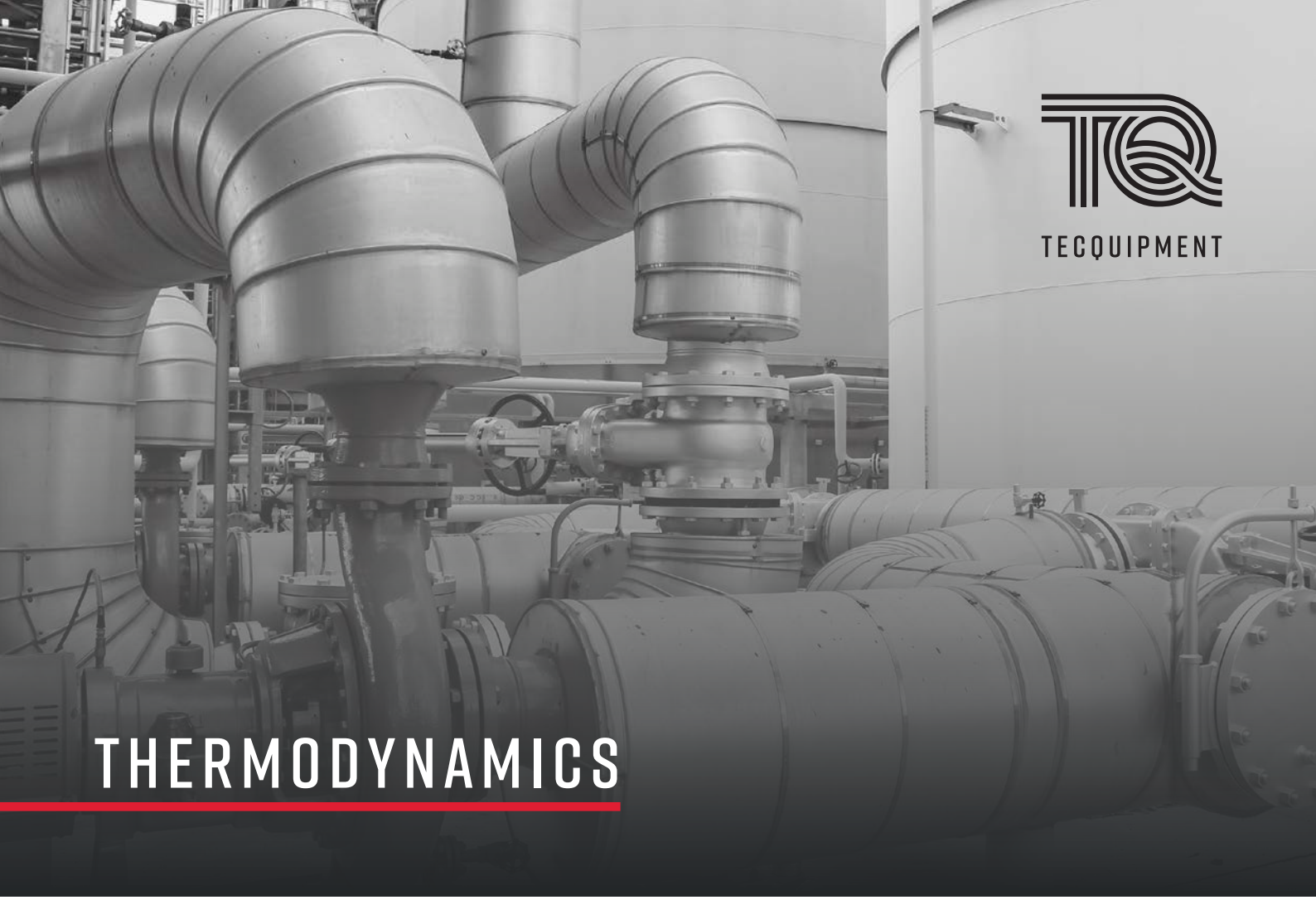


TECQUIPMENT

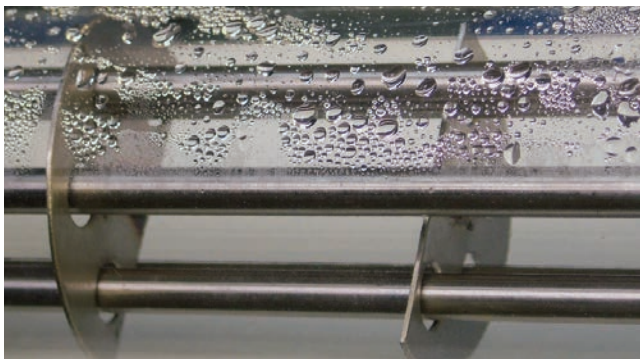
THERMODYNAMICS

The Thermodynamics range offers teaching equipment for the illustration of the basic principles of thermodynamics through to complex theories. Students can learn using practical experiments about the behaviour of gases, heat transfer and thermal conductivity, conduction, convection and heat exchange. They can get hands-on to prove theories such as the Antoine equation, Seebeck effect, Lenz and Thomson effects, Carnot cycle and reversible Carnot cycle, Stefan Boltzmann law, Kirchhoff's law and Lambert's direction law.

SAFE, PRACTICAL AND REALISTIC

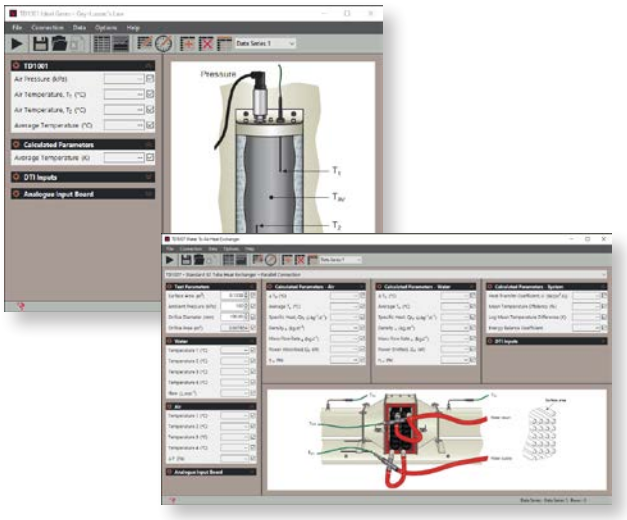
As thermodynamics experiments can often take many hours, the range has been designed to reduce the experiment time to a practical and realistic level, with safety as the key aspect.

YouTube **THERMODYNAMICS PLAY LIST**



FEATURES AND BENEFITS:

- **SAFE AND PRACTICAL DESIGN:** Reduced experiment times.
- **BROAD RANGE OF PRODUCTS:** From basic principles to gas turbines.
- **AUTOMATIC DATA ACQUISITION:** Thermodynamics experiments require setting time and constant monitoring to achieve thermal equilibrium, making automatic data acquisition a useful tool.



TECQUIPMENT.COM

IDEAL GASES – BOYLE'S LAW

VDAS®

TD1000

Benchtop apparatus that demonstrates the relationship between pressure and volume of an ideal gas at a fixed temperature.

PDF

IDEAL GASES – GAY-LUSSAC'S LAW

VDAS®

TD1001

Benchtop apparatus that demonstrates the relationship between pressure and temperature of a fixed volume of ideal gas.

PDF

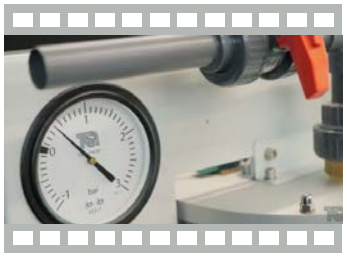
EXPANSION OF A PERFECT GAS

VDAS® ONBOARD

TD1004V

Benchtop apparatus to demonstrate the behaviour and expansion processes of a perfect gas.

PDF

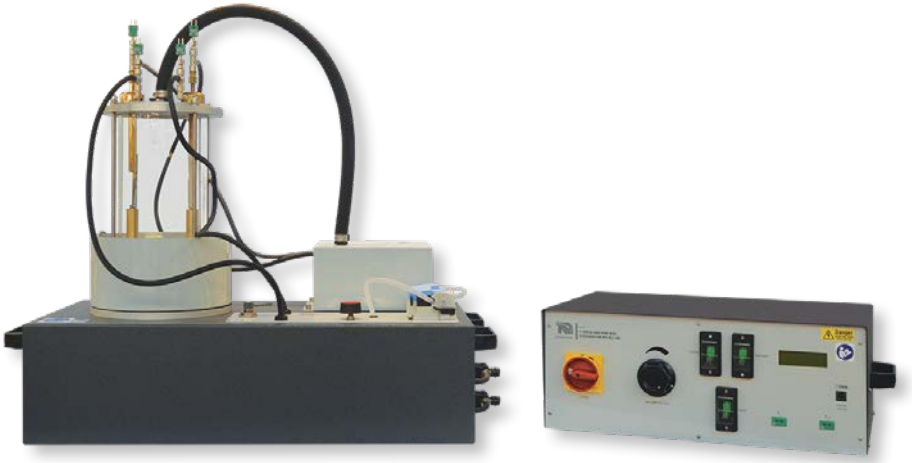


FILMWISE AND DROPWISE CONDENSATION AND BOILING VDAS®

TE78

Benchtop apparatus with control and instrumentation unit that demonstrates heat transfer during different boiling and condensing processes.

PDF



EMISSIVITY - NATURAL CONVECTION AND RADIATION

VDAS® ONBOARD

TD1011V

Trolley-mounted, mobile apparatus that demonstrates how different types of heat can transfer over a range of pressures; helps the understanding of the Stefan Boltzman constant.

PDF

UNSTEADY STATE HEAT TRANSFER

VDAS® ONBOARD

TD1009V

Benchtop apparatus that measures unsteady state heat transfer to bodies of different shape and thermal conductivity.

PDF

FORCED CONVECTION HEAT TRANSFER

TD1

Trolley-mounted, mobile apparatus that demonstrates forced convection in pipes and heat transfer theory. Illustrates the derivation of the value of Nusselt number, determination of the Stanton number and determination of the validity of the Reynolds analogy for air.

HEAT TRANSFER EXPERIMENTS BASE UNIT VDAS®

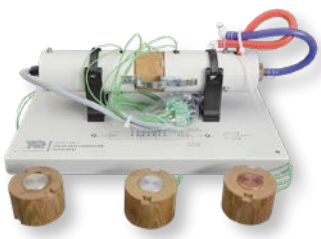
TD1002

A benchtop base unit for demonstrating different methods of heat transfer. Requires at least one of the four optional experiments.

EXPERIMENT MODULES:

- Linear Heat Conduction Experiment
- Radial Heat Conduction Experiment
- Extended Surface Heat Transfer Experiment
- Conductivity of Liquids and Gases Experiment

BASE UNIT FITTED WITH THE LINEAR HEAT CONDUCTION EXPERIMENT



LINEAR HEAT CONDUCTION EXPERIMENT

RADIAL HEAT CONDUCTION EXPERIMENT

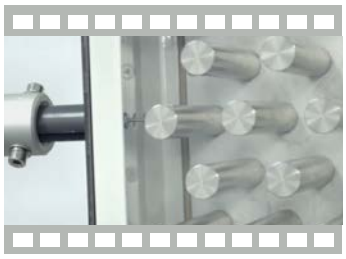
EXTENDED SURFACE HEAT TRANSFER EXPERIMENT

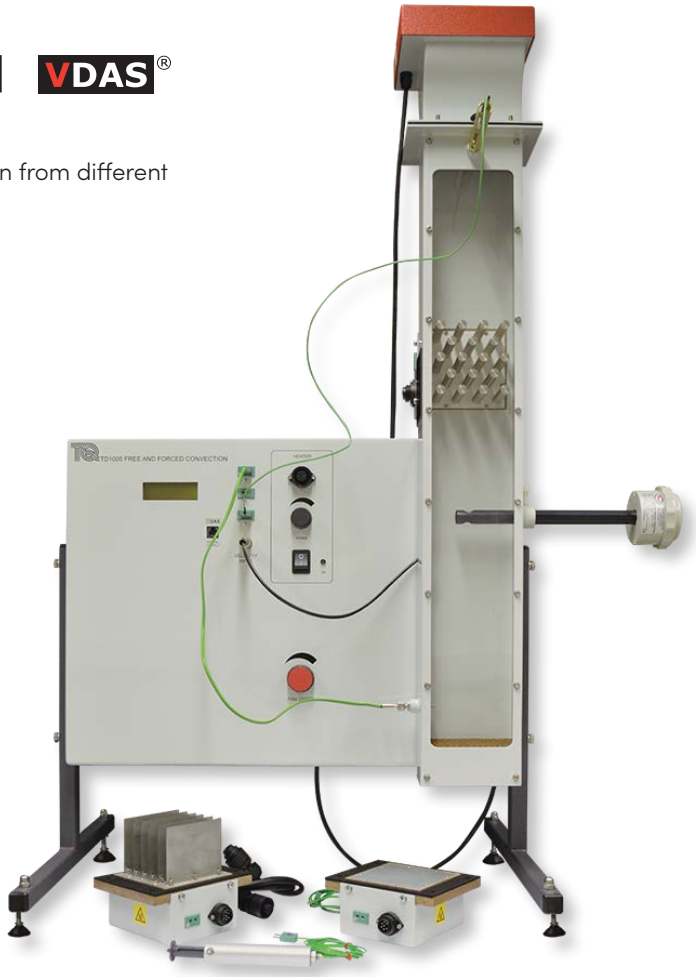
CONDUCTIVITY OF LIQUIDS AND GASES EXPERIMENT

FREE AND FORCED CONVECTION VDAS®

TD1005

Benchtop apparatus that illustrates free and forced convection from different transfer surfaces.



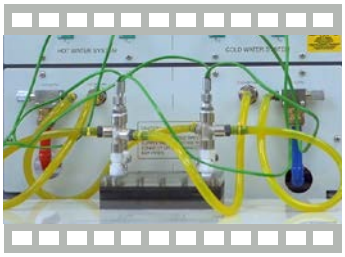


BENCHTOP HEAT EXCHANGERS SERVICE MODULE VDAS®

TD360

A benchtop base unit for examining and comparing small-scale heat exchangers to help students understand how they work. Requires at least one of the four associated experiments.

BASE UNIT FITTED WITH THE PLATE HEAT EXCHANGER AND VDAS®



EXPERIMENT MODULES:

- Concentric Tube Heat Exchanger
- Plate Heat Exchanger
- Shell and Tube Heat Exchanger
- Jacketed Vessel and Coil Heat Exchanger

CONCENTRIC TUBE HEAT EXCHANGER

PLATE HEAT EXCHANGER

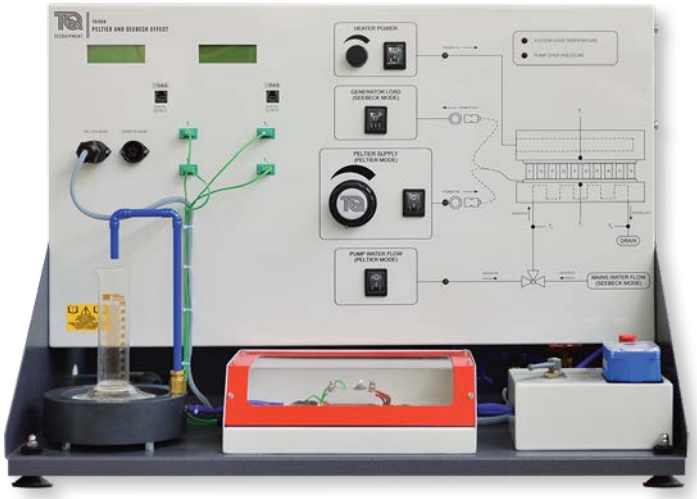
SHELL AND TUBE HEAT EXCHANGER

JACKETED VESSEL AND COIL HEAT EXCHANGER

PELTIER AND SEEBECK EFFECT VDAS®

TD1008

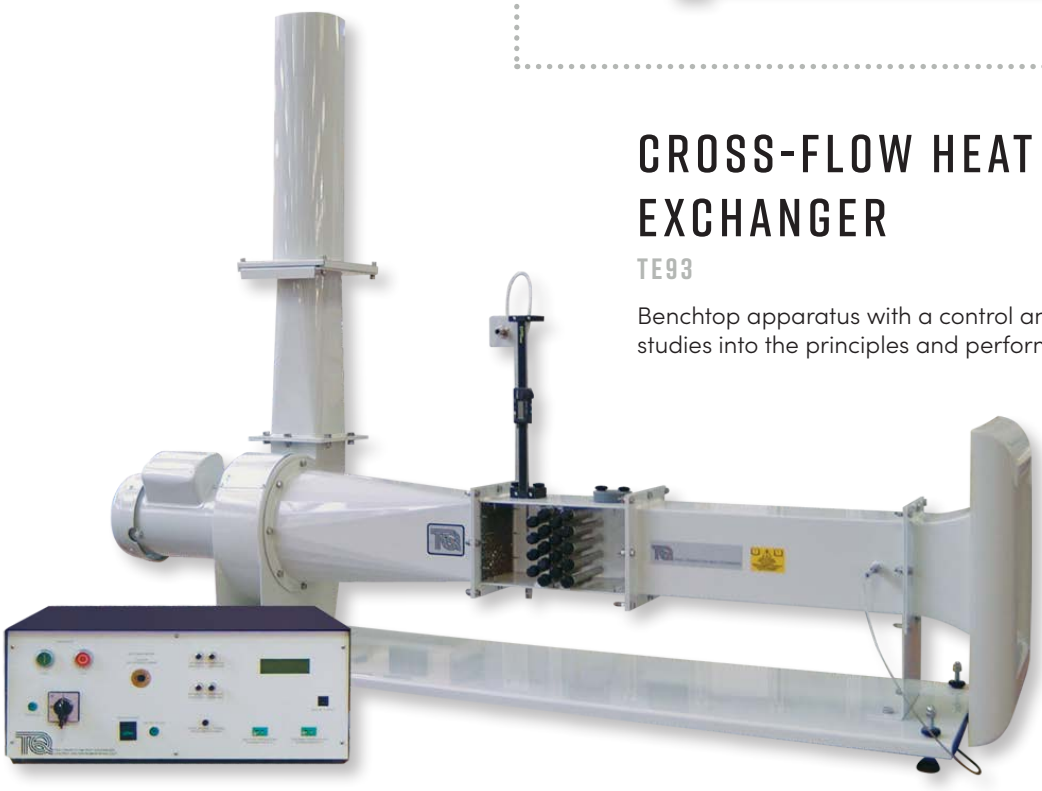
Benchtop apparatus that examines the performance of a thermoelectric device when connected for Peltier heat pump or Seebeck exchanger.



CROSS-FLOW HEAT EXCHANGER VDAS®

TE93

Benchtop apparatus with a control and instrument unit for studies into the principles and performance of heat exchangers.



RADIANT TRANSFER EXPERIMENTS VDAS®

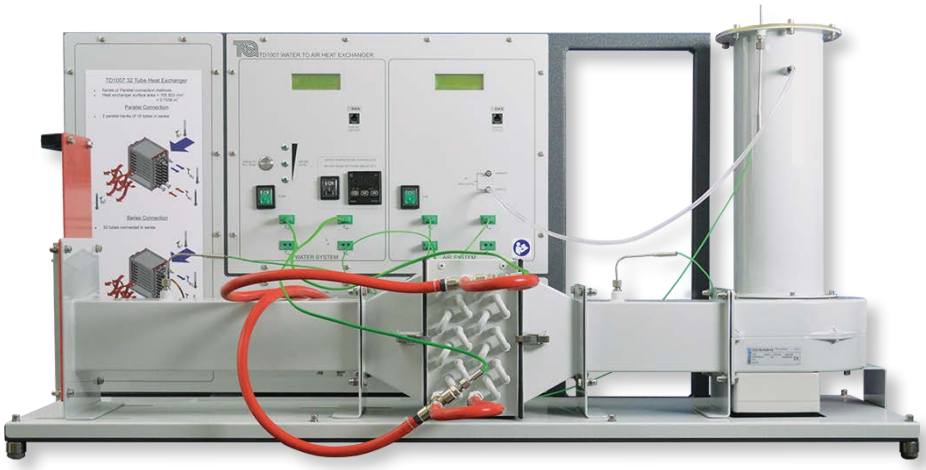
TD1003

Benchtop apparatus with a control box that demonstrates the laws of radiant transfer from heat and light sources.

WATER-TO-AIR HEAT EXCHANGERS VDAS®

TD1007

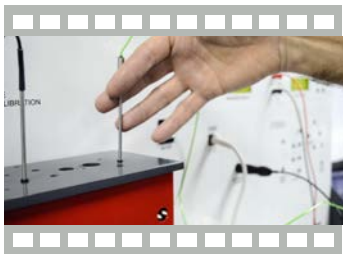
Benchtop apparatus that illustrates how cross-flow water-to-air heat exchangers work. Includes a 32-tube heat exchanger. Also available separately are 16-tube and finned heat exchangers.



TEMPERATURE MEASUREMENT AND CALIBRATION VDAS®

TD400

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



SATURATED STEAM - THE MARCET BOILER VDAS®

TD1006

Benchtop apparatus that illustrates the pressure and temperature relationship for saturated steam.

CASE STUDY

EAST TENNESSEE STATE UNIVERSITY EXPANDS ENGINEERING LABORATORY FACILITIES

East Tennessee State University made the decision to expand the course offering in 2015 to include a BSc in General Engineering which combines courses from mechanical, civil and electrical engineering. To teach the course they needed an engineering laboratory that had equipment to practically teach the principles of civil and mechanical engineering. After going out to bid, TecQuipment won, based on a balance between price and functionality of equipment.

With a complete basement floor renovation, new equipment from TecQuipment and the installation of high-tech classroom equipment, the floor now boasts to be one of many high-tech laboratories within the university.

DATA ACQUISITION CAPABILITIES

TecQuipment's own data acquisition system, VDAS®, is available on many of the company's products, and provides real time data display and capture, with real-time calculation of equipment-specific variables, and data charting with fast and easy data export.

> "TecQuipment is one of the few providers of engineering teaching equipment that integrate all the data acquisition into their products, making it easier to draw out data from the experiments. TecQuipment's products also lend themselves very well to student manipulation in the laboratory. Similar equipment in the market made it too easy, like a cook book. It's important for the students to interact, to get the full learning benefit," commented Professor J Paul Sims, Director of the BSc General Engineering degree programme.

All TecQuipment products come with a detailed user guide, which includes sample experiments. These set guidelines provide a great starting point for embracing the theories in focus. The equipment has the flexibility to be used beyond these set examples, some of which you can find illustrated by students on TecQuipment's YouTube channel.

Another key point for the BSc programme was the ability to integrate VDAS® with LabVIEW. Both the Engineering Technology and Engineering programmes use LabVIEW in most laboratories to support student development and provide students with a working knowledge of LabVIEW, which is a standard industrial platform for control and monitoring of processes.

INSTALLATION AND TRAINING

In major installation cases, TecQuipment personnel will often be sent out to site to help with the commissioning and training of products.

> "After the customer service installation I feel very confident. The products are straight forward and the user manuals are great!" explained Assistant Professor Samia Afran. "I came prepared with a whole blank notebook to document all that TecQuipment's applications engineer was going to train me on. But I didn't need to write anything, it was all in the provided documentation.

LOCAL SALES AND SUPPORT

TecQuipment works with partner companies across the world that specialise in understanding the local engineering education institutions and delivering products that best match their teaching requirements. In this case, local partner for Tennessee, RELETECH, had proven themselves before the bid even came in. "We trust the team from RELETECH, and TecQuipment too. This established relationship gave us extra conviction in knowing that the bid process had selected the rightful vendor to work with," added Professor Sims.

THERMAL POWER PLANT WITH STEAM TURBINE

VDAS® ONBOARD

PDF

TD1060V

Mobile laboratory-scale steam turbine that demonstrates fundamental thermodynamic principles of energy conversion and mechanical power measurement.

BOMB CALORIMETER

PDF

TD500

This compact fuel calorimeter (bomb calorimeter) is for the hands-on investigation of energy gained from burning different fuels, either in liquid or solid form, within a safe, student-friendly contained receptacle.

COMPRESSORS

TWO-STAGE COMPRESSOR TEST SET

VDAS®

GT103

Trolley-mounted, mobile apparatus that illustrates how single and two-stage compressors work, and their thermodynamic properties.

PDF

TECQUIPMENT

TecQuipment Ltd, Bonsall Street, Long Eaton, Nottingham NG10 2AN, UK