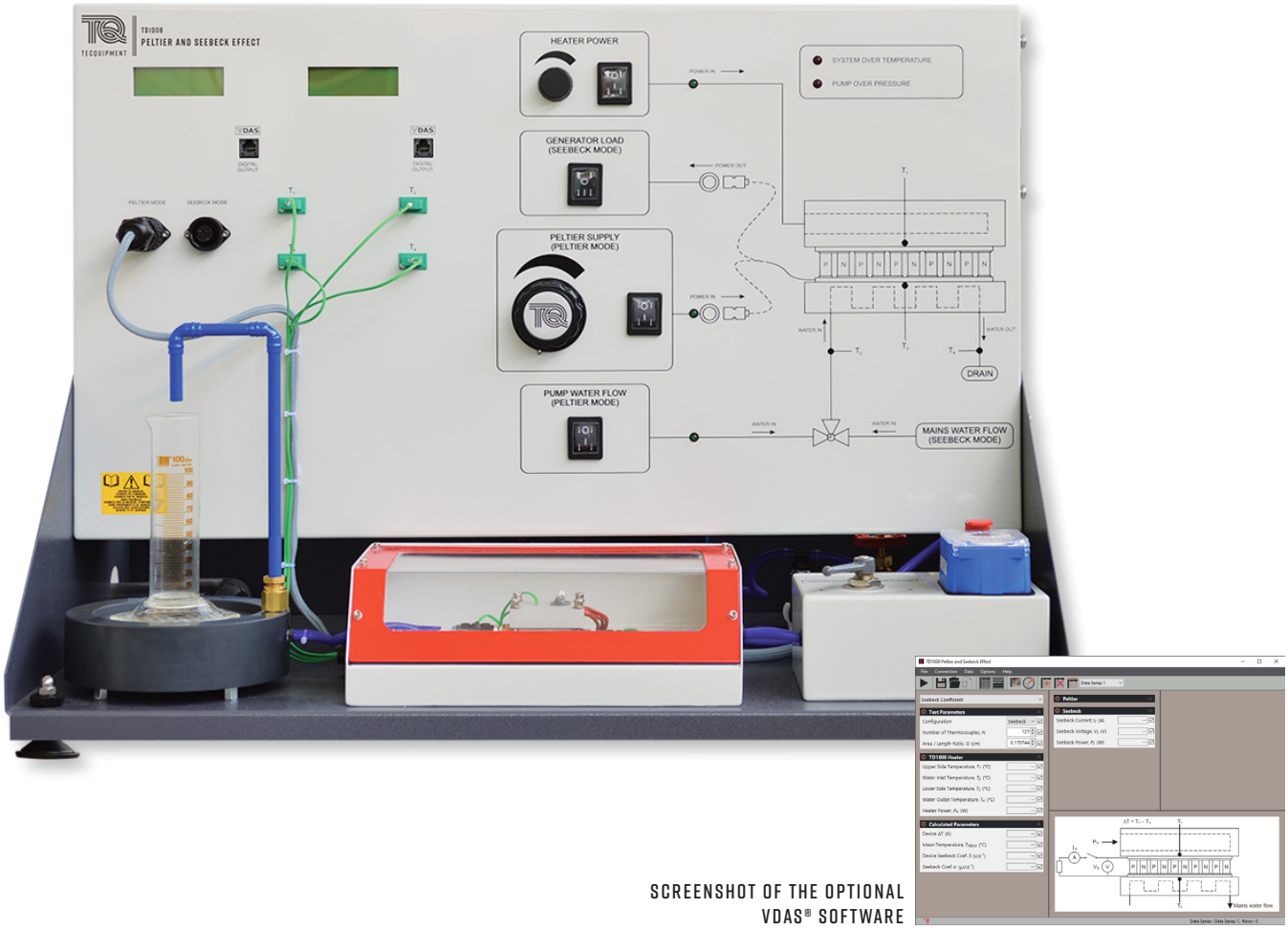
PELTIER AND SEEBECK EFFECT

VDAS® TD1008

Benchtop apparatus that examines the performance of a thermoelectric device when connected for Peltier heat pump or Seebeck exchanger.



SCREENSHOT OF THE OPTIONAL VDAS® SOFTWARE

KEY FEATURES

- A benchtop unit to demonstrate a thermoelectric device, designed for teaching
- Connects for both Peltier or Seebeck tests, giving a full set of experiments
- Schematic diagram and transparent guard to help students understand the device construction and allow simple demonstrations
- A switchable load, variable-heat source and device power supply for multiple test conditions
- Simple and safe to use, needs no tools
- Clear, multi-line digital displays of all readings, you do not need a computer to work it or collect data
- Can connect to TecQuipment's Versatile Data Acquisition System (VDAS®)

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PELTIER AND SEEBECK EFFECT

VDAS® TD1008

DESCRIPTION

The increasing need for smaller and more portable electrically powered equipment has produced a need for low maintenance, smaller and more portable cooling. To satisfy this need, manufacturers now use solid-state thermoelectric devices in computers, portable refrigerators and cool boxes.

The TecQuipment Peltier and Seebeck Effect apparatus shows how one of these devices work and tests its performance when connected in a choice of two modes:

- Heat to electricity for power generation when used in Seebeck mode. Often used for thermoelectric generation and given the acronym 'TEG'.
- As an electrically powered heat pump when used in Peltier mode. Often used in thermoelectric cooling and given the acronym 'TEC'.

Students then learn to analyse its performance in both modes, analysing several factors including coefficient of performance (COP) and energy balance.

For the Seebeck tests, the equipment uses an external cold water source and variable power electric heater to create a temperature difference across the device. The device then converts this into an electrical potential difference (voltage). A switch allows tests with and without an electrical load. The load allows generated power to flow and be measured for a range of applied temperature gradients.

For the Peltier tests it also uses the electric heater, but with a small water storage tank and water pump, creating a stable, fixed-flow water supply. A variable voltage supply controls the electrical power into the device. A calibrated vessel allows students to measure the fixed water flow accurately, for calculation of the heat pumped at the 'cold' side of the device. This allows assessment of the device performance over a range of temperature gradients and electrical power inputs.

A hand-operated valve allows the user to change the water source without the need to reconnect pipes. Students need no tools to do the experiments.

Thermocouples measure temperatures near to the surface of the device and at the inlet and outlet of the water circuit. Clear, multiline digital displays show all temperatures and electrical measurements around the device, such as voltage, current and power.

The equipment control panel includes a schematic diagram of the device. A transparent guard covers the device. These allow students to understand the device construction and view 'frost' formation in simple cooling demonstrations (determined by local conditions).

You can do tests with or without a computer connected. However, for quicker tests with easier recording of results, TecQuipment can supply the optional Versatile Data Acquisition System (VDAS®). This gives accurate real-time data capture, monitoring and display, calculation and charting of all the important readings on a computer (computer not included).

STANDARD FEATURES

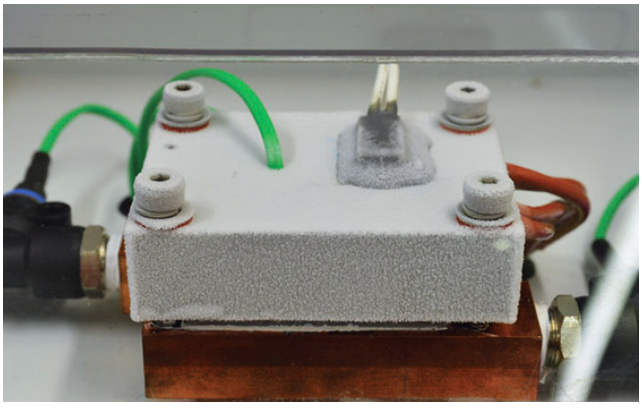
- Supplied with comprehensive user guide
- Five-year warranty
- Made in accordance with the latest European Union directives
- ISO9001 certified manufacturer

LEARNING OUTCOMES

- Seebeck coefficient and the performance of a thermoelectric generator (TEG)
- Peltier heat pump tests and the performance of a thermoelectric cooler (TEC)
- Coefficient of performance (COP) and energy balance
- Comparisons of manufacturers data, theoretical performance and results from experiments
- Observation of the Lenz and Thomson effects
- Simple cooling demonstrations (determined by local conditions)

RECOMMENDED ANCILLARIES

- VDAS-B (bench-mounted version of the Versatile Data Acquisition System)



ICE CRYSTALS FORMING ON THE MODULE

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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:

Roughly 1000 mm x 600 mm plus space for a computer if you need to use VDAS®

ELECTRICAL SUPPLY:

(Specify on order)

- Single Phase, 110 to 120 VAC, 50/60 Hz, 3 A

  OR

- Single Phase, 220 to 240 VAC, 50/60 Hz, 1.5 A

Contact TecQuipment for other voltage ranges.

WATER SUPPLY:

Clean, cold, low mineral content water at a minimum 1 bar and maximum 3 bar.

1 L/minute minimum flow.

For best results, use water < 20°C.

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:

810 mm wide x 500 mm front to back x 600 mm high and 47 kg

APPROXIMATE PACKED DIMENSIONS:

0.38 m^3 and 60 kg

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