

# STUDENT EXPERIMENT KIT SYSTEM

## ULTRASONIC WAVES



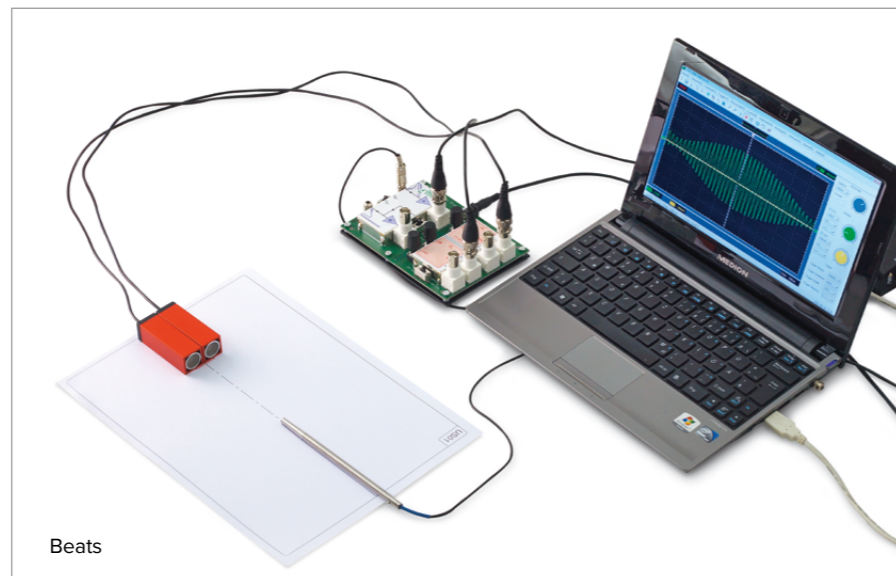
### > INCLUDES:

- 1 Ultrasonic Control Unit
- 2 Ultrasonic Transmitters, 40 kHz
- 1 Ultrasonic Pen
- 1 Holder for Ultrasonic Pen
- 1 Holder Base for Ultrasonic Pen
- 1 Microphone Probe
- 2 Beam Splitters
- 3 Clamps for Beam Splitters
- 1 Fresnel Zone Plate
- 1 Concave Mirrors
- 2 Side Pieces for Double Slit/Reflectors
- 1 Center Post for Double Slit
- 1 Clap for Double Slit
- 1 Ultrasonic Absorber
- 2 BNC Cables, 1 m
- 1 Cable, BNC/4-mm
- 1 Plug-in Power Supply

> CD-ROM CONTAINING ALL DIFFERENT SETS OF INSTRUCTIONS IS INCLUDED!

Large equipment set incorporating 30 student experiments for demonstrating the fundamental properties of waves using the example of 40 kHz ultrasonic waves. Stored in a tough Gratnell tray with foam inlay featuring recesses moulded to the shape of the apparatus and covered by a transparent lid. Includes CD with experiment instructions. Includes two ultrasonic transmitters, a rod-shaped microphonic sensor for recording and analysing oscillations using a standard oscilloscope and an ultrasonic pen for recording wave fronts along the desktop in the form of lines of the same phase (isophases). Many of the experiments can also be carried out without using an oscilloscope. In order to measure ultrasonic amplitudes, it is sufficient in many cases to use an analog voltmeter for alternating current if it has a wide enough frequency range.

- 1016651 (230 V, 50/60 Hz)
- 1014529 (115 V, 50/60 Hz)



Beats

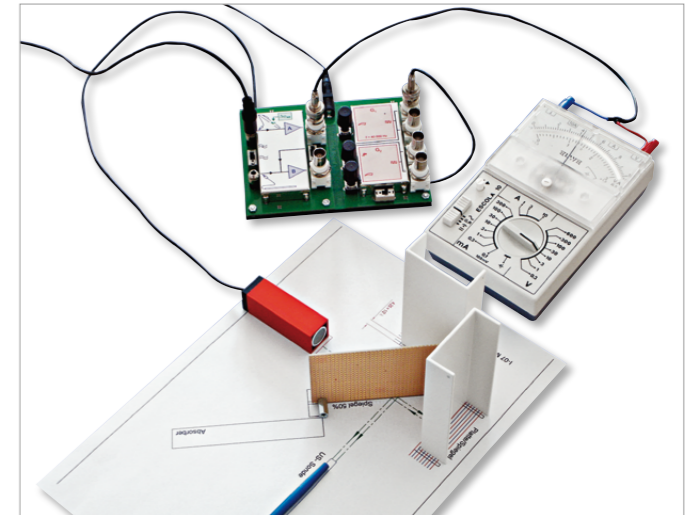
### INCLUDES INSTRUCTIONS FOR 30 EXPERIMENTS ON ULTRASONIC WAVES

- Display of sound oscillations on an oscilloscope \*)
- Relationship between oscillations and waves \*)
- Comparison of oscillations at two points along a wave \*)
- Analysis of phase relationships using an ultrasonic "pen" \*)
- Determination of wavelength and velocity of sound
- How velocity of sound depends on temperature
- Transmission characteristic of ultrasonic transmitters \*\*)
- Resonance curve for ultrasonic transducers \*)
- Transmission and reflection of ultrasonic waves \*\*)
- Absorption of ultrasonic waves \*\*)
- Superimposition of sinusoidal oscillations \*)
- Constructive and destructive reinforcement when sinusoidal oscillations are superimposed \*)
- Recording of wave fronts using ultrasonic pen
- Generation and detection of straight wave fronts
- Diffraction of ultrasonic waves by an edge
- Diffraction of ultrasonic waves by a single slit
- Interference between two beams \*\*)
- Law of reciprocity for interference between two beams \*\*)
- Diffraction by a double slit \*\*)
- Phase relationships for diffraction by a double slit / \*)
- Phase relationships for diffraction by a double slit / \*\*)
- Formation of images by a spherical concave mirror \*\*)
- Plotting of Fresnel zones \*\*)
- Formation of images by a Fresnel zone plate \*\*)
- Interference of ultrasonic waves by Lloyd's mirror \*\*)
- Design of a simple interferometer \*\*)
- Design of a Michelson interferometer \*\*)
- Elimination of interference by interrupting the path \*)
- Generation of standing ultrasonic waves \*\*)
- Beats in ultrasonic waves \*)
- Doppler effect in ultrasonic waves

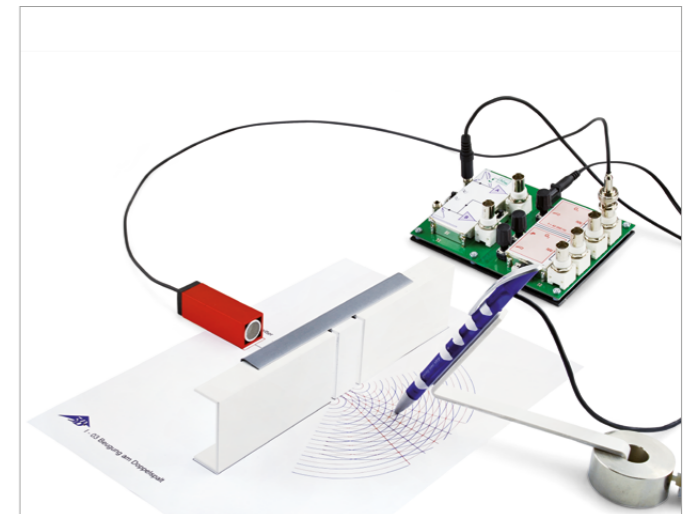
### Additionally required:

- 1017264 Dual-Channel Oscilloscope (for experiments marked \*)
- 1006811 Multimeter ESCOLA 2 (for experiments marked \*\*)

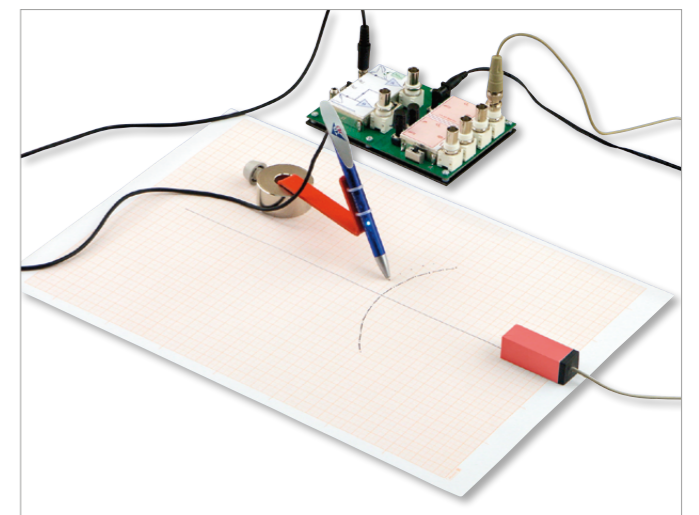
PLEASE ASK FOR QUANTITY DISCOUNTS ON CLASS SETS OF 8 PIECES OR MORE.



Michelson Interferometer



Diffraction by a double slit



Recording of wave front