HM 450.03
Propeller type turbine

Description

- **propeller type turbine with visible operating area**
- **closed water circuit and data processing software for use with the HM 450C trainer**

Similar to Kaplan turbines propeller type turbines are part of the reaction turbines with an axial through flow. In contrast to Kaplan turbines propeller type turbines have fixed blades. These turbines are used at low heads and very large flow rates. The turbine power is changed by adjusting the guide vanes. In practice, propeller type turbines and Kaplan turbines are used in run-of-the river power plants.

The propeller type turbine HM 450.03 is an accessory for the HM 450C trainer. The experimental unit consists of the rotor, the distributor with adjustable guide vanes, a wear-free and adjustable eddy current brake for loading the turbine and the housing with a transparent pipe element. The transparent cover enables you to observe the water flow, the rotor and the guide vanes during operation.

In the propeller type turbine, the water flows axially through the rotor. The angle of attack and the cross-section of flow are adapted to the speed and power of the turbine by adjusting the guide vanes.

The pressure at the turbine inlet is recorded with a pressure sensor. A force sensor and a speed sensor are attached to the eddy current brake. Thus, the mechanical power output of the turbine can be determined. Speed, torque and pressure are displayed on the switch cabinet of HM 450C and processed further in the software. Water supply and flow rate measurement are provided by HM 450C.

Learning objectives/experiments

- determination of mechanical output
- determination of efficiency
- recording of characteristic curves
- investigation of the influence of the guide vane position on the efficiency

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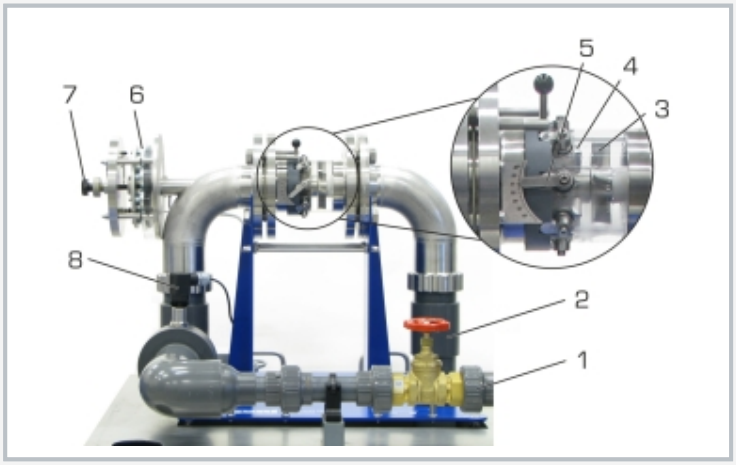
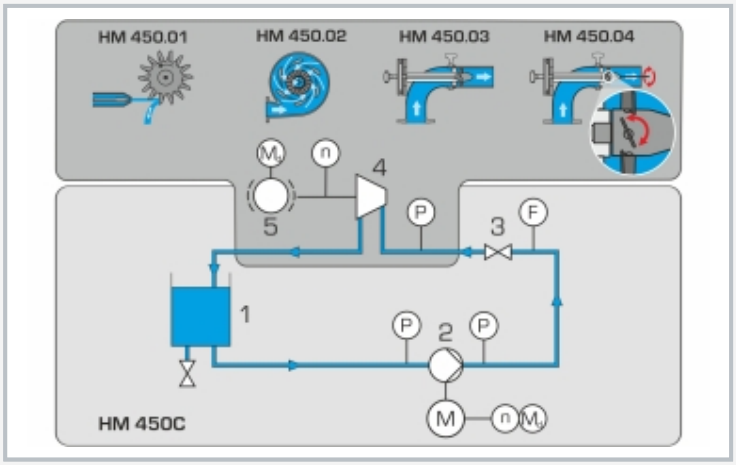
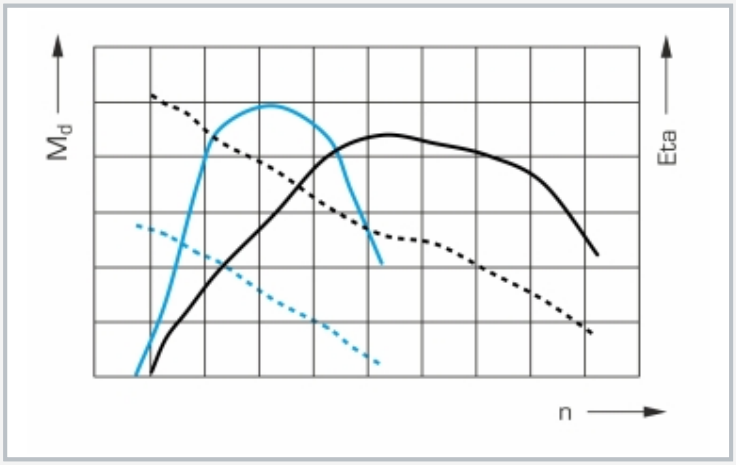


1 water supply via HM 450C, 2 water drain to HM 450C, 3 rotor, 4 adjustment of the guide vane position, 5 index with scale of the guide vane position, 6 eddy current brake, 7 handwheel for adjusting the brake, 8 pressure sensor



1 tank, 2 pump, 3 flow control valve, 4 turbine, 5 brake, M motor; F flow rate, P pressure, n speed, M_d torque



Efficiency and torque (dashed lines) depending on the speed at different angles of attack: black 35°, blue 15°, Eta efficiency, n speed, M_d torque

Specification

[1] transparent pipe element for observing the operating area
[2] rotor with fixed blades
[3] adjustable guide vanes for setting different angles of attack
[4] recording the curves of a propeller type turbine and investigating the influence of the guide vane position
[5] loading the turbine by use of a wear-free and adjustable eddy current brake
[6] non-contact speed measurement and force sensor at the brake for measuring the torque
[7] pressure sensor at the turbine inlet
[8] speed, torque and pressure displayed on the switch cabinet of HM 450C
[9] water supply, flow rate measurement and data processing software via HM 450C

Technical data

Turbine
- output: approx. 10W at 600min^{-1}, 516L/min
- max. speed: 900min^{-1}
- rotor
  - 6 blades, fixed
  - external Ø: 67mm,
  - internal Ø: 30mm
- distributor
  - 8 guide vanes, adjustable
  - angle of attack: -20...30°

Measuring ranges
- torque: -25...25Nm
- pressure: 0...4bar abs.
- speed: 0...4000min^{-1}

LxWxH: 685x480x490mm
Weight: approx. 42kg

Scope of delivery

1 experimental unit
1 set of instructional material

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Required accessories

HM 450C	Characteristic variables of hydraulic turbomachines