Features

- Heat transport between heating element and vessel wall by convection and radiation
- Software for data acquisition

Under real conditions, the heat transport between two objects is normally substance-bound, i.e. convection and/or heat conduction, and not substance-bound, i.e. radiation, at the same time. Determining the individual heat quantities of one type of transfer is difficult.

Tesca Heat Transfer by Convection & Radiation trainer enables users to match the individual heat quantities to the corresponding type of transfer. The core element is a metal cylinder in a pressure vessel. A temperature-controlled heating element is located at the centre of the cylinder. Sensors capture the wall temperature of the cylinder, the heating temperature and the heating power. This metal cylinder is used to examine the heat transfer between the heating element and the vessel wall.

The pressure vessel can be put under vacuum or positive gauge pressure. In the vacuum, heat is transported primarily by radiation. If the vessel is filled with gas and is under positive gauge pressure, heat is also transferred by convection. It is possible to compare the heat transfer in different gases. In addition to air, nitrogen, helium, carbon dioxide or other gases are also suitable.

A rotary vane pump generates negative pressures down to approx. 0,02mbar. Positive gauge pressures up to approx. 1bar can be realized with compressed air. Two pressure sensors with suitable measuring ranges are available for the pressure measurement: the negative pressure is captured with a Pirani sensor; a piezo resistive sensor is used for experiments with a filled cylinder.

The measured values can be read on digital displays. At the same time, the measured values can also be transmitted directly to a PC via USB, where they can be analyzed with the software.
The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

Specifications

- Heat transfer between heating element and vessel wall by convection and radiation
- Operation with various gases possible
- Experiments in vacuum or at a slight positive gauge pressure
- Electrically heated metal cylinder in the pressure vessel as experimental vessel
- Temperature-controlled heating element
- Vacuum generation with rotary vane pump
- Instrumentation: 1 temperature sensor at the heater, 1 temperature sensor at the vessel wall, 1 power sensor at the heating element, 1 Pirani pressure sensor, 1 piezo-resistive pressure sensor
- Digital displays for temperature, pressure and heating power
- Software for data acquisition via USB under Windows Vista or Windows 7

Technical Specifications

- **Heating element**
  - Output: 20w
  - Radiation Surface Area: Approx. 61cm²
- **Pump for vacuum generation**
  - Power Consumption: 370w
  - Nominal Suction Capacity: 5m³/h
  - Final Pressure With Gas Ballast: 20*10 3mbar
  - Final Pressure Without Gas Ballast: 5*10-3mbar
- **Measuring ranges**
  - Negative pressure: 0,5*10-3...1000mbar
  - Pressure: -1...1,5bar rel.
  - Temperature: 2x 0...200°C

Note: Specifications are subject to change.

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Website: www.tescaglobal.com

- output: 0...20W

Requirements:
- 230V, 50/60Hz, 1 phase
- Compressed air: 1500mbar

Accessories:
- Extended surface heat transfer module est

Specifications:
A small scale bench top accessory Tesca EXTENDED SURFACE HEAT TRANSFER MODULE EST designed to measure the temperature profile and heat transfer along a horizontal extended surface (cylindrical pin). A small diameter uniform rod is heated at one end and heat flowing along the rod by conduction is lost to the surroundings by a combination of natural convection and radiation. The resulting heat transfer gives a temperature profile that may be investigated and predicted by conventional analysis.

The apparatus consists of a solid cylindrical matt black brass bar supported in a frame and heated at one end. At intervals from the heated end are eight thermocouples recording the surface temperature so that a temperature profile along the bar may be developed. An additional thermocouple records the ambient temperature.

The heater is located inside an insulated cylinder at one end of the apparatus. The heater input power is controlled through the variable 240v ac supply from the Heat Transfer Service Unit EST and is designed to operate at up to 20 Watts.

All instrumentation and power supplies plug directly into the Heat Transfer Service Unit and readings are displayed on digital panel meters.

Note: Specifications are subject to change.

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