

Thermal measurement technology for forced convection on microstructured heat exchangers

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Abstract

In times of increasing power density in electronic components the development of efficient cooling technologies becomes more important. Microstructured heat exchangers have a high potential to fulfil the increasing cooling requirements.

In this study, the demands and challenges for thermal measurements in the field of forced convective cooling with microstructured heat exchangers are systematised. Furthermore, a concept for a modular test bench is presented. Figure 1 shows a schematic illustration of the closed circulation system of the test bench. By the help of the measurement system, the effects of microstructured surfaces on heat transfer, temperature distribution and pressure drop can be identified.

An essential requirement for thermal measurements is a two-dimensional temperature measurement device for the specification of the temperature distribution. Furthermore, measurements must be realised close to the microstructures. In order to determine the influence of the microstructure layout exactly, temperature sensors must have a high accuracy. Also a high temporal resolution is necessary, since the heating and cooling performance has to be analysed. As part of the work, selected solutions for the thermal measurement technology are introduced.

In addition, the requirements concerning the external boundary conditions, for example ambient temperatures, flow rates and input temperatures of the liquid, are figured out. In this context, the realisation of constant conditions is a prerequisite for suitable measurements. For this, concepts and analysis of requirements will be presented.

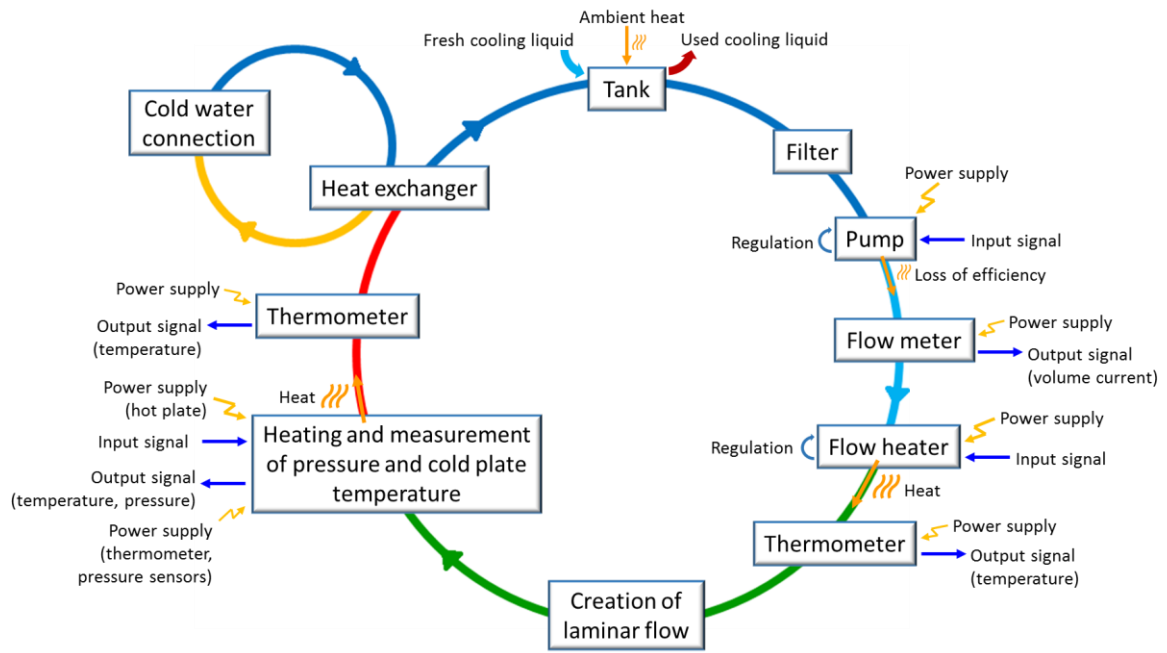


Figure 1: Schematic illustration of the closed circulation system of the measurement test bench