H405  Pipe Surge and Water Hammer

Shows pipe surge and water hammer effects in pipes

- Works with TecQuipment’s Volumetric Hydraulic Bench for easy installation
- Easy to operate
- Shows causes and effects of water hammer and surge in pipes
- Helps students find velocity of sound in pipes
- Includes transparent surge tower so students can see what is happening
Description
TecQuipment’s Pipe Surge and Water Hammer apparatus shows the transient effects of pipe surge and water hammer caused by changing flow rates in pipes.

The apparatus has two separate test pipes: one for water hammer investigations and one for surge investigations. A header tank supplies both test pipes, and includes an internal overflow weir to keep a constant head. A Volumetric Hydraulic Bench (H1D, available separately) supplies the header tank with a controlled flow of water via an inlet valve. The outlets from the test pipes flow into the measuring tank of the hydraulic bench. The outlet from the overflow weir goes to the sump.

The test pipe for surge investigations includes a clear plastic surge tower connected near its downstream end, and a control valve. A pressure transducer in the base of the surge tower connects to an electrical enclosure, with sockets for an oscilloscope with printout (H405a, available separately).

To perform surge experiments, students create a steady flow from the header tank through the pipe, using the inlet valve and surge pipe control valve. They set a known head drop from the header tank to the surge tower. To create the surge, students quickly close the surge pipe control valve. The oscilloscope records the pressure surge. Students also examine the maximum surge height, and use a stopwatch to measure the time from valve closure to maximum surge. They then repeat the experiment with a smaller initial head drop.

The test pipe for water hammer experiments has a manual valve and a special quick-closing valve. Pressure transducers on the water hammer pipe connect to an electrical enclosure, with sockets for an oscilloscope with printout (H405a, available separately).

To perform water hammer experiments, students create a steady flow from the header tank through the pipe, using the inlet valve and manual control valve. To create the water hammer effect, students use the quick-closing valve. The oscilloscope shows the passage of the acoustic wave past each pair of pressure transducers.

Standard Features
- Supplied with a comprehensive user guide
- Five-year warranty
- Manufactured in accordance with the latest European Union directives

Experiments
Investigations into the transient effects of pipe surge and water hammer caused by changing flow rates in pipes including:
- Demonstration and analysis of pipe surge
- Demonstration and analysis of water hammer
- Determination of frictional head loss between reservoir and surge tower
- Determination of pressure profiles
- Determination of velocity of sound in the test pipe

Essential Base Unit
- Volumetric Hydraulic Bench (H1D)

Essential Ancillary
- Two channel Oscilloscope (H405a) – Dual trace (two channel) oscilloscope with storage

Essential Services
- Electrical supply: For the electrical enclosure: 240 VAC 50 Hz (other supplies on request)
- Water supply: From the Hydraulic Bench (H1D)
- Floor space needed: Approximately 4 m x 1 m of solid, level floor (plus space for the Hydraulic Bench)

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

Specification
- Nett dimensions assembled:
  Main unit
  4000 mm long x 600 mm wide x 2600 mm high and 174 kg
  Electrical Enclosure
  210 mm x 340 mm x 240 mm and 4 kg
- Packed dimensions: 3.5 m³ and 300 kg
- Additional items (included):
  - Stopwatch, sealant
  - Connection leads for Hydraulic Bench, Oscilloscope and printout
  - All necessary pipe clips and tubing