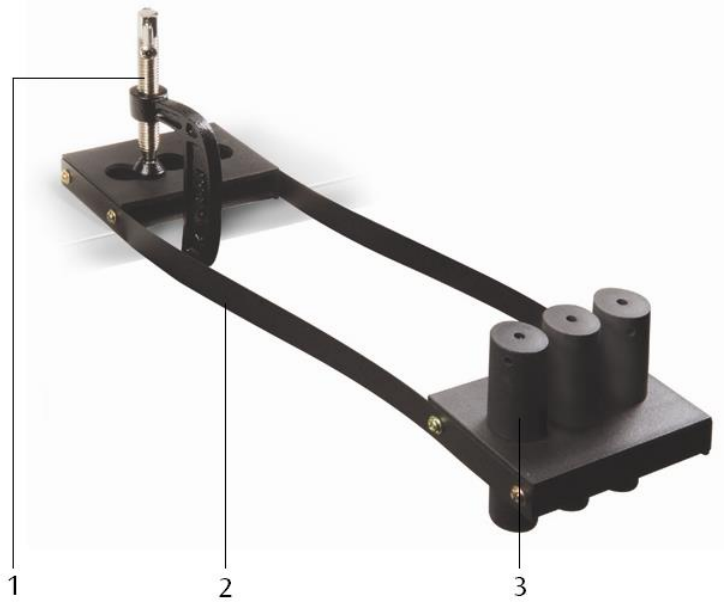
Inertia Balance 1003235

Instruction Sheet

05/18 ALF



1 Table clamp
2 Steel spring strip
3 Masses

1. Description

The inertia balance allows for measurement of mass independent of Earth's gravitational force.

The apparatus consists of two metal trays connected by stiff steel spring strips. One tray has 3 holes to hold up to three masses. The other tray may be anchored to a table edge or laboratory bench with the included table clamp so that the stage can vibrate horizontally. The period of the horizontal oscillations depends on the mass on the stage.

After the apparatus is calibrated by determining the vibration frequency for objects of known mass, it can be used to determine the unknown masses.

2. Equipment supplied

1 Inertia balance
1 Table clamp
1 Cord, 1.85 m
3 Masses

3. Technical data

Length of steel strip:	approx. 350 mm
Masses:	approx. 175 g each

4. Additionally required equipment

1 Mechanical Stopwatch, 15 min 1003369

5. Operation

The mass of an object is the amount of matter it contains, while its weight depends on the gravitational force acting on it. Most of the methods we use to compare masses depend on the forces they exert – in other words, they depend on their weight.

The inertia balance gives us a method of comparing masses directly, and independently of the gravitational forces exerted on them.

- Attach the inertia balance to a table edge.

- Using no mass on the stage displace the apparatus slightly so that the stage vibrates horizontally.
- Record the period for 10 oscillations.
- Do three measuring runs, then average the results.

The period T of one oscillation is the time taken between the stage passing through its mid point, and the next time it passes through the same point, moving in the same direction.

- Repeat this process using as many different combinations as possible of the three masses supplied.
- Put your results into a table.
- Plot a graph of period T against mass m.
- Repeat the experiment with the unknown mass, and use the graph to find the magnitude of this mass.

The inertia balance is actually a compound spring system. The period of an oscillating spring is given by the equation

$$T^2 = 4\pi^2 \cdot \frac{m}{D} \qquad (1)$$

where T = period, m = mass on the spring, D = the spring's elasticity constant.

- Plot a graph of T^2 against mass.
- Determine the elasticity constant D from the slope of the graph.
- Calculate the unknown mass m from the equation (1).