

HM 288

Experiments with a reaction turbine



The illustration shows HM 288 on top of the water tank in HM 290.

Description

- illustrative model of a water turbine according to the reaction principle
- adjustable, wear-free eddy current brake as turbine load
- GUNT software for data acquisition, visualisation and operation
- part of the GUNT Labline fluid energy machines

The conversion of pressure energy into kinetic energy in the rotor is characteristic for reaction turbines.

The experimental unit is placed upon the base unit HM 290. The two units together provide the basic experiments to get to know the operating behaviour and the most important characteristic variables of reaction turbines.

The water jet discharged from the rotor which drives the turbine according to the reaction principle can be observed during operation. This facilitates the understanding of the principle of operation and the underlying laws (eg. momentum).

HM 288 consists of a rotor mounted in a transparent housing and a loading device outside of the housing. The eddy current brake generates a defined load. The eddy current brake is specially developed by GUNT. It is wear-free and can be finely adjusted.

The torque delivered by the turbine is determined via an electronic force sensor. The speed is measured with an optical speed sensor. The measuring values are transferred to the base unit HM 290.

The water supply and the flow rate measurement are realised with the base unit HM 290. A pressure control included in HM 290 enables the recording of characteristics at a constant head.

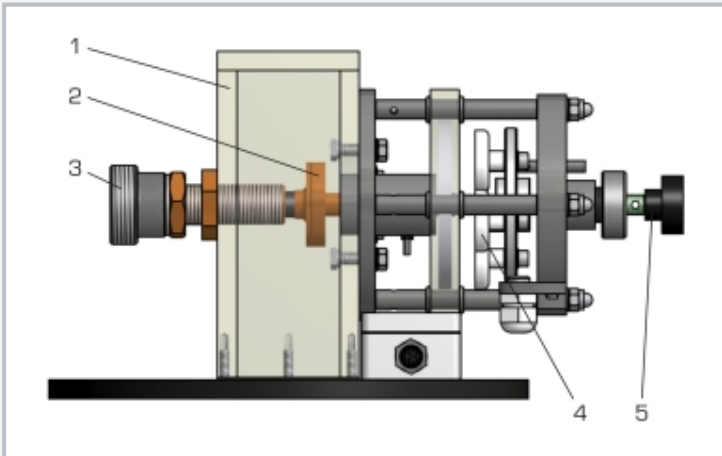
All the advantages of software-supported experiments and evaluation are offered by the GUNT software in HM 290.

Learning objectives/experiments

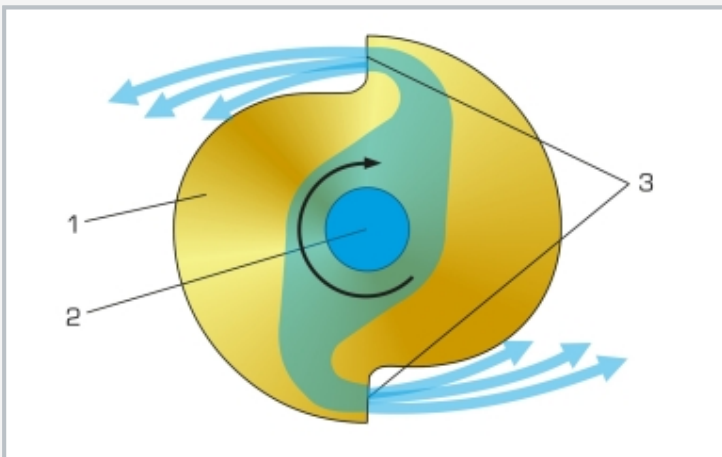
- principle of operation of a reaction turbine
- characteristic curves at constant head
 - ▶ relationship between torque and speed
 - ▶ efficiency dependent on speed
 - ▶ flow rate dependent on speed
 - ▶ hydraulic power and mechanical power depending on speed
- evaluation of measuring values and characteristics based on the theory

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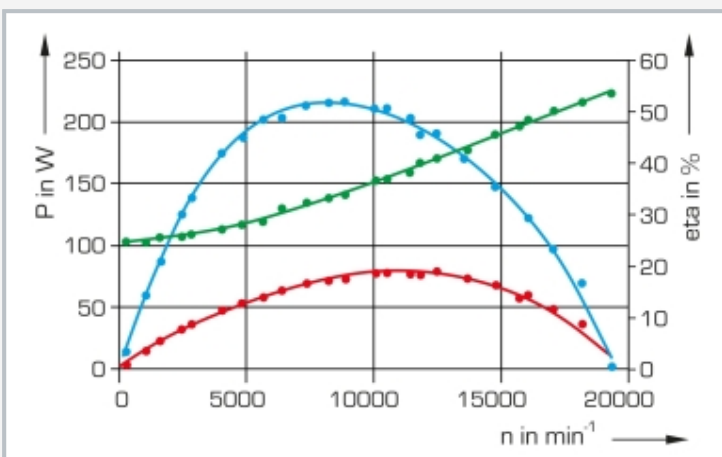
Experiments with a reaction turbine



1 transparent housing, 2 rotor, 3 water supply, 4 eddy current brake, 5 adjustment of the eddy current brake



Principle of operation of a reaction turbine
1 rotor, 2 water inlet via hub, 3 water outlet via tangential nozzles



Characteristic curves of the reaction turbine dependent on the speed
red: mechanical power P_{mech} , blue: efficiency, green: hydraulic power P_{hydr} ; P power, η efficiency, n speed

Specification

- [1] turbine to place upon the base unit HM 290
- [2] functioning and operating behaviour of a reaction turbine
- [3] transparent housing for observing the discharged water jet
- [4] constant pressure of the turbine represents in practice the head and is adjusted via HM 290
- [5] turbine load using the wear-free and adjustable eddy current brake
- [6] force sensor to determine the torque on turbine shaft
- [7] optical speed sensor for measuring the turbine speed
- [8] water supply, flow rate measurement and unit-specific software data acquisition and operation via HM 290

Technical data

- Turbine
- power output: approx. 60W at 8000min⁻¹
 - rotor diameter: 50mm

- Measuring ranges
- torque: 0...0,5Nm
 - speed: 0...20000min⁻¹

LxWxH: 360x250x180mm
Weight: approx. 5kg

Scope of delivery

- 1 experimental unit
- 1 set of instructional material

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Required accessories

HM 290 Base unit for turbines