitting corrosion and ultimately to a device defect.

Distilled/deionised water has an increased surface tension. This results in an inhomogeneous ultrasonic distribution, i.e. zones with strong and weak intensities. Cavitation erosion is intensified in the strong zones. This accelerates wear.

Instructions for indirect sonication

1. Due to the increased surface tension of tap water or demineralized water without added surfactant, the ultrasonic field is inhomogeneous: there are strong and weak zones in the bath, which leads to different sonication results in the samples and the process of cavitation erosion is accelerated in the strong zones. For this reason, a surfactant-containing agent should be added, 2% solution - e.g. with TICKOPUR R 33.
2. Please note that different ultrasonic baths also have different power densities in W/l and the results/sonication times may differ. The same applies to different filling levels in the same baths.
3. Do not position the containers above the drain or too far out (towards the edge of the bath) - there is hardly any cavitation here. The foil test can be used to observe the distribution in the bath.
4. Constant temperatures are required for many processes. In practice, crushed ice is often used for the necessary cooling. This must never be located under the reaction vessels, otherwise the ultrasound will not be transmitted into the vessels. We recommend our **LABOCOOL 400** for cooling the bath liquid.
5. The bottom of the reaction vessels should not be too thick.
6. The sonication vessels should preferably be made of glass, as - compared to plastic - a much better ultrasound transmission takes place.

Sample vessel can influence the sonication results:

1. Thicker walls (as with the volumetric flasks) could conduct or attenuate the ultrasonic waves differently than thinner walls (e.g. with the snap-on lid vials).
2. The shape of the vessel can influence formation and distribution of cavitation bubbles. These are crucial not only in ultrasonic cleaning, but also in ultrasonic extraction ➔„Breaking up“ the samples and increasing extraction efficiency.
3. Different vessel shapes/materials can influence the temperature distribution within the solution: Uneven temperature distribution leads to different extraction results.
4. Vessel geometry can change the ratio of surface area to volume. This influences the extraction rate. A larger surface area can lead to more efficient extraction.
5. Different positions of the vessels in the ultrasonic bath can lead to varying intensities.

Requirements for the trouble-free operation of an ultrasonic bath

Correct fill level
The lower the fill level, the higher the power density [W/l]. As a result, the bath temperature increases much faster. There is a risk of dry running as the fill level is reduced by evaporation.

Checking the bath temperature
Overheating or very rapid cooling can lead to damage to the glue of the oscillating elements.

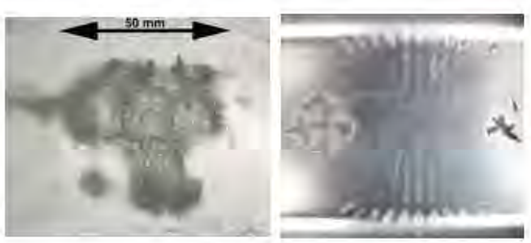
Avoiding overloading
Overloading (> 40 % of the filling volume) can lead to sound absorption. This results in overheating of the oscillating systems.

Suitable bath liquid
The use of unsuitable liquids, especially solvents, leads to overheating. Acidic liquids cause pitting in the oscillating tank.

Alterations to stainless steel surfaces caused by ultrasonic processing

Ultrasound cleans, homogenises, dissolves or disperses through cavitation. The parts to be cleaned are only exposed to cavitation for a short time, but the oscillating tank is permanently exposed. This means that wear cannot be avoided. Cavitation erosion is natural wear and tear and is not covered by the warranty. If the bath is used in accordance with the instructions for use, the life time can be well over 1,000 hours. To ensure a long life time, we recommend replacing the cleaning-liquid more frequently and cleaning the oscillating tank thoroughly on a regular basis. Any metal particles or residues of polishing agents remaining on the bottom of the tank must be removed to prevent contact corrosion with the stainless steel. Unsuitable cleaners and aggressive contaminants increase wear. In the worst case, the life time is only few hours.

The ultrasonic cleaning tank is made of stainless steel. The special treatment of the stainless steel surface creates corrosion protection, provided this is not destroyed by particles of other metals or rust. If the passivation layer is destroyed, the stainless steel rusts or corrodes at certain points and is quickly destroyed electrochemically. Because this attack only occurs at certain points, it is also known as pitting.



Examples of cavitation erosion at the bottom of the tank

Causes can be:
- Entry of rust particles from the pipe system: Drinking water contains metal salts (such as calcium, magnesium = hardness formers) and other salts (including iron salts). These salts lead to extraneous rust on stainless steel surfaces if left to act for a long time. This can only be prevented by adding a suitable ultrasonic cleaning agent to the drinking water. Most cleaning products contain ingredients that keep the substances described in solution and can prevent attack by extraneous rust. In addition, the formation of ultrasonic cavitation in such a liquid is significantly better than in pure, hard drinking water.
- Ferrous or corrosive water, corrosive vapour
- Cleaning of non-corrosion-resistant steel parts whose protective coating has been destroyed

To remove extraneous rust from the tank bottom, apply TICKOPUR R 27 (undiluted) to a wet sponge and spread over the surface. After a contact time of approx. 1-2 minutes, the surface must be carefully rinsed with water. In the case of heavy extraneous rust, the contact time should be increased to max. 15 min.
Ultrasonic baths are maintenance-free.

Repairs may only be carried out by BANDELIN or authorised specialist personnel.

Performance review through foil test

The international standard IEC 886 contains instructions for checking the function of an ultrasonic bath.
A foil test is recommended - on initial start-up, then at regular intervals (e.g. quarterly). The frequency is the responsibility of the user. The foil test is a simple procedure for showing the intensity and distribution of cavitation in an ultrasonic bath.
An aluminium foil wrapped over a foil test frame is inserted for this purpose. Depending on the duration, the foil is perforated or destroyed to a certain degree by cavitation during the ultrasonic treatment in the bath. The distribution and intensity of the cavitation can be assessed on the basis of the "hole pattern".

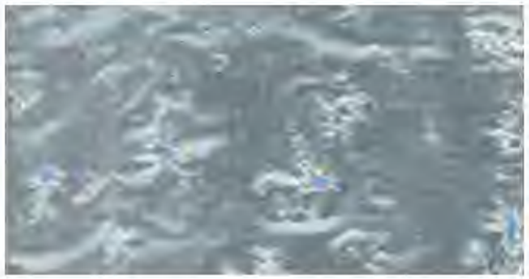
For reproducibility, it is important that the test conditions are always the same:
- Filling height in the oscillating tank (two thirds)
- Temperature of the bath contents
- If necessary, degas for 5-30 minutes before the test (depending on the tank contents). For acidic cleaning solutions, the time may need to be extended.
- Positioning the frame
- Foil properties (thickness, surface)
- Sonication time
- Concentration and type of cleaning agent

Testing an ultrasonic bath with the foil test
youtube.com/watch?v=5lvx-RsEz8Q

The foils can be archived in a suitable manner (scanning, photo, etc.). This makes it possible to compare the foils at any time. The perforated areas of the foils should have approximately the same size and distribution - they are never congruent. This is merely a qualitative, but not a quantitative assessment.
Regular foil tests are the only way to check the process, e.g. for the reprocessing of medical devices. Various FT foil test frames can be ordered from the manufacturer for the foil test (subject to a charge).
The foil test frames are designed for a wide range of tank dimensions.
For the test procedure, aluminium household foil required, this is not included in the scope of delivery.
Medium for the foil test: In order to obtain sufficiently strong cavitation, the interfacial tension of the water used for the foil test must also be reduced with the aid of surfactant-containing agents.

We recommend the following ultrasonic agents:
TICKOPUR R 33, TICKOPUR R 30, TICKOPUR TR 7, STAMMOPUR DR 8, STAMMOPUR R, TICKOMED 1.
If none of these agents are available, a neutral or mildly alkaline, non-aluminium-destroying agent should be used. The agent must be authorised by the manufacturer for use in an ultrasonic bath.

Foil stretched on a test frame



The perforation in the foil after the foil test can be used to check the intensity and functionality of the ultrasonic bath

IQ/OQ qualification for ultrasonic baths
- When ordering new devices
- Re-qualification of your existing device at our premises

What is checked:
- Function test with all possible parameter settings
- Foil test
- Power measurement
- Electrical safety
- You will receive the corresponding test reports

Detailed application examples
Application notes from our customers

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Other	A-1	Decontamination of samples, drugs adhering to the outside of the hair	Ultrasonic bath: RK/DT 100, without heating Bath medium: distilled water with TICKOPUR R 33 - 1 % t = 7 min Note: washing step prior to extraction	Analysis and laboratory company		University/ technical college/ institute
Other	A-2	Dissolution of salts on paper surface in tests for paper (size press) for IC	Ultrasonic bath: with heating Bath medium: distilled water with TICKOPUR R 33 - 1 % Indirect sonication Sample vessels: Erlenmeyer flask (250 ml) Insert basket K + spring clamps EK t = 20-30 min T = room temperature	Paper		Industry
Other	A-3	Extraction of digested proteins, peptides from gel electrophoresis for LC-MS, TOF-MS for gel electrophoresis	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: Eppendorf tubes in polystyrene holders Medium: aqueous solution, sometimes with detergent t = 10 min (pulsating) T = room temperature (partly ice filled into the contact liquid) Note: proteins/peptides go into aqueous solution. T = room temperature (sometimes ice is added to the contact liquid) Note: Proteins/peptides go into aqueous solution.	Biotechnology	Molecular biology	University/ technical college/institute
Degassing	D-1	Carbon dioxide in mineral water for the determination of AAS potassium	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: Erlenmeyer flask t = 1 min T = room temperature	Analysis and laboratory company		Service provider
Degassing	D-2	HPLC running liquid	Ultrasonic bath: RK 510 H, with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: Schott bottles in hanging basket	Cosmetics		Industry
Degassing	D-3	HPLC running liquids, buffers and solvents	Ultrasonic bath: square, with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: 2 x 500 ml bottles t = 20-30 min Note: Visual inspection!	Analysis and laboratory company		Service provider
Degassing	D-4	"Deaerating" samples and shampoos, shower baths for sample preparation e.g. for viscosity measurement	Ultrasonic bath: flat, without heating, i.e. DT 1028 F Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: with screw cap (200 ml), holder Sample volume: 100 ml t = approx. 5 min	Cosmetics		Industry
Degassing	D-5	Mineral water for the determination of heavy metals using ICP-M	Ultrasonic bath: without heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: Erlenmeyer flasks Sample volume: 100 ml t = approx. 30 s	Analysis lab	Environment (heavy metals, soils)	Public facility

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Degassing	D-6	HPLC running liquid	Ultrasonic bath: RK/DT 156 or RK/DT 1028, without heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: 1-litre bulkhead bottles in hanging basket t = 10 min	Cosmetics		Industry
Degassing	D-7	Solvent mixtures (alcohol-water-mixtures)	Ultrasonic bath: RK/DT 100, without heating, with hanging basket Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication, t = 30 min	Biotechnology		University/ technical college/ institute
Degassing	D-8	HPLC running liquid	Ultrasonic bath: RK 52 H, with heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: 1-litre bulk head bottles in a rack	Chemistry	Biotechnology	University/ technical college/ institute
Degassing	D-9	HPLC running liquid	Ultrasonic bath: RK/DT/smart 1028 H, with heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: 1-litre bulkhead bottles in insert basket t = 15 min	Analysis and laboratory company	Food	Service provider
Degassing	D-10	Molasses samples	Ultrasonic bath: DT 1028 H, with heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: Beakers (V= 200 ml) in insert basket t = approx. 2-4 min T = room temperature Specification: ICUMSA (sugar)	Analysis and laboratory company	Food	Service provider
Degassing	D-11	HPLC running liquid	Ultrasonic bath: RK 1028 H, with heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: 1-litre bulkhead bottles in insert basket t = 15 min	Analysis and laboratory company	Food (vitamins)	Service provider
Degassing	D-12	HPLC running liquid	Ultrasonic bath: RK/DT 255, without heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: 1-litre Schott bottles or 2-litre Schott bottles in insert basket For HPLC: t = 15 min	Toxicology		Service provider
Degassing	D-13	HPLC running agent, LC-MS solvent	Ultrasonic bath: RK/DT 100, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: 1-litre bulkhead bottles in insert basket (in some cases addition of ice to the contact liquid = cooling) t = 15 min	Analysis and laboratory company		Service provider
Extraction	E-1	Analytes from dried blood matrix in buffer for LC-MS (dried blood spot matrix for sample transport)	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Dried blood spot (dried blood matrix) for sample transport Dried blood on filter + buffer Sample containers: Eppendorf tubes or tubes in Eppendorf rank t = 10-20 min T = room temperature Note: Defined amount of liquid can be absorbed.	Toxicology	Analysis laboratory medicine	

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Extraction	E-2	Building pollutants (wallpaper, joint material) and air analysis: PCBs, wood preservatives for determination using GC-MS, explosive-type compounds from soils, air analysis using silica gel as adsorbent - desorption analytes in solutionmeans in the ultrasonic bath	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication ▪ Building pollutants: Sample vials: screw vials (22 ml) with plastic rack for vials t = 20 min-2 h T = room temperature Medium: various solvents, e.g. hexane, hexane-acetone, dichloromethane - Soil containing explosives: T = 40 °C Solvent: water - Air samples: Sample vials: E.g. hexane, hexane-acetone, dichloromethane ▪ Soils containing explosives: T = 40 °C Solvent: water ▪ Air samples: Sample containers: screw-top vials Adsorbents: silica gel + acetonitrile t = 30 min	Analysis lab	Environment (air, building pollutants)	Service provider
Extraction	E-3	Soil/waste for determination using GC-MS, Asphalt drill cores, PAHs	Ultrasonic bath: DT 1028 F (flat), without heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication ▪ Soil/waste: Weighing: 5 g sample + 20-30 ml solvent Medium: Hexane, hexane and acetone Sample vials: Screw-cap vials t = 10-15 min T = room temperature (too warm for analysis) ▪ Asphalt samples: T = room temperature	Analysis and laboratory company	Environment (soil, waste)	Service provider
Extraction	E-4	Analytes from heart muscle-tissue (preclinical study), analytes from animaltissue samples	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication 50 mg in 100 µl (slurry)-shock freezing (to prevent crystal-lisation) Recommended by Essay: V = 500 mg in 500 µl, ground in a cold environment t = 30 s - several cycles T = room temperature Medium: aqueous - Animal tissue samples: Note: closed lid, analyte concentration 0-10 ng in 50 mg tissue	Biotechnology		Industry
Extraction	E-5	Water-soluble substances in food samples (cheese, sugar) for sugar enzymology	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonification Sample vessels: volumetric flask or Erlenmeyer flask in insert basket or laboratory flask holder Water-soluble substances in ice water Medium: water/methanol t = 15 min T = room temperature or 50-60 °C	Analysis and laboratory-company	Food	Service provider
Extraction	E-6	Various environ-mental, chemical and phar-maceutical samples for analysis: AAS, ICP, NMR, IC	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: NMR tubes, small volumetric flasks, Falcon tubes (10-50 ml), beakers in insert basket Medium: various solvents, depending on the method (including chloroform, DMSO, acetonitrile) T = approx. 30 °C (sometimes 50 °C). including chloroform, DMSO, acetonitrile) T = approx. 30 °C (sometimes 50 °C) Note: prevent aggregate formation	Analysis and laboratory-company	Environment, chemistry, pharmacy	Service provider

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Extraction	E-7	Disagglomeration of soil and clays for sample preparation Grain size analysis	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Note: Fractions should remain in their natural state.	Analysis and laboratory company		Service provider
Extraction	E-8	Soil/waste for the determination of PAHs and PCBs (organic substances) - as a substitute for Soxhlet extraction	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: vials (10-20 ml) with plastic holder Medium: acetonitrile, n-hexane t = 1 h T = room temperature (bath medium heats up by itself.) Note: As a replacement for Soxhlet extraction! Interlabora-tory tests with BAM, much more solvent-saving.	Environmental analysis, technology		Service provider
Extraction	E-9	Hair for drug analysis for forensic and clinical purposes (blood, urine, serum by FI-FI extraction or SPE, more gentle)	Ultrasonic bath: RK/DT 100, without heating Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: Brown glass (4 ml) in test tube racks in insert basket t = 1 h	Analysis and laboratory company		University/technical college/institute
Extraction	E-10	Food samples (seeds, flour, baked goods)	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: glass (V to 50 ml) Medium: solvent t = 15-30 min	Analysis and laboratory company		Contract and analysis aboratory
Extraction	E-11	Plant constituents from powdered plants - quantitative analysis	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flasks, Erlenmeyer flasks placed in laboratory flask holders in insert basket t = 5-15 min T = 40 °C Note: The sample (extract) is pulverised. Dissipate the heat, as the sample material is sensitive!	Biotechnology		University/technical college/institute
Extraction	E-12	Drugs, tablet residues in stomach contents (homogenisation)	Ultrasonic bath: RK/DT 100, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: flasks (10 ml) Medium: alcohols t = 15 min T = room temperature	Toxicology		University/technical college/institute
Extraction	E-13	Soil/waste for LC-MS, HPLC, LC	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: screw-top vials (up to 100 ml), centrifuge vials t = 30 min (15-60 min) Note: good results in round robin tests	Analysis and labo-ratory company	Environment (soil, waste)	Service provider
Extraction	E-14	Soil samples (jars and sample) for organic analyses, GC-MS, etc.; surface samples taken using wipes	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Bath medium: n-hexane, deionised water Sample containers: Glass jars (jam jars 100-200 ml) in hanging basket t = 1-30 min (depending on the focus of the analysis)	Analysis and labo-ratory company	Environment (soil, water)	Service provider

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Extraction	E-15	Suspensions with all types of pharmaceutical-samples, vitamins as sample preparation for GC and HPLC	Ultrasonic bath: 20 x 15 cm, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication in insert basket Sample vessels: 10 ml volumetric flasks up to max. 100 ml (samples also in 100 ml volumetric flasks). 100 ml (samples also in 100 ml volumetric flasks) Medium: aqueous solutions, possibly mixed with methanol t = as required, sometimes for longer periods T = room temperature Note: Ice added to the contact liquid	Analysis and laboratory company	Pharmacy	Service provider
Extraction	E-16	Soil/waste for the determination of PAHs, PCBs, Mineral oil MW; analystes from asphalt	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flasks (25 ml), beakers (20-100 ml) in insert basket Medium: Hexane t = 5-10 min (longer, will become warm-cool with ice) T = room temperature	Analysis and laboratory company		Service provider
Extraction	E-17	Analyses from hair for the determination of drugs	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: vials, Schott vials (10 ml) t = 2-4 h	Toxicology		University/ technical college/ institute
Extraction	E-18	Food and cosmetics for the determination of residues using LC-MS, HPLC - Powdered plant drugs	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flasks (10 ml), Falcon tubes (15-50 ml), Eppendorf cups, some in racks, some in beakers with water, in which the volumetric flasks are placed Medium: methanol/ethanol, ether (for samples that need to be degreased) t = max. 30 min T = 40 °C Note: Ultrasonic bath sometimes better than samples in a shaker	Toxicology		University/technical college/institute
Extraction	E-19	Soil/waste for Determination of PAHs and PCBs (PAH sample separa-tely and combination of PAHs, PCBs)	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flask (250 ml) in sample holder in insert basket Medium: n-hexane T = room temperature	Analysis and Laboratory company	Environment	Analytics
Dissolving	L-1	Substances for Practical course: Cu-glycine complex and other organic solids	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Note: Dissolved particles need heat	Biotechnology		University
Dissolving	L-2	Cosmetic samples: Shampoos, condi-tioners without solvents, creams, lotions with solvents	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flask, beaker, volumetric flask (10-50 ml, usually 20 ml) in insert basket Medium: acetonitrile, methanol, ethanol t = 2 x 15 min T = room temperature	Cosmetics		Industry

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Dissolving	L-3	Residue analysis - veterinary drug analysis, Standard substances for LC-MS etc., poorly soluble buffer substances (potas-sium buffer), Residues LC-MS of processed samples (urine, blood, tissue) after drying in HPLC running liquid	Ultrasonic bath: with heating (many applications) Bath medium: Water with TICKOPUR R 33 - 3 % Indirect sonification Sample vessels: Erlenmeyer flask (V = 100 ml) t = approx. 30 s Sample vessels: Hand-tipped flasks, Eppendorf vials, test tubes (5-10 ml) Standard: 10 ml volumetric flask (or smaller), held by hand t = a few s to 2 min Buffer: 0.5l-1 l t = 10 min Note: when dissolving the blood samples, change 3 to 4 times between ultrasonic bath and VORTEX reactor	Analysis department	Veterinary medicinal products	public facility
Dissolving	L-4	Sample preparation Analyses of ointment drug raw materials, e.g. film-forming agent Providon (exci-pient) for HPLC	Ultrasonic bath: with heating, Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication ▪ Ointment excipients Sample vessels: volumetric flask (25-100 ml), shake t = 10-30 min T = room temperature to 40°C	Analysis and laboratorycompany		Service provider
Dissolving	L-5	Poorly soluble peptides, buffers, salts, standard substances (for quality checks)	Ultrasonic bath: with heating, V = approx. 3 l Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication ▪ poorly soluble peptides Medium: formic acid Sample vessels: 1.5 ml Eppendorf tubes to 50 ml Falcon tubes in plastic racks t = 1-10 min T = room temperature ▪ Buffer Sample vessels: 1 litre Schott bottles T = room temperature	Biotechnology	IND1	
Dissolving	L-6	Trace analysis MS	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: special vessels in insert basket t = 15 min T = room temperature Note: Sample preparation with hydrofluoric acid in special vessels, which are then placed in the microwave.	Chemistry	Glas/Ceramic	Industry
Dissolving	L-7	Resolubilisation of samples from PCR buffers for MS	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flask t = 15-30 s T = room temperature	Biotechnology		Industry
Dissolving	L-8	Viscose samples, cosmetic samples, e.g. hair conditioners	Ultrasonic bath: flat, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flask Medium: Water and organic solvents, vary Insert basket t = 1 min T = room temperature Note: viscose samples, dilute slightly, top up after one minute!	Cosmetics		Industry

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Dissolving	L-9	Creams, lotions, surfactants, viscous samples such as hair conditioners	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Note: Regulation of immersion depth with handle adjustment Sample vessels: small screw-top vials, flasks, smaller sample weight- Vials (50-100 ml), in insert basket Sample weight: 25 ml, with grid and little water Medium: Isopropanol and isopropanol-water mixture t = 1-15 min	Cosmetics		Industry
Dissolving	L-10	Deagglomeration of organic substances, e.g. Bacteriacultures	Ultrasonic bath: small, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: test tubes, sample tubes in the sample holder Medium: aqueous t = a few minutes T = room temperature Note: To avoid clumping, if possible only in water without the use of solvents.	Biotechnology	Biotechnology	Industry
Dissolving	L-11	Reference substances Drugs (hashish, cocaine, etc.) in solvents (coarse-grained)	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: 10 ml flasks Medium: alcohols t = 10-15 min T = room temperature	Toxicology		university/technical college/institute
Dissolving	L-12	Standards, Buffer (if crystallised)	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Insert basket Buffer: 1-litre bulkhead bottles Standards: 10-ml measuring flasks in basket t = as required, visual T = room temperature	Analysis and laboratory company	Pharmacy	Service provider
Dissolving	L-13	Preparations for OC practical course: solids in solvents, especially large crystals	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: test tubes in racks, in insert basket Medium: ethanol t = 2-3 min T = room temperature up to max. 30/40 °C	Chemistry	Biotechnology	university/technical college/institute
Dissolving	L-14	Food samples, food supplements, vitamins in extraction agents	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: centrifuge tubes, volumetric flasks (50, 100, 200 ml) in insert basket + laboratory spring clamp EK / ZF Medium: various, depending on method t = 1-2 min T = 60-70 °C	Analysis and laboratory company	Food	Service provider
Dissolving	L-15	Reference substances for determination of PCBs, PAHs etc.	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: volumetric flask (25 ml), shake t = 5-10 min T = room temperature	Analysis and laboratory company		Service provider

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Dissolving	L-16	Powder (also unknown substances) in various solvents for analysis HPLC, GC (forensic toxicology)	Ultrasonic bath: DT 1028 F (flat), without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Medium: various solvents Sample vials: glass vials (4 ml) for HPLC on holder, Glass vials (6-10 ml) for GC in the rack t = max. 10 min	Toxicology		university/technical college/institute
Dissolving	L-17	Food samples, food supplements, vitamins in extraction agents	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: centrifuge tubes, volumetric flasks (50, 100, 200 ml) in insert basket + fixation with weighting rings t = 1-2 min T = 60-70 °C	Analysis and laboratory company	Food (vitamins)	Service provider
Dissolving	L-18	Standards (e.g. Carotene)	Ultrasonic bath: with heating Bath medium: distilled water with TICKOPUR R 33 - 1 % Indirect sonication t = a few seconds (routine tasks) Note: Standards crystallise, dissolve immediately on sonication.	Analysis and laboratory company		Service provider
Dissolving	L-19	Substances, e.g. Caustic soda in water	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: beakers Medium: water t = 2-5 min	Toxicology		university/technical college/institute
Dissolving	L-20	Of non-temperature-sensitive solids in an organic-aqueous medium (whole tablets - confiscated goods) Dissolving standards in a small bath	Ultrasonic bath: with heating Bath medium: water with TICKOPUR TR 3 - 3 % (due to possible risk of bacterial contamination) Indirect sonication Sample vessels: test tubes Dissolving tablets Solvent: organic/aqueous; do not crush tablets beforehand due to risk of carry-over, not temperature-sensitive, large bath (RK 1028 H) T = 2 h-4 h Standard: small bath (RK 100) t = 5-10 min	Toxicology		public facility
Dissolving	L-21	Substances from the pharmaceutical sector and contract research: biopeptides and small molecules for solubility and stability studies	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample vessels: vials (2 ml) in floats (plastic) t = several s to 30 min T = room temperature, often also 40 °C	Pharmacy	Biotechnology	Contract and analysis laboratory
Dissolving	L-22	Solids (hundreds of active pharmaceutical ingredients), lipids	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample tubes: Eppendorf tubes (1-2 ml) t = a few seconds to 5 min	Biotechnology		Industry

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Cleaning	R-1	Sieves (fine) with chocolate	Ultrasonic bath: RK/DT 106, without heating Bath medium: Water with TICKOPUR R 33 - 5 % t = 2 min T = room temperature	Food and beverages, food industry	Confectionery	Industry
Cleaning	R-2	MS source	Ultrasonic bath: long, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: beakers, insert tubs Medium: methanol	Toxicology	Analysis laboratory Medicine	public facility
Cleaning	R-3	MS-Quelle, other lab equipment	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33- 5 % Containers: beakers	Toxicology		public facility
Cleaning	R-4	MS source and spray units	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: beakers, insert tubs Medium: acetone/ethanol Note: Disassemble MS source, rub with aluminium oxide, 2 x distilled water, then indirectly in ultrasonic bath with solvent, then rinse with pure water	Cosmetics		Industry
Cleaning	R-5	Quartz beakers, PTFE-containing glass to remove residues from cutting/ saw blade	Ultrasonic bath: round, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Cleaning in hanging tubs Medium: diluted nitric acid t = 15 min T = room temperature			
Cleaning	R-6	MS source	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: beakers Medium: ethanol/methanol	Biotechnology		Industry
Cleaning	R-8	Glassware laboratory	Ultrasonic bath: long, with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: beakers Medium: ethanol, methanol	Analysis and laboratory company	Environment, chemistry, pharmacy	Service provider
Cleaning	R-9	Sieves Subsoil samples (soil, clays) Grain size analysis	Ultrasonic bath: round, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication: in accordance with EN ISO 17892-4 for grain size analysis (suspended plastic container) t = 15 min-2 h Grain sizes: 0-0.125 µm (platelet grains, some of which tilt) Dispersing agent (disodium dihydroxide) partly tilted) Dispersing agent (disodium dihydrogen pyrophosphate) ▪ test sieves with larger mesh sizes: cleaning with a brush	Analysis and laboratory-company	Environment (soil, constructionprojects)	Service provider
Cleaning	R-10	Sieves	Bath: rectangular, with heating Bath medium: water with TICKOPUR R 33 - 5 % Contamination: feed Cleaning in insert basket Intervals t = 5 min	Environmental analysis, technology		Service provider

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Cleaning	R-11	Fermenter parts from stuck biofilms, e.g. agitator shafts - stuckbake after autoclaving	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 5 % Vessels: beakers with water for smaller parts, otherwise also directly into the bath t = 1 h or as required, visual inspection T = room temperature	Biotechnology		university/technical college/ institute
Cleaning	R-12	MS source	Ultrasonic bath: RK/DT 100, without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: plastic tub Medium: 1. water/methanol (+1- to 3% formic acid), 2. methanol, 3. isopropanol (very clean!)	Analysis and laboratory company		university/technical college/ institute
Cleaning	R-13	Lab equipment	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 5 % Contamination: oily residues t = 5 min T = 40/50 °C	Medicine/ Veterinary-medicine	Biotechnology	Hospital
Cleaning	R-14	Sieves from the sedimentation of soil material	Ultrasonic bath: RK 1028, without heating Bath medium: distilled water with TICKOPUR R 33 - 1 % t = 10-20 min			
Cleaning	R-15	Burettes after titration	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 5 % Contamination: acid/alkali residues t = a few minutes Note: rinse first	Pharmacy		Industry
Cleaning	R-16.	Ultra-Turrax rods	Ultrasonic bath: with heating Bath medium: Water with TICKOPUR TR 13 - 5 % T = approx. 50 °C t = a few minutes	Food and beverages, food industry		Food laboratory
Cleaning	R-17	Lab equipment: Parts made of glass, stainless steel	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: beakers Medium: water, alcohols t = a few minutes T = room temperature	Biotechnology	Biotechnology	Industry
Cleaning	R-18	Stubborn soiling on glassware	Ultrasonic bath: with heating: Bath medium: water with TICKOPUR R 27 - 1 % t = a few minutes T = approx. 50 °C	Biotechnology		university/technical college/ institute
Cleaning	R-19	MS source (GC-MS)	Ultrasonic bath: RK/DT 100, without heating Bath medium: distilled water with TICKOPUR R 33 - 1 % Medium: alcohol (methanol, ethanol) t = 15 min T = room temperature	Toxicology		university/technical college/ institute
Cleaning	R-20	MS source (LC-MS)	Ultrasonic bath: rectangular, with heating Bath medium: distilled water with TICKOPUR R 33 - 1 % Vessels: beaker, glass vessel in basket Medium: ultrapure water or + solvent	Toxicology	Analysis laboratory Medicine	public facility

Kind	No.	Application	Methodological notes	Branch	Subbranche	Company type
Cleaning	R-21	Loops required for crystallisation of proteins in the crystallisation laboratory (Use: Fishing protein crystals from aqueous solution for X-ray structure analysis)	Ultrasonic bath: with heating Bath medium: Water with TICKOPUR R 27 - 5 % t = approx. 5 min T = approx. 50 °C	Biotechnology		University/technical college/institute
Cleaning	R-22	Sieves with baking agent	Ultrasonic bath: without heating Bath medium: water with TICKOPUR R 33 - 5 % Cleaning in sieve holder or basket t = 5 min	Food and beverages, food industry	Baking agent	Industry
Cleaning	R-23	Clogged small parts from paper machines, deposits on other metal parts, e.g. after flue gas measurement, Manufacturing aids	Ultrasonic bath: narrow, without heating Bath medium: water with TICKOPUR R 33 - 5 % Indirect sonication Vessels: beakers with contaminated parts Medium: water with acetone, partly directly in the bath in R 33 solution t = 20 min T = room temperature			
Cleaning	R-24	Ceramic beads from the laboratory mill; laboratory equipment	Ultrasonic bath: small, with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: beakers with contaminated parts Medium: water with soapy water, ethanol can also be used t = 30 min T = room temperature	Toxicology		University/technical college/institute
Cleaning	R-25	Sieves with silver powder and precious metal-containing ash (loose); non-meltable (determination of particle size), electrodes, capillaries, small tubes	Ultrasonic bath: narrow, with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Vessels: beakers Medium: water without additives t = a few minutes T = room temperature	Metal processing		Industry
Cleaning	R-26	Decontamination of samples -> Cleaning of hair samples from adhering surfaces-contaminants	Ultrasonic bath: with heating Bath medium: water with TICKOPUR R 33 - 3 % Indirect sonication Sample containers: 10 ml + various solvents t = 5 min	Toxicology		public facility
Cell lysis	Z-1	Eukaryotic cells of various mammals (mouse to human, primary cells, tumour cells), but no fungi, no yeasts, in addition to lysis (lysis with and without detergent,) - Ultrasound treatment for safety	Ultrasonic bath: rectangular Bath medium: distilled water with TICKOPUR R 33 - 1 % Tubes: Eppendorf tubes Medium: aqueous solutions, buffer, detergent, inhibitors, cell soup + detergent, in ultrasonic bath 1. with detergent, 2. without detergent, (common salt, utilising the osmotic pressure)	Pharmacy	Biotechnology	University/technical college/institute

FAQ - Ultrasonic baths

Can I fill the bath with drinking water or distilled water if I don't want to clean anything but want to sonicate vessels?
No, please always use drinking water with the addition of an ultrasonic cleaning agent to reduce the surface tension. This results in a homogeneous ultrasonic field and extends the life time of the stainless steel tank.

Can I place containers such as 1-litre glass bottles on the bottom of the oscillating tank during sonication?
No! This would considerably shorten the life time of the tank and, above all, the ultrasonic waves can only distribute properly if there is at least 1 cm of liquid phase between the tank and the bottom of the vessel. In addition, damage to the glass vessel is possible.

How often does the bath liquid need to be changed?
If the cleaning performance decreases or if there is visibly heavy soiling.
This depends on the number of parts to be cleaned and the type of soiling. If the bath liquid is too contaminated, the cleaning performance decreases.

Can I reach into the bath liquid during operation?
No, this can lead to damage to the bone tissue.

Can ultrasound destroy the parts?
There are thousands of implosions per second, which are very powerful. Nevertheless, cleaning with ultrasound is a safe process as the energy is at a 'microscopic' level.

Is rinsing necessary after cleaning?
Yes, to remove chemical residues. During the removal of the cleaning objects, residues of the bath liquid or dissolved contamination particles remain on their surface. Rinsing can be carried out in another ultrasonic or rinsing bath as well as under running drinking water. A final rinse in demineralised water is recommended to ensure that the surface of the parts is free of stains.

Does degassing have to take place before the sonication process?
Yes, for a few minutes to half an hour (depending on the size of the bath) to expel any dissolved air bubbles. These would otherwise have a disruptive effect on the process. The degassing process is complete when the noise changes, becoming quieter and less shrill.

Is noise protection required?
Yes, for continuous activity within a radius of 2 m.

Can small parts be stacked/stacked during cleaning?
No, despite the distribution of the ultrasound in the entire bath liquid, shadowing effects can occur here. This means that the ultrasound intensity on the sample is not sufficient to trigger cavitation. The cleaning effect is not satisfactory.

Is there an optimum temperature for cleaning?
Normally, the best results are achieved between 50 and 60 °C. From approx. 80 to 90 °C, almost no cavitation takes place.
Take care with temperature-sensitive materials!

Are there alternatives if the power input in the ultrasonic bath does not yet produce the desired effect?
If the desired results are not yet achieved, testing with the SONOPULS ultrasonic homogenisers is recommended, as the energy input into the sample matrix with the liquid is significantly higher. Firstly, the power density is up to 3,000 W/l compared to up to 50 W/l in an ultrasonic bath and secondly, the homogenisers operate at 20 kHz. The lower the frequency, the more intensive the cavitation. For more information, please refer to the associated application guide 'SONOPULS Ultrasonic homogenisers - use and application' or contact us for advice and a free two-week trial.

Your contact at in the laboratory area

We will be happy to advise you personally!

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51092-007 en/2025-07