

## HM 225.02 *Boundary Layers*



- \* Investigation of the boundary layer at two different rough surfaces
- \* Boundary layer interference with pressure profile
- \* Accessories for HM 225 Aerodynamics Trainer

### Technical Description

During incident flow of bodies fluids such as air "stick" to the surface of the body and form the so-called boundary layer. The kind of flow within the boundary layer - laminar or turbulent - significantly affects the drag. The findings from studying the boundary layer are taken into consideration when designing aerofoils, turbine blades and hull, rudder and propeller blades.

The HM 225.02 experimental unit - used in the HM 225 Aerodynamics Trainer - allows the boundary layer on a flat plate to be studied. For this purpose, air flows along the plate, parallel to the surface. The plate has two different surfaces so as to study the effect of surface conditions on the boundary layer. Side bodies can be used in the measurement section. Thus the boundary layer phenomena can experience interference with a degressive or progressive pressure curve and, for example equalise the friction loss of the flow.

A horizontally movable pitot tube, adjusted using a micrometer screw, measures the total pressures at various distances from the plate surface. The plate can be moved vertically to enable the recording of total pressures in the direction of flow. The velocity can be determined from the pressures read off the HM 225.01 16-Tube Manometer.

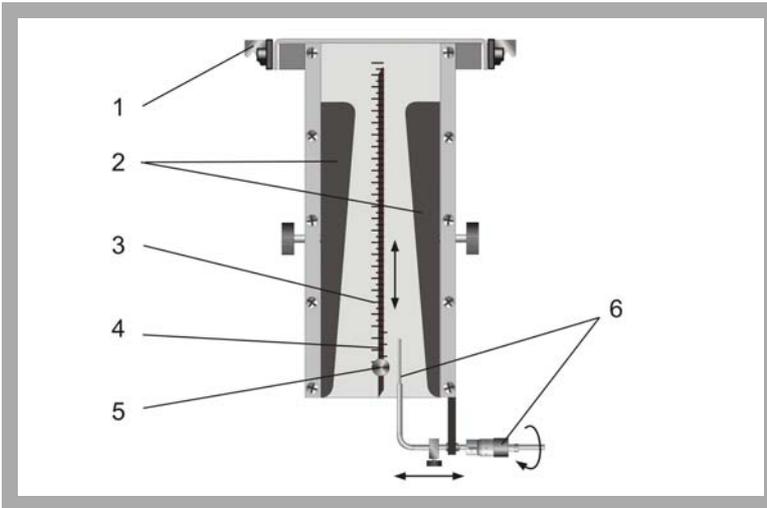
The experimental unit is attached to the air outlet of the HM 225 trainer, simply and precisely with quick release fasteners.

The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

### Learning Objectives / Experiments

- internal friction of gases
- investigation of the boundary layer on the flat plate
- influence of surface roughness on the formation of a boundary layer
- boundary layer interference with degressive/progressive pressure curve

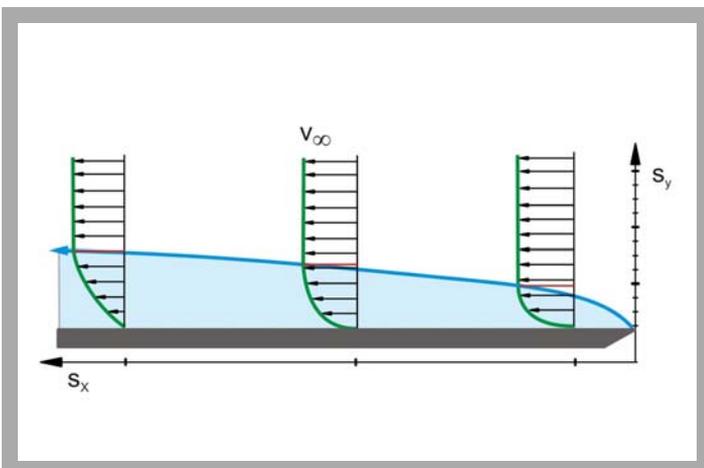
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1 quick release fastener for connecting to HM 225, 2 removable side bodies, 3 scale, 4 plate with different surfaces, 5 vertical adjustment of the plate, 6 pitot tube with micrometer screw for horizontal adjustment



Experiment setup: 1 HM 225, 2 HM 225.02, 3 tube manometer (HM 225.01) with connection to HM 225.02



Velocity distribution and boundary layer thickness in the boundary layer of a flat plate;  $S_y$  distance from the surface,  $S_x$  distance from leading edge, green: distribution of the velocity, blue: boundary layer thickness

### Specification

- [1] investigation of boundary layers on a flat plate with flow along the plate
- [2] accessories for HM 225 Aerodynamics Trainer
- [3] plate with two different rough surfaces
- [4] vertical displacement of the plate
- [5] pitot tube for measuring the total pressure at the plate
- [6] horizontal adjustment of the pitot tube using micrometer screw
- [7] removable side bodies for interference of the boundary layer with degressive or progressive pressure profile
- [8] tube manometer, 16-fold (HM 225.01) for displaying the dynamic pressures is recommended

### Technical Data

- Pitot tube
  - $d=0,7\text{mm}$
  - movable: 0,35...50mm
- Plate, movable: 0...250mm
  - LxW: 260x55mm, thickness: 5mm
  - chamfer:  $30^\circ$
  - smooth surface:  $25\mu\text{m}$
  - rough surface:  $400\mu\text{m}$
- 2 side bodies, removable
  - inclination: 1:12,5

### Dimensions and Weight

- LxWxH: 250x130x370mm
- Weight: approx. 4kg

### Scope of Delivery

- 1 experimental unit
- 1 plate
- 2 side bodies
- 1 set of instructional material

### Order Details

070.22502 HM 225.02 Boundary Layers