



Instructions for use

SONOPULS

Ultrasonic homogeniser



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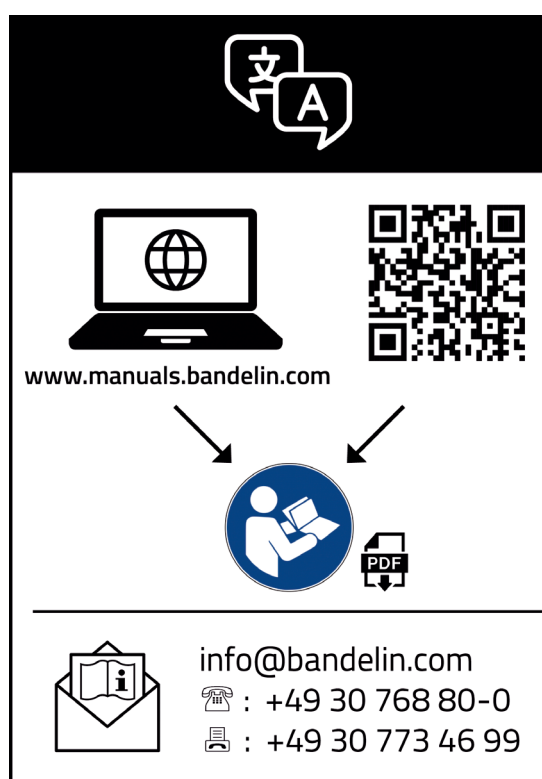
SONOPULS HD 5020

SONOPULS HD 5050

SONOPULS HD 5100

SONOPULS HD 5200

SONOPULS HD 5400



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Certified in accordance with ISO 9001 and ISO 13485

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1 About this operating manual

These instructions for use contain necessary and useful information on how to operate the device safely and efficiently.

- Read these instructions for use before using the device.
- Pay special attention to chapter **2 Safety**.
- If you pass this device on to others, please enclose these instructions for use.
- Contact your specialist dealer or BANDELIN if any of your questions are not answered in these instructions for use. Information on service can be found in chapter **6.3 Repair**.

Illustrations are provided as examples and are not to scale.

2 Safety

2.1 Use of the device

The device is intended to be used in laboratories, clinics and in industrial research. It performs diverse tasks during sample preparation in Quality Assurance, scientific experiments, analyses, and in pilot or short-series manufacture. Only use the GM 5000 ultrasonic generators with the ultrasonic transducers from chapter **8 Device information**. Examples of applications are:

- Disruption of cells, bacteria, viruses, tissue
- Production of the finest emulsions
- Homogenising of substances
- Degassing of liquids
- Sample preparation for the grain size analysis
- Acceleration of chemical reactions
- Sample preparation for sewerage analysis

Do not sonicate non-liquid media. In case of improper use, the manufacturer does not assume any responsibility for the safety as well as the functionality.

2.2 Explosion hazard

Do not use the device with combustible liquids as a sonicating medium. Combustible vapours may be generated when flammable liquids are sonicated. Vapours may ignite, e.g. on electrical components, resulting in an explosion. Do not use combustible solvents in open sonication vessels, as the operational safety of the device could be compromised. Safe extraction of combustible vapours must be guaranteed.

2.3 Hazards due to high temperature

Ultrasound heats up the sonicating medium. The device, the sonicating medium and the sonication vessel can become very hot during prolonged ultrasound operation. Contact with these products may cause burns.

- Do not leave the ultrasound switched on for longer than necessary.
- Allow the probe and sonication vessel to cool down before touching them.

Non-aqueous liquids can heat up many times faster than water. A possible flashpoint can be reached or exceeded after a very short sonication time. In the case of high-boiling liquids, the temperature can rise to over 120 °C due to the energy input of the ultrasound. This can lead to fires and severe burns.

2.4 Danger of electric shock

The device is an electrical device. Failure to follow safety rules can result in a life-threatening electric shock.

- Protect the device from moisture and wetness. Keep the surfaces and the touchscreen clean and dry.
- Do not spray or expose the device to splash water.
- Do not cover the device.
- Position the device so that it is easy to unplug the mains connection at any time and without difficulty.
- The device must be plugged into a power outlet with an earthing socket that fits the earthing contact on the device plug.



WARNING

For devices with type E+F plugs, please note:

Combining with type K sockets (particularly common in Denmark) is not permitted.

- Do not connect any external voltage sources to the external interfaces.
- If you notice a defect in the device, disconnect the mains plug immediately. Do not connect a defective device to the mains.
- Repairs should only be carried out by the manufacturer.

2.5 Danger due to ultrasound

Strong ultrasound destroys cell structures. Exposing a body part to ultrasound can lead not just to skin damage, but also to internal tissue damage. On fingers, the periosteum can become damaged.

- Do not touch the probe, the booster horn or the standard horn during operation. Do not touch the sonication fluid during operation.
- Never sonicate living beings.

2.6 Danger due to the sonicating medium

The sonicating media treated with the device can be toxic, corrosive or otherwise harmful to health. Vapours and aerosols can also be dangerous.

- Wear gloves and safety goggles when handling hazardous preparations.
- Make sure that the sonicating medium does not splash. This can particularly occur with small quantities of sonicating medium. Only switch on the device once the probe has been immersed in the sonicating medium. Start sonication with a low amplitude.
- Do not lean over the ultrasonic vessel, in order to avoid vapours from coming into contact with the eyes or from being inhaled.
- In case of dangerous vapours, use a suction device.

2.7 Harmful to health due to ultrasound noise

The ultrasound noise typical of the process can be perceived as very unpleasant. Remaining within a radius of 2 m for an extended period of time may cause damage to health.

- Use a sound proof box; see chapter **9 Accessories**. The sound proof box significantly reduces the noise level.
- When operating without a sound proof box, wear hearing protection.

2.8 Keep out of reach of children

Children cannot identify hazards posed by the device. Therefore, keep the device out of the reach of children.

2.9 Damage to the probe and sonication vessel

Probes are sensitive to shock. Handle the probes with care.

Make sure that the probe does not touch the sonication vessel. This can damage the probe and the vessel.

Foreign bodies on the contact surface between the probe and standard horn or booster horn can destroy both parts. Therefore, always clean the contact surfaces thoroughly before mounting the probe.

The sound-emitting surface of the probe is subject to erosion. Erosion reduces the efficiency of the sonication process. The sonication of corrosive liquids leads to increased wear.

The sound-emitting surface can be reconditioned up to a certain point of erosion. See chapter **6.2 Refurbish probe**.


2.10 Disturbance of wireless communication

The device may interfere with other wireless communication devices in the immediate vicinity.

If interference occurs with the operation of a wireless device, move it further away from the device.

2.11 Safety labels on the device

- Observe all safety labels on the device.
- Keep the safety labels in legible condition. Do not remove them. Replace them if they are no longer legible. To do so, please contact our Customer Service. See chapter **6.3 Repair**

Symbol	Meaning	Explanation
	Wear ear protectors	Wear hearing protection or use a sound proof box when operating the unit.

3 Design and function

3.1 Overview

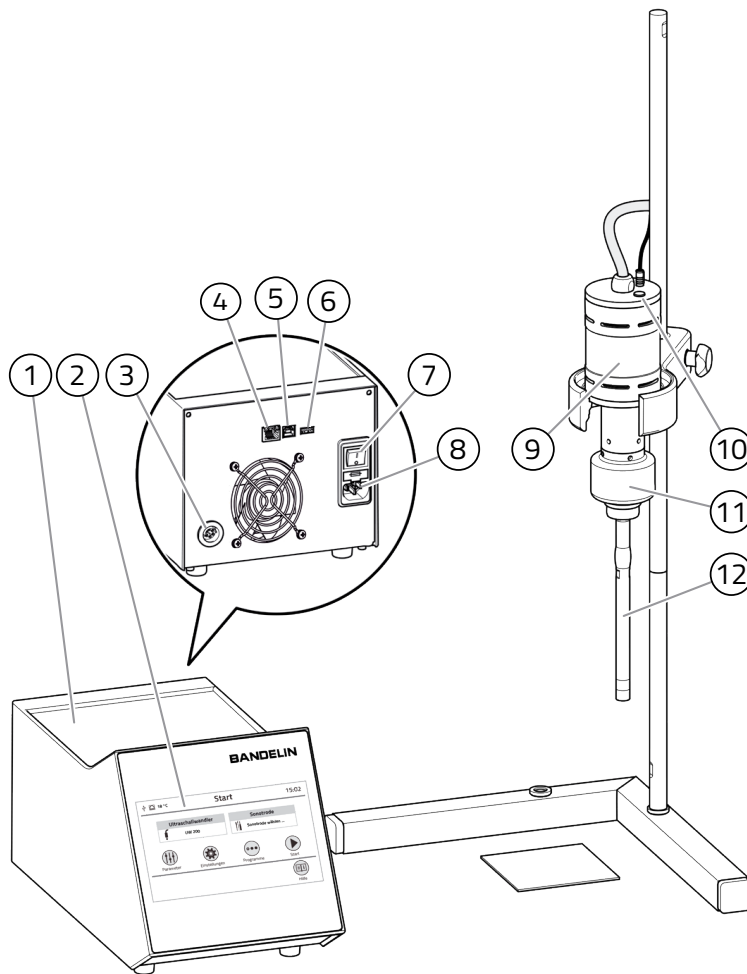










Fig. 1 Overview of the device

- 1 Ultrasound generator
- 2 Touchscreen
- 3 Connector for ultrasonic converter
- 4 LAN connection
- 5 USB Type B port
- 6 USB Type A port
- 7 Mains switch
- 8 Cold device socket with fuse holder
- 9 Ultrasonic converter
- 10 Start/Stop key
- 11 Standard horn/booster horn
- 12 Probe

3.2 Symbols and buttons on the touch screen

-  Return to previous screen
-  Reset values
-  Confirm/Save
-  Go to startup screen
-  Calling up the screen help
-  Start
-  Pause
-  Stop

3.3 Function

The device convert the absorbed grid energy into high-frequency energy. The ultrasonic converter converts the high-frequency energy into ultrasound. At the tip of the probe, mechanical deflections are created that are transferred into the sonicating medium as ultrasonic waves with a high power density. The standard horn or booster horn allows multiple amplification of the mechanical amplitude at the probe tip.

For sonication, the power or amplitude can be selected as the reference variable. If the amplitude is selected as the reference variable, it is kept constant by the ultrasonic converter regardless of the load, provided that the permissible maximum power is not exceeded. An optional temperature sensor enables the temperature of the sonicating medium to be monitored.

The device saves documentation of its function. Documentation can be backed up via a USB port or LAN port for evaluation and archiving.

The device is operated with a touchscreen. In addition, the ultrasound can be switched on and off with a button on the ultrasonic converter.

4 Preparation for operation

4.1 Set up homogeniser

1. Place the ultrasonic generator on a firm, level and dry surface.
 - Make sure that the ventilation slots in the bottom plate of the ultrasonic generator and the fan at the rear are not closed or blocked.
 - Prevent liquid from entering the unit.
2. Screw the probe onto the standard horn or booster horn, or to the ultrasonic converter (HD 5020/5050); see **4.2 Mounting/removing the probe**.
3. Clamp the ultrasonic converter on the black housing in a suitable holder. BANDELIN recommends the HG 40 stand; see **9 Accessories**.
4. If you are using a sound proof box, place the holder with the ultrasonic converter in the sound proof box.
5. Insert the plug of the ultrasonic converter into the connection on the rear of the ultrasonic generator.
6. Optional: Connect the temperature sensor to the ultrasonic converter.
7. Check that the mains switch is set to "0". Insert the mains plug into a grounded socket.

4.2 Mounting/removing the probe

NOTICE

Damage to the ultrasonic converter

If the ultrasonic oscillating system in the housing of the ultrasonic converter twists, the ultrasonic converter will be damaged.

- Always use the sickle spanner to secure the standard horn or booster horn.
- Never hold the ultrasonic converter by the housing when tightening or loosening the probe.

Requirement

- The ultrasonic converter is disconnected from the ultrasonic generator.
- Tools required: 1 sickle spanner, 1 spanner (supplied tool set).

Procedure

1. Clean the mounting surfaces of the standard horn, booster horn, or the ultrasonic converter (HD 5020/5050) and the probe.
2. Screw the probe on hand-tight.
3. Place the ultrasonic converter on a firm tabletop. In the case of probes, support the probe tip with a thick underlay if necessary.
4. Place the sickle spanner on the standard horn, booster horn, or the ultrasonic converter (HD 5020/5050). Support the sickle spanner on the tabletop; see also the following figures.
5. Firmly tighten the probe with the spanner. The use of a torque wrench (Code No. 3662) is recommended – not for HD 5020 and HD 5400. The required tightening torque can be found in the product information supplied with the probe.

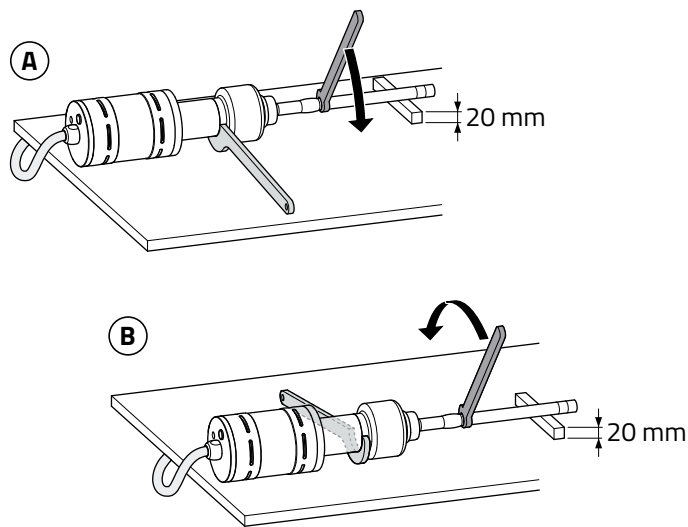


Fig. 2 Loosen (A) and tighten (B) the probe

A video on loosening and attaching the probe is available:
https://www.youtube.com/watch?v=hjTC_cvO4kQ



4.3 Mounting/removing standard horn or booster horn

NOTICE

Damage to the ultrasonic converter

If the ultrasonic oscillating system in the housing of the ultrasonic converter twists, the ultrasonic converter will be damaged.

- Always use the sickle spanner to secure the ultrasonic converter.

Requirement

- The ultrasonic converter is disconnected from the ultrasonic generator.
- Tools required: Sickle spanner for ultrasonic converter and standard horns or booster horns (supplied tool set).

Procedure

1. Place a sickle spanner on the ultrasonic converter. Place the ultrasonic converter on a fixed tabletop and support the sickle spanner on the tabletop.
2. Place a sickle spanner on the standard horn or booster horn. Loosen the standard horn or booster horn.

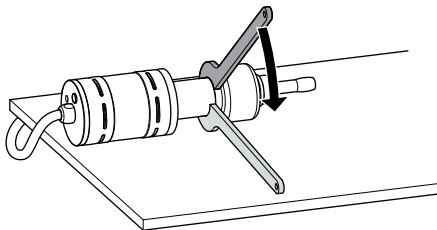


Fig. 3 Removing standard horn or booster horn

1. Unscrew the standard horn or booster horn by hand.
2. Clean the mounting surfaces of the ultrasonic converter and the standard horn or booster horn, as well as the thread of the threaded pin, with a lint-free cloth soaked in alcohol.
3. Screw the standard or booster horn hand-tight into the ultrasonic converter.
4. Place a sickle spanner on the ultrasonic converter. Place the ultrasonic converter on a fixed tabletop and support the sickle spanner on the tabletop.
5. Place a sickle spanner on the standard horn or booster horn. Tighten firmly. The use of a torque wrench is recommended. The required tightening torque can be found in the product information supplied with the standard horn or booster horn.

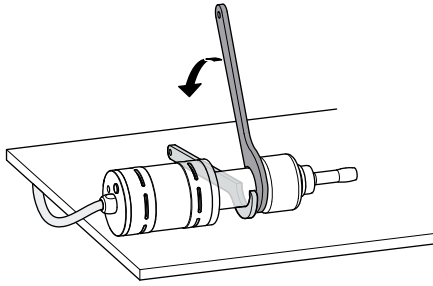


Fig. 4 Tightening standard horn or booster horn

A video is available for mounting and disassembling the standard horn or booster horn:

<https://www.youtube.com/watch?v=NXbGc6nAb5c>



4.4 Switching the device on and off

Switching on the ultrasonic homogeniser for the first time

Allow the device to stand for 2 hours at its operating location before switching it on so that it can adapt to the climatic conditions.

1. Switch on the device using the mains switch on the rear of the ultrasonic generator.
 - » The "Language" screen appears.
2. Select your language.
 - » The "Time/Date" screen appears.
3. Tap the values to be changed. Enter the desired values. Confirm the entries with the "Confirm/Save" button. Exit the "Time/Date" screen by pressing the "Confirm/Save" button.
 - » The startup screen appears.

If the language and time are set, the startup screen will appear immediately the next time the device is switched on. If the startup screen does not appear, see **5.7 Troubleshooting a malfunction**.

Switching the ultrasonic homogeniser off

Switch off the device using the mains switch on the rear of the ultrasonic generator.

4.5 Select probe

The control unit of the device automatically detects the connected ultrasonic converter. The mounted probe must be selected via the touchscreen

1. On the startup screen, tap "Probe".
2. Select the probe used.
3. Confirm your entry with the "Confirm/Save" button.

5 Operation

5.1 Immersion depth notes

The recommended immersion depth for probes is 10 ... 20 mm, to prevent the aspiration and mixing-in of air. If mixed-in air is desired, the probe may be immersed just a few millimetres. When producing emulsions, the probe should be immersed to the height of the surface separating the liquids to be mixed.

5.2 Preselect parameters for sonication

5.2.1 Set amplitude or power

i Information

In the case of greater immersion depths or the sonication of liquids with high viscosities, the probe is more heavily damped. As a result, the preset amplitude may not be reached.

The device can regulate the emitted ultrasonic power so that either a set amplitude is kept constant or a set power is kept constant. The amplitude is given in %. The absolute value of the amplitude depends on the combination of standard horn or booster horn and probe. The power is specified in watts and depends on the respective ultrasonic converter.

1. On the startup screen, tap "Parameters".
2. Tap "Ampl./Power".
3. Tap "Amplitude" if sonication is to be carried out with a constant amplitude, or "Power" if sonication is to be carried out with a constant power.
4. Select the desired value for amplitude or power. You can move the bar of the selected setting parameter or enter a numerical value.
5. Confirm your entry with the "Confirm/Save" button.

With amplitude regulation, the amplitude is kept constant. The power can vary depending on the condition of the medium. When the respective maximum power is reached, the amplitude is reduced.

Power control keeps the power constant. The power can vary depending on the condition of the medium. When the respective maximum amplitude is reached, the power is reduced.

5.2.2 Enter sonication time

1. On the startup screen, tap "Parameters".
2. Tap on "Time".
3. Make the desired settings for the sonication time.
 - » A time setting is only effective if "Continuous operation" is not activated.
4. Confirm your entry with the "Confirm/Save" button.

5.2.3 Set pulsation

The sonication can be switched on continuously or in pulses.

1. On the startup screen, tap "Parameters".
2. Tap "Pulsation".
3. Turn pulsation on or off.
4. Enter how long you want the sonication to be alternately switched on and off.
5. Confirm your entry with the "Confirm/Save" button.

5.2.4 Setting temperature monitoring

With the BANDELIN temperature sensor TM 5000 you can monitor the temperature of the sample during sonication. You can set whether the ultrasound is switched off or only a warning tone is emitted when a limit value between 0 °C and 100 °C is reached. To do this, connect the TM 5000 temperature sensor to the lid of the respective ultrasonic converter after removing the dust cap. The temperature now appears on the display.

1. On the startup screen, tap "Parameters".
2. Tap "Temperature."
3. Make the desired changes. To set the temperature, you can move the bar or enter a numerical value.
4. Confirm your entry with the "Confirm/Save" button.



Information

Only the TM 5000 temperature sensor is compatible with the unit.

5.3 Start sonication

Requirement

- The probe tip is immersed in the sonicating medium; see **5.1 Immersion depth notes**.
1. On the startup screen, tap the "Start" button.
 - » The "Sonication" screen appears.
 - » The preselected sonication parameters are displayed; see chapter **5.2 Preselect parameters for sonication**.
 2. Optional: Tap one of the buttons "Amplitude," "Power," "Time," "Pulsation" or "Temperature" to change the preselected settings for the current sonication. Confirm the new settings by tapping the "Confirm/Save" button.
 3. Tap the "Start" button at the bottom of the screen.
 - » The sonication begins.
 - » If the timer was set, the sonication ends automatically after the set time.
 - » You can interrupt the sonication at any time with the "Pause" button or end it with the "Stop" button.
 - » After the end of sonication, a screen with a summary of the sonication appears.
 4. Tap the "Confirm/Save" button
 - » The sonication screen reappears with the last settings.

5.4 Creating and starting programs

5.4.1 About programs

Programs are saved parameter sets for sonication. Amplitude or power, time and pulsation are stored in a program. A total of eight programs can be stored. Each program can be active or inactive. The sequence in which the programs are executed can be defined as required.

5.4.2 Creating a program

1. On the startup screen, tap "Programs".
 - » The "Programs" overview screen is shown.
2. Tap on a program number.
3. If a screen with the summary of the program parameters appears, tap "Edit".
4. Tap the "Ampl./Power," "Time" or "Pulsation" button to edit the program parameters; see **5.2 Preselect parameters for sonication**. Confirm your entry with the "Confirm/Save" button.
5. Tap the "Confirm/Save" button to save the program.

5.4.3 Activating and deactivating a program

Activating a program

1. On the startup screen, tap "Programs".
 - » The "Programs" overview screen is shown.
2. Tap on a program number.
3. If a screen with the summary of the program parameters appears, tap "Edit".
4. Under "Sequence," select the position in the sequence of programs.
5. Set the sliding switch to "on".
6. Tap the "Confirm/Save" button to save the activation.
7. Tap the "Back" button on the screen with the summary of the program parameters.
 - » The "Programs" overview screen is shown.
 - » Activated programs are shown in colour.
 - » For programs that are assigned a position in the sequence, the three dots under the program number are shown in black.

Deactivating a program

1. On the startup screen, tap "Programs".
 - » The "Programs" overview screen is shown.
2. Tap on a program number that is highlighted in colour.
 - » The screen with the summary of program parameters appears.
3. Tap the "Deactivate" button.
 - » The button changes to "Activate".
 - » The program is deactivated.
 - » The position of the program in the sequence remains reserved.
4. Tap the "Back" button.
 - » The "Programs" overview screen is shown.
 - » The deactivated program is shown in grey.

Deactivate a program and release its position in the sequence

1. On the startup screen, tap "Programs".
 - » The "Programs" overview screen is shown.
2. Tap on a program number that is highlighted in colour.
3. Tap the "Edit" button.
4. Tap the "Reset" button below.
 - » The number after "Sequence" changes to "0".
 - » The slide switch changes to "off".
5. Tap the "Confirm/Save" button.
6. Tap the "Back" button.
 - » The "Programs" overview screen is shown.
 - » The deactivated program is shown in grey.
 - » The three dots under the program number are shown in light colour.

5.4.4 Starting a program

To start set and activated programs in the specified sequence, proceed as follows:

Requirement

- The probe tip is immersed in the sonicating medium; see **5.1 Immersion depth notes**.
 - At least one program is activated and a space is assigned in the sequence; see **5.4.3 Activating and deactivating a program**.
1. On the startup screen, tap "Programs".
 - » The "Programs" overview screen is shown. The sequence of activated programs is displayed at the top.
 2. Tap the "Start" button.
 - » The "Sonication" screen appears with the settings of the first activated program in the specified sequence. The individual parameters can still be changed by tapping one of the buttons "Amplitude," "Power," "Time," "Pulsation" or "Temperature". Confirm the new settings by tapping the "Confirm/Save" button.
 3. Optional: Tap one of the buttons "Amplitude," "Power," "Time," "Pulsation" or "Temperature" to change the preselected settings for the first program. Confirm the new settings by tapping the "Confirm/Save" button. The changed parameters now only apply to the current sonication process. The parameters stored in the programs remain unchanged.
 4. Tap the "Start" button.
 - » The sonication begins.
 - » The sonication ends automatically after completion of the activated programs.
 - » You can interrupt the sonication at any time with the "Pause" button or end it with the "Stop" button.
 - » After the end of sonication, a screen with a summary of the sonication appears.
 5. Tap the "Confirm/Save" button.
 - » The "Sonication" screen appears again.

5.5 Creating documentation

Activate logging



Information

The logs are also generated without connection of a USB device. They can be exported later, as long as the device has not been switched off in the meantime. The logs are lost when the device is switched off.

1. On the startup screen, tap "Settings".
2. Tap "Documentation".
3. Activating logging.
4. Confirm your entry with the "Confirm/Save" button.

Define institution

The data specified under "Institution" is stored in the documentation issued.

1. On the startup screen, tap "Settings".
2. Tap "Documentation".
3. Tap "Institution".
4. Enter the desired data.
5. Confirm your entry with the "Confirm/Save" button.

Export documentation via USB

You can connect a USB device to the back of the ultrasonic generator to secure data even without a network connection.

1. On the startup screen, tap "Settings".
2. Tap "Documentation".
3. Tap "USB Export".
4. Select the desired medium.

Deleting documentation

1. On the startup screen, tap "Settings".
2. Tap "Documentation".
3. Tap on "Delete".
4. Select the desired documentation.
5. Confirm your entry with the "Confirm/Save" button.

5.6 Set settings

5.6.1 Adjusting the button function

You can specify whether the button on the ultrasonic converter must be held down in order to activate the ultrasound, or whether it is switched on and off by pressing briefly.

1. On the startup screen, tap "Settings".
2. Tap "UW button".
3. Select a setting.
4. Confirm your entry with the "Confirm/Save" button.

5.6.2 Adjust brightness

1. On the startup screen, tap "Settings".
2. Tap on "System".
3. Tap "Brightness".
4. Set the desired brightness.
5. Confirm your entry with the "Confirm/Save" button.

5.6.3 Set the language

1. On the startup screen, tap "Settings".
2. Tap on "System".
3. Tap "Language".
4. Select the desired language.
5. Confirm your entry with the "Confirm/Save" button.

5.6.4 Setting time and date

Information

The time does not adjust automatically to summer time. At the start and end of summer time, you must reset the time.

1. On the startup screen, tap "Settings".
2. Tap on "System".
3. Tap on "Time/Date".
4. Tap the values to be changed. Enter the desired values. Confirm the entries with the "Confirm/Save" button.
5. Exit the "Time/Date" screen by pressing the "Confirm/Save" button.

5.6.5 Set sleep mode

To save energy, the device will go into a sleep mode after a while. The touchscreen switches off in sleep mode. Wake up the device by tapping the touchscreen. The time of inactivity after which the sleep mode starts can be adjusted

1. On the startup screen, tap "Settings".
2. Tap on "System".
3. Tap "Sleep Mode".
4. Enter the desired switch-off time.
5. Confirm your entry with the "Confirm/Save" button.

5.6.6 Configuring the network

1. On the startup screen, tap "Settings".
2. Tap on "System".
3. Tap "Interface".
4. Tap on "Network".
5. Activate "DHCP" if you want the device to automatically obtain the network settings. You can enter the IP address, DNS addresses and netmask manually if you deactivate "DHCP".
6. Switch the device off and on again for the new settings to take effect.

5.6.7 Set temperature unit

You can select either Fahrenheit or Celsius as the displayed temperature unit.

1. On the startup screen, tap "Settings".
2. Tap on "System".
3. Tap "Units".
4. Select the desired temperature unit.
5. Confirm your entry with the "Confirm/Save" button.

5.7 Troubleshooting a malfunction

Proceed according to the message on the touchscreen to rectify the fault.
The following table contains faults that are not displayed on the touchscreen.

Error	Possible causes	Troubleshooting
Device cannot be switched on (touchscreen remains dark)	Mains cable loose or faulty	<ul style="list-style-type: none"> Check the plug connection for firm positioning. Check cable for continuity.
	No power	<ul style="list-style-type: none"> Check the main fuses.
	Device fuse defective	<ul style="list-style-type: none"> Check device fuses. The device fuses are located in the cold device socket on the rear side of the generator (2 fuses F2A).
Little or no ultrasonic power?	Standard horn, booster horn or probe not screwed tight	<ul style="list-style-type: none"> Disassemble the included tool parts, clean the surfaces and firmly re-tighten; see 4.3 Mounting/removing standard horn or booster horn.
	Standard horn, booster horn or probe defective	<ul style="list-style-type: none"> Check standard horn/booster horn (if present) and probe for cracks; disassemble and replace if necessary; see chapter 4.3 Mounting/removing standard horn or booster horn and 4.2 Mounting/removing the probe.
	Erosion on the probe	<ul style="list-style-type: none"> If there is minor erosion, repolish the sound-emitting surface of the probe. If pitting begins to form, grind or mill max. 1 mm. In case of severe erosion, replace the probe.
	Liquid has penetrated between standard horn/booster horn and probe	<ul style="list-style-type: none"> Disassemble the probe, clean the mounting surfaces and threads, dry and check for flatness, reassemble the probe; see 4.2 Mounting/removing the probe.
	Thread attachment on titanium plate defective	<ul style="list-style-type: none"> Replace titanium plate.
	Threaded pin on the standard horn/booster horn has a crack	<ul style="list-style-type: none"> Remove standard horn/booster horn, check threaded bolt, replace if necessary; see 4.3 Mounting/removing standard horn or booster horn.
Significant heating near the mounting surfaces between the ultrasonic converter and the standard horn/booster horn	Standard horn/booster horn or probe not mounted firmly enough, mounting surfaces dirty	<ul style="list-style-type: none"> Remove standard horn/booster horn or probe, clean mounting surfaces. Screw together firmly again; see 4.3 Mounting/removing standard horn or booster horn and 4.2 Mounting/removing the probe.

6 Maintenance

6.1 Cleaning the device

- Disconnect the device from the mains before cleaning.
- Wipe the device with a lint-free damp cloth. You can use a commercially available cleaning agent without abrasive additives.
- If necessary, the surfaces can be treated with a surface disinfectant.
- Clean the probe with a cloth soaked in alcohol.
- The probe can be processed in a steriliser. Unscrew it before cleaning.

6.2 Refurbish probe

The probes are subject to erosion on the sound-emitting surface. This leads to a reduction in sonication efficiency.

The sound-emitting surfaces can be carefully polished or milled a few times.

You can process the surface using a grinder with a fine grinding disc.

Suitable grinding materials are, for example:

- Fine abrasive wheel, polyurethane-bound – grain size 220
- Fine abrasive wheel, rubber-bound – grain size 180

As soon as material removal due to erosion or rework exceeds a value of approx. 1 mm, the probe can no longer be used. Amplitude or power is then no longer displayed on the touchscreen. In the case of frequent use, it is recommended that an inventory supply of probes be kept.

6.3 Repair



WARNING

Health risk due to contaminated device

- Decontaminate the device before shipping if it has come into contact with hazardous substances.
-

If the device needs to be repaired, send it to the manufacturer.

Clean and decontaminate the device and accessories before shipping.

The "Certificate of Decontamination" is intended to protect the occupational health and safety of our employees pursuant to the German Protection against Infection Act and the trade association accident prevention regulations.

Before sending the device back to us for inspection/repair, the device and accessories must be cleaned pursuant to current laws and regulations and, if necessary, must also be disinfected with a surface disinfection agent listed by the VAH (Alliance for Applied Hygiene). Please understand that we cannot start work until this Certificate is completed in full and submitted.

Download the "Certificate of Decontamination" form here:

<https://www.bandelin.com/downloads>

Fill out the form and attach it to the outside of the packing so that it is clearly visible. Acceptance will be refused without a completed form.



Send the device to the following address:

BANDELIN electronic GmbH & Co. KG
Heinrichstr. 3–4
12207 Berlin
Germany

+49 30 76880-13
service@bandelin.com

7 Disposal



WARNING

Health risk due to contaminated device

- Decontaminate the device before disposal if it has come into contact with hazardous substances.
- Also decontaminate accessories before disposal.

Dispose of the device properly as electronic waste if it can no longer be used. Do not dispose of the device with household waste. Observe the locally applicable regulations for the disposal of electronic waste.

The device contains a lithium-metal battery.

The vibrating elements contain sintered ceramics made of lead titanium zirconium oxide.

- EC No. 235-727-4
- CAS No. 12626-81-2



This use is authorised in accordance with RoHS Directive 2011/65/EU, Annex III, exception 7c. I.

Also dispose of accessories properly in accordance with the material used.

8 Device information

8.1 Technical data

Ultrasound generator

Type:	GM 5000
Mains supply:	100-240 V~ ±10% 50/60 Hz
Current consumption: 90 V AC/115 V AC	Max. 5.2 A
Current consumption: 230 V AC	2.6 A
Fuses:	F 6.3 A
Protection class:	I
Ultrasonic frequency:	20 kHz ±0.5 kHz, 30 kHz ±0.5 kHz
Frequency tracking:	Automatic
Time setting range [hh:mm:ss]:	00:00:01 - 99:59:59
Ultrasound operating modes:	Pulsating, continuous
Pulsation time:	0.5 ... 600 s
Regulation:	Amplitude or power
Amplitude setting range:	10% ... 100% in 1% steps
Power setting, power display:	Watt
Energy display:	Ws
Temperature display:	-10 °C ... +125 °C
Data memory locations:	8
Operating element:	7" touch screen
Remote operation	Button on ultrasonic converter
Interfaces:	USB Type A, USB Type B, Ethernet
Degree of protection:	IP 20 according to IEC 60529
Maximum power, depending on the ultrasonic converter:	20 W, 50 W, 100 W, 200 W, 400 W
Weight:	3.2 kg
Dimensions (width × depth × height):	195 mm × 385 mm × 215 mm

Ultrasonic converter UW 5020

Ultrasonic frequency:	30 kHz
Weight:	0,5 kg
Dimensions:	Ø 50 mm × 150 mm
Degree of protection:	IP 30

Ultrasonic converter UW 5050

Ultrasonic frequency:	20 kHz
Weight:	0,6 kg
Dimensions:	Ø 50 mm × 185 mm
Degree of protection:	IP 30

Ultrasonic converter UW 5100, UW 5200

Ultrasonic frequency:	20 kHz
Weight:	1,0 kg
Dimensions:	Ø 70 mm × 155 mm
Degree of protection:	IP 30

Ultrasonic converter UW 5400

Ultrasonic frequency:	20 kHz
Weight:	1,4 kg
Dimensions:	Ø 90 mm × 170 mm
Degree of protection:	IP 30

Temperature sensor

Type:	TM 5000
Sensor type:	Pt1000
Temp. range	–10 °C ... +125 °C
Cable length:	1 m
Measuring tip:	150 mm
Diameter:	2 mm

8.2 Ambient conditions

Overvoltage category:	II
Degree of contamination:	2
Permissible ambient temperature:	5 - 40 °C
Permissible relative humidity up to 31 °C:	80 % (non-condensing)
Permissible relative humidity up to 40 °C:	50 % (non-condensing)
Altitude	< 2000 m above sea level
For indoor operation only	

8.3 CE conformity

The device satisfies the CE-marking criteria of the European Union:

- 2014/35/EU – Low Voltage Directive
- 2014/30/EU – EMC Guideline
- 2011/65/EU RoHS Directive

A declaration of conformity can be requested from the manufacturer by providing the serial number.

9 Accessories

9.1 Available probes

Ultrasonic converter UW 5020

Probe	Ø sound emitting surface [mm]	Sonication volume [ml]	Max. amplitude [μm_{ss}]
MS 1.5	1,5	0,1 ... 10	70
MS 2.0	2,0	0,25 ... 20	75
MS 2.5	2,5	0,5 ... 25	80

Ultrasonic converter UW 5050

Probe	Ø sound emitting surface [mm]	Sonication volume [ml]	Max. amplitude [μm_{ss}]
TS 102	2	0,5 ... 20	135
TS 103	3	1 ... 25	105
TS 104	4,5	3 ... 50	90
TS 106	6	5 ... 75	75
TS 109	9	10 ... 100	65

Ultrasonic converter UW 5100 with standard horn SH 100 G

Probe	Ø sound emitting surface [mm]	Sonication volume [ml]	Max. amplitude [μm_{ss}]
TS 102	2	2 ... 25	260
TS 103	3	3 ... 50	245
TS 104	4,5	5 ... 75	190
TS 106	6	10 ... 100	160
TS 109	9	15 ... 150	135
TS 113	13	20 ... 200	80
TT 213	13	20 ... 200	80

Ultrasonic converter UW 5200 with standard horn SH 200 G

Probe	Ø sound emitting surface [mm]	Sonication volume [ml]	Max. amplitude [μm_{ss}]
TS 103	3	5 ... 90	320
TS 104	4,5	5 ... 100	265
TS 106	6	10 ... 350	230
TS 109	9	10 ... 500	200
TS 113	13	20 ... 900	140
TT 213	13	20 ... 900	140
TS 216	16	25 ... 900	105
TS 219	19	25 ... 900	80
TS 225	25	30 ... 1000	50

Ultrasonic converter UW 5400 with standard horn SH 400 G

Probe	Ø sound emitting surface [mm]	Sonication volume [ml]	Max. amplitude [μm_{ss}]
TS 413	13	100 ... 750	260
TS 416	16	250 ... 1000	180
TS 419	19	250 ... 1500	130
TS 425	25	500 ... 2000	75
TS 425 L	25	500 ... 3000	75
TS 432	32	500 ... 2500	50
TS 438	38	500 ... 3000	40

9.2 Optional accessories



Stand HG 40,
for correct, variable positioning of the ultrasonic converter.












Sound proof box LS 40,
reduces noise emissions by approx. 30 dB(AU).



Temperature sensor TM 5000,
Pt 1000, sample temperature monitoring.

For further accessories, please refer to the product information.

9.3 Optional tool

	Double open-end spanner MS 8/10 Mounting/disassembling of the probes for HD 5020
	Open-end spanner MS 10 Mounting/disassembling of the probes for HD 5050/5100/5200
	Open-end spanner MS 22 Mounting/disassembling of the probes for HD 5400
	Sickle spanner HS 25/28 For holding UW 5020/5050 in place during mounting/disassembling of the probes
	Sickle spanner HS 40/42 For holding SH 100 G/SH 200 G in place during mounting/disassembling of the probes
	Sickle spanner HS 40/42, long 2 pieces: Mounting/disassembling of stand-ard/booster horns, BR 30, BB 6, TR 110
	Sickle spanner HS 45/50 For holding SH 400 G in place during mounting/disassembling of probes
	Sickle spanner HS 45/50, long Mounting/disassembling of the standard/booster horn on the ultrasonic converter
	Torque wrench DMS 10 For mounting probes with defined torque Except probes for HD 5020/5400

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