

High-power ultrasound for industry – service – maintenance



Cleaning of parts and surfaces

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Ultrasonic baths

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SONOREX TECHNIK

Ultrasonic baths

Typical applications

Precision mechanics

Cleaning of stainless steel, brass and aluminium parts

Mechanical engineering

Cleaning and degreasing of bearings, crankshafts, double-sided plates, work pieces, electrostatic filters

Grinding and polishing shops

Cleaning of lamp shades

Mould cleaning

Cleaning of plastic moulding tools

Automobile industry

Cleaning of injection nozzles, carburettors, spray guns, nozzles, shock absorbers, engine parts, circuit boards and cutting tools

Wood working industry

Cleaning of wood working tools and maintenance of machine parts

Medicine technology

Cleaning of dentures, implants and joints

Power stations

Cleaning of oil and smoke filters, decontamination

Catering trade

Cleaning and degreasing of electrostatic filters and parts of coffee machines

Industrial safety and fire protection

Cleaning of respirator masks and sooty parts

Transport technology

Cleaning of relays, soldered frames, gear box and engine parts

Pneumatic tools

Removal of grease, oil, abrasion and resinous residues during maintenance

Cleaning with ultrasound – examples



Material testing

Cleaning and degreasing of measuring tools

Office technology

Component cleaning of copying machines, printers, postal franking machines, cases and keyboards

Energy management

Cleaning of armatures and water meters

Optical and glass industry

Preliminary and intermediate cleaning of optics and lenses

Thin-layer technology

Cleaning of sensor parts

Service

Cleaning of computer parts

Pharmaceutical industry

Cleaning of metal filters and tableting tools

Knowledge of ultrasound

How does ultrasound work

Vibrations at frequencies exceeding 18 kHz (18,000 vibrations per second) are called ultrasound.

As a result of these vibrations millions of smallest vacuum bubbles are formed in liquids. They implode during the high pressure phase and create highly effective pressure waves. This process is called cavitation and causes the removal of dirt particles from the objects to be cleaned. Lower frequencies of approx. 20 kHz which are applicable in cell disruption, produce bubbles with larger diameters and stronger pressure waves than higher frequencies of approx. 40 kHz which are used for intense but gentle cleaning.

Advantages of ultrasonic cleaning

Ultrasonic cavitation removes dirt rapidly from items, thoroughly and deep from pores, even from difficult to reach places such as cavities or holes.

Ultrasound cleans only in a few minutes and exceeds in its efficiency other cleaning methods. Ultrasonic cleaning is also gentle because even slight damage like scratches are eliminated.

Advantages in process engineering

Ultrasonic cavitation can be used for various purposes, such as producing fine emulsions of oil and water. Compared to other manufacturing processes this emulsion is more stable. In waste water treatment and biogas production disintegration and decomposition of organic material are increased.

How to select the proper device

Size and number of objects to be cleaned determine the size of the ultrasonic bath. When selecting the unit, dimensions of the accessories, e. g. baskets have to be considered. To avoid overloading, it is recommended to choose a slightly larger unit.

This also allows additional applications at a later stage. Further decision criteria are especially the structure and the kind of dirt of the parts to be cleaned. The shape of the parts and the kind of residues are also important for the decision. For higher requirement is additional equipment available, like rinsing baths or lifting devices.

Should an ultrasonic unit have a heating

Warm cleaning solutions reduce the cleaning time; dirt is removed faster. Units with heaters are the preferred choice for industrial cleaning processes.

What kind of accessories should be used

Cleaning objects must not lie on the bottom of the bath. Baskets and other inset beakers prevent scratching both to the cleaning objects and the bottom of the bath floor. When cleaning very small or sensitive parts, further accessories may be advisable to facilitate careful placement. For safety reasons, it is recommended that ultrasonic baths be kept covered (see TRBA 250).

What fluids should be used

TICKOPUR preparations have been specially developed for use in ultrasonic baths. Water without a detergent will not have a cleaning effect. Do not use household detergents or pure DI water. For work with acids, a plastic insert tub must be used. Never use inflammable or explosive fluids directly in the oscillating tank!

If you want to know more ...

... visit our website with its own YouTube channel and many helpful instruction videos!

Or contact us directly at info@bandelin.com.

We are always pleased to provide advice.

Further information about ultrasound ...

... can be found in the book "Low-Frequency Ultrasound"
ISBN: 3-937889-26-4,
available from your bookseller.



Ultrasonic cleaning

Economical

Regular ultrasonic cleaning saves money. Material to be cleaned will last longer due to the more gentle effect of ultrasound resulting in less needed spare parts. Faster cleaning times reduce standstill periods between productions.

Efficient

Ultrasonic cleaning processes are effective. Optimum cleaning results will be achieved. Brushing and wiping is no more necessary. The material to be cleaned – including its surfaces – will not be damaged. Even intricately shaped parts can be cleaned.

Environmentally friendly

Biologically degradable cleaning agents are used instead of ecologically harmful solvents. The consumption of chemicals and waste water can be further reduced by using an oil separator and a bath filtration.

Easy to use

Ultrasonic cleaning baths are easy to install, easy to operate and do not require special training.



What does ultrasound?

The interaction of four factors

Ultrasound

Ultrasound creates smallest vacuum bubbles in liquids. These bubbles implode immediately (cavitation). The forces resulting from cavitation cause an intensive and gentle removal of dirt particles from the object.

Chemistry

The cleaning agent supports the cavitation process, reduces the surface tension, separates and binds dirt particles. Depending on the type of dirt accumulation, different cleaning agents are employed.

Temperature

Many cleaning agents become fully effective only at high bath temperatures. The cleaning solution can be heated by the cleaning units heating system.

Time

Compared to other methods, the joint application of chemical agents and ultrasound reduces the time needed for cleaning up to 90 %. Depending on the amount of dirt, that time varies from a few seconds up to a couple of minutes.



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Selection of units

Three product lines with different configurations for application in industry, craft and service

Constantly increasing demands on product quality require also adequate ultrasonic equipment featuring sophisticated technology and high flexibility.

BANDELIN offers a variety of SONOREX TECHNIK equipment for individual cleaning requirements that meet today's demand for high quality, economic efficiency and environment associated factors.

- Ultrasonic baths with heating – for cleaning. The heating supports the cleaning effect of the chemistry.
- Ultrasonic baths without heating – for cleaning of temperature-sensitive parts or for rinsing.
- Units without ultrasound and heating – for the rinsing after ultrasonic cleaning.

The following summary gives an overview of the product range and is meant to help in pre-selecting suitable products:

The Established



The Convenient



The Two-Parts



Features	RM 16 to RM 210	RM 112 to RM 212	ZM 112 to ZM 212
internal tank	right-angled corners	round corners	round corners
operating volume	13 to 210 litres	115 to 230 litres	115 to 230 litres
ultrasonic power	fixed	fixed	adjustable
ultrasonic frequency	25 kHz* or 40 kHz	25 kHz or 40 kHz	25 or 40 kHz or both
ultrasonic transducers	at the bottom	at the bottom	at the bottom and at one side
operating elements	at bottom, right side	at upper right side	at upper right side
tank bottom	straight	inclined toward tank drain	inclined toward tank drain
ultrasonic generator	built-in	built-in	separate

*from RM 110 on

SONOREX TECHNIK RM

Ultrasonic baths

The Established

– RM 16 to RM 210 from 13 to 210 litres

in four versions combinable:

- RM ... UH – ultrasound and heating
- RM ... U – ultrasound
- RM ... H – heating
- RM ... without ultrasound / without heating



RM 40 UH

Basic equipment

- **welded cleaning tank**
made of 2 mm stainless steel AISI 316 Ti
- **weir**
Floating contamination like particles, oil and grease can be moved from the bath surface using an oil separator.
- **filling level mark**
Well recognizable imprint for the minimum filling level of the cleaning fluid.
- **drain for 3-way ball valve**
For emptying or refilling the tank or connecting to a filtration.
- **additional outlet**
For connection of an oil separator or for emptying the fluid behind the weir.
- **heating**
On / Off with pilot lamp, temperature thermostatically adjustable from 30 to 80 °C.

- **drip-proof housing**
made of stainless steel AISI 304
- **ultrasound**
On / Off with pilot lamp, timer 1 to 15 min. or continuous operation.
- **ultrasonic generator (built-in)**
frequency 40 kHz, from RM 110 also 25 kHz

Additionally from RM 110

- **spraying pipe**
Generates in connection with an oil separator a flow on the liquids surface that leads floating oil and grease from the bath surface into the weir.
- **liquid level switch**
for dry run protection of heating and ultrasonic transducers
- **height-adjustable feet**
to compensate uneven floor space

type (selection)	internal tank dimensions l x w x d mm	operating volume l	external dimensions l x w x h mm	ultrasonic peak power W**	HF power W _{eff}	heating power W	current consumption A***
RM 16 UH	325 x 275 x 200	13.0	365 x 340 x 390	1200	300	800	4.8
RM 40 UH	480 x 300 x 300	30.0	540 x 340 x 500	2000	500	1250	7.7
RM 75 UH	580 x 500 x 300	60.0	640 x 540 x 530	4000	1000	1950	12.9
RM 110 UH	600 x 450 x 450	110.0	780 x 550 x 800	4000	1000	4800	10.5
RM 180 UH	1000 x 500 x 400	160.0	1180 x 600 x 800	2 x 4000	2 x 1000	7200	14.8
RM 210 UH	750 x 650 x 500	210.0	930 x 750 x 800	2 x 4000	2 x 1000	7200	14.8

corresponds to 4 times HF output *from RM 110 per phase RM 16 UH to RM 75 UH: mains connection 230 V~ (±10 %) 50/60 Hz.
RM 110 UH to 210 UH: mains connection 400 V 3N~ (±10 %) 50/60 Hz, CEKON-plug 16 A

■ Suitable accessories please see page 6.

SONOREX TECHNIK RM

Ultrasonic baths

The Convenient

– RM 112 to RM 212 from 115 to 230 litres

**Basic equipment analogue RM 110 – RM 210,
additional comfort**

- **round tank corners**
at the bottom and at all sides facilitate the cleaning of the tank. Accumulation of residues is avoided.
- **operating elements at the upper side of the tank**
facilitate the turning of the knobs for ultrasound and heating
- **inclined tank bottom**
for improved cleaning results through ideal distribution of ultrasound. It also facilitates the draining of used cleaning liquid.



RM 112 UH

type (selection)	internal tank dimensions l × w × d mm	operating volume l	external dimensions l × w × h mm	ultrasonic peak power W**	HF power W _{eff}	heating power W	current consumption A***
RM 112 UH	600 × 450 × 450/470*	115.0	780 × 610 × 800	4000	1000	4800	10.5
RM 182 UH	1000 × 500 × 400/420*	170.0	1180 × 660 × 800	2 × 4000	2 × 1000	7200	14.8
RM 212 UH	750 × 650 × 500/520*	230.0	930 × 810 × 800	2 × 4000	2 × 1000	7200	14.8

*inclined tank bottom **corresponds to 4 times HF output ***per phase
mains connection: 400 V 3N~ (±1 0 %) 50/60 Hz. CEKON-plug 16 A

Accessories	RM 16	RM 40	RM 75	RM 110 RM 112 ZM 112	RM 180 RM 182 ZM 182	RM 210 RM 212 ZM 212
insert basket	MK 16 B	MK 40 B	MK 75 B	MK 110	MK 180	MK 210
insert basket load up to 40 kg	–	MK 40 S	MK 75 S	MK 110 S	MK 180 S	MK 210 S
insert basket for lifting device	MK 16 B	MK 40 B	MK 75 B	MK 110 B	MK 180 B	MK 210 B
insert basket for lifting device load up to 40 kg	–	MK 40 BS	MK 75 BS	MK 110 BS	MK 180 BS	MK 210 BS
lid	MD 16	MD 40	MD 75	MD 110	MD 180	MD 210
drop plate between 2 units	TB 16	TB 40	TB 75	TB 110	TB 180	TB 210

SONOREX TECHNIK ZM

Ultrasonic baths

The Two-Parts

– ZM 112 to ZM 212 from 115 to 230 litres

Basic equipment analogue RM 112 – RM 212

- Separate installation of generator apart from the wet area possible.
- The generator is equipped with a serial interface and a remote control connection for external control.
- Operation of several cleaning tanks fed by one generator is possible, even if each tank works with a different frequency.
- Version with transducers at the bottom (ZM ... U / UH) or with transducers at the bottom and at the side (ZM ... UL / UHL), also available in TwinSonic-version.



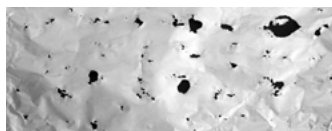
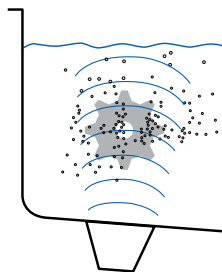
TwinSonic-version as multi-frequency unit

– registered utility model DE 20 2004 006 380

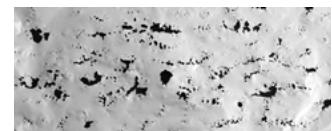
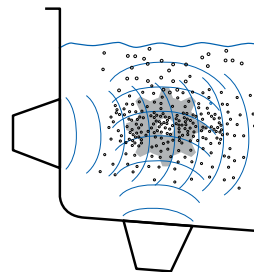
Multi-frequency units in the TwinSonic-version work with ultrasonic systems of different frequencies at the bottom and at one side. Advantage is a more homogenous distribution of ultrasound and power, thus improving the cleaning efficiency and reducing the time needed for cleaning.

Foil test in accordance with IEC / TR 60886

The foil test is a simple procedure for demonstrating the intensity and distribution of cavitation in an ultrasonic bath. Foils of multi-frequency units with bottom and side sonication show an uniform spread perforation.



foil test in an ultrasonic bath with bottom sonication



foil test in an ultrasonic bath with bottom and side sonication

type (selection)	internal tank dimensions l x w x d mm	operating volume l	external dimensions l x w x h mm	ultrasonic peak power W**	HF power W _{eff}	heating power W	current consump- tion A***
ZM 112 UH	600 x 450 x 450/470*	115.0	780 x 610 x 800	4000	1000	4800	4.3
ZM 112 UHL				2 x 4000	2 x 1000		8.6
ZM 182 UH	1000 x 500 x 400/420*	170.0	1180 x 660 x 800	2 x 4000	2 x 1000	7200	8.6
ZM 182 UHL				2 x 6000	2 x 1500		13.0
ZM 212 UH	750 x 650 x 500/520*	230.0	930 x 810 x 800	2 x 4000	2 x 1000	7200	8.6
ZM 212 UHL				2 x 6000	2 x 1500		13.0

*inclined tank bottom **corresponds to 4 times HF output ***per phase

mains connection oscillating tank: 400 V 3N~ (±1 0 %) 50/60 Hz, CEKON-plug 16 A, HF generator: 230 V~ (± 10 %) 50 / 60 Hz

■ Suitable accessories please see page 6.

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Ultrasonic baths for rent

You need an ultrasonic bath for the cleaning of parts for a specific period?



rental device pool

We rent ultrasonic baths from 13 to 210 litres operating volume: RM 16 UH, RM 40 UH, RM 75 UH, RM 110 UH, RM 180 UH, RM 210 UH, RM 212 UH and RL 70 UH with basket and lid.

Are you interested in further details of rental?
Lease agreement with questionnaire on request.

Rental only within Germany.

type	internal tank dimensions l x w x d mm	operating volume l	external dimensions l x w x h mm	ultrasonic peak power W**	HF power W _{eff}	HF frequency kHz	heating power W	current consumption A
RM 16 UH	325 x 275 x 200	13.0	365 x 340 x 390	1200	300	40	800	4.8
RM 40 UH	480 x 300 x 300	30.0	540 x 340 x 500	2000	500	40	1250	7.7
RM 75 UH	580 x 500 x 300	60.0	640 x 540 x 530	4000	1000	40	1950	12.9
RM 110 UH	600 x 450 x 450	110.0	780 x 550 x 800	4000	1000	25	4800	10.5***
RM 180 UH	1000 x 500 x 400	160.0	1180 x 600 x 800	2 x 4000	2 x 1000	40	7200	14.8***
RM 210 UH	750 x 650 x 500	210.0	930 x 750 x 800	2 x 4000	2 x 1000	40	7200	14.8***
RM 212 UH	750 x 650 x 500	230.0	930 x 810 x 800	2 x 4000	2 x 1000	40	7200	14.8***
RL 70 UH	1700 x 250 x 250	70.0	1750 x 300 x 450	4000	1000	40	2000	13.0

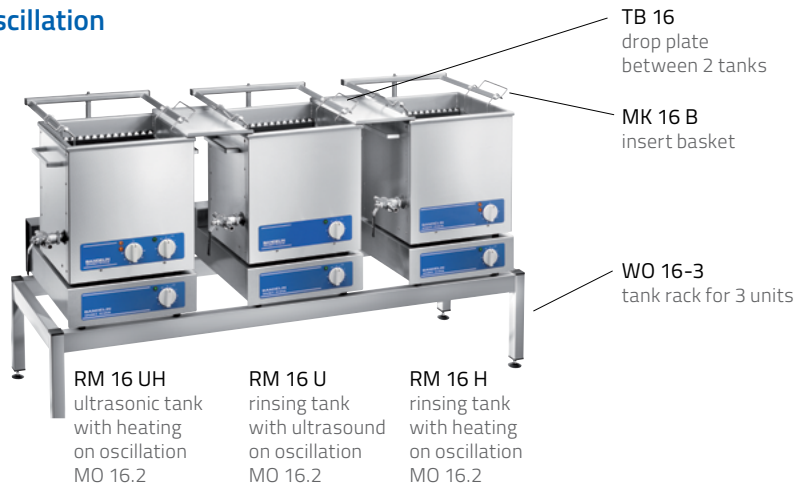
corresponds to 4 times HF output; *per phase

mains connection RM 16 UH – 75 UH + RL 70 UH: 230 V~ (±10%) 50/60 Hz, RM 110 UH–212 UH: 400 V 3N~ (±10%) 50/60 Hz, CEKON-plug 16 A

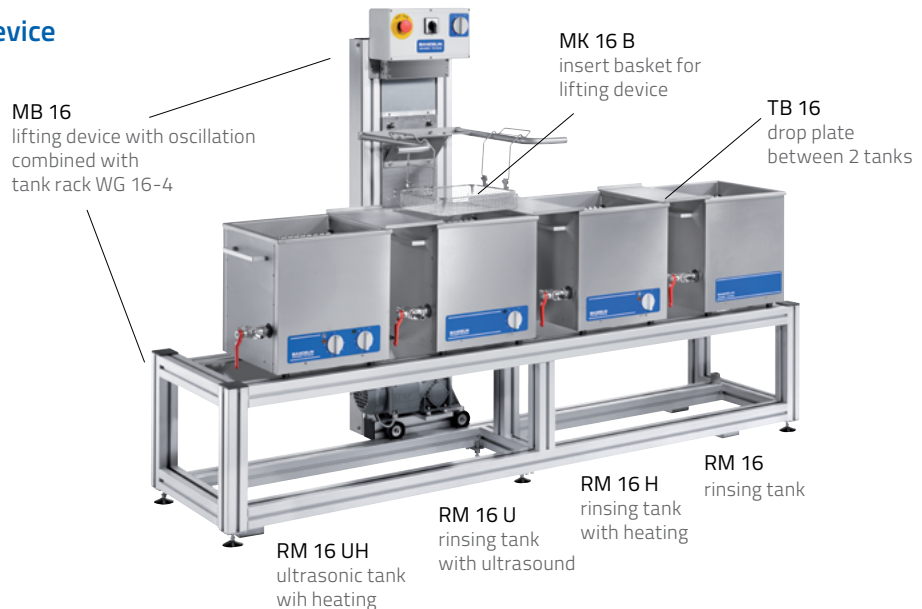
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Examples of modular installations

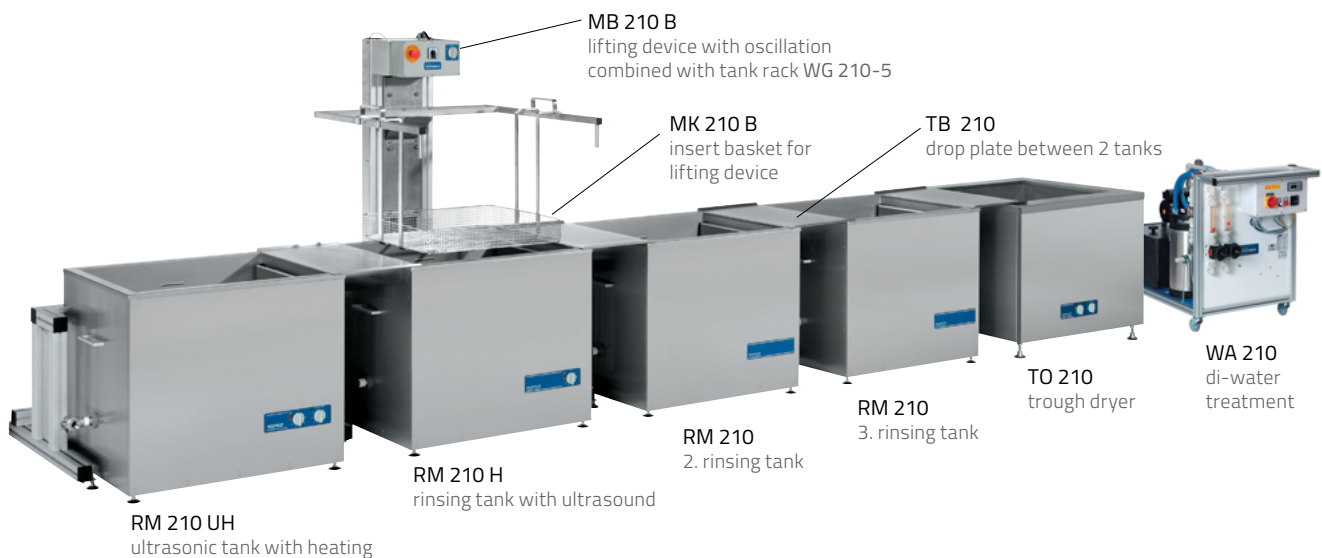
RM 16 range with oscillation



RM 16 range with lifting device



RM 210 range with lifting device and peripheral units



Supplementary equipment

Oscillation MO



MO 16.2

The oscillating movement of the parts intensifies the cleaning efficiency of the ultrasonic sonication and helps to remove dirt particles more efficiently.

Lifting device MB with oscillation



MB 110

The electrically driven lifting device with oscillation facilitates the lowering of the basket and its removal. In connection with a tank rack, the basket can be transported from one unit to the other.

Tank racks WG



WG 16-4
for 4 units

Tank racks WG for moving the lifting device MB, available for 2 and more units.

supplementary equipment (selection)	RM 16	RM 40	RM 75	RM 110 RM 112 ZM 112	RM 180 RM 182 ZM 182	RM 210 RM 212 ZM 212
oscillation	MO 16.2	MO 40	–	–	–	–
lifting device with oscillation, fix for 1 unit	–	–	–	MB 110	MB 180	MB 210
lifting device with oscillation, movable for tank rack	MB 16	MB 40	MB 75	MB 110 B	MB 180 B	MB 210 B
tank rack for 2 units	WG 16-2	WG 40-2	WG 75-2	WG 110-2	WG 180-2	WG 210-2

Supplementary equipment

Air agitation LU

for rinsing support by injection of air bubbles into the rinsing tank



LU 180

compressed air supply up to 6 bar
material made of stainless steel AISI 304

LU 110 for RM 110 / 112 rinsing tanks
LU 180 for RM 180 / 182 rinsing tanks
LU 210 for RM 210 / 212 rinsing tanks

Saw blade holder SA

for cleaning saw blades and cutting tools



SA 16 with RM 16 UH

- simple placement on existing ultrasonic units SONOREX TECHNIK RM 16 and RM 40
- motorised axis drive
- suitable saw blades dia. 240 – 480 mm

Specification

- adaptable axes $\frac{1}{2}$ ", other axes (dia. 20 – 50 mm) usable
- maximum load 8.0 kg
- rotation speed approx. 1 rpm
- timer 1 – 15 min and continuous operation
- mains connection 230 V~ ($\pm 10\%$) 50 / 60 Hz

Planing head holder HA

for efficient cleaning of planing heads



HA 40 with RM 40 UH

- simple retrofitting to existing ultrasonic units RM 40 UH, RM 110 UH, RM 112 UH, RM 210 UH
- motorised axis drive
- suitable planing heads dia.: 280 – 750 mm

Specification

- planing head holding axis $\frac{3}{4}$ ", other axes (dia. 20 – 50 mm) usable
- maximum load 80.0 kg
- rotation speed of the driver roller approx. 1 rpm
- timer 1 – 15 min and continuous operation
- mains connection 230 V~ ($\pm 10\%$) 50 / 60 Hz

supplementary equipment	RM 16	RM 40	RM 110	RM 110 RM 112 ZM 112	RM 180 RM 182 ZM 182	RM 210 RM 212 ZM 212
air agitation	-	-	-	LU 110	LU 180	LU 210
saw blade holder	SA 16	SA 40	-	-	-	-
planing head holder	-	RM 40	RM 110	RM 112 ZM 112	-	RM 210
	-	HA 40	HA 110	HA 112	-	HA 210

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Peripheral units

Filtration FA



To be connected to the ultrasonic cleaning tank. Removed particles are retained by filter. This prolongs the use of the cleaning liquid while its cleaning capacity remains unchanged.

Oil separator OX



To be connected to the ultrasonic cleaning tank, if oil and grease has to be removed. Dirt accumulations floating on the bath's surface are led via the weir into the oil separator and are separated by gravitation.

DI-water treatment WA



To be connected to a rinsing bath in order to remove stain making water residues on the cleaned parts.

Trough dryer TO



The cleaned parts are dried after rinsing in order to rapidly remove residual moisture.

	RM 16	RM 40	RM 75	RM 110 RM 112 ZM 112	RM 180 RM 182 ZM 182	RM 210 RM 212 ZM 212
peripheral unit						
filtration	FA 16	FA 40	FA 75	FA 110	FA 180	FA 210
oil separator	OX 16	OX 40	OX 75	OX 110	OX 180	OX 210
Di-water treatment	WA 16	WA 40	WA 75	WA 110	WA 180	WA 210
trough dryer	TO 16	TO 40	TO 75	TO 110	TO 180	TO 210

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Special units

RL 70 UH

extra long and narrow tank



Applications

perfectly suitable for cleaning of long parts such as tubes, profiles, mill saw blades, long cutting blades

L 220 / L 320

two-chamber configuration for cleaning and rinsing in a single unit



L 220 with lifting device LB 220

Applications

cleaning of blinds, lamp grids, reflectors, weaving healds, preforms and slat blinds

W 65 und W 300

extra deep tank



W 65 and W 300 (behind)

- specially designed for use on ships
- tank made of 2 mm stainless steel AISI 316 Ti, with high freeboard
- W 65: frequency 35 kHz,
W 300: frequency 40 kHz or 25 kHz

Applications

cleaning of oil filters, valves and cylinder heads

special unit	internal tank dimensions l x w x d mm	operating volume l	external dimensions l x w x h mm	ultrasonic peak power W**	HF power W _{eff}	heating power W	current consumption A
RL 70 UH	1700 x 250 x 450	70	1750 x 300 x 450	4000	1000	2000	13.1
L 220	2200 x 300 x 300/370*	185 per chamber	2320 x 750 x 850	2 x 4000	2 x 1000	–	8.6
L 320	3200 x 300 x 300/370*	270 per chamber	3320 x 750 x 850	4 x 4000	4 x 1000	–	13.0***
W 65	500 x 300 x 450	30	560 x 360 x 650	1200	300	1450	7.0
W 300	1000 x 500 x 600	185	1180 x 600 x 1000	2 x 4000	2 x 1000	7200	14.8***

*ultrasonic- / rinsing chamber **corresponds to 4 times HF output ***per phase

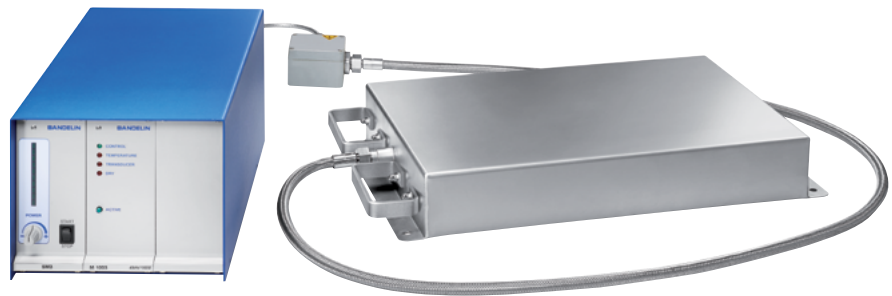
W 65 and RL 70 UH, L 220: mains connection 230 V~ (±10 %). 50/60 Hz., W 300 and L 320: mains connection 400 V 3N~ (±10 %) 50/60 Hz
W 300 on request additional with integrated autotransformer for connection to the existing voltage of the ship

■ Accessories and additional equipment on request.

SONOREX TECHNIK

High-power transducers

Immersible transducers and flat transducer plates from 200 W to 2000 W



Immersible transducers

for quick installation in large tanks.



Features

- stainless steel housing of 2 mm AISI 316 Ti, TIG welded
- ultrasonic frequencies 25 kHz or 40 kHz
- different versions support a variety of applications

SONOREX TECHNIK high-power transducers, such as immersible transducers and flat transducer plates, are used, to convert tanks to ultrasonic cleaning tanks or to accelerate chemical or physical processes.

They are efficient and functional stable and offer an uniform sonication by PZT-large area oscillating systems. High-power generators supply these transducers with energy.

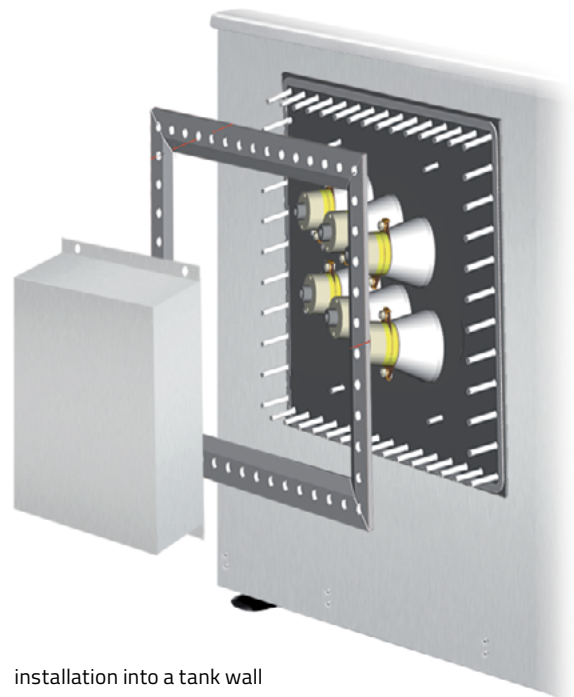
Flat transducer plates

for space-saving installation, if space is limited.
The nominal tank dimensions remain unchanged.



Features

- stainless steel plate of 3 mm, AISI 316 Ti
- ultrasonic frequencies 25 kHz or 40 kHz
- installation in rectangular outcut in tank.
- no drilling jigs and bores for mounting bolts are required.



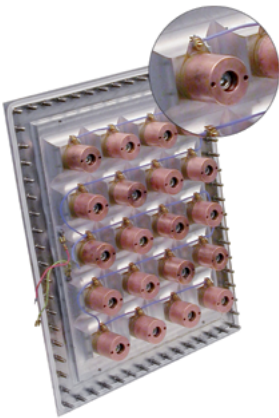
installation into a tank wall

■ Separate project advices on request.

SONOREX TECHNIK

High-power transducers

Versions made of special materials and in special designs



Explosive plated compound ultrasound

– patent EP 0 552 696

Robust design for an increased stability.

Solid plates of aluminium and stainless steel are inseparably connected by explosive force. PZT elements are screwed onto this compound plate without using any adhesives.

Features

- long life span caused by low erosion
- stainless steel 3 mm, AISI 316 Ti
- high temperature stability up to 125 °C max.
- suitable for pressure and vacuum applications
- new radiating characteristics
- ultrasonic frequencies: 25 kHz or 40 kHz
- immersible transducers and flat transducers plates are available in this technology

CONVEXON Immersible transducers TC

– patent D 100 13 120



Features

- convex radiating surface
- uniform distribution of ultrasound
- homogeneous cleaning effect
- little surface erosion
- extended life span
- stainless steel material of 2 mm, AISI 316 Ti, TIG-welded
- ultrasonic frequency 40 kHz

TC 40 30 6 P

CONCAVON Immersible transducers TN

– patent D 100 13 120



Features

- concave radiating surface
- uniform distribution of ultrasound
- focussed cleaning effect
- stainless steel material of 2 mm, AISI 316 Ti, TIG-welded
- ultrasonic frequency 40 kHz

TN 40 10 6 RF

HF connection technology

Quick-connect-technology

Immersible transducers are normally equipped with connection boxes with HF sockets for plug-in of HF cables. When operating the equipment in wet surroundings, we recommend a fixed cable connection (F) with high-strength cable gland (hose-proof). Flat transducer plates are equipped with HF sockets only, without connection boxes.



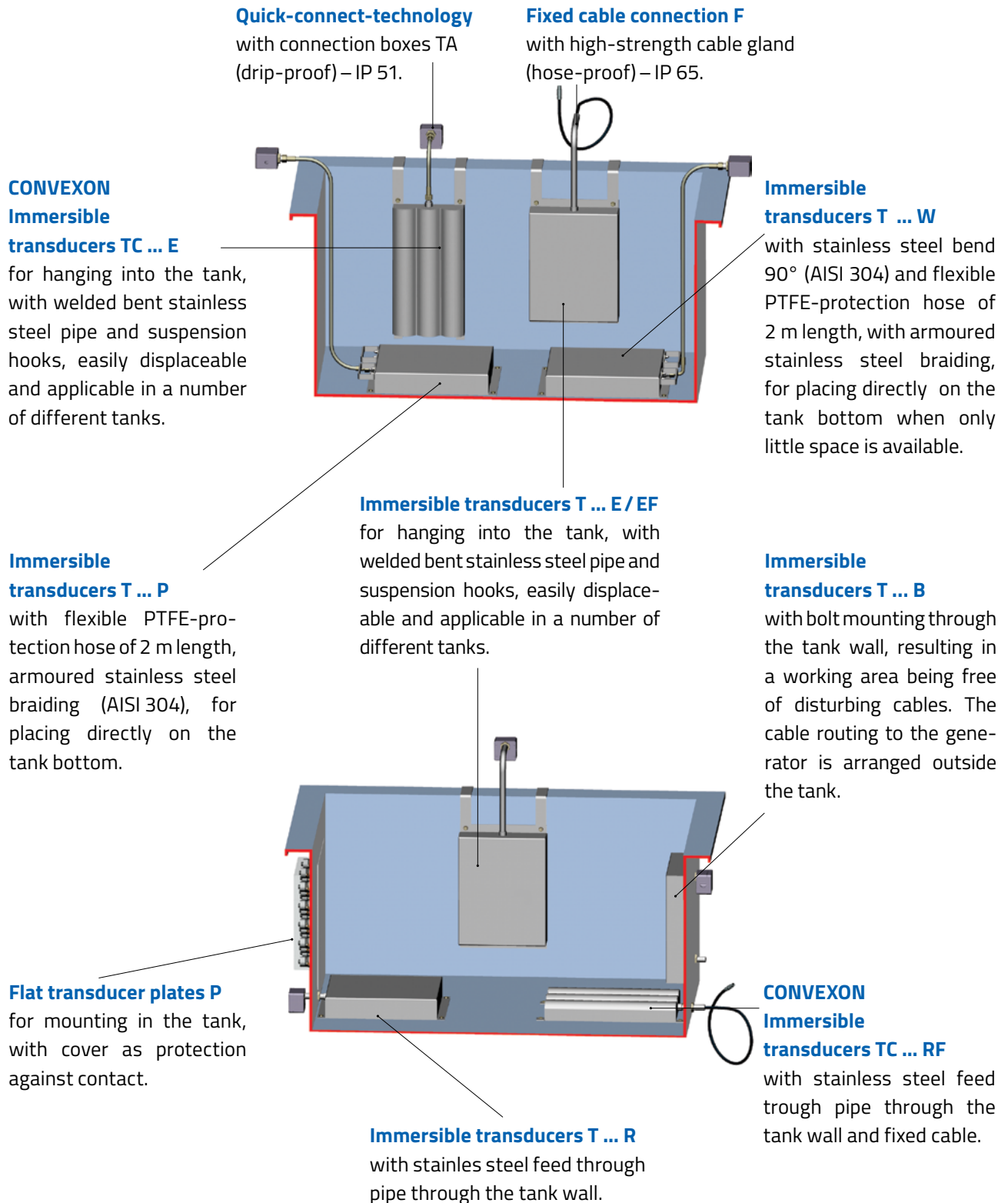
■ Separate project advices on request.

SONOREX TECHNIK

High-power transducers

Examples for mounting of ultrasonic transducers

For mounting in existing tanks alternative with pluggable HF cables in Quick-connect-technology (IP 51) or with fixed HF cable (IP 65).



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High-power ultrasonic generators LG and TG

■ Powerful generators are used for the operation of high-power transducers.

Module generators LG

The microprocessor controlled LG generators deliver the required HF power up to 9.0 kW at ultrasonic frequencies of 25 kHz or 40 kHz.

The selection of the generators and the installation of power and operating modules depend on the needed

total power of the ultrasonic transducers and on the desired way of controlling. Key part of every generator are uniform power modules up to 1.5 kW equipped with an on-board microprocessor for exact control of all working parameters.



LG 8008 D – 8.0 kW



LG 4004 F – 4.0 kW



LG 3020 T – 3.0 kW

■ Separate project advices on request.

Compact generators TG 1503 and TG 3003 – specifically for mechanical engineering Compact design for installation in an electrical cabinet

The microprocessor controlled ultrasonic generators are factory-programmed with a power of 0.3 to 3.0 kW. The operating frequency is 25 kHz or 40 kHz; a combination is also possible for the TG 3003.

Wall installation is possible using an angle bracket (optional).

Compact generator TG 1503

dimensions (l × w × h): 250 × 460 × 110 mm
mains connection: 230 V~ (± 10 %) 50/60 Hz

Compact generator TG 3003

dimensions (l × w × h): 250 × 460 × 160 mm
mains connection: 230 V~ (± 10 %) 50/60 Hz



TG 1503 – 1.5 kW



TG 3003 – 3.0 kW

■ Separate project advices on request.

SONOREX TECHNIK

Module concept generators LG

**Established modular technology – reliable and powerful,
with changeable operating and power modules**

Modular structure

All modules of the LG generator can be easily inserted or exchanged from the front. The generator is set up by the operating modules SM 3 or PRO 3.

Power is controlled via power modules M.

Flexibility

In order to increase the generator's power, additional power modules can be easily inserted into vacant slots.

Mixed installation of modules with different frequencies (25 or 40 kHz) is possible.

Communication

The connections for remote control and serial interface at the rear side allow the integration of the generators into higher ranking monitoring and controlling equipment.

HF generators

Operating modules

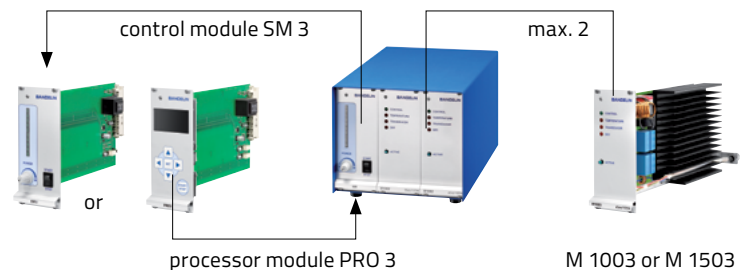
Power modules

Desktop housing (T)

up to 3.0 kW

dimensions (l × w × h): 218 × 405 × 198 mm

mains connection: 230 V~ (±10 %) 50 / 60 Hz



Industrial housing (F)

up to 6.0 kW

dimensions (l × w × h): 488 × 405 × 203 mm

or 19"-plug-in unit

for electrical cabinet

mains connection: 400 V 3N~ (±10 %) 50 / 60 Hz



Industrial housing (D)

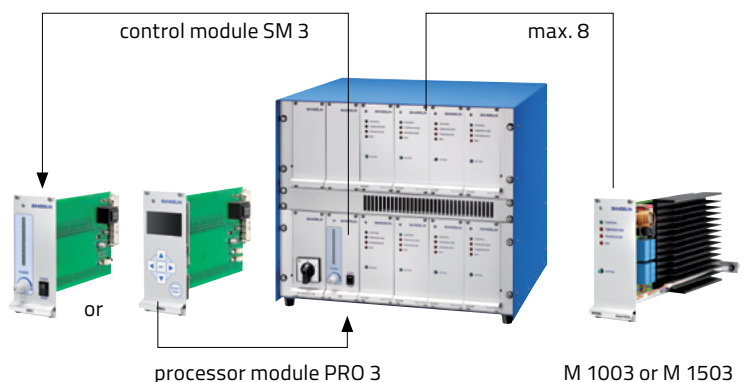
up to 9.0 kW

dimensions (l × w × h): 488 × 405 × 425 mm

or 19"-plug-in unit

for electrical cabinet

mains connection: 400 V 3N~ (±10 %) 50 / 60 Hz



SONOREX TECHNIK

Module concept generators LG

Operating and power modules of generators LG

Control module SM 3

- continuous setting of the nominal power range from 10 to 100 % via rotary controller
- START-STOP switch for switching on / off of the HF power



Processor module PRO 3

- individual programming of each power module
- degassing
- error indication



Power modules M 1003 and M 1503 – patent D 196 49 975

- LEDs indicate the working condition
- module switch for individual activation of separate power modules
- power deviation $\pm 2\%$
- protected against idle motion, short circuits and over load



■ Separate project advices on request.

Remote control / controlling of generators LG and TG

Remote control



remote control FS 15 L

The generators can be switched on/off via an external control contact at the rear side.

FS 7: cable for remote control, 7 m length, with plug at one side

FS 15 L: remote control with timer 1 to 15 min and continuous operation, cable for remote control, 7 m length, with plug

Interface RS 232 for PLC or PC



generator



PLC

The integration of the generator into higher ranking controlling and monitoring equipment is possible via its interface.

The power modules are controlled directly by the PLC equipment.

Software for process controlling

Software WINSONIC LG

The PC software WINSONIC LG allows comfortable operation and process planning under direct control via a PC.



Customised assemblies with ultrasonic oscillating systems

Tanks, sinks, plates, flanges and other elements made of metal or synthetics can be directly equipped in a customized fashion with PZT oscillating systems to be used for cleaning or for other sonication processes.

PZT oscillating systems are glued to the external surfaces so that the sonication efficiency is directed into the liquid or to an object placed within the liquid.

Examples



PVDF tank for sonication of aggressive media



foulard ponds for sonication of dye baths



probe flange of a refractometer



polarimeter tube for analysis

Project advices

- The area for the assembling has to be in level.
- Power per ultrasonic oscillating system:
metal surfaces: max 50 W
synthetic surfaces: max. 30 W
- The PZT oscillating systems can be covered with an housing (degree of protection IP 20) made of aluminium. This housing is only a protection against contact but no protection against splash water.

PZT oscillating systems	PD 40 12	PD 25 17
frequency	40 kHz	25 kHz
diameter of bonding surface per system	min. dia. 55 mm	min. dia. 65 mm
height without cover	55 mm	77 mm
height with cover	70 mm	90 mm
HF generator TG 50 /Z to TG 500 /Z		
number of possible oscillating systems	1 to 10 pieces	1 to 10 pieces
HF output	30 to 500 W	30 to 500 W
HF generator LG 1001 T to LG 3020 T /PRO HF generator TG 1503 or TG 3003		
number of possible oscillating systems	6 to 60 pieces	6 to 60 pieces
HF output	300 to 3000 W	300 to 3000 W

■ Further assembly variation – also for curved surfaces, such as tubes –on request.

Ultrasonic generators TG 50 –TG 50 / Z for connection to special assemblies

generators TG

HF-power up to 500 W
ultrasonic frequency:
40 kHz or 25 kHz



TG 50



TG 100 Z

mains connection:
230 V~ ($\pm 10\%$), 50/60 Hz
alternative
115 V ~ ($\pm 10\%$), 50/60 Hz

SONOBLOC

Tube reactors for use in process engineering and for cleaning



Bundesministerium
für Bildung
und Forschung



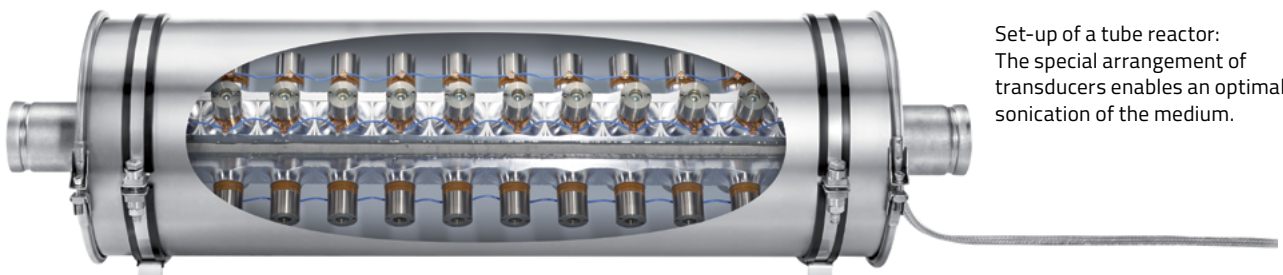
SB 8-1002.01



SB 101-2002.01

Applications

- ultrasonic intensive treatment of flexible fibrous products and wire or band-shaped endless profiles
- disintegration and decomposition of organic material to increase the biogas yield of anaerobic digestion
- support of disinfection of bacteria- and parasite-burdened fishbreeding circulating waters
- dispersion of solid particles in liquids (medicine production)
- support of disinfection (bacterial elimination) in water and wastewater treatment
- CO₂ degassing of aqueous reactants
- efficient cleaning by removing grease, oil, emulsions and/or crack residues with single- and multiple-wire cleaning
- support of industrial and biotechnological processes in cleaning, disintegrating, degassing and disagglomerating



Set-up of a tube reactor:
The special arrangement of
transducers enables an optimal
sonication of the medium.

■ Technical data regarding sonoreactors please see page 23.

SONOREX TECHNIK

Sonoreactors

VORTEX

Vortex reactor for use in process engineering – patent EP 22 23 742



Applications

- intensifying of industrial, biotechnological and chemical processes, disintegrating, degassing and disagglomerating
- intense degassing of dye solutions and photographic emulsions
- CO₂ degassing of aqueous reactants
- support of disinfection (bacterial elimination) in water and wastewater treatment
- disinfection of organic contaminant material in industrial rinsing liquids for recycling
- support of disinfection of bacteria- and parasite-burdened fishbreeding circulating waters
- producing of finest polishing pastes for wafer industry
- homogenizing of pigments in oil (producing of ink)

Ultrasonic-UV-reactor for use in process aquaculture, water treatment and sewage disinfection



Applications

- elumination of germs and parasites in the circulation water of aquaculture systems (fish and ornamental fish farming, leech farming)
- disinfection (elumination of bacteria) during water and sewage treatment



■ Technical data regarding sonoreactors please see next page.



	SONOBLOC tube reactorbloc RB			VORTEX vortex reactorbloc WB			ultrasonic- UV-reactorbloc AQ
	8-1002.01	8-1004.01	101-2002.01	4-1402.01	4-1503.01	4-1604.01	5-1002.05
flow-through rate (l/min)	1 – 100			1 – 50			3.5 – 50
internal pressure, max. (bar)	10			10			2 (UV lamp)
solid particles (mm)	< 50		< 80	< 5			< 5
power density, max. (W/l)	500		444	480	520	550	420
power max. (W)	1000		2000	1400	1500	1600	1000
frequency (kHz)	25	40	25	25	25 / 40	40	25
radiation power	-						UV-C 254 nm
reaction tube	tube 2"		tube 3"	gap between 2 tubes			gap between 2 tubes
sonicated volume (l)	2.0		4.5	2.9			2.3
tube material stainless steel AISI 316Ti dimensions (mm)	dia. 60.3 × 3.6		dia. 88.9 × 3.6	dia. 139.7 × 2.6 dia. 104 × 2			dia. 88.9 × 3.6 dia. 48.3 × 2
dimensions of housing (l × w × h) (mm)	260 × 150 × 990		dia. 370 × 1215	290 × 290 × 642			895 × 895 × 1000
built-in length (mm)	1215			856			-
Degree of protection	IP 22, optional IP 65		IP 65	IP 22			IP 30
weight, net (kg)	~ 35		~ 50	~ 50			~ 55
HF generator (separate)	LG 1001 T		LG 2002 T	LG 1510 T	LG 2002 T		LG 1001 T-UV

Accessories (optional)

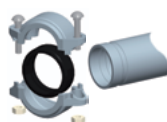
victaulic connection VAS

consisting of:

2 pcs. 2" or 3" victaulic stainless steel coupling,
AISI 316Ti with EPDM gasket

2 pcs. stainless steel tube connection,

AISI 316Ti, 2" or 3", for welding into existing pipe system



Other connection variants and
detailed documentation on request.

Ultrasonic baths – analog or digital



	SUPER RK ...	DIGITEC DT ...
capacity (l)	0.9 – 90.0	0.9 – 90.0
ultrasonic frequency (kHz)	35	35
sweep – SweepTec	✓	✓
fast degassing DEGAS	-	✓
operation	turning knobs	keypad
time setting (min)	1–15, ∞	1, 2, 3, 4, 5, 10, 15, 30, ∞
data memory	-	no, type H-RC: software WINSONIC
safety shut-down	-	after 12 hours
heating, thermostatically adjustable (°C)	30 – 80	20 – 80
heating	optional, version „H“	optional, version „H“
setting accuracy of bath temperature (K)	± 5	± 2.5
protection against retardation of boiling	-	✓, optional switch-on
excess temperature signal	-	✓
thickness tank material (mm) / material version „C“	0.8 / AISI 304 2 / AISI 316 Ti	0.8 / AISI 304 2 / AISI 316 Ti
hard chromium-plated	RK 102 H	DT 102 H / H-RC
filling mark for safe dosage	✓	✓
one-piece welded drain	✓, from RK 102 H	✓, from DT 102 H
degree of protection	IP 32	IP 33
mains connection: 230 V~ (± 10 %) 50 / 60 Hz alternative 115 V~ (± 10 %) 50 / 60 Hz	✓	✓
interface / PC software	-	RS 232, type H-RC / ✓
CE marked as medical device	✓	✓

SONOREX

Ultrasonic baths in compact design

for the usage in service, repair, maintenance and industry



cleaning of respirator masks in a fire department



drill head cleaning in the ultrasonic bath RK 102 H

type (selection)	internal tank dimensions l x w x d mm	capacity l	external dimensions l x w x h mm	ultrasonic peak power W**	HF power W _{eff}	heating power W
RK 102 H DT 102 H	240 x 140 x 100	3.0	260 x 160 x 250	480	120	140
RK 156 BH DT 156 BH	500 x 140 x 150	9.0	530 x 165 x 300	860	215	600
RK 170 H	1000 x 200 x 200	39.0	1050 x 250 x 385	1520	380	1600
RK 255 H DT 255 H	300 x 150 x 150	5.5	325 x 175 x 295	640	160	280
RK 510 H DT 510 H	300 x 240 x 150	9.7	325 x 265 x 305	640	160	400
RK 514 H DT 514 H	325 x 300 x 150	13.5	355 x 325 x 305	860	215	600
RK 514 BH DT 514 BH	325 x 300 x 200	18.7	355 x 325 x 385	860	215	600
RK 1028 H DT 1028 H	500 x 300 x 200	28.0	535 x 325 x 400	1200	300	1300
RK 1028 CH DT 1028 CH	500 x 300 x 300	45.0	540 x 340 x 500	1200	300	1450
RK 1050 CH DT 1050 CH	600 x 500 x 300	90.0	640 x 540 x 530	2400	600	1950

**corresponds to 4 times HF output

Accessories: Insert baskets

made of stainless steel. Additional accessories on request.



RK 102 H DT 102 H	RK 156 BH DT 156 BH	RK 170 H	RK 255 H DT 255 H	RK 510 H DT 510 H	RK 514 H DT 514 H	RK 514 BH DT 514 BH	RK 1028 H DT 1028 H	RK 1028 CH DT 1028 CH	RK 1050 CH DT 1050 CH
K 3 C	K 6 BL	K 7	K 5 C	K 10	K 14	K 14 B	K 28	K 28 C	K 50 C

TICKOPUR

Cleaning agents



Besides ultrasonic power, temperature and time, specially balanced cleaning agents are also necessary to achieve optimum cleaning results. With special agents from DR. H. STAMM GmbH BANDELIN offers a wide range of adequate cleaning agents.

These cleaning agents were specially developed for ultrasonic applications. With their cavitation-aiding properties, the special agents support the cleaning process and are gentle to the material at the same time. Depending on the cleaning tasks, either alkaline, neutral or acidic cleaning agents are recommended. They are biologically degradable and easy to dispose of. Rinsing after cleaning is necessary to remove remaining residues of cleaning agents and diluted soil particles from the parts to be cleaned.

It is not allowed to use combustible liquids directly in the ultrasonic bath. Household cleaners, acids and most of the customary acid cleaners are improper cleaning agents because they could destroy the tank by pitting corrosion resulting finally in breakdown of the ultrasonic bath.

All TICKOPUR agents are also suitable for immersing and wiping.

Brochure with more information on request. Product information, safety data sheets and dosing table as PDF file you will find at: www.bandelin.com

TICKOPUR

Cleaning agents

Dosing aids

	type	code no.
5-l-jerrycan	pump	268
25-l-jellycan (optional use)	stop cock pump	252 266



left: pump, right: stop cock

materials	contamination	concentrate	litres*
steel, stainless steel, non-ferrous, precious and light metals, glass, ceramics, plastics, rubber, windows, glasses, electrostatic filters, respirator masks	general contamination, drilling, grinding, polishing and lapping residues, oily and greasy residues, dust, soot, ink etc..	TICKOPUR R 33 universal cleaner anticorrosive, for service, industry, technology and laboratory, gentle cleaning, mildly alkaline, pH 9.9 (1 %), dosage 3 to 5 %	5 25 200
steel, stainless steel, non-ferrous, precious and light metals, glass, ceramics, plastics, rubber	light drilling, grinding, polishing and lapping residues, dust	TICKOPUR R 30 neutral cleaner based on tensides, anticorrosive, gentle cleaning, emulsifying, neutral, pH 7.0 (1 %), dosage 1 to 5 %	5 25 200
steel, stainless steel, precious metals, glass, ceramics, plastics, rubber. Not for tin, zinc, light and non-ferrous metals!	heavy mineral residues (chalk, silicate, phosphate, cement etc.), rust, temper colours, metal oxides, grease and oil films	TICKOPUR R 27 special cleaner based on phosphoric acid, for decalcification and rust removal, anticorrosive, acid, pH 1.9 (1 %), dosage 5 %	5 25 200
steel, stainless steel, non-ferrous, precious and light metals, glass, ceramics, plastics, rubber	mineral residues, drifting rust, grease, oils, waxes, pigments, drilling, grinding, polishing and lapping residues	TICKOPUR TR 3 special cleaner based on citric acid, gentle cleaning, without phosphate, anticorrosive, weakly acid, pH 3.0 (1 %), dosage 5 %	5 25 200
steel, stainless steel, non-ferrous, precious and light metals, glass, ceramics, plastics, rubber, soldering frame	grease, oils, waxes, pigments, flux media, soldering pastes, drilling, grinding, polishing and lapping residues	TICKOPUR TR 7 universal cleaner, demulsifying, for rapid separation of oil and grease, without phosphate, mildly alkaline, pH 8.9 (1 %), dosage 0.1 to 5 %	5 25 200
steel, stainless steel, glass, ceramics, plastics, rubber Not for tin, zinc and light metals! Non-ferrous metals can be affected.	coke residues, resinous residues, soot, grease, oils, waxes, pigments, coloured fog, drilling, grinding, polishing and lapping residues	TICKOPUR TR 13 intensive cleaner, demulsifying, for stubborn contamination, without phosphate and silicate, alkaline, pH 11.9 (1 %), dosage 0.1 to 10 %	5 25 200
steel, stainless steel, glass, ceramics, plastics, rubber Not for light metals! Caution with tin, zinc and non-ferrous metal!	coke residues, resinous residues, soot, pigments, grease, oils, waxes, silicon oils, coloured fog, drilling, grinding, polishing and lapping residues etc.	TICKOPUR R 60 intensive cleaner, without phosphate, saponifying, alkaline, pH 12.8 (1 %), dosage 2 to 20 %	5 25 200

*Other sizes on request.

Anticorrosive for ferrous metals

materials	features	concentrate	litres
Applicable for all ferrous metal such as cast iron, unprotected steels of different alloys.	Efficient anticorrosive after cleaning with TICKOPUR agents and consecutive aqueous rinsing. No formation of oil or grease films.	TICKOPUR KS 1 all-purpose anticorrosive for all ferrous metals, without solvents, neutral, pH 7.4 (1 %), dosage 0.5 to 2 %	2 5

■ Detailed advice and technical documentation: Phone +49 30 76880-258

BANDELIN

The Company profile

BANDELIN electronic, a family-owned mid-sized company, is located in the capital of Germany – Berlin. Development and manufacture of ultrasonic devices and disinfection and cleaning agents are carried out in Berlin. A wide vertical range of manufacture, modern production lines and a motivated staff guarantee a high quality of the products. The customers can buy everything from one-hand. Ultrasonic devices are in use in nearly all branches like industry, maintenance, service, medical, pharmaceutical and dental fields as well as laboratories.

Development and manufacture of high-power ultrasonic units began already in 1955. The product range was enlarged in the middle of the eighties caused by increased sales. Adjustable and power-constant HF-generators were launched in 1992.

The brand names SONOREX, SONOPULS and SONOMIC are equated with ultrasound from experts.

The most important product groups are:

- SONOREX – Ultrasonic baths and reactors
- SONOPULS – Ultrasonic homogenisers
- SONOMIC – Ultrasonic bath for rinsable keyhole surgery instruments and standard instruments
- TRISON – Ultrasonic bath for robotic instruments, rinsable keyhole surgery instruments and standard instruments
- TICKOPUR – Cleaning agents

BANDELIN electronic is the leader in development of new ultrasonic devices and opening up new application areas. In the past about 27 patterns / utility patents and 34 brand names were applied for. The company supports several committees in compiling of norms and guidelines. All products are CE marked.



Some impressions of our production



Made in Germany

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12207 Berlin
DEUTSCHLAND
☎ +49 30 76880-0
☎ +49 30 7734699
info@bandelin.com

Certified in accordance with
EN ISO 9001 and EN ISO 13485



Tell us your requirements –
We will be pleased to advise you at no obligation.

+49 30 76880-0

www.bandelin.com

2842 GB /2016-03

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Illustrations exemplary, not true to scale.

Decoration products are not included in delivery.

The general terms and conditions apply.