# Project planning information

BANDELIN
Ultraschall seit 1955

## *High-performance ultrasonic generators*

## *SONOREX TECHNIK*

### High-performance ultrasonic generators

| | |
|---|---|
| **Desktop housing** | **LG …. T /PRO** |
| **Industrial housing** | **LG …. F /PRO** |
| **Industrial housing** | **LG …. D /PRO** |
| **Compact housing** | **TG 1503 and TG 3003** |
| **Protective housing** | **SG 1510** |

**for the operation of ultrasonic cleaning baths (TM), ultrasonic immersible transducers, ultrasonic flat transducer plates and ultrasonic reactors**

2329d GB/2017-06

# Content






**BANDELIN** electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

Copyright & limitation of liability

This document may not be reproduced, either in full or in extracts, without prior approval of BANDELIN electronic GmbH & Co. KG, hereinafter referred to as BANDELIN electronic.

The German-language original is the binding version of this document. Any differences in the translation are not binding and have no legal effect. In case of any discrepancies between the translation and the original of this document, the original version will take precedence.

The documentation has been prepared with great care. Liability for indirect or direct damages arising because of incomplete or erroneous information in this documentation, as well as in its delivery and usage, is excluded.

© 2017

**BANDELIN** *electronic* GmbH & Co. KG, Heinrichstraße 3 – 4, Germany, 12207 Berlin,

Tel.: +49-30-768 80 - 0, Fax: +49-30-773 46 99, info@bandelin.com

**Explanation:**
On this page, power modules, generator modules and HF units are called "modules" and the designation "generator" relates to LG generators, SG generators and TG generators.

# 1 General information

SONOREX TECHNIK generators are microprocessor-controlled high-tech generators with rated outputs from 1000 to 9000 W in 6 housing sizes:

| | | |
|---|---|---|
| Protective housing | — | up to 1500 W |
| Compact housing<br>Desktop housing | } | up to 3000 W |
| 19" industrial housing<br>19" plug-in units | } | up to 9000 W |

The main feature of the generators is the use of different modules for 1000 W or 1500 W with a special transformer and the control of all operating parameters by an on-board microprocessor. The operating frequencies are 25 kHz as standard or alternatively 40 kHz.
Modules with different ultrasound frequencies can be operated at the same time in a single generator with several modules. The HF frequency is set at the factory via software.

The modular design of the generators meets the latest requirements for process design in ultrasound application technologies.

In its basic configuration, the generator system consists of a power supply, an RS 232 interface for higher-ranking communication with PLC or PC and one or more 1000 W or 1500 W modules. A maximum of 9000 W (6 x 1500 W or 8 x 1000 W) can be integrated in one system.

Generator control is based to a great extent on software. This significantly enhances operational reliability and functionality, for instance, in the recognition of dry running in ultrasonic systems. Servicing is thus facilitated.


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 2 Equipment features:

- Modules with on-board microprocessor
- Dry running recognition – protects the ultrasonic systems from destruction
- Intelligent software controls and monitors all operational functions (e.g. power control, error detection, status memory and temperature-dependent power reduction)
- Mixed fitting with modules of different frequencies possible
- Each module has LEDs for display of operating status
- Short-circuit proof and no-load protected
- Connection for remote control
- LG generators with automatic power control and display,
  range of power control 10 – 100 %
- For a homogeneous sound field, the generator system may be operated by frequency-modulated ultrasound (i.e. sweep). Frequency deviation approx. ± 250 Hz. Thus local intensity peaks will be less (factory setting: sweep off).


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# I LG generators

Modular design also in 19" plug-in technology.

## 3 Technical data

LG generators are interference-free and CE marked.
Safety: EN 61010-1;
EMC: EN 61326-1

| **Generator housing** | **LG ... T / PRO** | **LG ... F / PRO** | **LG ... D / PRO** |
|---|---|---|---|
| max. number of power modules | 2 | 4 | 8 |
| Operating voltage | 230 V~ 50/60 Hz | 400 V 3N~ 50/60 Hz | |
| Cable length | 2 m | 3 m | |
| Voltage tolerance | ± 10 % | | |
| Current consumption (max. per phase) | 13 A | | |
| Rated ultrasonic output (max.) | 3 kW | 6 kW | 9 kW |
| Ultrasonic frequency | 25 or 40 kHz | | |
| Mains fuse | 16 A | 3 × 16 A | |
| Dimensions (L × W × H) | 218 × 405 × 198 mm | 488 × 405 × 203 mm | 488 × 405 × 425 mm |
| Weight (max.) | 9 kg | 21 kg | 38 kg |
| Degree of protection | IP 20 | | |

**Ambient conditions**

Overvoltage category: II
Degree of contamination: 1
Permissible ambient temperature: 5 to 45 °C
Permissible relative humidity up to 31 °C: 80%
Permissible relative humidity up to 40 °C: 50%
Condensation not allowed.


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

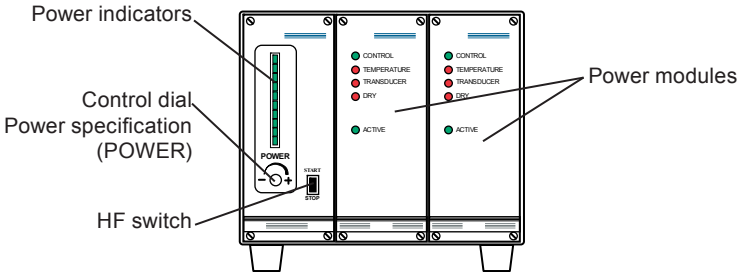
# 4 Housing:

## 4.1 Front views (examples)

Complete description, see Chapter10.

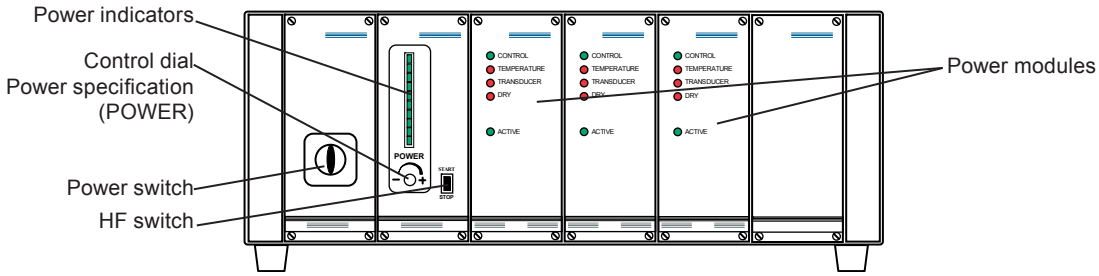
Desktop housing up to 3 kW

example: **LG 3020 T**



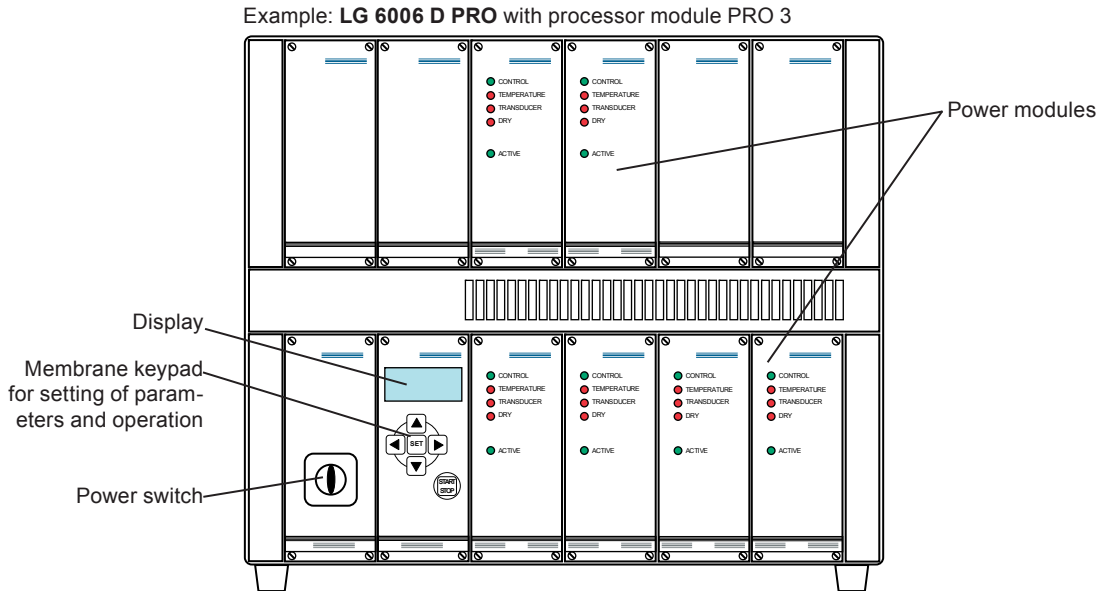

19" industrial housing or 19" plug-in units up to 6 kW

Example: **LG 3512 F** with control module SM 3 (Standard)




19" industrial housing or 19" plug-in units up to 9 kW

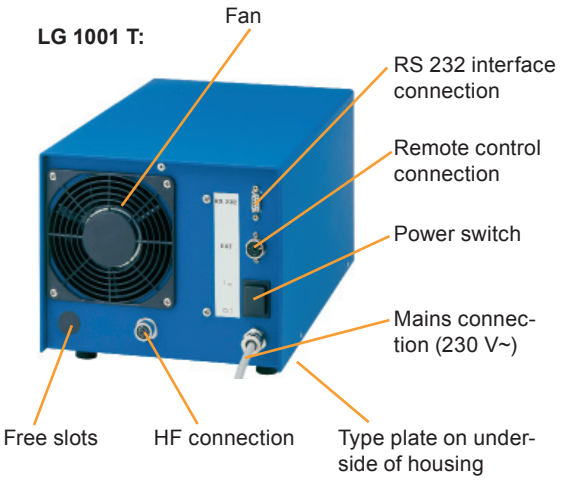
Example: **LG 6006 D PRO** with processor module PRO 3

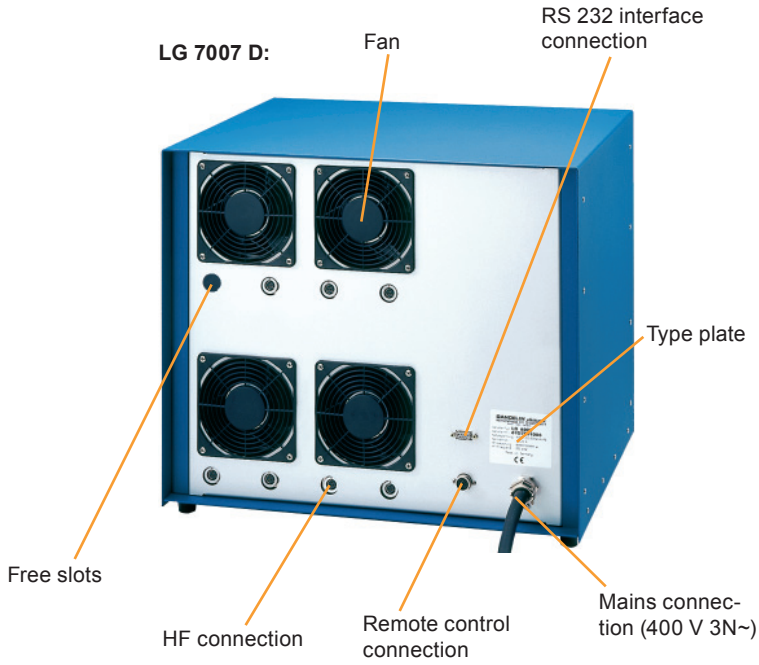



**Notes**

- On all generators, it is possible to replace the control module SM 3 by a processor module PRO 3.
- The generators can be equipped with power modules of 1000 W or 1500 W, frequencies 25 kHz or 40 kHz, up to a maximum of 9000 W.

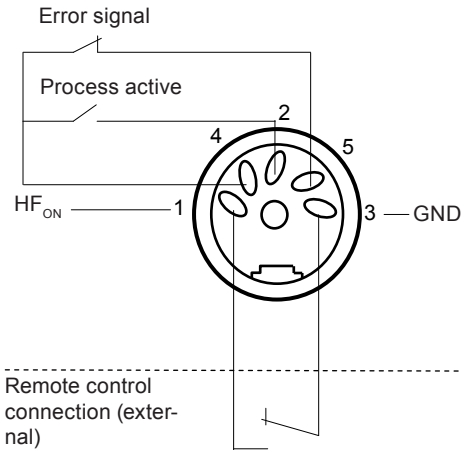
## 4.2 Rear views (examples)




### Remote control connection socket (view of rear panel)

For remote control and monitoring (error signal and process time)




1* Open = $HF_{ON}$
2** "Process active" NO contact (60 V; 0,5 A; 10 VA resilient)
3 GND - Generator's earth connection
4 Internal relay contacts
5*** "Error signal" opening contact - standard (60 V; 0,5 A; 10 VA resilient)

* If $HF_{ON}$ is switched to GND via a potential-free contact, the power modules are blocked.
Caution! No voltage source may be placed on pin 1.
** Only with an installed PRO 3 module.
*** Emitted only in operation, as soon as at least one error occurs on a module.

### HF output sockets

for connecting ultrasound transducer, per connection max. 1000 W or 1500 W.
Parallel interconnection of the outputs of power units is strictly forbidden.

### RS 232 interface connection

All generators have an RS232 interface for high-ranking control tasks such as PLC or PC.

### Mains connection:

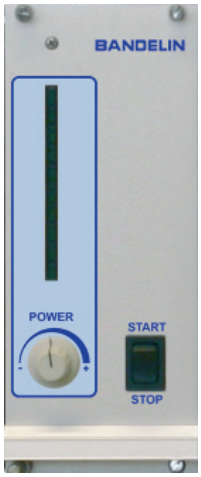
Fixed power cable connection.

# 5 Operation

**Replaceable operating modules**

The operating modules, control module SM3 or processor module PRO3, are exchangeable on all generator types.

## 5.1 Control module SM 3



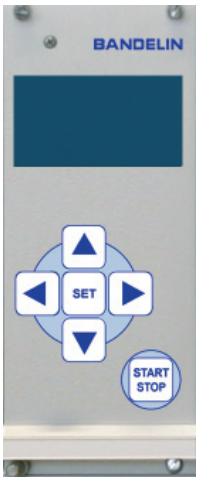

The nominal power for all power modules is set with the "POWER" control dial. The nominal power is displayed.

The generator is switched on/off with the HF switch (start/stop). Immediately after switching on, a soft start will commence, during which power will increase from zero to the set point within approx. 3 seconds.

The generator can be controlled externally via an RS 232 interface.

- by PC
- by serial communication with a PLC.

## 5.2 processor module PRO 3




The processor module is suitable for controlling complex tasks.

In addition to the individual setting of parameters for individual power modules, the programming of comprehensive application programs and countdowns is also possible.
Programming can be directly carried out on the processor module PRO 3. If the LG generator is fitted with a PRO module, the serial interface can take on the following tasks:

- Remote control of a generator via PLC.
- Remote control via PC

Caution: For proper operation with the processor module PRO3, it is necessary to install power modules from series 3 (M 1003, M 1503).

Menus can be displayed and called up, and parameters set on the membrane keypad or display, e.g.:

**For every individual power module**

- Setting of the output power in %
- Setting of process times
- Display of operating hours
- Selection of operating readiness (activation/deactivation)
- DEGAS (degassing function)

**For all power modules together**

- Display of the current modular outputs
- Setting of process times
- Display of non-available and switched-off power modules
- Setting of the output power in %
- DEGAS (degassing function)


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

## 5.3 Remote control via RS 232 interface connection for PLC or PC

The generators can be connected to PLC or PC and controlled via the RS 232 interface. In addition to the individual setting of performance parameters for the ultrasonic generator, the programming, saving and logging of customer-related process data is also available.

## 5.4 Remote control via external user controls

The following can be connected to the remote control connection:

- the FS 15 L remote control with timer or
- the FS 7 remote control cable (simple on/off function via relay, switch, PLC, etc.)

can be connected.

**Important:**
The "CONTROL" LED on the power modules lights up as long as the ultrasound is turned on.

Turning on ultrasound with the timer on the FS 15 L:

- Time range, 1 to 15 min. or
- Continuous operation

## 5.5 Relay-controlled remote control with external PLC

The generators can be remote controlled via the remote control connection by means of an external floating control contact of a PLC or another remote control device (see terminal assignment under point 4.2 Remote control connection).

When performing relay-controlled remote control, the following points must be observed:

- Wiring of connection socket, see point 4.2.
- All power modules M on the generator can be locked via a relay contact between terminal 1 and 3 (may also be used as "Emergency OFF").
- A contact for error display is opened between terminal 4 and 5 inside the generator.
- In an LG generator with PRO 3 module, the "process active" signal is created between terminals 4 and 2 if at least one power module M is switched on.


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 6 Properties of power modules M

## 6.1 Output stage

The ultrasonic energy is generated by a MOSFET bridge circuit and fed to the ultrasonic systems via a special output transformer. This means a considerable reduction of the power-adapting components in the power module's load circuit.
The application of MOFSET transistors allows effective circuit engineering with high efficiency and low losses. Fast protective circuits serve to protect both the generator and the ultrasonic systems from destruction. Even under critical operating conditions, a permanent error analysis guarantees high levels of operational reliability by rapid lowering of power as long as the condition deemed to be an "error" persists.

## 6.2 LED status indicators

The LEDs on the front panel of each power module allow quick overview of the operational status of each module and its load:


LED "CONTROL" (green) lights up when the target power is reached.
Flickering of the LED indicates a momentary deviation from the target value that is not an error.

LED "TEMPERATURE" (red) flashes if the power is reduced due to excessively high temperatures inside the generator.

LED "TRANSDUCER" (red) lights up permanently in the case of a short circuit.
(Defective transducer or feed cable).
Flashes 1× per second during no-load motion; the "CONTROL" LED may flash simultaneously.
Flashes quickly or flickers if HF current or HF voltage is too high.

LED "DRY" (red) lights up if the reactive power is too high
(generally when running dry or if transducer is incorrectly adjusted).
Flickers once the limit state for running dry is attained.

Module switch ACTIVE (green)
This switch enables the individual switching on or off of modules in operation, e.g. when a partial load operation in a generator equipped with several power modules is required.

## 6.3 Power control and power constancy

The HF power of all power modules in an LG generator is simultaneously adjusted on the front panel via the "Power" control dial, and in the PRO version also individually via the processor module PRO 3.
The power is continuously adjustable between 10 and 100 %.
The maximum output power is 1000 W or 1500 W at 100 % as standard.
The power module's microprocessor control guarantees high power constancy at a min. installed load of 300 W.

# 7 Notes

## 7.1 Safety information

- Keep the LG generator's surface and user controls clean and dry!
- Make sure that neither dust nor humidity can penetrate into the LG generator (degree of protection IP 20).
- To protect the generator from humidity (splash water, steam, oil, oil mist, etc.), it must be set up at a sufficient distance from the cleaning tank and other machinery.
- In order to avoid overheating, do not install the LG generator in an enclosed housing. The air supply on the underside of the generator and the air outlet on the rear must not be obstructed.
- After internal verification, LG generators can also be used for operating external high-power transducers. If such systems are only equipped with a two-pole HF connection, e.g. with a high-voltage BNC socket, an additional protective conductor connection must be installed on the transducer.
  The HF connection must be adjusted to the Quick-Connect technology.
- It must be ensured that the power modules and the transducers attached in each case are mutually matched for frequency and power output. Mismatchings can lead to damage to the transducers or the power modules.
- LG generators must only be connected to earthed mains operating voltages with **protective conductor systems**. Here, the intended supply voltage for the generator must be observed.
- It is forbidden to connect any type of power or voltage sources to the generator's signal inputs or outputs.
- A parallel interconnection of the outputs of power modules in the LG generator is strictly forbidden.
- **Use only the connection material supplied**.
- Cavitation noises are emitted during ultrasonic cleaning.
  When working continuously within a radius of 5 m from the cleaning tanks or transducers, wear ear protection for protection against injuries to health!

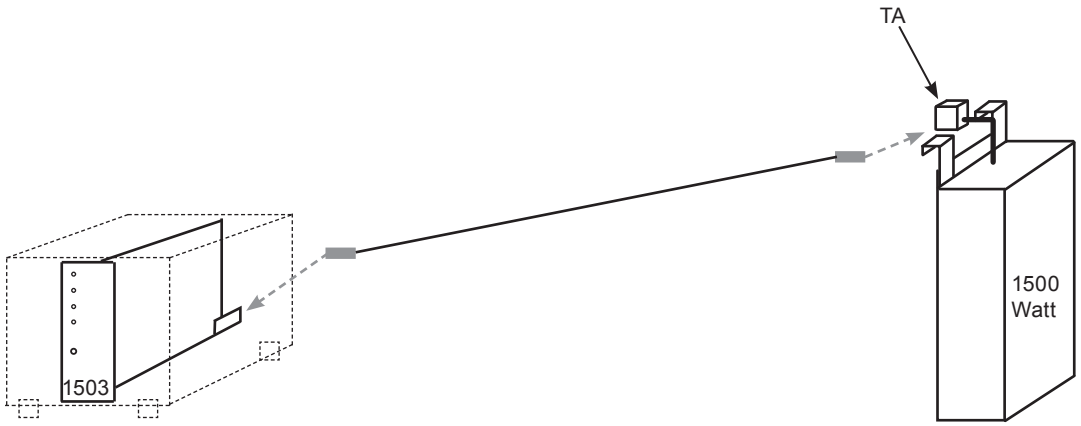

BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

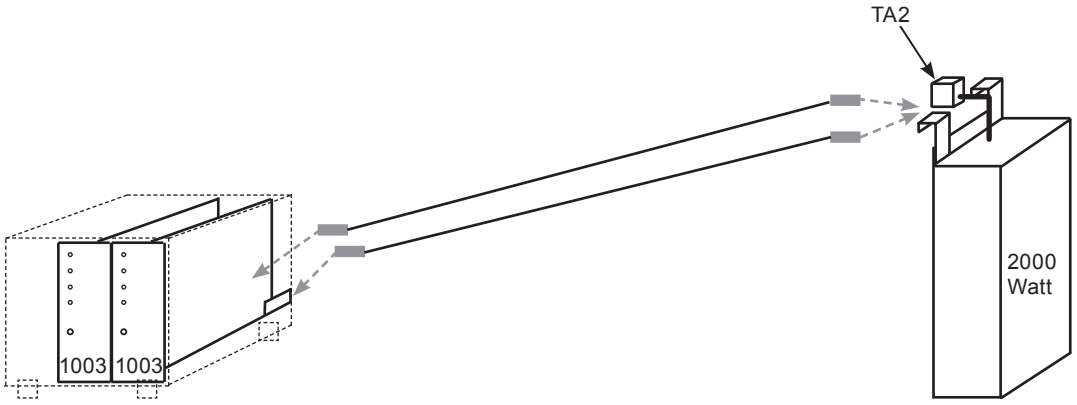
## 7.2 Installation and connection

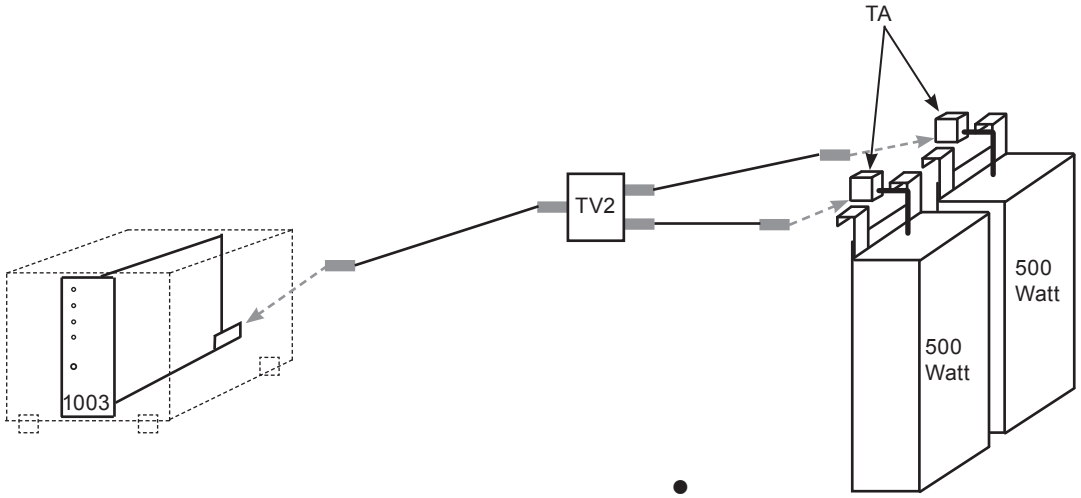
- Place the LG generator in a dust-free, dry room. The ambient temperature should not exceed **45 °C** (above 45 °C the generator may reduce its output power).
- The generator should be set up on a flat, stable surface at least 10 cm away from the back wall in order to ensure sufficient cooling for the dissipation of the lost heat.
- Installation in an enclosed construction is only permissible on the condition that it is possible to dissipate the maximum possible thermal loss.
  Each power module can generate thermal losses of up to a maximum of 200 W!
- When installing a complete generator or a 19" plug-in unit, the total dissipation loss must be considered, depending on the number of modules.
  In addition, when installing a 19" plug-in module in a control cabinet, it is important to ensure that an air gap of 1 HU (44.45 mm) is present beneath the plug-in module. The air gap can be covered using the front plate that was supplied (slot on the right, underneath the modules).
  Control cabinets for the installation of 19" plug-in modules must be at least 600 mm deep, in order to offer sufficient space for the HF plug and mains connection. In addition, adequate ventilation from the front and rear must be ensured.
- To protect it from moisture (splashes, steam, oil, oil mist, etc.) the generator must be set up at a suitable distance from the cleaning bath and other machines (standard: 5 m HF feed cable; max. 20 m).
- Do not expose the LG generator to corroding influences. The following environmental conditions must be observed.

# 8 Connection of power module M

Illustrated by examples of immersible transducer installation type E.



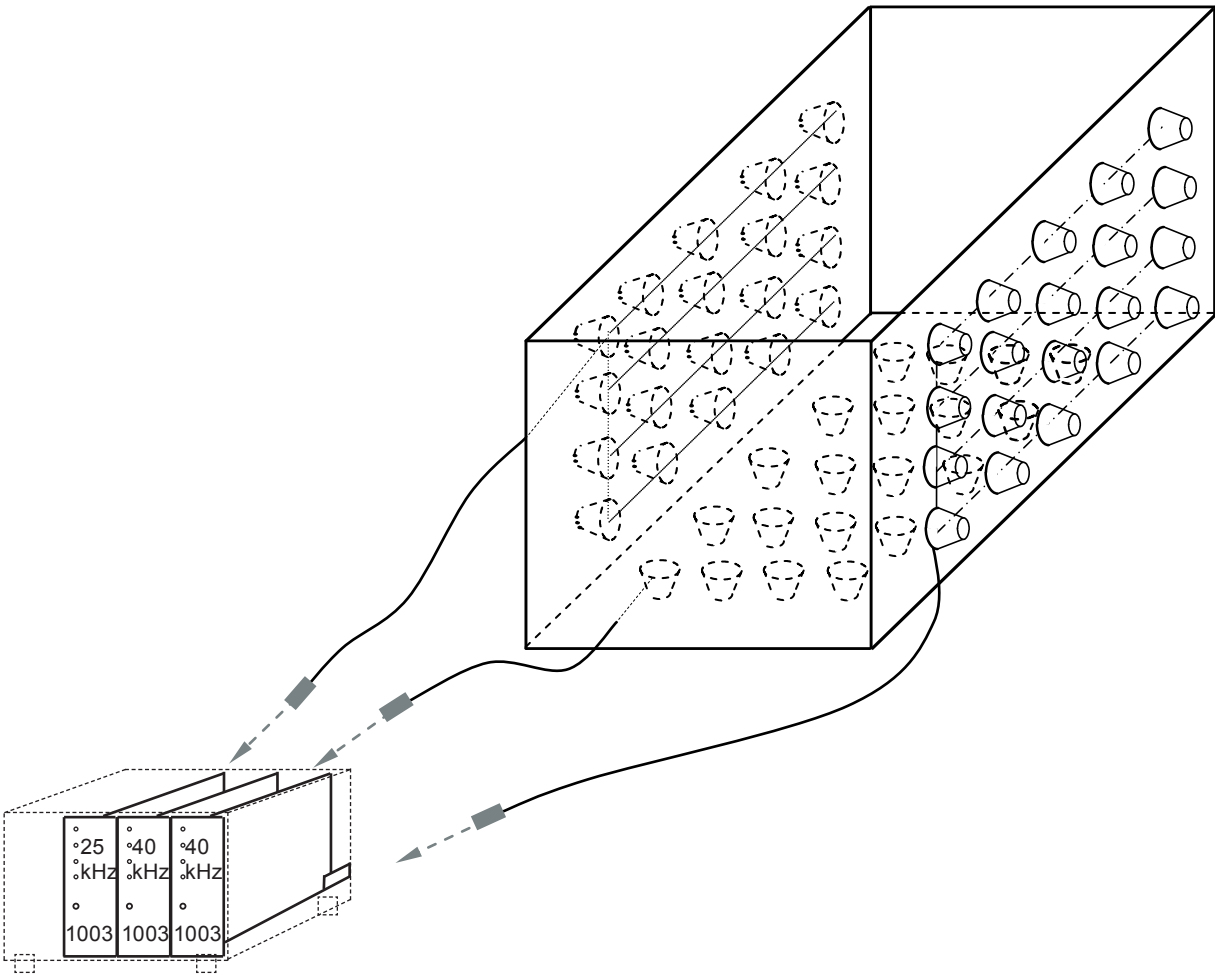

- or 3 x 300 W
- or 5 x 200 W

Ultrasonic tanks, flat transducer plates, reactors and transducers with corrugated surfaces (CONVEXON, CONCAVON) can be connected in similar fashion to a power module M up to 1500 W total output.
All further power modules in an LG generator can be configured in the same way.


**BANDELIN** electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 9 Connection of power module M with different ultrasound frequencies

Illustrated by an example of an ultrasonic cleaning tank:




Ultrasonic immersible transducers, flat transducer plates and reactors of different HF frequencies are connected to LG generators in similar fashion.
Further information on immersible transducers and flat transducer plates is given in the relevant project planning advice.


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 10 Standard configurations

## 10.1 LG generators

### Desktop housing (T) up to 3000 W

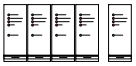
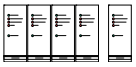
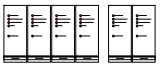
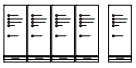
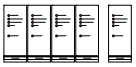
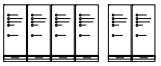
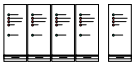
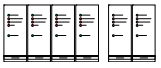
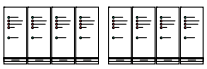
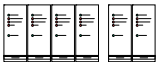
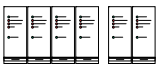
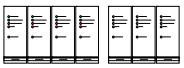
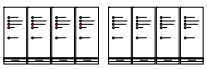
| - DEGAS (degassing function) (W) | Type | Number of modules M 1503, M 1003 | | Module breakdown |
|---|---|---|---|---|
| 1000 | LG 1001 T /PRO | 0 | 1 |  |
| 1500 | LG 1510 T /PRO | 1 | 0 |  |
| 2000 | LG 2002 T /PRO | 0 | 2 |  |
| 2500 | LG 2511 T /PRO | 1 | 1 |  |
| 3000 | LG 3020 T /PRO | 2 | 0 |  |

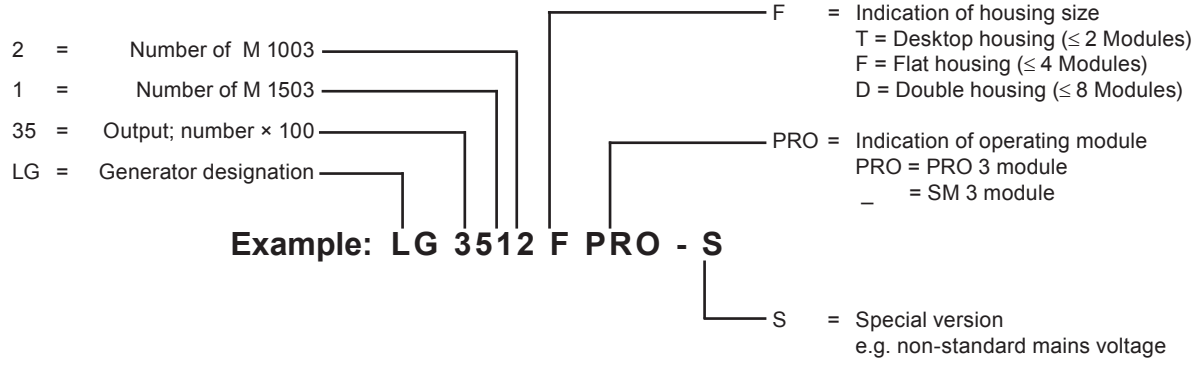
### 19" industrial housing (F) or 19" plug-in units up to 6000 W

| Rated power [W] | Type | Number of modules M 1503, M 1003 | | Module breakdown |
|---|---|---|---|---|
| 1000 | LG 1001 F /PRO | 0 | 1 |  |
| 1500 | LG 1510 F /PRO | 1 | 0 |  |
| 2000 | LG 2002 F /PRO | 0 | 2 |  |
| 2500 | LG 2511 F /PRO | 1 | 1 |  |
| 3000 | LG 3003 F /PRO | 0 | 3 |  |
| 3000 | LG 3020 F /PRO | 2 | 0 |  |
| 3500 | LG 3512 F /PRO | 1 | 2 |  |
| 4000 | LG 4004 F /PRO | 0 | 4 |  |
| 4000 | LG 4021 F /PRO | 2 | 1 |  |
| 4500 | LG 4530 F /PRO | 3 | 0 |  |
| 4500 | LG 4513 F /PRO | 1 | 3 |  |
| 5000 | LG 5022 F /PRO | 2 | 2 |  |
| 5500 | LG 5531 F /PRO | 3 | 1 |  |
| 6000 | LG 6040 F /PRO | 4 | 0 |  |


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

## 19" industrial housing (D) or 19" plug-in units up to 9000 W

| Rated power [W] | Type | Number of modules M 1503, M 1003 | | Module breakdown |
|---|---|---|---|---|
| 5000 | LG 5005 D PRO | 0 | 5 |  |
| 5500 | LG 5514 D PRO | 1 | 4 |  |
| 6000 | LG 6006 D PRO | 0 | 6 |  |
| 6000 | LG 6023 D PRO | 2 | 3 |  |
| 6500 | LG 6532 D PRO | 3 | 2 |  |
| 6500 | LG 6515 D PRO | 1 | 5 |  |
| 7000 | LG 7007 D PRO | 0 | 7 |  |
| 7000 | LG 7041 D PRO | 4 | 1 |  |
| 7000 | LG 7024 D PRO | 2 | 4 |  |
| 7500 | LG 7550 D PRO | 5 | 0 |  |
| 7500 | LG 7533 D PRO | 3 | 3 |  |
| 7500 | LG 7516 D PRO | 1 | 6 |  |
| 8000 | LG 8008 D PRO | 0 | 8 |  |
| 8000 | LG 8042 D PRO | 4 | 2 |  |
| 8000 | LG 8025 D PRO | 2 | 5 |  |
| 8500 | LG 8551 D PRO | 5 | 1 |  |
| 8500 | LG 8534 D PRO | 3 | 4 |  |
| 9000 | LG 9060 D PRO | 6 | 0 |  |
| 9000 | LG 9026 D PRO | 2 | 6 |  |





BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 10.2 Accessories

## Accessories for expansion and extension

| | Order No. | Description |
|---|---|---|
| FS 15 L | 8466 | Remote operation with timer 1-15 min and continuous operation, Cable with plug, 7 m long |
| FS 7 | 8468 | Remote control cable with 7 m cable length, one end with plug |
| V 148 | 3164 | Plug for remote control |
| M 1003 | 9634 | 1000 W output module (for increasing output) |
| M 1503 | 9639 | 1500 W output module (for increasing output) |
| PRO 3 module | 9644 | Processor module for retrofitting |
| SM 3 module | 9648 | Control module for retrofitting |


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# II TG generators

Compact generators TG 1503 and TG 3003 have been specially developed for mechanical engineering.

These generators offer the same characteristics and advantages as the LG generators. Unlike LG generators, no manual adjustments are possible. All settings are made via the remote control connection or the RS 232 interface. Thus these TG generators are especially suitable for installation in existing electrical cabinets.
With the optional bracket, a space-saving installation on a wall is possible too.
In the following, only data which are different from the LG generators are noted.

## 11 Technical data

| Generator housing | TG 1503 | TG 3003 |
|---|---|---|
| Number of HF units | 1 | 2 |
| Operating voltage | 230 V~ 50/60 Hz | |
| Voltage tolerance | ± 10 % | |
| Mains cable | 2 m, with safety plug | |
| Current consumption (max. per phase) | 6.5 A | 13 A |
| Rated ultrasonic output (max.) | 1.5 kW | 3 kW |
| Ultrasonic frequency | 25 or 40 kHz | |
| Mains fuse | 16 A | |
| Dimensions (L × W × H) | 250 × 460 × 110 mm | 250 × 460 × 160 mm |
| Degree of protection | IP 20 | |
| Weight (approx.) | 5.5 kg | 9.5 kg |

**Ambient conditions**

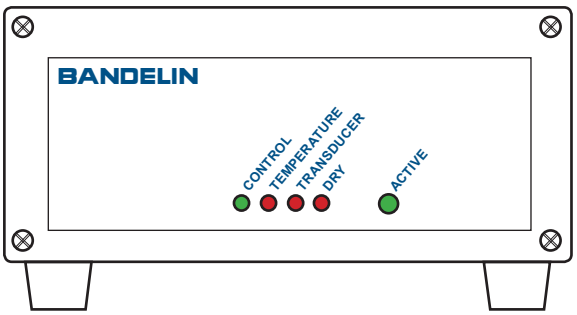
Overvoltage category: II
Degree of contamination: 1
Permissible ambient temperature: 5 to 45 °C
Permissible relative humidity up to 31 °C: 80%
Permissible relative humidity up to 40 °C: 50%
Condensation not allowed.


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 12 Housing versions

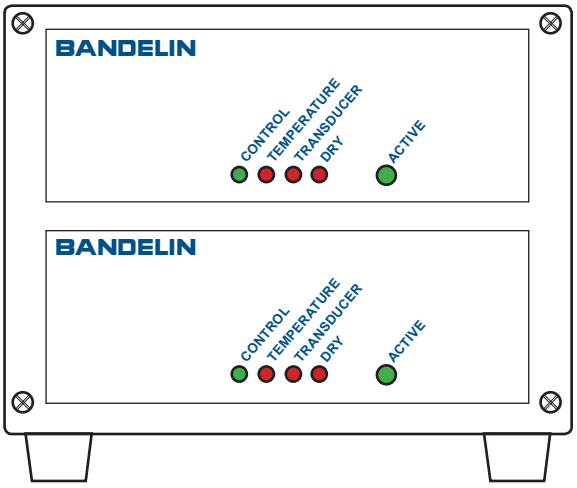
**Equipment TG 1503:**

1 Mains switch on rear
1 HF unit E 1503
(Setting: 300 to 1500 W,
frequency: 25 or 40 kHz)



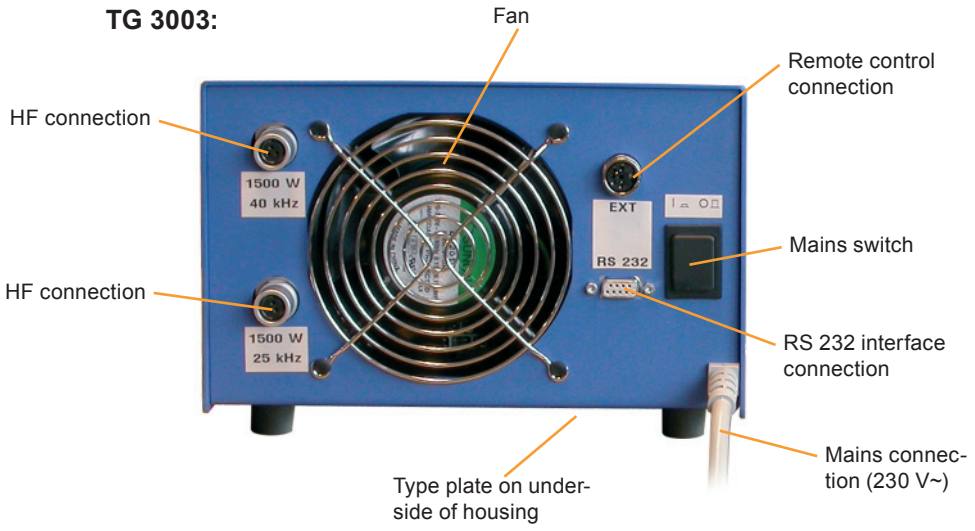

**Equipment TG 3003:**

1 Mains switch on rear
2 HF units E 1503
(Setting: 300 to 1500 W,
frequency: 25 or 40 kHz)




## 12.1 Rear view

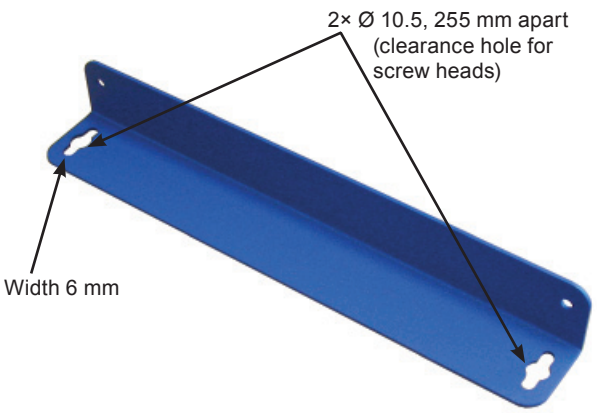
**TG 3003:**




TG 1503: Figure similar

## 12.2 Bracket TGW 1

The generator can be hung on a vertical surface by installing mounting bracket TGW 1 on the right or left side.





BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 13 Accessories

## Accessories for expansion

| | Order No. | Description |
|---|---|---|
| FS 15 L | 8466 | Remote operation with timer 1-15 min and continuous operation, Cable with plug, 7 m long |
| FS 7 | 8468 | Remote control cable with 7 m cable length, one end with plug |
| V 148 | 3164 | Plug for remote control |
| TGW 1 | 9680 | Bracket |


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# III SG generators

Generator SG 1510 in protective housing has been specially developed for outdoor/humid areas.

These generators offer the same characteristics and advantages as the LG generators.
Unlike LG generators, no manual adjustments are possible. All settings are made via the remote control connection or the RS 232 interface.
This makes the SG generators specially suited for use in outdoor or humid areas.
With the pre-mounted bracket, a space-saving installation on a wall is possible too.
In the following, only data for the SG generators which are different from the LG generators are noted.
In order to avoid overheating, do not install the generator in an enclosed housing.
The air supply on the underside of the generator and the air outlet on the rear must not be obstructed.

## 14 Technical data

| | |
|---|---|
| Generator housing | SG 1510 |
| Order No.: | 9670 |
| Operating voltage | 230 V~ 50/60 Hz |
| Voltage tolerance | ± 10 % |
| Mains cable | 6 m, with safety plug |
| Current consumption | 6.5 A |
| Rated ultrasonic output (max.) | 1.5 kW |
| Ultrasonic frequency | 25 or 40 kHz |
| Mains fuse | 16 A |
| External dimensions (LxWxD) | 490 × 265 × 225 mm |
| Degree of protection | IP 67 |
| Weight (approx.) | 20 kg |

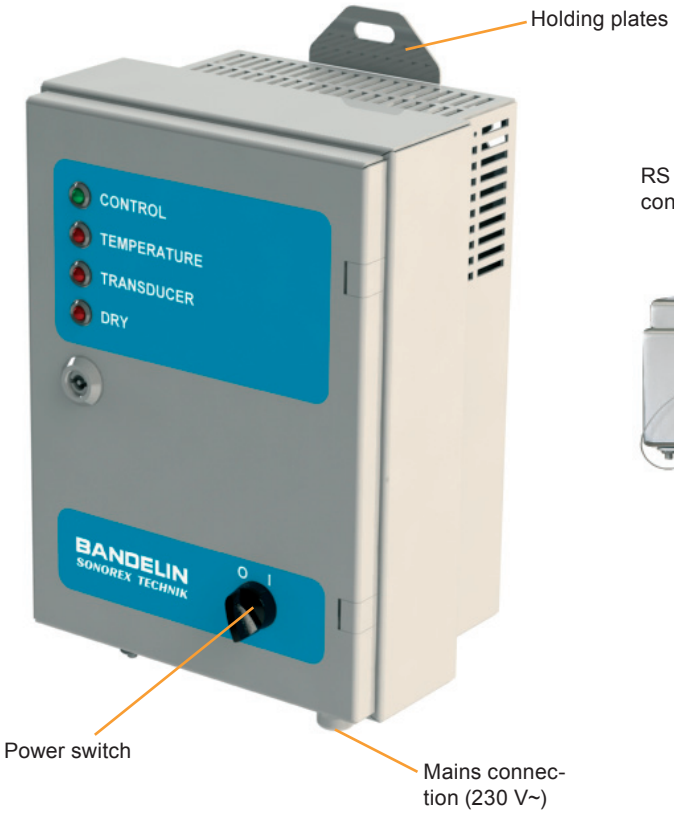
**Ambient conditions**

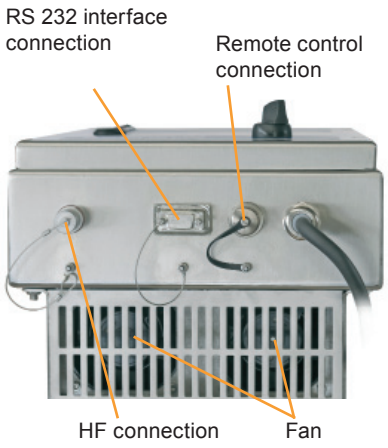
| | |
|---|---|
| Overvoltage category: | II |
| Degree of contamination: | 4 |
| Permissible ambient temperature: | -20 to 55 °C |
| Permissible relative humidity up to 31 °C: | 100 % |

Condensation allowed.
Use inside rooms or outdoors.


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

# 15 Protective housing




## HF connection

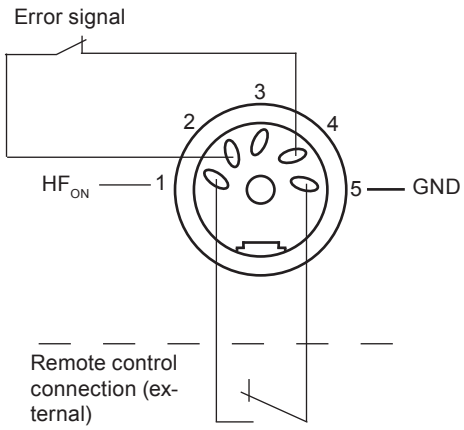
- for connecting ultrasound transducer, per connection max. 1500 W.
- For connection of the ultrasound transducer, the HF cable must be fitted on both sides with a rubber grommet.

## RS 232 interface connection

All generators have an RS232 interface for higher-ranking control tasks such as PLC or PC.
Note: Jack for connecting a 3-pole round cable (dia 5 - 10 mm) is included. This may already be connected to the cable provided by the factory.

## Remote control connection

Remote control and monitoring (error signal and process time)
Important: Jack for connecting a 5-pole round cable (dia 4 - 8 mm) is included. This may already be connected to the cable provided by the factory.




1* Open = HF$_{ON}$
5 GND - Generator's earth connection
2 Internal relay contacts
4** "Error signal" opening contact - standard (60 V; 0,5 A; 10 VA resilient)

* If HF$_{ON}$ is switched to GND via a potential-free contact, the generator is blocked. Caution! No voltage source may be placed on pin 1.

** Emission in operation as soon as at least one error has occurred.
Additional emissions when the generator is locked by HF$_{ON}$ or mains power is turned off.


BANDELIN electronic GmbH & Co. KG • Heinrichstraße 3-4 • 12207 Berlin • Deutschland • info@bandelin.com

## 15.1 Suspension

The generator can be suspended both from the keyholes (1) on the rear to a suitable fixing or mounted on a vertical surface with the holding plates.

Rear with attachment holes