

HM 250.02

Measurement of flow profile



Complete experimental setup with the HM 250 base module, screen mirroring is possible on up to 10 end devices

Description

- **representation of laminar and turbulent flow profiles**
- **intuitive experiment execution via touch screen (HMI)**
- **integrated router for operation and control via an end device and for screen mirroring on up to 10 end devices: PC, tablet, smartphone**
- **network capability: access to ongoing experiments from external workstations via the local network**
- **automatic identification of accessories via RFID technology**

The HM 250.02 is used to investigate the flow profile. Differences in the flow formation can thus be detected by the use of measurement technique.

The experimental unit consists of a pipe section with a conical inlet section. In the experiment, the flow is accelerated in the conical inlet section. The flow profile develops in the subsequent pipe section. At the end of the pipe section, a vertically movable Pitotstatic tube is inserted into the flow. The position of the Pitotstatic tube is determined with a digital dial gauge and adjusted by means of a fine hand adjustment.

The Pitotstatic tube measures the dynamic pressures at different positions of the diameter of the pipe section. The velocity profile in pipe flow is determined from the measured pressures. The pipe section opens into a stabilisation tank with a transparent front panel to observe the measuring device.

In addition, the influence of viscosity on the flow formation can be investigated. For this purpose, the water is heated with a heater integrated in the base module, thus changing viscosity.

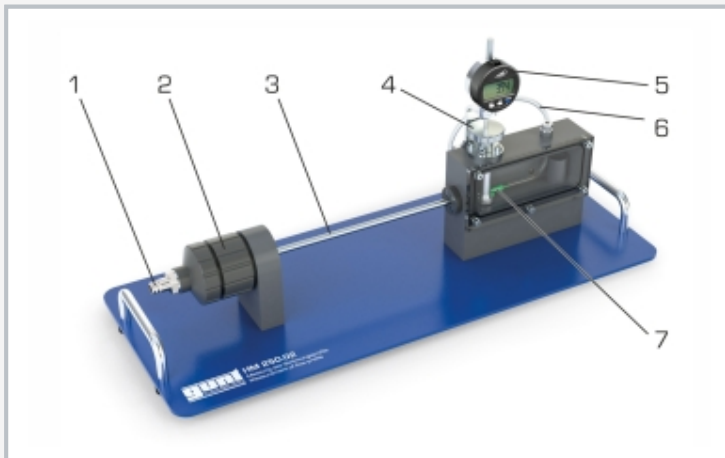
The accessory HM 250.02 is easily and safely positioned on the worktop of the HM 250 base module. Via RFID technology the accessories are automatically identified, the appropriate GUNT software is loaded and an automatic system configuration is performed. The intuitive user interface guides through the experiments and displays the measured values graphically. For tracking and evaluation of the experiments, up to 10 external workstations can be used simultaneously using the local network via LAN connection. The base module supplies the water and is used to adjust the flow rate and temperature. Flow rate, pressure and temperature measurements are also carried out via the base module.

Learning objectives/experiments

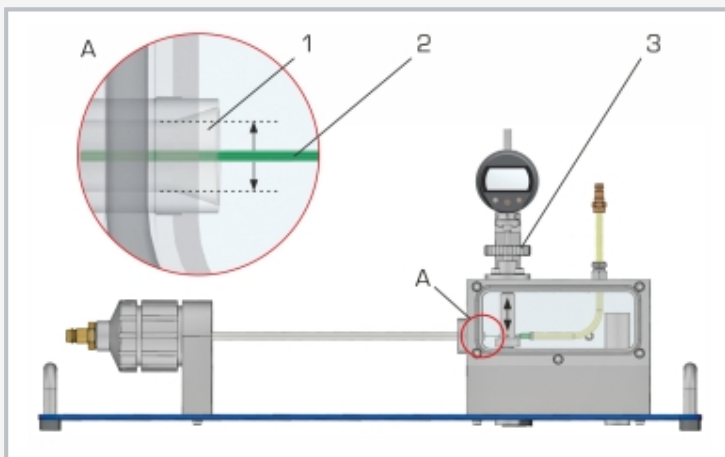
- representation of the flow profile
- determination of local and averaged flow velocity
- effect of the Reynolds number on the flow profile
- recognise differences between laminar and turbulent flow formation
- pipe friction / shear stress
- recognise boundary conditions in the formation of the flow profile
- investigation how temperature affects flow formation
- GUNT software specifically adapted to the accessories used
 - ▶ learning module with theoretical fundamentals
 - ▶ device description
 - ▶ guided experiment preparation
 - ▶ execution of the experiment
 - ▶ graphical representation of the flow profile
 - ▶ data transfer via USB for versatile external use of measured values and screenshots e.g. evaluation in Excel
 - ▶ different user levels available

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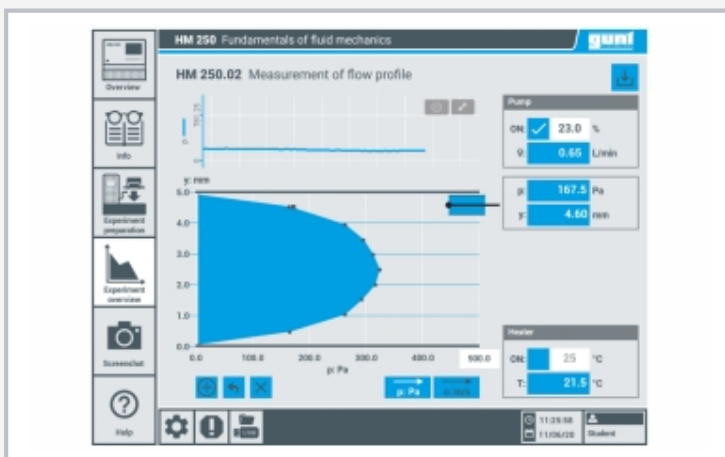
Measurement of flow profile



1 water supply, 2 flow settling and inlet, 3 pipe section, 4 setting of the Pitotstatic tube position, 5 position measurement, 6 pressure connections, 7 Pitotstatic tube



Measuring principle
1 pipe section, 2 Pitotstatic tube for measuring dynamic pressure, 3 setting of the Pitotstatic tube position, A detail view



Intuitive user interface in the HM 250 touch screen: graphic display of the measured values, flow profile with laminar flow

Specification

- [1] determine the flow profile by use of the dynamic pressure
- [2] measurement of the dynamic pressure at the pipe section using a Pitotstatic tube
- [3] position of the vertically movable Pitotstatic tube can be determined using digital dial gauge
- [4] transparent experimental setup shows the measuring method
- [5] flow rate and temperature in the pipe section can be adjusted via HM 250 base module
- [6] automatic identification of accessories via RFID technology and use of the corresponding GUNT software
- [7] experiment execution and display of the measured values via touch screen (HMI)
- [8] network capability: access to ongoing experiments and their results from up to 10 external workstations simultaneously via the local network
- [9] water supply and heating via HM 250 base module

Technical data

Pipe section

- length: 310mm
- \varnothing inner: 5mm
- conical inlet angle: 36°
- material: stainless steel

Measuring device with vertically moveable Pitotstatic tube

- Pitotstatic tube
 - ▶ \varnothing outer: 0,8mm
 - ▶ \varnothing inner: 0,57mm
 - ▶ material: stainless steel, polypropylene
- dial gauge, digital
 - ▶ adjustment range: 12,5mm
 - ▶ resolution: 0,01mm
 - ▶ clamping shank: \varnothing 8mm
 - ▶ display (LCD)
 - ▶ data output: RS 232

Measuring ranges

- indicated measuring range flow rate: 0...5,3L/min
- indicated measuring range pressure: 0...150mbar
- indicated measuring range temperature: 0...50°C

LxWxH: 650x260x300mm

Weight: approx. 5,2kg

Scope of delivery

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

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Required accessories

HM 250 Fundamentals of fluid mechanics

Optional accessories

HM 250.90 Laboratory shelf