

Troubleshooting Pump Issues

In sequential injection, pump troubles are the most common issue. These issues can range from poor precision or accuracy, pressure surges, aspiration air leaks and plunger repositioning errors. In order to identify which facet of the pump is causing the problem, one must look at more than just the pump itself. More often than not, exceeding the syringe pump's physical/mechanical limitations is the main cause.

First, let's examine the cases where the syringe pumps limitations are not breached. If an operator is having trouble receiving robust reproducibility, there could be portions of the valve rotor stuck within the rotor channel. This is the result of the valve actuating over a rotor that is not completely flush with the valve head/stator. To identify this, unscrew the stator from the valve head (locating the 3 Allen screws on the valve head). Remove the stator and then the rotor. Take a close look at the rotor to see if there is plastic shedding in the rotor channel. If there is, use a Kimwipe and your nail to smooth out the rough area on the rotor. If the problem was the rotor, this would immediately improve accuracy/precision results.

The next item to check is whether or not the system is over pressurized. An over pressurized system will move fluid even after the syringes have stopped moving. One has to physically observe the movement of fluid (either by watching the waste or reagent lines) to see if valve actuations cause fluid to move instead of the pumps themselves. If a valve actuation is responsible for moving fluid out/into waste/reagent containers, and an operator cannot seem to get accuracy or precision, the pressurized system could be the problem.

Aspiration on the MicroSIA units is not as robust and powerful as dispensing. The act of aspiration puts a lot of pressure strain on connections downstream of the pump. Once the pressure of aspirating out of either long lengths of small ID tubing or through check valves and other pressure-generating components is too potent for the pump, air leaks occur. This will generate an army of bubbles into your system, which will cause accuracy/precision problems. Also, the liquid becoming aspirated will not fully enter the space desired.

Lastly, SIA systems that have exceeded the pressure capacity (~60-80PSI) can have pumps fail to return to the home position (where the plunger is all the way up). This happens when the system is running and the method causes fluid to dead-head on the syringe pump. Once the home position has been forcefully changed by this, that syringe will no longer return to home until the system is de-pressurized and communication is reset. Other ways to deal with this issue (if the method in use cannot change much) is by commanding the syringe pump 3-way valve to the "Top" position while the system is pressurized. Once the syringe needs to be utilized, the operator must have the system de-pressurize (by commanding the valve to the waste position) letting the fluid exit the system. Once the pressure is equilibrated, the syringe pump may be used to move fluid once more.