CE 117
Flow through particle layers

Description

- **experiments in the fundamentals of fluid mechanics on particle layers**
- **flow through fixed beds**
- **flow through fluidised beds**
- **pressure loss in fixed beds and fluidised beds**

Flow through particle layers is widely encountered in process engineering. In reactors, fixed and fluidised beds are subjected to through-flow by liquids and gases. The separation of solids from suspensions by cake and depth filtration is another area of application.

With CE 117 the fluid mechanic principles involved in flow through fixed beds and fluidised beds can be investigated. For the purpose, a fillable test tank made of glass is provided, through which water can be made to flow from both ends. A sintered-metal plate serves as the base for bulk solids.

Water from the laboratory water connection flows into the test tank. To investigate flow through fixed beds, the water enters the test tank from the top. It flows through the fixed bed and the sintered-metal plate and passes by way of a distributor to the outlet.

The experimental setup can be modified by means of quick-release couplings. This also enables the flow through the test tank to be reversed and fluidised beds to be investigated. The water flows upwards through the porous sintered-metal plate and the fixed bed. If the velocity of the water is less than the so-called fluidisation velocity, the flow merely passes through the fixed bed. At higher velocities a fluidised bed is formed. The water flows from the head of the test tank into an expansion tank. From there it flows into the outlet.

Regardless of the specific setup, the flow rate is adjusted by a valve and indicated by a flow meter. To determine the pressure loss via the fixed bed or fluidised bed, two manometers with differing measuring ranges are provided. The desired manometer is selected by way of valves.

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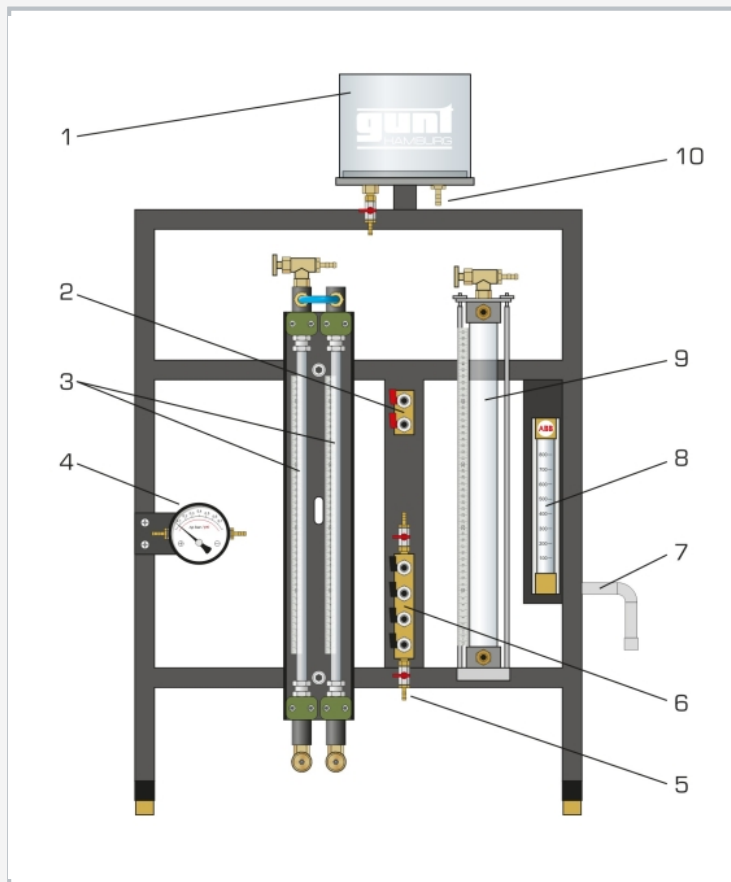
1 expansion tank, 2 inlet distributor, 3 tube manometer, 4 manometer, 5 outlet, 6 distributor for pressure measurement, 7 inlet, 8 flow meter, 9 test tank, 10 outlet
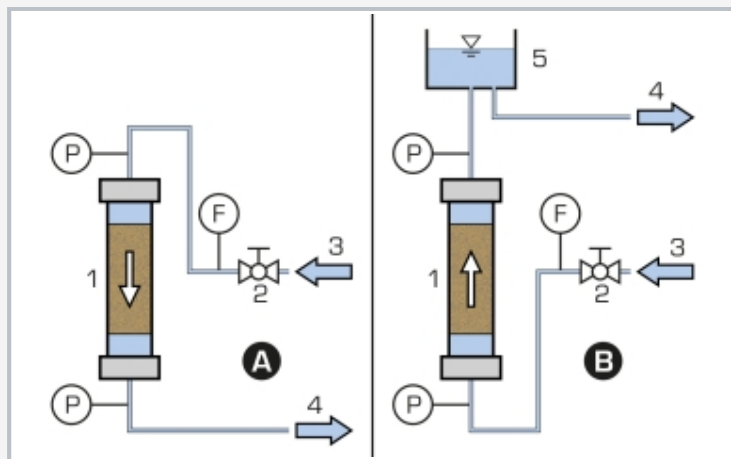
Process schematic for the investigation of fixed beds (A) res. fluidised beds (B): 1 test tank (particle layer), 2 valve (flow rate), 3 inlet, 4 outlet, 5 expansion tank; P pressure, F flow rate

Specification

[1] investigation of the properties of fixed and fluidised beds subjected to liquid flow
[2] glass test tank with sintered filter medium on its base
[3] test tank removable for filling
[4] downward flow to investigate fixed beds
[5] upward flow to investigate fluidised beds
[6] flow meter with valve for adjustment
[7] 2 manometers with differing measuring ranges to measure pressure loss through the test tank
[8] steel rule to measure the height of the fixed or fluidised bed

Technical data

Test tank
- length: 510mm
- inner diameter: approx. 37mm
- material: DURAN glass

Filter medium
- thickness: 2mm
- material: sintered metal

Expansion tank
- capacity: approx. 4500mL
- material: PVC

Measuring ranges
- flow rate: 82...820mL/min
- differential pressure:
  - 2x 0...500mmWC
  - 1x 0...250mbar
- height: 10...500mm

LxWxH: 690x410x1150mm
Weight: approx. 26kg

Required for operation

water connection: approx. 1L/min
drain

Scope of delivery

1 experimental unit
1 packing unit of glass-shot beads (420...590µm; 1kg)
1 packing unit of sand (1...2mm; 0,5kg)
1 packing unit of glass-shot beads (180...300µm; 0,5kg)
1 set of accessories
1 set of instructional material

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Optional accessories

020.30009 WP 300.09 Laboratory trolley