

HM 150.18

Osborne Reynolds experiment



The illustration shows the device on the work surface of the HM 150 base module and the GUNT Media Center, tablet not included

Learning objectives/experiments

- visualisation of laminar flow
 - visualisation of the transition zone
 - visualisation of turbulent flow
 - determination of the critical Reynolds number
- GUNT 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

Description

- visualisation of laminar and turbulent flow with ink
- determining the critical Reynolds number
- traditional experiment based on the model of the British physicist Osborne Reynolds
- flow visualisation using CFD technology
- multimedia teaching material on-line in the GUNT Media Center: E-Learning course, prepared CFD simulations, worksheets, videos

The Osborne Reynolds experiment is used to display laminar and turbulent flows. During the experiment it is possible to observe the transition from laminar to turbulent flow after a limiting velocity. The Reynolds number is used to assess whether a flow is laminar or turbulent.

With HM 150.18 the streamlines during laminar or turbulent flow are displayed in colour with the aid of an injected contrast medium (ink). The experimental results can be used to determine the critical Reynolds number.

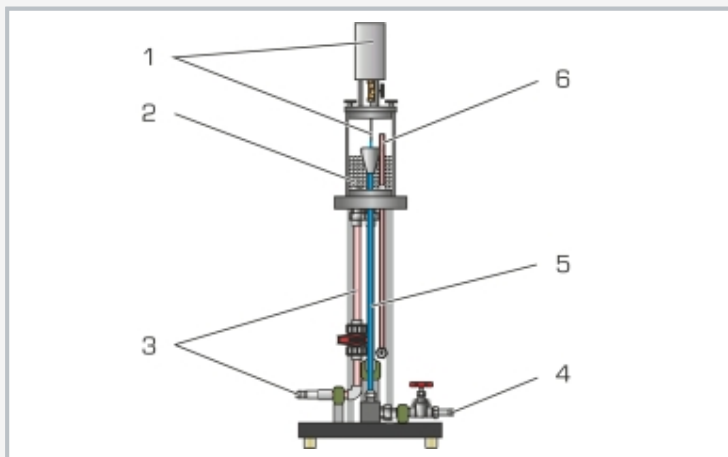
The experimental unit consists of a transparent pipe section through which water flows, with flow-optimised inlet. A valve can be used to adjust the flow rate in the pipe section. Ink is injected into the flowing water. A layer of glass beads in the water tank ensures an even and low-turbulence flow.

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 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.

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1 tank for ink with inlet pipe, 2 overflow, 3 water supply, 4 water drain, 5 pipe section with valve, 6 water tank with glass beads



Flow conditions from left to right: laminar flow, transition from laminar to turbulent flow, turbulent flow



Screenshot of the GUNT Media Center

Specification

- [1] visualisation of laminar and turbulent flow in the Osborne Reynolds experiment
- [2] water as flowing medium and ink as contrast medium
- [3] vertical glass pipe section
- [4] water tank with glass beads to stabilise the flow
- [5] flow rate in the pipe section can be adjusted via a valve
- [6] flow rate determined by HM 150 base module
- [7] water supply using HM 150 base module or via laboratory supply
- [8] flow visualisation using prepared CFD simulations
- [9] digital multimedia teaching material online in the GUNT Media Center: E-Learning course, prepared CFD simulations, worksheets, videos

Technical data

Water tank

- capacity: 2200mL

Pipe section

- length: 675mm
- Ø, inner: 10mm

Tank for ink

- capacity: approx. 250mL

LxWxH: 400x400x1140mm

Weight: approx. 16kg

Required for operation

HM 150 (closed water circuit) or water connection, drain;
PC or online access recommended

Scope of delivery

- 1 experimental unit
- 1 bag of glass beads
- 1 ink (1L)
- 1 set of instructional material
- 1 online access to the GUNT Media Center

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Optional accessories

HM 150 Base module for experiments in fluid mechanics