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Operating instructions

The unit complies with the corresponding EU guidelines.

Fig. 1: Torsion pendulum after Pohl; 11214-00

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1 SAEFTY PRECAUTIONS

Attention!

- Carefully read these operating instructions completely before operating this instrument. This is necessary to avoid damage to it, as well as for user-safety.
- Take care that no liquids or objects enter in through the ventilation slots.
- Only use the instrument for the purpose for which it was designed.
- Protect the instrument from dust, moisture, and vapours. Only clean it in voltage-free state with a slightly moistened, lint-free cloth. Aggressive cleaning agents and solvents are unsuitable.
- Do not operate if there are visible signs of damage to the unit, the connection cord or the measuring lines.
- Do not open the unit.

2 PURPOSE AND DESCRIPTION

The realization of the wide significance of forced oscillations was the motivation which led to the development of the torsion pendulum acc. to Prof. R. W. Pohl. This pendulum is distinguished by its simplicity and vividness. Pohl's pendulum enables quantitative resonance graphs to be prepared for various exciting amplitudes. The interpretation of these graphs leads to a series of fruitful considerations, not only on inertia, but also on kinetic and potential energy. Reflections on the tuning process are just as informative. The oscillating system is a copper wheel which turns on ball bearings. One end of a spiral spring is fitted to the axis of the wheel, while the other end is connected to a lever. Once given an impulse to set it in motion, the wheel carries out turning oscillations which are only damped by the friction of the bearings and the air. Only a very small damping effect results from the energy lost in the work done to distort the spring. The amplitudes can be read off from a fixed scale which surrounds the wheel. A direct current gear motor with cam and a connecting-rod fitted to the lever serves to excite the forced oscillations. It pushes and pulls the lever, and so also the spiral spring, in periodic succession. In this way, sine-shaped moments of rotation of constant highest value, but of any, adjustable frequency, can be caused to act on the axis of the torsion pendulum.

3 HANDLING

A direct voltage of 24 V, 650 mA is required to drive the motor.
The "coarse" and "fine" rotary knobs on the motor housing allow the number of rotations, and so the exciting frequency, to be adjusted. The motor voltage, which has a reproducible relationship to the number of rotations, i.e. to the exciting frequency, can be measured at the "motor test sockets". The frequency of rotation of the motor, which is dependent on the motor voltage, can be determined by simply counting the revolutions while taking the time with a stopwatch. The motor voltage should be measured as accurately as possible, so that a frequency of rotation which has once been set can be conveniently reproduced.
To change the amplitude of the exciter, loosen the connecting rod screw and move the rod along the lever guide. Moving it up results in larger amplitudes, moving it back in smaller ones. The natural damping of the oscillating system is effected by an electromagnet, between the poles of which the wheel turns, which acts as an eddy current brake. This damping can be continuously adjusted by changing the current strength in the electromagnet, and can be briefly used up to the maximum of 2 A.
For demonstrations in front of a large audience, the torsion pendulum can be shown by projecting the silhouette. A light source which approaches a point source, and is placed at some distance from the pendulum, throws a sharp shadow of the apparatus which is clearly visible from even a large distance. It allows all important parts to be recognized, also during operation. The room needs only be darkened a little for this.

4 NOTES ON OPERATION

This high-quality instrument fulfills all of the technical re-quirements that are complied in current EC guidelines. The characteristics of this product qualify it for the CE mark.

This instrument is only to be put into operation under specialist supervision in a controlled electromagnetic environment in research, educational and training facilities (schools, universities, institutes and laboratories).
This means no mobile phones etc. are to be used in the near vicinity. The individual connecting leads must not be longer than 2 m.
The Instrument can be influenced by electromagnetic charges and other electromagnetic phenomena in such way, that it works no longer within the given specifications. The following measures reduce or prevent disturbing influences: Avoid carpeted floor ensure potential equalization, perform the experiments on conductive and grounded surfaces, use screenings and screened cables and do not work with high frequency emitters (radios, mobile phones etc.) in the immediate vicinity. After a total blackout, carry out a "Reset" (new start) of the complete system.

5 TECHNICAL DATA

Natural frequency	approx. 0,55 Hz
Exciting frequency	0,1 ... 1,3 Hz
Scale diameter	300 mm
Motor voltage	24 V DC
Current consumption	max. 650 mA
Eddy current damping	0.... 20 V
Coil loading capacity	short-time, max. 2 A
Dimension (mm)	430 x 305 x 140
Weight	3050 g

6 EXPERIMENTS

P2132705 Forced oscillations - Pohl's pendulum
P2132785 Forced oscillations - Pohl's pendulum with measure dynamics

7 WASTE DISPOSAL

The packaging mainly consists of environmentally-friendly materials that should be returned to the local recycling stations.

Do not dispose of this product with normal household waste. If this unit needs to be disposed of, please return it to the address that is stated below for proper disposal.

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