BANDELIN
Ultraschall seit 1955

SONOPULS
HD 5020 and HD 5050
Ultrasonic homogenisers

For use in laboratory

NEW

BANDELIN – Specialist of ultrasound in laboratory

SONOPULS ultrasonic homogenisers are in demand worldwide and a must for many laboratories.
The first SONOPULS ultrasonic homogeniser from our company was sold in 1964. Almost 60 years experience - that is what BANDELIN stands for.

Training courses for our sales partners and practice-oriented seminars with our users ensure a constant exchange of experience. In the process, new applications are constantly being developed. The constantly growing application database - a result of this cooperation - offers the new user great support in the selection of equipment.
In the further development of our homogenisers, we not only focus on today's customer needs, but also have future requirements in mind. The functionality of the units is always in the foreground.

We can react quickly to special customer requests: Development and production under one roof, short decision-making paths and proximity to the customer make this possible.

SONOPULS ultrasonic homogenisers deliver high amplitudes with the same electrical power by optimally adapting all components. Regardless of changing conditions in the sample to be sonicated, e.g. viscosity, the amplitude remains constant. This guarantees reproducible results.

BANDELIN is the only supplier where an ultrasonic generator can be combined with different ultrasonic transducers. This means that an upgrade from laboratory scale to pilot plant scale does not require the purchase of a completely new unit.

All probes and booster horns are equipped with fixed threaded pins. The advantage is obvious: quick and easy assembly with the given tools - no further aids are required!

Would you like to convince yourself of the advantages of a SONOPULS ultrasonic homogeniser?
We would be happy to offer you a unit with suitable accessories for a test setting.

BANDELIN – Ultraschall since 1955

Company portrait

We are a family-owned company located in Berlin and meanwhile run in the third generation, specialised in development, manufacturing and sales of ultrasonic devices, the corresponding accessories and application-specific cleaning agents and disinfectants.

A wide vertical range of manufacture, modern production lines and a motivated staff guarantee a high quality of the products. Our devices contribute to the success of our customers in the laboratory, medical, dental, pharmaceutical, industrial, craft as well as service.

As early as 1955, our company began developing and manufacturing high-performance ultrasonic devices. The constant expansion of the product range and a sharp rise in sales led to an expansion of the production area in 1985. In 1992, ultrasonic homogenisers and controllable, power-constant ultrasonic generators were introduced to the market.
The period from 1996 to 2004 was characterised by the development and production of innovative ultrasonic baths and immersible transducers as well as tube reactors for industrial applications. In the following years, BANDELIN's product range was expanded by new laboratory ultrasonic devices.

After the introduction of the ultrasonic bath for simultaneous cleaning and rinsing of MIC instruments, a further development was launched in 2016 for robotic instruments.

Today, the reputation of our brands SONOREX, SONOPULS, SONOMIC and TRISON stand for the high quality awareness of our employees and is equated in expert circles with ultrasound.
The most important product groups include:

SONOREX	– ultrasonic baths and reactors
SONOPULS	– ultrasonic homogenisers
SONOMIC	– ultrasonic baths for rinsable MIC and standard instruments
TRISON	– ultrasonic baths for robotic-, rinsable MIS and standard instruments
TICKOPUR	– cleaning agents
STAMMOPUR	– cleaning agents and disinfectants

We are innovation leaders in the development of ultrasonic devices and new areas of application. In the past we have registered 79 patents / utility models as well as 68 trade brands. Our participation in various committees in the development of new standards and guidelines serve to ensure the highest standards for ultrasonic applications.

As the only complete supplier of ultrasonic devices, accessories, disinfectants and cleaning agents with approvals and certifications according to ISO 9001 and ISO 13485, BANDELIN is the market leader.
Over one million units have already been delivered to our customers.

1964

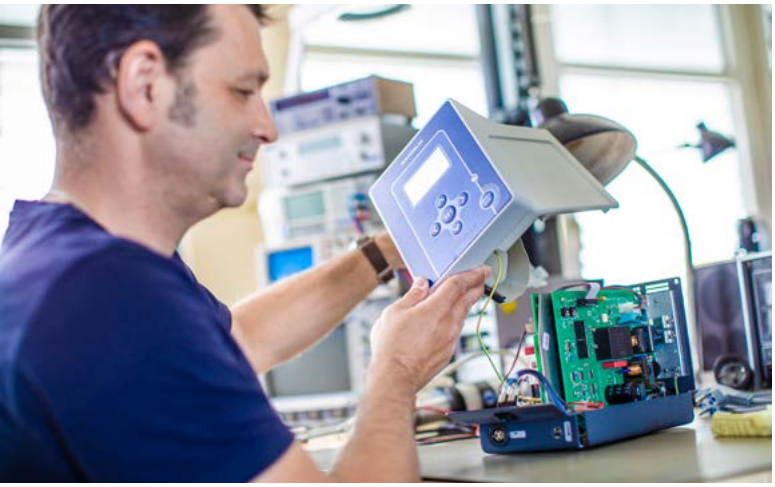
Production of the first ultrasonic homogenisers with tube technology **SONOREX HE 1**

1986

Product launch of ultrasonic homogenisers **SD 9**

1991

SONOPULS HD



Take a look at our Company portrait Laboratory!

1999

SONOPULS series 2000

2004

SONOPULS series 3000

2016

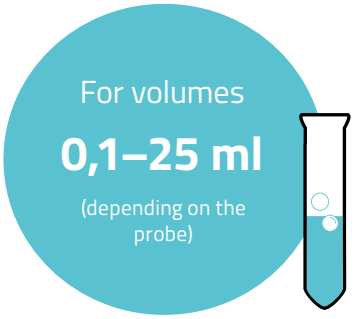
SONOPULS series 4000

2022

SONOPULS series 5000

SONOPULS HD 5020
Ultrasonic homogeniser 30 kHz und 20 W

The HD 5020 is ideally suited for the gentle sonication of the smallest sample volumes of 0.1 – 25 ml at 30 kHz with probes with diameters of 1.5 - 2.5 mm. The generator produces power of up to 20 W.



Ready-to-use set:

Ultrasonic nominal power max. 20 W
- Ultrasonic generator GM 5020
- Ultrasonic converter UW 5020
- Probe MS 1.5, Ø 1,5 mm (for volumes 0,1–10 ml)

Code No.
15020 – EU plug CEE 7/7
15020-GB – GB plug BS 1363
15020-CH – CH plugSEV 1011: T12
15020-1 – US plug NEMA 5-15

Hint:
Low noise level compared to the more more powerful homogenisers.

Sample vessels:

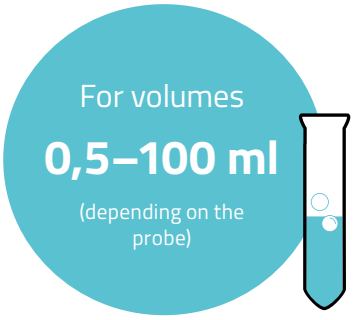
- PCR tubes
- Cryotubes
- Reaction cups

Ultrasonic generator	GM 5020
l × w × d [mm]	380 × 195 × 215
Ultrasonic converter	UW 5020
Ø × l [mm]	50 × 150
Available probe dia. [mm]	1,5 / 2,0 / 2,5

SONOPULS HD 5050

Ultrasonic homogeniser 20 kHz und 50 W

The HD 5050 is particularly suited for the gentle sonication of smaller sample volumes of 0.5 – 100 ml at 20 kHz and probes with a diameter of 2 – 9 mm. Here, the generator operates with a power of up to 50 W.



Ready-to-use set:

Ultrasonic nominal power max. 50 W

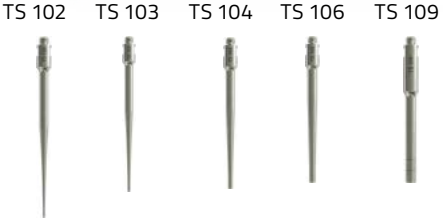
- Ultrasonic generator GM 5050
- Ultrasonic converter UW 5050
- Probe TS 102, Ø 2 mm (for volumes 0,5–20 ml)

Code No.

15050 – EU plug CEE 7/7
15050-GB – GB plug BS 1363
15050-CH – CH plug SEV 1011: T12
15050-1 – US plug NEMA 5-15

Sample vessels:

- PCR tubes
- Cryotubes
- Reaction cups



Ultrasonic generator	GM 5050
l × w × d [mm]	380 × 195 × 215
Ultrasonic converter	UW 5050
Ø × l [mm]	50 × 185
Available probe dia. [mm]	2 / 3 / 4,5 / 6 / 9

SONOPULS series HD 5000
Ultrasonic converter

Switch

There is a switch on the ultrasonic converter. It can be used to switch the ultrasound operation on/off and to control a hand-held pulsation. There is also a connection socket on the ultrasonic converter for the use of a temperature sensor to monitor the sample temperature.

Ultrasonic converter UW 5020

Connection for temperature sensor TM 5000

For temperature monitoring, the temperature sensor is connected to the socket provided, which is otherwise covered with a dust cap. A temperature display appears on the generator, allowing the user to record the temperature at any time. If the limit temperature is exceeded, a warning signal may sound and/or the process may be automatically aborted.

Temperature sensor TM 5000

Ultrasonic converter UW 5020

Operating frequency:
30 kHz

Dimension:
Ø 50 × 150 mm

Cable length:
2,5 m

Code No. 3738

Ultrasonic converter UW 5050

Operating frequency:
30 kHz

Dimension:
Ø 50 × 185 mm

Cable length:
2,5 m

Code No. 3739

SONOPULS series HD 5000
Ultrasound generators

Ultrasound generators in easy-care, robust plastic housing with a connection for the respective SONOPULS ultrasonic converters from the HD 5000 series, and a recessed handle for easy transportation and setup on the laboratory bench.

The modern 7" touch display provides an intuitive, user-friendly operation.
The adjustment of the setpoints for amplitude, pulsation and time, and the display of the actual values, allow for reproducibility of the results.

Ultrasound generator GM 5020

Applicable for:
- UW 5020

Further information:
- External dimensions (l × w × h): 380 × 195 × 215 mm
- Mains cable, pluggable: 2 m
- Mains connection: 90-250 V ~, 50/60 Hz

Code No. 373601

Ultrasound generator GM 5050

Applicable for:
- UW 5050

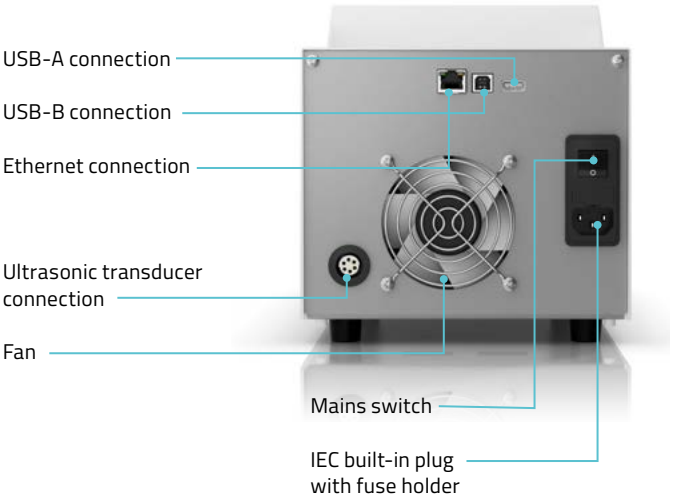
Further information:
- External dimensions (l × w × h): 380 × 195 × 215 mm
- Mains cable, pluggable: 2 m
- Mains connection: 90-250 V ~, 50/60 Hz

Code No. 3736

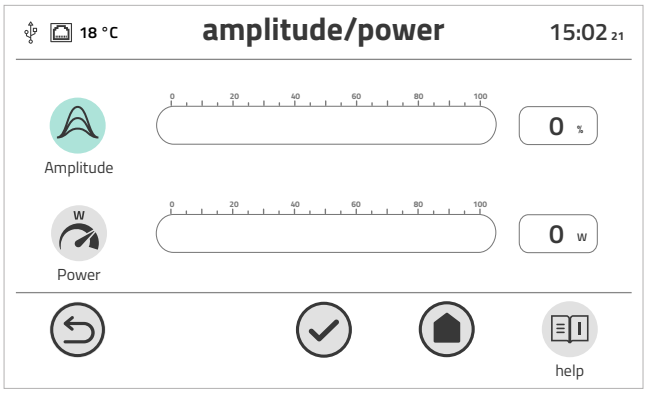
Front side

7" touch display, colour, comfortable tilt

Back side



Operating concept / Display

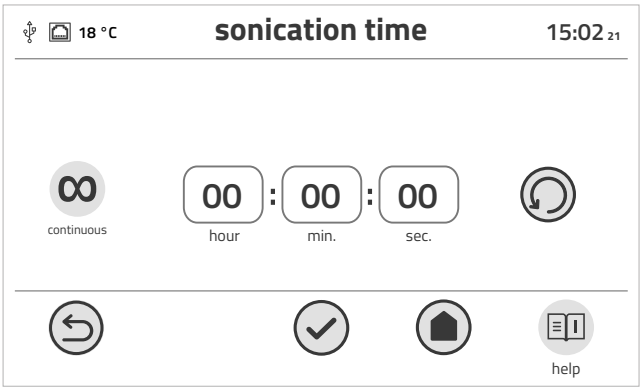


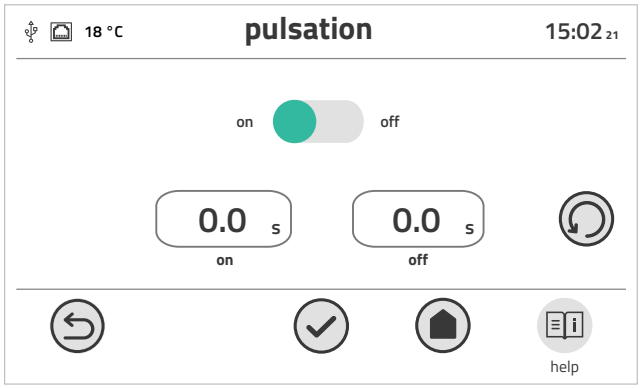
Amplitude and power setting

Amplitude setting in 1% steps (in the range of 10–100%) for all probes. Alternative power control in watts is also possible via a slider or a numerical input. The display of the actual values allows for a continuous process control.

Time setting and sequence

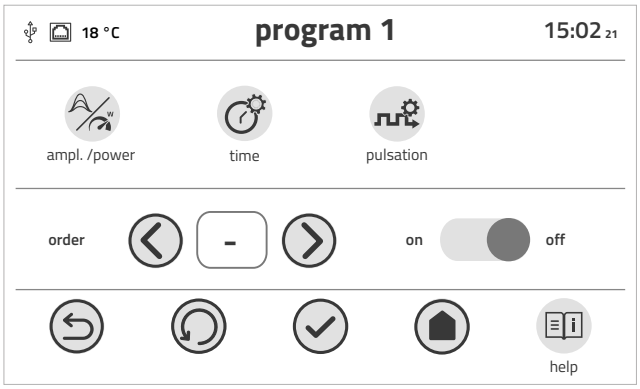
Selectable time settings: Timer (countdown) or continuous operation (up to 99 h: 59 min: 59 s). The elapsed time is displayed in continuous mode while the remaining time is displayed in timer mode.





Pulsation

The pulse interval can be individually adjusted in 0.5 steps for the safe sonication of temperature-sensitive samples. The desired sonication time and the pause can be set independently of each other in the range of 0.5–600 s.

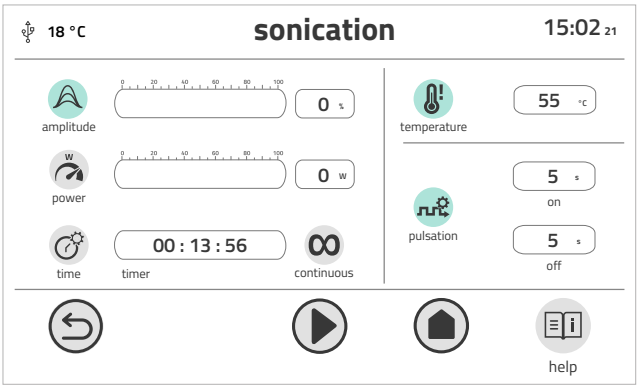


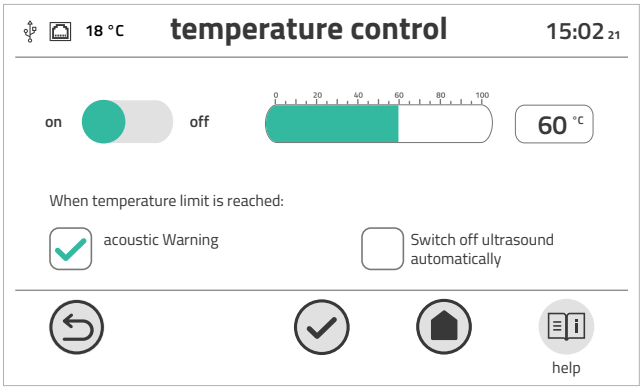
Data memory

Saving of recurring processes as a program, to start them conveniently and quickly at the push of a switch. Up to 8 programs can also be combined and played automatically and successively, in any order.

Process display

Display and control of all set parameters of the running program during operation, including the remaining running time or elapsed time.





Temperature monitoring

The optional TM 5000 temperature sensor ensures continuous monitoring of the sample temperature. When the limit temperature is reached, a warning signal appears or the ultrasound is immediately switched off, depending on your preference.

Help

If an error occurs, it is shown on the display. Help screens provide step-by-step instructions on how to solve a problem.


BANDELIN
SONOPULS
18 °C
start
15:02
ultrasonic converter
UW 5020
probe
MS 1.5
parameter
settings
programs
start
help


BANDELIN
SONOPULS
start
ultrasonic converter
UW 3070
probe
KS 102
15:02
parameter
settings
programs
start
help
MH 40

SONOPULS
Processing vessels for direct sonication

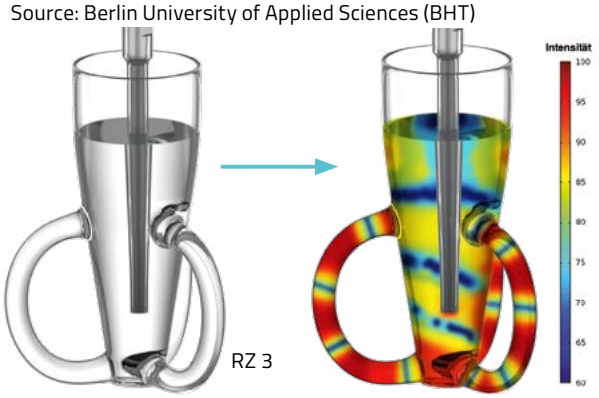
During direct sonication, the probe is immersed in the sample to be sonicated. The advantage of this method is the very high energy input as compared to indirect sonication. All glass containers are made of borosilicate glass.

The material has very good chemical and temperature resistance and is therefore very well suited for laboratory use. The cleaning and/or disinfection can be performed using appropriate preparations, in an ultrasonic bath or in a cleaning and disinfection device. The glass is autoclavable.

Rosette cells RZ

The rosette cells allow for a uniform and intensive sonication of liquid media. The ultrasound pressure presses the sample against the bottom of the vessel and then through the three lateral arms, enabling it to circulate well. The result is a continuous mixing of the medium. When placing the rosette cells in an ice bath, the contents are effectively cooled due to the enlarged glass surface and the good circulation.

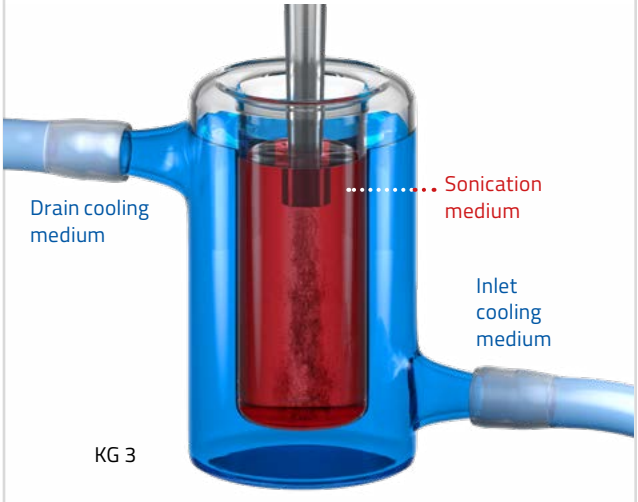
Intensity distribution
(distance between probe tip and vessel bottom = 3 cm)
Source: Berlin University of Applied Sciences (BHT)



Cooling vessel KG

During sonication mechanical energy is converted into heat (through internal friction in the liquid), and thus to a more or less pronounced heating of the samples. Cooling of the medium may therefore become necessary for temperature-sensitive samples.
The sample containers can be placed e.g. in an ice bath. However, by doing so the immersion depth of the probe will not be visible. The KG cooling vessels with cooling jacket for connection to an external cooler are a better alternative. They enable a controlled temperature control during sonication.

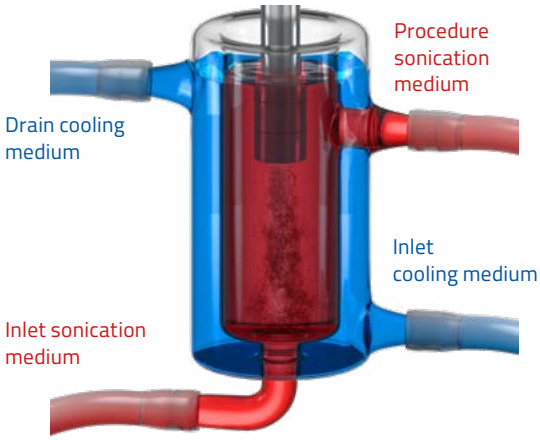
The cooling medium is pumped through the cooling jacket in a circuit with the help of a thermostat. This makes it possible to react quickly to a temperature increase.



Flow-through vessels DG

With cooling jacket. Continuous sonication of samples in flow of up to 30 l/h is possible.
The cooling jacket allows for temperature control by liquid coolant during the sonication.

The cooling medium is pumped through the cooling jacket in a circuit with the help of a thermostat. This allows a quick reaction to an increase in temperature. The sonication medium is directed directly against the sound-emitting surface of the horn.



Type	RZ 1	KG 3	DG 3
For probe diameter [mm]	2–3	2–13	2–13
For HD	4050/4100/4200//5050		
Min. volume [ml]	20	20	Max. Flow rate [l/h]
Max. volume [ml]	25	20	5,6
Diameter inside [mm]	27	55	20
Depth [mm]	80	3	55
Code No.	3606	536	538

RZ 1 KG 3 DG 3

Cell disruption, homogenisation or mixing of very small volumes simply and reliably at the touch of a switch with the SONOPULS HD 5020. The higher ultrasonic frequency of 30 kHz and a lower amplitude prevent foaming or splashing of the sample despite the very small volume during sonication.

Reaction Cup

Cooling with crushed ice

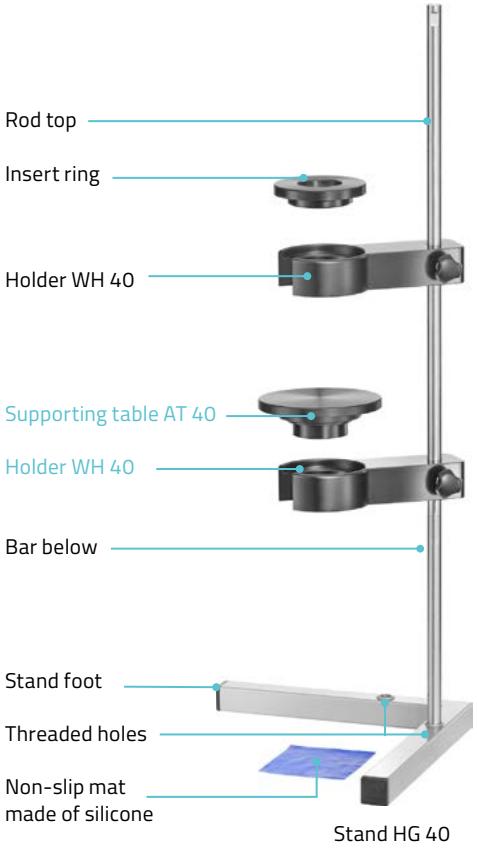
SONOPULS Accessories

BANDELIN already supplies a ready-to-use unit with the standard set.
For individual adaptations to the applications, an extensive range of accessories is available.

The most practical and popular accessories for the most common applications are presented in more detail below.

Stand HG 40

Material: Stainless steel and POM
The HG 40 offers a firm stand and flexible handling for adjustment of the holder for the ultrasonic converter with probe. The positioning of the sonication vessel can be made significantly easier by using an additional holder with supporting table. Sufficient freedom of movement for the user is guaranteed.



Stand HG 40

Scope of delivery:
- holder WH 40
- insert for UW 50/UW 5020/UW 5050
- silicone non-slip mat

Optional accessories:
- second holder WH 40
- Supporting table AT 40

Type	HG 40	WH 40	AT 40
For HD	2070.2 / 2200.2 / 3100 / 3200 / 3400 4050 / 4100 / 4200 / 4400 / 5020 / 5050		
Code No.	3681	3900	3901

Flexible mounting/installation

The stand rod can be positioned to the left or right side of the device base. The rod is two-piece and screwed together by a thread. If both parts are mounted, the total length is 816 mm. With just one rod, the stand is 548 mm high. This provides ample scope for configuration of the device and sonication vessel. The rod has a standard diameter of 16 mm. Commercially available clamps can be attached to it in order to e.g. affix laboratory vessels with a round bottom.
The WH 40 holder for the ultrasonic converter is height-adjustable and swivelling.

One holding frame, suitable for all SONOPULS ultrasonic homogenisers

All ultrasonic converters in the 5000 series as well as those in the 4000, 3000 and 2000.2 series can be inserted in the support frame.
The supplied insert ring is required for the ultrasonic converters UW 5020, 5050 and UW 50.

insert ring

Ultrasonic converter
UW 5050

HD 3100 with HG 40

HD 2200.2 with HG 40

HD 4200 with HG 40

HD 5050 with HG 40

Temperature sensor TM

Connecting the temperature sensor to the ultrasonic generator activates temperature recording and enables user-defined temperature monitoring during the sonication process.
Sample temperatures in the range -10–125 C° can be measured.

High temperatures may not enter the ultrasonic converter (max. 80°C). Long-term exposure to high temperatures must be avoided!

Type	TM 5000
For HD	5020 / 5050
Diameter of the measuring tip [mm]	1,9
Length of sensor [mm]	150
Code No.	3763

TM 5000

Sound proof box LS 40

Cavitation produces unpleasant noises for the user and other people nearby. We recommend the use of sound proof boxes to reduce the noise level.

The housing, splash guard, drip tray and perforated plate are made of stainless steel (1.4301).

Noise reducing by approx. 30 dB-AU

LED interior lighting and acrylic glass for process viewing

Removeable drip tray; made of stainless steel, easy to clean

Splash guard, stainless steel insert inside easy to wipe clean

Closeable bushing at the rear side to accomodate lines and hoses for cooling or circulation systems or to connect a temperature sensor

Ventilation system for reducing a process-related formation of moisture

Door opening angle 180° for easy sample handling

Type	Code No.	Description	For HD
LS 40	36821	Sound proof box (attenuation 30 dB (AU)) 100-240 V ~ (+- 10 %) 50/60 Hz EU plug CEE 7/7	2070.2 / 2200.2 3100 / 3200 3400 / 4050 4100 / 4200 4400 / 5020 5050
	36822	Sound proof box (attenuation 30 dB (AU)) 100-240 V ~ (+- 10 %) 50/60 Hz-CH plug SEV 1011: T12	
	36823	Sound proof box (attenuation 30 dB (AU)) 100-240 V ~ (+- 10 %) 50/60 Hz-GB plug BS 1363	
	36824	Sound proof box (attenuation 30 dB (AU)) 115 V-US plug NEMA 5-15	

The sound proof box LS 40 can be used with the stand HG 40 or alternatively a suitable laboratory stand.

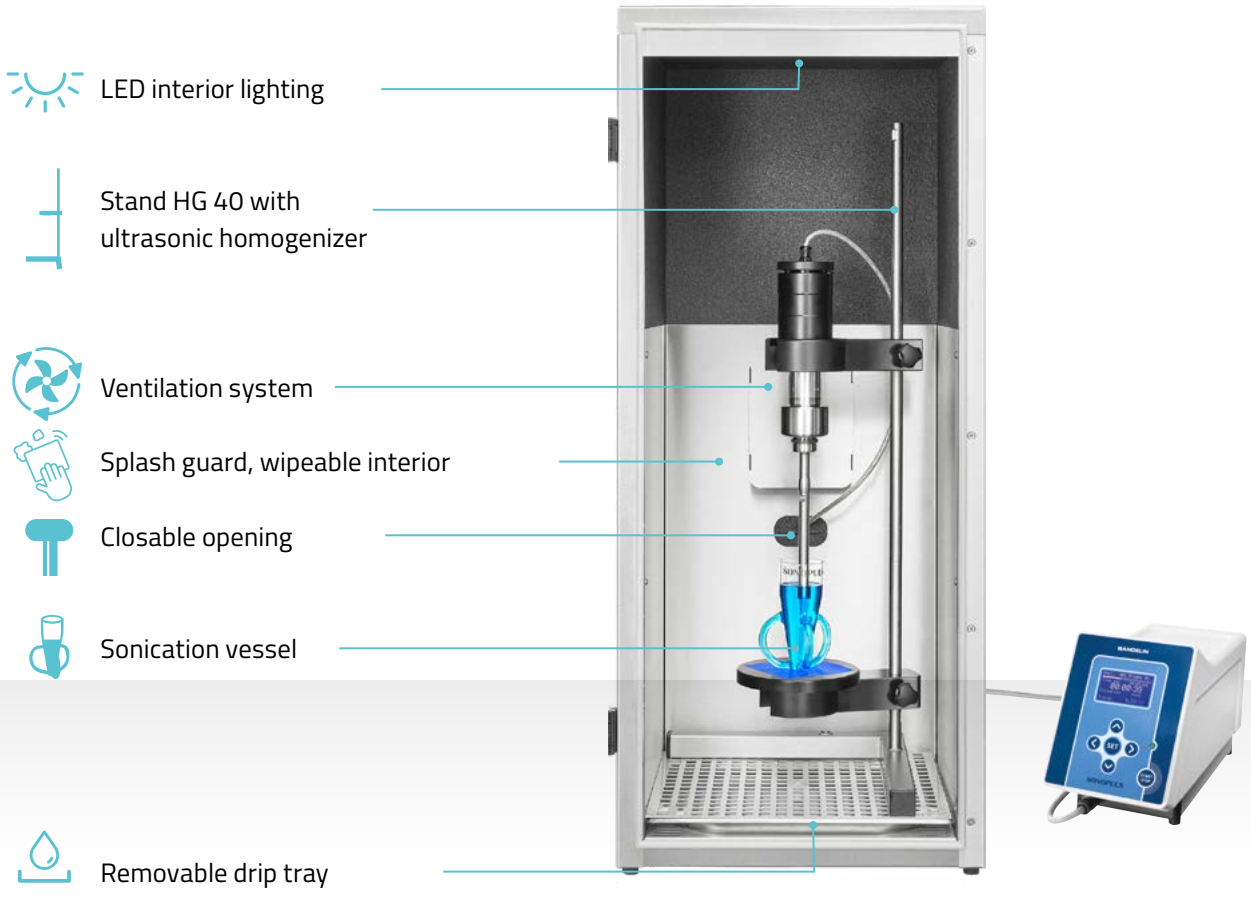
For direct and indirect sonication

The stand HG 40 can be flexibly placed in the sound proof box LS 40 to perform direct or indirect sound reinforcement.

Direct sonication
Sound proof box LS 40, stand HG 40, two holders WH 40 and supporting table AT 40, ultrasonic converter UW 200, booster horn SH 200 G, probe TS 113 and rosette cell RZ 3

Direct sonication
Sound proof box LS 40, stand HG 40 with two holders WH 40 and supporting table AT 40, ultrasonic converter UW 200, booster horn SH 200 G, probe TS 113 and rosette cell RZ 3

Indirect sonication
Sound proof box LS 40, stand HG 40 with two holders WH 40, ultrasonic converter UW 200 and cup horn BB 6 with microtube holder EH 6



FAQs

FAQs concerning practical application

Selection of the working frequency: 20 or 40 kHz?
40 kHz is generally used for homogenizing or mixing because the cavitation bubbles formed are smaller than at 20 kHz. Thus, these bubbles have less force during the implosion phase.

Are there technical limits to the use of ultrasound?
A) Viscosity - the higher the sample viscosity, the lower the ability to transmit the sound waves into the sample. Maximum viscosity approx. 1500 mPa s - own tests are recommended for higher viscosities.
B) Temperature - max. 80°C during continuous operation

Sample liquid splashes out of the vessel.
What do I have to change? Possible approaches:
Setting a lower amplitude and checking if the result is still satisfactory.
Use conical vessels
Increase the immersion depth

My sample liquid foams very much.
How can I prevent this?
Increase the immersion depth
Adding glass beads
Using a conical vessel
Positioning wire on the sample surface

How deep should I insert the probe?
Normally min. 0.5, max. 2 cm; too deep an immersion will cause too much damping of the horn.
Insufficient power input into the specimen is the result.
With Eppendorfcups, immerse the probe as far as possible, making sure that the sample does not foam!

May the probe touch the sample vessel during sonication?
sample vessel during sonication?
No. Damage to the probe and to the tube (melting, damage to the tube) may occur.
vessel (melting, breakage).

Can the probe be touched with the hands during the sonication process?
No. Damage to the bone tissue may occur.

I want to separate / deagglomerate cells, but cells are destroyed in the process.
What do I have to change?
Reduce the amplitude or use a probe with a larger diameter.

How is the power determined for SONOPULS ultrasonic homogenizers?
For the determination of the introduced power, the vessel that is also used in everyday laboratory work should act as the test vessel. This vessel is filled with water. During a defined period of time, the water is sonicated and the temperature increase is measured. In the calorimetric measurement, the amount of heat ΔQ can be determined by means of the heat capacity C and the temperature difference ΔT. From this, taking into account the time difference Δt, the applied power is obtained.
The following formula1 applies for this purpose[1]:

$$P = \frac{\Delta Q}{\Delta t} = \frac{c \cdot m \cdot \Delta T}{\Delta t}$$

The following applies:

P	power [W]
ΔQ	supplied energy, in this case the amount of heat [Ws]
Δt	time [s]
ΔT	temperature difference [K]
m	test water mass [kg]
c	specific heat capacity $[\frac{J}{kg\,K}]$

This method allows for documentation of the input of power in the test series. Further information can be requested from www.bandelin.com (power determination of SONOPULS ultrasonic homogenisers – 5169).

Can solvents be sonicated?
- Yes, but safe extraction of vapours must be guaranteed!
- Only small amounts!
- Observe the flashpoint; cooling may be required!

1 Note: The formula is only adequate for small volumes

FAQs concerning devices, probes and safety aspects

What should be done if the probe displays mild pitting?

At depths of up to approx. 1 mm, the probes should be carefully polished manually in your facility. For further information, refer to the instructions for use.

Are probes available in different lengths?

No. The probes are always calibrated to the resonance frequency and dictated by the design. They vary in the millimetre range depending on the acoustic properties of the titanium cast used (batch).

Do I have to pay attention to anything when disposing of the probes?

Sonotrodes can be disposed of easily by yourself, there is no potential danger, they do not contain any heavy metal and are therefore environmentally friendly. Scrap dealers pay a small fee (titanium weighs little, but is valuable).

Can probes also be produced from another material?

Yes, but with the respective restrictions:

- **Quartz glass** – only low amplitudes are possible, as the material cannot withstand high amplitudes.
- **Ceramics** – permit higher amplitudes than quartz glass, but is liable to break.
- **Stainless steel** – very brittle. Breaks quickly and more likely to heat.
- **Aluminium** – too soft. A certain hardness is essential for prolonging cavitation erosion. Limited chemical resistance.

Is hearing protection necessary?

The ultrasonic homogeniser can be operated in a soundproof box, available for purchase from BANDELIN, please enquire for more information. Alternatively, hearing protection should be worn: capsule hearing protection with an HM value of 25 – 30 dB or similar ear plugs or coverings if capsule hearing protection is unsuitable for the respective application.

FAQ concerning standards and guidelines

Do ultrasonic homogenisers comply with RoHS guidelines?

The devices comply with RoHS guidelines.

A final word

You can find our application guide at bandelin.com/prospekte/Application_guide_GB_BANDELIN.pdf. You can request our individual applications according to chapter 4 „Detailed applications“ at: marina.herrmann@bandelin.com.

Your contact person for the laboratory area

We will pleased to advice you

Dipl.-Ing.

Marina Herrmann

Sales director
Laboratory ultrasound

☎ +49 30 76880-18

marina.herrmann@bandelin.com

Contact

Address:

BANDELIN electronic
GmbH & Co. KG
Heinrichstraße 3 – 4
12207 Berlin
GERMANY

☎ +49 30 76880-0

+49 30 7734699

info@bandelin.com

www.bandelin.com

Visit us on social media:

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Made in Germany

BANDELIN electronic
GmbH & Co. KG
Heinrichstraße 3 – 4
12207 Berlin
GERMANY
☎+49 30 76880-0
🖷 +49 30 7734699
info@bandelin.com

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+49 30 76880-0

www.bandelin.com

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