H18

Francis Turbine

Shows how a Francis turbine works and tests its performance

Shown mounted on a Hydraulic Bench

Key Features

- Includes band brake to measure turbine torque
- Fully adjustable guide vanes with position indicator
- Includes pressure gauge to measure inlet pressure
- Transparent front so students can see what is happening
- Works with TecQuipment's Hydraulic Bench for easy installation

Learning Outcomes

- Efficiency of a Francis turbine
- Performance of a Francis turbine at different flow rates
- The effect of different guide vane settings on turbine performance

Key Specifications

- 3 Watt nominal power
- Band brake
- Six adjustable guide vanes
- Inlet pressure gauge
- Transparent front

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TecQuipment

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Description

The Francis Turbine is a laboratory-scale reaction turbine for use with TecQuipment's Digital Hydraulic Bench (H1F, available separately).

The turbine has a sturdy base which sits on the top of the hydraulic bench. The turbine connects to the pumped supply of the hydraulic bench. The bench measures the flow rate. A mechanical gauge measures the inlet pressure to the turbine. Adjustable guide vanes in the turbine alter the flow rate and direction of flow to the impeller (runner) of the turbine. The end of the turbine outlet tube (draft) sits in the recess in the top of the hydraulic bench.

Included with the turbine is a weir plate to create a shallow reservoir in the water channel of a volumetric bench (H1D). This ensures that water covers the end of the draft tube during tests. You do not need this plate when you use the Digital Hydraulic Bench (H1F).

A band brake with spring balances measures the torque at the turbine shaft. A stroboscope with speed display (ST1, available separately) or an optical tachometer (OT1, available separately) can measure the speed of the turbine. The stroboscope can also 'freeze' the image of the turbine and water flow to improve students' understanding of the turbine.

Students test the turbine at different flow rates, loads and guide vane settings. They use the flow, torque, pressure and speed measurements to calculate hydraulic power input and mechanical (shaft) power at the turbine. They use these to create performance curves for the turbine.

Standard Features

- Supplied with a comprehensive user guide
- Five-year warranty
- Manufactured in accordance with the latest European Union directives
- ISO9001 certified manufacturer

Essential Base Unit

- Digital Hydraulic Bench (H1F)*

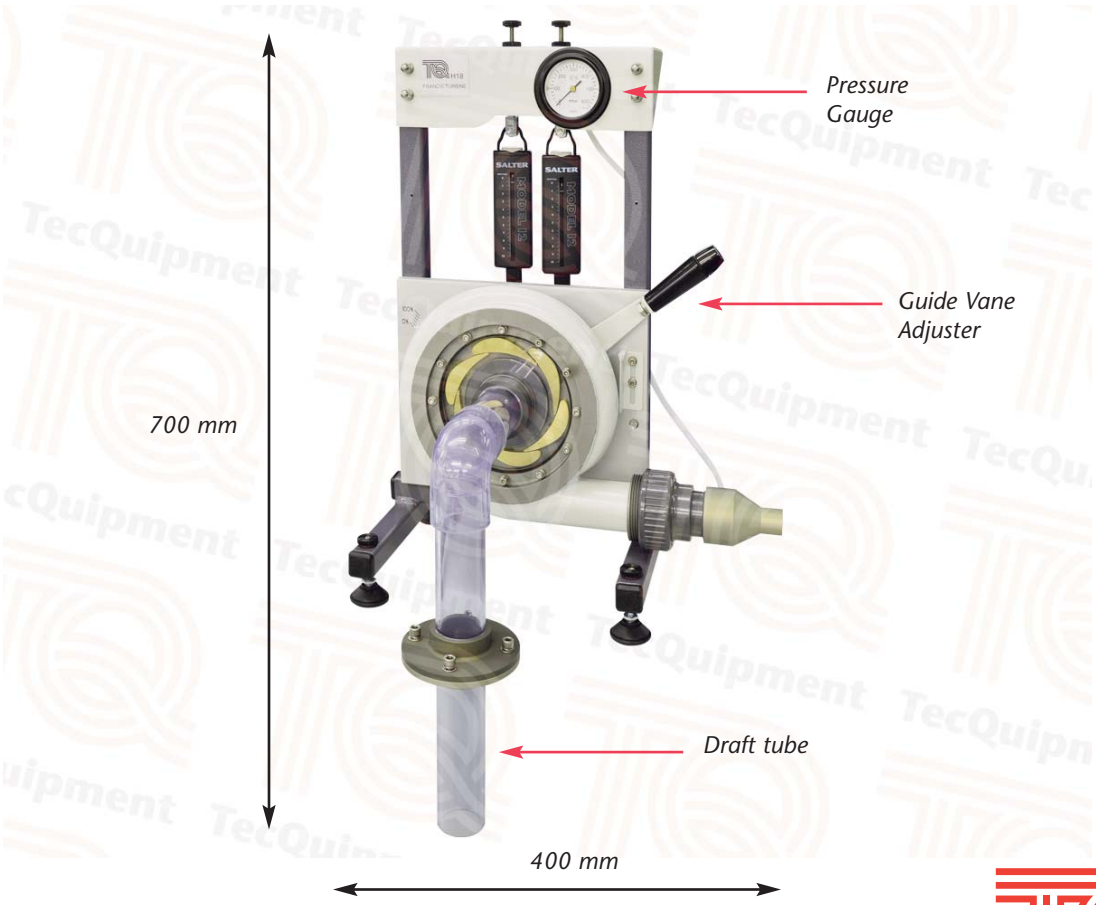
This product will also work with an existing TecQuipment Volumetric Hydraulic Bench (H1D)

Essential Ancillary

- Optical Tachometer (OT1)

Recommended Ancillary

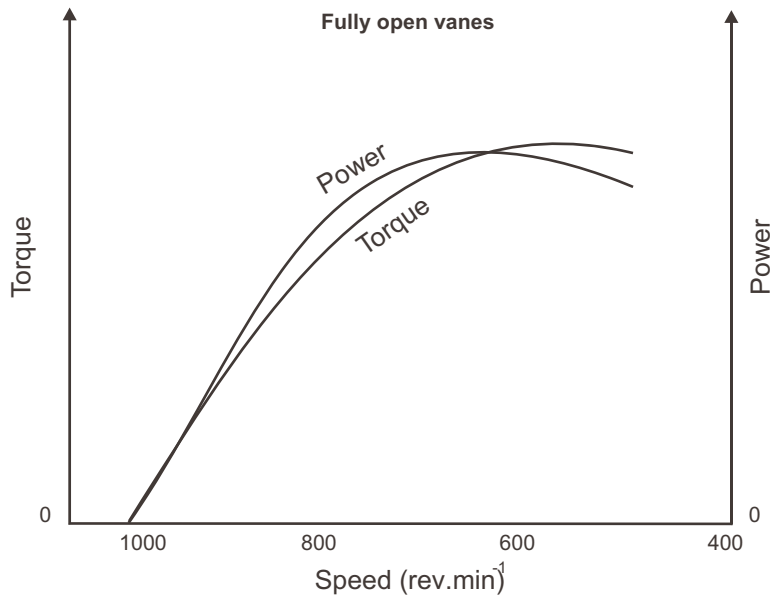
- Stroboscope (ST1)

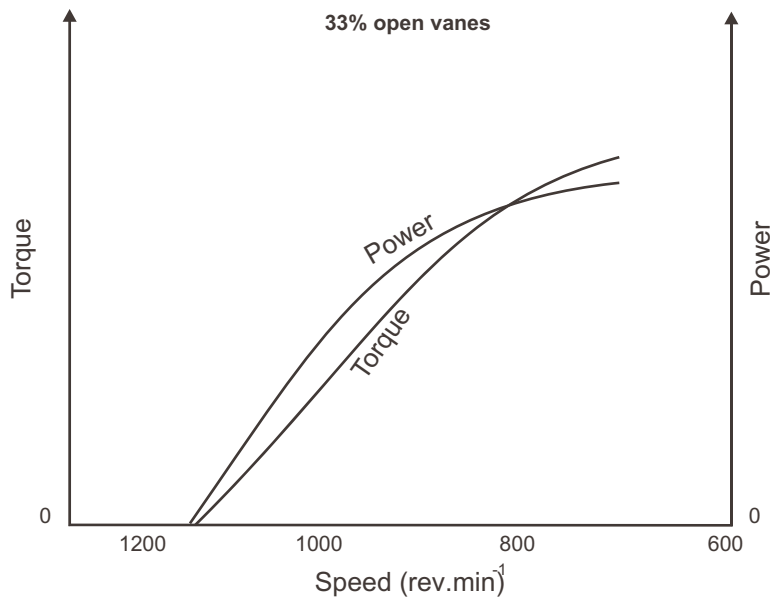


Typical Work Assignments

Speed, torque and power

This experiment tests the performance of the turbine with vanes fully open, and adjusted to 66% and 33% open. The results produce curves of torque and power against speed.





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Detailed Specifications

TecQuipment is committed to a programme of continuous improvement; hence we reserve the right to alter the design and product specification without prior notice.

Nett dimensions and weight (assembled):

400 mm x 360 mm x 700 mm and 11 kg

Approximate packed dimensions and weight (with draft tube extension removed for packing):

0.15 m^3 and 15 kg

Guide vanes:

6 off, adjustable from fully shut to fully open

Impeller:

80 mm diameter, 10 blades

Turbine speed:

Maximum 1100 $rev.min^{-1}$

Turbine power:

Nominal maximum 3 Watts

Operating Conditions

Operating environment:

Laboratory

Storage temperature range:

–25°C to +55°C (when packed for transport)

Operating temperature range:

+5°C to +40°C

Operating relative humidity range:

80% at temperatures < 31°C decreasing linearly to 50% at 40°

Sound Levels

Less than 70 dB(A)

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