



Features:

- Model of a reaction turbine¹
- Transparent operating area¹
- Turbine with adjustable guide vanes¹
- Loading by band brake

Water turbines are turbomachines utilizing water power. The Francis turbine is a type of reaction turbine which converts the pressure energy of the water into kinetic energy in the control device and in the impeller. The water is fed in the control device by means of a spiral housing. The flowing water is accelerated in the control device by the adjustable guide vanes and directed onto the vanes of the impeller. The redirection and further acceleration of the water in the impeller generate an impulse that is transmitted to the impeller.

Tesca Francis Turbine Operating Principles is the model of a Francis turbine demonstrating the function of a reaction turbine.

The experimental unit consists of the impeller, the control device with adjustable guide vanes, a band brake for loading the turbine, and a housing with a transparent front panel. The transparent cover enables the observation of the water flow, the impeller, and the guide vanes during operation. The angle of attack and thus the power of the impeller are modified by adjusting the guide vanes.

The turbine torque is determined by force

measurement on a band brake and is read on spring balances. For measuring the rotational speed, a non-contact speed sensor, HM 082, is required. A manometer shows the water pressure at the turbine inlet.

The experimental unit is positioned easily and securely on the work surface of the HM 150 base module. The water is supplied and the flow rate is measured. Alternatively, the experimental unit can be operated by the laboratory supply. The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

Specifications:

- The function of a Francis turbine
- Transparent front panel for observing the operating area
- Loading the turbine by use of the band brake
- Adjustable guide vanes for setting different angles of attack
- Marking on brake drum for non-contact speed measurement
- Instruments: spring balances for determining the torque, manometer shows the pressure at the turbine inlet
- Flow determination by the base module
- Water supply using the base module or via lab supply

Technical Specifications:

Turbine

- Output: 12W at $n=1100\text{min}^{-1}$, approx. 40L/min, $H=8\text{m}$
- Impeller, 7 vanes

Vane width: 5mm

External diameter: 50mm

- Guide vanes: 6 vanes, adjustable (20 stages)

Measuring ranges

- Braking force (spring balance): 10N
- Pressure: 0...1,0bar

List of Experiments:

1. Design and function of a Francis turbine
2. Determination of torque, power, and efficiency
3. Graphical representation of characteristic curves for torque, power, and efficiency

Note: Specifications are subject to change.

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