U20600 Kundt's tube

U20601 Microphone probe

U20602 Battery box

Operating instructions

11/02 ALF

The equipment set comprising Kundt's tube and accessories is meant to display stationary sound waves with open or closed tube ends and determine wavelengths in air and other gases.

1. Safety instructions

- Protect the microphone and loudspeaker against moisture.
- The external voltage through the microphone's connection line should not exceed 5V.
- Do not clean the acrylic glass body with aggressive agents or solvents.

2. Description, technical data

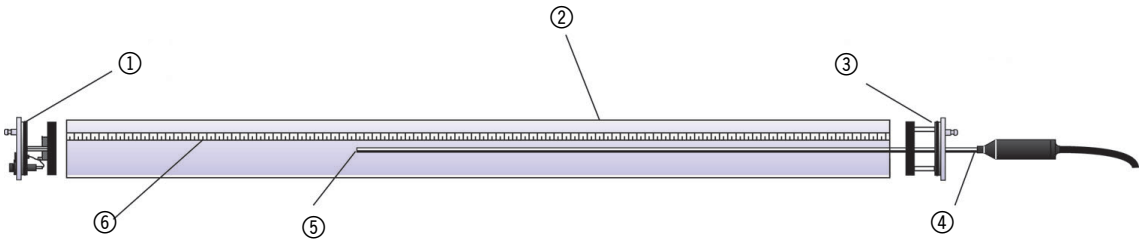
The equipment set designated Kundt's tube consists of an acrylic-glass tube with a scale, two removable end plates and an integrated hose nipple for filling the tube with various gases. One end plate is furnished with a loudspeaker, the other with a bore and guide for mounting a movable piston or microphone probe (U20601).

The equipment set includes two clamps for mounting Kundt's tube on a tripod, and cables for connecting the loudspeaker.

Length:	1000 mm
Diameter:	70 mm
Hose nipple:	7 mm Ø
Scale:	1000 mm
Division:	mm and cm

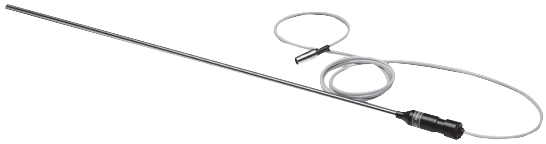
Drawing:

① End plate with loudspeaker, 4-mm jacks and hose nipple
② Resonance tube
③ End plate with bore and guide for mounting a piston or microphone probe
④ Microphone probe
⑤ Microphone
⑥ Scale



2.2. Microphone probe

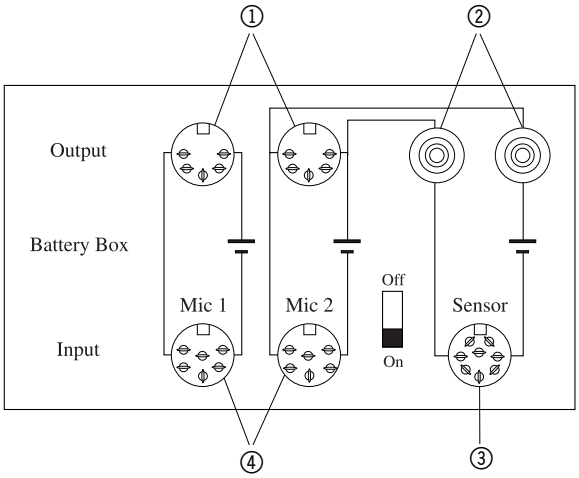
The microphone probe is used to measure changes in sound pressure inside Kundt's tube.
A miniature microphone is attached to the end of a long rod made of stainless steel. It is connected by means of a 5-pole DIN plug to the battery box (U20602). This battery box also has a terminal for connecting an oscilloscope or voltmeter. The microphone probe can be connected directly to the digital counter (U21000) via the adapter U20603.



Microphone's frequency range:	20 Hz to 20000 Hz
Probe's dimensions:	740 mm x 8 mm Ø
Connection cable's length:	2 m

2.3. Battery box

The battery box supplies the microphones (for instance, U20601 or U18030) and other analog sensors with a power of 5 V DC so that they can be connected directly with a measuring device or an oscilloscope.
The box consists of a compartment for a 9-V alkaline battery which supplies the required 5 V DC via a regulator. Two 6-pole DIN jacks (180°) and one 8-pole DIN jack (270°) are available as input channels. Two 5-pole DIN jacks and two 4-mm safety jacks serve for connecting measuring devices.
Dimensions: 143 mm x 84 mm x 37 mm



① DIN jacks for connecting measuring devices
② 4-mm safety jacks for connecting an oscilloscope, voltmeter or interface
③ DIN jack for connecting various sensors or a LabPro interface via an output adapter
④ DIN jacks for connecting microphones

Note:In order to make simultaneous use of the microphone probe U20601 and an oscilloscope, connect the microphone probe to the sensor input (3) and the oscilloscope to the output (2).

3. Sample experiments

3.1 Stationary waves in a closed tube

3.2 Stationary waves in carbon dioxide

3.3 Stationary waves in a tube with one closed end

3. Stationary waves in an open tube

3.5 Changes in the air column
Sound source: Tuning fork or loudspeaker

To perform these experiments, additional use is required of a function generator (for example, U21015) to excite the loudspeaker, and an oscilloscope (for instance, U11175) to display the oscillation nodes and antinodes.

3.6 Determination of the speed of sound in air

- Install Kundt's tube with closed ends and the microphone probe on a tripod; connect a function generator (for instance, U21015) and an oscilloscope (for instance, U11175).
- Apply a frequency f = 2700 Hz to the loudspeaker.
- Move the microphone probe past the nodes and measure the intervals between them using the scale.
- The average interval between two neighbouring nodes turns out to be 6.3 cm.
- This results in a wavelength λ = 12.6 cm.
- The speed of sound c is calculated with the formula $c = f \cdot \lambda$
  $c = 2{,}7 \cdot 10^3 \cdot 12{,}6 \cdot 10^{-2}$ m/s = 340 m/s