

# HM 291

## Experiments with an action turbine



The illustration shows HM 291 on top of the water tank in HM 290.

### Description

- illustrative model of an axial constant-pressure turbine
- 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

Action turbines operate according to the principle of equal pressure. The static pressures at the inlet and at the outlet of the rotor are equal.

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 action turbines.

The water jets are discharged at high velocity from the four nozzles of the distributor. The water jets are deflected in the rotor and put it in motion. The axially discharged water from the rotor can be observed.

HM 291 consists of a rotor, mounted in a transparent housing, a distributor with four nozzles and a loading device outside of the housing. The number of active nozzles can be adjusted by valves. 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.

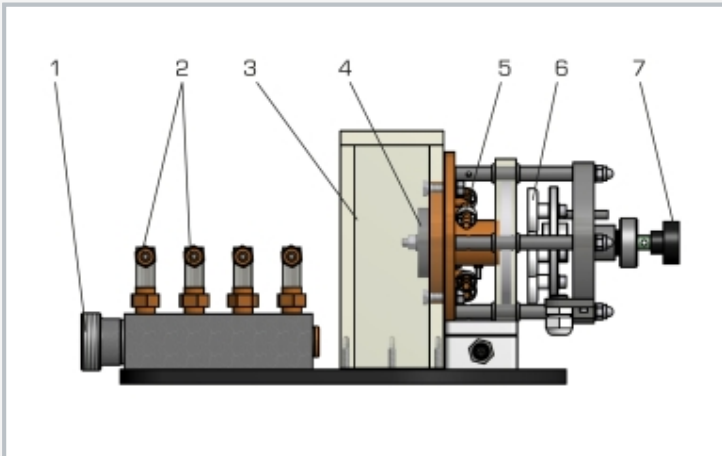
All the advantages of software-supported experiments and evaluation are offered by the GUNT software in HM 290.

### Learning objectives/experiments

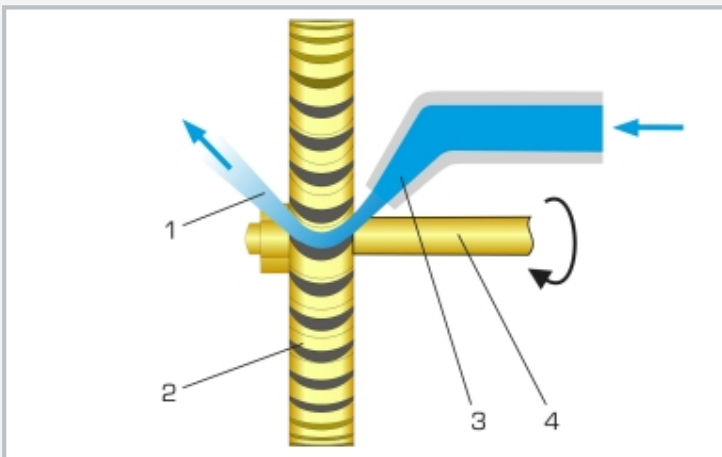
- principle of operation of an action turbine
- characteristic curves at constant head
  - ▶ relationship between torque and speed
  - ▶ efficiency dependent on speed
  - ▶ flow rate dependent on speed
  - ▶ hydraulic power and mechanical power dependent on speed
- evaluation of measuring values and characteristics based on the theory
- partial load behaviour with controlling the number of nozzles in comparison to throttle control

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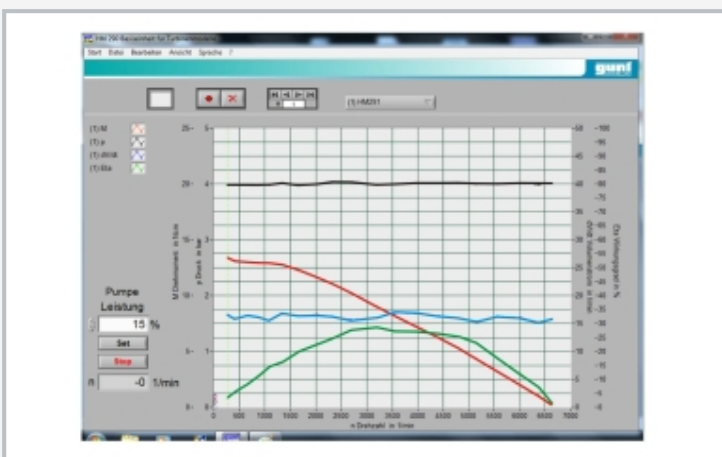
## Experiments with an action turbine



1 water supply, 2 nozzle valves, 3 transparent housing, 4 rotor, 5 distributor with 4 nozzles, 6 eddy current brake, 7 adjustment of the eddy current brake



Principle of operation of an action turbine  
1 water outlet, 2 rotor, 3 water inlet from four nozzles, 4 turbine shaft



Software screenshot: characteristic curves of the action turbine dependent on speed

### Specification

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

### Technical data

- Turbine
- power output: approx. 28W at 3600min<sup>-1</sup>
  - rotor diameter: 50mm
- Measuring ranges
- torque: 0...0,5Nm
  - speed: 0...9000min<sup>-1</sup>
- LxWxH: 420x320x180mm  
Weight: approx. 7kg

### Scope of delivery

- 1 experimental unit
- 1 set of instructional material

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Required accessories

HM 290            Base unit for turbines