

## Variable-g Pendulum U8403950

### Instruction Sheet

05/09 THL



- 1 Pendulum bob
- 2 Pendulum rod
- 3 Disc with scale
- 4 Pointer
- 5 Pendulum clamp
- 6 Knurled screw (rear of disc with scale)

#### 1. Safety instructions

When used correctly the instrument should not present any risks.

The instrument requires a good degree of stability as there is a danger of it tipping over.

- Set the instrument up securely in the stand base so that there is no risk of tipping over.

#### 2. Description

The instrument is used to measure the period of a pendulum as a function of the length of the pendulum and the effective component of the earth's gravitational field ("acceleration due to gravity").

It can be used, for example, to simulate the effects on the period of the pendulum that would be observed on the surfaces of planets or other bodies of lower mass than Earth, such as the moon or Mars.

The effective gravitational field influencing the periodic motion is reduced according to the inclination of the plane of the pendulum relative to the vertical. The axis of rotation lies along the pointer, the inclination of which can be varied between 0° und 90°.

The mass of the pendulum rod is small compared to that of the pendulum bob (the discs), and therefore the arrangement approximates closely to an ideal mathematical pendulum, so that it is described by the relationship:

$$T = 2 \cdot \pi \cdot \sqrt{\frac{l}{g \cdot \cos \alpha}}$$

The length  $l$  of the pendulum can be assumed to be the distance between the pendulum sleeve and the lower surface of the pendulum bob.

The bob can be moved along the pendulum rod and secured by means of a screw.

The pointer is provided with a hole into which it is possible to screw a mounting rod (U8403955) for a photo gate.

### 3. Equipment supplied

- 1 Pendulum rod
- 1 Disc with scale
- 1 Pointer
- 1 Pendulum bob

### 4. Technical data

Pendulum bob:	300 g
Length of pendulum rod:	350 mm
Scale markings:	0° ... 90°

### 5. Operation

In order to carry out the experiments, the following equipment is also required:

- |                        |          |
|------------------------|----------|
| 1 Stand base, A-shaped | U8611150 |
| 1 Stainless steel rod  | U8611330 |
| 1 Mechanical stopwatch | U40801   |
- or
- |                                     |              |
|-------------------------------------|--------------|
| 1 Photo gate                        | U11365       |
| 1 Mounting rod for light barrier    | U8403955     |
| 1 Digital counter (230 V, 50/60 Hz) | U8433341-230 |
- or
- |                                     |              |
|-------------------------------------|--------------|
| 1 Digital counter (115 V, 50/60 Hz) | U8433341-115 |
|-------------------------------------|--------------|

- Set up the instrument on a level surface using the large stand base and rod, positioning it as low as possible so that there is no risk of tipping over.
- Adjust the base so that the rod is exactly vertical.
- Set the angle of inclination  $\alpha$ , by loosening the knurled screw (6), moving the pendulum rod and pointer to the required angle on the scale, and re-tightening the screw.

To measure the frequency or period of the pendulum, a photo gate (U11365) can be attached using the mounting rod (U8403955) as shown in Fig. 1.



Fig. 1 Variable-g pendulum with mounting rod and photo gate