WL 314.02

Heat transfer in pipes in mixed flow

Learning objectives/experiments

- heat transfer from the pipe wall to the fluid
- interrelationships between Nusselt, Reynolds and Prandtl
- characteristics of shell & tube heat exchangers
- pressure loss over the entire measuring section
- determination of the overall heat transfer coefficient

Specification

[1] pipe section and tube bundle with heating element form a shell & tube heat exchanger
[2] tube bundle with 18 unheated tubes and 1 heating element in the centre as a heated tube
[3] up to 8 deflection plates guide the air through the tube bundle
[4] thermocouple type K: temperature measurement on the shell surface of the rod heater
[5] accessory installed in WL 314 with quick-release fasteners

Technical data

Pipe section
- Ø 100mm

Heating element
- output: 250W
- heat transfer surface: 0,011m^2

Tube bundle
- 18 tubes
- heat transfer surface per tube: 0,011m^2

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 1050x210x320mm
Weight: approx. 15kg

Scope of delivery

1 experimental unit
1 set of instructional material

Description

- **heat transfer in the tube bundle**
- **model of a shell & tube heat exchanger with deflection plates**

The WL 314.02 accessory extends the experimental scope of WL 314 to include the topic: convective heat transfer on pipes with mixed flow. Convective heat transfer from the tube wall to the fluid is studied.

The core element of WL 314.02 is a transparent pipe section, equipped with a tube bundle. A heating element located in the centre of the tube bundle simulates a heated pipe. The tube bundle together with the pipe section form a shell & tube heat exchanger. The experiment examines the convective heat transfer between tube and fluid.

The accessory is inserted into the air duct of WL 314 using quick-release fasteners. A fan in the air duct sucks in ambient air and conveys it through the pipe section of the accessory. The air is directed to the transfer surfaces by forced convection and heated up. The pipe section is constructed in such a way that deflection plates guide the air through the tube bundle. The number of deflections can be varied by removing and installing the deflections plates.

The power and surface temperature on the shell surface of the heating element is measured and displayed on the WL 314 trainer.

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Required accessories

WL 314	Convective heat transfer in air flow