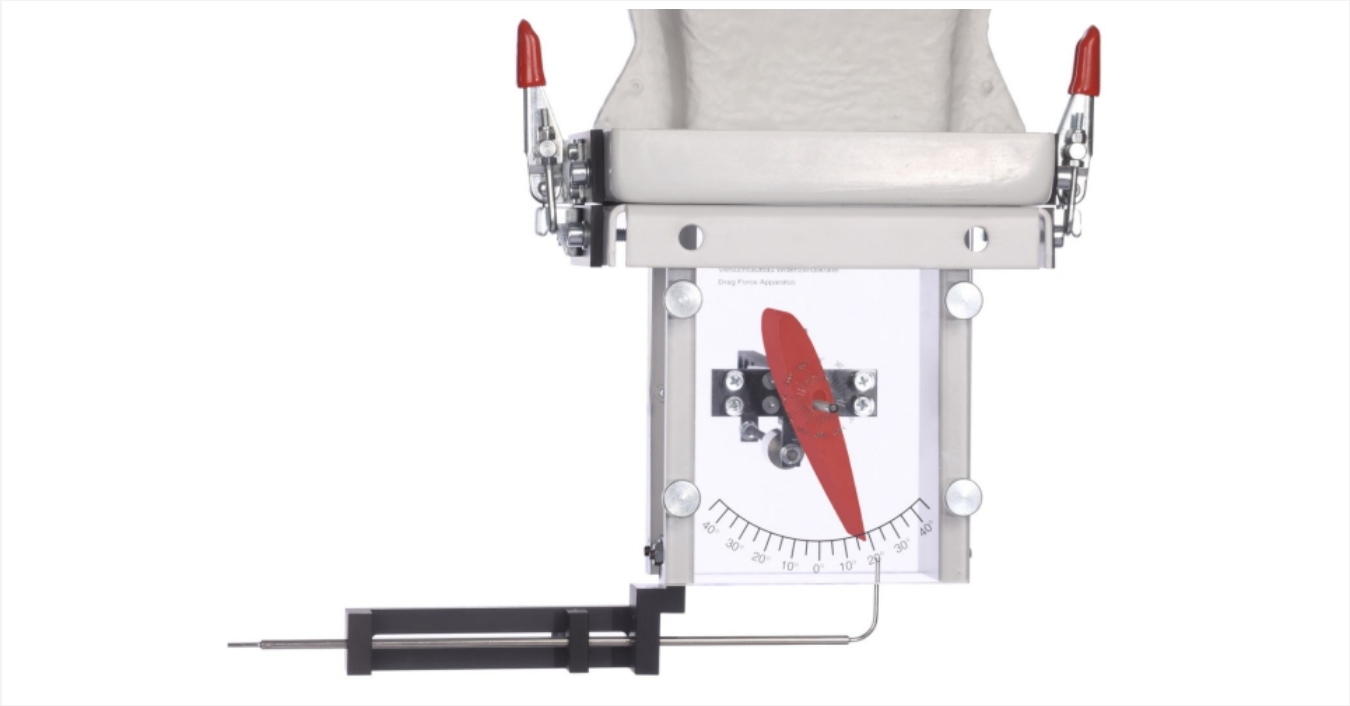
HM 225.04
Drag forces



Description

- **determining drag forces on models immersed in a flow**
- **accessories for aerodynamics trainer HM 225**

Every body immersed in a flow is subject (besides hydrostatic lift) to a flow-induced force, which depends mainly on the velocity of flow, the size of the body and the shape of the body. The shape of the body is represented by the dimensionless number, the drag coefficient c_w.

The goal of scientific study and practical application (e.g. in vehicle construction) is to design the perfect body shape in order to keep drag low. The drag coefficient for arbitrarily shaped bodies can only be determined reliably by experimentation.

The HM 225.04 experimental unit – used in the aerodynamics trainer HM 225 – allows drag to be measured in various models so as to determine the respective drag coefficients. In the measuring section, a model (plate, cylinder and aerofoil model) is used as a drag body. The forces occurring in the air flow are measured with a beam scale with movable weight. When conducting the experiment with a cylinder, a Pitot tube can be used to record a pressure distribution of the surrounding flow.

Also, the drag can be measured indirectly via the pulse rate. The Pitot tube, movable obliquely to the direction of flow, allows pressures to be recorded so as to determine the velocity profile downstream of the cylinder and thus to gauge the so-called wake depression.

The experimental unit is attached to the HM 225 trainer, simply and precisely with quick release fasteners.

Learning objectives/experiments

- measure drag forces on models immersed in a flow
- determining drag coefficients
- application of the pulse rate
- record pressure distribution on the cylinder immersed in a flow
- measure the wake depression behind the cylinder immersed in a flow

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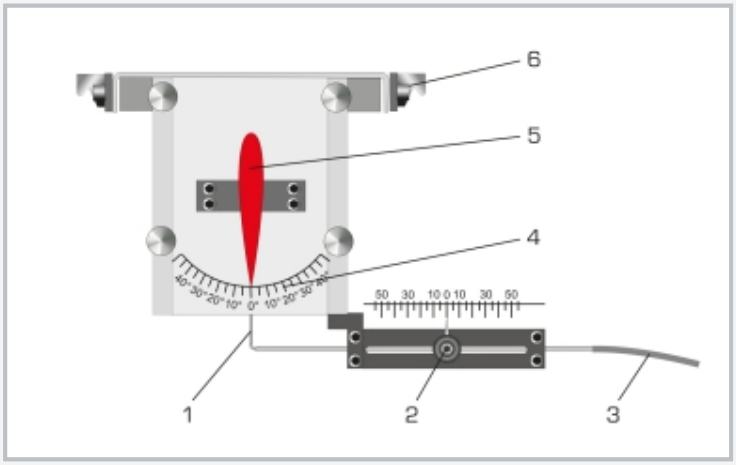
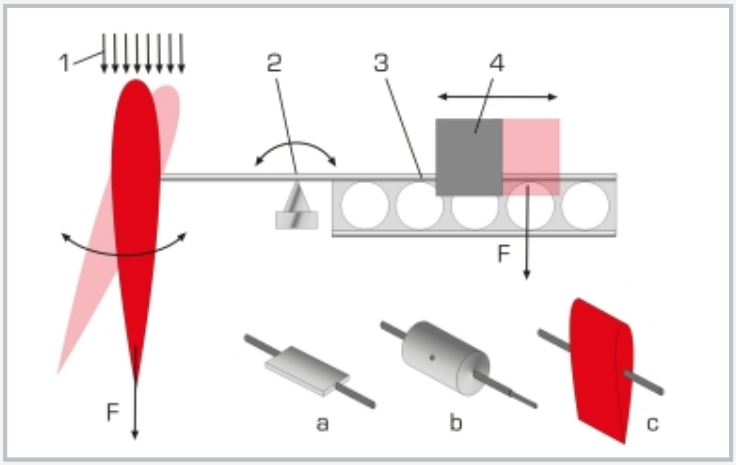
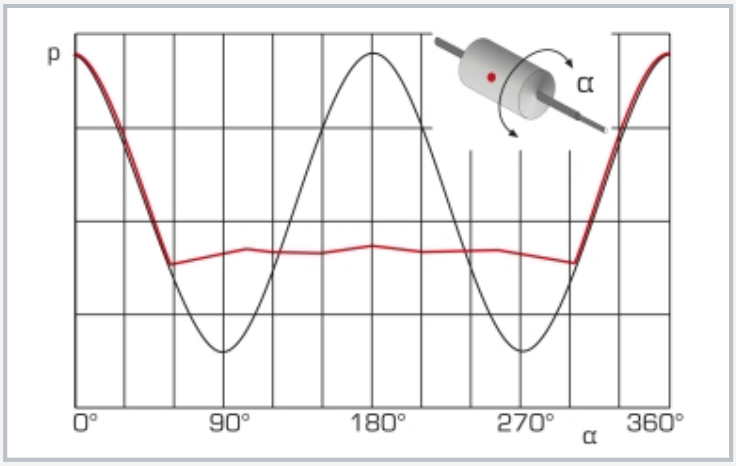


Recording the pressure distribution with Pitot tube: 1 Pitot tube, 2 horizontal adjustment of the Pitot tube, 3 connection to tube manometer (HM 225), 4 scale for adjusting the angle of attack, 5 aerofoil model, 6 quick release fastener for connecting to HM 225



Measurement of drag forces on models immersed in a flow: 1 air flow, 2 pivot point for calculating the equilibrium of moments, 3 beam scale, 4 movable weight; drag bodies: a plate, b cylinder, c aerofoil model



Pressure distribution on the cylinder immersed in a flow; p pressure (relative), α angle between pressure tap and flow direction; red: measured values, black: theoretical curve (potential flow)

Specification

[1] determining drag forces on models immersed in a flow
[2] recording the pressure distribution on models immersed in a flow
[3] recording the velocity profile for measuring the wake depression behind the cylinder immersed in a flow
[4] accessories for the aerodynamics trainer HM 225
[5] models: plate, cylinder and aerofoil model as drag body
[6] cylinder with additional pressure measuring point
[7] Pitot tube with horizontal adjustment for measuring the total pressures

Technical data

Pitot tube
- diameter: 1,1mm
- horizontal adjustment: 50...0...50mm

Measuring section: cross-section 50x100mm
Angle scale: ±40°
Weights: 1x10g, 1x40g

Drag body
- plate: LxW: 45x15mm, thickness: 1mm
- cylinder: DxH: 15x45mm
- aerofoil model: LxWxH: 100x15x45mm

LxWxH: 320x250x200mm
Weight: approx. 2kg

Scope of delivery

1 experimental unit
3 drag bodies
1 set of instructional material

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Required accessories

HM 225	Aerodynamics trainer