



## Thermodynamics

## TD1007

## Water to Air Heat Exchangers

**Shows how cross-flow water to air heat exchangers work**

Works with  
**VDAS®**



Screenshot of the optional VDAS® software

- A self-contained bench-top unit for demonstration heat exchangers – designed for teaching
- Includes one heat exchanger as standard for a full range of experiments
- Two additional heat exchangers available for extended experiments
- Heat exchangers have transparent sides and schematic diagrams to help students understand how they work and how to connect them
- Simple and safe to use – quick release and self-sealing fittings allow students to connect and change the heat exchangers quickly and easily – needs no tools
- Clear digital displays of all readings – you do not need a computer to work it or take readings
- Can connect to TecEquipment's Versatile Data Acquisition System (VDAS®)

- TecEquipment Ltd, Bonsall Street, Long Eaton, Nottingham NG10 2AN, UK
- T +44 115 972 2611 • F +44 115 973 1520 • E info@tecquipment.com • W www.tecquipment.com
- An ISO 9001 certified company
- VDAS is a registered trademark of TecEquipment Ltd

# TD1007

## Water to Air Heat Exchangers

### Description

Many thermodynamic applications use water to air heat exchangers. Examples include using circulated water to heat or cool air in a HVAC installation, or to cool hot water using a flow of air, as in the radiator of a combustion engine.

The TecEquipment Water to Air Heat Exchanger mirrors air heating and water cooling applications. It fits on a bench top and includes a hot water supply, a cooling air duct and all instruments needed for tests on cross-flow heat exchangers. The heat output of the design produces good results without greatly affecting the temperature of a reasonable size classroom or laboratory.

It's hot water system includes a tank with a PID controlled electric heater for stable temperatures, a pump and tank level indicators. An electrically operated valve opens to let water in to fill the tank. The tank has protection in case of over temperature, low water level and overfilling. A precision needle valve and flow meter control and measure the water flow rate.

The cooling air passes down a vertical duct containing an orifice plate which connects to a differential pressure transducer. The air then passes through a fixed speed centrifugal fan and along a horizontal duct containing the heat exchanger. The air exits the duct through a hand-operated slide-valve. Students use the orifice and valve to measure and control the air flow.

Thermocouples at the water connectors and in the air duct measure hot and cold inlet and outlet fluid stream temperatures. Clear, multiline digital displays show the temperatures, water flow rate and orifice pressure (to calculate air flow).

For safety and simplicity, the heat exchangers have self-sealing quick connectors for their water supply. Quick release clamps and locating dowels hold the heat exchanger in the air duct. Students need no tools to fit and change the heat exchangers.

Each heat exchanger includes a mimic diagram that attaches to a space on the main unit panel. The diagram gives useful information to the student, including how to connect the heat exchanger. Each heat exchanger has transparent sides so students can easily see their construction and understand how they work.

The equipment includes one heat exchanger as standard. It has 32 tubes in two banks of 16, allowing the addition of a thermocouple at the mid point. TecEquipment supply two different heat exchangers as optional extras. One (TD1007a) has a single bank of 16 tubes, giving half the heat transfer area of the standard heat exchanger. The other (TD1007b) also has a single bank of 16 tubes, but includes fins to increase the heat transfer area to equal that of the standard 32 tube heat exchanger.

The different heat exchanger options give students a better understanding of how they work and how size and construction may affect practical applications.

The equipment includes a space for TecEquipment's optional VDAS-F.

You can do tests with or without a computer connected. However, for quicker tests with easier recording of results, TecEquipment 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).

### Experiments

- Heat transfer between fluids through a solid wall
- Energy balance and efficiency
- Finding the heat transfer coefficient and Log Mean Temperature Difference (LMTD)
- Effect of water temperature (the 'driving force')
- Comparing actual midpoint water temperature with the average based on overall inlet and outlet temperatures
- Comparing temperature change between upstream and downstream tube banks
- Comparison of heat exchangers of different construction and heat transfer area (needs optional TD1007a and TD1007b)

### Recommended Ancillaries

- 16 Tube Heat Exchanger TD1007a
- 16 Tube Finned Heat Exchanger TD1007b
- VDAS-F (frame-mounted version of the Versatile Data Acquisition System)

- TecEquipment Ltd, Bonsall Street, Long Eaton, Nottingham NG10 2AN, UK
- **T** +44 115 972 2611 • **F** +44 115 973 1520 • **E** info@tecequipment.com • **W** www.tecequipment.com
- An ISO 9001 certified company
- VDAS is a registered trademark of TecEquipment Ltd



# TD1007

## Water to Air Heat Exchangers

### Standard Features

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

### Operating Conditions

*Operating environment:*  
Laboratory environment

*Storage temperature range:*  
-25°C to +55°C (when packed for transport)

*Operating temperature range:*  
+5°C to +40°C

**Note:** For best experiment results, your laboratory or classroom ambient air temperature must be around 20°C.

*Operating relative humidity range:*  
80% at temperatures < 31°C decreasing linearly to 50% at 40°C

*Heat Loading:*  
1 kW maximum heat loading to the environment at 20°C

### Sound Levels

Less than 70 dB(A)

### Essential Services

*Bench space needed:* 1300 mm x 900 mm

*Electrical supply:* Single-phase 220 VAC 50 Hz or two-phase 220 VAC 60 Hz at 13 A

*Water supply (to fill the water heater):*  
Clean, low mineral content water at a minimum 1 bar and maximum 3 bar.

### Specifications

*Standard heat exchanger:*  
32 off 10 mm diameter tubes in four rows, cross-flow, approximate surface area of 0.16 m<sup>2</sup>

*16 Tube Heat Exchanger (TD1007a):*  
16 off 10 mm diameter tubes in two rows, cross-flow approximate surface area of 0.08 m<sup>2</sup>



*16 Tube Finned Heat Exchanger (TD1007b):*  
16 off 10 mm diameter tubes in two rows, cross-flow with vertical fins, approximate surface area of 0.16 m<sup>2</sup>



#### *Nett dimensions:*

- TD1007 – (with standard heat exchanger fitted)  
1250 mm wide x 810 mm front to back x 620 mm high and 80 kg.
- TD1007a – 130 mm wide x 280 mm front to back x 210 mm high and 3 kg.
- TD1007b – 130 mm wide x 280 mm front to back x 210 mm high and 3 kg.

#### *Approximate packed dimensions:*

- TD1007 – 0.9 m<sup>3</sup> and 100 kg
- TD1007a – 0.013 m<sup>3</sup> and 5 kg
- TD1007b – 0.013 m<sup>3</sup> and 5 kg

- TecEquipment Ltd, Bonsall Street, Long Eaton, Nottingham NG10 2AN, UK
- **T** +44 115 972 2611 • **F** +44 115 973 1520 • **E** info@tecquipment.com • **W** www.tecquipment.com
- An ISO 9001 certified company
- VDAS is a registered trademark of TecEquipment Ltd

*tradition.*

*innovation.*

*integration.*

**infoWERK** is a leading expert in the development of eLearning courseware, learning system solutions, teaching and AV equipment.

**Furthermore infoWERK is the representative and system integrator of "TecQuipment".**

**TecQuipment** is one of the global leaders in technical teaching equipment for engineering. If you are interested in one of TecQuipment's products feel free to contact us at:



**infoWERK Medien & Technik GmbH**

**Martinsbühel 6 / A-6170 Zirl / Austria**

Phone: +43 (0) 5238 52099-0 / Fax: +43 (0) 5238 52099-40

E-Mail: [info@infowerk.at](mailto:info@infowerk.at) / Website: [infowerk.at](http://infowerk.at)

**Otto-Dürr-Straße 25**

**D-70435 Stuttgart, Zuffenhausen/ Germany**

Phone: +49 (0) 711 342471-0 / Fax: +49 (0) 711 342471-11

E-Mail: [info@de.infowerk.at](mailto:info@de.infowerk.at) / Website: [infowerk.at](http://infowerk.at)