

If the volume of an enclosed gas is reduced, then the pressure of the gas increases, if the volume is increased, then the pressure decreases. The pressure difference to air pressure can be so great that the diaphragm bursts with a loud bang.

Material

Experiment with stands, clamps and accessories		Experiment on the board		P1423601
1	Tripod base "PASS"	P1423602	1	Demo physics board with stand 02150.00
1	Support rod "PASS", 630 mm	02002.55	1	Clamping holder, $d = .13$ mm, fix. magnet. 02151.07
1	Right angle clamp -PASS-	02027.55	1	Holder for gas syringes, fix. magnet. 02156.00
1	Universal clamp	02040.55	1	Gas syringe, 100 ml 02614.00
1	Gas syringe, 100 ml	37715.00	1	Immersion probe 02632.00
1	Immersion probe	02614.00	(1)	Iron wire, $d = 0,2$ mm, $l = 100$ m, 0.5 m 06104.00
(1)	Iron wire, $d = 0,2$ mm, $l = 100$ m, 0.5 m	02632.00	1	Silicone tubing i.d. 7 mm 39296.00
1	Silicone tubing i.d. 7 mm	06104.00		Scissors
	Scissors	39296.00		Plastic film
	Plastic film			

The experiment can be performed with the tripod (Fig. 1) or on the board (Fig. 2). The experiment with the stands, clamps and accessories is described here.

Setup

- Setup the tripod according to Fig. 1
- Attach the immersion probe into the universal clamp
- Connect the lower end of the probe and the gas syringe via a tube
- Pull the piston out of the syringe

Implementation

Experiment 1

- Place a piece of plastic film tightly over the immersion probe and seal it by wrapping a wire several times around the edge
- Press the piston slowly into the syringe and observe the diaphragm

Experiment 2

- Remove the plastic film and the wire and place a new piece of film over the immersion probe
- Pull the piston slowly out the syringe and observe the diaphragm

Fig. 1

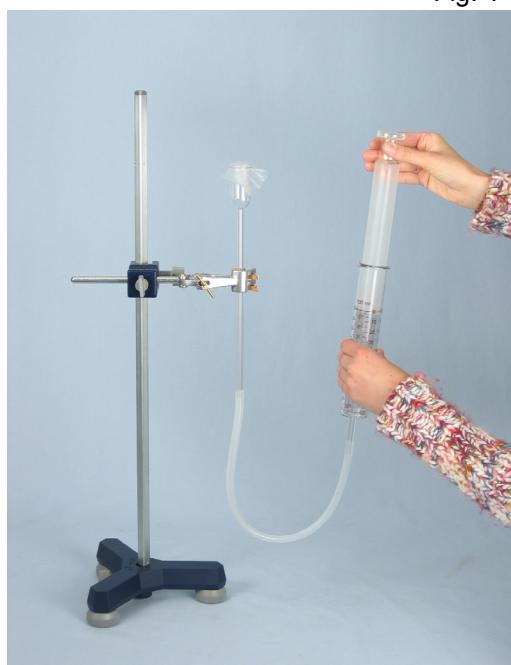


Fig. 2



Observation

If the piston is pressed into the syringe the foil bulges outward. In the second experiment the piston is pulled out and the diaphragm bulges inward. In both experiments the plastic film finally bursts with a loud bang.

Evaluation

Experiment 1

The immersion probe and the syringe form a closed vessel/ container. When pressing the piston into the syringe the volume of the enclosed air is reduced. This causes the pressure of the air in the vessel/container to increase. Compared to the outer air there is now an overpressure (Fig. 3). This becomes noticeable due to a force exerted on the diaphragm pressing it outward and if the pressure is too great the foil bursts.

Experiment 2

Pulling the piston out of the syringe causes the volume of air to increase. The air pressure in the vessel is reduced. The negative pressure existing compared to the outer air becomes noticeable as the foil bulges inward and then finally bursts (Fig. 4).

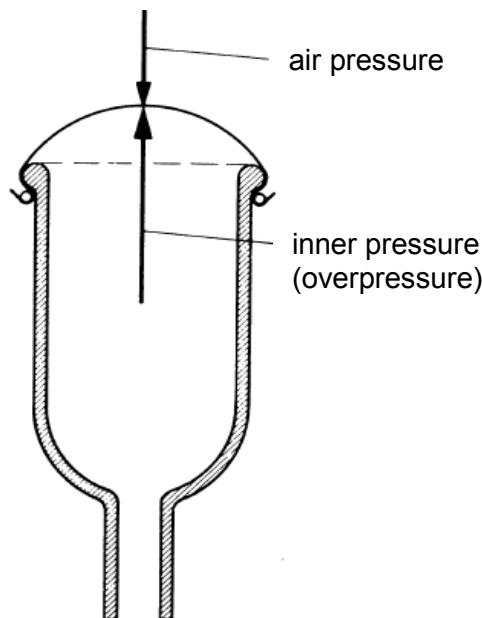


Fig. 3

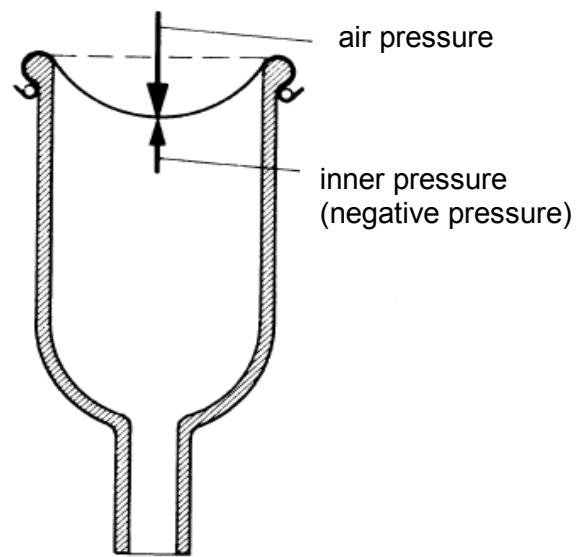


Fig. 4

The change in volume of a gas changes the pressure of the gas.

The overpressure and negative pressure in a container exerts force on the container walls. Depending on the size of the pressure difference between the inner and outer air pressure the greater the acting force.

Remarks

The plastic film used should be very thin. Saran wrap, plastic bags or fruit bags from the supermarket are best suited for this experiment.