

Application Note

Micropumps for Infusion Therapy

In medical applications, such as infusion therapy, micropumps can be an attractive alternative to standard pumps due to their size, weight and low energy demand. The micropump mp6-psense with its double actuator configuration offers the possibility of an intrinsic flow control. Therefore it can fulfill higher requirements on safety and accuracy under varying conditions as the standard pump mp6. By the controlled loop function the flow can run constantly under varying conditions as pressure, viscosity or temperature changes.

Infusion therapies like for example the continuous dosing of nutrient solution in parenteral diets have high demands on the flow accuracy. Important is the starting behavior and the stable flow during the course of infusion with a minimum of short time fluctuations. The micropump mp6-psense from Bartels Mikrotechnik with intrinsic flow control has been tested for such applications. A clear and simple picture of the general flow rate stability over time can be gained by a trumpet curve analysis. The trumpet curve shows the variations of the mean flow accuracy over specific observation periods. The variations are presented only as maximum and minimum deviations from the overall mean flow within the observation window. The flow performance of the pumps is measured over a time period of 25 hours after a 24 hour stabilizing phase or emptying of half the reservoir according to the definitions of the standard DIN EN 60601-2-24.

Since the flow controlled micropump mp6-psense has a very dynamic behavior stable flow conditions can already be achieved after 10 minutes. Therefore the stabilization phase could be considerably shortened. The trumpet curve analysis over defined time intervals then shows the maximum positive and negative errors, occurring in the time interval. Achievable flow rates of the mp6-psense are 0,5 – 5 ml/min with a flow accuracy of 10%. For a flow rate of 125 ml/h the exemplarily trumpet curve of mp6-psense is shown below. In short observation windows the error of flow is already below 5 %. With increasing intervals it decreases below 1 %. The absolute error is below 2 %.

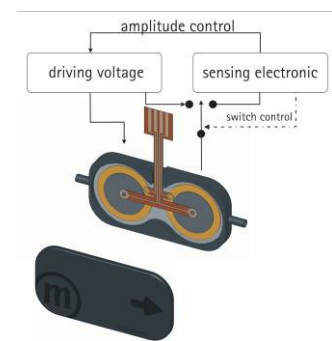
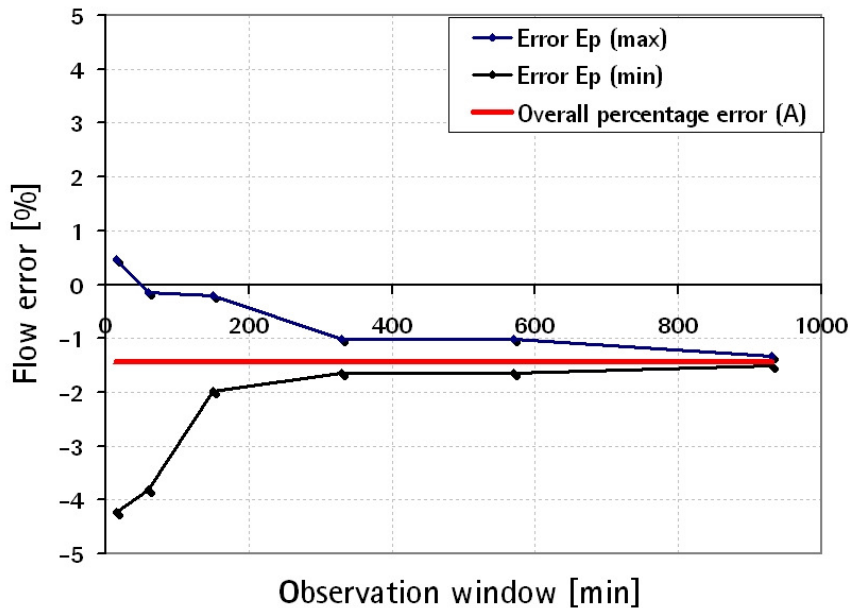


Fig. 1: Flow-sensing schematic of micropump mp6



Flow deviation according to IEC-60601-2-24



Looking at the overall complexity, from the pump side, this solution is fully based on a proven, mass produced component. Additional effort is required for the driving electronics but as the signal processing is straightforward the unit keeps its portability and capability of being driven with batteries. Especially in applications where the micropump should be used as a disposable unit while the electronics is being reused, the full potential of this solution comes into play. Infusion therapies with flow rates below 0,5 ml/min can either be achieved by quasi-continuous pumping, for which small volumes are dosed in defined time intervals. Or a flow controlled micropump with an integrated flow sensor is used which can achieve lower flow rates with higher accuracies. The flow range of such a system is from 60 µl/min to 5 ml/min with 5 % accuracy.

Take benefit of the innovative potential of this pump for your products! Be one step ahead compared to your competitors and get in contact with us concerning your application. Besides the standard components, Bartels Mikrotechnik is also specialized in the development of customer specific adaptations.

