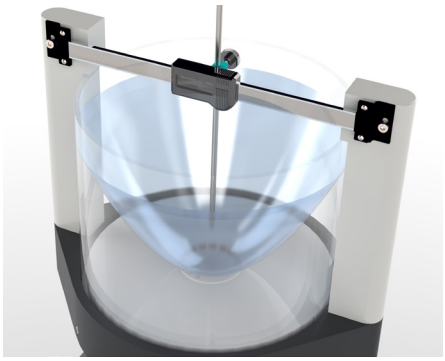
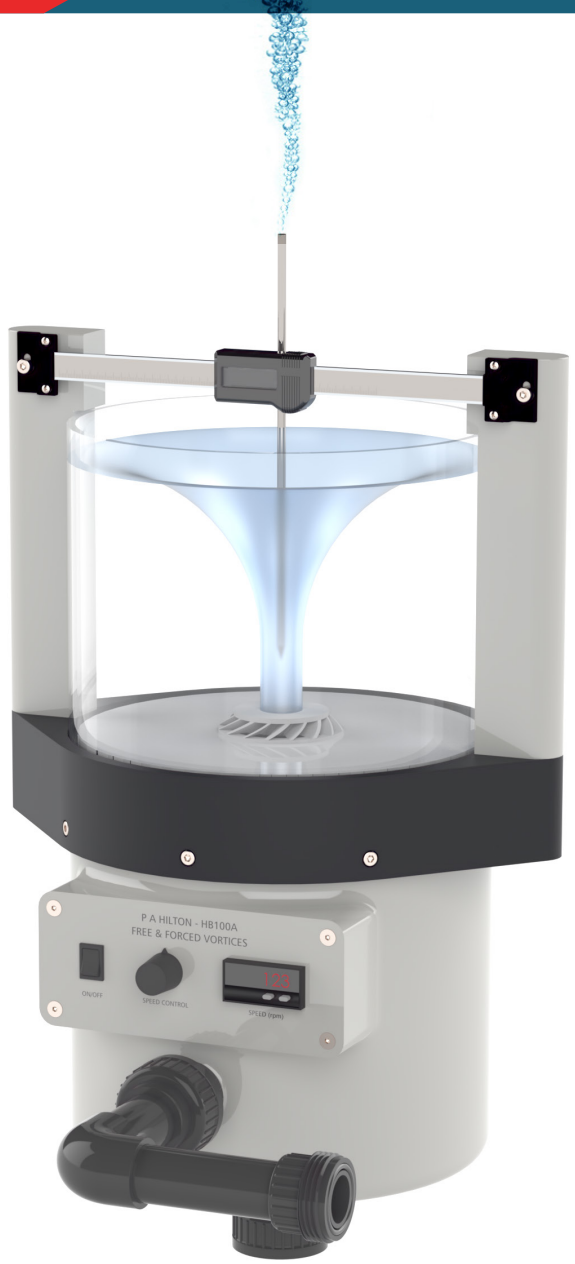
World leading supplier of engineering teaching equipment

HB100A Free and Forced Vortices

A benchtop unit designed to help students visualise and analyse key principles relating to free and forced vortices used as part of the following study areas:

- Bernoulli's theorem
- Irrotational flow
- Turbulent flow
- Vector Analysis
- Helmholtz's Theorem





PA Hilton

sales@pahilton.co.uk

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Vortices

In fluid dynamics, a vortex is defined as a region in a fluid in which the flow revolves around an axis line, which may be straight or curved. Vortices form in stirred fluids and may be observed in smoke rings, whirlpools in the wake of a boat and the winds surrounding a tornado.

Vortices are a major component of turbulent flow. The distribution of velocity, vorticity, as well as the concept of circulation, is used to characterise vortices.

In the absence of external forces, viscous friction within the fluid tends to organise the flow into a collection of irrotational or Free Vortices.

A rotational vortex can be maintained indefinitely only through the application of some extra force, that is not generated by the fluid motion itself.

For example, if a container of water is spun at constant angular speed about its vertical axis, the water will eventually rotate in a rigid body fashion. In this case, the free surface of the water will assume a parabolic shape. A Forced Vortex.

In this situation, the rigid rotating enclosure provides an extra force, namely an extra pressure gradient in the water, directed inwards, that prevents evolution of the rigid body flow to the irrotational free state.

Learning capabilities

- Determination of the surface profile and radii of various size free and forced vortices.
- Determination of total head variation of a free and forced vortex.
- Comparison of results with theoretical predictions.
- To be able to visually demonstrate the primary and secondary flow of a free vortex.

Available in 230V/115V versions

*Images used may be generated digitally and therefore may differ in colour and texture from that of the received items

The HB100A Free and Forced Vortices unit enables students to easily investigate the concept of vortices.

The apparatus allows a clear 360° view of the experiment, along with no visual refractory interference thanks to its single skin clear plastic tank.

A pure parabolic forced vortex is produced by spinning the tank via an internal motor controlled by a front mounted speed controller. Interchangeable free vortex orifices allow investigation of different sized free vortices.

Measurement of the different profiles is achieved with a digital sliding horizontal scale and a precision engraved needle point rod allowing an infinite degree of measurement points to be achieved. The apparatus operates from the atop the HB100 Hydraulics bench base unit.

Hydraulics range experiments

- HB100A – Free and Forced Vortices
- HB100B – Bernoulli's Theorem Demonstrator
- HB100C – Orifice and Venturi Flow Measurement Module
- HB100D – Pressure Losses in Bends and Fittings
- HB100E – Stability Floating Bodies C/W Digital Display
- HB100F – Center of Pressure Module
- HB100G – Impact of a Jet Module
- HB100J – Osborne Reynold's Apparatus
- HB100K – Flow Meter Module
- HB100M – Pressure and Throttle Module
- HB100 – Hydraulics Bench
- HB100L – Series and Parallel Pump Upgrade

P. A. Hilton Ltd, Horsebridge Mill, Kings Somborne, Stockbridge, Hampshire, SO20 6PX UK. www.pahilton.co.uk