SONOREX • SONOPULS

High-power ultrasound in laboratories

Cleaning – Degassing – Emulsifying
Cell disruption – Homogenizing
Sample preparation

BANDELIN

65 years of experience in ultrasound

Company Profile

BANDELIN electronic, a family-owned mid-sized company, is located in the capital of Germany – Berlin. The company has 65 years of experience in ultrasound technology. Development and manufacture of ultrasonic devices and disinfectant and cleaning agents are carried out in Berlin. A high vertical range of manufacture, modern production lines and a high-motivated staff guarantee a high quality of the products. The customers can buy everything from one source.
Ultrasonic devices are in use in nearly all branches like laboratories, industry, maintenance, medical, pharmaceutical and dental fields as well as service.

The brand names **SONOREX, SONOPULS** and **SONOMIC** are equated with ultrasound from experts. The most important product groups are:

- **SONOREX** – ultrasonic baths
- **SONOPULS** – ultrasonic homogenisers
- **SONOCOOL** – ultrasonic bath with cooling
- **SONOREX TECHNIK** – ultrasonic cleaning devices and sonoreactors
- **SONOMIC** – ultrasonic cleaning device for rinseable keyhole surgery instruments
- **STAMMOPUR** and **TICKOPUR** – disinfectant and cleaning agents

All products are CE marked, also as medical devices according to Medical Device Directive (MDD), and classified to UMDNS™, too.

Contents

Recommendations on ultrasonic cleaning

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. 35 kHz which are used for intense but gentle cleaning.
The HF generator converts the mains frequency into the corresponding frequency of the ultrasonic bath.
This frequency is transformed into mechanical vibrations by transducers underneath the tank.Ultrasound is transmitted to the liquid in the bath.
All ultrasonic baths use **SweepTec**® – a special frequency modulation around on optimally fixed operating point. A very homogeneous and even ultrasonic field is achieved.

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 and sonochemistry

Cavitation not only can be used for various purposes, but a very fine emulsion of oil and water can be produced by ultrasonic application. Compared to other manufacturing processes this emulsion is more stable. For sonochemical processes in an ultrasonic bath, the reaction vessel should have a thin bottom. Thus, the ultrasonic energy is radiated directly and effectively into the reaction vessel.

How to select the proper unit

SONOREX ultrasonic baths work with the intense cleaning frequency of 35 kHz.
Size and number of objects to be cleaned determine 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.

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 cleaning processes in laboratories.
Disinfectant solutions must not be warmed-up because protein coagulation starts at a temperature of 40 °C (104° F) and this poses an obstacle for some cleaning and all disinfection processes.
Therefore, units without heaters are recommended for these applications.

What kind of accessories should be used

Objects to be cleaned and reaction vessels must not be placed on the tank bottom. Insert baskets avoid scratching either the parts to be cleaned or the tank bottom.
Beakers are placed into positioning lids and are used for cleaning of small objects or when working with aggressive solutions.

Which cleaning agents are appropriate

TICKOPUR and **STAMMOPUR** cleaning and disinfectant agents have been especially developed for application in **SONOREX** ultrasonic baths.
Water without any cleaning agent does not clean.
Household detergents as well as DI-water should never be used. It is necessary to use plastic insert tubs, when working with acids or removing acid residues.
Flammable liquids must not be used directly in the ultrasonic tank.

Contents

Overview on *SONOREX* ultrasonic baths


DT 102 H


DL 102 H


RK 102 H

Features / Series	DIGITEC DT ...	DIGIPLUS DL ...	SUPER RK ...
Tank volume (litres)	0.9 – 90.0	3.0 – 28.0	0.9 – 90.0
Control elements	push-buttons	push-buttons	turning knobs
Time setting (min)	1 – 30, continuous operation∞	1 – 30, continuous operation∞	1 – 15, continuous operation∞
Safety shut-down	after 12 hours	after 12 hours	no
Heating	optional, version "H"	yes	optional, version "H"
Heating, thermostatically adjustable	20 – 80 °C	20 – 80 °C	30 – 80 °C RK 31 H: 65 °C fixed
Excess temperature signal	yes	yes	no
Protection against retardation of in boiling	yes, optionally switch-on	yes, optionally switch-on	no
Setting accuracy of bath temperature	± 2.5 K	± 2.5 K	± 5 K
Thickness tank material, standard: Version "C":	0.8 mm. AISI 314 2 mm. AISI 316 Ti	0.8 mm. AISI 314	0.8 mm. AISI 304 2 mm. AISI 316 Ti
Marking of filling level for safe dosage	yes	yes	yes
Hard chromium-plated	DT 102 H / H-RC	DL 102 H	RK 102 H
Warranty period (years)	2, DT 102 H = 3	2, DL 102 H = 3	2, RK 102 H = 3
One-piece drain, welded	yes, from DT 102 H	yes	yes, from RK 102 H
Liquid protection	protected against spray	protected against spray	drip-proof
Degree of protection	IP 33	IP 33	IP 32
Ultrasonic frequency (kHz)	35	35	35
Sweep – SweepTec®	yes	yes	yes
Power setting	no	20 – 100 % in 10 % steps	no
PCT-transducers (PCT = lead circonate titanate)	yes	yes	yes
Fast degassing	yes	yes	no
Mains supply 230 V~ (± 10 %) 50/60 Hz	yes	yes	yes
alternatively: mains supply 115 V~ (± 10 %) 50/60 Hz	yes	yes	yes
Data memory	no Type H-RC: WINSONIC® software	no	no
Interface	RS 232, type H-RC	no	no
PC software	yes	no	no
CE marked as medical device	yes, except for DT 1050 CH	no	yes, except for RK 1050

High-power ultrasonic baths with a simple turning knob operation

Applications:

- Cleaning of
  - technical glassware like burettes, pipettes, petri dishes and laboratory flasks
  - analysis sieves up to 400 mm diameter
  - metal parts of all kinds
  - electronic components
- Cleaning and disinfection of medical instruments
- Degassing of liquids to determine concentration
- Acceleration of suspending processes
- Production of emulsions
- Preparation of samples for analysis, e. g. analysis of hair

Internal tank dimensions (l x w x d) mm	Capa-city litres	Type	Code No.	External dimensions (l x w x h) mm	Drain ball valve	Ultrasonic peak output * W	HF output W_{eff}	Heating power W	Current con-sump-tion A	Weight net kg
190 × 85 × 60	0.9	**RK 31** **RK 31 H**	329 044	205 × 100 × 180	- -	160 160	40 40	- 70	0.2 0.5	2.2 2.3
150 × 140 × 100	1.8	**RK 52** **RK 52 H**	311 164	175 × 165 × 225	- -	240 240	60 60	- 140	0.3 0.9	2.6 2.9
240 × 140 × 100	3.0	**RK 100** **RK 100 H** **RK 102 H**	301 312 303	260 × 160 × 250	- - G ¼	320 320 480	80 80 120	- 140 140	0.4 1.0 1.2	3.4 3.6 4.1
240 × 140 × 150	4.0	**RK 103 H**	326	260 × 160 × 310	G ¼	560	140	200	1.5	4.6
Ø 240 × 130	5.6	**RK 106**	306	Ø 265 × 270	G ¼	480	120	-	0.6	5.0
500 × 140 × 100	6.0	**RK 156**	305	530 × 165 × 245	G ¼	640	160	-	0.7	6.1
500 × 140 × 150	9.0	**RK 156 BH**	646	530 × 165 × 300	G ¼	860	215	600	3.6	7.1
1000 × 200 × 200	39.0	**RK 170 H**	076	1050 × 250 × 385	G ½	1520	380	1600	8.7	26.5
300 × 150 × 150	5.5	**RK 255** **RK 255 H**	3066 316	325 × 175 × 295	G ¼ G ¼	640 640	160 160	- 280	0.7 2.0	5.2 5.3
300 × 240 × 150	9.7	**RK 510** **RK 510 H**	327 321	325 × 265 × 305	G ½ G ½	640 640	160 160	- 400	0.7 2.5	7.0 7.6
300 × 240 × 200	13.0	**RK 512 H**	795	325 × 265 × 350	G ½	860	215	400	2.7	8.0
325 × 300 × 150	13.5	**RK 514** **RK 514 H**	277 207	355 × 325 × 305	G ½ G ½	860 860	215 215	- 600	1.0 3.6	8.2 8.8
325 × 300 × 200	18.7	**RK 514 BH**	263	355 × 325 × 385	G ½	860	215	600	3.6	9.8
500 × 300 × 200	28.0	**RK 1028** **RK 1028 H**	322 324	535 × 325 × 400	G ½ G ½	1200 1200	300 300	- 1300	1.4 7.0	14.3 14.7
500 × 300 × 300	45.0	**RK 1028 C**	661	540 × 340 × 500	G ½	2000	500	-	2.2	24.6
500 × 300 × 300	45.0	**RK 1028 CH**	143	540 × 340 × 500	G ½	1200*	300	1450	7.7	23.7
Ø 500 × 195	39.5	**RK 1040**	319	Ø 540 × 500	G ½	1200	300	-	1.4	20.5
600 × 500 × 200	58.0	**RK 1050**	323	655 × 535 × 425	G ½	2400	600	-	2.7	31.0
600 × 500 × 300	90.0	**RK 1050 CH**	184	640 × 540 × 530	G ½	2400*	600	1950	11.1	37.0

*Corresponds to 4 times HF output

High-power ultrasonic baths with fast degassing

Applications:

- Cleaning of technical glassware like burettes, pipettes, petri dishes and laboratory flasks
- disinfection and cleaning at the same time
- Degassing of beer samples for analysis of alcohol contents, original worth, colour, pH value
- Degassing of food samples from cans for analysis of stannous contents
- Extraction of quaternary ammonium compounds (QAC) of wood
- Extraction of herbs samples for determination of aflatoxines (causing mold decay on food)
- Extraction of soil samples for determination of hydrocarbons
- Test method for freeze-thaw resistance of concrete: CDF test – through sonication,loosely adhering scaled particles are removed from surface

Internal tank dimensions (l x w x d) mm	Capa-city litres	Type	Code No.	External dimensions (l x w x h) mm	Drain ball valve	Ultrasonic peak output * W	HF output W_{eff}	Heating power W	Current con-sump-tion A	Weight net kg
190 × 85 × 60	0.9	**DT 31** **DT 31 H**	3200 3220	205 × 100 × 180	-	160 160	40 40	- 70	0.2 0.5	2.2 2.3
150 × 140 × 100	1.8	**DT 52** **DT 52 H**	3205 3225	175 × 165 × 230	-	240 240	60 60	- 140	0.3 0.9	2.6 2.9
240 × 140 × 100	3.0	**DT 100** **DT 100 H** **DT 102 H**	3210 3230 3235	260 × 160 × 250	- - G ¼	320 320 480	80 80 120	- 140 140	0.4 1.0 1.2	3.4 3.6 4.1
240 × 140 × 150	4.0	**DT 103 H**	3201	260 × 160 × 310	G ¼	560	140	200	1.5	4.6
Ø 240 × 130	5.6	**DT 106**	3270	Ø 265 × 270	G ¼	480	120	-	0.6	5.0
500 × 140 × 100	6.0	**DT 156**	3275	530 × 165 × 245	G ¼	640	160	-	0.7	6.1
500 × 140 × 150	9.0	**DT 156 BH**	3221	530 × 165 × 300	G ¼	860	215	600	3.6	7.1
300 × 150 × 150	5.5	**DT 255** **DT 255 H**	3215 3240	325 × 175 × 295	G ¼ G ¼	640 640	160 160	- 280	0.7 2.0	5.2 5.3
300 × 240 × 150	9.7	**DT 510** **DT 510 H**	3245 3206	325 × 265 × 305	G ½ G ½	640 640	160 160	- 400	0.7 2.5	7.0 7.6
300 × 240 × 200	13.0	**DT 512 H**	3226	325 × 265 × 350	G ½	860	215	400	2.7	8.0
325 × 300 × 150	13.5	**DT 514** **DT 514 H**	3250 3211	355 × 325 × 305	G ½ G ½	860 860	215 215	- 600	1.0 3.6	8.2 8.8
325 × 300 × 200	18.7	**DT 514 BH**	3216	355 × 325 × 385	G ½	860	215	600	3.6	9.8
500 × 300 × 200	28.0	**DT 1028** **DT 1028 H**	3255 3231	535 × 325 × 400	G ½ G ½	1200 1200	300 300	- 1300	1.4 7.0	14.3 14.7
500 × 300 × 300	45.0	**DT 1028 CH**	3266	540 × 340 × 500	G ½	1200	300	1450	7.7	23.7
600 × 500 × 300	90.0	**DT 1050 CH**	3271	640 × 540 × 530	G ½	2400	600	1950	11.1	37.0
DT ... RC baths with infrared interface for process documentation										
240 × 140 × 100	3.0	**DT 102 H-RC**	3071	260 × 160 × 250	G ¼	480	120	140	1.2	4.3
300 × 150 × 150	5.5	**DT 255 H-RC**	3081	325 × 175 × 295	G ¼	640	160	280	2.0	5.3
300 × 240 × 150	9.7	**DT 510 H-RC**	3091	325 × 265 × 305	G ½	640	160	400	2.5	7.6
325 × 300 × 200	18.7	**DT 514 BH-RC**	3095	355 × 325 × 385	G ½	860	215	600	3.6	9.8

*Corresponds to 4 times HF output

DT 102 H-RC with IR 1

WINSONIC® DT remote control consisting of:
infrared adapter IR 1 and software CD Code No. 3090

The PC program is designed for operating systems MICROSOFT® WINDOWS®2000 and MICROSOFT® WINDOWS® XP in connection with the infrared adapter IR 1 allowing a comfortable operation and monitoring of DIGITEC DT ... RC ultrasonic baths.

Interface for automation of laboratories

RS 232 data interface to the laboratory PC allows processing of individual control tasks and integration into an automated laboratory line.

High-power ultrasonic baths with fast degassing and with power settings from 20 to 100 % in 10 % steps

Applications:

- Degassing of solvents for HPLC
- Accelerating of chemical reactions
- Mixing of plasma and sera
- Emulsifying
- Homogenizing of samples for residue analysis in vegetarian food
- Preparation for pollutant analysis of either drinking or drain water
- Preparation of liposomes in cosmetics and pharmacy
- Preparation of samples for analysis of THC-content in canabis
- Cleaning of technical glassware like burettes, pipettes, petri dishes and laboratory flasks and sensitive materials

Internal tank dimensions (l x w x d) mm	Capa-city litres	Type	Code No.	External dimensions (l x w x h) mm	Drain ball valve	Ultrasonic peak output * W	HF output W_{eff}	Heating power W	Current con-sump-tion A	Weight net kg
240 × 140 × 100	3.0	**DL 102 H**	7180	260 × 160 × 250	G ¼	480	120	140	1.2	4.1
500 × 140 × 150	9.0	**DL 156 BH**	7181	530 × 165 × 300	G ¼	860	215	600	3.6	7.1
300 × 150 × 150	5.5	**DL 255 H**	7182	325 × 175 × 295	G ¼	640	160	280	2.0	5.3
300 × 240 × 150	9.7	**DL 510 H**	7183	325 × 265 × 305	G ½	640	160	400	2.5	7.6
300 × 240 × 200	13.0	**DL 512 H**	7184	325 × 265 × 350	G ½	860	215	400	2.7	8.0
325 × 300 × 200	18.7	**DL 514 BH**	7185	355 × 325 × 385	G ½	860	215	600	3.6	9.8
500 × 300 × 200	28.0	**DL 1028 H**	7186	535 × 325 × 400	G ½	1200	300	1300	7.0	14.7

*Corresponds to 4 times HF output

sample degassing

slurry suspending

SONOREX Accessories


D 514

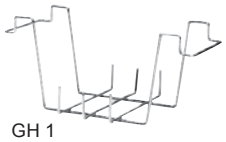
Lid D
stainless steel, to protect the liquid from outside dirt. Condensation water runs back into the tank.

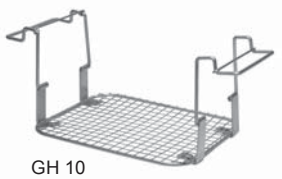

K 14

Insert baskets K
stainless steel


PK 2 C

Insert baskets PK...C/K..P
plastic, with perforations, for gentle cleaning of sensitive surfaces.


GH 1


GH 10

Utensil holders GH
stainless steel, mesh size 12.5 × 12.5 mm, for larger objects.
Utensil holder **GH 1**, suitable for flasks up to a diameter of 105 mm.


KW 3

Insert tubs KW
plastic, non-perforated and with lid. For working with chemicals that corrode the stainless steel oscillating tank. Insert tubs KW are made of PP, except for KW 3/5 made of PE. Stable up to a temperature of 80 °C (176° F) in water and up to 60 °C (140° F) in acids.


KD 0 PD 04

Inset sieve baskets
mesh net, suitable for inset beakers.
KD 0
stainless steel, diameter 75 mm
PD 04
plastic, diameter 60 mm


SD 06 DD 06

Inset beakers
for indirect cleaning of small parts. Suitable for **DE/ES**

SD 06, glass, 600 ml
PD 06, plastic, 600 ml
EB 05, stainless steel, 600 ml
diameter 85 mm, 100 mm deep, with retaining ring and lid DD 06.
SD 09, glass, with ring, 1000 ml

Suitable for DE 08
SD 04, glass, 400 ml
SD 05, glass, 600 ml
KB 04, plastic, 400 ml
with ring


EB 05 PD 06


DE 100

Positioning lids DE
stainless steel, for inset beakers SD 06, PD 06, EB 05, SD 09:
DE 52 for 1 beaker
DE 100/6/255 for 2 beakers
DE 156/510/514 for 4 beakers


ES 4

Beaker holder ES 4
stainless steel, for 4 inset beakers SD 06, PD 06, EB 05, SD 09.

Appropriate accessories facilitate ultrasonic application and simultaneously protect oscillating tank and parts to be cleaned. Objects to be cleaned or vessels must not be placed onto the tank bottom!

Type / Accessories	RK 31 / H DT 31 / H	RK 52 / H DT 52 / H	RK 100 / H, RK 102 H DT 100 / H DT 102 H / H-RC DL 102 H	RK 103 H DT 103 H
Lids, s/s	**D 08**	**D 52**	**D 100**	**D 100**
Insert baskets, s/s l × w × h (mm)	**K 08** 170 × 65 × 50	**K 1 C** 120 × 110 × 40	**K 3 C** 200 × 110 × 40	**K 3 CL** 200 × 110 × 40
Insert baskets, plastic l × w × h (mm)	-	**PK 1 C** 90 × 90 × 66	**PK 2 C** 187 × 90 × 56	**PK 3 C** 187× 90 × 56
Utensil holders l × w × d (mm)	-	**GH 1** 129 × 117	**GH 1** 129 × 117	**GH 1** 129 × 117
Insert tubs l × w × d (mm)	-	-	**KW 3** 195 × 115 × 88	**KW 3** 195 × 115 × 88
Positioning lids	**DE 08**	**DE 52**	**DE 100**	**DE 100**

Type / Accessories	RK 510 / H DT 510 / H / H-RC DL 510 H	RK 512 H DT 512 H DL 512 H	RK 514 / H DT 514 / H	RK 514 BH DT 514 BH / BH-RC DL 514 BH
Lids, s/s	**D 510**	**D 510**	**D 514**	**D 514**
Insert baskets, s/s l × w × h (mm)	**K 10** 250 × 195 × 50	**K 10 B** 250 × 195 × 50	**K 14** 275 × 245 × 50	**K 14 B** 275 × 245 × 50
Utensil holders l × w × d (mm)	**GH 10** 260 × 200	-	-	-
Insert tubs l × w × d (mm)	**KW 10-0** 242 × 182 × 136	-	**KW 14** 280 × 215 × 145	**KW 14 B** 275 × 210 × 195
Positioning lids	**DE 510**	**DE 510**	**DE 514**	**DE 514**

K 10 with 2 EK 100

Spring clamps for laboratory flasks

Stainless steel. Neither floating nor canting of flasks. Fast and easy fixing to the bottom of insert baskets or utensil holders, with mesh sizes up to 12.5 x 12.5 mm. (More indications Page 14)

EK 10 for 10-ml-laboratory flask to maximum dia. 31 mm, minimum dia. 23 mm
EK 25 for 25-ml-laboratory flask to maximum dia. 42 mm, minimum dia. 30 mm
EK 50 for 50-ml-laboratory flask to maximum dia. 52 mm, minimum dia. 35 mm
EK 100 for 100-ml-laboratory flask to maximum dia. 65 mm, minimum dia. 40 mm
EK 250 for 250-ml-laboratory flask to maximum dia. 85 mm, minimum dia. 55 mm

Suitable for baskets K 3 C/CL, K 5 C, K 6, K 10/B, K 14/B, K 28/C,
utensil holders GH 10 and GH 28, flask holder 510 F and shaking device SA 1028

GV 10

Handle adjustment for insert baskets and utensil holders

Stepless adjustment of immersion depth, no floating, tipping over or flooding of labortatory flasks. Quick and easy to attach.
GV 3 - 2 pieces suitable for baskets K 1 C, K 3 C/CL K 5 C, K 6 BL
GV 10 - 2 pieces suitable for baskets K 10/B, K 14/B, K 28/C and utensil holders GH 10 and GH 28

Test tube holder

RG 2, stainless steel
For sonication of 6 test tubes up to a diameter of 25 mm and 8 test tubes up to a diameter of 16 mm. Also applicable as a test tube rack. Contents of the test tubes remain visible.

Suitable for ultrasonic units DT 52/H, DT 100/H, DT 102 H/H-RC, DL 102 H
RK 52/H, RK 100/H, RK 102 H, RK 103 H

Tabletting punch holders

For tabletting punches with different diameters:

TH 14 B für RK/DT 514 BH
holes with dia. 22 mm for 30 punches EU B
holes with dia. 28 mm for 30 punches EU D

TH 14 B-S 22 for RK/DT 514 BH
holes with dia. 22 mm for 60 punches EU B

TH 14 B-S 28 for RK/DT 514 BH
holes with dia. 28 mm for 52 punches EU D

TH 28-S 22 for RK/DT 1028 H
holes with dia. 22 mm for 44 punches EU B

TH 28-S 28 for RK/DT 1028 H
holes with dia. 28 mm for 31 punches EU D

TH 28 C-S 22 for RK/DT 1028 CH
holes with dia. 22 mm for 44 punches EU B

TH 28 C-S 28 for RK/DT 1028 CH
holes with dia. 28 mm for 31 punches EU D

Type / Accessories	RK 106 DT 106	RK 156 DT 156	RK 156 BH DT 156 BH DL 156 BH	RK 170 H	RK 255 / H DT 255 / H / H-RC DL 255 H
Lids, s/s	**D 6**	**D 156**	**D 156**	**D 170**	**D 255**
Insert baskets, s/s l × w × h (mm)	**K 6** Ø 215 x 50	**K 6 L** 460 × 100 × 50	**K 6 BL** 460 × 100 × 50	**K 7** 950 × 150 × 50	**K 5 C** 260 × 110 × 40
Insert baskets, plastic l × w × h (mm)	-	-	-	-	**K 5 P** 254 × 96 × 130
Utensil holders l × w × d (mm)	-	-	-	-	-
Insert tubs l × w × d (mm)	-	-	-	-	**KW 5** 254 × 96 × 130
Positioning lids	**DE 6**	**DE 156**	**DE 156**	-	**DE 255**

Type / Accessories	RK 1028 / H DT 1028 / H DL 1028 H	RK 1028 C RK 1028 CH DT 1028 CH	RK 1040	RK 1050	RK 1050 CH DT 1050 CH
Lids, s/s	**D 1028**	**D 1028 C**	**D 40**	**D 1050 C**	**D 1050 C**
Insert baskets, s/s l × w × h (mm)	**K 28** 455 × 245 × 50	**K 28 C** 455 × 245 × 50	**K 40** Ø 480 × 50	**K 50** 545 × 450 × 50	**K 50 C** 545 × 450 × 50
Utensil holders l × w × d (mm)	**GH 28** 455 × 250	-	-	-	-
Insert tubs l × w × d (mm)	**KW 28-0** 437 × 230 × 155	**KW 28-0** 437 × 230 × 155	-	**KW 50-0** 517 × 445 × 184	**KW 50 B-0** 520 × 445 × 284
Beaker holder	**ES 4**	**ES 4**	-	**ES 4**	**ES 4**

Specific applications

DT 106 with SH 7

Analysis sieves − careful cleaning

Analysis sieves are test equipment and require careful cleaning.
Clean sieves are necessary for safe results.

Sieve holder SH 7 Code No. 314
stainless steel, for single cleaning of analysis sieves up to dia. 200 mm,
suitable for ultrasonic baths SONOREX SUPER RK 106, SONOREX DIGITEC DT 106

Sieve holder SH 28 C Code No. 307
stainless steel, allows simultaneous cleaning of up to 5 analysis sieves dia. 200 mm,
suitable for ultrasonic bath SONOREX SUPER RK 1028 C

Ultrasonic bath for single-cleaning of analysis sieves up to dia. 400 mm:
SONOREX SUPER RK 1040

Recommended cleaning concentrate: TICKOPUR R 33

PR 140 C with K 140 B

Pipettes and burettes cleaning in SONOREX PR 140 C

Short cleaning time. No time-consuming washing. Rinsing process in the same vessel using the siphon principle - no shifting around. Accelerated circulation of pipettes. No glass breakage when used according to the operating instructions. Also suitable for burettes, other glassware and plastic pipettes.
Max. lengths of objects to be cleaned: 765 mm.

Technical data:

Operating capacity 13.9 l, operating depth 765 mm, height of the device 1.130 mm, **please note that 800 mm free space above the cylindrical vessel is necessary for loading**, required floor space 335 × 255 mm, ultrasonic peak output 860 W, HF output 215 W_{eff}, 35 kHz, SweepTec®, radiating surface diameter 150 mm, time switch 1 to 15 min or continuous.
Mains connection: 230 V~ (± 10 %), alternatively 115 V~ (± 10 %), 50/60 Hz.

Quantity of pipettes to be cleaned - suitable for K 140 B:

- diameter 9.0 mm – approx. 90 pieces
- diameter 10.7 mm – approx. 55 pieces
- diameter 14.0 mm – approx. 35 pieces
- diameter 20.0 mm – approx. 15 pieces
- diameter 2.0 mm – approx. 10 pieces

SONOREX PR 140 C

Ready-to-use set consisting of:

- pipette cleaner PR 140 C
- pipette basket K 140 B
- lid D 140
- cleaning concentrate: TICKOPUR R 33 – 5 litres

Code No. 2083

Three-way valves to change from tap water to DI-water (for final rinsing)

AR 140 C, metal	Code No. 017
AR 140 CP-1, plastic	Code No. 3039
Lid D 140, made of stainless steel	Code No. 676

dirty cleaned by ultrasound

SONOREX SUPER RK 1028 CH
with basket K 28 CA for 6 full masks

Breathing masks − Cleaning and disinfecting in one process

thorough – reliable removal of dirt from internals or even from angles and corners
gentle – no scratching by manual treatment
economical – cleaning and disinfecting of up to 15 breathing masks in one process

Full masks	Full vision masks	Type	Insert basket
2	1	SONOREX SUPER RK 514 BH	K 14 AZ
6		SONOREX SUPER RK 1028 CH	K 28 CA
	3		K 28 CV
9		SONOREX SUPER RK 1050 CH	K 50 CA
	6		K 50 CV
15		SONOREX TECHNIK RM 180 UH	MK 180 A

Detailed documentation on request.

EXAM-expertise concerning material compatibility:
Cleaning and disinfecting concentrate **STAMMOPUR 24**
Universal cleaning concentrate **TICKOPUR R 33** (see pages 12, 13)

RM 16 to RM 210 and RM 112 to RM 212 in 4 versions combinable:

RM ... UH	with ultrasound and heating	RM ... H	with heating
RM ... U	with ultrasound	RM ...	without ultrasound and without heating

Ultrasonic industrial units RM 16 to 210 from 13 to 210 Liter

Spraying pipe
(from RM 110) generates in connection with an oil seperator a movement on the liquid's surface that leads floating oil and grease from the bath surface into the overflow weir

Liquid level switch as dry run protection
for heating and ultrasonic transducers

Drain for 3-way ball valve
for emptying or refilling the tank or connecting to a filtration

Height-adjustable feet

Filling level mark
well recognizable imprint for the minimum filling level of the cleaning fluid

Weir
floating contamination like particles, oil and grease can be removed from the bath surface using an oil separator

Welded cleaning tank
made of 2 mm stainless steel AISI 316 Ti

Additional outlet
for connection of an oil separator or for emptying the fluid behind the weir

Ultrasound
on/off with pilot lamp, time switch 1 to 15 min. or continuous operation

Heating
on/off with pilot lamp, temperature thermostatically adjustable from 30 to 80 °C

Drip-proof housing
made of stainless steel AISI 304

Ultrasonic generator
frequency 40 kHz
from 110 also 25 kHz

Internal tank dimensions (l x w x d) mm	Operating volume litres	Model (selection)	Code No.	External dimensions (l x w x h) mm	Ultrasonic peak output * W	HF output W_{eff}	Heating power W	Current consumption A**
325 × 275 × 200	13.0	**RM 16 UH**	8200	365 × 340 × 390	1200	300	800	4.8
480 × 300 × 300	30.0	**RM 40 UH**	8210	540 × 340 × 500	2000	500	1250	7.7
580 × 500 × 300	60.0	**RM 75 UH**	8220	640 × 540 × 530	4000	1000	1950	12.9
600 × 450 × 450	110.0	**RM 110 UH**	8230	780 × 550 × 800	4000	1000	4800	10.5
1000 × 500 × 400	160.0	**RM 180 UH**	8250	1180 × 600 × 800	2 × 4000	2 × 1000	7200	14.8
750 × 650 × 500	210.0	**RM 210 UH**	8270	930 × 750 × 800	2 × 4000	2 × 1000	7200	14.8

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

Example of modular installation
RM 16 series with lifting device

Detailed documentation for SONOREX TECHNIK industrial units, additional equipment and accessories on request.

Why special agents for ultrasonic cleaning?

Water and ultrasound without any additives do not clean!

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.

Optimum cleaning results with ultrasound require special agents.

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.

Contamination	Objects to be cleaned	Concentrate	Litres
General contamination, oily and greasy residues, soot, ink, drilling, grinding, polishing and lapping residues etc.	Glass, ceramics, plastics, rubber, steel, stainless steel, non-ferrous-, precious- and light metals, sieves, pipettes, respirators, PC-boards, glasses. Caution with tin and zinc.	**TICKOPUR R 33** **universal cleaner** gentle cleaning, anticorrosive mildly alkaline, pH 9.9 (1 %) dosage 1 to 5 % , 1 to 10 min **EXAM-expertise**	2 5 25 200
Light drilling, grinding, polishing and lapping residues, dust, soot, oily and greasy residues etc.	Glass, ceramics, plastics, rubber, steel, stainless steel, non-ferrous-, precious- and light metals.	**TICKOPUR R 30** **neutral cleaner** gentle cleaning, anticorrosive neutral, pH 7 dosage 1 to 5 %, 1 to 10 min	2 5 25 200
Heavy mineral residues like limescale, silicate, phosphate, rust, cement, temper colours, metal oxides, grease and oil films etc.	Glass, ceramics, plastics, rubber, steel, stainless steel, precious metals. **Not** for light and non-ferrous metals, tin and zinc!	**TICKOPUR R 27** **special cleaner − based on phosphoric acid** anticorrosive acid, pH 1.9 (1 %) dosage 5 %, 1 to 10 min	2 5 25 200
Resinous residues, soot, grease, oils, waxes, pigments, coloured fog, silicon oils, flux media, oxides at copper, brass, bronze and precious metals.	Glass, ceramics, plastics, rubber, steel, stainless steel, non-ferrous- and precious metals, analysis sieves. Caution with light metals.	**TICKOPUR RW 77** **special cleaner with ammonia** without phosphate, gentle to material mildly alkaline, pH 9.9 (1 %) dosage 5 %, 1 to 10 min	2 5 25 200
Coke residues, resinous residues, soot, pigments, grease, oils, waxes, silicon oils, coloured fog, drilling, grinding, polishing and lapping residues etc.	Glass, ceramics, plastics, rubber, steel, stainless steel. Not for light metals, tin and zinc!	**TICKOPUR R 60** **intensive cleaner** saponifying, without phosphate alkaline, pH 12.8 (1 %) dosage 2 to 20 %, 1 to 10 min	2 5 25 200
Mineral residues, drifting rust, grease, oils, waxes, pigments, drilling, grinding, polishing and lapping residues.	Steel, stainless steel, non-ferrous, precious and light metals, glass, ceramics, plastics, rubber.	**TICKOPUR TR 3** **special cleaner − based on citric acid** gentle cleaning, without phosphate, anticorrosive weakly acid, pH 3.0 (1 %) dosage 5 %, 1 to 10 min	2 5 25 200
Coke residues, resinous residues, soot, grease, oils, waxes, pigments, coloured fog, drilling, grinding, polishing and lapping residues.	Steel, stainless steel, glass, ceramics, plastics, rubber Not for tin, zinc and light metals! Non-ferrous metals can be affected.	**TICKOPUR TR 13** **intensive cleaner − demulsifying** for stubborn contamination, without phosphate and silicate alkaline, pH 11.9 (1 %) dosage 0.1 to 10 %, 1 to 10 min	2 5 25 200

Contamination	Objects to be cleaned	Concentrate	Litres
General contamination, biofilms, soot, pigments, oil- and fat-containing residues etc.	Glass, ceramics, plastics, rubber, steel, stainless steel, non-ferrous-, precious- and light metals, instruments, pipettes, respirators, protective goggles etc.	**STAMMOPUR 24** **intensive instrument cleaning and disinfection** Residue-free rinsing, neutral scent. Very gentle to material. Free from aldehydes, chlorine and phenols. Bactericidal, tuberculocidal, yeasticidal, virucidal against Vaccinia, BVDV, H5N1, HBV, HCV, HIV. Mildly alkaline, pH 9.4 (1 %) Application with ultrasound: 1 % – 15 min, 2 % – 5 min **VAH certified, EXAM-expertise**	2 5 25

Dosing aids

For	Type	Code No.
5-l-jerrycan	**pump**	268
25-l-jerrycan	**stop cock**	252
25-l-jerrycan	**pump**	266

pump

stop cock

Choice of agents

Soilling \ Material	Steel	Stainless steel	Light metal	Non-ferrous metal	Tin, zinc	Precious metal	Glass	Laboratory glass	Ceramics	Rubber	Plastics	Acryl glass
Fat	TR 13 R 60	TR 13 R 60	R 33 TR 3	R 33 TR 3	R 30	TR 13 RW 77	TR 13 R 33	TR 13 R 33	TR 13 R 33	R 33 TR 13	TR 13 R 33	R 33 TR 13
Oil	TR 13 R 60	TR 13 R 60	R 33 TR 3	R 33 TR 3	R 30	TR 13 RW 77	TR 13 R 33	TR 13 R 33	TR 13 R 33	R 33 TR 13	TR 13 R 33	R 33 TR 13
Silicon-Oil	TR 13 R 60	TR 13 R 60	R 33 TR 3	R 33 TR 3	R 30	TR 13 RW 77	TR 13 R 33	TR 13 R 33	TR 13 R 33	R 33 TR 13	TR 13 R 33	R 33 TR 13
Resinous residues	TR 13 R 60	TR 13 R 60	R 33 TR 3	TR 3 R 33	R 33 R 30	TR 13 R 60	TR 13 R 60	TR 13 R 60	TR 13 R 60	TR 13 R 33	R 60 TR 13	TR 13 R 33
Wax	TR 13 R 60	TR 13 R 60	R 33	R 33	R 33	TR 13 R 60	TR 13 R 33	TR 13 R 60	R 60 TR 13	TR 13 R 33	TR 13 R 60	TR 13 R 33
Temper colours	R 27 TR 3	R 27 TR 3	-	TR 3	TR 3	R 27 TR 3	- -	- -	- -	- -	- -	- -
Lime	R 27 TR 3	R 27 TR 3	TR 3	TR 3	TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3
Mineral resudues	R 27 TR 3	R 27 TR 3	TR 3	TR 3	TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3
Oxides	R 27 TR 3	R 27 TR 3	TR 3	RW 77 TR 3	TR 3	R 27 RW 77	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3
Rust	R 27 TR 3	R 27 TR 3	TR 3	TR 3	TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3	R 27 TR 3
Coloured fog	TR 13 R 60	TR 13 R 60	R 33	R 33	R 33	TR 13 R 60	TR 13 R 33	TR 13 R 33	TR 13 R 33	TR 13 R 33	TR 13 R 33	TR 13 R 33
Pigments	TR 13 R 33	TR 13 R 33	R 33	TR 3 R 33	R 33 R 30	TR 13 R 33	TR 13 R 33	TR 13 R 33	TR 13 R 33	TR 13 R 33	TR 13 R 33	TR 13 R 33
Ink	R 33	R 33	R 33	R 33	R 33	R 33	R 30	R 33	R 33	R 33	R 33	R 33
Combustion residues	R 60 TR 13	R 60 TR 13	R 33 TR 3	RW 77 TR 3	R 33 TR 3	R 60 TR 13	TR 13 R 60	TR 13 R 60	TR 13 R 60	R 33 TR 13	R 33 TR 13	R 33 TR 13
Destillation residues	R 33 R 27	R 33 R 27	R 33 TR 3	R 33 TR 3	R 33 TR 3	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27
Organic residues	R 33 R 27	R 33 R 27	R 33 TR 3	R 33 TR 3	R 33 TR 3	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27	R 33 R 27
Inorganic residues	TR 13 R 27	TR 13 R 27	R 33 TR 3	R 33 TR 3	R 33 TR 3	TR 13 R 27	TR 13 R 27	TR 13 R 27	TR 13 R 27	TR 13 R 27	TR 13 R 27	TR 13 R 27

This table shall facilitate the choice of the suitable cleaning agent and only offers a choice for the best possible cleaning result.
The recommendation does not relieve of the obligation to carefully carry out preliminary tests of sensitive materials regarding durability.

EC-Safety Data Sheets are available as PDF-data via internet at: www.bandelin.com
All TICKOPUR agents are also suitable for immersing and wiping.

SONOREX DIGITEC DT... F
flat ultrasonic baths with fast degassing function for sample preparation

Uniform sonication of samples irrespective of size and arrangement of the flasks:
Homogenizing or fast degassing of samples at the push of the button – sample preparation in laboratory flasks.

Internal tank dimensions (l x w x d) mm	Capacity litres	Type	Code No.	External dimensions (l x w x h) mm	Drain ball valve	Ultrasonic peak output * W	HF output W_{eff}	Current consumption A	Weight net kg
300 × 240 × 65	4.3	**DT 510 F**	3242	325 × 265 × 195	G ½	560	140	0.7	5.2
500 × 300 × 65	9.5	**DT 1028 F**	3243	535 × 325 × 205	G ½	1280	320	1.4	9.7

*Corresponds to 4 times HF output

Basic set:

- SONOREX DIGITEC DT 510 F, flask holder GL 510 F, 250 ml TICKOPUR TR 3
- SONOREX DIGITEC DT 1028 F, 2 flask holders GL 510 F, 250 ml TICKOPUR TR 3

TICKOPUR TR 3, concentrate for producing the contact liquid.
Spring clamps EK are necessary to fix the laboratory flasks fast and easy to the flask holder GL. Floating or canting of flasks is prevented.

SONOREX DIGITEC DT 1028 F
with 2 flask holders GL 510 F

Flask size / Type	10 ml EK 10	25 ml EK 25	50 ml EK 50	100 ml EK 100	250 ml EK 250
Code No.	051	053	055	057	3259
for GL 510 F are suitable	18 ×	18 ×	9 ×	6 ×	5 ×

See also page 9 info to flasks size.

SONOSHAKE® – ultrasonic bath SONOREX DIGITEC DT 1028 F combined with shaking device SA 1028 – registered pattern DE 20 2009 017 749

SONOSHAKE offers a wide range of possible applications for sample preparation in many areas of analysis, for example, in environmental and foodstuffs analytics as well as in the area of medical diagnostics.
Both procedures can be carried out simultaneously or separately.
This means that a sample can be pre-homogenized at a specified shaking frequency, and then final homogenization can be achieved in a very short time using ultrasound.

- basic area 500 mm x 300 mm
- tank depth only 65 mm
- quick degassing using the DEGAS function

SONOSHAKE®

consisting of:

- ultrasonic bath DT 1028 F
- shaking device SA 1028

Code No. 3257

Shaking device SA 1028

- analogue setting of time (1 – 15 min or continuous) and shaking frequency
- reciprocating motion: settings in 4 steps possible of up to 200 shakes/min
- constant amplitude of 20 mm independently of loading
- rack easy to remove
- easy mounting of the laboratory clamps EK 10 –250 (ordering separately)
- shaking platform approx. 410 x 280 mm (l × w)
- mounting of 36 × 10-ml-flasks or 36 × 25-ml-flasks or 18 × 50-ml-flasks or 12 × 100-ml-flasks or 10 × 250-ml-Kolben
- required floor space of SONOSHAKE approx. 850 x 360 mm (l × w)

The shaking device **SA 1028** can also be added to existing SONOREX DIGITEC DT 1028 F ultrasonic bath.
Code No. 3249

SA 1028

Ultrasonic special device for gentle removing of biofilm

Fast microbiological diagnostic method for implant-associated infections

The successful treatment of implant infections depends on an accurate microbiological diagnosis.
Microorganisms form biofilms on implant surfaces, what makes them difficult to detect by conventional methods.
BactoSonic® gently removes biofilms from implant surfaces.

Principle of BactoSonic®

The implants are placed in the air-tight implant boxes and sonicated in the specially designed ultrasonic device BactoSonic®. Compared to other ultrasonic baths, BactoSonic® works with a very low ultrasound intensity.
The biofilm is removed without killing the bacteria, a quantitative assessment is possible.

The sonicated liquid is cultured and the quantity of bacteria can be determined.
Compared to standard methods (e. g. biopsies from periprosthetic tissue) up to 10,000 times more bacteria can be detected.
Mixed infections and different bacteria morphotypes can better be identified.
The sensitivity especially of patients with previous antibiotic therapy is improved.

BactoSonic 14.2

Ready-to-use set consisting of:

- ultrasonic special device BS 14
- scientifically tested procedure
- wire frame for foil test FT 14
- TICKOPUR TR 3 (contact liquid, concentrate) – 250 ml

Implant boxes	Dimensions mm (l × w × h)	Box trays for implant boxes
IB 5, PP, 0.52 l - 2 pcs	145 × 110 × 67	BT 5, PC, for 2 pcs IB 5
IB 6, PP, 0.6 l - 2 pcs	dia. 142 × 68	BT 6, PC, for 2 pcs IB 6
IB 10, PP, 1.0 l - 1 pc	278 × 115 × 60	BT 10, PC, for 1 pc IB 10
IB 18, PP, 1.8 l - 1 pc	208 × 143 × 94	BT 18, PC, for 1 pc IB 18
IB 20, PP, 2.0 l - 1 pc	135 × 102 × 282	GH 14, stainless steel, for 3 pcs IB 20

PP = polypropylene (plasma sterilisable), PC = polycarbonate (plasma sterilisable)

Code No. 3290

Implantant boxes for repeat order

Type	Pkg Qty (pieces)	Code No.
IB 5	5	3280
IB 6	5	3281
IB 10	5	3282
IB 18	5	3283
IB 20	5	3284

Technical data BS 14

Inner tank dimensions, stainless steel:	325 × 300 × 150 mm (l × w × d)	HF output:	max. 200 W_{eff} **
Filling volume for operation:	9.5 litres (contact liquid)	Frequency:	40 kHz
Exterior dimensions:	355 × 325 × 305 mm (l × w × h)	Current consumption:	1.0 A
Drain:	ball valve G ½, left side	Mains connection:	230 V~ (± 10 %), alternatively 115 V~ (± 10 %), 50/60 Hz
Time switch:	1 − 15 min and ∞		
Power selection switch:	adjustable 20, 40, 60 80 and 100 %	Weight with accessories:	14.0 kg

**Exceptionally homogeneous sound field with low intensity for a constant and gentle sonification.

Ultrasonic device with cooling for use in pathology and analysis laboratories

SC 255

sample holder PH 255-11 with inset beakers SD 01.2

Advantages:

- increased life span by welded tank: stainless steel AISI 316Ti, 2 mm thick
- lid made of glass for sample observation and easy cleaning
- level sensor for contact liquid as dry run protection
- lighted LCD display for
  remaining time – actual temperature – pause/diagnostics
  set time/set temperature – ultrasonic power
- serial interface for remote control

SONOCOOL 255

Ready-to-use set consisting of:

- ultrasonic device SC 255
- sample holder PH 255-11 for 11 inset beakers SD 01.2
- lid made of glass D 255 G
- inset beakers SD 01.2, glass – without spout, 20 pieces à 100 ml,
- 250 ml TICKOPUR TR 3
  (concentrate for producing the contact liquid)

Code No. 3500

Technical data SC 255

Inner tank dimensions:	280 × 150 × 150 mm (l × w × d)
Tank volume:	5 litres (contact liquid)
Adjustable bath temperature:	**15 – 40 °C (at 20 °C room temperature)**
Cooling power:	200 W
Ultrasonic power:	180 W, adjustable in 4 steps
Ultrasonic frequency:	35 kHz, **SweepTec®**
Countdown operation:	up to 100 h
External dimensions:	360 × 605 × 385 mm (l × w × h)
Housing:	aluminium: coated with flush pulls (grips recessed inside the housing)
Outlet:	front left, concealed
Current consumption:	1.6 A
Mains connection:	230 V~ (± 10 %) 50/60 Hz
Weight:	27.5 kg

Accessories

Sample holder PH 255-11 Code No. 3512	for 11 inset beakers SD 01.2
Inset beaker SD 01.2 Code No. 3517	Pkg Qty = 10 pieces, à 100 ml, made of glass, without spout, inner dia. 44 mm, 80 mm high
Sample holder PH 255-1 Code No. 3519	for 1 box IB 18
Box IB 18 Code No. 3283	Pkg Qty = 5 pieces
Sample holder PH 255-2 Code No. 3518	for 2 inset beakers SD 06
Inset beaker SD 06 Code No. 330	made of glass, 600 ml, inner dia. 84 mm, 125 mm high, with lid, inset is made without black ring
Lid D 255 G Code No. 3515	made of glass

Decalcification process at variable ultrasonic outputs in a subjective comparison (cuttability test, microscopic analysis) – PT 101

After 24 hours, each of the tissue samples was subjectively tested for cuttability by an MTA, using routine lab procedures. When cuttability was achieved, the samples were embedded in paraffin, H&E-stained slices were prepared, and their quality was evaluated microscopically.

Type of sample:	Femoral head specimens, 4 mm-thick bone slices (include spongiosa, cortical bone, some joint cartilage)
Type of decalcification solution:	buffered EDTA solution
Device temperature:	24 °C
Decalcification duration:	17 h up to 89 h
Results and comments:	All decalcified bone samples in this test underwent a complete demineralisation of the osseous tissue portions, with very good preservation of osseous and non-osseous tissue structures (spongiosa, cortical bone, marrow cavity tissue, cartilage, connective tissue).

Decalcification process at variable ultrasonic outputs and variable decalcification solutions, in an objective comparison (contact radiography) – PT 102

After 24 hours, each of the tissue samples was examined by means of contact radiography, to be able to assess demineralisation using the X-ray image. After 48 hours of decalcification, the bone samples were embedded in paraffin, irrespective of their subjectively-evaluated condition. H&E-stained slices were prepared and their quality was evaluated microscopically.
Since, as expected, the compacta was not sufficiently decalcified in the gentle decalcification solution after 48 hours, it was removed prior to production of the paraffin blocks. Only the spongiosa was further processed histologically.

Type of sample:	Tibial shaft specimens, 4mm-thick bone slices taken from an amputated lower leg (include 3–4 mm-thick compactas and spongiosas)
Type of decalcification solution:	buffered EDTA solution and hydrochloric acid-containing medium
Device temperature:	24 °C
Decalcification duration:	24 h and 48 h
Results and comments:	With a hydrochloric acid-containing medium: extensive demineralisation of spongiosa and cortical bone after 24 hours, irrespective of ultrasonic output. With the gentle medium: Decalcification of the spongiosa completed after 48 hours at 100 % ultrasonic output. Cuttability: free of problems for all prepared blocks Histotechnical quality: very good, good structure preservation No loss of quality at 100 % ultrasonic output Note: As expected, the blocks decalcified with the hydrochloric acid-containing medium showed reduced colouration of the cell nuclei and of the bone matrix, constituting a reduction in quality for bone tumours or bone marrow.

Decalcification for osteosarcoma – PT 103

The osseous tissue blocks were produced in a well-established cutting process using a diamond cut-off grinding system. Size: Lateral length 15 mm and thickness 3–4 mm Three embedding capsules were processed in a glass jar. A subjective evaluation of the cuttability was conducted.

Type of sample:	Bone samples from surgical specimens of malignant bone-forming tumours in children and adolescent
Type of decalcification solution:	buffered EDTA solution
Device temperature:	24 °C
Decalcification duration:	Varied between 3–5 days since the bone structure is very inhomogeneous in these samples (tumour spread and variably-pronounced tumour-specific bone formation).
Results and comments:	Very good preservation of the tissue structure and of the tumour's cell profile. Stainability with routine colours and immunohistochemical reactivity is guaranteed. Note: Bone biopsies for hematopathologic diagnosis (bone marrow, leukemia, or lymphoma diagnosis) were not used since material of this Type is only available in small quantities and cannot be easily obtained.

Biomolecular preparation of a bone speciment – PT 104

A rib with fibrous dysplasia of the bone was available as a surgical specimen.
In these benign tumour-like bone lesions, a detectable, specific biomolecular mutation in the GNAS1 gene is well-known, the detection of which can be important for diagnostic purposes. After decalcification, a small amount of tissue was removed from a block and was processed in the biomolecular lab using DNA extraction and PCR.

Type of sample:	Surgical specimen of a rib with a fibrous dysplasia of the bone
Device temperature:	24 °C
Decalcification duration:	48 h
Results and comments:	It was possible to obtain a sufficient amount of tumour DNA of the required quality, and the sequencing of the PCR product yielded evidence of a mutation in this gene.

Application notes PT ... on request.

Features of SONOPULS ultrasonic homogenizers

AMPLICHRON®-system
guarantees a constant amplitude independently from changing conditions within the sample - for reproducible results. Settings within a range of 10 to 100 % are possible. Verification of actual value at the display. Permanent control of ultrasound irradiation as well as indication of wear of the probe.

Pulsation
limits temperature increase when processing heat-sensitive samples. The adjustable pulsation allows cooling during rest intervals.

Continuous operation
Constant sound radiation – extremely effective.

Switching ON / OFF - easy to handle
either at the generator or directly at the ultrasonic converter via button or remote control.

Integrated timer
Duration of sonication storable. Indication of elapsed time during continuous operation or of remaining time in count-down mode.

Foil keypad

Fail-safe during continuous operation and idling

CE-marked, also as medical device compliant to the directive for in-vitro diagnostics 98/79/EG

Type / Features	mini20	HD 2000 series	HD 3000 series	HD 4000 series
Application	for small volumes	for lab routine	for research and technology	for research
Sample volume	0.1 – 25 ml	1 – 1000 ml	1 – 2500 ml	0.5 – 250 ml
Ultrasonic converter	1	1	1	2, optionally
Amplitude control	10 – 100 %	10 – 100 %	10 – 100 %	10 – 100 %
Power control	yes (HF power)	no	yes (HF power)	yes (HF power)
Automatic amplitude limiting	yes	no	yes, after preselection of probe	yes, after preselection of probe
Pulsation	ON cycles 0.1 – 60 s OFF cycles 0.2 – 60	10 – 100 % – storable (duty cycle, base 1 sec)	ON cycles 0.2 – 600 s OFF cycles 0.3 – 600 s	ON cycles 0.2 – 600 s OFF cycles 0.3 – 600 s
Time modes	50 min: 59 s	99 min: 59 s continuous or timed	9 h: 59 min: 59 s continuous or timed	9 h: 59 min: 59 s continuous or timed
Safety shut down	50 min: 59 s	no	9 h: 59 min: 59 s	9 h: 59 min: 59 s
Display	alphanumeric liquid crystal display of amplitude, pulsation mode, time, energy	numerical seven-segment display of amplitude, pulsation mode and time	alphanumeric liquid crystal display of amplitude, pulsation mode, time, energy, temperature	alphanumeric liquid crystal display of amplitude, pulsation mode, time, energy, temperature
Menu guided	comfortable setting of all values through „push & turn"	no	comfortable setting of all values through „push & turn"	yes (keys)
Energy monitoring	in kJ	no	in kJ	in kJ
Temperature monitoring and measurement	no	no	optional, 0 to 120 °C, temperature probe necessary, optional signal tone or switch - off	optional, -20 to 100 °C, temperature probe necessary, optional signal tone or switch - off
Remote control with PC	RS 232 (infrared)	no	RS 232 (infrared)	RS 232
PC-Software, optionally available	no	no	WINPULS®	WINPULS®
Error diagnosis	yes	no	yes	yes
Processing frequency	30 kHz	20 kHz	20 kHz	20 kHz
Program storage	yes, 9	no	yes, 9	yes,9
Operating test	yes	no	yes	yes
Remote control	no	foot switch	foot switch	foot switch
Mains connection	115 V~/230 V~ (±10 %), 50/60 Hz, automatic voltage detection	230 V~ (±10 %), optionally with voltage selector 115 V~ (±10 %), 50/60 Hz	230 V~ (±10 %), optionally 115 V~ (±10 %) except HD 3400, 50/60 Hz	230 V~ (±10 %), optionally 115 V~ (±10 %), 50/60 Hz

How to select the proper unit
Power output in watt is not the sole criterion for selecting an ultrasonic homogenizer. This value only indicates the power of the HF-generator but not the energy delivered to the sample. The amplitude at the radiating surface of the probe is the determining factor for the evaluation of the irradiation result while taking into consideration the volume of the sample.

Principle of operation SONOPULS of ultrasonic homogenizers

HF generator:
Transforming of low-frequency voltage of 50 Hz into high-frequency voltage of 20 kHz.

Ultrasonic converter:
Transforming of electrical voltage delivered from the generator into mechanical vibrations of 20 kHz.

Standard and booster horns:
Increasing of amplitude by their specially designed shape.
The external thread is made for close connection of vessels.

Probes:
Transmitting of ultrasonic energy into the sample.
Microtips, tapered and flat tips dia. e. g. 2, 3, 6, 13, 19 or 25 mm for use in different volumes.
Material: Ti-Al6-V4

SONOPULS mini20

Special unit for small volumes

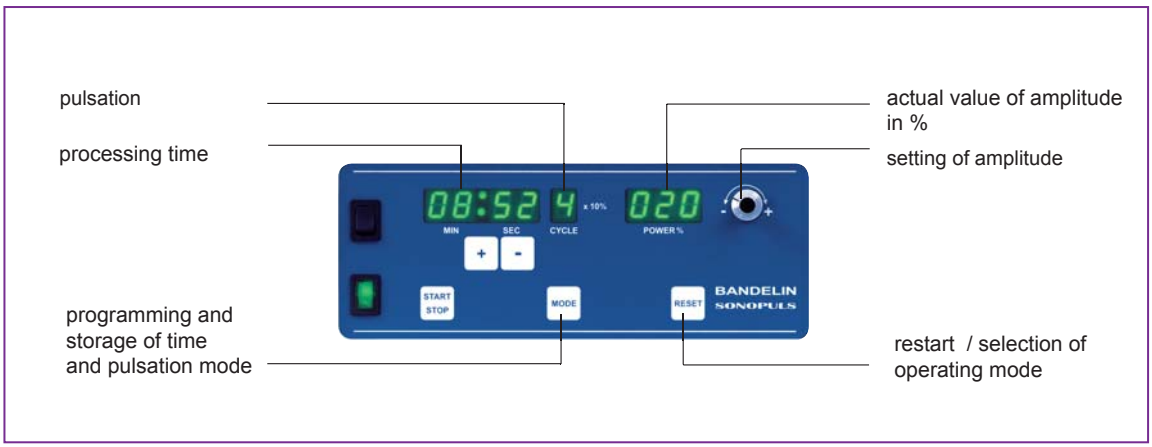
SONOPULS mini20 for volumes up to 25 ml
Ready-to-operate for volumes from 0.5 ml to 25 ml, consisting of: • HF generator mini20 • ultrasonic converter mini20 • microtip MS 2.5, diameter 2.5 mm
HF output max. 20 W_{eff} Code No. 3665

Pulsation on pressing the bottom at the ultrasonic converter by thumb.

HF generator		**GM mini20**
dimensions, l × w × h	mm	250 × 256 × 154
weight	kg	2.0
converter		**UW mini20**
dimensions, dia. × l	mm	50 × 160
weight	kg	0.27
available titanium probes, dia.	mm	1.5, 2.0, 2.5

Simple standard unit for lab routine

Operating panel ultrasonic homogenizers SONOPULS HD 2070 / HD 2200



SONOPULS HD 2070
for volumes up to 200 ml

Ready-to-operate basic equipment for volumes from 2 ml to 50 ml consisting of:
- HF generator GM 2070
- ultrasonic converter UW 2070
- standard horn SH 70 G
- microtip MS 73, dia. 3 mm

HF output max. 70 W_{eff}
Code No. 2450

SONOPULS HD 2200
for volumes up to 1000 ml

Ready-to-operate basic equipment for volumes from 20 ml to 900 ml consisting of:
- HF generator GM 2020
- ultrasonic converter UW 2200
- booster horn SH 213 G
- titanium flat tip TT 13, dia. 13 mm

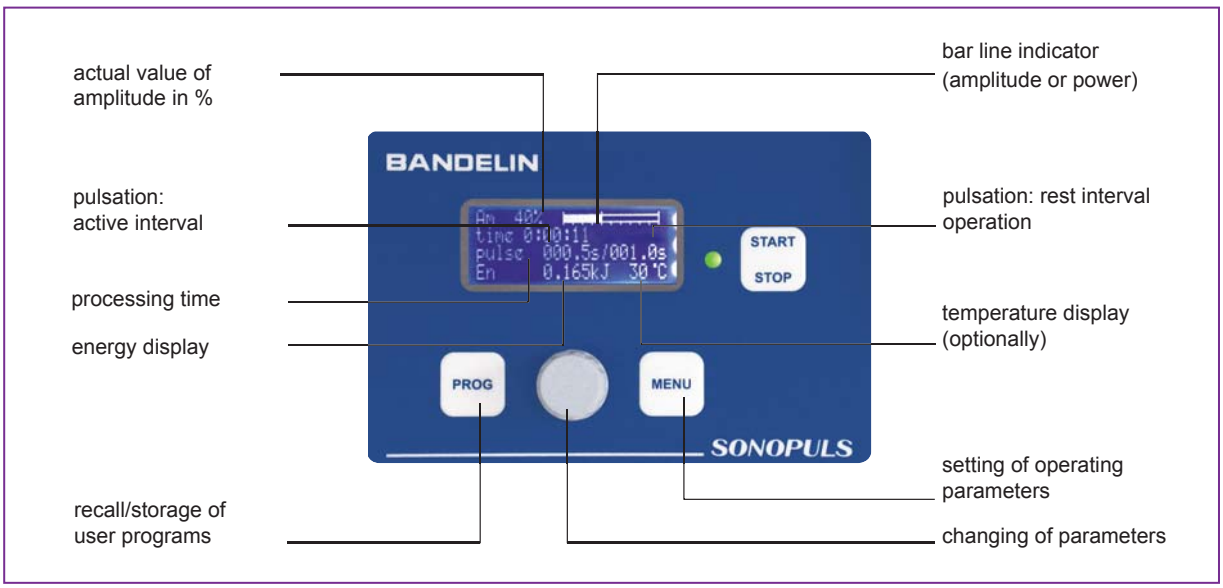
HF output max. 200 W_{eff}
Code No. 2530

HF generator		**GM 2070**
dimensions, l × w × h	mm	257 × 180 × 115
weight	kg	2.5
converter		**UW 2070**
dimensions, dia. × l	mm	70 × 150
weight	kg	1.0
available titanium probes, dia.	mm	2, 3, 6, 13

HF generator		**GM 2200**
dimensions, l × w × h	mm	257 × 180 × 115
weight	kg	2.5
converter		**UW 2200**
dimensions, dia. × l	mm	70 × 150
weight	kg	1.0
available titanium probes, dia.	mm	2, 3, 6, 13, 19, 25

Units with extended functionality for research and pilot plant stations

Operating panel ultrasonic homogenizers SONOPULS HD 3100 / HD 3200 / HD 3400



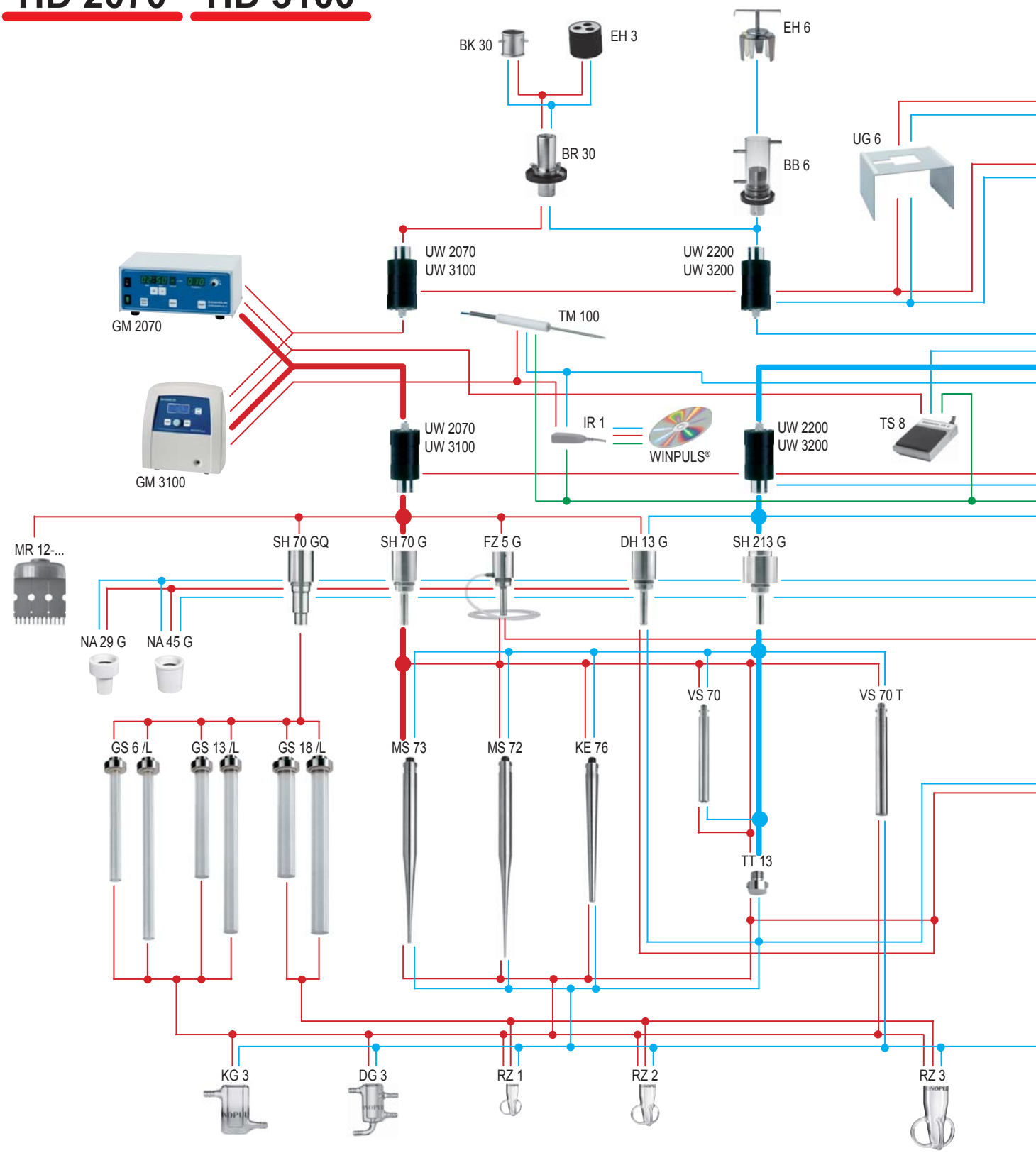
SONOPULS HD 3100 for volumes up to 200 ml	**SONOPULS HD 3200** for volumes up to 1000 ml	**SONOPULS HD 3400** for volumes up to 2500 ml
Ready-to-operate for volumes from 2 ml to 50 ml, consisting of: • HF generator GM 3100 • ultrasonic converter UW 3100 • standard horn SH 70 G • microtip MS 73, dia. 3 mm	Ready-to-operate for volumes from 20 ml to 900 ml, consisting of: • HF generator GM 3200 • ultrasonic converter UW 3200 • booster horn SH 213 G • titanium flat tip TT 13, dia. 13 mm	Ready-to-operate for volumes from 100 ml to 2500 ml, consisting of: • HF generator GM 3400 • ultrasonic converter UW 3400 • booster horn SH 3425 • extended probe VS 200 T, dia. 25 mm
HF output max. 100 W_{eff} Code No. 3680	HF output max. 200 W_{eff} Code No. 3660	HF output max. 400 W_{eff} Code No. 3690

HF generator		**GM 3100**
dimensions, l × w × h	mm	250 × 256 × 154
weight	kg	2.0
converter		**UW 3100**
dimensions, dia. × l	mm	70 × 150
weight	kg	1.0
available titanium probes, dia.	mm	2, 3, 6, 13

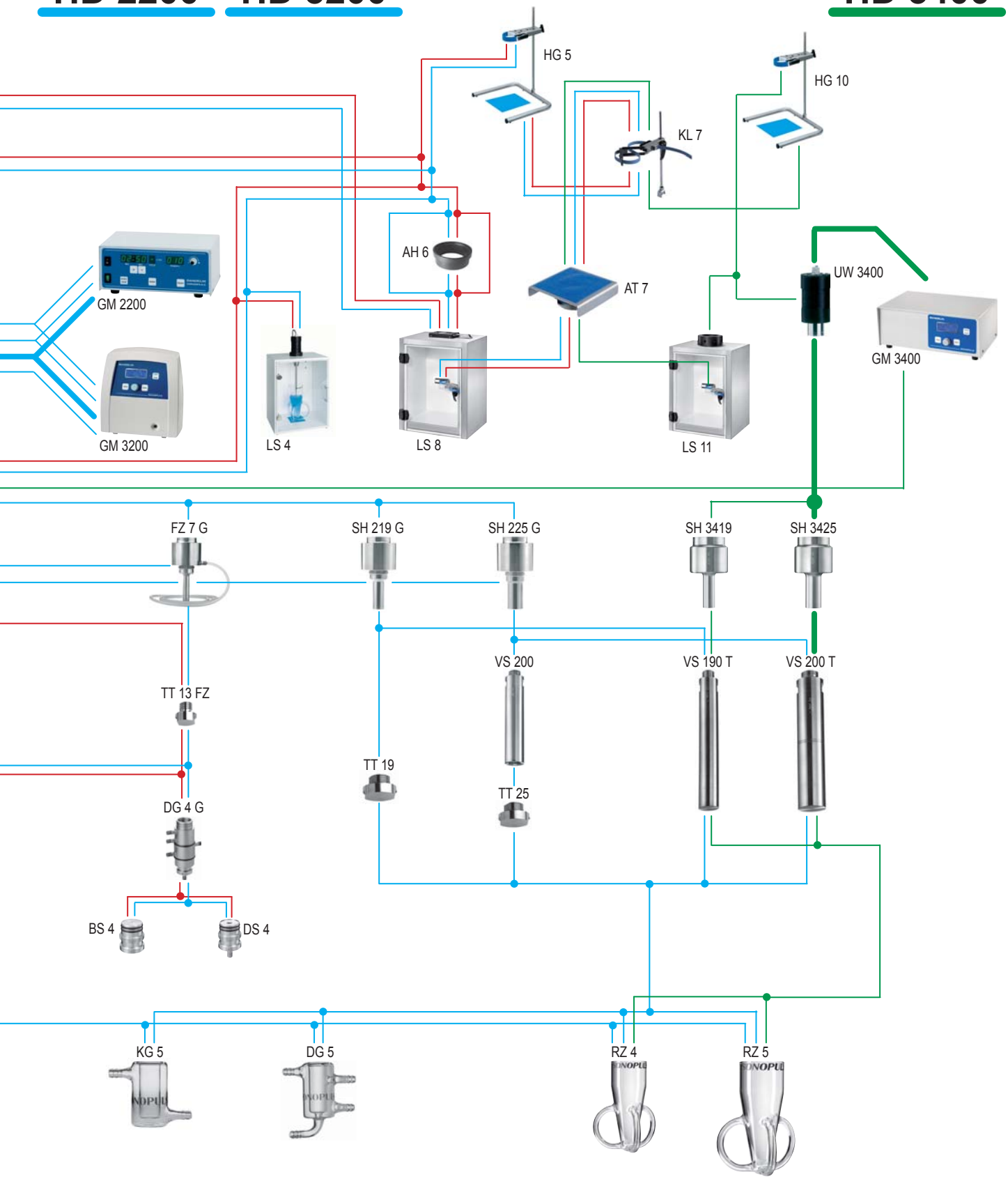
HF generator		**GM 3200**
dimensions, l × w × h	mm	250 × 256 × 170
weight	kg	2.7
converter		**UW 3200**
dimensions, dia. × l	mm	70 × 150
weight	kg	1.0
available titanium probes, dia.	mm	2, 3, 6, 13, 19, 25

HF generator		**GM 3400**
dimensions, l × w × h	mm	324 × 230 × 131
weight	kg	3.1
converter		**UW 3400**
dimensions, dia. × l	mm	90 × 180
weight	kg	2.2
available titanium probes, dia.	mm	19, 25

HD 2070 HD 3100

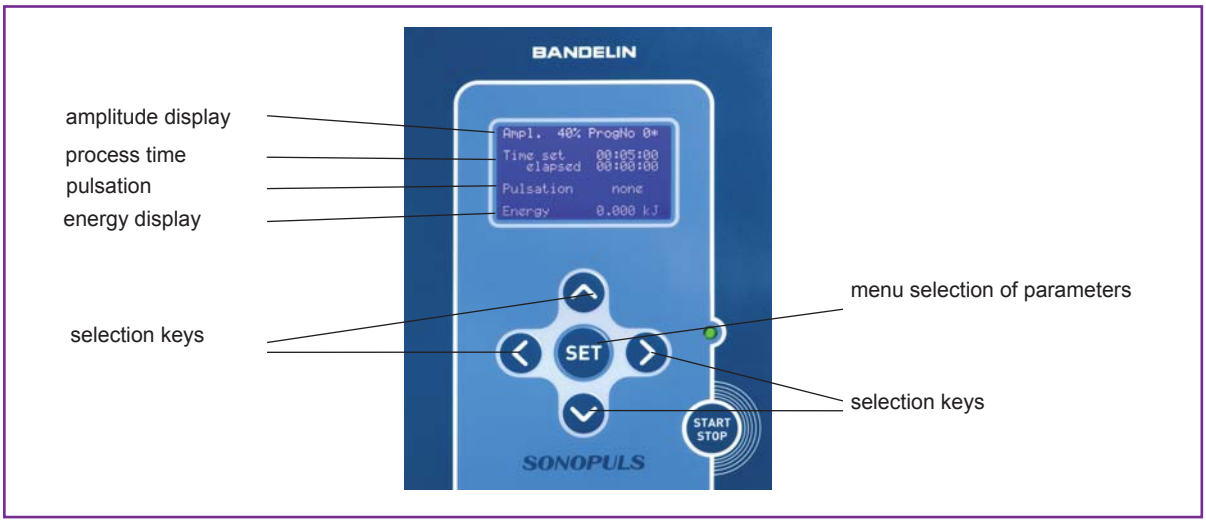


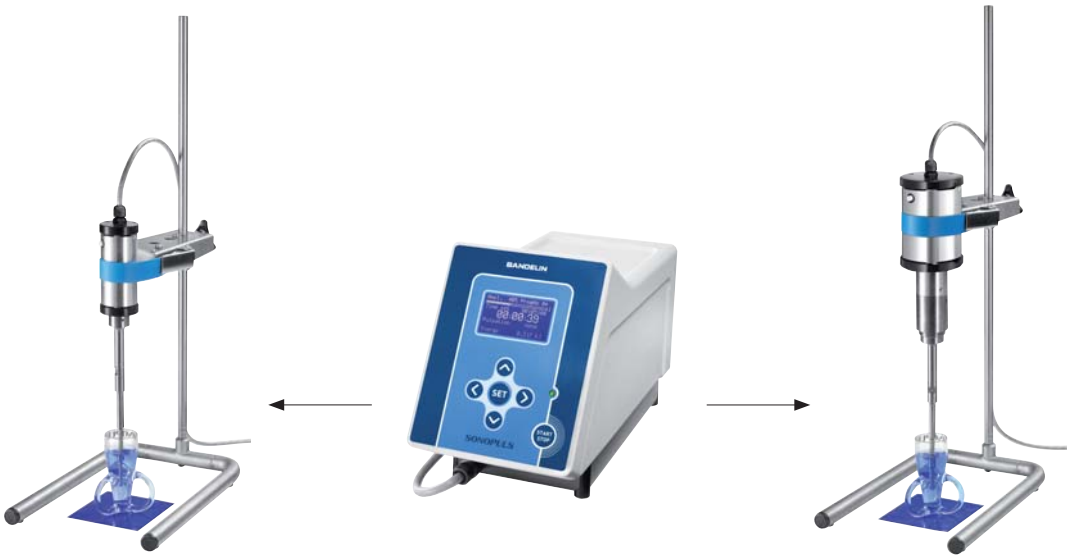
HD 2200 HD 3200 HD 3400



New technology for lab routine

Operating panel ultrasonic homogenizers SONOPULS HD 4050 / HD 4100





SONOPULS HD 4050
for volumes up to 100 ml

Ready-to-operate basic equipment for volumes from 0,5 ml to 100 ml consisting of:
- HF generator GM 4100
- ultrasonic converter UW 50
- titanium probe TS 102, dia. 2 mm

HF output max. 50 W_{eff}
Code No. 4050

SONOPULS HD 4100
for volumes up to 250 ml

Ready-to-operate basic equipment for volumes from 2 ml to 250 ml consisting of:
- HF generator GM 4100
- ultrasonic converter UW 100
- standard horn SH 100 G
- titanium probe TS 103, dia. 3 mm

HF output max. 100 W_{eff}
Code No. 4100

HF generator		**GM 4100**
dimensions, l × w × h	mm	150 × 220 × 335
converter		**UW 50**
dimensions, dia. × l	mm	45 × 175
available titanium probes, dia.	mm	2, 3, 4.5

HF generator		**GM 4100**
dimensions, l × w × h	mm	150 × 220 × 335
converter		**UW 100**
dimensions, dia. × l	mm	70 × 150
available titanium probes, dia.	mm	2, 3, 4.5

GM 4100

UW 50

UW 100

HG 5

LS 4

LS 8

SH 100 G

TS 102

TS 103

TS 104

KG 3

DG 3

RZ 1

RZ 2

RZ 3

SONOPULS Applications

Applicaton notes

5119i General information on ultrasonic homogenizers
5169b Power determination
5159i Life span of probes

Ultrasonic homogenizers are used in laboratories, hospitals and in industry for scientific experiments and analysis as well as in pilot or small lot production. Here are some examples showing the vast variety of applications for ultrasonic homogenizers:

Typical areas of application

- Disruption of cells, bacteria, virus, tissue, also mixed tissue e. g. for extraction of cell contents
- Emulsifying of hardly mixable liquids, e.g. oil and water, particle size in µm range
- Deagglomeration of nanoparticles in material research (nanostructurized material) in medicine, biotechnology, automobile industry
- Acceleration of chemical reactions
- Production of dispersions

Analysis

- Preparing samples for grain size determination or environmental analysis: **HD 3200** or **HD 2200** with tapered tip **KE 76** or with extended probe **VS 70 T**.
- Homogenizing of cheese samples for determination of nitrates: **HD 3200** or **HD 2200** with **MS 73**

Biochemistry − Biology − Medicine

- Sonication of small high-quality samples for analysis like EIA or RIA: **HD 3100** and HD 2070 with microtip **MS 72** or **MS 73**.
- Due to high amplitudes, disruption of high-resistant bacteria, cells or tissues is possible. Indirect processing of sample in cup booster **BR 30** or in cup horns **BB 6** is recommended to avoid cross-contamination.
- Detection of prions by cyclic amplification of protein misfolding: **HD 2070** with **MS 73**
- Simultaneous sonication of 12 samples in microplates: **HD 3100** with MR 12-2

Chemistry and Sonochemistry

- Acceleration of chemical reactions or destroying of highly-molecular compounds: **HD 3200** or **HD 2200** with tapered tip **KE 76** and sleeve adapters **NA 29 G** or **NA 45 G** for tight fitting to a sonochemical reaction vessel.

Pharmacy − Cosmetics

- Production of larger volumes of long lasting emulsions, e. g. lotions and production of antigens, vaccines or liposomes: **HD 3200** or **HD 2200** with flow-through cell **DG 4 G**

General overview

5469b Applications - overview
5299b Food sector

Professional hints

Molecular Biology - Microbiology − Pharmacy − Medicine

B-101 Protein extraction
B-102 Yeast cells
B-103 Procurement of stroma-free haemolysate / paternity test
B-104 Muscle and pulmonary tissue from mice - homogenization for RNA isolation
B-106 Liposomes - producing SLV (unilamellar liposomes) by disintegration of MLV (multilamellar liposomes)
B-109 Homogenization of pulp of sugar beet, for cell disruption
B-110 Replication of infectious prions - process acceleration via ultrasound
B-111 Tissue disruption generally
B-112 Tissue disruption of e. g. aorta, liver, stomach, bowel, lung
B-121 Escherichia coli
B-124 DNA / fragmentation
B-125 Enterobacter

Sample preparation for analysis

C-105 Cellulose samples
C-106 Sediments of water samples / disagglomeration
C-108 Dispersing of solid particles (Al_2O_3, SiO_2)
C-113 Sample preparation for grain size analysis

Sample preparation for analytics in the area of environment

U-101 Sewerage samples / homogenizing
U-102 Soil samples / homogenizing
U-103 Produzing of ceramic slurry
U-104 Soil samples / fertiliser recommendation

Listed application notes as well as professional hints on request: info@bandelin.com

Probes
for connection to standard and booster horns

made of titanium alloy (Ti-Al6-V4) transmit mechanical longitudinal waves into the sample. They are thermo-resistant, can be treated in autoclaves and are resistant to corrosive media. Sample volume, diameter of the processing vessel and the required amplitude determine the selection of the unit and the type of probe.
The higher the amplitude, the more intense the sonication.
Titanium flat tips TT 13, TT 19 and TT 25 are used for sonication of medium sized samples.
Extended probes VS 70 T / VS 190 T / VS 200 T are especially used for treatment of ceramic suspensions or for sample preparation for following grain size determination.
Probes achieve an enhanced amplitude caused by their configurations. This is followed by highest ultrasonic power density in liquids.
These probes are used for special tasks in laboratories like for cell and bacteria disruption in biology or acceleration of reactions in chemistry.

Probes subject to wear and tear.
We recommend to order spare probes when purchasing the homogenizer.

Probes for SONOPULS mini20

MS 1.5 M S 2.0 MS 2.5

Probes for SONOPULS 4000 series

TS 102 TS 103 TS 104

Description		Microtips					Titanium probes		
Type		MS 1.5	MS 2.0	MS 2.5	MS 72	MS 73	TS 102	TS 103	TS 104
Code No.		3639	3654	3652	492	529	3740	3741	3742
Diameter	mm	1.5	2.0	2.5	2	3	2	3	4.5
Length* approx.	mm	64	59	55	191	175	145	135	130
Standard horn for HD 2070/3100 Booster horn for HD 2200/3200 Booster horn for HD 3400		- - -	- - -	- - -	SH 70 G SH 213 G -	SH 70 G SH 213 G -	- - -	- - -	- - -
Amplitude for HD 2070/3100 Amplitude for HD 2200/3200 Amplitude for HD 3400 Amplitude for mini20 Amplitude for HD 4050/4100	μm_{ss} (peak to peak)	- - - 65 -	- - - 70 -	- - - 72 -	253 / 285 282 / 286 - - -	212 / 245 302 / 308 - - -	- - - - 180/280	- - - - 150/250	- - - - 125/230
Volume HD 2070/3100	ml	-	-	-	1–25	2–50	-	-	5–100
Volume HD 2200/3200	ml	-	-	-	2–30	5–90	-	-	10–350
Volume HD 3400	ml	-	-	-	-	-	-	-	-
Volume mini20	ml	0.1–10	0.25–20	0.5–25	-	-	-	-	-
Volume HD 4050/4100	ml	-	-	-	-	-	0.5-20/2-25	1-25/3-50	3-50/5-75
Vessel diameter (minimum)	mm	4	6	6	4	6	4	6	8

*Probe length may vary slightly due to the variations in the titanium material.

Probes
for SONOPULS HD 2000- und 3000 series

MS 72 MS 73 KE 76 VS 70T VS 190 T VS 200 T TT 13 TT 19 TT 25

Description		Tapered tip	Extended probes			Titanium flat tips		
Type		KE 76	VS 70 T	VS 190 T	VS 200 T	TT 13	TT 19	TT 25
Code No.		530	494	3638	478	497	491	532
Diameter	mm	6	13	19	25	13	19	25
Length* approx.	mm	135	130	130	130	5	5	6
Standard horn for HD 2070/3100 Booster horn for HD 2200/3200 Booster horn for HD 3400		SH 70 G SH 213 G -	SH 70 G SH 213 G -	- SH 219 G SH 3419	- SH 225 G SH 3425	SH 70 G SH 213 G -	- SH 219 G -	- SH 225 G -
Amplitude for HD 2070/3100 Amplitude for HD 2200/3200 Amplitude for HD 3400 Amplitude for mini20	μm_{ss} (peak to peak)	165 / 191 249 / 255 -	80 / 97 153 / 170 -	- 73 / 81 116	- / - 46 / 51 82	78 / 93 149 / 165 -	- / - 73 / 81 -	- / - 48 / 53 -
Volume HD 2070/3100	ml	5–100	10–200	-	-	10–200	-	-
Volume HD 2200/3200	ml	10–350	20–900	25–900	30–1000	20–900	25–900	30–1000
Volume HD 3400	ml	-	-	500–1500	500–2500	-	-	-
Vessel dia. (minimum)	mm	8	17	23	29	17	23	29

*Probe length may vary slightly due to the variations in the titanium material.

Probe extension

for enlarging the operating depth when using flat tips.

VS 70 between SH 70 G / 213 G and TT 13
VS 200 between SH 225 G and TT 25

VS 70 VS 200

	Probe Extensions	
Type	**VS 70**	**VS 200**
for HD	2070 / 2200 3100 / 3200	2200 / 3200
Code No.	500	415

Silica glass probes

for connection to HD 2070/3100 with special horn SH 70 GQ.
For application in food analysis, pharmacy or environmental analysis. No intrusion of metal particles or boron compounds - ideal for trace analysis.
High chemical and temperature shock resistance, no electric conductivity.

SH 70 GQ

GS 13 GS 6

Description		Silica glass probes					
Type		GS 6	GS 6 L	GS 13	GS 13 L	GS 18	GS 18 L
Code No.		024	048	028	050	040	054
Diameter	mm	6		13		18	
Length approx.	mm	145	290	145	290	145	290
Standard horn for HD 2070/3100		SH 70 GQ		SH 70 GQ		SH 70 GQ	
Amplitude for HD 2070/3100	μm_{ss} (peak to peak)	13 / 13		13 / 13		13 / 13	
Volume HD 2070/3100	ml	2–100		25–200		25–500	
Vessel dia. (minimum)	mm	10		17		22	

Standard and Booster horns • Adapters

Standard and booster horns

(Ti-Al6-V4) are furnished with a thread for replaceable probes. With exterior thread (except SH 3419, SH 3425) to connect various vessels.

SH 70 G SH 100 G SH 213 G SH 219 G SH 225 G SH 3419 SH 3425

Flow-through standard and booster horns

(Ti-6Al-4V)

To prepare stable mixtures of non-mixable or hardly mixable liquids (oil-in-water) by direct intrusion of pre-mixed samples into the cavitation field.

In combination with flow-through cell DG 4 G, the continuous treatment of 2 different media and parallel tempering is possible.

FZ 5 G FZ 7 G

	Standard horn		Booster horns					Flow-through standard horn	Flow-through booster horn
Type	**SH 70 G**	**SH 100 G**	**SH 213 G**	**SH 219 G**	**SH 225 G**	**SH 3419**	**SH 3425**	**FZ 5 G**	**FZ 7 G**
for HD	2070 / 3100	4050 / 4100	2200 / 3200			3400		2070 / 3100	2200 / 3200
Code No.	486	3731	527	3647	3634	3679	3692	490	452

Adapters

Sleeve adapters made of PTFE for tight mounting of standard ground glass vessels.

NA 29 G for NS 29/32 für SH 70/213 G

NA 45 G for NS 45/40 für SH 70/213/219/225G

NA 29 G NA 45 G

	Sleeve adapters	
Type	**NA 29 G**	**NA 45 G**
for HD	2070 / 2200 / 3100 / 3200	
Code No.	540	487

MULTISON® ultrasonic probe

Patent DE 10 2005 022 179

for connection to HD 2070/3100.

Composed of Multison horn MRH 12 and 12 Multison tips MRS 2, MRS 3 or MRS 2-2C . For irradiation of samples in microplates and deep well plates. Simultaneous sonication of 12 samples.

Multison tips individually replaceable.

	Multison probe consisting of Mulitison horn with 12 tips			Multison tips		
Type	**MR 12-2**	**MR 12-2C**	**MR 12-3**	**MRS 2**	**MRS 3**	**MRS-2C**
Diameter, mm	2	2	3	2	3	2
Length, mm				16		
Code No.	3626	3643	3633	3628	3629	3642

Processing vessel made of stainless steel

DG 4 G for high-volume flow-through processing like emulsifying, dispersing or homogenizing, up to 50 l/h, overpressure < 2 bar.
The sample can be repeatedly sonicated in circulation.
For connection to SH 70 G or SH 213 G with TT 13, DH 13 G.

KG 4 G, closed vessel with cooling jacket.
Processing volume about 65 ml.


DG 4 G

	Flow-through processing vessel	Cooling vessel
Type	**DG 4 G**	**KG 4 G**
for HD	2070 / 2200 3100 / 3200	2070 / 2200
Code No.	3608	3609

Processing vessels made of glass

Rosett cell RZ
optimal homogenous and intense circulation of liquids caused by the shape of the vessel and its 3 sidearms

Cooling vessel KG
for sonication of temperature-sensitive samples.
The cooling jacket allows circulation of cooling liquid during sonication.

Flow-through vessel DG
with cooling jacket for irradation of larger volumes. The cooling jacket allows circulation of cooling liquid during sonication.

RZ 3

Intensity distribution
(distance between probe tip KE 76 and vessel bottom = 3 cm)
Reference: Beuth Hochschule Berlin


KG 3


DG 3

	Cooling vessels		Flow-through vessels		Rosett cells				
Type	**KG 3**	**KG 5**	**DG 3**	**DG 5**	**RZ 1**	**RZ 2**	**RZ 3**	**RZ 4**	**RZ 5**
for HD	2070 / 2200 3100 / 3200 4050 / 4100	2200 3200	2070 / 2200 3100 / 3200 4050 / 4100	2070 / 2200	2070 / 2200 / 3100 / 3200 / 4050 / 4100			2200 / 3200 / 3400	
Volume, ml	15	70	max. 5.6 l/H	max. 30 l/h	25	40	110	390	660
interior dia., mm	20	35	20	53	30	42	50	75	90
depth, mm	65	95	65	95	85	100	135	202	243
Code No.	536	481	538	482	3606	3607	522	3256	483

Processing vessels for indirect processing

Sonication of smallest samples without any probe intrusion into the sample and no cross-contaminationn

Cup horn BB 6
The cup horn is equipped with inlet and outlet for circulation of cooling liquid. Also useable for direct sonication.

Microtube holder EH 6
for simultaneous treatment of up to 6 samples. A mixing of samples is excluded due to markings at the holder.

Cup booster BR 30
High-intensive irradiation, of e. g. radioactive seeds or bacteria as well as for flow-through sonication. The cup booster is equipped with inlet, outlet and overflow. Either cooling or flow-through processing are possible.

Microtube holder EH 3
for simultaneous treatment of up to 3 samples.
2 exchangable discs with hole diameters 8.5 or 11.5 mm.

Cup booster BK 30
for intensive cleaning of small parts, e. g. cleaning of radioactively contaminated seeds.


EH 6

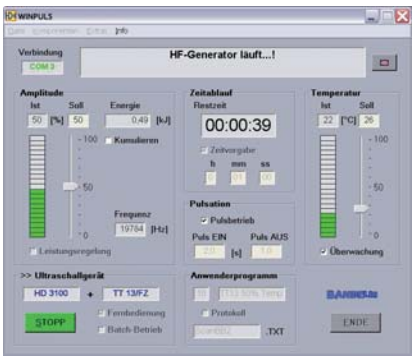

BB 6


EH 3
BK 30
BR 30

Type	BB 6	EH 6	BR 30	BK 30	EH 3
for	2200 / 3200	2200 / 3200	2070 / 2200 3100 / 3200	BR 30	BR 30
Code No.	3605	059	082	098	078

WINPULS® remote control

For process control with PC for operation systems MICROSOFT® WINDOWS® 2000 and MICROSOFT® WINDOWS® XP. With different additional functions like test logging and comfortable data storage (up to 99 storages).
Set composed of WINPULS® software and infrared adapter IR 1 for interface RS 232



Type	WINPULS® software with infrared adapter IR 1
for HD	3100 / 3200 / 3400
Code No.	3625

Foot switch remote control

for easy switching ON/OFF of the HF generator.
With 3 m connection cable.


TS 8

Type	TS 8
for HD	2070 / 2200 3100 / 3200 / 3400
Code No.	531

Temperature sensor

for measuring the sample temperature from 0 up to 120 °C.
Sensor diameter: 4 mm


TM 100

Type	TM 100
for HD	3100 / 3200 / 3400 / 4050 / 4100
Code No.	3622

Stand

Stainless steel stand
with lab clamp and non-slip mat to hold processing vessels securely in place

Clamp KL 7
(DE 20 2006 005 654)
for HG 5 / HG 10 with rod and swivelling clamp for reaction vessels dia. 15 mm to dia. 100 mm

Supporting table AT 7
suitable for KL 7 or in LS 8 with non-slip mat to hold sample vessels securely in place

HG 5
with clamp KL 7
and supporting table AT 7

Type	HG 5	HG 10	KL 7	AT 7
for	2070 / 2200 3100 / 3200 4050 / 4100	3400	HG 5 HG 10	KL 7 LS 8
Code No.	459	3646	3636	3644

Sound proof boxes

reduce the noise level considerably. Precut holes at the backside allow connections for gas supply and flow-through processing. Acrylic door permits process monitoring.

LS 4 Plastic coated walls, 10 dB-AU damping.

LS 8 made of stainless steel, with damping material.
20 dB-AU damping.
The damping material is water resistant – easy cleaning.
With rod, swivelling clamp and clamp for height adjustment of sample vessels.
Clamping belt for safe fixing of sample vessels with different sizes.
Also applicable for sonication of samples in glass vessels with round bottoms or with inlets from below.
Special support UG 6 is available for inverted position of the box during indirect sonication with cup horn BB 6 or cup booster BR 30.
Ultrasonic converter is fixed safely through a special clamp.

LS 11 made of stainless steel with damping material, 20 dB-AU damping. The damping material is water resistant, easy cleaning.
Distance tube for direct processing with long probes.

AH 6 for MS 72/73, KE 76, VS 70 with TT 13, VS 200 mit TT 25 / VS 200 T, VS 70 T, GS ...

BD 8 damping material for sound proof boxes

AH 6

LS 4

LS 8 with UG 6

LS 8

Type	LS 4	LS 8	LS 11	UG 6	AH 6	BD 8
for	2070 / 2200 3100 / 3200 4050 / 4100	2070 / 2200 3100 / 3200 4050 / 4100	3400	2070 / 2200 3100 / 3200	LS 8	LS 8 LS 11
dB-AU damping	10	20	20	-	-	-
Code No.	416	3653	3663	3616	3619	3661

V⊙RTEX® reactor for use in process engineering

SONOREX TECHNIK V⊙RTEX® Reactor

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
- CO_2 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)

Bundesministerium für Bildung und Forschung

WR 4-1503.01

Ready-to-operate Wirbelreaktor WR
consisting of:
Vortex reactorbloc WB and HF generator LG

Ultrasonic-UV-Reactor for use in process aquaculture, water treatment and sewerage desinfection

SONOREX TECHNIK Ultrasonic-UV-Reactor

gefördert durch DBU Deutsche Bundesstiftung Umwelt

Applications

- Killing of germs and parasites in the circulation water of aquaculture systems (fish and ornamental fish farming, leech farming)
- Disinfection (killing of bacteria) during water and sewerage treatment

UV 5-1002.05

Ready-to-operate Ultraschall-UV-Reaktor
consisting of:
Ultrasonic-UV Reactorbloc AQ and
HF UV generator LG

SONOBLOC® for use in process engineering and cleaning

SONOREX TECHNIK Tube Reactor SONOBLOC®

Bundesministerium für Bildung und Forschung

Applications

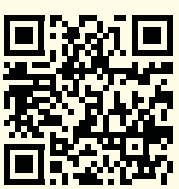
- Ultrasonic intensive treatment of flexible fibrous products and wire or band-shaped endless profiles
- Support of industrial and biotechnological processes in cleaning, disintegrating, degassing and disagglomerating
- Efficient cleaning by removing grease, oil, emulsions and/or crack residues with single- and multiple-wire cleaning
- CO_2 degassing of aqueous reactants
- Support of disinfection (bacterial elimination) in water and wastewater treatment
- Acceleration of disintegration and/or decomposition of organic material to increase the yield of biogas and in treatment of sludge
- Support of disinfection of bacteria- and parasite-burdened fishbreeding circulating waters
- Dispersing of solid particles in liquids (medicine production)

SB 8-1002.01

Ready-to-operate Rohrreaktor SB
consisting of:
Tube reactorbloc RB and HF generator LG

Technical Data	Vortex reactorbloc – WB			Ultrasonic-UV-Reactor	Tube reactorbloc – RB	
Type	**WB 4-1402**	**WB 4-1503**	**WB 4-1604**	**UV 5-1002.05**	**RB 8-1002**	**RB 8-1004**
Flow-through rate	1 – 50 l/min			3.5 — 50 l/min	1 – 100 l/min	
Internal pressure, max.	10 bar			2 bar (UV-lamp)	10 bar	
Solid particles	< 5 mm			< 5 mm	-	
Power density, max.	480 W/l	520 W/l	550 W/l	~ 420 W/l	500 W/l	
Power, max.	1400 W	1500 W	1600 W	1000 W	1000 W	
Frequency	25 kHz	25 und 40 kHz	40 kHz	25 kHz	25 kHz	40 kHz
Radiation power UV-C (254 nm)	-			16.000 h Decrease of intensity < 15 %	-	
Tube material dimensions	stainless steel AISI 316 Ti dia. 139.7 × 2.6 mm; dia. 104 × 2 mm			stainless steel AISI 316 Ti dia. 88.9 × 3.6 mm; dia. 48.3 × 2 mm	stainless steel AISI 316 Ti dia. 60.3 × 3.6 mm	
Housing dimensions (l × w × h)	290 × 290 × 642 mm			895 × 895 × 1000 mm	260 × 150 × 990 mm	
Weight, net	approx. 50 kg			approx. 55 kg	approx. 35 kg	
HF generator (separate)	LG 1510 T	LG 2002 T		LG 1001 T-UV	LG 1001 T	

Seprate documentation on request.



58720 GB/2014-03

All units are CE marked.
Illustrations exemplarily, not to scale

Subject to technical alterations without notice.
Decoration products are not included in delivery.

The general delivery terms apply.

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65 years of experience in ultrasound

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