Ultrasonic generator

11744.93

Operating Instructions

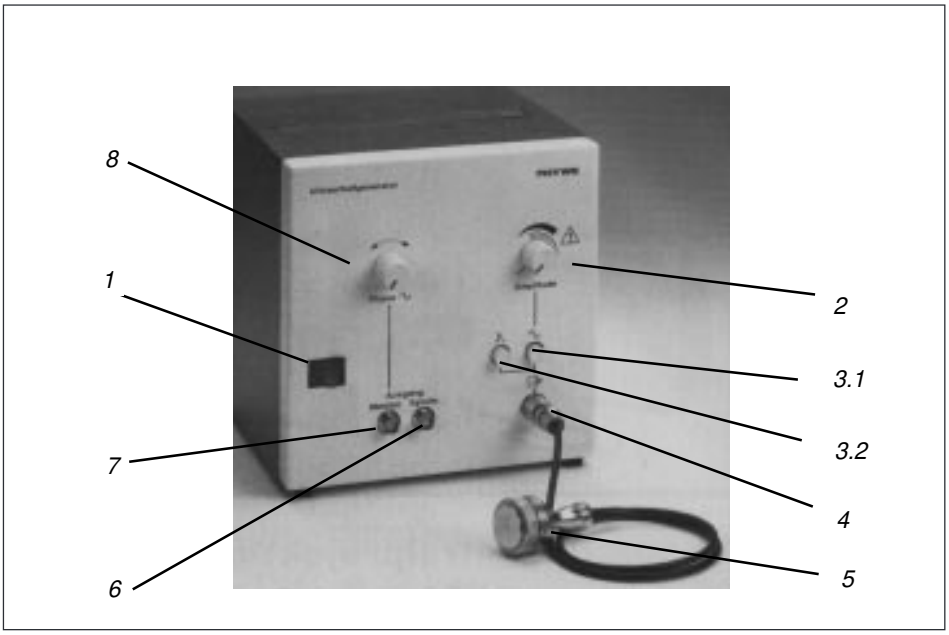

Fig.1

1 PURPOSE AND CHARACTERISTIC FEATURES

The ultrasonic generator serves to generate both sinusoidal ultrasonic waves and ultrasonic
impulses. Radiation is from a sound head, which is connected to the generator by a flexible cable.
The generator enables experiments to be carried out - in part using an ultrasonic receiver - to examine the wave nature of ultrasound, its propagation in liquids and solids, reflection, the speed of sound, the Doppler effect etc.. Further to these, it enables technical applications of ultrasound such as cleaning, atomizing, welding, testing materials, echo-sounding and measuring thickness to be demonstrated.

2 FUNCTION AND OPERATING ELEMENTS

Fig. 1 shows the following functional and operating elements:

1 *Mains switch with control lamp*

2 *Amplitude adjusting knob*
for adjustment of the sound output in the sine mode of operation (button > ~ < pressed). This knob has no function in the impulse mode (button > ⊥Λ < pressed), however.
Important: In the sine mode, when only a small amount of energy is drawn from the sound head, e.g. when working in air, do not turn the adjusting knob so far that the line marked on it is in the shaded range. This could lead to strong heating of the sound head and, according to circumstances, to its destruction within a few minutes.
When the propagating surface of the sound head is in a liquid, on the other hand, then the maximum generation voltage can be used even in permanent operation. In the impulse mode, the generating power is constant and also small enough for working in air.

3.1 *Button for the sine mode*
When this button is pressed in, the sound head is excited by a sinosoidal voltage of 800 kHz frequency.

3.2 *Button for the impulse mode*
When this button is pressed in, the sound head is excited by a succession of impulses of 500 kHz frequency and constant, negative amplitude.

4 *Output with UHF sockets*
for connection of the sound head *5*.

5 *Sound head (with 0.8 m screened cable with UHF plug)*
for propagating ultrasonic waves. The face of the watertight sound head is capable of vibrating and has a piezoceramic plate fixed to its inner side which is excited by the generator. The sound head and generator are tuned to each other.

6 *Output > Synchr. <*
BNC output socket for external triggering of an oscilloscope connected to monitor output *7*. Trigger voltage and excitation voltage are coupled, same frequency and fixed phase.
The trigger output supplies a sinusoidal voltage U_{SS} of approx. 5 V in the sine mode, and a positive input voltage U_S of approx. 5 V of the impulse mode.

7 *Output > Monitor <*
with BNC socket for connection of an oscilloscope. The monitor voltage is of the same frequency as the excitation voltage. In the sine mode, the monitor output voltage is proportional to the excitation voltage which has been set, and is max. 5 V_{SS}.
In the impulse mode, there is a succession of positive impulses of approx. 5 V_S amplitude at the monitor output. Monitor and exciter impulses occur at practically the same time.
When an ultrasound receiver is used in the experiment, monitor and receiver signals can be visualized by means of a 2 channel oscilloscope. In the sine mode, for example, the wavelength can then be determined

from the phase relationship between the sound head and receiver signals when the distance between the sound head and the receiver is varied. In the impulse mode, the sound transmission time can be determined.

8 Adjusting knob > Phase <
to change the phase difference between the exciting and monitor voltage by approx. 150° in the sine mode. The minimum phase difference with the adjusting knob as far as it will go to the right is approx. 20°.

3 HANDLING

Connect the screened cable of the sound head with the generator output 4. The instrument is ready for use approx. 30 s after switching it on. Select the required mode of operation with button 3. In the sine mode, start with minimum power, ensuring that, in experiments in air, the amplitude setting knob is not turned into the shaded area. With experiments in liquids, the whole amplitude range can be used.
When the recommended ultrasound receiver is used (see „Ultrasonic pickup“ in the List of Equipment), the ultrasonic waves and impulses can be visualized by means of an oscilloscope.
The vibrating quartz crystal of the watertight ultrasonic pickup is tuned to the generator frequency. With sufficiently high signal strengths, it can be connected directly to the oscilloscope with the connecting cable and adapter supplied. With lower signal strengths, the use of a screened cable is recommended to decrease noise. The grip of the pickup can be held in a clamp to fix the pickup on a stand.

4 SPECIFICATIONS

Sound head	
Construction	watertight
Sending area	approx. 5 cm^2
Sine mode	
Frequency	800 kHz ± 5 kHz
Sound power, adjustable	max. 16 W ± 1 W
Monitor voltage	0...5 V_{SS} ± 20%
Trigger voltage	5 V_S ± 20%
Phase shift	20° - 150°
Impulse mode	
Pulsing frequency	500 Hz ± 50 Hz
Monitor output	
Impulse height	+ 5 V_S ± 20%
Impulse increase time	< 3 µs
Difference to exciter impulse	max. 2 µs
Trigger output	
Impulse height	+ 5 V_S ± 20%
Difference to monitor impulse	approx. 12 µs, preceding
Electrical supply	230 V / 50 ... 60 Hz
Mass	approx. 7 kg
Housing dimensions	(225 x 214 x 225) mm

5 LITERATURE

Handbuch Ultraschallgenerator	01184.01
University laboratory experiments	16502.12

6 LIST OF EQUIPMENT

Ultrasonic generator, complete with sound head and 1 adapter BNC-plug / 4 mm connector	11744.93
Recommmended accessories	
Ultrasonic pickup	11744.00
Oscilloscope, 20 MHz, 2 channel	11454.93

7 NOTE ON THE GUARANTEE

We guarantee the instrument supplied by us for a period of 6 months. This guarantee does not cover natural wear nor damage resulting from improper handling.
The manufacturer can only be held responsible for the function and safety characteristics of the instrument, when maintenance, repairs and changes to the instrument are only carried out by the manufacturer or by personnel who have been explicitly authorized by him to do so.