

HM 150.29

Energy losses in piping elements



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

Description

- pressure losses in various pipe fittings and in the ball valve
- precise pressure measurement via annular chambers
- flow visualisation using CFD technology
- multimedia teaching material on-line in the GUNT Science Media Center: E-Learning course, prepared CFD simulations, worksheets, videos

When water flows through a pipe system, the flow resistances causes pressure losses to occur at pipe fittings and valves and fittings.

The HM 150.29 unit can be used to investigate and visualise the pressure losses in pipe elements. The experimental unit can be used to assess how different pipe geometries affect the flow.

The HM 150.29 experimental unit comprises a pipe section containing several pipe elements with different flow resistances, as well as a contraction and enlargement piece. There is also a ball valve integrated in the pipe. There are pressure measuring points with annular chambers upstream and downstream of the pipe elements, which ensure accurate pressure measurement.

The pressure measuring points can be connected in pairs to a 6 tube manometers in order to determine the pressure loss of a pipe element.

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.

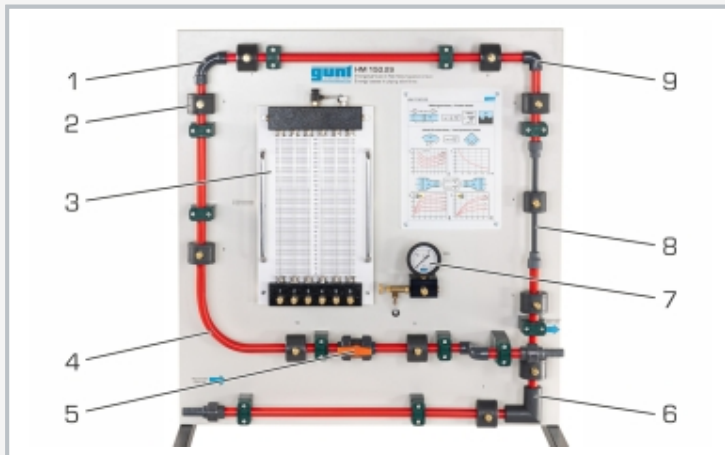
In order to perform a virtual analysis of flow behaviour, CFD simulations are often used in practice. Such simulations allow, for example, flow visualisations in areas that cannot be visualised experimentally. In the GUNT Science Media Center, flow visualisations based on CFD calculations are available 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

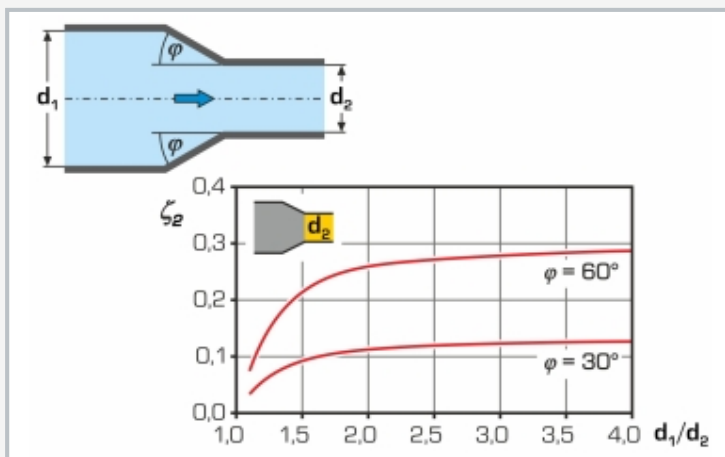
- investigate pressure losses and loss coefficients at
 - ▶ segment bend and bends
 - ▶ contraction and enlargement
 - ▶ a ball valve
 - determination of a pipe characteristic
- GUNT Science Media Center, develop digital skills
- E-Learning course with fundamental knowledge and calculations
 - prepared 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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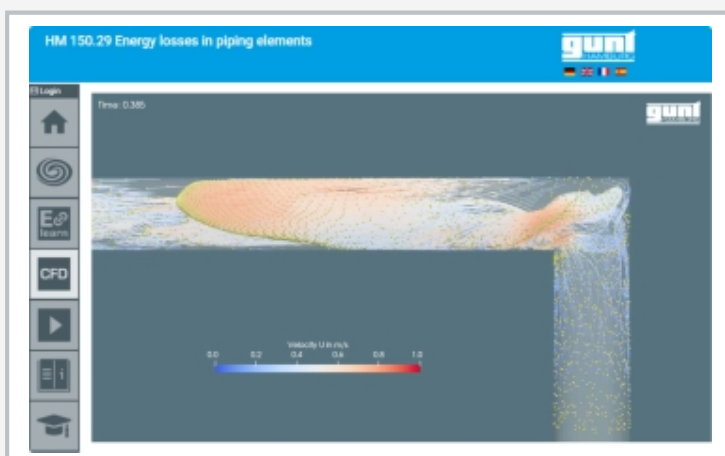
Energy losses in piping elements



1 narrow pipe bend, 2 annular chamber, 3 tube manometers, 4 wide pipe bend, 5 ball valve, 6 segment bend, 7 Bourdon tube pressure gauge, 8 contraction/enlargement, 9 pipe angle



Representation of the flow conditions in a contraction and associated resistance coefficient ζ ; d inner diameter, ϕ angle



Screenshot of the GUNT Science Media Center

Specification

- [1] investigation of the pressure loss in flow through pipe fittings and in the ball valve
- [2] contraction and enlargement, pipe bend, segment bend, pipe angle and ball valve as measurement objects
- [3] annular chambers allow precise measurement of pressure
- [4] 6 tube manometers for displaying the pressures
- [5] Bourdon tube pressure gauge for pressure measurement
- [6] flow rate determined by base module HM 150
- [7] water supply via HM 150 or via laboratory supply
- [8] flow visualisation using prepared CFD simulations
- [9] digital multimedia teaching material online in the GUNT Science Media Center: E-Learning course, prepared CFD simulations, worksheets, videos

Technical data

Pipe, PVC

- inner diameter: 17mm

Pipe elements, PVC

Inner diameter: d

- contraction: from $d=17$ to $d=9,2$ mm
- enlargement: from $d=9,2$ to $d=17$ mm
- segment bend: $d=17$ mm, 90°
- pipe angle: $d=19$ mm, 90°
- narrow pipe bend: $d=18$ mm, $r=40$ mm, 90°
- wide pipe bend: $d=17$ mm, $r=100$ mm, 90°

Measuring ranges

- pressure:
 - ▶ 1x 0...0,6bar
 - ▶ 6x 0...290mmWC

LxWxH: 840x675x930mm

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 hoses
- 1 set of instructional material
- 1 online access to GUNT Science Media Center

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Optional accessories

HM 150 Base module for experiments in fluid mechanics