HM 241
Fundamentals of water flow

Learning objectives/experiments

- fundamentals of pipe flow and open-channel flow
- differential pressure measurement at the orifice, Venturi nozzle, pipe bends and pipe angles, contraction and enlargement
- investigation of weir structures in an open channel
- in conjunction with the power meter HM 240.02
  - ▸ recording a pump characteristic

Description

- **water flow in open channels**
- **experiments on pipe flow**
- **closed water circuit**

In the field of fluid mechanics of incompressible fluids a distinction can be made between pipe flow and open-channel flow. With sufficient pressure and flow velocity in the completely filled pipe, the flow is considered as one-dimensional for reasons of simplicity. Due to this precondition physical phenomena can easily be described and calculated. Open-channel flow in contrast is always multi-dimensional.

The compact HM 241 experimental unit enables a variety of experiments on the fundamentals of incompressible flow in open channels and pipes.

A pump supplies water from the storage tank through the supply line into the open channel or the pipe. The flow processes are clearly visible since all parts are made of transparent plastic.

In the pipe section the water flows through an orifice, a Venturi nozzle, a contraction, an enlargement as well as pipe bends and pipe angles of varying diameters. The open channel has a broad-crested weir and a sharp-crested weir. A valve is used to close off or open up the two different working sections.

A pressure sensor is located on the device for differential pressure measurement. This sensor can be connected to the measuring points in the pipe via a hose. The supply line contains a flow rate sensor to determine the flow rate.

The measured values are transmitted directly to a PC via USB. The GUNT software is included and clearly displays the results of the experiments.

The water level is determined with an electronic water level gauge.

The power meter HM 240.02 is required to measure the power consumption of the pump.

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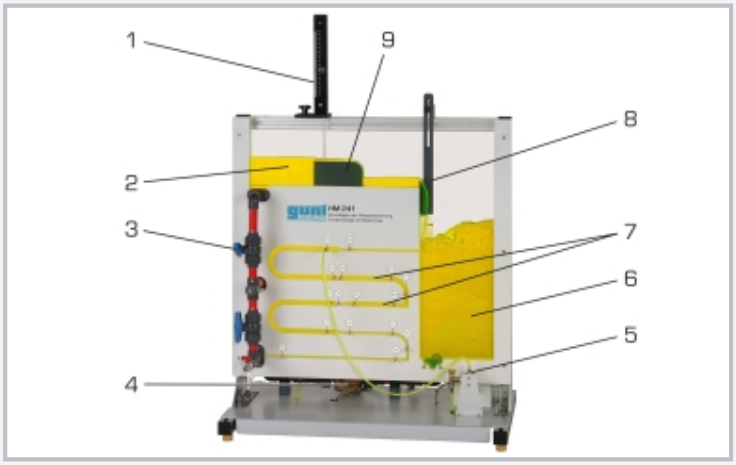
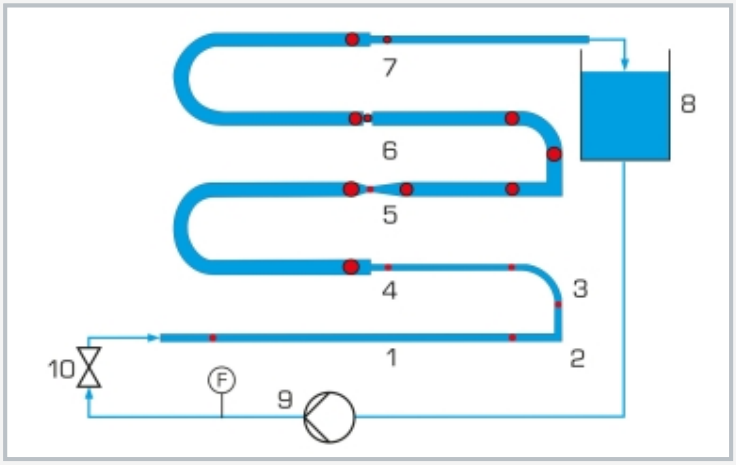
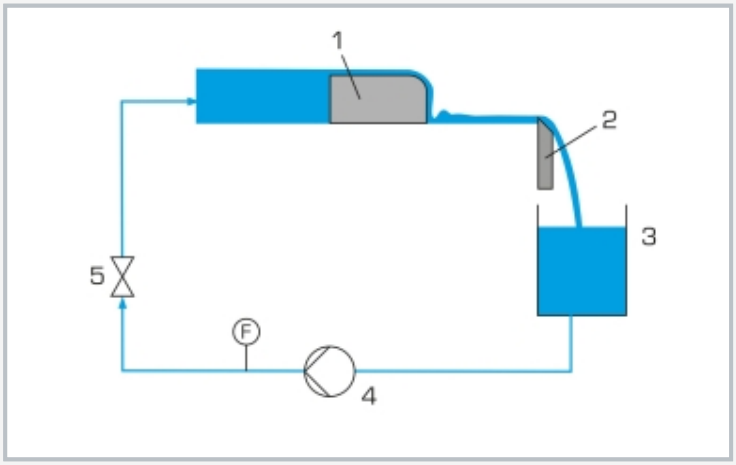


1 level gauge, 2 open channel, 3 shut-off valve, 4 pump, 5 pressure sensor, 6 storage tank, 7 pipe section with pressure measuring points, 8 sharp-crested weir, 9 broad-crested weir



Pressure losses in pipes: 1 straight pipe section, 2 90° pipe angle, 3 90° pipe bend, 4 sudden enlargement, 5 Venturi nozzle, 6 orifice plate, 7 sudden contraction, 8 storage tank, 9 pump, 10 shut-off valve; F flow, red: pressure measuring points



Open-channel flow: 1 broad-crested weir, 2 sharp-crested weir, 3 storage tank, 4 pump, 5 shut-off valve; F flow

Specification

[1] investigation of the fundamentals of different areas of incompressible flow
[2] closed water circuit with pump
[3] transparent pipe section and open channel
[4] experiments on pressure losses at pipe bends and pipe angles, Venturi nozzle, orifice plate
[5] one broad-crested weir and one sharp-crested weir
[6] horizontally travelling level gauge with vertically travelling probe tip to measure the water levels
[7] pressure measuring points for differential pressure measurement before and after the respective pipe resistances
[8] measurement of the power consumption of the pump with power meter HM 240.02
[9] GUNT software for data acquisition via USB under Windows 10

Technical data

Pump, 3 stages
- max. power consumption: 100W
- max. flow rate: 83L/min
- max. head: 6m

Electronic water level gauge
- measuring range: 0...200mm
- graduation: 1mm
- travel: max. 205mm

Measuring ranges
- differential pressure: 0...600mbar
- flow rate: 3,5...50L/min

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase
120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 850x540x970mm
Weight: approx. ca. 50kg

Required for operation

PC with Windows

Scope of delivery

1 experimental unit
2 weirs
1 set of tools
1 electronic water level gauge
1 CD with GUNT software + USB cable
1 set of instructional material

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Optional accessories

070.24002	HM 240.02	Power meter
020.30009	WP 300.09	Laboratory trolley