Dependence of the buoyancy force on the volume of the immersed body - Measurement via Sensor-CASSY and CASSY-Display

Object of the experiment

1. Investigating the dependence of the buoyancy force on the volume of the immersed body

Setup

Preparing the bodies to be immersed:
- Tie an 8 cm long piece of fishing line to the aluminium and to the steel body.

Stand setup:
- Slide the 40 cm long stand tube over the other one by about 10 cm, and connect the tubes using the universal bosshead.
- Clamp the stand tube with the smaller diameter in the stand base.
- Fasten the clamp with hook to the other stand tube.
- The height of the stand setup can now be adjusted continuously by carefully loosening the lower screw of the universal bosshead.

Preparing the force measurement:
- Put the CASSY-Display into operation with the Sensor-CASSY being connected.
- Connect the force sensor to Input A.
- Switch the display of Input B off with the key NEXT (CASSY) at the display.
- Make the zero adjustment for the unloaded force sensor by pressing the key OFFSET (CALIBRATION) until the red LED blinks.
- After the zero has been adjusted, confirm by pressing the key OFFSET (CALIBRATION) once more.

Apparatus

1 Bodies of equal mass, set of 3	362 28
1 Plastic beaker	590 06
1 Force sensor S, ±50 N	524 042
1 Sensor-CASSY 2	524 013
1 CASSY-Display USB	524 020USB
1 Measuring cylinder, 100 ml, with plastic base	665 754
1 Stand base, V-shape, small	300 02
1 Stand tube, 450 mm, 10 mm diam., set of 2	666 609ET2
1 Stand tube, 400 mm, 13 mm diam.	666 607
1 stand rod, 25 cm, 12 mm diam	300 41
1 Universal bosshead	666 615
1 Leybold-multiclamp	301 01
1 Fishing line, set of 2	309 48ET2

Carrying out the experiment

- First determine the volumes of the two bodies by applying the difference method (D 1.1.1.4).
- Suspend the aluminium body from the force sensor, and determine its gravitational force G.
- Then use the height-adjustable stand to lower the body until it is completely immersed in the water.
- Read the force F' from the CASSY-Display, and calculate the buoyancy force F_b.
- Repeat the experiment with the steel body.

Measuring example

Volume V in cm³	Gravitational force G in N	Force F' in N	*Buoyancy force F_b in N
11	0.3	0.18	0.12
4	0.3	0.25	0.05

*$F_b = G - F'$

Evaluation

The buoyancy force depends on the volume of the immersed body.

The greater the volume of the body, the greater the buoyancy force acting on the body.