

# HM 150.29

## Energy losses in piping elements



### Learning objectives/experiments

- investigate pressure losses at segment bend and bends
- investigate pressure loss at contraction and enlargement
- pressure loss at a ball valve and determination of a simple valve characteristic

### Description

- pressure losses in various pipe fittings and in the ball valve
- precise pressure measurement via annular chambers
- visualisation of differential pressures on manometer panel

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.

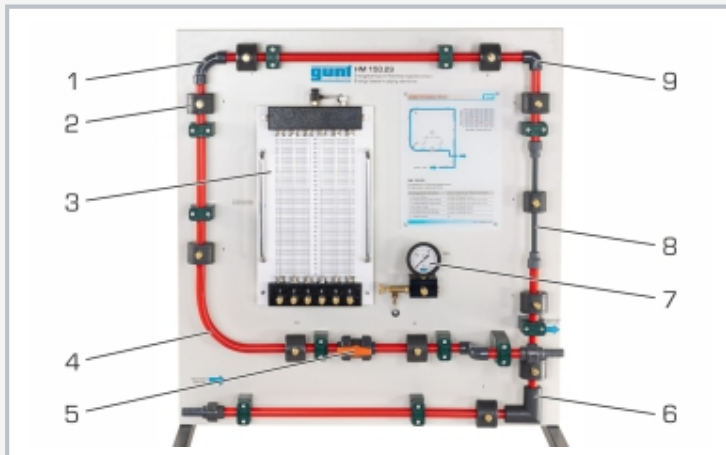
The HM 150.29 experimental unit comprises a pipe section containing several pipe elements with different flow resistances, as well as a contraction and enlargement piece. There is also a ball valve integrated in the pipe. There are pressure measuring points with annular chambers upstream and downstream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

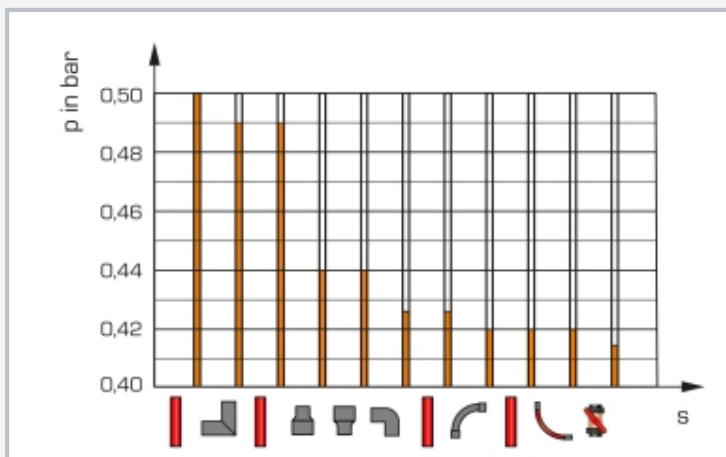
The experimental unit is positioned easily and securely on the work surface of the HM 150 base module. The water is supplied and the flow rate measured by HM 150. Alternatively, the experimental unit can be operated by the laboratory supply.

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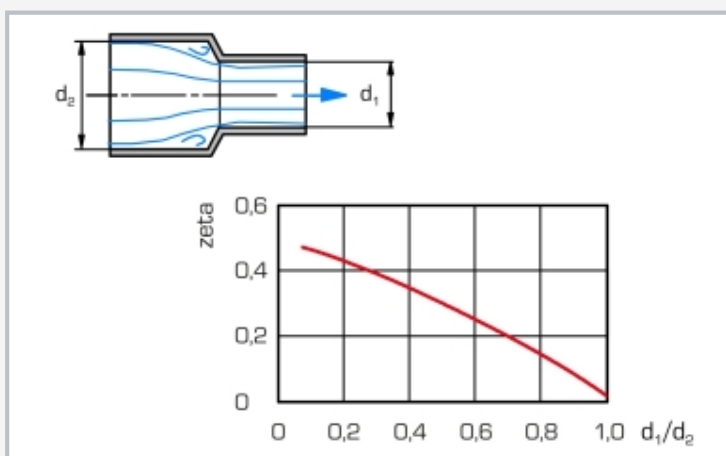
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1 narrow pipe bend, 2 annular chamber, 3 6 tube manometers, 4 wide pipe bend, 5 ball valve, 6 segment bend, 7 Bourdon tube pressure gauge, 8 contraction/enlargement, 9 pipe angle



Sample measurement of the pressures between the various pipe elements at a flow rate of 10,3L/min; p pressure, s continuous pipe section from inlet to outlet



Representation of the flow conditions in a sudden contraction and associated resistance coefficient zeta;  $d_1$  inner diameter

### Specification

- [1] investigation of the pressure loss in flow through pipe fittings and in the ball valve
- [2] sudden contraction and sudden 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

### Technical data

Pipe, PVC

- inner diameter: 17mm

Pipe elements, PVC

Inner diameter:  $d$

- sudden contraction: from  $d=17$  to  $d=9,2$ mm
- sudden enlargement: from  $d=9,2$  to  $d=17$ mm
- segment bend:  $d=17$ mm,  $90^\circ$
- pipe angle:  $d=17$ mm,  $90^\circ$
- narrow pipe bend:  $d=17$ mm,  $r=40$ mm,  $90^\circ$
- wide pipe bend:  $d=17$ mm,  $r=100$ mm,  $90^\circ$

Measuring ranges

- pressure:
  - ▶ 1x 0...1,6bar
  - ▶ 6x 0...0,03bar

LxWxH: 840x675x930mm

Weight: approx. 28kg

### Required for operation

HM 150 (closed water circuit) or water connection, drain

### Scope of delivery

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

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Optional accessories

070.15000

HM 150

Base module for experiments in fluid mechanics