

TEMPERATURE MEASUREMENT AND CALIBRATION

VDAS® TD400

Benchtop apparatus that studies the accuracy, linearity and important characteristics of popular temperature measuring devices.



SCREENSHOT OF THE
OPTIONAL VDAS®
SOFTWARE

KEY FEATURES

- Self-contained benchtop unit for experiments with nine different popular temperature measuring devices, and a thermowell to show temperature lag
- Uses a platinum resistance thermometer as a reference to accurately calibrate the other devices
- Demonstrates how electrical resistance devices and thermocouples work, their characteristics and how to connect them correctly to reduce measurement errors
- Includes liquid-in-glass thermometers with safe, non-toxic liquid (no mercury)
- Hand-held digital thermometer for thermal infrared measurements
- Built-in water heater tank with protective guard and drain tap for safe experiments
- Built-in pressure sensor (barometer) with display of local water boiling temperature
- Works with TecEquipment's Versatile Data Acquisition System (VDAS®) for simple and reliable recording and processing of results

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DESCRIPTION

The Temperature Measurement and Calibration apparatus (TD400) fits on a desk or benchtop. It includes eight different temperature measurement devices and shows their characteristics and how to calibrate them against a standard. The built-in precision reference sensor works as an accurate temperature reference. A display shows the temperature from the reference sensor and the local (barometric) pressure from the built-in pressure sensor. The display also calculates the local boiling point of water based on the barometric pressure.

Students add crushed ice (not supplied) to the insulated icebox and clean water to the fully guarded water heater tank. A carefully rated immersion heater in the tank heats the water steadily up to boiling, giving time to take accurate results. The water heater tank includes a water level float switch and a safety temperature cut-out switch to turn off the heater in case of low water level. The water heater tank has a drain tap for connection to a suitable container or local water drain. This helps students to change the heated water safely and quickly, reducing experiment time. As an extra reference, a liquid crystal temperature indicator strip on the front of the heater tank shows its temperature during experiments.

To the right of the temperature indicator strip, a window allows students to test the thermal infrared thermometer on a matt black or brushed steel surface of the heater tank. This shows limitations of infrared measurements caused by surfaces of different emissivity.

The equipment includes a thermowell that works with the gas (vapour) thermometer to show temperature lag.

Sockets on the front panel connect to electronic circuits and a multiline display that work with the electrical resistance and thermocouple devices. The sockets include resistances to simulate a resistance device and show the problems of adding resistances (for example - long wires) to your measuring circuits.

The electronic circuits also include:

- an amplifier to increase the output of the thermocouples for more useful voltage measurement;
- constant current and voltage sources, and a resistive bridge. These show the problems with different measurement circuits and power sources for electrical temperature measurement devices.

This equipment connects to TecQuipment's Versatile Data Acquisition System (VDAS®). Refer to the separate VDAS® datasheet for full details.

STANDARD FEATURES

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

LEARNING OUTCOMES

- Simulation of two, three and four-wire connection of a platinum resistance thermometer (PRT)
- Constant current and voltage sources
- Calibration and linearity of temperature measurement devices and temperature lag
- Thermal infrared temperature measurement on surfaces of different emissivity
- Thermocouples in series, parallel and the Seebeck effect
- Resistance in thermocouple circuits

RECOMMENDED ANCILLARY

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

ESSENTIAL SERVICES

ELECTRICAL SUPPLY (SPECIFY ON ORDER):

- Single Phase, 110 VAC, 50/60 Hz, 5 A

OR

- Single Phase, 230 VAC, 50/60 Hz, 2.5 A

WATER AND ICE:

- Cold clean water (1.5 litres needed to fill the heater tank) and a suitable container or local water drain
- 0.5 to 1 litre of crushed ice or small ice cubes

APPROXIMATE BENCH SPACE NEEDED:

500 mm x 920 mm

OPERATING CONDITIONS

OPERATING ENVIRONMENT:

Laboratory or classroom

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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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:

920 mm long x 600 mm high x 500 mm front to back and 41 kg

PACKED VOLUME AND WEIGHT:

Approximately 0.43 m³ and 50 kg

DEVICES:

- J and K-type thermocouples
- NTC thermistor
- PT100 platinum resistance thermometer (four wire)
- 2 x liquid in glass thermometers
- Bimetal and gas (vapour) pressure thermometers
- Liquid crystal temperature indicator strip (for reference only)
- Hand-held infrared thermometer