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Technical Note
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Service Note FLOM HPLC pumps (Error 4)

Titel
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Instruments
FLOM PEEK pumps

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1 Introduction

FLOM HPLC pumps have a problem to get out air bubbles by simply using purge mode. Sometimes it is very difficult to get them rid of the pump head or the check valves, especially with the PEEK version of 301 or AI series pump.
The intelligent flow mode of the 301 and AI series tries to compensate the compression and after some minutes the pump stops and error 4 is displayed. When this problem happens, here is what to do:

2 How to solve

2.1

Use a 10 / 25 ml syringe and remove air manually. Please connect the syringe needle to the drain port, open the drain valve and run the pump at 2-4 ml/min (NOT at full flow rate, this will not solve the problem because of creating laminar flow) and draw the solvent manually with a syringe.
Please make sure that the outlet port is plugged or this will not work. If the outlet port is connected to something that prevents a reverse flow, then the outlet tube can stay connected. Do this repeatedly and fill the syringe at least 10 times or more if necessary.

Then close the valve and reconnect the outlet port with the tube, and flow the solvent at purge mode for about 30 minutes at the flow rate that can create the pressure above 1MPa (higher the pressure the better - you do not have to set the high flow rate - the pressure is more important). A flow of 3-5 ml / min is typically adequate. Full flow of 9.99 ml / min is too high because the degasser fails to degas adequately.
All common analytical degasser can degas typically up to 5 ml / min. maximal. Also please do check the degasser capacity. Most brand do not degas above 3 ml/min, especially a degasser with Teflon AF membrane. Most manufacturers claim max. flow rate of 10 ml/min for degassing, but our data shows they are only good for 1-5 ml/min, depending on the brand.

If the operation flow rate is 5 ml/min, we recommend the purge flow to be set at 5 ml/min as well. You can monitor the pressure on display as well, to make sure that the range of pressure variance stabilizes - if there is a bubble, the pressure variance will not stabilize easily. After this procedure is done, you can set it to the normal pump mode.

Another method is to connect the syringe needle directly to the outlet check valves. Of course, there are 2 check valves and you can only do one at a time, but this is very effective.
All you have to do is to remove the black PEEK fittings from the check valves and connect the syringe needle directly to remove bubble manually with a syringe. You do not have to run the pump.

Caution - reconnecting the PEEK fittings is very delicate - it must NOT be over-tightened. The way to do is to finger-tight the fittings and then use a wrench to turn about 60 to 90 degrees. If there is a leakage, that is good (you did not over-tighten it!).
Then just gently tighten the fitting a little more to stop the leakage.

3 Differing pump sounds

3.1

About the sound - it is NORMAL to sound differently in the normal pump mode.
What the pump does is to adjust the speed of stepper motor inside to reduce pressure pulsation, which creates funny wiggling sound that is constantly changing. The purge mode sounds more quiet and stable because there is no speed adjustment in purge mode - the motor runs at the fixed rate of speed (therefore no compensation of pressure pulsation). But even at normal flow mode, the sound stabilizes eventually once the pressure variance has been reduced. The wiggling sound is a good sign that pulse reduction mode is working properly.

If you hear a increasing noise of wiggling sound, the pump will compensate for the sudden pressure loss created by a bubble by increasing the motor speed. When this pressure drop becomes too sever (which is often the case of air inside), the motor fails to increase the pressure and result in motor error 4.
Error 4 is the result of failed attempt by the motor to bring the pressure back to where it was. The motor tries to increase the pressure by running faster and faster, and eventually failed to run faster. The bubble typically stays in the check valves which prevent them from closing, causing the pressure drop and inhibit pressure increase. Solution: see 2.0