

HM 225.03

Bernoulli's principle



Learning objectives/experiments

- investigation of the continuity equation and Bernoulli's principle
- determination of the dynamic pressure from the measurement data via Bernoulli's principle
- calculation of the flow velocity from the measurement data using Bernoulli's equation
- pressure and velocity distribution

Description

- investigation of Bernoulli's equation
- determination of the dynamic pressure
- calculation of the flow velocity
- accessory for aerodynamics trainer HM 225

The total pressure in a steady flow is constant. The sum of the static and dynamic pressures gives the total pressure. A change in the cross-section of the flow channel causes the flow velocity to vary inversely proportional to the cross-sectional area. These physical laws are fundamentals of fluid mechanics education.

The HM 225.03 experimental unit – used in the aerodynamics trainer HM 225 – allows the measurement of the total pressure and the static pressure.

A model is placed in the measuring section, which uses lateral bodies to produce a Venturi-shaped cross-sectional profile of the flow.

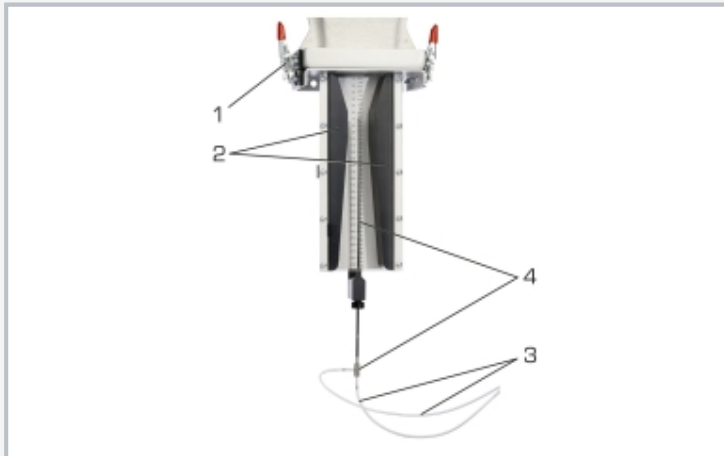
At the centre of the flow channel there is a Pitotstatic tube. The Pitotstatic tube has an opening opposite to the flow direction to measure the total pressure. The static pressure is measured through lateral inlet openings. Both pressures are read from the tube manometers in HM 225. The dynamic pressure is the difference between both measured values.

In order to illustrate pressure and velocity distribution, measurements can be taken at different cross-sectional areas by moving the Pitotstatic tube in the flow direction.

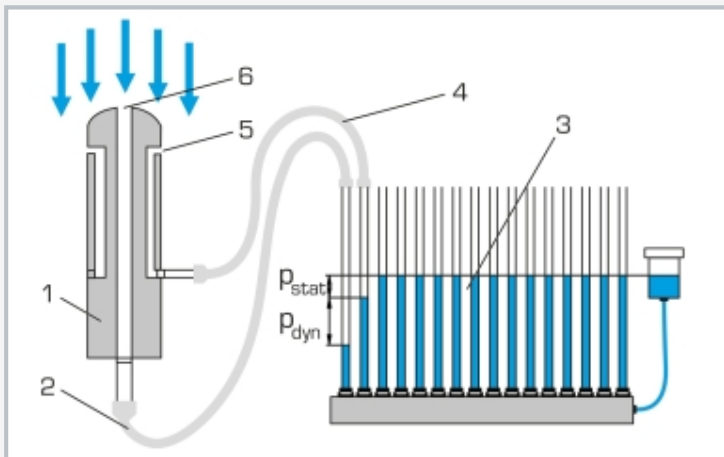
The experimental unit is attached to the HM 225 trainer, simply and precisely with quick release fasteners.

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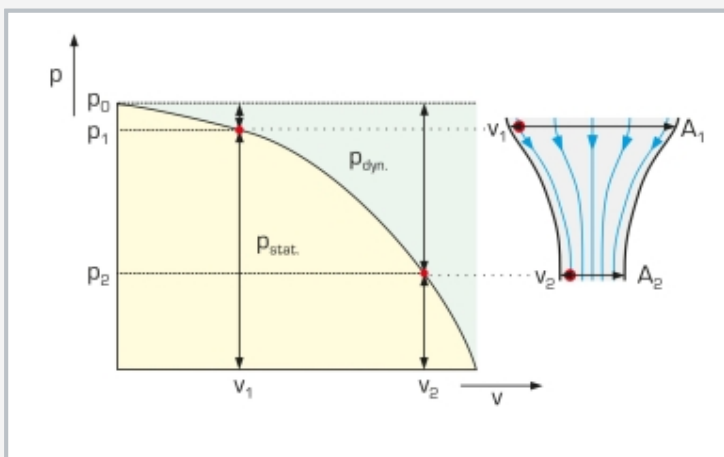
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1 quick connector for connection to HM 225, 2 Venturi-shaped lateral body, 3 hose connections to the tube manometers, 4 movable Pitotstatic tube



Pitotstatic tube measurement principle: 1 Pitotstatic tube, 2 total pressure, 3 tube manometer (HM 225), 4 static pressure, 5 lateral inlet opening for measuring the static pressure, 6 front inlet opening for measuring the total pressure



Pressure and velocity distribution along the streamlines: p pressure, v flow velocity, A cross-sectional area, p_0 total pressure, yellow area: static pressure, green area: dynamic pressure

Specification

- [1] investigation of the continuity equation and Bernoulli's principle
- [2] measurement of the total pressure and the static pressure in a steady flow
- [3] accessory for the aerodynamics trainer HM 225
- [4] 16 tube manometers of HM 225 for displaying the pressures

Technical data

Pitotstatic tube
 ■ $d=2\text{mm}$
 ■ movable: $0\text{...}290\text{mm}$

LxWxH: $240\times 140\times 420\text{mm}$
 Weight: approx. 4kg

Scope of delivery

- 1 experimental unit
- 1 set of hoses
- 1 set of instructional material

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Required accessories

HM 225 Aerodynamics trainer