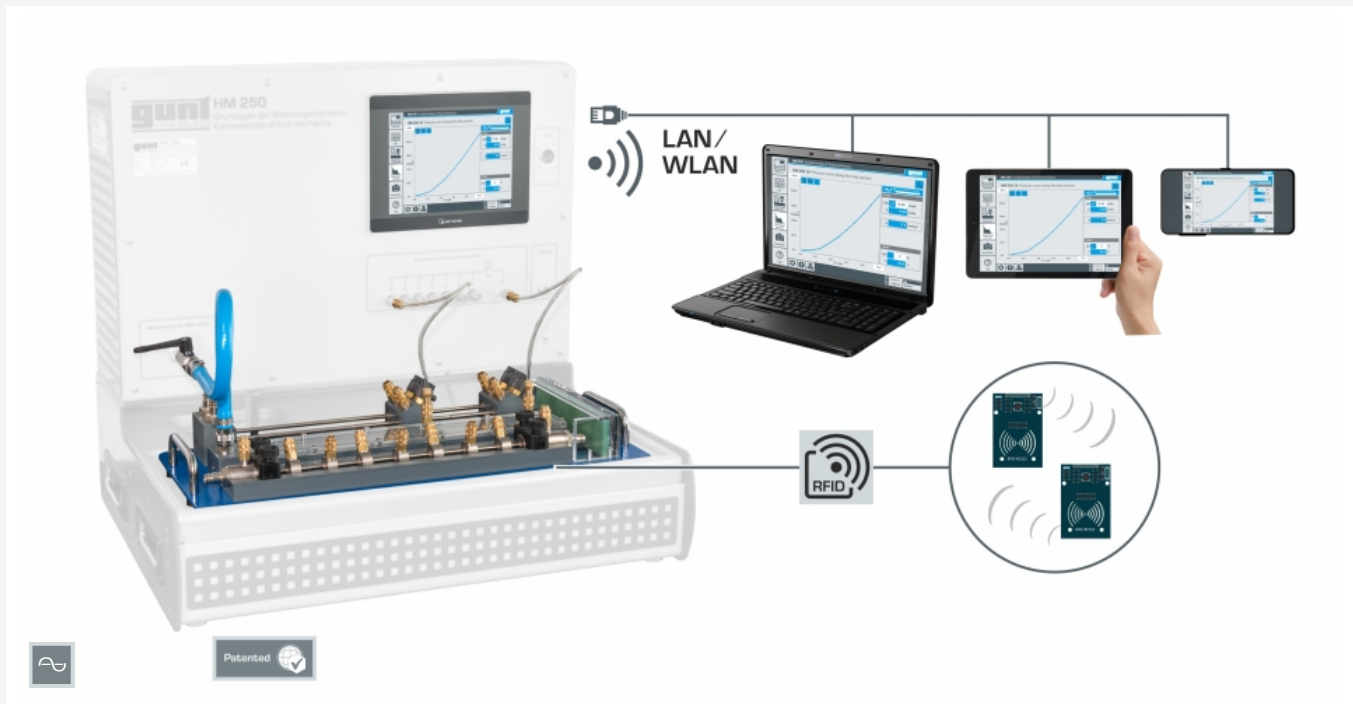


# HM 250.10

## Pressure curve along the inlet section



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

### Description

- investigation of pressure losses at the inlet and along the inlet section
- 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

In pipe flow, the surfaces, the cross-sectional geometries and the geometry of the inlet section influence the internal friction and thus also the flow formation. In HM 250.10 the flow processes in the pipe inlet and in the formed flow are investigated. For this purpose, the experimental unit contains three pipe sections for the general investigation of the pipe flow and one pipe section which serves as a pure inlet section.

In experiments, the three pipe sections with different pipe surfaces and geometries are examined. The two key figures Reynolds number and pipe friction coefficient are determined from the measured values and can be displayed in the

Moody diagram. The pressure is measured individually for each pipe section in the formed flow area. The water emerges from the pipe section as a free jet. Differences in the flow formation can be observed on the surface of the water jet.

The inlet section has a streamlined and a non-streamlined inlet. The inlet section can be turned in the experimental unit. In this way different geometries can be investigated at the pipe inlet. The inlet section has pressure connections for measuring the pressure loss at the pipe inlet and along the inlet section.

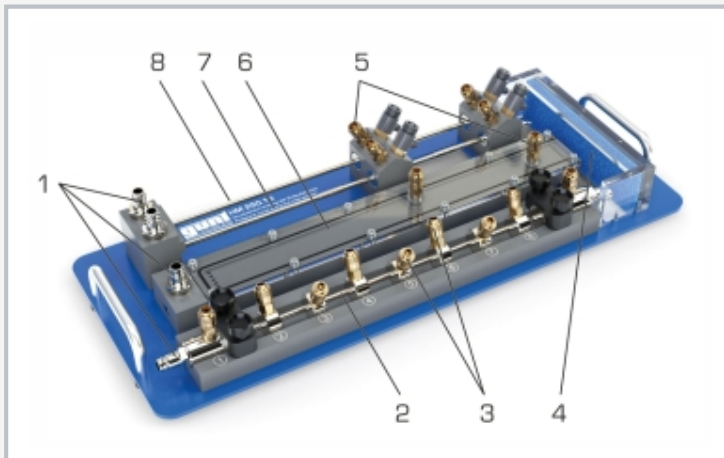
The accessory HM 250.09 is positioned easily and securely on the worktop of the HM 250 base module. Via RFID technology the accessories are automatically identified, the appropriate GUNT software is loaded and an automatic system configuration is performed. The intuitive user interface guides through 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 HM 250.

### Learning objectives/experiments

- formation of the flow along the inlet section
- difference between hydraulically smooth and rough pipes
- difference between round pipe and rectangular cross-section
- distinction between laminar and turbulent flow
- determine pressure loss in laminar flow / turbulent flow
- compare theoretical values with measured values
- investigate the influence of temperature
- using the Moody chart
- 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 pressure curves
  - ▶ data transfer via USB for versatile external use of measured values and screenshots e.g. evaluation in Excel
  - ▶ different user levels available

# HM 250.10

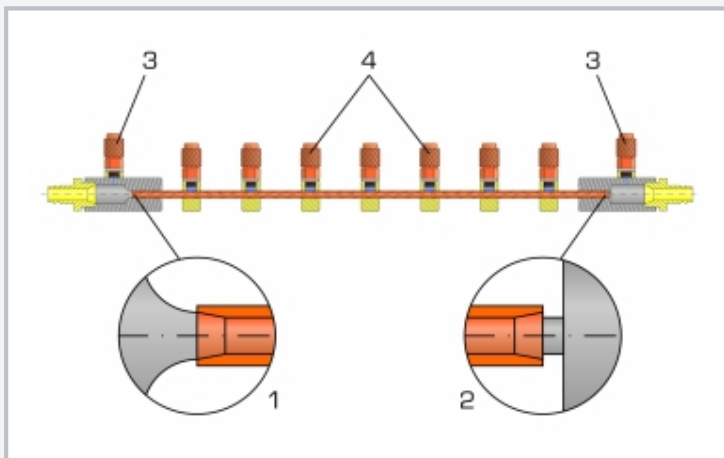
## Pressure curve along the inlet section



1 water supply, 2 rotatable experimental section for investigations at and along the inlet, 3 pressure connections, 4 open discharge with foam insert as splash guard, 5 pressure connections, 6 pipe with rectangular cross-section, 7 hydraulically rough pipe, 8 hydraulically smooth pipe



Intuitive user interface in the HM 250 touch screen: pressure measuring at pipe section (rectangular cross-section) and graphic display of the measured values, pressure curve in the formed flow area



Inlet section rotatable, observation of different geometries at the pipe inlet  
1 rounded pipe inlet, streamlined geometry, 2 sharp-edged pipe inlet, non-streamlined geometry, 3 pressure connections for measurement in the pipe inlet, 4 pressure connections for measurements along the inlet section

### Specification

- [1] investigation of pipe friction in laminar or turbulent flow
- [2] measurement of the pressure loss to and along an inlet section
- [3] inlet section with streamlined and non-streamlined inlet
- [4] inlet section inserted in the experimental unit according to the desired flow direction
- [5] pipes with different geometries and surfaces for further experiments
- [6] flow rate and temperature in the pipe sections can be adjusted via HM 250 base module
- [7] automatic identification of accessories via RFID technology and use of the corresponding GUNT software
- [8] experiment execution and display of the measured values via touch screen (HMI)
- [9] network capability: access to ongoing experiments and their results from up to 10 external workstations simultaneously via the local network
- [10] water supplied via HM 250 base module

### Technical data

#### Pipe section

- material: brass, nickel-plated
- hydraulically smooth
- $\varnothing$  4mm  $\pm$  0,12mm
- distance of pressure measurement: 150mm

#### Pipe section

- material: brass, nickel-plated
- hydraulically rough
- $\varnothing$  4mm  $\pm$  0,12mm
- distance of pressure measurement: 150mm

#### Pipe section with rectangular cross-section

- material: PVC
- covering, transparent: PMMA
- WxH: 30x2,1mm
- distance of pressure measurement: 150mm

#### Inlet section

- material: brass, nickel-plated
- length: 270mm
- $\varnothing$  4mm  $\pm$  0,12mm
- distance of the first pressure measurement: 65mm
- distance of the following pressure measurements: 6x 50mm

#### Measuring ranges

- indicated measuring range pressure: 0...0,76mbar
- indicated measuring range flow rate: 0...15L/min
- indicated measuring range temperature: 0...50°C

LxWxH: 650x260x105mm

Weight: approx. 7,9kg

### Scope of delivery

- 1 experimental unit
- 1 set of instructional material

# HM 250.10

## Pressure curve along the inlet section

Required accessories

HM 250                    Fundamentals of fluid mechanics

Optional accessories

HM 250.90              Laboratory shelf