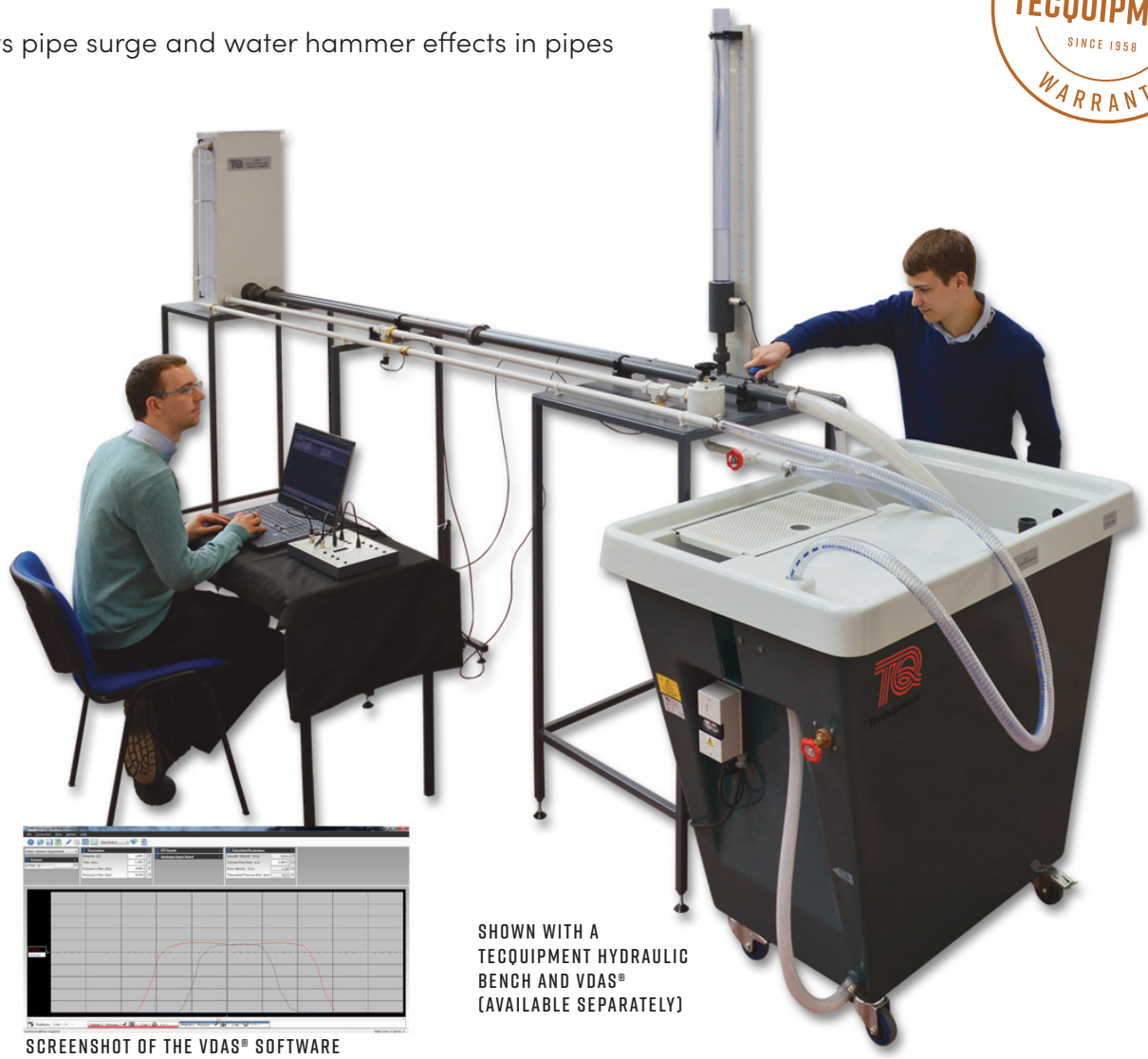
VDAS® H405

PIPE SURGE AND WATER HAMMER

Shows pipe surge and water hammer effects in pipes



SHOWN WITH A TECQUIPMENT HYDRAULIC BENCH AND VDAS® (AVAILABLE SEPARATELY)

SCREENSHOT OF THE VDAS® SOFTWARE

KEY FEATURES

- Works with TecQuipment's Digital Hydraulic Bench (H1F)* for easy installation
- Multiple pipes and valves give two different experiments in one product
- Two pressure sensors in one pipe to help calculate velocity of sound
- Transparent surge tower so students can see what is happening
- Works with TecQuipment's VDAS® (mkII) for real-time display of the pressure surges and acoustic waves

LEARNING OUTCOMES

- Demonstration and analysis of pipe surge and water hammer
- Frictional head loss between reservoir and surge tower
- Pressure profiles
- Velocity of sound in a pipe

KEY SPECIFICATIONS

- Two different experiments in one product
- Three pressure sensors

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VDAS® H405

PIPE SURGE AND WATER HAMMER

DESCRIPTION

TecQuipment's Pipe Surge and Water Hammer apparatus shows the transient effects of pipe surge and water hammer caused by sudden flow rate changes in pipes.

The apparatus has two separate test pipes: one for pipe surge investigations and one for water hammer investigations. A header tank (reservoir of water) supplies both test pipes. This tank includes an internal float valve and an overflow for good engineering practice. A Digital Hydraulic Bench (H1F, available separately)* supplies the header tank with a controlled flow of water via an inlet valve. The outlets from the test pipes flow back into the hydraulic bench.

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 TecQuipment's optional VDAS®.

For surge investigations, students adjust valves to create a steady flow from the header tank through the surge pipe. This flow creates a measurable head loss (due to friction) along the surge pipe from the header tank to the surge tower. To create the surge, students quickly shut the surge valve downstream of the surge pipe. VDAS® displays and records the pressure surge in the surge tower. Students also examine the maximum surge height, and use VDAS® to measure the time from valve closure to maximum surge. They then repeat the experiment for different flows and therefore different values of head loss.

TecQuipment's VDAS® (mkII) also allows students to study the surge decay waveform and compare it with a viscous damping model.

The test pipe for water hammer experiments has a special quick-closing valve at its downstream end. This pipe has two pressure transducers which connect to TecQuipment's optional VDAS®.

For water hammer investigations, students adjust valves to create a steady flow from the header tank through the pipe. To create the water hammer effect, students shut the quick-closing valve. VDAS® displays and records the passage of the acoustic wave as it passes back along the water hammer test pipe, past each of the pressure transducers.

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

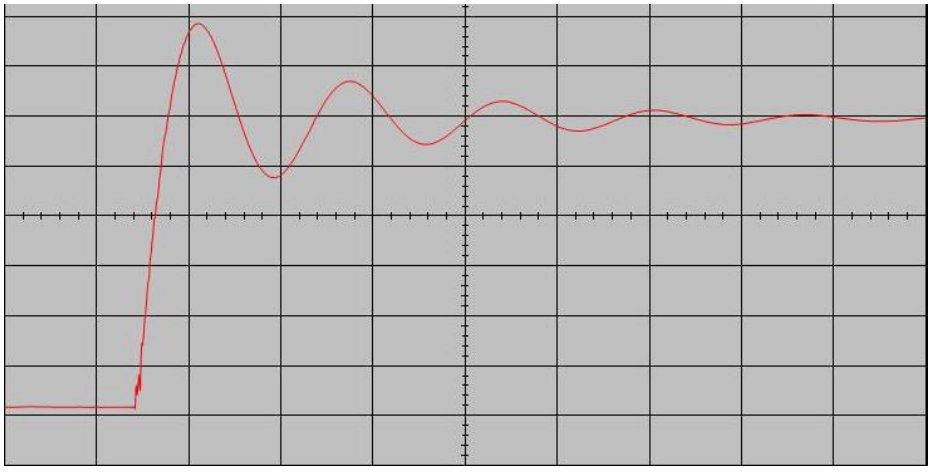
- Digital Hydraulic Bench (H1F)*

*This product will also work with an existing TecQuipment Volumetric Hydraulic Bench (H1D)

ESSENTIAL ANCILLARY

- Versatile Data Acquisition System – bench-mounted version VDAS-B (mkII)

NOTE: This equipment needs VDAS® (mkII) and will not work with earlier versions of VDAS®. If unsure, contact TecQuipment or your local agent.



VDAS® SOFTWARE SHOWING PLOT OF PIPE SURGE OSCILLATIONS

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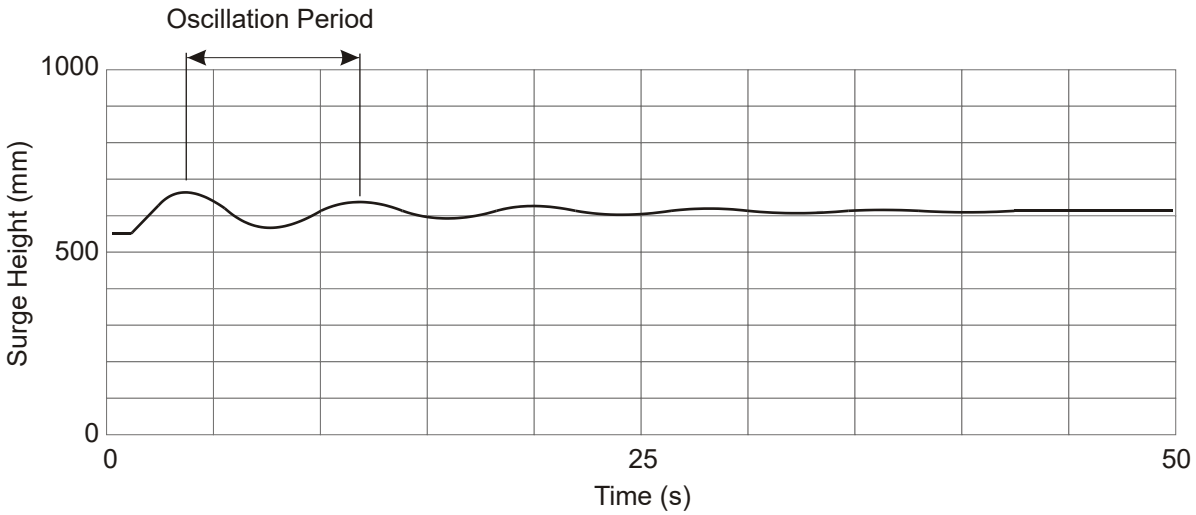
PIPE SURGE AND WATER HAMMER

TYPICAL WORK ASSIGNMENTS

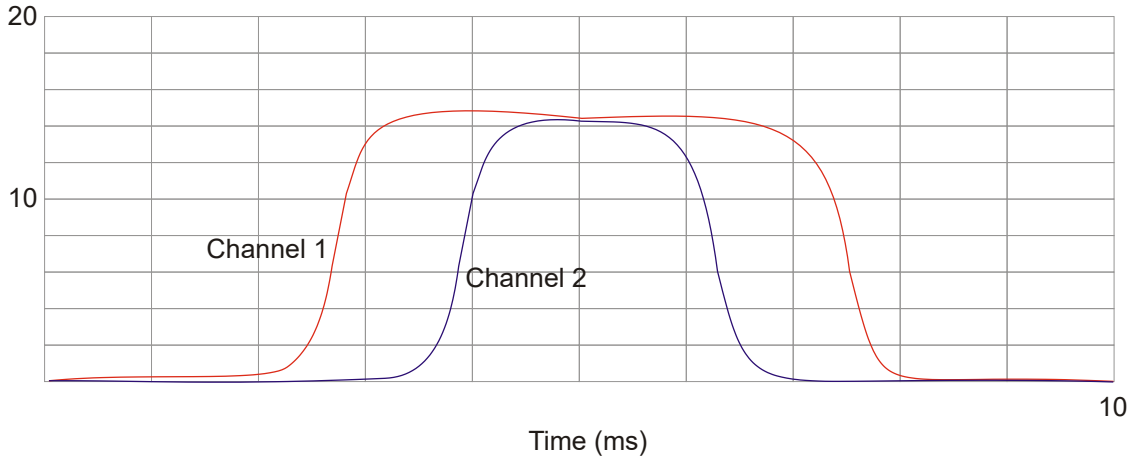
PIPE SURGE

This experiment asks the students to set a flow through the surge pipe and shut its valve, creating a pressure surge in the surge tower, which oscillates for a few seconds. Students analyse their results and compare with the theoretical oscillation period and amplitude. The experiment also helps students to understand how pipe friction affects the oscillation amplitude.



WATER HAMMER

This experiments asks the students to set a flow through the water hammer pipe and shut its valve, creating a 'water hammer' pressure wave that travels along the pipe, passing two sensors. Students analyse their results to measure the speed of sound in the pipe and compare the transient pressure wave amplitude with that predicted by theory.



PIPE SURGE AND WATER HAMMER

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 (ASSEMBLED):

3850 mm long x 630 mm wide x 2400 mm high and 100 kg

APPROXIMATE PACKED DIMENSIONS:

3 m^3 and 150 kg

ADDITIONAL ITEMS (INCLUDED):

- Pressure sensor connection leads for VDAS®
- All necessary pipe clips and tubing

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

SOUND LEVELS

Less than 70 dB(A)