

**WL 302**

**Trainer Tubular Heat Exchanger**



**Technical Description**

Using the trainer, the characteristic properties of heat transfer in pipe flows can be demonstrated. The heat transfer takes place in a coaxial tubular heat exchanger. The hot water is fed through the inner tube.

Using the trainer both parallel flow and counterflow operation with their different temperature profiles can be demonstrated. The non-linear temperature profile along a heat exchanger can be demonstrated by measuring temperatures at the inlet, outlet and halfway along the pipe. After the experiment the key parameters such as heat flux, heat transfer coefficient and heat loss are determined.

The closed hot water circuit includes a tank with electrical heater and a pump. The hot water temperature is kept constant using a thermostat. The cold water is drawn from the water mains and is fed to a drain after use.

The flow rate and relevant temperatures are recorded by sensors. A display panel for the measured values is located on the instrument panel next to the copper pipework. The measured values are indicated on digital displays and can also be transmitted directly to a PC via USB. The data acquisition software is included.

**Learning Objectives / Experiments**

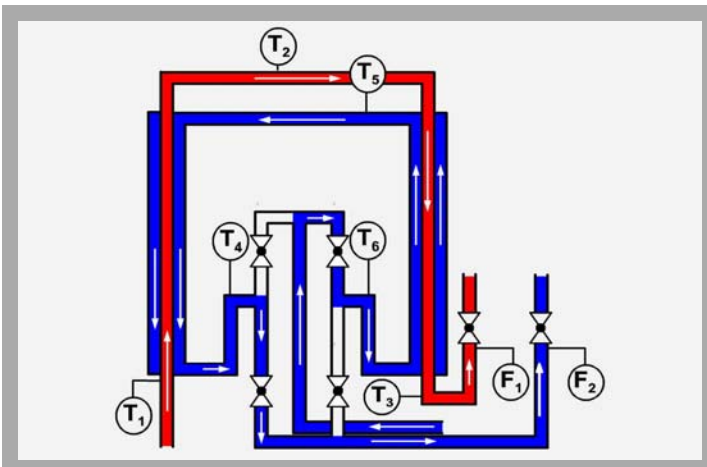
- Plotting temperature curves
  - \* in parallel flow operation
  - \* in counterflow operation
- Determination of mean heat flux for parallel flow and counterflow operation
- Determination of mean heat transfer coefficient

- \* Clear experimental set-up
- \* Heat transfer in pipe flows
- \* Processing of measured data on a PC
- \* Closed, insulated hot water circuit

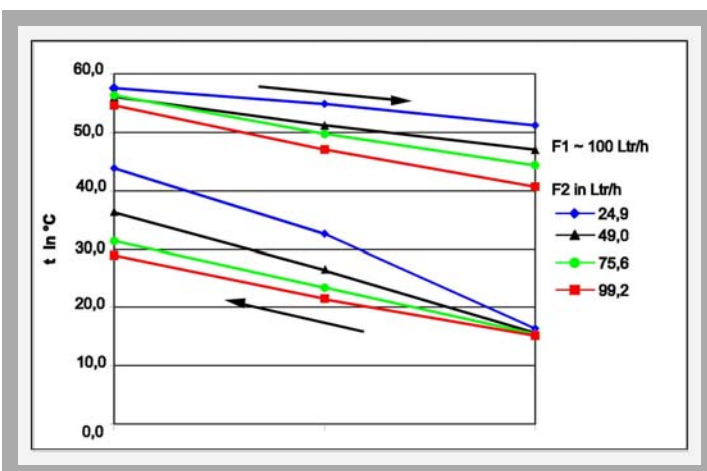
## WL 302 *Trainer Tubular Heat Exchanger*



1 vent valve, 2 temperature sensor, 3 ball valve, 4 pump, 5 tank, 6 heater with thermostat, 7 water connections, 8 flow rate sensor, 9 main switch and emergency, pump and heater switches, 10 valve to adjust flow rate, 11 displays



Process schematic: counterflow operation with measuring points for temperature and flow rate



Temperature profile in counterflow mode with different cold water flow rates F2 at constant hot water flow rate F1

### Specification

- [1] Trainer with a tubular heat exchanger
- [2] Closed hot water circuit, insulated with pump and heater with thermostat
- [3] Copper piping
- [4] Ball valves in the cold water circuit to select the operation mode parallel flow or counterflow
- [5] Temperature measurement with 6 sensors
- [6] Flow rate measurement with sensor
- [7] LabVIEW software for data acquisition via USB under Windows XP or Windows Vista

### Technical Data

- Pump
- power consumption: 70W
  - max. flow rate: 3800L/h
  - max. head: 4m
- Heater: 2kW, with thermostat: 0...80°C
- Heat transfer areas
- hot side: 30159mm<sup>2</sup>
  - cold side: 40212mm<sup>2</sup>
  - mean transfer area: 34945mm<sup>2</sup>
- Tank: 20L

### Measuring ranges

- temperature: 0...200°C
- flow rate: 0...720L/h

### Dimensions and Weight

- l x w x h: 1385 x 550 x 1850 mm  
Weight: approx. 110 kg

### Connections

- 230V, 50/60Hz, 1 phase or 120V, 60Hz, 1 phase  
Cold water connection: min. 150L/h

### Scope of Delivery

- 1 trainer
- 1 LabVIEW software CD + USB cable
- 1 manual

### Order Details

060.30200 WL 302 Trainer Tubular Heat Exchanger