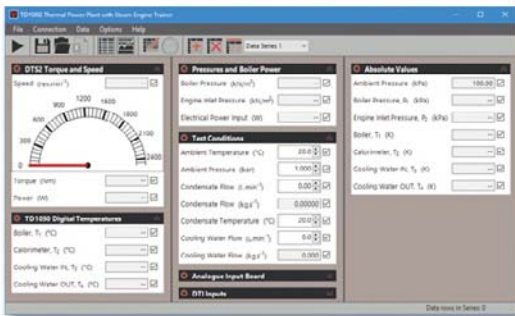




**VDAS® TD1050**

## THERMAL POWER PLANT WITH STEAM ENGINE TRAINER

A laboratory-scale steam plant that shows fundamental thermodynamic principles of energy conversion and mechanical power measurement.



SCREENSHOT OF THE OPTIONAL VDAS® SOFTWARE



- Ideal for students to gain insight into the first and second laws of thermodynamics
- Introduces students to industry-standard methods of analysing steam plant performance, including Rankine cycle analysis and using the Willans line
- Uses a simple two-cylinder steam motor and an electrically-heated boiler for easy understanding of the main parts of a steam plant
- Self-contained in a mobile frame that includes all instruments needed for experiments
- Allows students to copy the Marcet boiler experiment to prove the pressure-temperature relationship for saturated steam
- Connects to TecQuipment's optional Versatile Data Acquisition System (VDAS®)



# THERMAL POWER PLANT WITH STEAM ENGINE TRAINER

## DESCRIPTION

A mobile laboratory-scale steam plant for experiments in thermodynamic principles. It helps students to understand:

- Thermodynamic laws of energy conservation
- Steady flow energy equation
- Thermal efficiency and the control surface
- Rankine cycle analysis
- The Willans line

A mobile frame contains all the parts of the test set. An electric pump draws from a reservoir (included) to deliver water to an electrically-heated boiler. The boiler includes a safety valve, water level gauge and 'blow-down cock'. The boiler produces steam to turn a two-cylinder steam motor. The used steam from the motor outlet passes through a mains water-cooled condenser, then down to a waste tank or to a measuring vessel (supplied). TecQuipment supply a stopwatch and thermometer to allow accurate measurement of the flow and temperature of the condensate (steam flow).

The equipment includes all instruments needed for the experiments. These include a band-brake dynamometer with a digital torque and speed display, to measure and display motor speed, torque and power. Thermocouples connect to a digital temperature display to measure and display temperatures at key points in the test set. A throttling calorimeter allows students to measure the dryness fraction of the steam.

Two mechanical gauges show the boiler and engine inlet pressures. A meter shows the electrical power supplied to the heaters in the boiler.

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).

## RECOMMENDED ANCILLARIES

- VDAS-F (frame-mounted version of the Versatile Data Acquisition System)

## STANDARD FEATURES

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

## LEARNING OUTCOMES

- Steam plant performance, including the Rankine cycle analysis and the Willans line
- Marcet boiler experiment on saturated steam (pressure temperature relationship)

## ESSENTIAL SERVICES

### COOL, CLEAN MAINS WATER SUPPLY AND DRAIN:

Maximum 150 litres/hour (2.5 Litres/minute) and with low mineral content

### ELECTRICAL SUPPLY:

- 220 to 240 VAC single phase, 50/60 Hz 32 A

OR

- 220 to 240 VAC two phase, 50/60 Hz 32 A

## 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

# THERMAL POWER PLANT WITH STEAM ENGINE TRAINER

## 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.

### DIMENSIONS:

Nett: 1700 mm high (assembled) x 1000 mm wide x 800 mm front to back.

Packed volume : 1.6 m<sup>3</sup>

### WEIGHT:

Nett: 190 kg (without water)

### MOTOR POWER:

Approximately 90 W at 2000 rev.min<sup>-1</sup>

### BOILER:

Electrically heated by two independently-switched immersion heaters. Maximum experiment pressure approximately 350 kPa (set by 400 kPa pressure relief safety valve)

### INSTRUMENTATION AND MEASUREMENT:

- Throttling calorimeter and thermocouple to measure the dryness fraction of the steam
- Dynamometer and display unit for motor speed and power measurement
- Pressure gauges for boiler and engine (motor) inlet pressures, including electronic transducers for connection to VDAS®
- Thermocouples and display for steam and cooling water temperatures
- Power meter for heater power input, including an output for VDAS®
- Calibrated vessel with stopwatch and thermometer for condensate (steam flow) measurement