

## HM 150.14

### Vortex formation



#### Learning objectives/experiments

- visualisation of various vortices
- investigation of free and forced vortices
- representation of surface profiles
- determination of velocity

#### Description

- **generation and investigation of free and forced vortices**
- **different inserts for the water drain**
- **impeller for generating a forced vortex**

In fluid dynamics, a vortex is a circular flow of a fluid caused by sufficiently large velocity gradients. In practice, this can be observed when water flows out of a basin into a pipe or when two fluids with different speeds meet each other.

The HM 150.14 experimental unit allows you to produce and study free and forced vortices.

The experimental unit has a transparent tank with nozzles, various inserts on the water drain, an impeller and a point gauge for detecting the vortex profiles.

To form the free vortex, water is introduced radially into the tank and flows through a ring to slow down. The vortex is created by the flow out of the tank. There are four easily replaceable inserts of various diameters available for the drain.

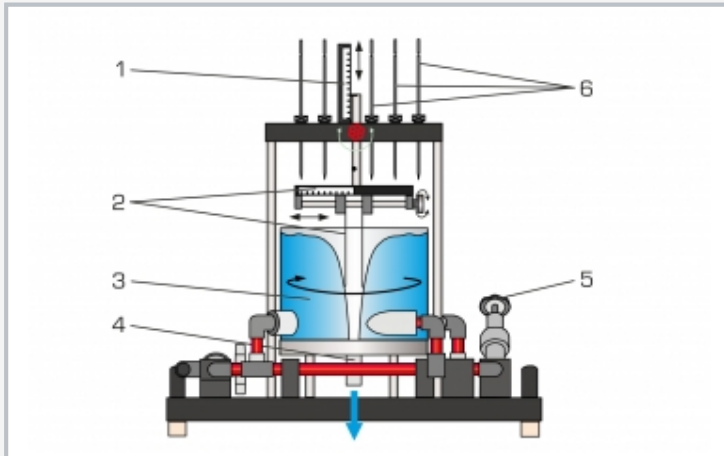
To form a forced vortex, the water is introduced tangentially. The vortex is generated via an impeller driven by a water jet.

The point gauges are used to measure the surface profiles of the vortices. The speed of the vortex is also determined.

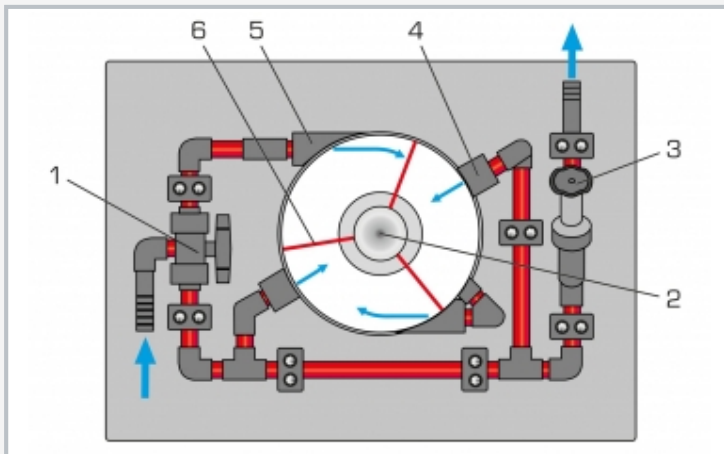
The experimental unit is positioned easily and securely on the work surface of the HM 150 base module. The water is supplied and the flow measured by HM 150. Alternatively, the experimental unit can be operated by the laboratory supply.

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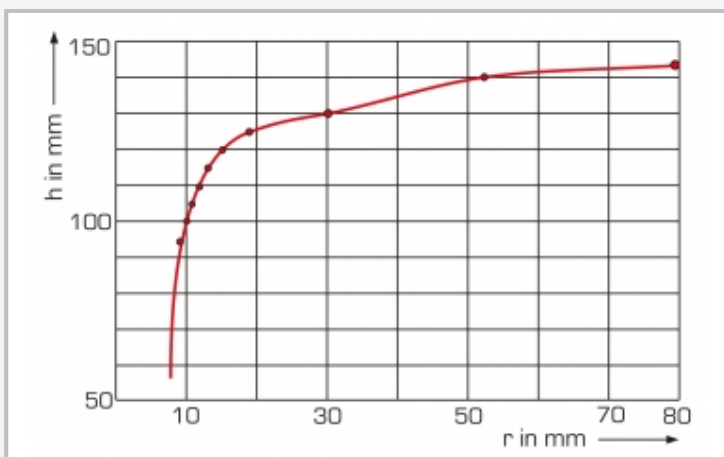
## Vortex formation



1 scale for measuring height, 2 point gauge with scale for measuring vortex radii, 3 free vortex, 4 water drain, 5 valve for water drain, 6 point gauge for measuring height of the vortex surface



Plan view of the experimental unit: 1 valve for selecting tangential/radial water inlet, 2 water drain, 3 valve for water drain, 4 nozzle for radial water supply, 5 nozzle for tangential water supply, 6 impeller



Surface profile of a free vortex: r radius, h height

### Specification

- [1] generation and investigation of vortices
- [2] transparent tank allows visualisation of vortex formation
- [3] two nozzles for radial water supply (free vortex)
- [4] two nozzles for tangential water supply (forced vortex)
- [5] different inserts for the water drain to generate free vortex
- [6] impeller for generating a forced vortex
- [7] point gauges detect the surface profile
- [8] flow rate determined by HM 150 base module
- [9] water supply using HM 150 base module or via laboratory supply

### Technical data

#### Tank

- diameter: 250mm
- height: 190mm

#### 4 inserts for the water drain

- diameter: 8, 12, 16 and 24mm

#### Impeller with 3 blades

#### Vertical point gauge

- 6 movable rods

#### Horizontal point gauge

- 2 movable rods

#### Measuring tube, movable

- horizontal 0...90mm, vertical 70...190mm
- diameter: 4mm

LxWxH: 640x400x675mm

Weight: approx. 18kg

### Required for operation

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

### Scope of delivery

- 1 experimental unit
- 4 inserts for the water drain
- 1 impeller
- 1 set of instructional material

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Optional accessories

070.15000

HM 150

Base Module for Experiments in Fluid Mechanics