UNSTEADY STATE HEAT TRANSFER

Measures unsteady state heat transfer to bodies of different shape and thermal conductivity.

KEY FEATURES

- Includes TecQuipment’s Versatile Data Acquisition System (VDAS®)
- A bench-top module – designed for education
- Includes a set of different solid shapes of different materials – for multiple experiments
- Simple to use – needs no tools
- Water temperature controller for consistent results
- Clear digital displays of all readings – a computer is not essential to operate it or take readings
- VDAS® Software – includes Heisler charts

LEARNING OUTCOMES

- Transient temperature changes with sudden immersion (unsteady state)
- How shape and surface area affects heat transfer
- How materials of different thermal conductivity affect heat transfer
**UNSTEADY STATE HEAT TRANSFER**

**DESCRIPTION**

A sturdy, bench-mounting frame contains a hot water vessel and instrumentation.

A controller switches the power to an electric heater to keep a constant ‘bulk’ water temperature inside the vessel. A temperature controller maintains a constant water temperature for the test shape. Precision instruments measure the temperatures at key points, shown on clear multiline displays.

The test shapes are of different dimensions and materials to give different heat transfer areas and thermal conductivities. This gives multiple experiments in heat transfer.

The student immerses a test shape and measures the transient temperature changes caused by the sudden immersion. They then immerse the other test shapes in turn and compares the results to find how their different surface area, shape and thermal properties affect the heat transfer.

The vessel has a large volume of water compared to the test shapes, so their immersion has a negligible affect on the bulk temperature.

Students can do tests with or without a computer connected. However, for quicker tests with easier recording of results, TecQuipment supply their Versatile Data Acquisition System (VDAS®) with this product.

The software is intuitive and easy to use, with clear and convenient data display options. It looks similar and works in a similar way for each TecQuipment VDAS® compliant product. This saves time as students do not have to learn to use new software when changing experiments.

**VDAS® SOFTWARE FEATURES INCLUDE:**

- Recording data manually or automatically
- Data capture set by time or intervals
- Display of real-time data, in digital form or as an analogue meter
- Real-time traces of analogue signals
- Logging data for printing and later analysis
- Exporting data for use by other software
- Performing real-time calculations to generate user-defined data
- Creating and printing charts and data tables
- Customisable layouts

**VERSATILE DATA ACQUISITION SYSTEM (VDAS®)**

For both individual student use or for lecturers demonstrating experiments to a whole class, VDAS® gives real-time calculation, recording and charting with fast data export. This makes for efficient, productive and effective use of time for both students and lecturers.

VDAS® consists of hardware and software. TD1009 is supplied with integrated VDAS® hardware. The software is free to download.

The output from the apparatus connects to a computer (not supplied) running the VDAS® software. The software has extra features that allow the generation of Heisler Charts for each of the shapes tested.

**STANDARD FEATURES**

- Supplied with comprehensive user guide
- Five-year warranty
- Made in accordance with the latest European Union directives
- An ISO 9001 certified company

**TEST SHAPES**
UNSTEADY STATE HEAT TRANSFER

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)

ESSENTIAL SERVICES

BENCH SPACE NEEDED:
1000 mm x 600 mm

ELECTRICAL SUPPLY:
Single-phase 220 VAC 50 Hz or two-phase 220 VAC 60 Hz at 13 A

WATER SUPPLY (TO FILL THE VESSEL):
Clean, low mineral content water

VDAS® SOFTWARE
PC running Windows 7 or newer, required for optional VDAS® software

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:
755 mm wide x 480 mm front to back x 640 mm high and 40 kg

APPROXIMATE PACKED DIMENSIONS AND WEIGHT:
0.4 m³ and 55 kg

TEST SHAPES:
- 2 x solid spheres (1 brass, 1 stainless steel)
- 3 x solid cylinders (2 brass, 1 stainless steel)
- 2 x solid rectangular slabs (1 brass, 1 stainless steel)