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Flow velocimetry for weakly conducting electrolytes based on high resolution Lorentz force measurement. CHRISTIAN RESAGK, RESCHAD EBERT, SUREN VASILYAN, ANDREAS WIEDERHOLD, Ilmenau University of Technology — We demonstrate that a flow velocity measurement can be transformed into a non-invasive force measurement by metering the drag force acting on a system of magnets around a flow channel. This method is called Lorentz force velocimetry and has been developed in the last years in our institute. It is a feasible principle for materials with large conductivity like liquid metals. To evolve this method for weakly conducting fluids like salt water or molten glass the drag force measurement is the challenging bottleneck. Here forces of 10^{-8} and less of the weight force of the magnet system have to be resolved. In this paper different force measurement techniques get tested and compared. For the current setup the magnet system is attached to a state of the art electromagnetic force compensation balance. Different ways of getting the correct force signal out of the two measurement setups will be presented and discussed. For generalization of the measurement principle the Lorentz force is determined for different fluid profiles. In addition to that we have developed new systematic noise reduction methods to increase the resolution of the force measurement techniques by a factor of ten or larger which we will present here.

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