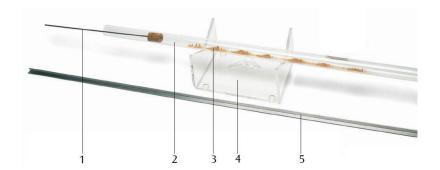
# 3B SCIENTIFIC® PHYSICS



## Kundt's tube 1000814

#### Instruction sheet

09/15 ALF



- 1 Movable plunger
- 2 Kundt's tube
- 3 Cork powder
- 4 Stand (not included)
- 5 Refill rail

## 1. Safety instructions

- Store the glass tube in a safe place where it cannot be exposed to danger of shocks or breaking.
- Do not expose the glass tube to any mechanical stress or strain.
- Do not bend the movable piston while pushing it in or pulling it out.
- Do not use the apparatus, if the glass tube is damaged.
- Protect the apparatus from humidity and dust

## 2. Description

By employing cork dust, a Kundt's tube is used to demonstrate the distribution of nodes and antinodes in a standing sound wave. Using the apparatus, it is also possible to demonstrate that standing waves are formed when a resonance condition is fulfilled for sound wavelength  $\lambda$  and length s of the vibrating air column in the tube such that:

 $s = n \lambda/2$  for reflected waves with antinodes at the open end,

 $s = (2n+1)\lambda/4$  for reflected waves with nodes (n = 1, 2...n) at the closed end.

The wavelength can be determined from the

number of nodes *n* and the distance *a* between the first and last nodes

 $\lambda = 2a/(n-1).$ 

The rod with the cork plunger seals the tube and is used for changing the effective tube length to tune the frequency of the resonant sound waves.

A whistle, a tuning fork or a loudspeaker driven by a function generator can be used as a sound source.

A funnel reduces the wave impedance at the opening of the tube. As a result, more sound energy can be introduced into the tube.

### 2.1 Scope of delivery

- 1 Glass tube
- 1 Movable piston
- 1 Funnel
- 1 Whistle
- 1 Refill rail

#### 3. Technical data

Tube: 600 mm
Internal diameter: 17 mm
Glass thickness: 1.5 mm

Movable plunger: 280 mm x 3 mm dia.

#### 4. Operation

In order to conduct the experiments, the following apparatus is additionally required:

1 Tuning fork 1700 Hz	1002607
or	
1 Pneumatic loudspeaker	1000811
1 Sine Wave Generator	1001038
1 Transformer @230 V	1000866
or	
1 Transformer @115 V	1000865
Cork powder	1000815
1 Metre scale	1000742
1 Stand for coils	1000964

- Use a refill rail to introduce a small quantity of cork dust into the tube.
- Slightly tilt the tube and shake it gently till the cork dust has uniformly spread throughout the length of the tube.
- Position the Kundt's tube on the stand so that the strip of cork dust is at the bottom.
- Slowly rotate the tube along its length in order to spread the cork dust along the walls too.
- For determining the wavelength with the whistle, fit the tube with the funnel.
- For determining resonance conditions, conduct the experiment without a funnel.

It is recommended that a 1700-Hz tuning fork be used. The fork produces a resonant wavelength  $\lambda$  of 0.2 m for the 0.6-m tube. When the wave is reflected at the open end, antinodes are produced at both ends. When the wave is reflected at the closed end, nodes are produced at both ends.

- Position the sound source right at the end of the tube.
- If blowing a whistle, make sure that it is perpendicular to the tube. This is necessary to prevent any air from entering the tube.
- When using a tuning fork, strike it and quickly hold it with its prongs in the direction of vibration in front of the opening of the tube or the funnel.
- When using a loudspeaker, gradually change the frequency on the sine wave generator to identify the resonance frequency. Effective range: between 600 Hz and 8000 Hz.
- To tune a closed tube to the resonant length, gradually move the movable plunger.



Fig. 1 Determination of the wavelength