

HM 150.07

Bernoulli's principle



The illustration shows the device and the GUNT Media Center, tablet not included

Description

- investigation and verification of Bernoulli's principle
- static pressures and total pressure distribution along the Venturi nozzle
- flow visualisation using CFD technology
- multimedia teaching material on-line in the GUNT Media Center: E-Learning course, prepared CFD simulations, worksheets, videos

Bernoulli's principle describes the relationship between the flow velocity of a fluid and its pressure. An increase in velocity leads to a reduction in static pressure in a flowing fluid, and vice versa. The total pressure of the fluid remains constant. Bernoulli's equation is also known as the principle of conservation of energy of the flow.

The HM 150.07 experimental unit is used to demonstrate Bernoulli's principle by determining the pressures in a Venturi nozzle. The experimental unit includes a pipe section with a transparent Venturi nozzle and a movable Pitot tube for measuring the total pressure. The Pitot tube is located within the Venturi nozzle, where it is displaced axially. The position of the Pitot tube can be observed through the Venturi nozzle's

transparent front panel. The Venturi nozzle is equipped with pressure measuring points to determine the static pressures. The pressures are displayed on the six tube manometers. The total pressure is measured by the Pitot tube and displayed on another single tube manometer.

The experimental unit is positioned easily and securely on the work surface of the HM 150 base module. The water is supplied and the flow rate measured by HM 150. Alternatively, the experimental unit can be operated by the laboratory supply.

In order to perform a virtual analysis of flow behaviour, CFD simulations are often used in practice. Such simulations allow, for example, flow visualisations in areas that cannot be visualised experimentally. In the GUNT Media Center, flow visualisations based on CFD calculations are available online. There are also multimedia teaching materials including E-Learning courses on basic knowledge and calculations. Videos show a complete experiment with preparation, execution and evaluation. Worksheets with solutions supplement the teaching material.

Learning objectives/experiments

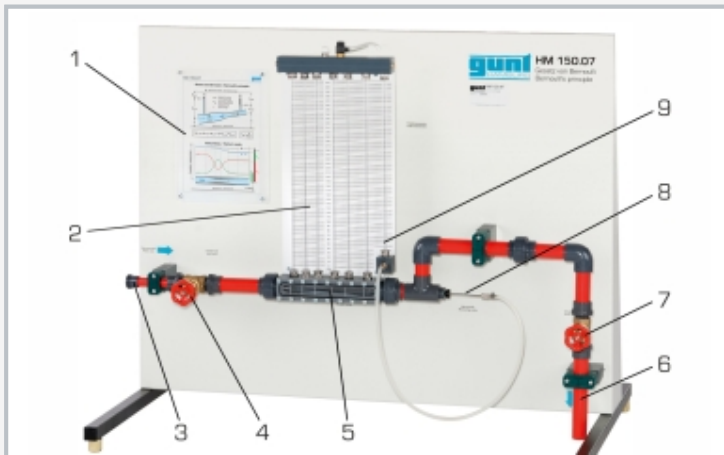
- energy conversion in divergent/convergent pipe flow
- recording the pressure curve in a Venturi nozzle
- recording the velocity curve in a Venturi nozzle
- determining the flow coefficient
- recognising friction effects

GUNT Media Center, develop digital skills

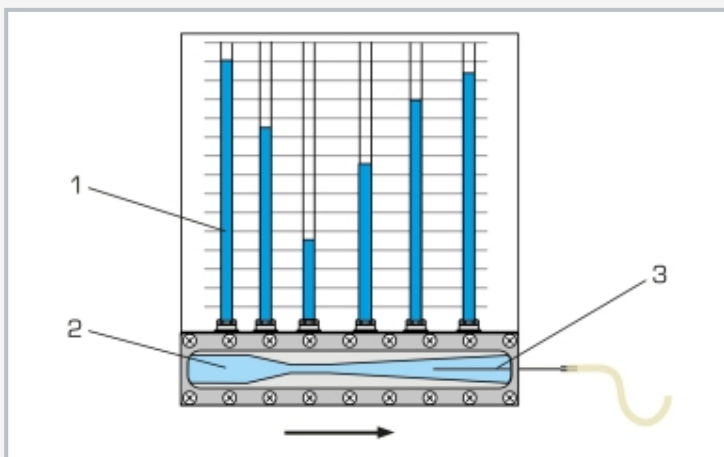
- E-Learning course with fundamental knowledge and calculations
- prepared CFD simulations for flow visualisation
- videos with detailed demonstration of the experiments: preparation, execution, evaluation
- assured learning success through digital worksheets
- retrieve information from digital networks

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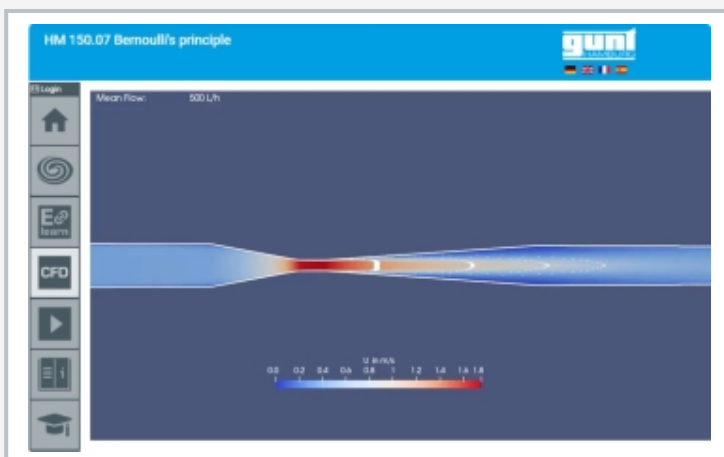
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1 diagram, 2 tube manometers (static pressures), 3 water supply, 4 valve, 5 Venturi nozzle, 6 water outlet, 7 valve for water outlet, 8 Pitot tube, 9 single tube manometer (total pressure)



Measuring the pressures in a Venturi nozzle
1 tube manometers for displaying the static pressures, 2 Venturi nozzle with measuring points, 3 Pitot tube for measuring the total pressure, axially movable



Screenshot of the GUNT Media Center

Specification

- [1] familiarisation with Bernoulli's principle
- [2] Venturi nozzle with transparent front panel and measuring points for measuring the static pressures
- [3] axially movable Pitot tube for determining the total pressure at various points within the Venturi nozzle
- [4] 6 tube manometers for displaying the static pressures
- [5] single tube manometer for displaying the total pressure
- [6] flow rate determined by HM 150 base module
- [7] water supply using HM 150 base module or via laboratory supply
- [8] flow visualisation using prepared CFD simulations
- [9] digital multimedia teaching material online in the GUNT Media Center: E-Learning course, prepared CFD simulations, worksheets, videos

Technical data

Venturi nozzle

- A: 84...338mm²
- angle at the inlet: 10,5°
- angle at the outlet: 4°

Pitot tube

- movable range: 0...200mm
- Ø inner: 1mm

Pipes and pipe connectors: PVC

Measuring ranges

- pressure:
 - ▶ 40...455mmWC (static pressure)
 - ▶ 90...455mmWC (total pressure)

LxWxH: 1100x680x900mm

Weight: approx. 28kg

Required for operation

HM 150 (closed water circuit) or water connection, drain;
PC or online access recommended

Scope of delivery

- 1 experimental unit
- 1 set of instructional material
- 1 online access to the GUNT Media Center

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Optional accessories

HM 150 Base module for experiments in fluid mechanics