SONOPULS

Ultrasonic Homogenizers

Sonochemistry — Emulsifying — Homogenizing

Cell disruption — Suspending

Accelerating Reactions

BANDELIN

60 Years of Experience in Ultrasound Technology

Features

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

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

Continuous operation
Constant sound radiation- extremely effective

Built-in timer
Process duration storable. Indication of elapsed time in continuous operation or of remaining time in countdown mode.

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

Accessories
A wide range of probes and special accessories for a vast variety of applications

Foil keypad
easy to clean and user-friendly

ROHS compliant
Devices are built lead free.

Fail-safe during continuous operation and idling

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

Features	mini20	HD 2000 series	HD 3000 series
Samples volumina	0,1 – 25 ml	1 – 1000 ml	1 – 2500 ml
Amplitude control	10 – 100 %	10 – 100 %	10 – 100 %
Power control	yes (HF power)	no	yes (HF power)
Automatic amplitude limiting	yes	no	yes, after preselection of probe
Pulsation	ON cycles 0,1 – 60 s OFF cycles 0,2 – 60 s	10 – 100 % – storable (duty cycle, base 1 sec)	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
Safety shut down	50 min: 59 s	no	9 h: 59 min: 59 s
Display	grafic / alphanumeric liquid crystal display of amplitude, pulsation mode, time, energy	numerical seven-segment display of amplitude, pulsation mode and time	grafic / alphanumeric liquid crystal display of amplitude, pulsation mode, time, energy and optionally temperature
Menu guided	comfortable setting of all values through „push & turn	no	comfortable setting of all values through „push & turn
Energy monitoring	in kJ	no	in kJ
Temperature monitoring and measurement	no	no	optional, 0 – 120 °C, temperature probe necessary, optional signal tone or switch - off
user programs	9	1	9, with software WINPULS®: 99
Remote control with PC	RS 232 (infrared)	no	RS 232 (infrared)
PC-Software, optionally available	no	no	WINPULS®
error diagnosis	yes	no	yes
Processing frequency	30 kHz	20 kHz	20 kHz
Automatic storage of the last adjusted values	yes	no	yes
Operating test	yes	no	yes
Remote control	no	foot switch	foot switch

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.

Equipment

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

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

Standard and booster horns:
Horns increase the 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. 2, 3, 6, 13, 19 and 25 mm, for use in different volumes.

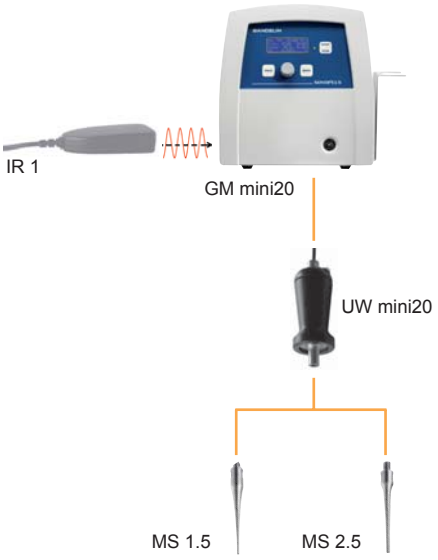
SONOPULS mini20

SONOPULS mini20
for volumes up to 25 ml

Fast hand operation
Ready-to-operate for volumes from 0,5 ml to 25 ml, consisting of HF generator GM mini20, ultrasonic converter UW mini20 and microtip MS 2.5, diameter 2,5 mm.
Max. 12 W_{eff} HF output.

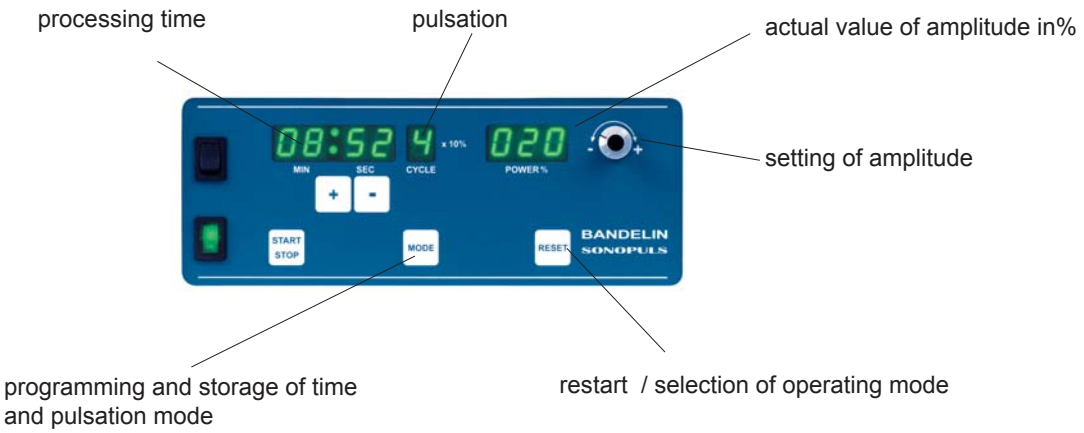
Code No. 3665

Fast manual use – ideal for smallest volumes. Pulsation on pressing the bottom at the ultrasonic converter by thumb.



HF generator		GM mini20
dimensions	mm	250 × 256 × 154
weight	kg	2,0
mains supply		230 V~, 50/60 Hz (optionally 115 V~, 50/60 Hz)
converter		**UW mini20**
dimensions	mm	dia. ca. 50 × 160
weight	g	270
available titanium probes	dia. mm	1,5 or 2,5

Operating panel HD 2070 / HD 2200



SONOPULS HD 2070

for volumes uo to 200 ml

Small unit for lab routine

Ready-to-operate basic equipment for volumes from 2 ml to 50 ml consisting of generator GM 2070, ultrasonic converter UW 2070, stepped standard horn SH 70 G and microtip MS 73, 3 mm diameter.
HF-output max. 70 W_{eff}

Code No. 2450

SONOPULS HD 2200

for volumes uo to 1000 ml

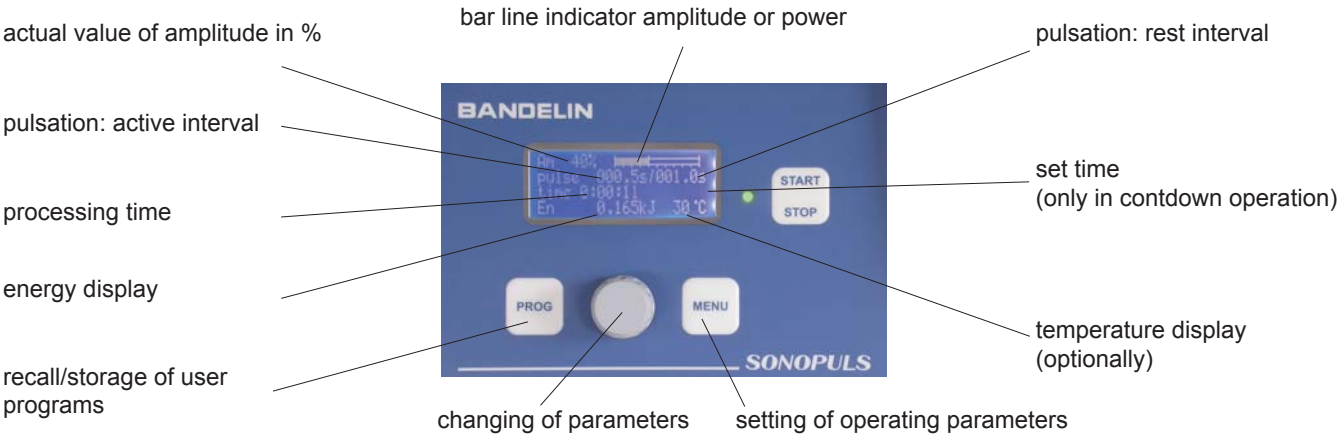
Standard unit for lab routine

Ready-to-operate basic equipment for volumes from 20 ml to 900 ml consisting of generator GM 2200, ultrasonic converter UW 2200, booster horn SH 213 G and titanium flat tip TT 13 of 13 mm diameter.
HF-output max. 200 W_{eff}

Code No. 2530

HF generator		**GM 2070**	**GM 2200**
dimensions	mm	257 x 180 x 115	257 x 180 x 115
weight	kg	2,5	2,5
mains supply		230 V~, 50/60 Hz, optionally with voltage selector for 115 V~, 50/60 Hz	
converter		**UW 2070**	**UW 2200**
dimensions	mm	Ø 70 x 120	dia. 70 x 120
weight	kg	1,0	1,0
available titanium probes	dia. mm	2, 3, 6, 13	2, 3, 6, 13, 19 or 25

Operating panel HD 3100 / HD 3200 / HD 3400



SONOPULS HD 3100

for volumes uo to 200 ml

High-Tech for research

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 and microtip MS 73 diameter 3 mm. Max. 100 W_{eff} HF output.

Code No. 3680

SONOPULS HD 3200

for volumes uo to 1000 ml

High-Tech for reserch

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 and flat tip TT 13, diameter 13 mm. Max. 200 W_{eff} HF output.

Code No. 3660

HF generator		**GM 3100**	**GM 3200**
dimensions	mm	250 x 256 x 154	250 x 256 x 170
weight	kg	2,0	2,7
mains supply		230 V~, 50/60 Hz, optionally 115 V~, 50/60 Hz	
converter		**UW 3100**	**UW 3200**
dimensions	mm	dia. 70 x 120	dia. 70 x 120
weight	kg	1,0	1,0
available titanium probes	dia. mm	2, 3, 6 or 13	2, 3, 6, 13, 19 or 25

HD 3200

SONOPULS HD 3400

for volumes uo to 2500 ml

High-Tech for reserch and pilot plant stations

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 and extended probe VS 200 T, diameter 25 mm. Max. 400 W_{eff} HF output.

Code No. 3690

HF generator		**GM 3400**
dimensions	mm	324 x 230 x 131
weight	kg	3,1
mains supply		230 V~, 50/60 Hz
converter		**UW 3400**
dimensions	mm	dia. 90 × 180
weight	kg	2,2
available titanium probes	dia. mm	19 or 25

Applications

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 2 G** or **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 - Cosmetic

- 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**

For special customer requests: BANDELIN will supply booster horns and probes for special applications.

Waste water samples
Aim: Homogenizing for determination of harmful substances, e.g. mineral oil, grease AOX in industrial and butcher's waste water
Quantity: 250 ml
Approx.time: 5 - 10 min
Unit: HD 2200/3200 with TT 13,
or taller vessels with VS 70 T

Aluminium oxide suspensions
Aim: Dispersing
Quantity: 100 ml
Approx.time: ca. 4 min
Unit: HD 3200 with KE 76

Soil samples
Aim: Extraction for determination of pH value, Mg, K, P, N – contents for recommendation of fertilizer / determination of radio nucleides to control radioactivity in the environment (milk research)
Quantity: 50 - 100 ml / 100 - 150 ml
Approx.time: a few seconds
Unit: HD 2200/3200 with KE 76 / VS 70 T

Bladder tissue
Aim: Disruption
Quantity: 1,5 ml
Approx.time: ca. 1,5 min
Unit: HD 2200 with MS 72, cooling necessary

Candida albicans
Aim: Disruption
Quantity: 10 ml
Approx.time: ca. 10 min
Unit: HD 2070/3100 with MS 73

ChIP (Chromatin immunoprecipitation)
Aim: DNA fragmentation
Quantity: 1 ml
Approx.time: ca. 2 min
Unit: HD 3200 with MS 72

Large intestine tissue
Aim: Disruption
Quantity: 1,5 ml
Approx.time: ca. 3 min
Unit: HD 2200 with MS 72, cooling necessary

Dispersing of solid particles
Aim: grain size analysis
Quantity: 50 - 100 ml
Approx.time: ca. 2 - 5 min
Unit: HD 2200/3200 with KE 76

Small intestine tissue
Aim: Disruption
Quantity: 1,5 ml
Approx.time: ca. 2,5 min
Unit: HD 2200 with MS 72, cooling necessary

Escherichia coli
Aim: Disruption for proteine lay off
Quantity: 10 ml
Approx.time: ca. 5 - 10 min
Unit: HD 2070/3100 with MS 73 or HD 2200 with MS 73

Eucaryotic cells
Aim: Disruption for proteine lay off
Quantity: 1,5 ml
Approx.time: ca. 1 min
Unit: HD 2200/3200 with BR 30 u. EH 3, cooling necessary

Meat and sausage samples
Aim: Homogenizing for determination of nitrates
Quantity: 100 ml
Approx.time: ca. 3 min
Unit: HD 2200/3200 with KE 76

Heart muscle tissue
Aim: Homogenizing
Quantity: 1,5 ml
Approx.time: ca. 4 min
Unit: HD 2200/3200 with MS 72, cooling necessary

Brain tissue
Aim: Disruption
Quantity: 1,5 ml
Approx.time: ca. 1 min
Unit: HD 2200 with MS 72, cooling necessary

Yeast cells
Aim: Disruption
Quantity: 10 ml
Approx.time: ca. 2 min
Unit: HD 3200 with MS 73

Insect cells
Aim: Disruption for proteine lay off
Quantity: 20 - 50 ml
Approx.time: ca. 25 sec, pulsed
Unit: HD 2070/3100 with MS 73 and RZ 2

Liver tissue
Aim: Homogenizing for moleculargenetic tests
Quantity: 1,5 ml
Approx.time: ca. 1½ min
Unit: HD 2200/3200 with MS 72, cooling necessary

Liposomes
Aim: Producing of small unilamellar phospholipid vesicles
Quantity: 20 ml
Approx.time: ca. 10 - 15 min
Unit: HD 2070/3100 with TT 13,
cooling necessary

Lymphocytes
Aim: Disruption
Quantity: 50 µl - 2 ml
Approx.time: ca. 1 - 5 min
Unit: HD 2070/3100 with BR 30 and EH 3

Nano emulsions
Aim: Drop sizes within nm range
Quantity: 2 ml
Approx.time: ca. 5 min
Unit: HD 3100 with MS 72,
cooling necessary

Nano particles
Aim: Dispersing
Quantity: 100 ml
Approx.time: ca. 2 min
Unit: HD 3200 with KE 76

Retina
Aim: Tissue disruption
Quantity: 60 ml
Approx.time: 15 short stokes
Unit: mini20 with MS 2.5

Kidney tissue
Aim: Homogenizing
Quantity: 1,5 ml
Approx.time: ca. 40 sec
Unit: HD 2200/3200 with MS 72,
cooling necessary

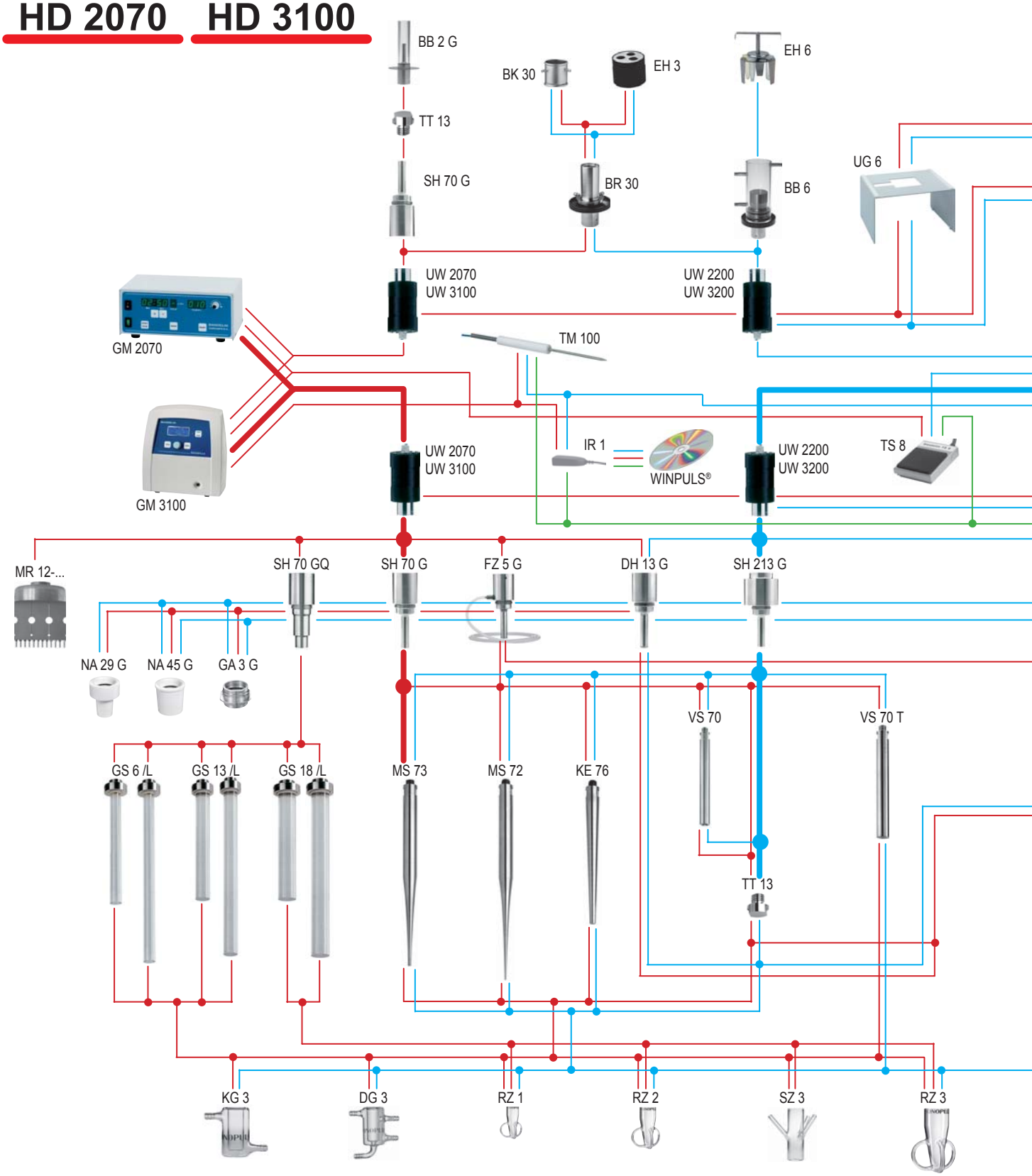
O/W emulsions
Aim: Finest emulsions
Quantity: 10 ml
Approx.time: ca. 1 min
Unit: HD 3200 with KE 76,
Vessel: rosett cell

Homogenizing of aqueous ink
Aim: Dispersing of ink pigments in oil
Quantity: 200 ml
Approx.time: ca. 5 min
Unit: HD 2200 with VS 70 T

Carbon black dispersions
Aim: Homogenizing
Quantity: 50 ml
Approx.time: ca. 5 min
Unit: HD 2200 with DH 13 G, vessel: KG 3

Accessories and Applications

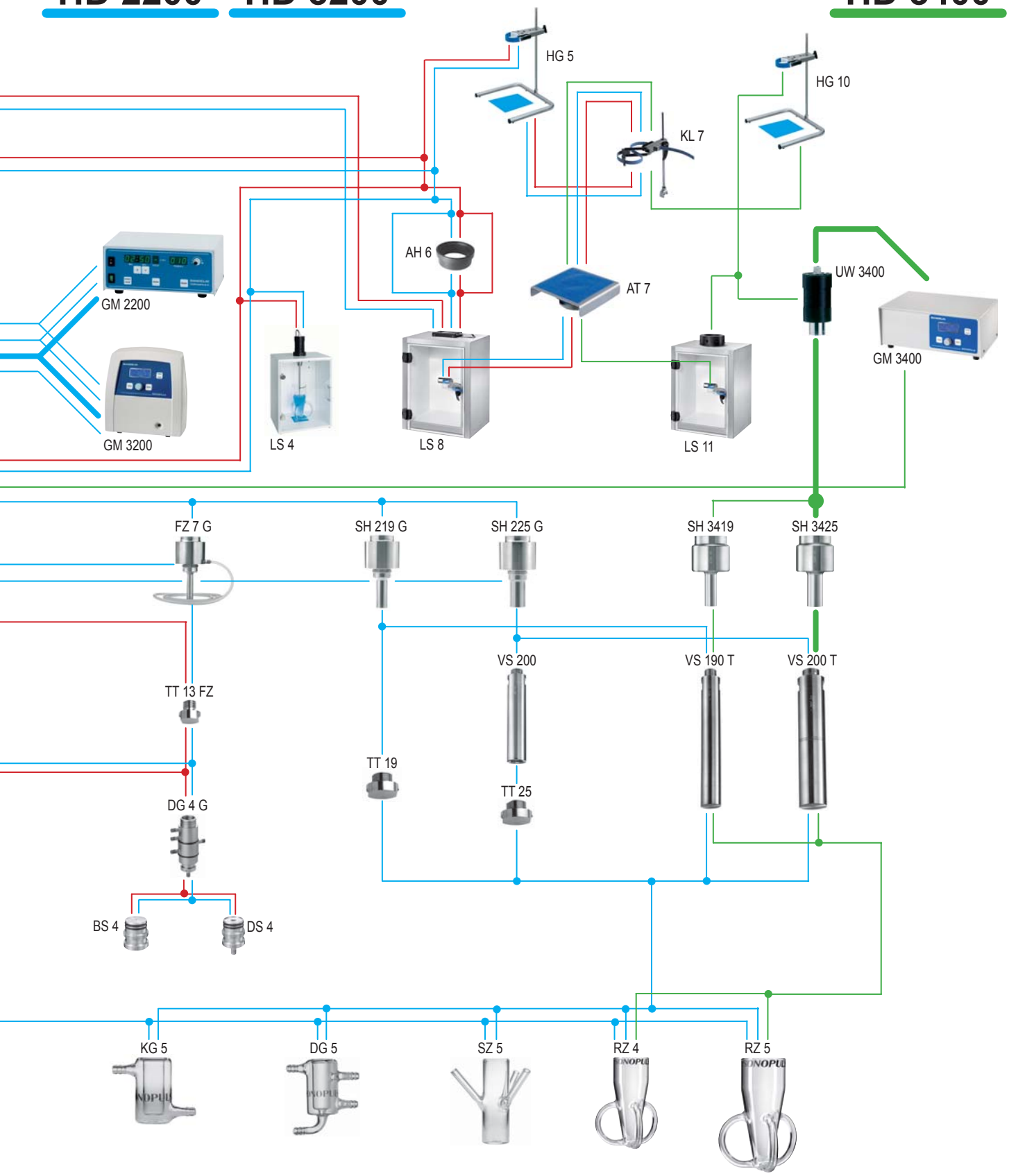
HD 2070 HD 3100



Saccharomyces cerevisiae
Aim: Disruption
Quantity: 20 ml
Approx time: 15 min
Unit: HD 2200/3200 with KE 76, addition of glass beads to accelerate process, cooling necessary

Staphylococcus aureus
Aim: Disruption
Quantity: 10 ml
Approx time: ca. 10 min
Unit: HD 2070/3100 with MS 73

HD 2200 HD 3200 HD 3400



Streptococcus
Aim: Disruption
Quantity: 10 ml
Approx time: ca. 8 - 10 min
Unit: HD 2200/3200 with MS 73

Detection of prions by cyclic amplification of protein misfolding
Quantity: 200 µl
Approx time: ca. 1,5 min
Unit: HD 2070 with MS 73

Probes • Standard- / Booster Horns • Adapters

MS 1.5 MS 2.5 MS 72 MS 73 KE 76 VS 70T VS 190 T VS 200 T TT 13 TT 19 TT 25

Probes

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.

Please note that probes are subject to wear and tear. It is advisable to order spare probes with the first homogenizer.

description		microtips				tapered tip	extended probe		
Type		MS 1.5	MS 2.5	MS 72	MS 73	KE 76	VS 70 T	VS 190 T	VS 200 T
Code No.		3639	3652	492	529	530	494	3638	478
Diameter	mm	1,5	2,5	2	3	6	13	19	25
Length approx	mm	57	53	191	175	135	130	130	130
Standard horn for HD 2070/3100		-	-	SH 70 G	SH 70 G	SH 70 G	SH 70 G	-	-
Booster horn for HD 2200/3200		-	-	SH 213 G	SH 213 G	SH 213 G	SH 213 G	SH 219 G	SH 225 G
Booster horn for HD 3400		-	-	-	-	-	-	SH 3419	SH 3425
Amplitude for HD 2070/3100	μm_{ss} (peak to peak)	-	-	253 / 285	212 / 245	165 / 191	80 / 97	-	- / -
Amplitude for HD 2200/3200		-	-	282 / 286	302 / 308	249 / 255	153 / 170	-	46 / 51
Amplitude for HD 3400		-	-	-	-	-	-	116	82
Amplitude for mini20		50	70	-	-	-	-	-	-
Volume HD 2070/3100	ml	-	-	1–25	2–50	5–100	10–200	-	-
Volume HD 2200/3200	ml	-	-	2–30	5–90	10–350	20–900	25–900	30–1000
Volume HD 3400	ml	-	-	-	-	-	-	500–1500	500–2500
Volume mini20	ml	0,1–10	0,5–25	-	-	-	-	-	-
Vessel diameter min	mm	4	6	4	6	8	17	23	29

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

Standard- und booster horns

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

solid standard horn - DH 13 G -
with diamond coating on the radiating area; lifetime is thirty times longer than usual.

SH 70 G SH 213 G SH 219 G SH 225 G SH 3419 SH 3425 DH 13 G

Flow-through standard and booster horns

material: 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 horn					diamond standard horn	flow-through standard horn	flow-through booster horn
Type	SH 70 G	SH 213 G	SH 219 G	SH 225 G	SH 3419	SH 3425	DH 13 G	FZ 5 G	FZ 7 G
for HD	2070 / 3100	2200 / 3200			3400		2070 / 2200 3100 / 3200	2070 / 3100	2200 / 3200
Code No.	486	527	3647	3634	3679	3692	403	490	452

Adapters

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

NA 29 G for NS 29/32 for SH 70/213 G

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

Threaded adapter made of stainless steel with external thread M 40 x 1
GA 3 G for SH 70/213/219/225 G

NA 29 G NA 45 G

GA 3 G

	sleeve adapters		threaded adapters
Type	NA 29 G	NA 45 G	GA 3 G
for HD	2070 / 2200 / 3100 / 3200		
Code No.	540	487	473

Probe extensions

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

titanium flat tips			silica glass probes					
TT 13	TT 19	TT 25	GS 6	GS 6 L	GS 13	GS 13 L	GS 18	GS 18 L
497	491	532	024	048	028	050	040	054
13	19	25	6		13		18	
5	5	6	145	290	145	290	145	290
SH 70 G SH 213 G -	- SH 219 G -	- SH 225 G -	SH 70 GQ - -		SH 70 GQ - -		SH 70 GQ - -	
78 / 93 149 / 165 - -	- / - 73 / 81 - -	- / - 48 / 53 - -	13 / 13 - / - - / - - / -		13 / 13 - / - - / - - / -		13 / 13 - / - - / - - / -	
10 – 200	-	-	2 – 100		25 – 200		25 – 500	
5 – 900	25 – 900	30 – 1000	-					
-	-	-	-					
-	-	-	-					
17	23	29	10		17		22	

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 and boron compounds - ideal for trace analysis.
High chemical and temperature shock resistance, no electric conductivity.


SH 70 GQ


GS 13 GS 6

MULTISON® ultrasonic probe

patent applied D 10 2004 024 214

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 composed of multison horn with per 1 multison tip			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

Direct processing

Processing vessel, made of stainless steel

DG 4 G for high-volume flow-through processing like emulsifying, dispersing or homogenizing, up to 30 l/h,
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	3608

Processing vessels made of glass

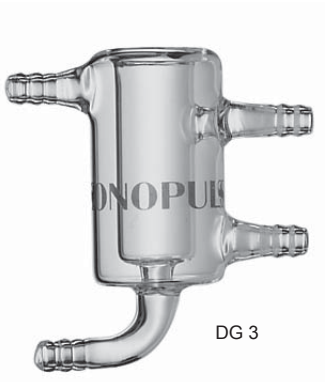
Cooling vessel KG
zfor sonication of temperature-sensitve samples.
The cooling jacket allows circulation of cooling liquid during sonication.

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

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

Suslick cell SZ
hwith 3 sidearms for introduction of gas or measuring probes.

KG 3



DG 3

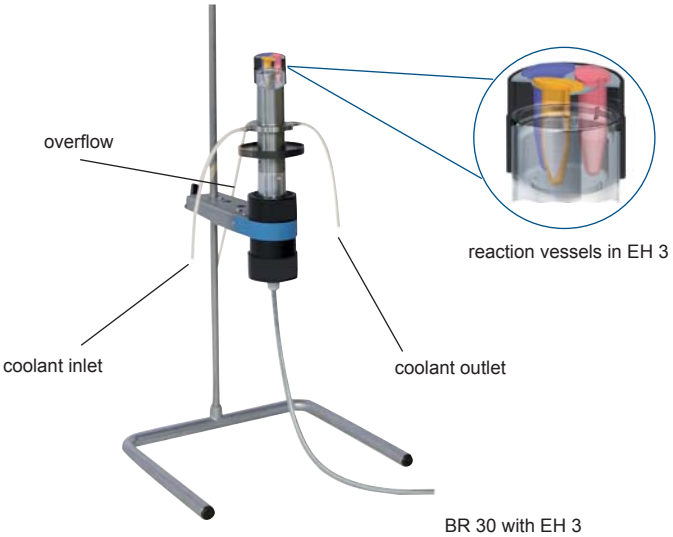
RZ 3

SZ 3

	cooling vessel		flow-through vessel		rosett cell					suslick cell	
Type	**KG 3**	**KG 5**	**DG 3**	**DG 5**	**RZ 1**	**RZ 2**	**RZ 3**	**RZ 4**	**RZ 5**	**SZ 3**	**SZ 5**
for HD	2070 / 2200 3100 / 3200	2200 3200	2070 / 2200 3100 / 3200	2070 / 2200	2070 / 2200 / 3100 / 3200			2200 / 3200 3400		2070 3100	2200 3200
volume, ml	15	70	max. 5,6 l/H	max. 30 l/h	25	40	110	390	660	20	110
interior diameter, mm	20	35	20	53	30	42	50	75	90	20	40
height, mm	65	95	65	95	85	100	135	202	243	80	144
Code No.	536	481	538	482	3606	3607	522	3256	483	534	484

Indirect processing

- High-intensity mini ultrasonic baths
- Processing of µl-samples without sample loss
- No cross contamination
- No contamination of samples through cavitation erosion at the probe
- Uniform sonication of several samples with simultaneous cooling
- No aerosoling when sonicating pathogenic or hazardous materials
- Application for e. g. cell disruption, preparing of liposomes



BR 30 with EH 3


EH 6


BB 6


BB 2 G
+ SH 70 G + TT 13


EH 3


BK 30


BR 30

Microtube holder EH 6
For use in BB 6. Up to 6 samples can be treated simultaneously. Pressure plate holds tubes in place.
No floating of cups.
A mixing of samples is excluded due to markings at the holder.

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

Cup horn BB 2 G
plastics, for indirect sonication of pathogenic material.

Microtube holder EH 3
for use with BR 30. Up to 3 samples can be treated simultaneously. 2 exchangable discs with diameters 8,5 or 11,5 mm.

Inset basket BK 30
For intensive cleaning of small parts, e. g. cleaning of radioactively contaminated seeds in BR 30.

Cup booster BR 30
For high-intensive irradiation of smallest and sensitive sample volumes, e. g. radioactive seeds or bacteria as well as for flow-through sonication of liquids like cell suspensions. During indirect processing of samples the ultrasound will be transferred by the contact liquid. The sonication will be carried out in reaction vessels or in the inset beaker BK 30.
The cup booster is equipped with inlet, outlet and overflow.
A cooling as well as a flow-through process is possible.

Type	BB 6	BB 2 G	EH 6	BR 30	BK 30	EH 3
for HD	2200 / 3200	2070 / 3100	2200 / 3200	2070 / 2200 3100 / 3200	BR 30	BR 30
Code No.	3605	552	059	082	098	078

Stand • Sound proof boxes

HG 5

Stand

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

Clamping device KL 7 (DE 20 2006 005 654.98)
for HG 5 / HG 10 with rod, swivelling clamp for reaction vessels dia. 15 mm to dia. 100 mm

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

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

LS 4

LS 8

LS 8 with UG 6

AH 6

LS 11

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
Plastics 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 for easy cleaning.
With rod, swivelling clamp and quick 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.

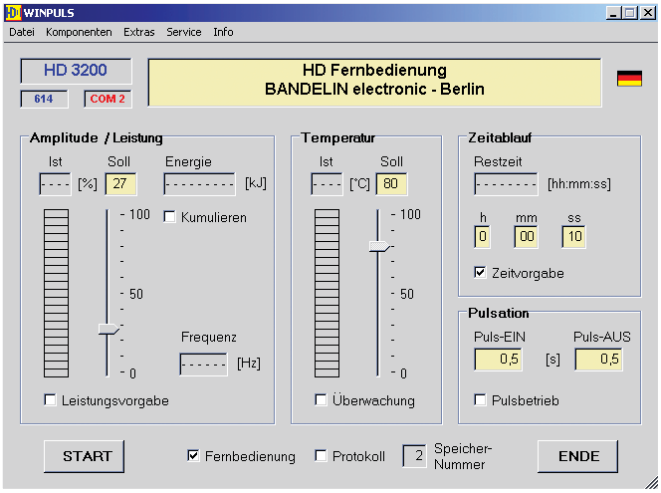
Special support UG 6 is available for inverted position of the box during indirect sonication with horn BB 6 or cup booster BR 30.
Ultrasonic converter is fixed safely through a special clamp.

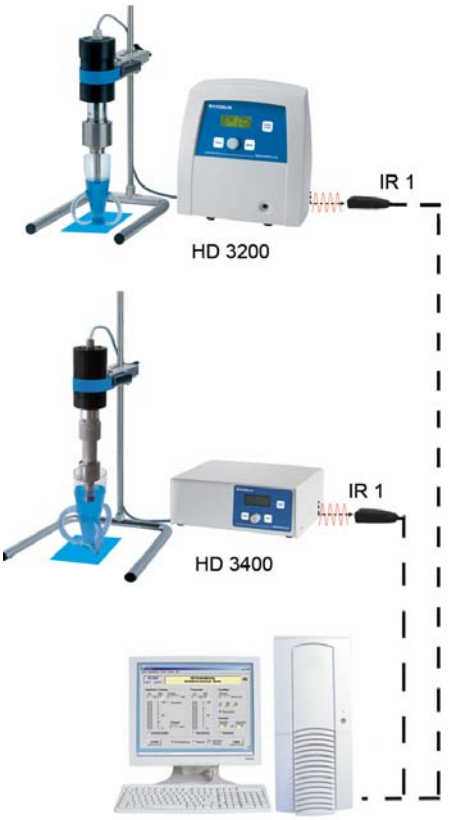
LS 11
stainless steel with damping material, 20 dB-AU damping,
The damping material is water resistant for easy cleaning

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

Type	LS 4	LS 8	LS 11	UG 6	AH 6	BD 8
for HD	2070 / 2200 3100 / 3200	2070 / 2200 3100 / 3200	3400	2070 / 2200 3100 / 3200	LS 7	LS 8 / LS 11
dB-AU damping	10	20	20	-	-	-
Code No.	416	3653	3663	3616	3619	3661





WINPULS® up PC

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 ifraded 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 cable.

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

TS 8

Temperature sensor

for measuring the sample temperature from 0 up to 120 °C
Diameter sensor: 4 mm

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

TM 100

Ultrasound in Laboratory

SONOREX TECHNIK
Vortex reactor

Applications

- Intensifying of industrial, biotechnological and chemical processes
- Degassing
- Support of disinfection (bacterial elimination)
- Disinfection of liquids
- Producing of finest polishing pastes for wafer industry
- Homogenizing

Vortex reactor
consisting of:
Vortex reactorbloc WB and
HF generator LG 2002 T

WR 4-1503.01

SONOREX TECHNIK
Tube reactor SONOBLOC®

Applications

- Ultrasonic intensive treatment of fibrous and band-shaped products
- Support of industrial and biotechnological processes
- Wire cleaning
- Degassing
- Support of disinfection (bacterial elimination)
- Acceleration of disintegration
- Dispersing of solid particles in liquids

Tube reactor SONOBLIOC®
consisting of:
Tube reactorbloc RB and
HF generator LG 1001 T

SB 8-1002.01

Technical Data	Vortex reactorbloc - WB			Tube reactorbloc - RB	
Type	**WB 4-1402...**	**WB 4-1503...**	**WB 4-1604...**	**RB 8-1002...**	**RB 8-1004...**
Flow-through rate	1 - 50 l/min			1 - 100 l/min	
Internal pressure, max.	10 bar			10 bar	
Solid particles	< 5 mm			-	
Power density, max.	480 W/l	520 W/l	550 W/l	500 W/l	
Power, max.	1400 W	1500 W	1600 W	1000 W	
Frequency	25 kHz	25 und 40 kHz	40 kHz	25 kHz	40 kHz
Tube material / dimensions	Stainless steel AISI 316 Ti / dia. 139.7 × 2.6 mm ; dia. 104 × 2 mm			Stainless steel AISI 316 Ti / dia. 60.3 × 3.6 mm	
Housing dimensions (l × w × h)	290 × 290 × 642 mm			260 × 150 × 990 mm	
Weight, net	approx. 50 kg			approx.35 kg	
HF-Generator (separat)	LG 1510 T	LG 2002 T		LG 1001 T	

Units are equipped with standard victaulic connection. Further connection variants on request.

Separate documentation on request.

SONOREX ultrasonic baths

- standard baths from 1 - 200 litres
- compact construction
- easy to handle
- optionally with heating
- integrated timer
- from 3 ltr. upwards with drain

- cost-saving - reduced cleaning time
- intensive, gentle, thorough
- large range of accessories

Further documentation on request.

BANDELIN *electronic*
specialized in manufacturing of ultrasonic units, maintain a quality management system complying with the requirements of
EN ISO 9001 / 12.2000
and EN ISO 13485:2003 + AC:2007

5732 e/2009-04

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60 years of experience in ultrasound technology