

WL 314.01

Heat transfer in pipes in parallel flow



Learning objectives/experiments

- heat transfer inside the tube and around a tube
- comparison of convective heat transfer in a ring heater and a heating element
- analysis of the interrelationships between Nusselt, Reynolds and Prandtl
- determination of the overall heat transfer coefficient
- determination of flow velocity

Specification

- [1] heating elements and pipe section form a tubular heat exchanger
- [2] ring heater as partially heated tube
- [3] heating element as heated inner tube
- [4] heating elements arranged parallel to the flow
- [5] 2 thermocouples type K: measurement on the surface of the heating element and on the inner surface of the ring heater
- [6] overheat protection in WL 314
- [7] accessory installed in WL 314 with quick-release fasteners

Technical data

Pipe section

- Ø 60mm

Ring heater

- output: 220W
- Ø 60mm
- length: 30mm

Heating element

- output: 250W
- Ø 8mm
- length: 130mm

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 1050x210x320mm

Weight: approx. 10kg

Scope of delivery

- 1 experimental unit
- 1 set of instructional material

Description

- two heating elements for different considerations of the convective heat transfer
- heating elements parallel to the flow in the tube

The WL 314.01 accessory extends the experimental scope of WL 314 to include the topic: convective heat transfer inside and on the tube under parallel flow. Convective heat transfer from the tube wall to the fluid is studied.

The core element of WL 314.01 is a transparent pipe section, equipped with a ring heater and a heating element for different considerations of convective heat transfer. The heating elements together with the pipe section form a tubular heat exchanger. The ring heater is used to study the convective heat transfer from the outer wall to the inside of the tube.

A heating element along the pipe axis, on the other hand, enables the study of the convective heat transfer from a heated inner tube to the outer tube. The heating elements are arranged parallel to the flow in the tube.

The accessory is inserted into the air duct of WL 314 by means of 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 past the transfer surfaces by forced convection and heats up.

The power and surface temperature of the two electric heaters is measured and displayed on the WL 314 trainer.

WL 314.01

Heat transfer in pipes in parallel flow

Required accessories

WL 314 Convective heat transfer in air flow