H7

FRICTION LOSS IN A PIPE

For direct measurement of friction loss in a small-bore horizontal pipe, during both laminar and turbulent flow

KEY FEATURES

- Directly measures friction loss in a small-bore test pipe
- Investigates laminar and turbulent flow and the transition point
- Shows the critical Reynolds Number and verifies Poiseuille's Equation for laminar flow
- Includes precision valve for precise flow control and a Header Tank for good laminar flow
- Works with TecQuipment's Hydraulic Bench for easy installation

LEARNING OUTCOMES

- Investigations of laminar and turbulent flows
- Demonstration and measurement in the change of the laws of resistance (friction factor) from laminar to turbulent flow
- Finding the critical Reynolds Number
- Verifying Poiseuille's Equation and the coefficient of viscosity for water in the laminar flow region

KEY SPECIFICATIONS

- Digital pressure meter
- Precision flow control valve
- Header Tank for laminar flow
- 3 mm test pipe
- Stopwatch

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DESCRIPTION

The Friction Loss in a Pipe apparatus allows students to study the change in the laws of resistance for laminar to turbulent flow and find the critical Reynolds number.

The equipment is a small-bore, straight test pipe on a base plate. It works with TecQuipment's bench (H1F, available separately)* and stands on the hydraulic bench worktop.

Static pressure tappings upstream and downstream of the test pipe connect to a water manometer or a hand-held digital pressure meter (supplied). The back panel holds the manometer with calibrated scales. The water manometer measures lower differential pressures in the laminar and lower turbulent flow regions (just above the critical Reynolds Number). The pressure meter measures higher pressures in the turbulent flow region. The water manometer includes an air valve and hand-pump. The hand-pump adjusts the datum of the water manometer where necessary. A precision needle valve downstream of the test pipe accurately controls flow rate.

To perform experiments, students stand the apparatus on the hydraulic bench and fit the Header Tank (supplied) to the bench. For low flow rate experiments, the Header Tank supplies the test pipe. For higher flow rate experiments, the hydraulic bench supplies the test pipe directly. Students set the flow rate, measuring it by using a stopwatch to time the collection of water in a measuring vessel (both included).

Students take readings of temperature from a thermometer (supplied) and readings of head from the manometer or the pressure meter. They then use the results to produce charts to help compare actual results with theory.

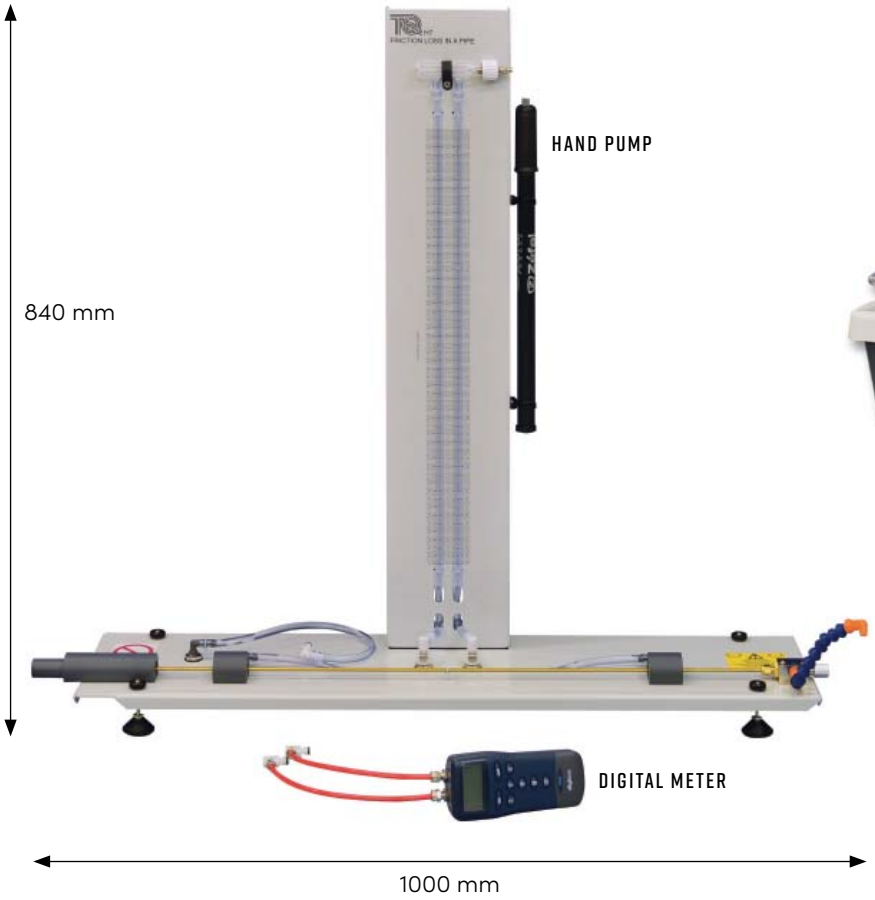
STANDARD FEATURES

- 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)



SHOWN FITTED TO THE DIGITAL HYDRAULIC BENCH (H1F) AVAILABLE SEPARATELY

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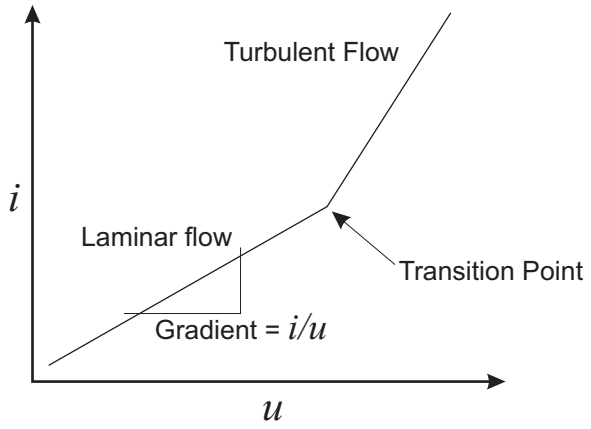
TYPICAL WORK ASSIGNMENTS

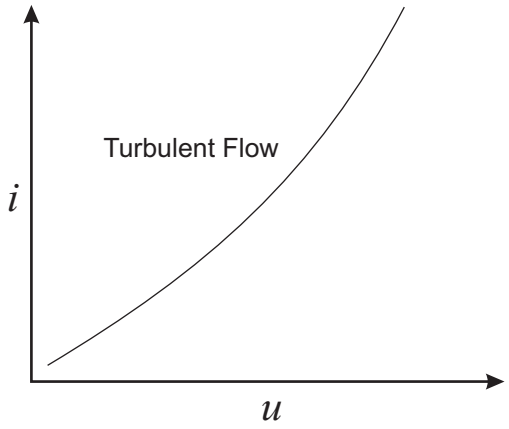
LOWER AND HIGHER FLOW RATES

These experiments find the hydraulic gradient (i) for lower and higher flow velocities (u) to produce curves over a range of flow from laminar to turbulent. They should also show the transition point.

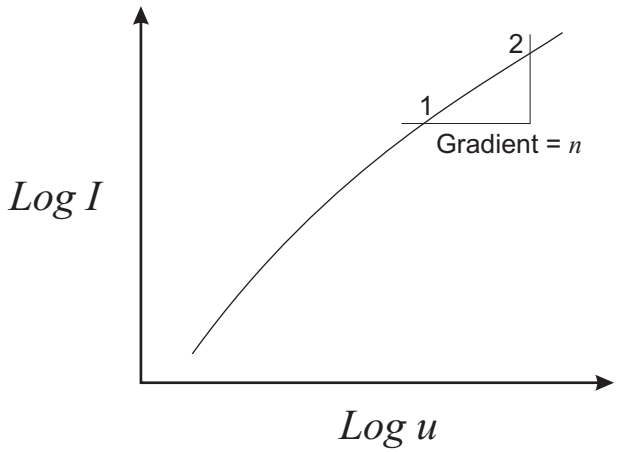
Lower Flow Results



Higher Flow Results



Log/log Higher Flow Results



FRICTION LOSS IN A PIPE

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.

MAIN UNIT NETT DIMENSIONS AND WEIGHT (ASSEMBLED):

1000 mm long x 840 mm high x 240 mm front to back and 6 kg.

HEADER TANK NETT DIMENSIONS AND WEIGHT (ASSEMBLED):

400 mm high x 250 mm outside diameter and 800 mm overflow/support pipe. Combined 5 kg.

TOTAL NETT WEIGHT:

12 kg

APPROXIMATE PACKED DIMENSIONS AND WEIGHT:

0.2 m^3 and 15 kg

TEST PIPE INTERNAL DIAMETER (NOMINAL):

3 mm

WATER MANOMETER RANGE:

0 to 530 mm water

PRESSURE METER RANGE:

0 to 20 m water

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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