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First helium measurements with a new cryogenic flow meter

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A new method for flow measurement in cryogenic systems was published recently. The caloric measuring principle is based on two analytical and linearly independent evaluation functions for the mass flow rate, both using the same temperature and heater power measuring data as input parameters. This enables a complete compensation of systematic errors, as well as in situ calibration of the flow meter during operation. The remaining measurement uncertainty, constituting only of random errors, is typically less than 1 % with regard to the actual flow rate.

The Karlsruhe Institute of Technology and WEKA AG, Switzerland, are presently developing a commercial flow meter for application in helium cryostats. The flow meter, which consists of a cryogenic sensor and room temperature electronics, is designed for operating temperatures between 300 K and 4 K, for pressures up to 5 MPa and for helium flow rates of 0.2 to 12 g/s. The sensor design is compact, which enables the installation in most helium cryostat and transfer systems.

This paper presents the results of first low-temperature experiments with supercritical helium, which were carried out in a control cryostat of the 2 kW helium refrigerator of the TOSKA test facility. The new flow meter was connected in series to an existing Venturi tube, which was used for reference measurements.

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