H10

Flow Measurement

Demonstrates the application of Bernoulli's equation and the typical methods of measuring the flow of an incompressible fluid

Key Features

- Includes Venturi meter, orifice plate and rotameter
- Works with TecQuipment's Digital Hydraulic Bench for easy installation
- Direct measurement of head loss
- Three different flow meters that work with Bernoulli's equation
- Multitube manometer shows pressure at various points

Key Specifications

- Venturi meter, orifice plate and rotameter
- Sudden enlargement and 90° elbow
- Eleven manometer tubes
- Downstream flow control valve

Learning Outcomes

- Application of the Bernoulli equation for incompressible fluids
- Direct comparison of flow measurement using a Venturi meter, orifice plate and rotameter
- Comparison of pressure drops across each flow measurement device
- Comparison of pressure drops across a sudden enlargement and a 90° elbow

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TecQuipment

H10 Flow Measurement

Description

TecQuipment's Flow Measurement apparatus shows the typical methods of measuring the flow of an essentially incompressible fluid (water). It also shows applications of Bernoulli's equation.

Students measure flow using a Venturi meter, an orifice plate meter and a rotameter. Bernoulli's equation works for each meter. Students find and compare the head losses for each meter. They also find the losses in a rapid enlargement and a 90-degree elbow.

The apparatus is for use with TecQuipment's Hydraulic Bench (H1F, available separately)*.

The product has a horizontal pipe that includes a Venturi meter, orifice plate and pressure tappings. An elbow connects the pipe to a rotameter (gap-type flow meter) with further pressure tappings. All pressure tappings connect to manometers held on a vertical panel behind the pipe work. The manometers measure and show pressure distribution against a calibrated scale.

To perform experiments, students connect the product to the hydraulic bench supply, and set it to a low, steady flow through the apparatus.

Shown fitted to the Digital Hydraulic Bench

Water from the hydraulic bench then flows through the Venturi meter, through a sudden enlargement, a settling length and the orifice plate. It then flows around the elbow, through the rotameter, then a flow control valve, finally returning to the hydraulic bench. The control valve is downstream, so it does not cause any upstream turbulence.

To adjust the datum water level in the manometer tubes, students connect a hand-pump (included) to the valve above the manometer tubes.

Students measure the flow using the hydraulic bench, noting the manometer levels and rotameter reading. They then increase the flow in set increments, taking readings each time, until reaching maximum flow rate. They then use Bernoulli's equation to find mass flow rate through each of the meters, comparing to flow rates measured using the hydraulic bench. Students can compare advantages, disadvantages and potential applications of each meter.

Standard Features

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

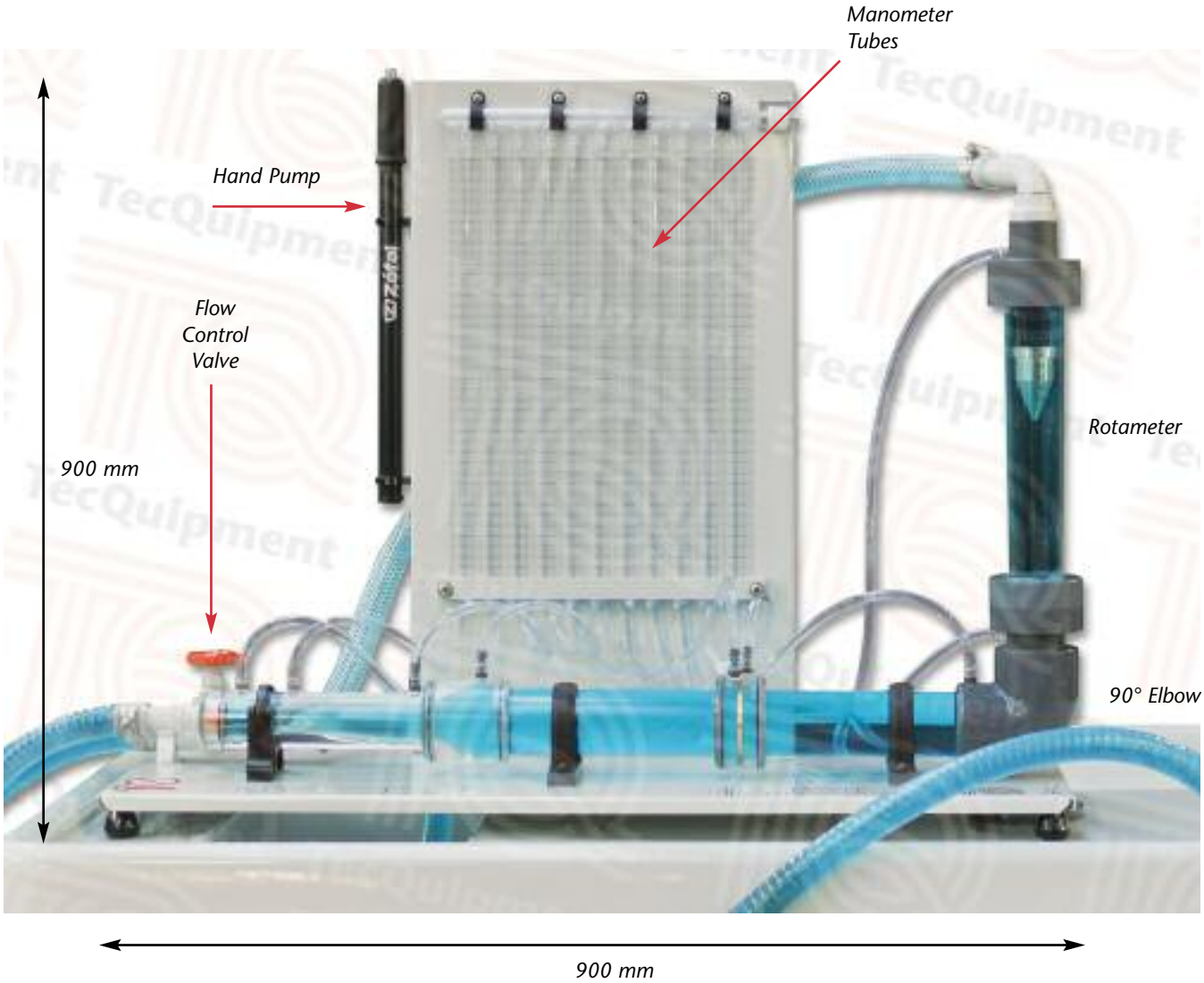
Essential Base Unit

- Digital Hydraulic Bench (H1F)*

*This product will also work with existing TecQuipment Gravimetric and Volumetric Hydraulic Benches (H1 and H1D)

H10

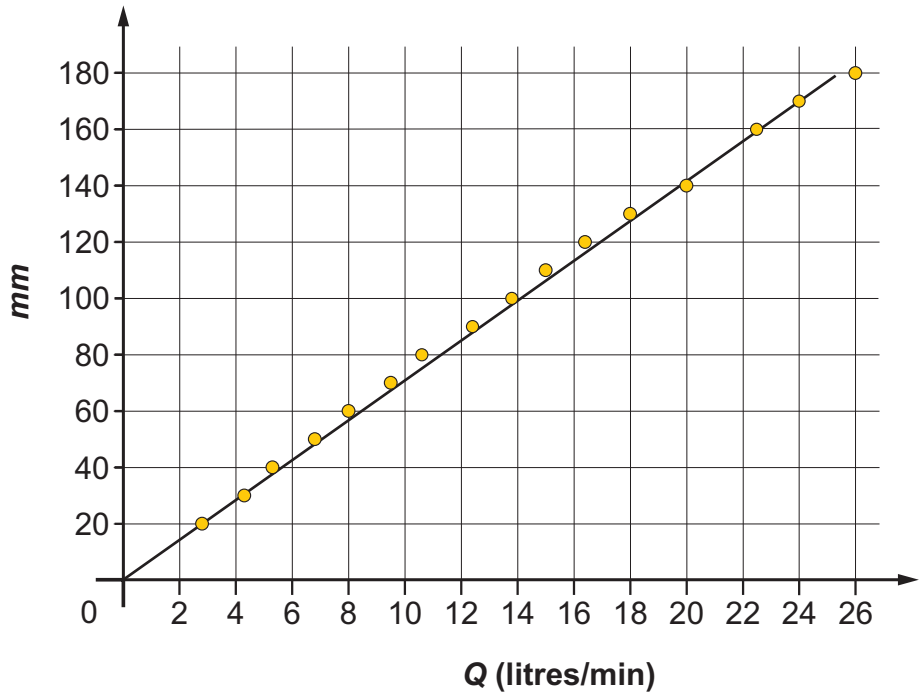
Flow Measurement



Typical Work Assignment

Calibration of the Rotameter

The results from tests at different flow rates can produce a chart that compares the height of the float in the rotameter with the flow rate measured by the hydraulic bench, producing a calibration chart for the rotameter. The chart should show an almost linear response when compared to flow in litres per minute.



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:

900 mm x 380 mm x 900 mm and 10 kg

Approximate packed dimensions and weight:

0.31 m^3 and 19 kg

Orifice plate:

20 mm diameter with corner tappings, manufactured to BS1042

Sudden enlargement:

26 mm to 51.9 mm

Rotameter:

Scaled 0 to 210 mm. Includes calibration chart for 0 to 35 litres per minute.

Manometer:

Scaled 0 to 380 mm

Maximum flow:

28 litres per minute

Accessories (included):

All necessary tubing and pipe clips

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°