

Instruction sheet  
Pressure balance

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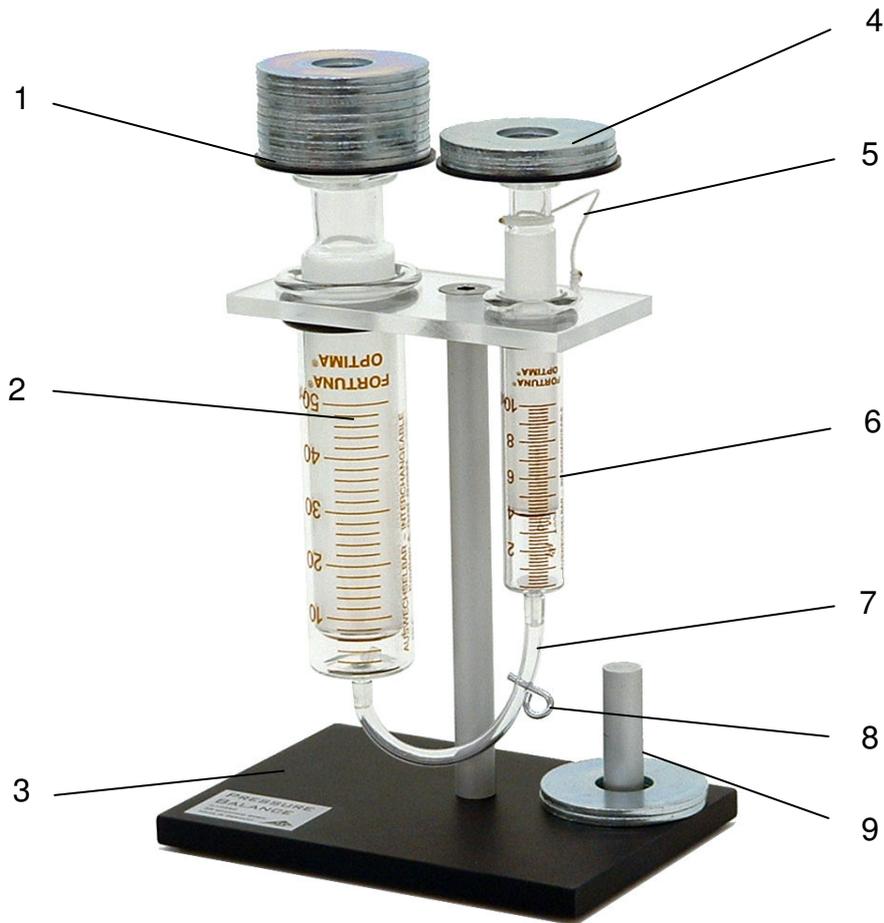


Fig. 1: Components

- |                   |                  |
|-------------------|------------------|
| 1 Tray            | 2 Large cylinder |
| 3 Base plate      | 4 Weights        |
| 5 Safety cord     | 6 Small cylinder |
| 7 Connecting hose | 8 Air inlet      |
| 9 Rod for weights |                  |

The pressure balance is for experiments that clearly illustrate key concepts of force and pressure.

## 1. Safety instructions

**Risk of injury!** The plungers and cylinders of the pressure balance are made of glass. If the glass breaks the shards can cause cuts. Glass components should be checked to make sure they are in a safe condition before performing any experiment. The plastic buffers inside the two glass syringes prevent the plungers colliding heavily with the glass and may not be removed.

The tray 1 on the large plunger may not be loaded with more than 500 g and that of the smaller cylinder can take a maximum of 200 g.

**Risk of flying components!** The small plunger 6 is fastened by a safety cord 5 to prevent it flying out of the cylinder. You should check to see that the safety cord is tightly fastened.

**Appropriate usage:** The pressure balance should only be used for demonstration or student experiments that are supervised by a teacher.

## 2. Description, technical data

Two precision-made glass syringes [2, 6] of differing volume are attached to an acrylic carrier plate on top of an anodised aluminium stand rod. Each of the plungers has a tray 1 for holding weights. The syringes are linked by a connecting hose 7 so that they form a closed system. An air inlet 8 allows air to be drawn into the system. A safety cord prevents the small plunger flying out of the cylinder. A rod 9 is included on the base plate 3 upon which disc weights can be stacked when not in use.

- Volume of syringes: 10 ml and 50 ml
- Ratio of plunger diameters: 10:3 ( $\varnothing$  26.9 mm : 14.7 mm)
- Ratio of plunger masses with tray: 10:3
- Number of weights: 15
- Mass of weights: 40 g each (approx.)
- Base plate dimensions: 140 mm x 100 mm
- Total weight: 1.2 kg

## 3. Operation

Preparation: open the air inlet 8, pull out the large cylinder to about the 20-30 ml mark then close the inlet again.

Experiment procedure: first lay a weight onto the small plunger. Next lay weights one by one on top of the large plunger. When the fourth weight is laid on, the plunger starts to descend. Thus when the weight ratio is about  $1 : 3.5 \pm 0.5$  weights, the system is in equilibrium. This ratio is confirmed by placing weights in the ratio of 2 : 7 (if the plungers are very clean and weights precisely centered, the large plunger may start to descend). Equilibrium is also apparent for a weight ratio of 3 : 10.

During the course of an experiment, air gradually seeps out since syringes that were entirely airtight would not move at all. It may be necessary to let in more air.

## 4. Storage and cleaning

For the equipment to function perfectly, it is essential that the plungers and cylinders are free of any grease or dust. Even fingerprints can affect the functionality adversely. The equipment can be cleaned using methylated spirits (caution: flammable!). If the safety cord is removed to facilitate cleaning, it can be replaced by any suitable strong nylon cord (e.g. buttonhole thread). The equipment should be stored in a dry, dust-free location.