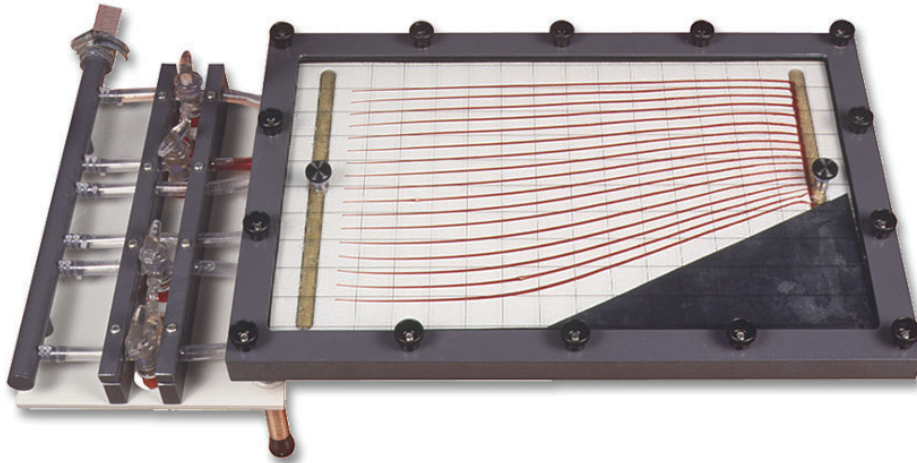


## HELE-SHAW APPARATUS

H9

A benchtop apparatus to demonstrate two-dimensional laminar flow around differently shaped models, allowing the study of various source and sink arrangements.



### KEY FEATURES:

- Visually effective demonstration of a wide variety of flow patterns around different shapes
- Ideal for individual as well as group work and classroom demonstrations
- Compact and free-standing
- Models easily cut from sheet (included) – almost any shape possible
- Ideal introduction to incompressible potential flow (aerodynamics)
- Source and sink points provided
- Can show soil seepage problems

# HELE-SHAW APPARATUS

H9

## DESCRIPTION

TecQuipment's Hele-Shaw apparatus produces streamlines in a laminar, steady flow. It allows students to study various source and sink arrangements, and look at flow around an unlimited variety of different shaped models. The apparatus can represent water seepage through solids, and can simulate any process satisfying the Laplace equation in two dimensions. Thus lecturers can also use it to represent flow in other branches of engineering, such as aerodynamics or electricity and heat flow.

The apparatus works with a steady, air-free water supply and suitable drain. The equipment consists of a channel formed between two plates, where water flows along the channel at a low Reynolds number.

A dye flowing through several small holes at the upstream end produces streamlines. The removable top glass plate has gridlines to help analysis of the flow patterns. The apparatus comes with a rubber sheet from which to cut out various shapes of models. When placed between the two plates, students can see the streamline patterns flowing around the models. Also, valves and a vacuum pump allow students to connect two sources and two sinks (or any combination of both).

To perform experiments, students start the water flow and open a dye valve just enough to produce easily visible streamlines. They then use valves to allow water to flow from a source point or drain into a sink point, or various combinations of flow or sink points. The vacuum pump strengthens the sink points.

To incorporate models into the free stream of the apparatus and study the effect on streamlines, students cut the shapes they need from the rubber sheet (supplied). They then sandwich the model between the two plates of the apparatus and start the flow.

To provide a constant head and smooth, air-free flow from your water supply, TecQuipment offers the optional Header Tank (H9a).

## STANDARD FEATURES

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

## RECOMMENDED ANCILLARIES

- Header Tank (H9a) – A wall-mounting tank with a float valve, overflow and a flow control valve and pipework.

## LEARNING OUTCOMES

Various flow visualisation experiments in two dimensions, including sink and source points and flow around models, for example:

- Sources and sinks in a uniform stream
- Doublet in a uniform stream
- Flow around a cylinder (disc) and an aerofoil
- Flow through an orifice and a diffuser
- Flow through a heat exchanger
- The momentum equation
- Laminar flow relationship for flow between two parallel plates
- Mean velocity equations (including seepage in soils)
- Potential flow relationships
- Allows lecturers to represent flow in other branches of engineering, such as aerodynamics or electricity and heat flow

## ESSENTIAL SERVICES

- Clean, air-free water at 1 litre per minute at constant pressure between 1.5 and 2.5 metres head. This can be supplied by the Header Tank (H9a, available separately).
- A suitable drain

## 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

# HELE-SHAW APPARATUS

H9

## SPECIFICATIONS H9

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:

720 mm x 520 mm x 470 mm and 18 kg

### APPROXIMATE PACKED DIMENSIONS AND WEIGHT:

0.176 m<sup>3</sup> and 28 kg

### CHANNEL WORKING SECTION (NOMINAL):

300 mm x 250 mm, depth 0.75 mm

### ANCILLARIES (INCLUDED):

- Rubber sheet (from which to cut models)
- All necessary pipe clips, connectors, pipes and tubing
- Dye bottle, clamp and dye
- Water jet vacuum pump
- Retort rod and clamp
- Adaptor
- Spare tap
- Transfusion clips

## SPECIFICATIONS H9A

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 (MAINLY THE TANK):

600 mm wide x 445 mm deep x 430 mm height and 13.5 kg all parts.

### APPROXIMATE PACKED DIMENSIONS AND WEIGHT:

0.32 m<sup>3</sup> and 25 kg