H13

VORTEX APPARATUS

Studies the phenomena of free and fixed vortices

SHOWN MOUNTED ON A DIGITAL HYDRAULIC BENCH (H1F) – AVAILABLE SEPARATELY

KEY FEATURES

- For studies of both free and forced vortices
- Transparent vessel – users can see the vortices from all angles
- Includes a traverse probe to measure water surface profile and a Pitot tube to measure total head
- Low-voltage variable-speed motor for safety
- Works with TecQuipment's Hydraulic Bench for easy installation

LEARNING OUTCOMES

- Determination of the surface profile of a free and forced vortex
- Determination of the total head variation in a forced vortex
- Comparison of results with theoretical predictions

KEY SPECIFICATIONS

- Transparent vessel
- Traverse probe
- Pitot tube
- Variable speed

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DESCRIPTION

The TecQuipment Vortex Apparatus enables students to produce both free and forced vortices, and measure the vortex water surface profile.

The product consists of a transparent vessel on a support frame, which mounts on a TecQuipment Digital Hydraulic Bench (H1F, available separately).*

A low-voltage, variable-speed motor rotates the vessel about its vertical axis. A speed-control unit (included), sited away from the main apparatus, controls the speed of rotation.

To produce a forced vortex, students add water to the rotating vessel until it is about half full. A forced vortex forms. After a few minutes the vortex becomes constant, and students can measure the surface profile using the traverse probe. The traverse probe can move both horizontally and vertically, and both axes have linear scales. Students can also measure distribution of total head by replacing the traverse probe with a Pitot tube.

To produce a free vortex, students place a smaller, perforated transparent cylinder inside the main vessel, forming an annulus. They direct the water supply from the bench into the annulus. When the vessel rotates, water passes through the perforations and spirals slowly inwards to a small hole in the centre of the base of the vessel. The surface falls rapidly towards the centre and produces an air core. Students measure the surface profile using the traverse probe.

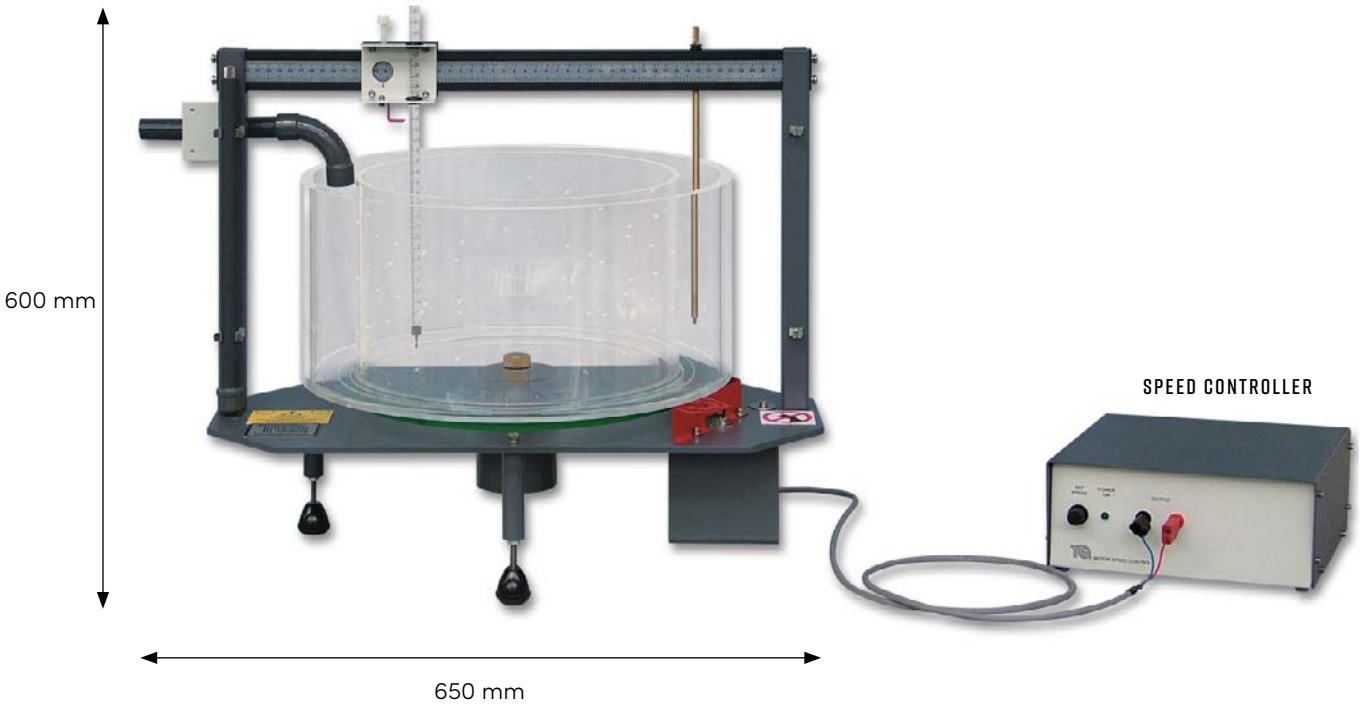
STANDARD FEATURES

- 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 Gravimetric or Volumetric Bench (H1 or H1D).



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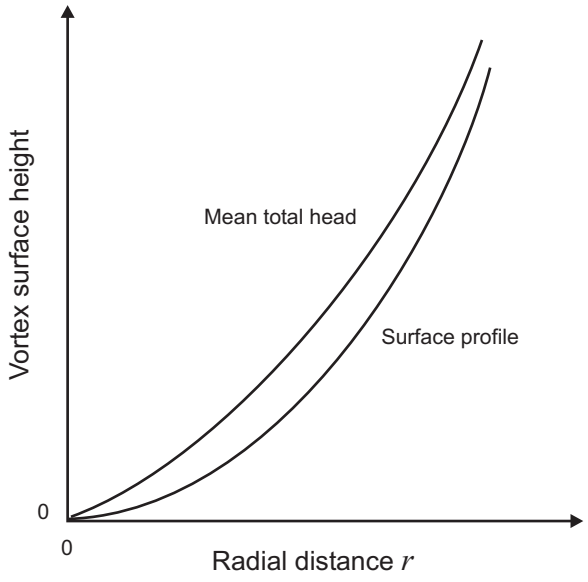
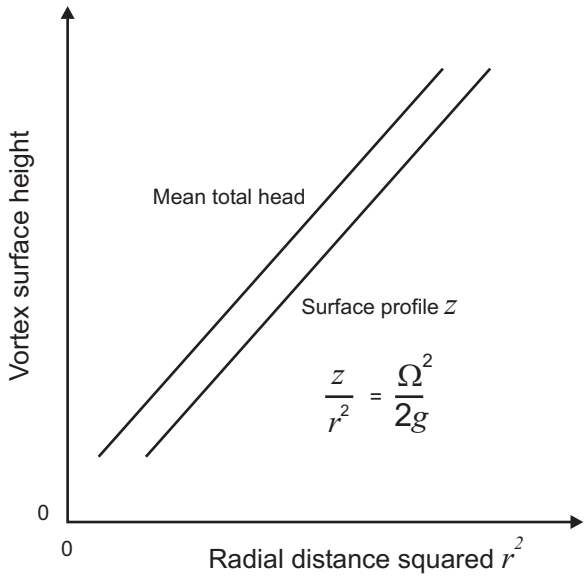
TYPICAL WORK ASSIGNMENTS

FORCED VORTEX

This experiment asks the student to set up a forced vortex and use the pointer and Pitot tube to measure the vortex surface profile (z) and mean total head (H). The results plotted against radial distance should be non-linear. However, when plotted against radial distance squared (r^2) they should be linear. The gradient of the line representing the surface profile should be similar to that predicted by theory, based on the rotational velocity and the acceleration due to gravity (g).





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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 WEIGHTS:

Vortex vessel: 650 mm x 400 mm x 600 mm and 20 kg

Speed controller: 250 mm x 270 mm x 110 mm and 3.5 kg

APPROXIMATE PACKED DIMENSIONS AND WEIGHT:

0.3 m^3 and 33 kg

TRANSPARENT CYLINDER:

Approximately 380 mm wide x 180 mm deep

PERFORATED CYLINDER:

Approximately 286 mm wide x 180 mm deep

INSTRUMENTATION:

Traverse probe and Pitot tube with scales calibrated in millimeters

WATER SUPPLY (IF NO TECQUIPMENT HYDRAULIC BENCH IS AVAILABLE):

Up to 8 litres a minute

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°C

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