

WATER WATER TURBULENT FLOW HEAT EXCHANGER H102G



Year 1
study

Description

This is a highly advanced concentric tube heat exchanger with hot water flowing through the central tube while cooling water flows through the annular space. The heat exchanger has been divided into three equal sections in order to allow examination of the intermediate stream temperature conditions and temperature distribution through the heat exchanger. Thermocouples sense the hot and cold stream temperatures at the four stations and the inner tube wall temperatures on entry and exit. The addition of the central tube surface temperatures at inlet and exit allow detailed investigation of the surface heat transfer coefficient inside and outside the central tube. This allows advanced students to investigate the Nusselt, Reynolds, Prandtl relationship $Nu = k Re^a Pr^b$. The core tube temperatures also allow students to plot hot stream, cold stream and core tube temperatures for both con-current and counter-current flow. The unit incorporates an extended range flowmeter in order to allow investigation of low and high range Reynolds numbers. The PID temperature control on the H102 Heat Exchanger Service Unit allows investigation of turbulent flow conditions at a range of fixed Prandtl numbers. Investigations using these two methods of control allow students to experimentally determine the constants in one of the classic empirical equations for turbulent heat transfer in a tube. $Nu = 0.023 Re^{0.8} Pr^{0.4}$

Related Laws/Applications

- Reynolds Number
- Nusselt
- Prandtl

Learning capabilities

- Determination of heat transfer rate, logarithmic mean temperature difference, overall heat transfer coefficient and 4 point hot and cold stream temperature profiles.
- Determination of surface heat transfer coefficient inside and outside the tube, and of the effect of fluid velocity.
- Comparison of performance in concurrent and in counter-current flow.
- Investigation of the relationship between Nusselt (Nu), Reynolds (Re) and Prandtl (Pr) Numbers for Reynolds Numbers up to 65000 and for Prandtl Numbers between 2.5 and 5.0.
- Determination of the constants in $Nu = k Re^a Pr^b$.

Technical Specification

- Core Material: Copper
- External Diameter: Ø9.5mm
- Internal Diameter: Ø7.9mm
- Length: 3 x 350mm
- Outer Tube Material: Copper
- External Diameter: Ø12.7mm
- Internal Diameter: Ø11.1mm

Essential Ancillaries

- H102

What's in the Box?

- 1 x H102G
- Spare fasteners and blanking plugs
- Instruction manual
- Packing List
- Test sheet

Essential Services

- H102

Ordering information

To order this product, please call PA Hilton quoting the following code:
H102G

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