Ripple Tank PM02 1017591

Instruction Sheet

04/18 Alf/UD

1 Control unit
2 Observation screen
3 Carrying handle
4 Water tank
5 Holder with spirit level
6 Drainage hose
7 Stand rod with magnetic holder
8 Stroboscope

1. Safety instructions

The glass components of the ripple tank can be broken if they are not handled properly.

- Do not subject the ripple tank to excessive mechanical forces.

2. Equipment supplied

1 Ripple tank with projection mirror, viewing screen and lighting system

1 Control unit

1 Plug-in power supply

1 Universal plug

1 Module for generating straight waves

1 Module for generating circular waves

1 Module for generating two interfering circular waves

1 Hose

3 Immersion bodies for reflection and refraction (prism, biconcave lens and biconvex lens)

4 Immersion bodies for setting up a single slit and a double slit

1 Drainage hose

3. Description

The purpose of the ripple tank is to provide clear demonstrations of basic wave phenomena in the form of ripples on water that can easily be made visible.

Experiment examples:

Generation of circular and straight waves, reflection, refraction, diffraction, interference, Doppler effect

The ripple tank consists of flat basin set in an aluminium frame. In the glass floor, there is an opening with a drainage hose to let out the water. For levelling purposes, the ripple tank is equipped with a spirit level and height-adjustable feet. It is possible to generate both circular or straight waves in the tank by means of localised oscillations in air pressure and the frequency and amplitude of those waves can be set up using a control unit. An LED lighting system illuminates the ripple tank from above and takes the form of a stroboscope for which both asynchronous and synchronous frequencies can be set. Inside the frame, there is a mirror inclined at an angle that allows the waves to be projected onto a frosted-glass pane.

Various bodies are available to be laid in the water in order to carry out experiments.

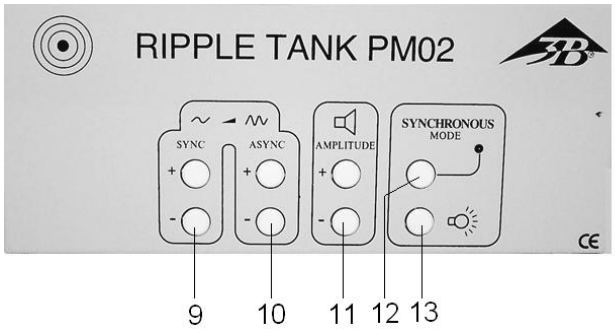
The frequency of the stroboscope, as well as frequency and amplitude of the wave generator (vibrator), can be set separately using the control unit. An external counter can be connected via 4-mm safety sockets to the back of the control unit housing in order to measure the frequency.

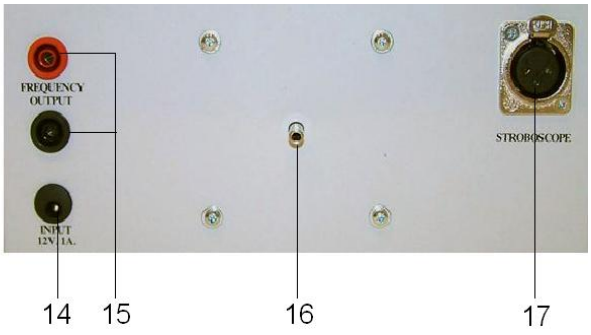
The stroboscope is connected via a three-pin socket to the back of the control unit. In order to generate waves, the hose is connected to the nozzle (metal tube) on the back of the housing and connected to the desired wave exciter module.

Power is supplied via a plug-in power supply.

At the back of the ripple tank there is a drawer for storing the control unit and accessories.

3.1 Operating elements – control unit





9 Knobs for adjusting vibrator frequency in synchronous mode

10 Knobs for adjusting vibrator frequency in asynchronous mode

11 Knobs for adjusting vibrator amplitude

12 Switch for toggling between synchronous and asynchronous modes

13 On/off switch for strobe illumination

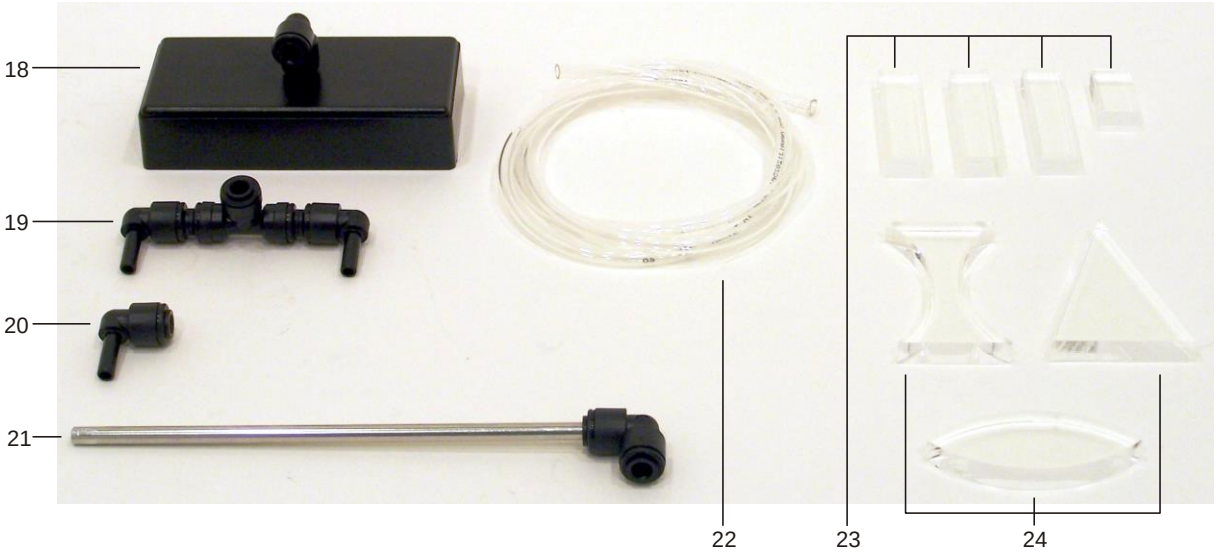
14 Socket for connecting plug-in power supply

15 Terminal sockets for external frequency measuring instrument

16 Hose nozzle

17 Stroboscope socket

3.2 Accessories



18 Module 1 for generating straight wave fronts
19 Module 2 for generating 2 interfering circular waves
20 Module 3 for generating circular waves
21 Extension tube
22 Hose
23 Immersion bodies for setting up a single slit and a double slit
24 Immersion bodies for reflection and refraction (prism, biconcave lens and biconvex lens)

4. Technical data

Dimensions:	
Tank structure:	400x300x320 mm^3 approx.
Projection screen:	375x320 mm^2 approx.
Frequency range:	1 – 60 Hz, continuously adjustable
Power supply:	12 V DC via plug-in power supply 100 – 240 V
Stroboscope lighting:	LED

5. Operation

It is recommended that the experiments be carried out using distilled water.

- Place the ripple tank upon a horizontal surface, making sure it is not subject to any shocks.
- Use the spirit level and the height-adjustable feet to align the ripple tank horizontally.
- Connect the drainage outlet hose in its clamp on the tank in such a way that in it points vertically upwards.
- Attach the stand rod with the stroboscope to the side of the tank with the aid of the magnetic holder.
- Connect the stroboscope to the control unit by means of the three-pole cable and plug the control unit into the mains using the plug-in power supply.
- Set the stroboscope frequency to zero initially.
- Align the height and position of the stroboscope in such a way that the tank is fully illuminated.
- Insert the required exciter module into the holder and secure it with the knurled screw.
- Set the height of the exciter module by adjusting the height of the holder and secure it to the back of the fitting with the help of the knurled screws.
- Fill the tank with distilled water. For experiments on refraction, fill the tank to approx. 1 mm over the level of the immersion bodies. For other experiments, fill to approx. 5 mm over the level of the immersion bodies.
- Use the drainage hose to empty the tank after the experiment.
- Thoroughly dry the apparatus to prevent forming of lime scale deposits.
- Lay the appropriate immersion bodies in the tank to set up a reflecting barrier or single and double slits.

6. Wave excitation

Water depth, depth of immersion of the wave exciters as well as frequency and amplitude of the vibrator must be carefully selected in order to present the optimum representation of the phenomena to be observed.

When the vibrator and stroboscope frequencies are synchronised, it is possible set up a view of standing waves.

If the frequency is altered, it may require a readjustment of the amplitude in certain cases.

In some experiments, e.g. diffraction and reflection, it may be necessary to set certain ranges of the wave pattern to an enhanced resolution. This is done by modifying the amplitude accordingly.

6.1 Excitation of straight wave fronts

- Insert the extension tube into its slot on module 1 and fasten it into the holder.
- Set the depth of the exciter module by adjusting the height of the holder such that the lower edge of the module is just touching the surface of the water.
- On the control unit, set the desired frequency and amplitude.

On the viewing screen, a stationary or slowly moving wave pattern can be observed.

- Make fine adjustments using the rotary knob.

6.2 Excitation of circular waves

- Insert the extension tube into its slot on module 3 and fasten it into the holder.
- Set the depth of the exciter module by adjusting the height of the holder such that the lower edge of the module is just touching the surface of the water.
- On the control unit, set the desired frequency and amplitude.

On the viewing screen, a stationary or slowly moving wave pattern can be observed.

- Make fine adjustments using the rotary knob.

6.3 Excitation of interfering circular waves

- Insert the extension tube into its slot on module 2 and fasten it into the holder.
- Set the depth of the exciter module by adjusting the height of the holder such that the lower edge of the module is just touching the surface of the water.
- On the control unit, set the desired frequency and amplitude.

A standing wave image, or one that drifts only slightly, featuring two circular waves can be seen on the screen. The waves interfere with each other where they overlap.

- Make fine adjustments using the rotary knob.

6.4 Determining the wavelength

When determining the wavelength, the magnification factor *b* must be taken into account.

Magnification factor *b* can be calculated by placing the biconcave lens onto the ripple tank for instance and checking the ratio of its actual size *A* to the size of its projection on the viewing screen *A*'.

$b = A'/A$

The actual wavelength λ can be calculated from the wavelength λ' measured on the viewing screen as follows.

$\lambda = \lambda'/b$

7. Storage and maintenance

- Store the ripple tank in a dust-free place.
- Thoroughly dry the ripple tank after use to prevent it developing water stains and lime scale deposits.