

SHORT OPERATING INSTRUCTIONS

SONOPULS Ultrasonic Homogenizers HD 2070, HD 2200

230 V or with change-over switch 115 V / 230 V

Attention:

- ◆ Before starting, check the fixing of the probe (point 1).
- ◆ **Avoid any contact of the vessels with the oscillating probe, otherwise probe or vessels could be damaged.**
- ◆ **Do not touch any** oscillating part (standard or booster horn and probes) during the process.
- ◆ **Switch off the unit** before removing or fixing the probes, standard or booster horns (point 1 and point 4).
- ◆ **Use only** spanners 10, 15 or 22, sickle spanner 40/42 and sickle spanner 40/42, long for fixing /removing from probes, standard or booster horns (appendix 3).
- ◆ **Noise protection** - use a sound-proof box or wear hearing protectors.
- ◆ Do not use **combustible solvents** in open vessels because the operational safety of the homogenizer can not be guaranteed. Do not place the homogenizer into a sound-proof box because solvent fumes could not escape.

⇒

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**55 years of experience in
ultrasound technology**

Certified according to EN ISO 9001:12.2000
EN ISO 13485:11.2000

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Please observe detailed operating instructions!

- ① Fix probes (flat tips, micro tips or tapered tips → point 1, use only tools listed in appendix 3.
Do not use pliers or other tools:
 - Fitting surfaces must be clean.
 - Tighten probes well.
 - Handle probes with care – they are sensitive precision items.

- ② Place the ultrasonic converter into the opening of the sound-proof box or fit the black anodised housing into the clamp of the stainless steel stand. Connect the ultrasonic converter to the HF-generator → point 2.

- ③ Connect the HF-generator to a grounded safety socket 230 V~ or 115 V~, 50/60 Hz depending on type (observe mains voltage selector) → point 3 and 3.9.

- ④ - Turn "POWER" - tuner to left stop.
 - Press the mains switch (green pilot lamp lights up), after 3 seconds the unit is ready to start, LED-display lights up.
 - operating mode:
 - a) Countdown operation - enter required settings by means of +/- key and mode-key and confirm
 - b) Continuous operation - enter required settings by means of +/- key and mode-key and confirm
 - c) To change between countdown- and continuous operation press reset-key.
 - d) "CYCLE" operation - applicable for both, continuous or countdown operation by means of +/- key and mode-key and confirm
 - On / Off – either with Start/Stop-key, with push button on top of the converter or foot switch
 - After immersing the probe into the liquid set "POWER"-tuner clockwise at the required value.

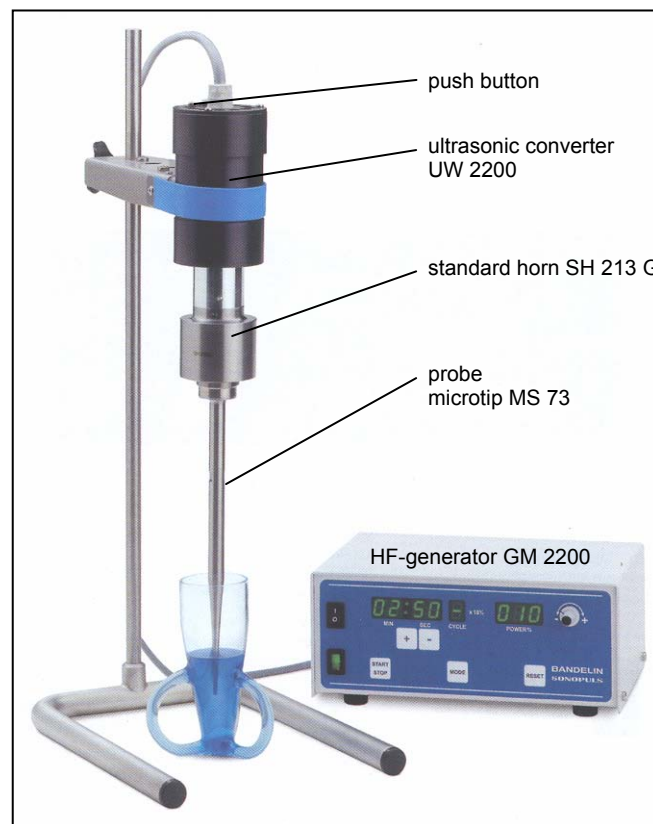
Important: Respect output limits of different probes (point 1. 3).

Operating Instructions

SONOPULS Ultrasonic homogenizers

**HD 2070 / HD 2200 for 230 V or
HD 2070-U / HD 2200-U with change-over switch for 115 V / 230 V**

**HD 2070 /-U for volumes from 50 μ l - 200 ml
HD 2200 /-U for volumes from 200 μ l - 1000 ml**



Ultrasonic homogenizers are efficient equipment for a large application range in science and technology, e.g.:

- cell disruption (extraction of micro-organisms, tissue cells)
- homogenization of liquids
- emulsification of hardly mixable liquids
- dispersing agglomerates
- increasing the speed of chemical reactions
- degassing of liquids
- environmental analyses (investigation of waste water, earth samples)
- sonochemistry

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Product informations **SONOPULS** accessories



Safety instructions to be followed carefully!

- After the packing has been removed, check the HF-generator and ultrasonic converter for any damage which might have occurred during transport. If damage due to transport has been discovered, **do not** connect the HF-generator to the mains supply, but report the damage immediately and in writing to the carrier and to your supplier. **Save** the original packing.
- Before connection, check for local mains supply. For safety reasons the default position is 230 V. Adjust the voltage selector if necessary, see point 3.1.
- Connect the HF-generator to a grounded safety socket only.
- Keep the HF-generator and operating elements clean and dry!
- **Use only SONOPULS** original parts for replacement!
- **Do not** touch oscillating parts (e. g. standard or booster horns, microtips or tapered tips and titanium flat tips, or the ultrasonic converter) when equipment is in operation! This could be harmful to your health!
- Avoid any contact of the vessels with the oscillating probe, otherwise probe or vessels could be damaged.
- The unit must be switched off before fixing or removing accessories!
- Sonication of liquids causes noise. Suitable accessories like a sound-proof box reduce the noise considerably. If the equipment is being operated without a sound-proof box, wear hearing protectors.
- Do not use **combustible solvents** in open vessels because the operational safety of the homogenizer is not guaranteed.

The principle of how it works

The ultrasonic homogenizer uses the high power density of ultrasound on the probe's surface to expose small quantities of liquid to ultrasound.

The HF-generator transforms the mains voltage of 50 or 60 Hz into high frequency voltage of 20 kHz. The alternating mains voltage is rectified and smoothed. The direct voltage is then transformed into HF-voltage, resulting in a constant high frequency and therefore also ultrasonic output ⇒ "direct sound". The ultrasonic converter, equipped with a very effective PZT-ultrasound oscillating system, transforms the electrical energy delivered by the generator into mechanical oscillations of the same frequency (20 kHz).

The amplitude which is generated in this way is kept constant, using amplitude proportional frequency tracking in the AMPLICHRON® system independent from the actual load.

Standard or booster horns with probes (microtips and tapered tips as well as titanium flat tips) are mounted to the ultrasonic converter. Therefore the ultrasonic amplitude is multiplied by their gain.

1 Fixing and removal of probes

Probes

- are screwed onto the standard or booster horn,
- transmit the ultrasound into the medium to be processed,
- are made of high-grade titanium alloy.

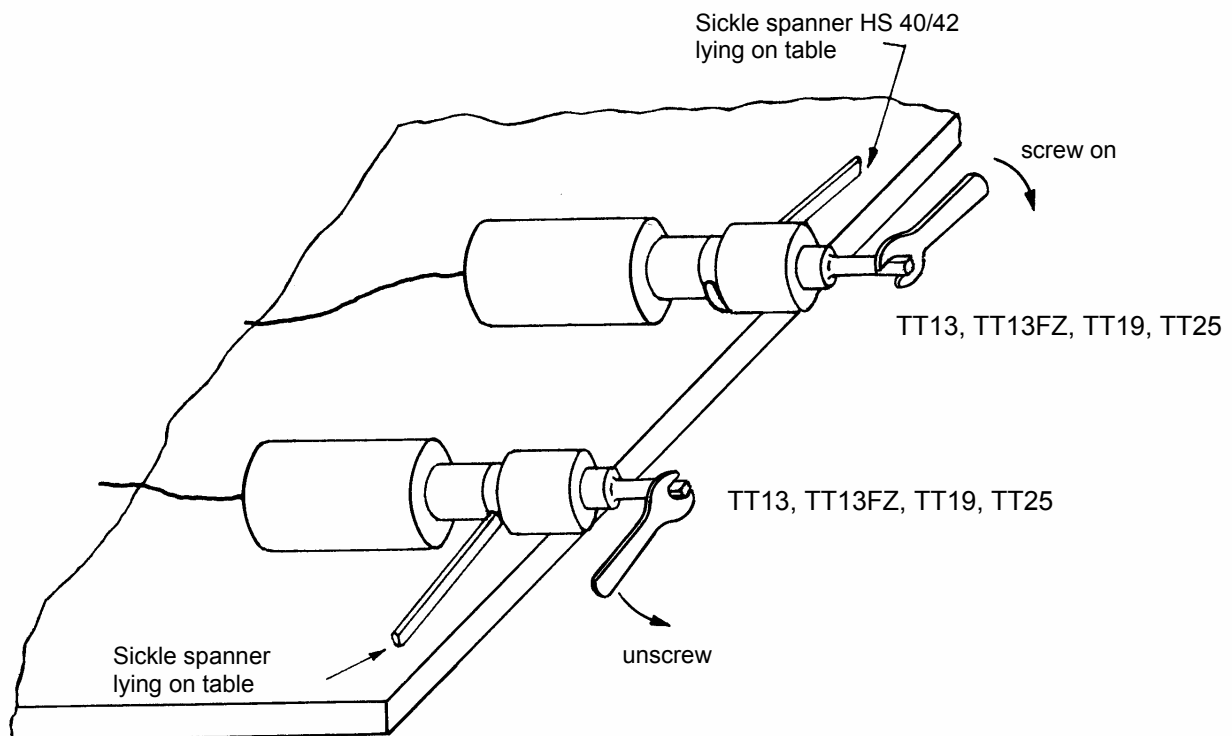
Attention! Probes are shock sensitive.

1.1 Fixing and removal of titanium flat tips

Screw titanium flat tip into the female thread of the standard or booster horn

□ Titanium flat tips

- TT 13 is mounted to the standard horn SH 70 G (HD 2070) or to the booster horn SH 213 G (HD 2200).
 - TT 13 FZ is mounted to the flow-through standard horn FZ 5 G (HD 2070) or to the flow-through booster horn FZ 7 G (HD 2200).
 - TT 19 is mounted to the booster horn SH 219 G on HD 2200.
 - TT 25 is mounted to the booster horn SH 225 G on HD 2200.
- ① Wipe carefully the mating surfaces of the standard or booster horn and the titanium flat tip ⇒ make sure that these surfaces are clean.
 - ② Screw in the titanium flat tip manually.
 - ③ Use spanner - 10 for TT 13 and TT 13 FZ, 15 for TT 19, 22 for TT 25.
 - ④ Hold the standard or booster horn with the sickle spanner HS 40/42 and turn the titanium flat tip clockwise, **pull hard**. See fig.
 - ⑤ Twist off the titanium flat tip anti-clockwise. See fig.

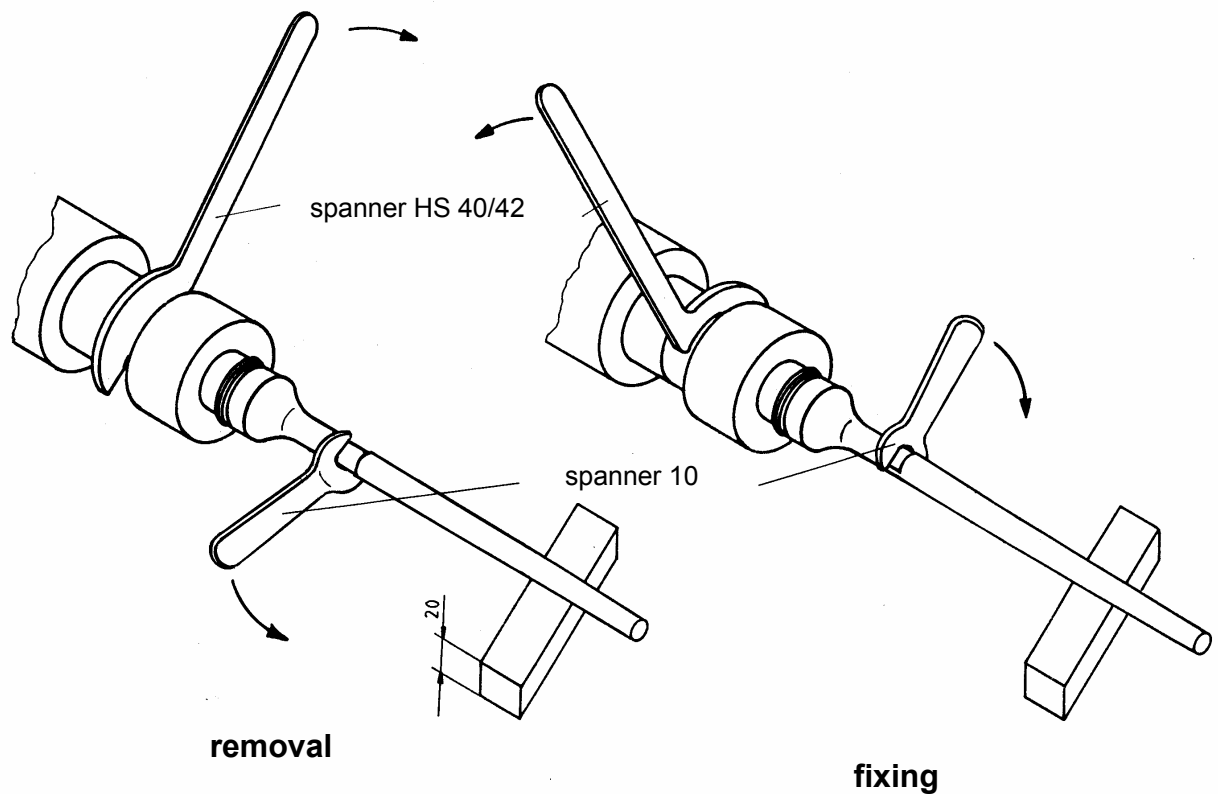


1.2 Fixing and removal of microtips and tapered tips

□ Microtips MS 72, MS 73 and tapered tip KE 76

- MS 72, MS 73 and KE 76 are screwed onto the standard horn SH 70 G (HD 2070) or booster horn SH 213 G (HD 2200).

- ① Wipe carefully the mating surfaces of the horn and the tip (MS 72, MS 73 or KE 76)
⇒ make sure that surfaces are clean.
- ② Screw the tip into the horn manually.
- ③ Place the tip onto a pad, which is approximately 20 mm thick, to prevent it from being bent.
- ④ Hold the horn tightly at the fixing holes by using the sickle spanner HS 40/42. Tighten the tip with the spanner 10. See fig.
- ⑤ To remove the tip, twist the spanner in reverse direction.



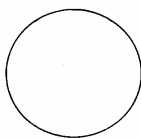
1.3 Range of probes, their connection to standard and booster horns and their maximum amplitude settings

For detailed information about individual probes see separate product information.

	HD 2070								
Probe	MS 72	MS 73	KE 76	TT 13	VS 70 T	TT 13 FZ	GS 6 GS 6 L 6 mm	GS 13 GS 13 L 13 mm	GS 18 GS 18 L 19 mm
Diameter	2 mm	3 mm	6 mm	12,7 mm	12,7 mm	12,7 mm			
Connection to standard horns	SH 70 G (FZ 5 G)	SH 70 G (FZ 5 G)	SH 70 G (FZ 5 G)	SH 70 G (FZ 5 G)	SH 70 G (FZ 5 G)	FZ 5 G	SH 70 GQ	SH 70 GQ	SH 70 GQ
Volume range	1 ml - 25 ml	2 ml - 50 ml	5 ml - 100 ml	10 ml - 200 ml	10 ml - 200 ml	-	2 ml - 100 ml	25 ml - 200 ml	25 ml - 500 ml
Amplitude	200 μm_{SS}	210 μm_{SS}	180 μm_{SS}	60 μm_{SS}	60 μm_{SS}	-	12 μm_{SS}	12 μm_{SS}	12 μm_{SS}
Maximum admissible amplitude setting	<u>70 %</u>	100 %	100 %	100 %	100 %	100 %	<u>50 %</u>	<u>50 %</u>	<u>50 %</u>

	HD 2200								
Probe	MS 72	MS 73	KE 76	TT 13	VS 70 T	TT 13 FZ	TT 19	TT 25	VS 200 T
Diameter	2 mm	3 mm	6 mm	12,7 mm	12,7 mm	12,7 mm	19 mm	25 mm	25 mm
Connection to booster horns	SH 213 SH 213 G (FZ 7 G)	SH 213 SH 213 G (FZ 7 G)	SH 213 SH 213 G (FZ 7 G)	SH 213 SH 213 G (FZ 7 G)	SH 213 SH 213 G (FZ 7 G)	FZ 7 G	SH 219 G	SH 225 G	SH 225 G
Volume range	2 ml - 30 ml	5 ml - 90 ml	10 ml - 350 ml	20 ml - 900 ml	20 ml - 900 ml	-	25 ml - 900 ml	30 ml - 1000 ml	30 ml - 1000 ml
Amplitude	250 μm_{SS}	310 μm_{SS}	260 μm_{SS}	140 μm_{SS}	140 μm_{SS}	-	60 μm_{SS}	50 μm_{SS}	30 μm_{SS}
Maximum admissible amplitude setting	<u>25 % !</u>	<u>40 % !</u>	<u>60 %</u>	100 %	100 %	100 %	100 %	100 %	100 %

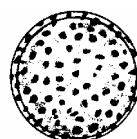
All probes are subject to natural wear and tear, which leads to erosion on the ultrasound emitting surface and to a reduction of their performance. If probes are used frequently, a quantity of spare probes should be kept in stock. Typical samples of erosion at titanium flat tip TT 13:



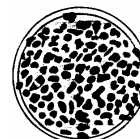
New titanium flat tip.



Erosion still admissible, flat tip can be polished.



Cavities are beginning to form. Grinding necessary.



Limits of erosion exceeded. New tip necessary.

The surfaces emitting ultrasound can repeatedly be grinded or re-polished very thoroughly. If the material has been reduced by approx. 1 mm due to erosion or grinding, the probe is out of tune and cannot be used any longer.

Reworking of the sound radiating surface

A reworking can be made by a grinding machine with a fine-grained grinding wheel or manually with a diamond-coated file. Suitable abrasives are for example:

- fine grinding disc, PUR-bonded, grain size 150
- fine grinding disc, caoutchouc-bonded, grain size 120
- grinding disc PNK, corundum, grain size 180 ... 280
- diamond-coated file, D 181 or D 251

2 Fixing the ultrasonic converter

- Set ultrasonic converter into the opening of the sound-proof box or fix the black anodised housing into the clamp of the stainless steel holder.
- Connect the ultrasonic converter UW 2070 to HF-generator GM 2070 (UW 2200 to GM 2200).
- Do not touch the contact pins of the plug in order to avoid possible electrical charging and discharging of the piezo-elements caused by temperature changes.
- Do not cover the ventilation openings of the ultrasonic converter's housing.
- Keep the ultrasonic converter dry and clean, prevent any liquid from penetrate into the converter.
- On delivery, the standard horn SH 70 G is fixed tightly to the ultrasonic converter UW 2070, or the booster horn SH 213 G to UW 2200.
- Other booster horns can be mounted, please see point 5.

Technical data of ultrasonic converters UW 2070 and UW 2200

- equipped with high efficient PZT output oscillators.
- suitable for continuous operation.
- stable against idling, due to automatic amplitude control in AMPLICHRON® system.
- frequency: 20 kHz
- weight: 1,2 kg
- dimensions: diameter 70 × 120 mm

3 HF-generator

Technical data

Generator	GM 2070	GM 2200	GM 2070-U	GM 2200-U
HF-output	70 W	200 W	70 W	200 W
HF-frequency	20 kHz	20 kHz	20 kHz	20 kHz
mains supply	230 V~, 50/60 Hz	230 V~, 50/60 Hz	115 V~ or 230 V~, 50/60 Hz	
weight	2,5 kg	2,5 kg	5,5 kg	5,5 kg
dimensions (l × w × h)	257 × 180 × 115 mm	257 × 180 × 115 mm	255 × 272 × 115 mm	255 × 272 × 115 mm

Before connecting to the mains socket check mains voltage. Set voltage selector to the appropriate value (units GM 2070-U and GM 2200-U).

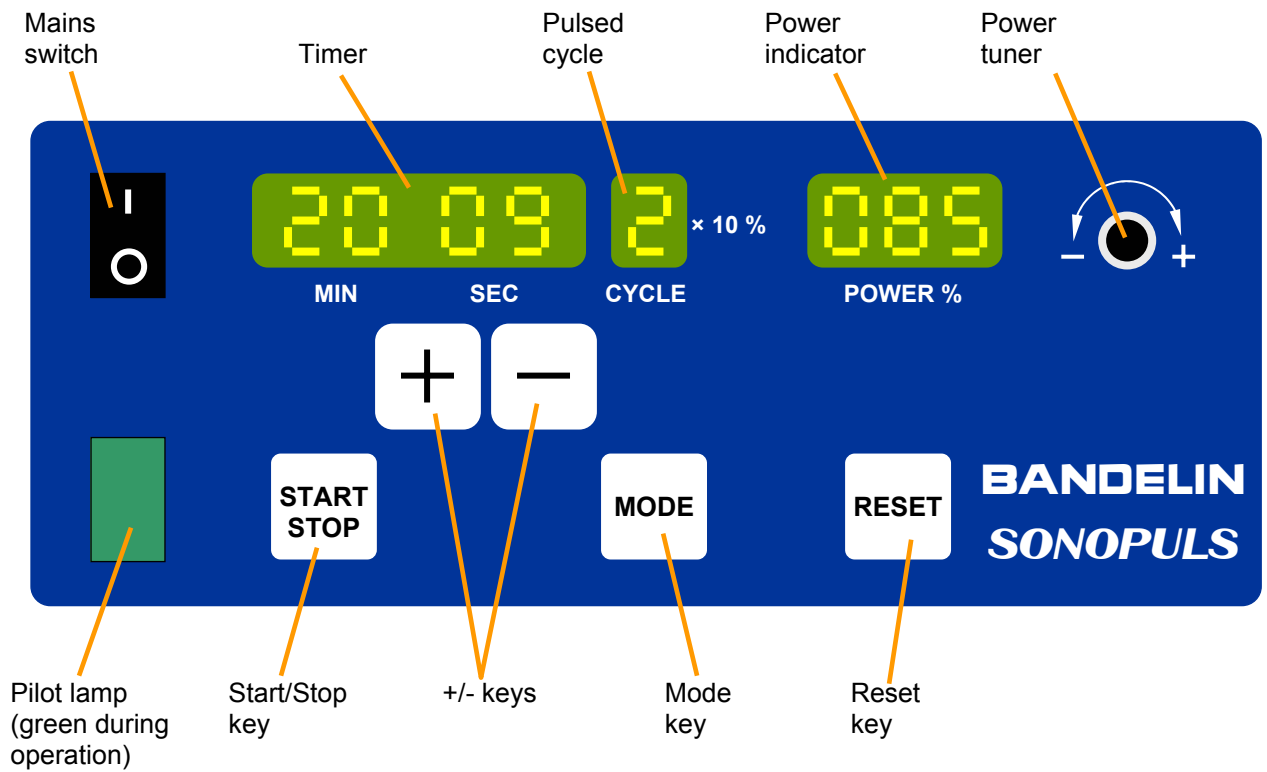
Place HF-generator GM 2070 or GM 2200 on a stable and dry surface and connect it to a grounded safety socket 230 V~ or 115 V~, 50/60 Hz.

- constant amplitude provided by AMPLICHRON® system.
- simple operation by foil keys, power tuner and push button.
- integrated digital timer to set process time.
- Start - Stop - also possible by optional remote control (foot switch) or push button on top of the ultrasonic converter
- "POWER" ⇒ amplitude setting displayed in %
- "CYCLE" ⇒ indicates pulsed mode; it is divided in active and passive intervals (10 digits are possible).

pulsed cycle	active interval (sec)	passive interval (sec)
1	0.1	0.9
2	0.2	0.8
3	0.3	0.7
4	0.4	0.6
5	0.5	0.5
6	0.6	0.4
7	0.7	0.3
8	0.8	0.2
9	0.9	0.1
-	1	0

3.1 Operating elements

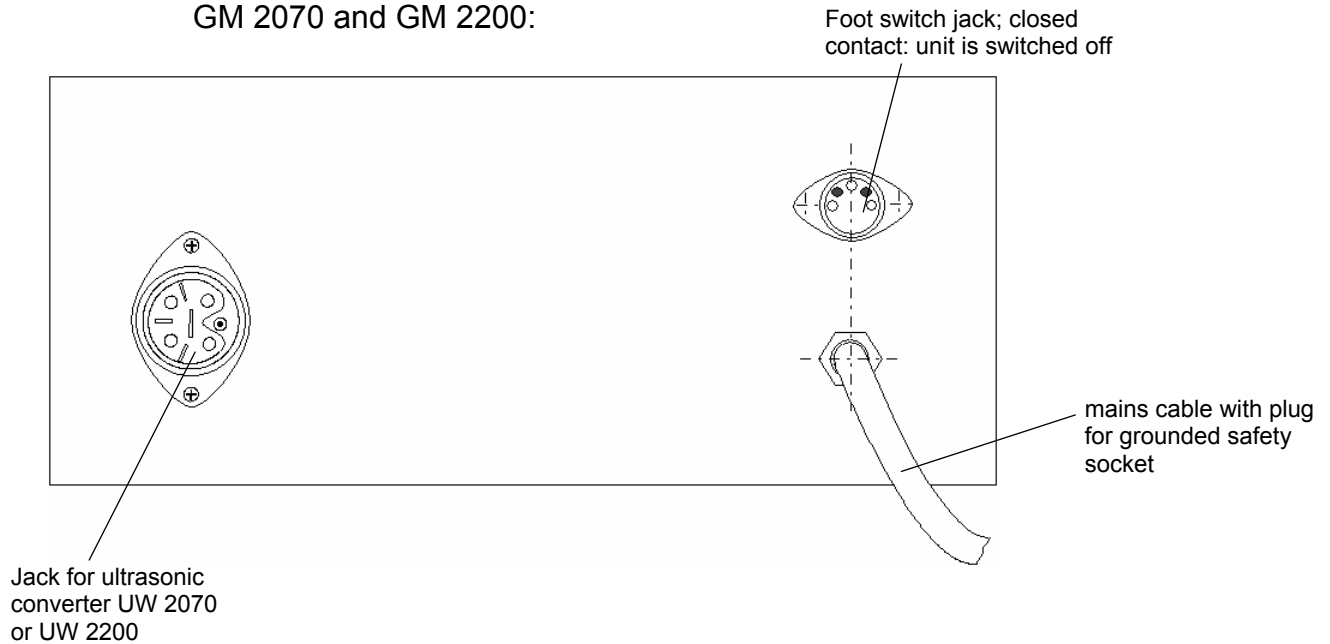
Front



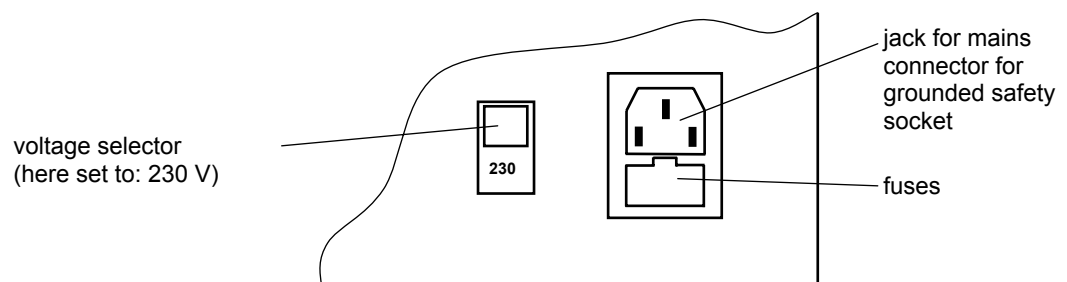
Mains switch	ON / OFF.
Pilot lamp	operating indicator (green).
START/STOP	start or stop of stored program.
MODE	selection of time - (minutes, seconds) and pulsed cycle - and after selection for storing countdown or continuous operation.
+/-	Push: the indicated value can be increased or reduced in intervals of 1 digit.
RESET	continuous pressing (>2 sec): enables fast run; program interruption.
POWER-tuner	Change between countdown and continuous operation. to set the amplitude (10 - 100 %) during operation.

Back side

GM 2070 and GM 2200:



GM 2070-U and GM 2200-U:



Push button on top of the ultrasonic converter: start or stop of stored program
⇒ see front page.

Remote foot switch optional: start or stop of stored program.

3.2 Advantages of the generator

- environment-friendly due to a very low stand-by current consumption.
- start - stop - function can either be operated by remote foot switch (optional) or push button on top of the ultrasonic converter.
- storage of pulsation and time.
- bright digital display for time, pulsation and amplitude.
- timer check by simultaneous pressing of "+" and "-" keys (see point 3.5).
- easy time and pulsation adjustment, fast run.
- the last setting is stored even after mains failure.
- automatic check of converter / generator connection (see point 3.5).

3.3 Operation modes

The unit can work in two modes:

countdown and continuous operation

In **countdown operation** you can set the time and the pulsed cycle. After starting the generator either by START/STOP-key, push button on top of the ultrasonic converter or foot switch, the countdown mode (cycle in seconds) - proceeds until zero with automatic switch-off.

The maximum time setting is 99 min and 59 sec. (The unit refuses time setting 00:00)

In **continuous operation** the ultrasound can be set to continuous or pulsed operation (see table page 8, below). When reaching the maximum time of 99 min and 59 sec, it continues starting again at 00:00.

Detailed information is scheduled in „Working in continuous operation“ and „Working in countdown operation“.

3.4 Power - amplitude setting

The range of the amplitude setting is 10 ... 100 %, adjustable in 1 %-steps. Having started the unit, set the power tuner to the required value. It is always displayed and constantly regulated. Due to changes in processed liquid medium, caused by sonication, the actual display can vary up to 5 digits during operation.

3.5 Test routines

Operating functions can be tested immediately:

Test of display press the keys „+“ and „-“ simultaneously. All display-segments light up from 0 to 9, then the last stored settings are displayed.

Test of connection If the ultrasonic converter has not been tightened strong enough to the generator, power indicator will not display any value after 1 second - the generator switches off.

Fix tightly the converter, restart the unit by START/STOP.

3.6 Advices

3.6.1 Operation

- **Avoid any touching of the vessels with the oscillating probe, otherwise the probe or the vessels can be damaged.**
- Do not use deformed probes; their power is considerably reduced, or breakage can occur.
- Only after having immersing the probe into the liquid set "POWER"-tuner clockwise at the required value.
- When sonicating liquids, probes must always be immersed to approx. 10 mm, in order to avoid air aspiration and its mixing with the liquid.
If air aspiration is required, the probe has to be immersed just a few millimetres below liquid level.
- Microtips and tapered tips are to be immersed to 20 mm at maximum.
- If emulsions are being prepared, it is useful to immerse the probe down to the joint face of the liquids to be mixed.
- Do not use **combustible solvents** in open vessels, the operational safety of the homogenizer is not guaranteed. Do not place the homogenizer into a sound-proof box, solvent fumes cannot escape.

3.6.2 Treatment of oscillating parts at the ultrasonic converter, vessels and accessories in medical range

During the operation of ultrasonic homogenizers oscillating parts, vessels or other accessories like laboratory stands and tools can be contaminated by micro-organisms or toxic substances and cross infection might be the result. A thorough disinfection and cleaning after each operation is necessary.

In case of improper or irregular disinfection and cleaning micro-biological or toxic contamination is possible, caused by settlement of micro-organisms, especially at the joint between titanium flat tip and booster horn, or at the radiating faces of the probes.

Therefore, all oscillating parts like standard horns, booster horns, microtips, tapered tips or titanium flat tips, vessels and other accessories must be cleaned and disinfected after every treatment. The parts must detached, if necessary.

In case of toxic contamination, the respective national rules and conditions must be strictly respected.

According to the hygienic plan, the user must carry out regular disinfection and cleaning with a surface disinfecting agent certified by DGHM*, or another efficiently classified agent.

* Deutsche Gesellschaft für Hygiene und Mikrobiologie (German Society for Hygiene and Microbiology)

3.7 Working in countdown operation

	Action	Display	Remark
1	<p>Switch on generator Set „POWER“ tuner to left stop. Press “mains switch” ⇒ Display lights up after 3 seconds.</p>	<p>MIN/SEC: last setting CYCLE: last setting (“-“ = max.) POWER: 000 % The green pilot lamp lights up.</p>	<p>When switching on the generator the previously used operation is always active. Required change to continuous operation by pressing RESET-key possible. Once the generator has been started, program changes or other commands except power tuning are not possible!</p> <p>Start —————> point 5</p>
2	<p>Setting Selection of time (sec, min) and pulsed cycle by pressing MODE-key step-by-step. Set time or/and pulse interval by +/- keys. If the keys are pressed longer than 2 sec, the fast run begins!</p>	<p>MIN/SEC: last setting CYCLE: last setting POWER: 000 %</p>	<p>Start possible without entering a new program - actual storing.</p> <p>In case of no setting within 10 sec. display is fluctuating - The setting modus will be inactivated. No storage possible. Display returns to the last setting.</p> <p>Start —————> point 5</p>
3	<p>End of programming (storing). Use the MODE-key until display remains in fluctuating.</p>	<p>MIN/SEC: new setting CYCLE: new setting POWER: 000 %</p>	<p>The programme is stored.</p> <p>During operation power is to be set or modified</p> <p>Start —————> point 5</p>
4	<p>Programming without storing Do not confirm settings by the MODE-key.</p>	<p>MIN/SEC: new setting CYCLE: new setting POWER: 000 %</p>	<p>Start possible without setting a new program - actual storing when starting within 10 sec.</p> <p>Use the RESET-key for a new setting.</p> <p>Start —————> point 5</p>
5	<p>Starting up Use the START/STOP key at the generator, on top of the converter or the foot switch.</p>	<p>MIN/SEC: counts down CYCLE: new setting POWER: %, actual</p>	<p>In case of no power indication, the ultrasonic converter is not well connected ⇒ converter must be connected before starting any program.</p>



	Action	Display	Remark
6	<u>Interruption</u> Press the START/STOP-key at the generator, the push button on top of the converter or the foot switch.	MIN/SEC: remaining time CYCLE: new setting POWER: 000 % During interruption the colon in the min/sec indicator is fluctuating.	New settings can be made or current operation can be continued. - actual storing
7	<u>Continuing</u> Press the START/STOP-key at the generator, on top of the converter or the foot switch.	MIN/SEC: count down CYCLE: new setting POWER: %, actual	The pulsed mode is being kept. End of countdown shows 00 : 00. After a short time display returns to previously stored programme.
8	<u>Break-off</u> Press the RESET-key.	MIN/SEC: last setting CYCLE: last setting POWER: 000 %	The current program can be interrupted at any time by pressing RESET. The last setting will automatically be displayed. When pressing the RESET-key a second time after interruption, the generator switches over to continuous operation.
9	<u>Switch over to continuous operation after generator stop</u> Press RESET-key, once.	MIN/SEC: 00 min 00 sec CYCLE: last setting POWER: 000 %	
10	<u>Activate stored programme</u> Press RESET-key, once.	MIN/SEC: stored value CYCLE: stored value POWER: 000 %	1st pressing: the stored program is indicated in continuous mode. 2nd pressing: the stored program is indicated in countdown mode.
11	<u>Switch off generator</u> Turn power tuner to the left stop. Press the "mains switch".	Display extinguishes. Pilot lamp extinguishes. The programme, previously set, is being kept.	A break of 10 sec has to be made before restarting the generator. The stored countdown operation is being kept.

Attention ! Refer the maximum admissible amplitude setting of the probes see point 1. 3.

3.8 Working in continuous operation

	Action	Display	Remark
1	<p><u>Switch on generator</u> Set „POWER“ tuner to left stop. Press “mains switch“ ⇒ Display lights up after 3 seconds.</p>	<p>MIN/SEC: last setting CYCLE: last setting (“-“ = Max.) POWER: 000 %</p> <p>The green pilot lamp lights up.</p>	<p>When switching on the generator, always the last used operation is active. Required change to continuous operation by pressing RESET-key possible.</p>
2	<p><u>Starting up</u> Use the START/STOP key at the generator, on top of the converter or the foot switch.</p>	<p>MIN/SEC: counting forward CYCLE: current value POWER: %, actual</p>	<p>Power tuning is to be set or modified during operation. When reaching the maximum time of 99 min and 59 sec, it recontinues at zero.</p> <p><i>Once the generator has been started, program changes or other commands except power tuning are not possible!</i></p>
3	<p><u>Interruption</u> Press the START/STOP-key at the generator, the push button on top of the converter or the foot switch.</p>	<p>MIN/SEC: run off time CYCLE: setting value POWER: 000 %</p> <p>During interruption the colon in the min/sec indicator is fluctuating.</p>	<p>New settings can be made or current operation can be continued. - actual storing.</p>
4	<p><u>Continuing</u> Press the START/STOP-key at the generator, on top of the converter or the foot switch.</p>	<p>MIN/SEC: counting forward CYCLE: value set POWER: %, actual</p>	
5	<p><u>Break off</u> Press RESET-key.</p>	<p>MIN/SEC: 00 min 00 sec CYCLE: value set POWER: 000 %</p>	<p>A restart or change over to countdown operation by pressing the RESET-key is possible.</p>
6	<p><u>Switch over to countdown operation</u> After the break off, press RESET-key once.</p>	<p>MIN/SEC: last stored value CYCLE: last stored value POWER: 000 %</p>	<p>If another time as 00:00 is indicated, continuous operation is switched off. The setting 00:00 is not possible in continuous mode and will not be indicated, either.</p>
7	<p><u>Switch off generator</u> Turn power tuner to the left stop. Press the mains switch.</p>	<p>Display extinguishes. Pilot lamp extinguishes.</p> <p>The programme, previously set, is being kept.</p>	<p>A break of 10 sec has to be made before restarting the generator. The stored continuous operation is being kept.</p>

Attention ! Refer the maximum admissible amplitude setting of the probes see point 1. 3.

4 Fixing and removing standard and booster horns

Standard or booster horns

- are screwed onto the ultrasonic converter,
- are made of high grade titanium alloy,
- transmit the oscillations to the probe,
- boost the amplitude due to their special construction.

Upon delivery, standard horn SH 70 G is fixed to ultrasonic converter UW 2070, booster horn SH 213 G to ultrasonic converter UW 2200.

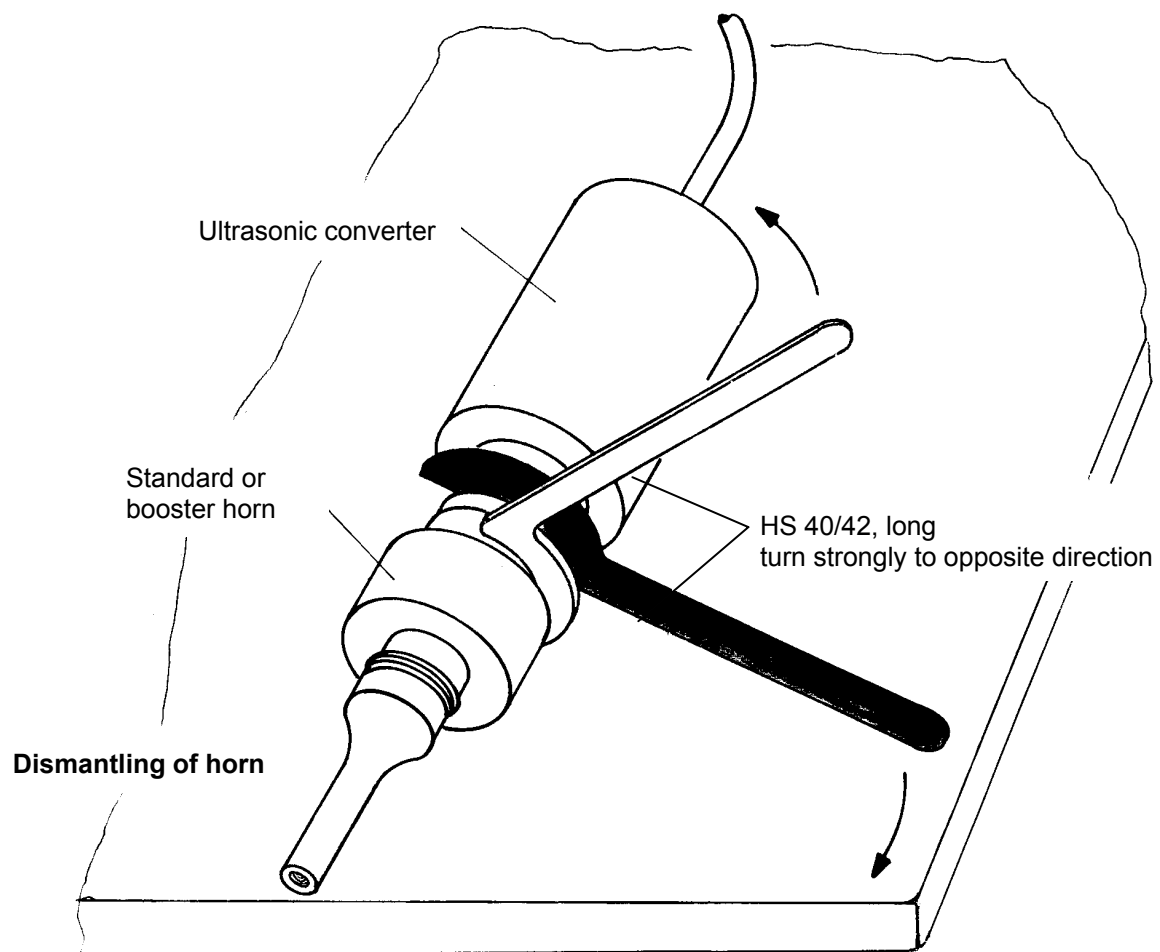
Before other horns are mounted the unit has to be switched off.

At first dismantle the standard or booster horn SH 70 G or SH 213 G from ultrasonic converter UW 2070 or UW 2200. Place the ultrasonic converter on a solid plate (non-slippery).

Dismantling

Attach a sickle spanner HS 40/42, long to the ultrasonic converter and another one to the standard or booster horn, see fig. To remove the horn, press one sickle spanner downwards, and the other one upwards.

When ordering extra horns, the sickle spanner HS 40/42, long, is included.



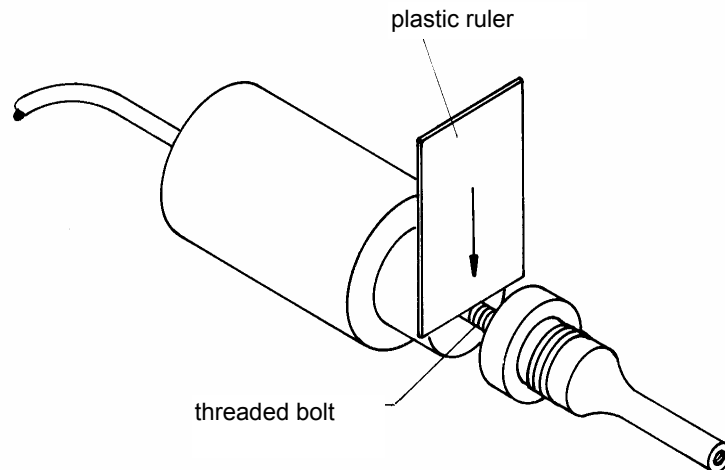
Mounting

Clean threads and mating faces are necessary for successful operation.

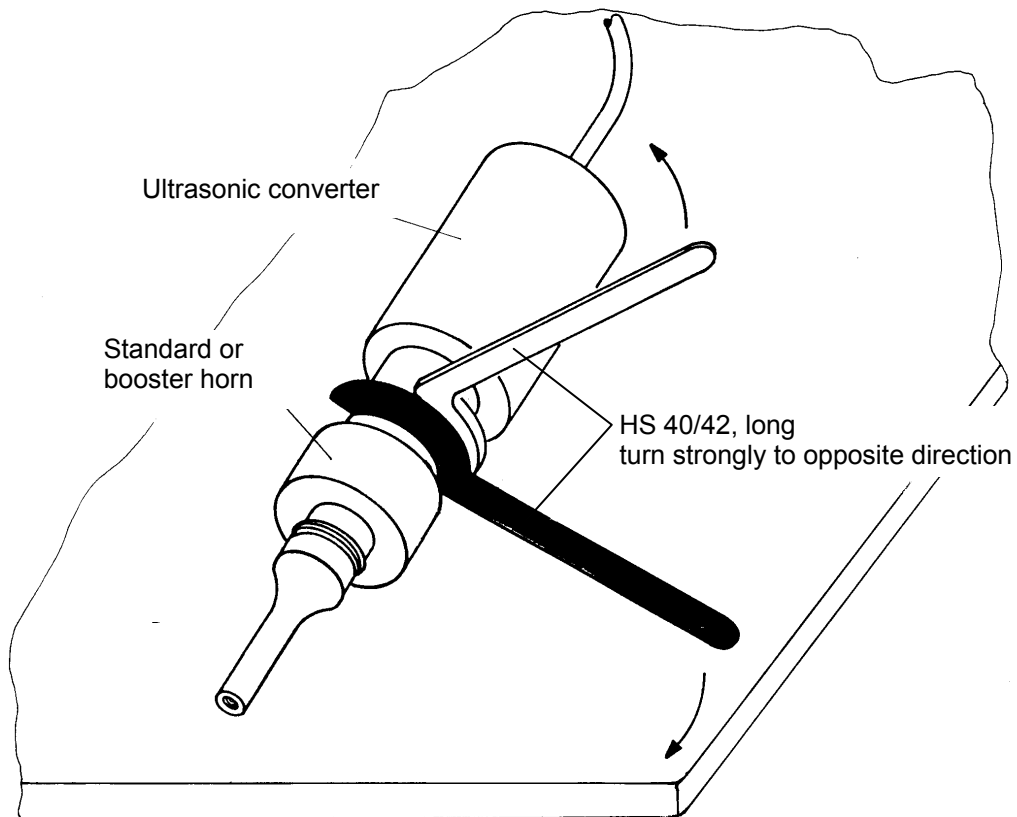
Clean all mating faces, studs and threaded holes with alcohol and lint-free cloth.

Screw the stud of the standard or booster horn into the threading (M 10) of the ultrasonic converter up to approx. $\frac{2}{3}$ of its length.

In order to avoid screwing in the stud more than $\frac{2}{3}$, place a plastic ruler or similar onto the thread and press it slightly down, see fig.



Screw the horn on to the threaded bolt, take the ruler out and fix the horn manually. Then use both long sickle spanners HS 40/42 to fix it tightly to the converter, see fig.



For detailed information about individual standard or booster horns see separate product information.

The following standard or booster horns can be connected to the ultrasonic converter:

Homogenizer	HD 2070	HD 2200
Ultrasonic converter	UW 2070	UW 2200
Standard supply: standard or booster horn	standard horn SH 70 G	booster horn SH 213 G
Special accessories (to be ordered separately)	diamond probe horn DH 13 G Flow-thru standard horn FZ 5 G Special standard horn SH 70 GQ	booster horns SH 219 G SH 225 G diamond probe horn DH 13 G Flow-thru booster horn FZ 7 G Special booster horn HL 219

5 Accessories

BANDELIN offers a wide range of accessories for many applications.

How to connect them is shown in appendix 1 and 2.

Use only the spanners for mounting / dismantling as pictured in **appendix 3**.

Appendix 4 gives information on possible malfunction, causes and remedies.

SONOPULS Homogenizers are maintenance-free.

The only wear-out can occur on the radiating area of the probes caused by cavitation erosion. For a trouble-free operation, homogenizers should **not** be used in places of:

- high humidity,
- high temperatures,
- corrosive influences (e. g. chemical processes) and
- intensive dust.

Environment at conditions in accordance with EN 61 010-1 (IEC 1010-1)

- Degree of soiling: 2 to IEC 664
- Excess voltage category: II
- permissible temperature of surroundings: 5 up to 40 °C
- permissible relative humidity up to 31 °C: 80 %
- permissible relative humidity up to 40 °C: 50 %
- must not be exposed to dew

Information for the use as a medical product

Denotation: Ultrasonic homogenizer
UMDNS-nomenclature (ECRI): 17-125
Purpose determination: homogenizing, emulsifying, cell disruption and suspending

Medical device according to in vitro Diagnostic Device
Directive 98/79/EEC: device according to product category 5

Type, model, serial number, year of manufacture: see label at rear of generator

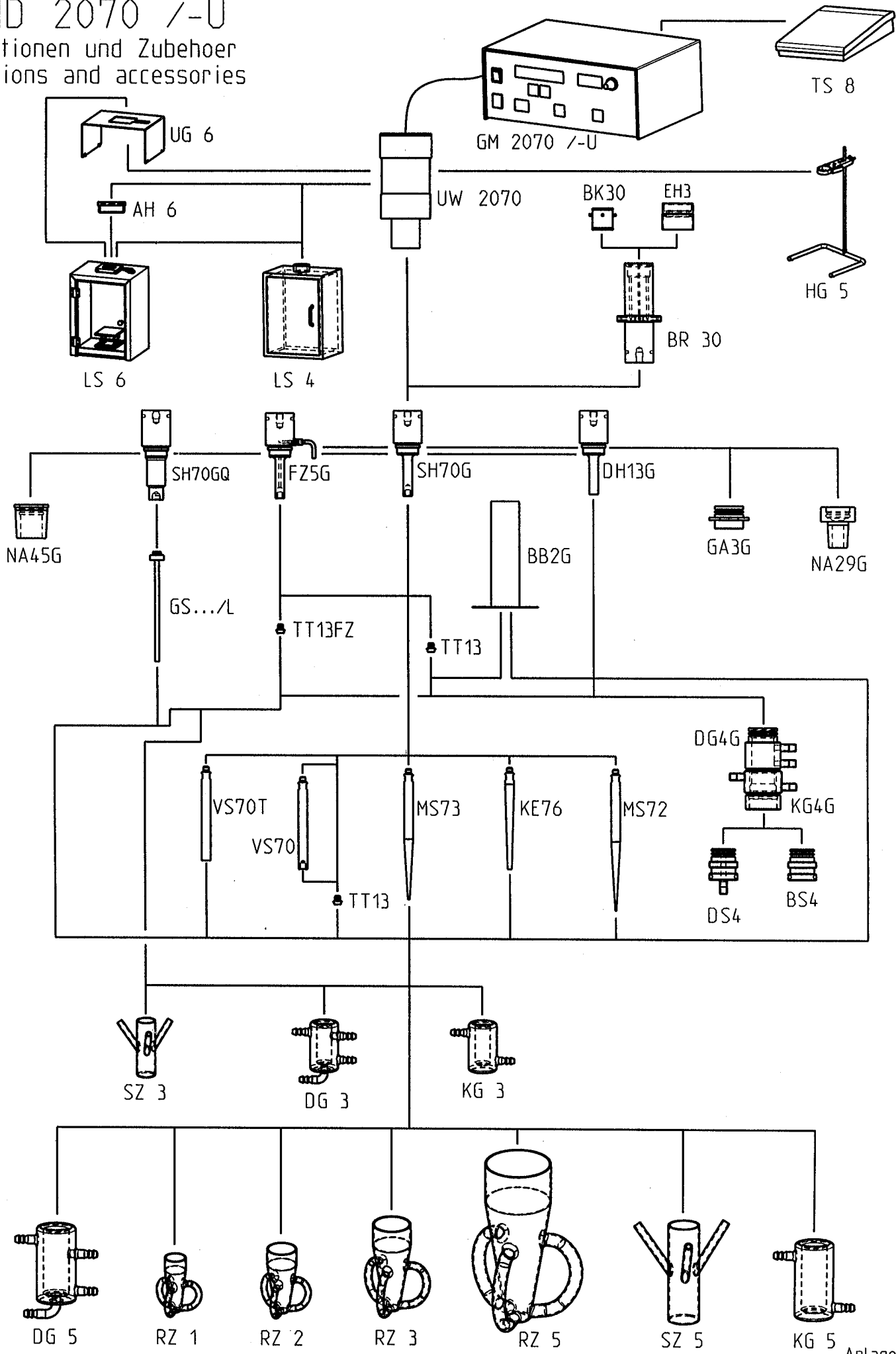
Information according to IEC 601-1:

Protection class: I
Protection type (B, BF, CF): n. a.

Internet

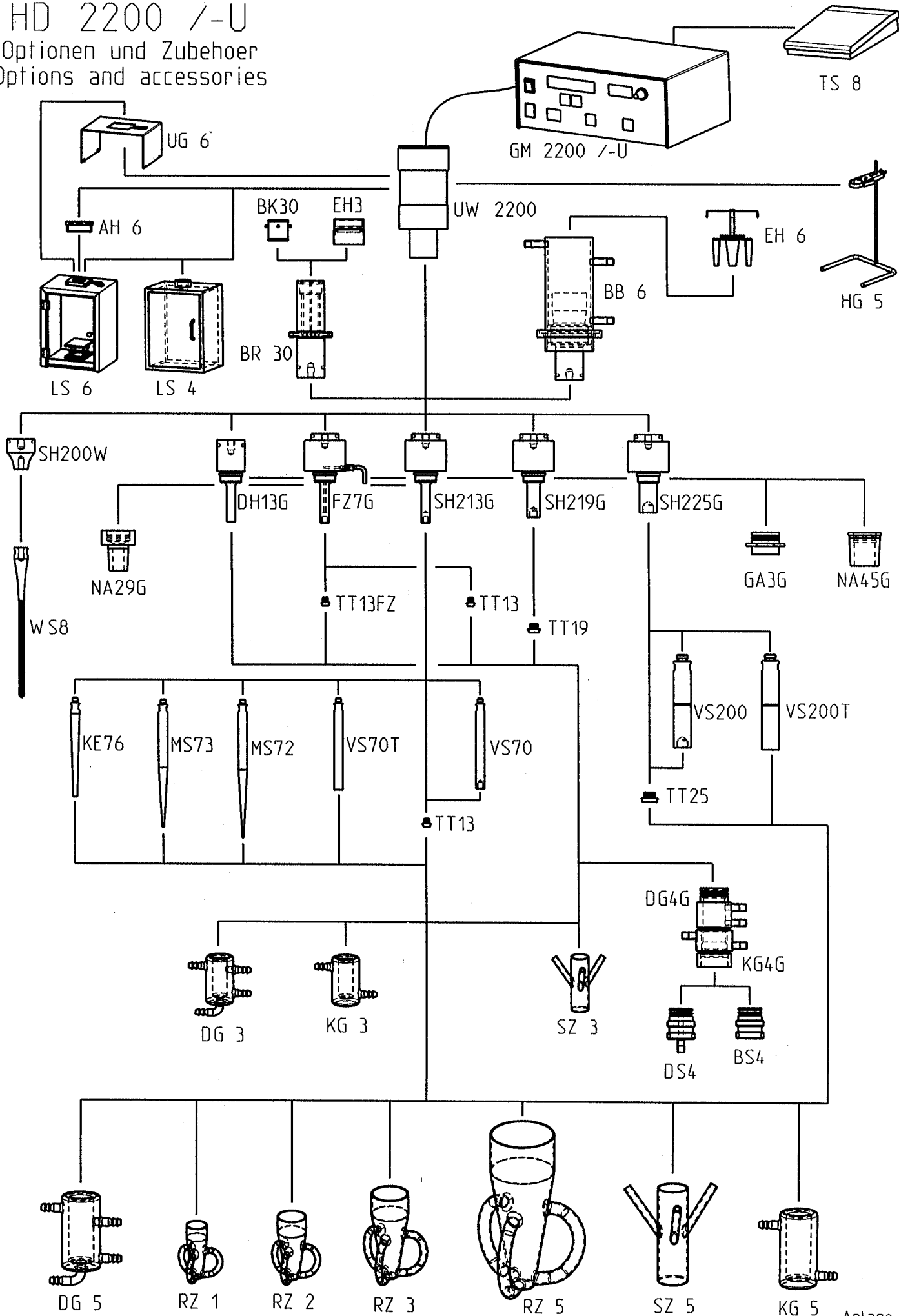
e-cl@ss:
Class of HD units: 32-01-21-05
Class of HD accessories: 32-01-21-06

HD 2070 /-U
 Optionen und Zubehoer
 Options and accessories



HD 2200 /-U

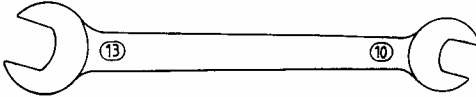
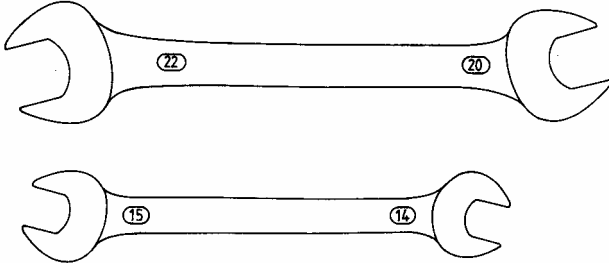
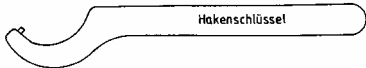
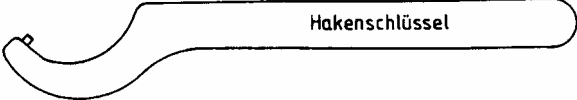

Optionen und Zubehoer
Options and accessories



Spanners for mounting and dismantling

Probes and standard or booster horns are extremely sensitive parts, they must be mounted or dismantled with utmost care.

Use only the following spanners.

Spanner type	Application
<p>Spanner 10</p>  <p>is part of delivery</p>	<p>For mounting / dismantling of MS 72, MS 73, KE 76, TT 13 and TT 13 FZ (⇒ point 1.1 and 1.2), as well as probe extender VS 70</p>
<p>Spanners 22 / 15</p>  <p>not supplied by BANDELIN</p>	<p>For mounting / dismantling of titanium flat tips TT 19 and TT 25. spanner 15 for TT 19 spanner 22 for TT 25 (⇒ point 1.1) as well as probe extender VS 200</p>
<p>Sickle spanner HS 20/22</p>  <p>Part of delivery of each silica glass probe.</p>	<p>For mounting / dismantling of silica glass probes: GS 6 /L GS 13 /L GS 18 /L (⇒ point 1.1).</p>
<p>Sickle spanner HS 40/ 42</p>  <p>part of standard delivery</p>	<p>For mounting / dismantling of probes (⇒ point 1). (Serves to hold the horn.)</p>
<p>Sickle spanner HS 40 / 42, long</p>  <p>2 pieces belong to a delivery of each optionally ordered standard or booster horn.</p>	<p>For mounting / dismantling standard or booster horn to the ultrasonic converter (⇒ point 5).</p>

Maintenance and trouble-shooting

Repairs must be carried out by skilled personal only!

Important information

- Before repairing, switch off the unit!
- Replace defective parts only by original **SONOPULS** parts!
- Please ensure correct fixing of ultrasonic converter and horn, as well as horn and probe. Faulty functions are frequently caused by insufficient mechanical coupling between these parts. Please note detailed descriptions in the main part (fig. 1, 5)



Never turn the black housing of the ultrasonic converter against the aluminium cylinder. This causes destruction of the oscillating system and its electrical connection.

Error analysis

Error analysis for HD 2070, HD 2200, HD 2070-U or HD 2200-U

Fault	Probable causes	Remedy
1. Unit cannot be switched on → green pilot lamp does not light?	Defective central fuse ? <u>No mains power</u> Loose or defective mains cable?	- Change central fuse. - Check plug-and-socket connection. - Check cable for conductivity, or exchange mains connector, if necessary.

Error analysis for HD 2070-U or HD 2200-U

Fault	Probable causes	Remedy
1. Unit cannot be switched on → green pilot lamp does not light?	Wrong position of voltage selector at the generator ? (severe operating fault) - Mains supply 115 V but switch position at 230 V ? - Mains supply 230 V but switch position at 115 V ?	- Change the switch position to 115 V at the rear of the generator. ⇒ return the homogenizer to the manufacturer, because of severe damage.

Error analysis for HD 2070, HD 2200, HD 2070-U or HD 2200-U

Fault	Probable causes	Remedy
2. No power indication → does the green pilot lamp light?	HF-cable of ultrasonic converter is not connected ?	Plug in the HF-cable to ultrasonic converter (Section 3.5).
3. No time display	Defective micro controller ?	After test failure (Section 3.5) ⇒ return the homogenizer to the manufacturer
4. Little or no ultrasonic power	Loose horn or tip ?	Dismantle the parts with the included tools, clean the surfaces and screw it tightly together (Section 1 or 4).
	Defective standard or booster horn or probe ?	Check horn, probe and threaded bolt for cracks; dismantle and exchange them, if necessary ⇒ Make sure that their surfaces are clean and plane (Section 4).
	Check the cavitation erosion on the tip / probe – section 1.3 - low ? - cavities are beginning to form ? - strong ?	Polish the irradiating surface. Face or grind the irradiating surface (max. 1 mm). Replace the tip.
	Liquid between horn and probe ?	Remove probe, clean threads and mating faces, dry them, check for plane surfaces and remount the probe (Section 1).
	The threaded bolt on the horn and/or the micro- or tapered tip has a crack	Dismantle parts, check threaded bolt, replace it if necessary, remount all parts (Sections 1.2 or 4).
	The threaded neck on the titanium flat tip is defective	Replace titanium flat tip, (Section 1.1).

Fault	Probable causes	Remedy
5. Unusual high temperature near the joint ultrasonic converter – standard or booster horn or standard or booster horn – probe	Oscillating parts (standard or booster horn and probe) are not tightened sufficiently ? Mating faces of the oscillating parts are contaminated ?	} - Dismantle corresponding parts, clean the surfaces and fix them tightly (Section 1 or 4).
6. HF-generator is not working in pulse mode, or is operating continuously in pulse mode „CYCLE“	Defective micro controller ?	After test failure (Section 3.5) ⇒ return the homogenizer to the manufacturer.

If a faulty function cannot be eliminated according to this schedule, please contact your dealer, always quoting model and serial number of both, the converter and the generator.

SONOPULS homogenizers have strictly to be used in accordance with these operating instructions. In case of improper use or unauthorized changes, the manufacturer will not take any responsibility for security or functioning of the equipment. Should a service become necessary, please contact your dealer.

Subject to technical alterations.

BANDELIN

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**55 years of experience in
ultrasound technology**
 Certified according to EN ISO 9001:12.2000
 EN ISO 13485:11.2000

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