AIR RESISTANCE AND TYPE OF SURFACE

MED 19.15

Material:

Item Code	Qty	Description
DS101-1G	1	Support base, large, L=500 mm
DS103-7G	1	Sliding saddle, H=70 mm
DS103-3G	1	Sliding saddle, H=34 mm
DS103-1G	1	Rail support "parallel", H=150 mm
DM701-2L	1	Blower 12 V
P3130-2Q	1	Fixed voltage transformer 12V DC/10 A
DM715-2S	1	Adapter rail
DM712-1H	1	Stand for aerodynamic objects
DM710-2S	1	Aerodynamic objects, set
DM725-ND	1	Newtonmeter "inno" 20 N / 2000 g
P3120-5B	1	S-shaped assembly platform

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Purpose

The air resistance F is dependent on the surface of the body around which flow is taking place.

$F = c_w \cdot \rho/2 \cdot v^2 \cdot A$ (c_w... Factor of shape and surface condition)

Preparation

- the sliding saddle mm is fixed on the support base
- the blower is inserted into the sliding saddle and screwed down tightly
- the adapter rail is mounted on the blower
- at the right end of the adapter rail the vertical rail support is fixed with the sliding saddle (34 mm)
- the Newtonmeter is attached to the S-shaped assembly platform
- the holder for the aerodynamic objects is placed in the slit of the adapter rail
- the weighing bar is positioned so that both hooks fit exactly into each other (see image)
- the rotary knob for the flow speed of the blower is turned to the very left
- the blower is powered by a fixed voltage transformer (12 V DC, min. 6 A)

Experiment 1

The „Flow line profile, smooth" is used as an aerodynamic body; we attach it to the stand for aerodynamic objects from below. We adjust the weighing bar through the sliding saddle and place the aerodynamic body in a complete vertical position.

Then we turn on the Newtonmeter, select the range „mN" and tare it to 0. We turn on the blower and slowly increase the flow speed to 15 m/s. Afterwards we read off the value and note it.

Experiment 2

We measure the resistance at the „Flow line profile, rough" and compare our results with Experiment 1.

Result

Since nearly no whirls are created around streamline-shaped bodies the roughness can only result in an increase of friction of the air that is passsing by.

Note

Certain surface forms can also reduce the air resistance for high speeds.
Thus, the bumps of a golf ball have a resistance-reducing action, because smaller eddies are formed instead of larger ones; even a football has better flight properties because of the seams than a completely smooth ball. In motorized vehicles, aircraft and even ships (water as the medium) even a small reduction in the resistance can result in large fuel savings.