Catalogue **Education**




Products Experiments Experimental setups

Ultrasound in Physics, Medicine and Technique

gaMPT ULTRASONIC SOLUTIONS

V3.30 | 20170314

Ultrasonic probe 1 MHz

The ultrasonic probes are characterised by high sound intensity and short sound impulses. These are especially suitable for the pulse-echo method. The probes have a robust metal housing and are moulded so that they are watertight at the sound surface. The probes are delivered with special plugs for connection to the GAMPT echoscopes or with a BNC connector for universal use. Due to their high sound intensity they are especially suitable for investigations with large penetration depths, of highly attenuating materials and for the generation of Rayleigh and/or shear waves. They can here be used as transmitters or receivers.

Technical data:

- Frequency: 1 MHz
- Dimensions: length = 70 mm, diameter = 27 mm
- Cable length: approx. 1 m
- Sound adaptation to water/acrylic
- Different plugs with probe identification for connection to GAMPT echoscopes or universal plug connector (BNC)

Experiments

PHY01 Basics of pulse echo method (A-Scan)
PHY02 Sound velocity in solids
PHY03 Acoustic attenuation in solids
PHY06 Frequency dependence of resolution power
PHY07 Shear waves in solids
PHY08 Ultrasonic B-Scan

Order no. 10131 (GAMPT-Scan/FlowDop)
Order no. 10141 (BNC)
Order no. 10151 (GS200/GS200i)

PHY16 Mechanical scan methods
PHY20 Determination of focus zone
PHY22 Phase shift and resonance effects
PHY23 Dispersion of ultrasonic waves (Lamb waves)
IND02 Detection of cracks with Rayleigh waves
MED02 Ultrasonic imaging at breast phantom (mammasonography)

Ultrasonic probe 2 MHz

With a frequency of 2 MHz, these probes are suitable for a wide range of applications. Due to the higher frequency, the axial and lateral resolution power is clearly higher than with the 1 MHz probes. On the other hand, the attenuation for 2 MHz in most materials is still not too large, so investigation areas at medium depth can still be reached without any problem. In particular, these probes are also suitable for studies on medical objects and as ultrasonic Doppler probes.

Technical data:

- Frequency: 2 MHz
- Dimensions: length = 70 mm, diameter = 27 mm
- Cable length: approx. 1 m
- Sound adaptation to water/acrylic
- Different plugs with probe identification for connection to GAMPT echoscopes or universal plug connector (BNC)

Experiments

PHY02 Sound velocity in solids
PHY03 Acoustic attenuation in solids
PHY04 Acoustic attenuation in liquids
PHY05 Spectral investigations
PHY08 Ultrasonic B-Scan
PHY09 Ultrasonic computer tomography (CT)
PHY10 Characteristics of sound field
PHY13 Ultrasonic Doppler effect
PHY15 Fluid mechanics
PHY16 Mechanical scan methods
PHY20 Determination of focus zone
PHY21 Reflection and transmission at boundaries

Order no. 10132 (GAMPT-Scan/FlowDop)
Order no. 10142 (BNC)
Order no. 10152 (GS200/GS200i)

PHY22 Phase shift and resonance effects
PHY23 Dispersion of ultrasonic waves (Lamb waves)
IND01 Non-Destructive Testing (NDT)
IND03 Level measurement
IND05 Doppler flow measurement
IND06 Angle beam testing
IND07 Crack depth determination (TOFD)
IND08 Detection of discontinuities
IND09 Transit time flow meter
MED04 Biometry at the eye phantom

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Ultrasonic probe 4 MHz

The 4 MHz probes are characterised by extremely short dying out behaviour and thus the highest axial resolution power. They are particularly used where very small structures must be detected.

Technical data

- Frequency: 4 MHz
- Dimensions: length = 70 mm, diameter = 27 mm
- Cable length: approx. 1 m
- Sound adaptation to water/acrylic
- Different plugs with probe identification for connection to GAMPT echoscopes or universal plug connector (BNC)

Experiments

PHY03 Acoustic attenuation in solids
PHY06 Frequency dependence of resolution power
MED01 Ultrasonic TM-mode (echocardiography)

Order no. 10134 (GAMPT-Scan/FlowDop)
Order no. 10144 (BNC)
Order no. 10154 (GS200/GS200i)

Hydrophone

The hydrophone can be used to measure the characteristics of sound field of an ultrasonic probe. The near-field length (focus zone) can be determined from the amplitude modulation along the central axis of a sound probe. Similarly, the lateral extension of the sound field can be measured at different distances from the probe surface. The hydrophone is suitable for a frequency range of 1-5 MHz and can be connected directly to the receiver inputs of a GAMPT echoscope. In the simplest case, the measurements are carried out by shifting the hydrophone by hand or by using the CT scanner. For both variants, there is an appropriate support for the hydrophone.

Technical data

- Frequency range: 1-5 MHz
- Dimensions: length = 125 mm, width = 24 mm
- Active sensor area: diameter = 3 mm
- Cable length: approx. 1 m

Experiments

PHY10 Characteristics of sound field
PHY19 Phase and group velocity
PHY20 Determination of focus zone
PHY23 Dispersion of ultrasonic waves (Lamb waves)

Order no. 10250 (GAMPT-Scan)
Order no. 10450 (GS200/GS200i)

Test block (transparent)

The transparent test block made of homogeneous acrylic is especially suitable for echoscopy investigations. Acrylic is a material with medium acoustic attenuation, so that a sufficient penetration depth is achieved with all probes. The block has a group of differently sized defects at different depths, a large defect (acoustic shadow) and a double defect (resolution power). In this way fundamental knowledge can be gained of the determining of sound velocity, the echo method, acoustic shadows, multiple reflections, focus zones and the resolution power of ultrasound of different frequency.

Order no. 10201

Technical data

- Dimensions: 150 mm × 80 mm × 40 mm
- Material: acrylic, transparent
- Sound velocity: ~ 2700 m/s (longitudinal)
- Density: 1.2 g/cm³
- Defects: 11

Experiments

PHY01 Basics of pulse echo method (A-Scan)
PHY06 Frequency dependence of resolution power
PHY08 Ultrasonic B-Scan
PHY16 Mechanical scan methods
IND01 Non-Destructive Testing (NDT)

Test block (black)

This test block made of black opaque acrylic is intended for a version of the basic experiment PHY01, in which the focus is upon searching for defects in unfamiliar test objects. In this, the test block can be scanned from all sides and the number and location of the defects can be determined. In further experiments, probes of different frequencies are used to determine the shape and size of the individual inhomogeneities. In these investigations, the main aim is to develop suitable strategies for the complete localisation of all defects. In addition to this, all experiments in which the use of the transparent test block is envisaged can, of course, also be carried out with the black test block. The acoustic characteristics and the arrangement of the defects correspond to those of the transparent test block.

Order no. 10204

Technical data

- Dimensions: 150 mm × 80 mm × 40 mm
- Material: acrylic, black
- Sound velocity: ~ 2700 m/s (longitudinal)
- Density: 1.2 g/cm³
- Defects: 11

Experiments

PHY01 Basics of pulse echo method (A-Scan)
PHY06 Frequency dependence of resolution power
PHY08 Ultrasonic B-Scan
PHY16 Mechanical scan methods
IND01 Non-Destructive Testing (NDT)

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Test cylinder set

Sound velocity, acoustic impedance and attenuation are typical material-specific parameters, which can be determined in reflection and transmission using these three acrylic cylinders. The determining of sound velocity at three objects made of the same material but of different lengths allows a detailed error analysis. Determining attenuation in transmission at various ultrasonic frequencies conveys knowledge of fundamental relationships of ultrasound absorption in solids.

Technical data

- Dimensions: diameter = 40 mm, length = 40 mm, 80 mm and 120 mm
- Material: acrylic, transparent
- Sound velocity: ~ 2700 m/s (longitudinal)
- Density: 1.2 g/cm³

Experiments

PHY02 Sound velocity in solids
PHY03 Acoustic attenuation in solids
PHY22 Phase shift and resonance effects

Order no. 10207 (Set)

Spare parts

3 cylinders	10203
Probe support	10215
Cylinder holder	10205

Shear wave set

If an ultrasonic wave hits a solid body at an oblique angle, shear waves are generated with an increasing angle. Shear waves have a sound velocity that differs from the longitudinal wave. With this experiment equipment, the angle-dependent transition from longitudinal to shear waves can be measured. The measurement is carried out in transmission with two fixed probes (1 MHz). The sample holder can be longitudinally shifted on the sample reservoir and has an angle scale. The elastic constants of the material can be determined from the measurement of the longitudinal and transversal velocity of sound. Acrylic and aluminium are available as sample materials. With the aluminium sample, this experiment arrangement is also suitable for determining the attenuation of ultrasound in liquids (water, glycerine, oil,...) due to the adjustable and movable sample plate.

Technical data

- Sample holder with angle scale 0-360° in 5° steps
- Sample material 1: acrylic (transparent)
- Sound velocity: longitudinal ~ 2700 m/s;
  transversal ~ 1450 m/s
- Sample material 2: aluminium
- Sound velocity: longitudinal ~ 6400 m/s;
  transversal ~ 3100 m/s
- 2 probe supports of acrylic (black)
- 1 sample reservoir for taking a liquid and the material sample component

Experiments

PHY04 Acoustic attenuation in liquids
PHY07 Shear waves in solids

Order no. 10218 (Set)

Spare parts

Sample reservoir	10214
Probe support	10215
Acrylic sample	10211
Aluminium sample	10213

Acrylic sample for shear wave set

For the determination of elastic material constants from the longitudinal and transversal sound wave velocity there is a material sample made of acrylic. The longitudinal sound velocity is higher in acrylic than in water, whereas the transversal sound velocity is in the order of magnitude of the sound velocity in water.

Technical data

- Sample material: acrylic
- Sound velocity: longitudinal ~ 2700 m/s
  transversal ~ 1450 m/s

Experiments

PHY07 Shear waves in solids

Order no. 10211

Aluminium sample for shear wave set

For the determination of elastic material constants from the longitudinal and transversal sound wave velocity there is a further material sample made of aluminium. In aluminium, both the longitudinal and the transversal sound velocity are higher than in water. The aluminium sample is furthermore suitable as a movable reflecting plate for measurements using the pulse-echo method, e.g. to determine the acoustic attenuation in liquids.

Technical data

- Sample material: aluminium
- Sound velocity: longitudinal ~ 6400 m/s
  transversal ~ 3100 m/s

Experiments

PHY04 Acoustic attenuation in liquids
PHY07 Shear waves in solids

Order no. 10213

POM sample for shear wave set

For the determination of elastic material constants from the longitudinal and transversal sound wave velocity, a third material sample made of polyoxymethylene (POM) is available. In POM, the transversal sound velocity is lower than the sound velocity in water.

Technical data

- Material: POM
- Sound velocity: longitudinal ~2470 m/s
  transversal ~1200 m/s

Experiments

PHY07 Shear waves in solids

Order no. 10212

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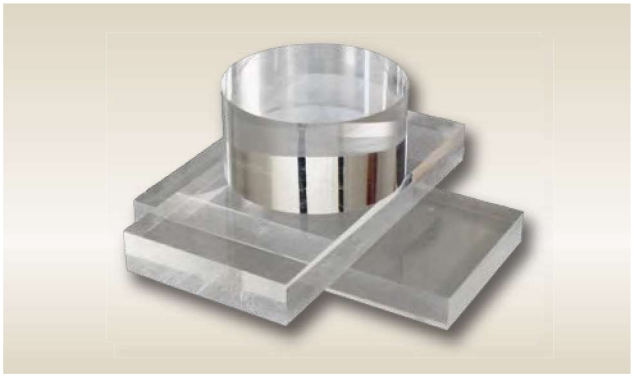
Set of reflecting plates

The pair of acrylic plates makes possible a number of interesting spectral investigations with ultrasound. Due to the low plate thicknesses, the echogram shows multiple reflections. The spectral analysis of individual reflections shows an increasing shifting of the spectrum towards lower frequencies as a result of the frequency-dependent attenuation. The plate thickness is included as a periodic modulation in the spectrum of all reflections. When the plates lie on top of each other, a diffuse echogram is obtained, the spectrum of which also includes diffuse modulations. The individual plate thicknesses can only be determined by a cepstrum analysis. The set includes an acrylic delay line.



Order no. 10202

Technical data

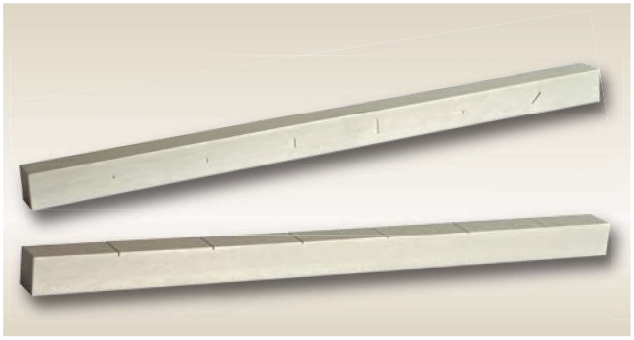
- Material: acrylic, transparent
- Dimensions: width = 40 mm, length = 80 mm, plate thicknesses ~7.5 mm and ~10 mm
- Sound velocity: ~ 2700 m/s (longitudinal)
- Density: 1.2 g/cm³

Experiments

PHY05 Spectral investigations

Rayleigh wave test block

The material sample for investigation with Rayleigh waves has an intact surface side, at which the velocity of Rayleigh waves can be determined in transmission mode. Another side has different material defects that can be detected and localised by means of the Rayleigh waves. A special process in material testing is crack depth measuring using Rayleigh waves. For this purpose, on one side there are several cracks of varying depths, from which the signal amplitude of the Rayleigh wave can be measured.



Order no. 10232

Technical data

- Material: aluminium
- Dimensions: 35 mm × 35 mm × 600 mm
- Weight: 2.5 kg
- Sound velocity of Rayleigh waves: ~ 2950 m/s
- Different discontinuities for non-destructive testing

Experiments

IND02 Detection of cracks with Rayleigh waves

Test block for angle beam probe

The aluminium test block is for the adjustment of angle beam probes, regarding the refraction angle, sound velocity, sound emergence point and the length of the delay line. The angle is here determined by the measurement of the wall echo at different projection intervals. The adjustment is checked at a cylindrical discontinuity (drilled hole).

Order no. 10240

Technical data

- Material: aluminium
- Sound velocity: longitudinal ~ 6400 m/s; transversal ~ 3100 m/s
- Dimensions: 35 mm × 35 mm × 120 mm
- Drilled hole: diameter = 8 mm

Experiments

IND06 Angle beam testing

Angle beam wedge

Angle beam testing is one of the most important processes in non-destructive testing with ultrasound. The refraction angle for the longitudinal wave and the shear wave results from the sound velocity of the delay line and of the test material in accordance with the refraction law. The delay line is suitable for tests in transmission, reflection and in case of the use of 2 delay lines as a transmitter-receiver (TR) probe, also known as dual-element probe. The angle beam wedges can be used with all GAMPT probes (1, 2 and 4 MHz).

Technical data

- Material: acrylic
- Sound velocity in acrylic: ~ 2700 m/s (longitudinal)
- Angle of incidence (delay line): 17° 38° 56°
- Refraction angle in aluminium
  shear wave (~ 3100 m/s): ~ 20° ~ 45° ~ 72°
  longitudinal wave (~ 6400 m/s): ~ 44°

Order no. 10233 (17°)

Order no. 10234 (38°)

Order no. 10235 (56°)

Experiments

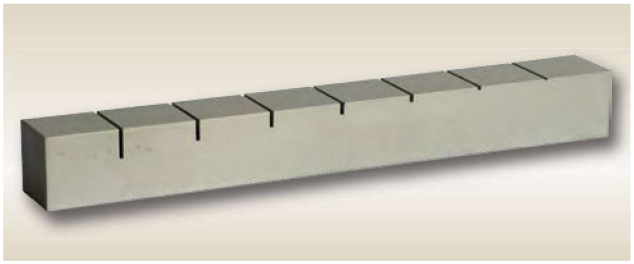
IND06 Angle beam testing
IND07 Crack depth determination (TOFD)
IND08 Detection of discontinuities

Crack depth test block

The test block contains cracks with different depths. Using two different measuring techniques the cracks can be localised and their depths determined. With an angle beam probe, the angle echo amplitude is determined in dependence on crack depth. This method fails, however, in the case of greater crack depths. With the TOFD technique, cracks of greater depth can also be localised and measured. The capabilities and the limitations of the two processes are determined on this test block.

Technical data

- Material: aluminium
- Sound velocity: longitudinal ~ 6400 m/s;
  transversal ~ 3100 m/s
- Dimensions: 35 mm × 35 mm × 300 mm
- Crack depths: 2, 4, 6, 8, 10 and 15 mm



Order no. 10241

Experiments

IND07 Crack depth determination (TOFD)

Discontinuity test block

The aluminium test block contains different reflector types that can be used for producing echoes. Five mirror-type reflectors and one crack-type reflector are differentiated. The mirror-type reflectors include three cylinders, a disk, a vertical crack and a oblique crack each with different orientations to the surface. Diffraction effects can be investigated at the crack. Different locating techniques such as the echo, delta, tandem, transfer and angle techniques are applied for the locating of discontinuities (defect search).

Technical data

- Material: aluminium
- Sound velocity: longitudinal ~ 6400 m/s;
  transversal ~ 3100 m/s
- Dimensions: 35 mm × 35 mm × 300 mm
- Number of discontinuities: 6

Order no. 10242

Experiments

IND08 Detection of discontinuities

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Transceiver delay line (TOFD)

A special probe is used in the testing for discontinuities with the TOFD method (time of flight diffraction). This consists of a transmitter probe and a receiver probe, which are guided over the surface of the test object at a particular angle and a fixed distance to each other. Such a transmitter-receiver or dual-element probe can be put together with this delay line and two GAMPT probes of the same frequency.

Technical data

- Material: acrylic
- Sound velocity (acrylic): ~ 2700 m/s
- Angle of incidence: 38°
- Refraction angle of the shear wave in aluminium (c ≈ 3100 m/s): ~ 45°

Order no. 10237

Experiments

IND07 Crack depth determination (TOFD)
IND08 Detection of discontinuities

Acoustic impedance samples

This sample set can be used to examine the reflection and transmission behaviour of ultrasonic waves at the boundary of materials of different acoustic impedance. PVC, acrylic and brass are available as sample materials. Comparative measurements of the reflection coefficients at the material/air boundaries can be used to determine the reflection coefficients of different combinations of these materials.

Technical data

3 cylindric test samples
- Materials: acrylic, PVC and brass
- Dimensions: height = 20 mm, diameter = 38 mm

Clamping plates
- Material: aluminium
- Dimensions: height = 10 mm, diameter = 100 mm

Order no. 10208

Experiments

PHY21 Reflection and transmission at boundaries
PHY22 Phase shift and resonance effects

Rayleigh wave attachment

With this attachment adjusted to aluminium, surface waves (Rayleigh waves) can be stimulated and received in a sample. In this way, the sound velocity of the Rayleigh waves can be determined and statements can also be made about material faults close to the surface. The attachment has been directionally worked for optimisation of the signal amplitude and specially adapted to a 1 MHz probe.

Technical data

- Material: acrylic
- Required excitation frequency (probe): 1 MHz
- Diameter: 32 mm
- Height: 10 mm

Experiments

IND02 Detection of cracks with Rayleigh waves

Order no. 10231

Hydrophone set

With this set, different experiments can be carried out for investigating ultrasound propagation phenomena and sound fields. It contains a hydrophone, with which the sound pressure amplitudes in the frequency range of 1-5 MHz can be measured with a lateral resolution of approx. 3 mm. To determine the focus zone of an ultrasonic probe the set contains a small sample reservoir and an appropriate hydrophone support. With this, the sound field along the sound axis can be measured by simple pushing of the hydrophone by hand and the focus zone of the probe can be determined. At the same time, this arrangement is suitable for the determining of the phase and group velocity with the cw generator SC600 (order no. 20100). One part of the hydrophone holding appliance can be directly adapted to the sample holder of the CT scanner (order no. 60100/60200). Because of this, the lateral distribution of the sound pressure amplitude can also be recorded at high resolution with the hydrophone.

Technical data (hydrophone)

- Frequency range: 1-5 MHz
- Dimensions: length = 125 mm, width = 24 mm
- Active sensor area: diameter = 3 mm
- Cable length: approx. 1 m

Experiments

PHY10 Characteristics of sound field
PHY19 Phase and group velocity
PHY20 Determination of focus zone

Order no. 10251 (Set for GAMPT-Scan)

Order no. 10451 (Set for GS200/GS200i)

Spare parts

Sample reservoir	10214
Probe support	10215
Hydrophone (GAMPT-Scan)	10250
Hydrophone (GS200/GS200i)	10450
Hydrophone support plate	10252
Hydrophone support	60123

Lamb wave set

With the set the frequency-dependent propagation velocity (dispersion) of ultrasonic waves in a thin glass plate (Lamb waves) can be measured. The set contains several Lamb wave combinations (LW1-KW7), each consisting of a glass plate and two angle beam delay lines. One of the delay lines is adhered to the glass plate and the other is free. Together with an ultrasonic probe (order no. 10151, 10152, 10154) the delay lines form angle beam probes which allow an oblique ultrasound coupling into the glass plate. The delay line angles and the plate thicknesses are selected in such a way, that in combination with one of the ultrasonic probes Lamb wave modes can be selectively excited and amplified. The group velocity of the excited Lamb wave can be determined by varying the distance between the probes and measuring the associated change of time of flight in the glass plate (transmission measurement).

Technical data

Angle beam delay lines

- Material: acrylic (c_L ~ 2700 m/s)
- Incidence angle: 12°, 15°, 25°, 28°, 32° or 35°

Plate structure

- Material: glass (E = 73 kN/mm², ρ = 2.52 g/cm³, μ = 0.22)
- Thickness: approx. 1 or 1.3 mm

Experiments

PHY23 Dispersion of ultrasonic waves (Lamb waves)

Order no. 10300

Spare parts

Lamb wave combination LW1 (12°, 1 mm)	10311
Lamb wave combination LW2 (15°, 1 mm)	10312
Lamb wave combination LW3 (28°, 1 mm)	10313
Lamb wave combination LW4 (32°, 1 mm)	10314
Lamb wave combination LW5 (35°, 1 mm)	10315
Lamb wave combination LW6 (25°, 1.3 mm)	10316
Lamb wave combination LW7 (32°, 1.3 mm)	10317

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cw generator SC600

The cw generator SC600 permits the generation of continuous sound waves (continuous wave - cw) with high power over a wide frequency range up to 20 MHz. Additional the output can be switched to burst or pulse mode. The transmission frequency can be digitally adjusted in 1 Hz steps and is shown on a display. The sound power can also be adjusted. It is controlled via the transmission voltage on the ultrasound transformer and can be switched on and off separately. The transmission mode is displayed by an indicator light. The transmission voltage and current are shown by a LCD display. The limit of transmission current can be adjusted from 0 mA to 1000 mA to protect the ultrasonic probe from overheating. A sinusoidal signal with a maximum amplitude of 46 Vpp is available at the transmission output. The cw generator SC600 is specially adapted for connection of the GAMPT multifrequency probe (order no. 20139). With this, ultrasonic waves can be produced in the range of 1-13 MHz.

Furthermore, the transmission frequency is present as a TTL signal at a BNC connector and as a low power signal (sine, square, triangle) at an other BNC connector. That means the SC600 can also be used as a flexible signal generator.

In addition, an appropriate voltage output is available for controlling the laser diodes (red, green and blue) when they are used for the Debye-Sears experiment or the central projection of standing waves. The output voltage can be adjusted and displayed. This can also be separately switched on and off and is equipped with an indicator light.

Technical data

- Frequency: ≤ 20 MHz
- Frequency graduation: 1 Hz
- Signal amplitude ultrasound generator: 2-46 Vpp
- Transmission signal output: cw/burst/pulse signal, on-off switch, LED indicator light
- TTL output: 0-5 V, square wave signal

- Signal generator output: sine/triangle/square with cw/burst/pulse, max. signal amplitude 2 Vpp
- Connection for laser module: adjustable, on-off switch, LED indicator light
- Display: current, voltage, frequency and mode (cw/burst/pulse) or alternative laser voltage, signal generator amplitude and type (sine/triangle/square), burst length and pulse repetition frequency
- Dimensions: 255 mm × 170 mm × 265 mm
- Mains voltage: 100-240 V, 50/60 Hz

Experiments

PHY11 Debye-Sears effect
PHY12 Projection of standing waves
PHY17 Acousto-optical modulation at standing waves
PHY19 Phase and group velocity
PHY24 Thermoacoustic sensor
IND04 Concentration measurement with resonance cell

Order no. 20100

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Debye-Sears set

The generation of standing waves for the Debye-Sears experiment and the projection of ultrasonic waves in a special sample reservoir, with the probe adjustment of which the ultrasonic probe can be aligned so that incidence is precisely perpendicular. In addition, a laser support - with lens holder - arranged perpendicularly to the sound axis is attached, which allows exact positioning of the laser beam in the sound field and the insertion of a lens for the generation of a divergent laser beam (for central projection).

Technical data

- Sample reservoir: glass, with laser support and lens holder, 105 mm × 125 mm × 100 mm
- Probe adjustment: POM, three-point adjustment, 105 mm × 125 mm × 50 mm
- Ultrasonic probe: 1-13 MHz, metal housing, moulded
- Laser module: red, ~ 650 nm

Experiments

PHY11 Debye-Sears effect
PHY12 Projection of standing waves
PHY17 Acousto-optical modulation at standing waves
IND04 Concentration measurement with resonance cell

Order no. 20200 (Set)

Spare parts

Multifrequency probe	20139
Laser module (red)	20210
AOM probe adjustment	20224
AOM sample reservoir	20225

Multifrequency probe

This ultrasonic probe has been specially developed for use with the multifrequency cw generator. It is distinguished by very good sound generation characteristics in a frequency range from 1 MHz to over 10 MHz, so that all experiments with the cw generator can be carried out with one probe over a broad frequency range. Like all GAMPT probes it is equipped with a robust metal housing. The sound emission area is moulded watertight.

Technical data

- Frequency: 1-13 MHz
- Dimensions: 65 mm × 27 mm
- Cable length: approx. 1 m

Experiments

PHY11 Debye-Sears effect
PHY12 Projection of standing waves
PHY17 Acousto-optical modulation at standing waves
PHY19 Phase and group velocity
PHY24 Thermoacoustic sensor
IND04 Concentration measurement with resonance cell

Order no. 20139

Laser module (red)

The red laser module with a wavelength of approx. 650 nm is in a special housing for simple positioning in the laser support of the sample reservoir. The laser module is connected to the cw ultrasonic generator via coaxial power connectors and from there supplied with the appropriate voltage. The laser beam is focussed.

Technical data

- Dimensions: length = 107 mm, Ø = 18 mm | cable: ~ 1 m
- Wavelength: ~ 650 nm
- Current consumption: max. 40 mA | Voltage: ≤ 3.3 V DC
- Power: ≤ 5 mW | Laser class: 3R (EN 60825-1)

Experiments

PHY11 Debye-Sears effect
PHY12 Projection of standing waves
PHY17 Acousto-optical modulation at standing waves

Order no. 20210

IND04 Concentration measurement with resonance cell

Laser module (green)

The green laser module with a wavelength of approx. 532 nm is in a special housing for simple positioning in the laser support of the sample reservoir. The module with a laser diode of the laser class 3R is connected to the cw ultrasonic generator via coaxial power connectors and from there supplied with the appropriate voltage. The laser beam is focussed.

Technical data

- Dimensions: length = 107 mm, Ø = 18 mm | cable: ~ 1 m
- Wavelength: ~ 532 nm
- Current consumption: max. 375 mA | Voltage: ≤ 3.3 V DC
- Power: ≤ 5 mW | Laser class: 3R (EN 60825-1)

Experiments

PHY11 Debye-Sears effect
PHY12 Projection of standing waves

Order no. 20211

Laser module (blue)

The blue laser module with a wavelength of approx. 405 nm is in a special housing for simple positioning in the laser support of the sample reservoir. The module with a laser diode of the laser class 2 is connected to the cw ultrasonic generator via coaxial power connectors and from there supplied with the appropriate voltage. The laser beam is focussed.

Technical data

- Dimensions: length = 107 mm, Ø = 18 mm | cable: ~ 1 m
- Wavelength: ~ 405 nm
- Current consumption: max. 90 mA | Voltage: ≤ 3.3 V DC
- Power: ≤ 1 mW | Laser class: 2 (EN 60825-1)

Experiments

PHY11 Debye-Sears effect
PHY12 Projection of standing waves

Order no. 20212

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AOM sample reservoir

The sample reservoir made of glass is suitable for all liquids, is easy to clean and offers optimal conditions for sound reflection for the production of standing waves and radiography with laser light, thanks to the even bottom and the plane-parallel side areas. Due to the fixed installation of the laser support, the laser beam is always perpendicularly aligned to the outer wall so that only the sound probe has to be adjusted. At the same time, the laser support includes a shaft for insertion of the lens for the projection of the standing waves in the beam path. In order to investigate different liquids or series of concentrations, it is recommended to use several reservoirs so that measurements can be carried out in quick alternation by simple placing on the sample cover with probe and probe adjustment. The costly probe support here only needs to be purchased once.

Order no. 20225

Technical data

- Material: glass (wall thickness 4 mm)
- Dimensions: 120 mm × 110 mm × 140 mm

Experiments

PHY11 Debye-Sears effect

PHY12 Projection of standing waves
PHY17 Acousto-optical modulation at standing waves
IND04 Concentration measurement with resonance cell

Cover for AOM sample reservoir

If more than one sample reservoir is used, this cover prevents evaporation and therefore a change in the concentration of the liquid. The cover also helps to prevent contamination.

Order no. 20223

Technical data

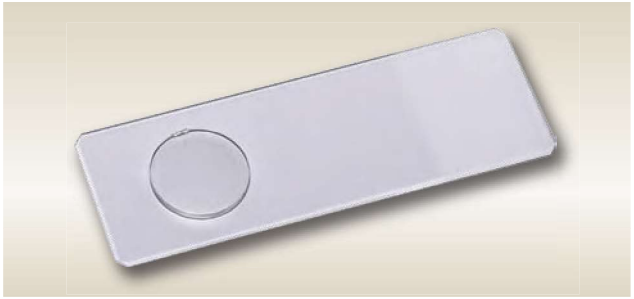
- Material: POM
- Dimensions: 120 mm × 25 mm × 105 mm

Experiments

PHY11 Debye-Sears effect

Projection lens

The plano-convex optical lens is placed, for the projection of standing ultrasonic waves, in the beam path between laser source and ultrasonic wave, to produce a divergent laser beam. The lens is fixed onto a rectangular glass holder which can be inserted into the corresponding slot in the laser support on the sample reservoir. By simple insertion and removal of the lens holder, it is possible to change quickly between diffraction and projection experiment.



Order no. 20230

Technical data

- Dimensions of the glass holder: 25 mm × 75 mm
- Lens diameter: 12.5 mm
- Focal length of lens: 173 mm

Experiments

PHY12 Projection of standing waves

AOM probe adjustment

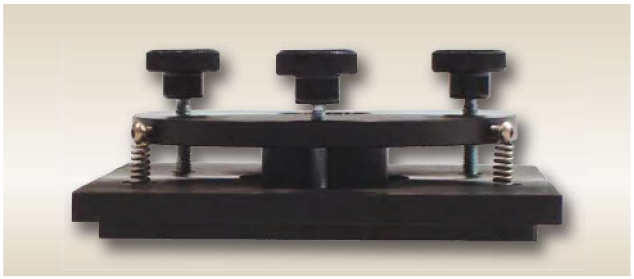
This cover for the glass sample reservoirs (order no. 20225) possesses a probe support for firm holding of the multifrequency probe (order no. 20139). This can be further secured with a screw. The sprung suspended adjusting washer with the probe support is adjusted with three-point adjustment with adjusting screws, so that the probe and thus the emitted sound wave can be optimally oriented to the laser beam. With a precisely perpendicular orientation of the sound axis and a spacing adapted to the wavelength, a standing wave can be generated. This means a maximum of orders of diffraction and/or resolution as sharp as possible in the imaging of the central projection.

Technical data

- Material: POM
- Dimensions: 120 mm × 50 mm × 105 mm
- Three-point adjustment with probe support

Experiments

PHY11 Debye-Sears effect
PHY12 Projection of standing waves
PHY17 Acousto-optical modulation at standing waves
IND04 Concentration measurement with resonance cell



Order no. 20224

Acoustic absorber

The acoustic absorber consists of a special silicone material that is able to absorb ultrasonic waves almost completely. The absorber is used for the prevention of undesired sound reflections in the AOM experiments or with the thermoacoustic sensor. The acoustic impedance of the silicone material has been adapted to water. In addition, the circular lamellae reduce reflections on the absorber surface. The sound energy absorbed is entirely transformed into heat by the high absorption capacity of the material.
(The colour of the acoustic absorber supplied can differ from that shown in the product photo.)

Technical data

- Material: silicone
- Dimensions: 90 mm × 110 mm × 19 mm

Experiments

PHY12 Projection of standing waves
PHY24 Thermoacoustic sensor

Order no. 20227

GAMPT mbH · Hallesche Straße 99F · D-06217 Merseburg · Germany · Fon: +49-3461-2786910 · Fax: +49-3461-27869101 · www.gampt.de

Beam splitter

A semipermeable reflector is used as a beam splitter for laser light. The transmission/reflection ratio is 1:1.

Technical data

- Dimensions of the reflector: 38 mm × 25 mm
- Dimensions of the support: 90 mm × 60 mm × 80 mm

Experiments

PHY17 Acousto-optical modulation at standing waves

Order no. 20301

Adjustable reflector

The reflector is fastened to a support with three-point adjustment. It can be horizontally and vertically adjusted to align the laser beam precisely to the target object (photodiode, reflector, beam splitter).

Technical data

- Dimensions of the reflector: 80 mm × 52 mm
- Dimensions of the support: 120 mm × 60 mm × 80 mm

Experiments

PHY17 Acousto-optical modulation at standing waves
IND04 Concentration measurement with resonance cell

Order no. 20302

Photodiode receiver

With this photodiode receiver with built-in amplifier, a quantitative recording of the intensity of the laser light is possible. The amplitudes of the orders of diffraction can thus be measured and the occurring modulations (AOM) can be analysed with an oscilloscope. The photodiode receiver is delivered complete with power pack and BNC connection cable.

Technical data

- Photodiode - spectral range of sensitivity (10% of the max.): 400-1100 nm
- Maximum light sensitivity: 850 nm
- Light sensitive area: 7 mm²
- Power supply: 12 V, 500 mW
- Amplifier output (BNC): 0-10 V adjustable
- Dimensions: 120 mm × 60 mm × 80 mm

Experiments

PHY17 Acousto-optical modulation at standing waves
IND04 Concentration measurement with resonance cell

Order no. 20303