

HM 133

Visualisation of Flow Fields



- * **Visualisation of flow fields and streamlines by using electrolytically generated hydrogen bubbles**
- * **Illuminated experimental section**
- * **Different models: drag bodies and changes in cross section**
- * **Investigations in laminar and turbulent flow**

Technical Description

Fine gas bubbles are perfectly suited to visualising flow fields. Due to the Reynolds analogy, many flow processes that occur in air can also be demonstrated by experiments in water.

The experimental unit HM 133 can be used to visualise laminar and turbulent flow processes in a water channel. Hydrogen bubbles are generated electrolytically at a cathode made of thin platinum wire. A stainless steel plate is used as an anode. Small bubbles that detach from the platinum wire are easily carried along by the flow due to their small size.

An interchangeable model is used in the shallow water channel and flow travels around and through it. Bulbs are located along the experimental section on the walls of the water channel. The indirect illumination results in a high-contrast image.

The experiments run with a low flow velocity. Flow separation and vortex formation are clearly visible. Different drag bodies or changes in cross sections are used as models, e.g. cylinder, aerofoil profile and rectangle. A flow straightener and a layer of glass balls ensure a smooth and low-turbulence flow. The power for the electrolysis, its pulse and pause length and the flow velocity in the water channel can all be adjusted.

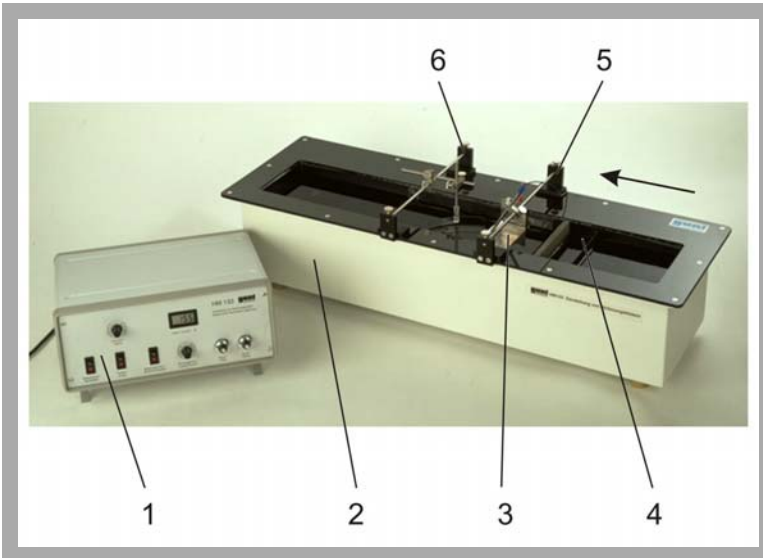
The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

Learning Objectives / Experiments

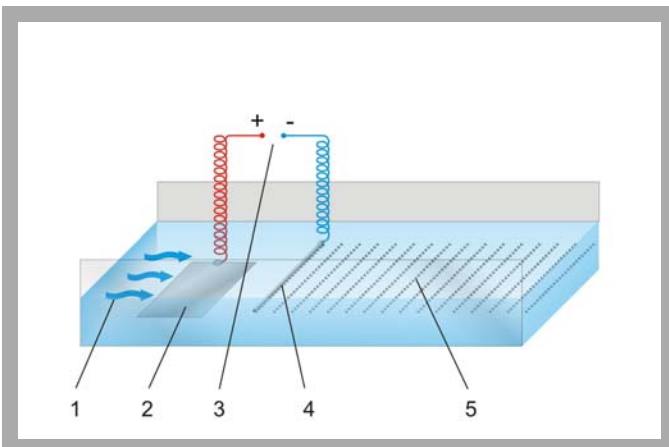
- visualisation of two-dimensional flows
- streamline course in flow around and through models
- flow separation
- vortex formation, demonstration of Karman vortices
- qualitative observation of the velocity distribution in laminar and turbulent flow
- analogy to air flow

HM 133

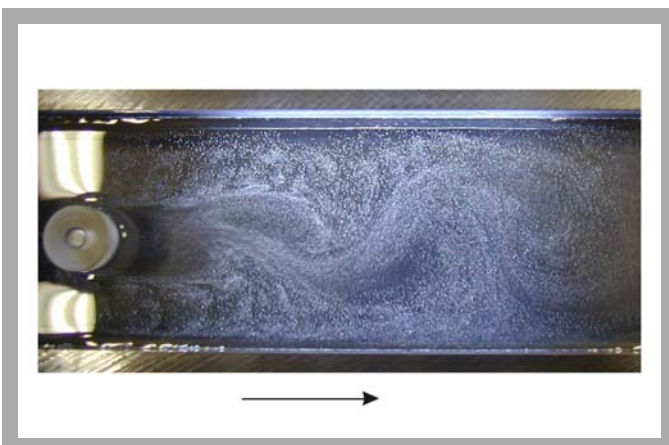
Visualisation of Flow Fields



1 display and control unit, 2 water channel with bulbs along the experimental section, 3 anode, 4 flow straightener, 5 mount for cathode, 6 mount for model; arrow shows the direction of flow



Principle of electrolytic generation of hydrogen bubbles
1 water inlet, 2 anode, 3 power source, 4 cathode, 5 diffusion of bubble fronts (pulsed)



When flowing around a cylinder, a Karman vortex forms behind the model; Arrow shows the direction of flow

Specification

- [1] visualisation of flow fields by using electrolytically generated hydrogen bubbles
- [2] platinum wire as cathode and stainless steel plate as anode for electrolysis
- [3] shallow water channel fitted with bulbs along the experimental section for indirect illumination
- [4] various models are included: aerofoil, rectangle, straight plate, curved plate, cylinder (various sizes), various models for changes in cross section
- [5] flow straightener and glass balls ensure consistent and low-turbulence flow
- [6] different flow velocities via variable-speed circulating pump
- [7] setting power (with display), pulse and pause length of the power and the flow velocity in the water channel

Technical Data

- Pump with adjustable speed
 - max. head: 10m
 - max. flow rate: 20L/min
- 3 cathodes with platinum wire
 - diameter: 0,2mm
 - length: 30, 50, 75mm
- Anode, stainless steel plate, L-shaped
 - LxWxH: 70x50x145mm
 - thickness: 0,5mm
- Water channel: approx. 6L
- Experimental section: LxWxH: 560x150x176mm
- Illumination: 30 white LEDs on the walls of the water channel

Dimensions and Weight

- LxWxH: 900x300x220mm (experimental unit)
- LxWxH: 360x340x160mm (display and control unit)
- Weight: approx. 24kg

Connections

230V, 50/60Hz, 1 phase or 120V, 60Hz/CSA, 1 phase

Scope of Delivery

- 1 experimental unit
- 1 display and control unit
- 3 cathodes
- 1 set of models (drag bodies, changes in cross section)
- 1 set of instructional material

Order Details

070.13300 HM 133 Visualisation of Flow Fields