

Calibration of Syringe Pumps Using Interferometry and Optical Methods

Authors : E. Batista, R. Mendes, A. Furtado, M. C. Ferreira, I. Godinho, J. A. Sousa, M. Alvares, R. Martins

Abstract : Syringe pumps are commonly used for drug delivery in hospitals and clinical environments. These instruments are critical in neonatology and oncology, where any variation in the flow rate and drug dosing quantity can lead to severe incidents and even death of the patient. Therefore it is very important to determine the accuracy and precision of these devices using the suitable calibration methods. The Volume Laboratory of the Portuguese Institute for Quality (LVC/IPQ) uses two different methods to calibrate syringe pumps from 16 nL/min up to 20 mL/min. The Interferometric method uses an interferometer to monitor the distance travelled by a pusher block of the syringe pump in order to determine the flow rate. Therefore, knowing the internal diameter of the syringe with very high precision, the travelled distance, and the time needed for that travelled distance, it was possible to calculate the flow rate of the fluid inside the syringe and its uncertainty. As an alternative to the gravimetric and the interferometric method, a methodology based on the application of optical technology was also developed to measure flow rates. Mainly this method relies on measuring the increase of volume of a drop over time. The objective of this work is to compare the results of the calibration of two syringe pumps using the different methodologies described above. The obtained results were consistent for the three methods used. The uncertainties values were very similar for all the three methods, being higher for the optical drop method due to setup limitations.

Keywords : calibration, flow, interferometry, syringe pump, uncertainty

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