



Disposable filters

Manual

The use of disposable filters:

Filtration of groundwater under anaerobe conditions and directly on site is necessary to prepare groundwater samples for later analysis in the lab on (trace) metals. Soil particles ($> 0.45 \mu\text{m}$) must be removed from the sample. We supply on a standard base the following disposable filters.:

Disposable filter 0.45 micron 20 cm² (art. no. 12.30.01 (5 pcs) and 12.30.02 (bulk))

Disposable filter 0.45 micron 300 cm² (art. no. 12.30.10 (single) and 12.30.11 (bulk))

Disposable filter 0.45 micron 700 cm² (art. no. 12.30.05 and 12.30.06 (bulk))

Disposable filter 0.20 micron 20 cm² (art. no. 12.30.15)

These filters are ideally used in combination with a peristaltic pump. The filter then is placed on the outgoing (pressure) tubing from the pump. Whether directly on the silicone pump house tubing (with a clamp) or pushed in the end of an intermediate piece of PE tubing. Then the silicone tubing should have a clamp where it is sled into the PE tubing. In this way, water can be pumped directly from the well into the filter without any prior oxygen contact. After filtration, so after passing the membrane, oxydation is no problem anymore and the sample can be acidified as a standard conservation procedure.

Some points:

Acidifying prior to filtration (for instance later in the lab) will greatly increase trace metal concentrations of silt laden water. Filtration after simple storage (with inevitable oxygen contact) will diminish trace metal concentration because of (co-)precipitation of (trace) metals at the bottom of the flask.

Submersible impeller (centrifugal) pumps tend to overheat the water. Also there is too much cavitation and turbulence to speak of an undisturbed sample. Also the pump may become overheated! You can use these filters with an impeller pump by using a T-piece to direct a large part of the water into a drum or sewer and a much smaller part to direct to the filter. In this way the pump will get sufficient water for cooling.

The foot-valve or inertia-pump does not have these last mentioned disadvantages but tends to give too high peak-pressures. This will surely damage the membrane (pressure should stay < 4 bars) and will blow off the foot valve from the bottom of the tubing too! Do not use a foot-valve pump with a 20 or 28 cm² filter straight at the outlet of the tubing. These peak pressures may be diminished by attaching a 30 cm piece of silicone rubber tubing in between, to even out these peak pressures (the tubing will swell and de-swell with each stroke of the foot-valve pump). The flow through capacity of the 300 and 700 cm² filters is so high that the peak pressures will stay below the maximum allowable pressure of the filter. It is strongly advised to move the foot-valve pump by hand and not with machinery.

A filter can be attached straight on the outlet tubing of a bladder pump. Keep the air-overpressure < 2.5 bars. When working with a bailer stick the suction tubing of the peristaltic pump through the top piece of the bailer to the bottom (valve) section of the bailer. Then start the filtration with the pump.

If you are in doubt about any pump you can always fill a bottle from the bottom and keep it overflowing to get and keep the contents anoxic and then simultaneously pump out water with a 12 Volt (or hand-operated) peristaltic pump with the disposable in-line filter placed at the pressure tubing of the peristaltic pump.

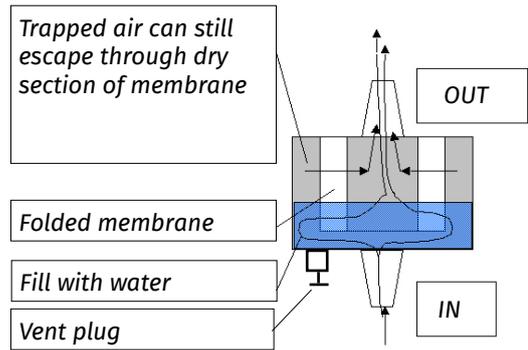
Connecting the filter:

Meet the difference

Activate the pump (any type) until all air bubbles are expelled from the tubing.

- Connect all tubings in such a way that there are no leaks possible. Air entering by any connection will collect on the membrane and reduce its efficiency with up to 50% (!) and also make the filtration aerobic instead of anaerobic! Once the membrane is wet, trapped air can not escape anymore!

After having pumped out all air bubbles from the tubing you take a new filter. Handle it in such a way that you do not touch the IN or OUTLET connections. Place the 20 or 28 cm² with the IN marked side on the tubing. The 300 and 700 cm² filters have an air vent, but following the procedure we suggest here you will never need to use it. The 700 cm² filter also features imprints IN or OUT. If in doubt or if there is no indication, consult the drawing on the right. This shows the direction in which the water should flow through the folded circularly placed membrane. The filters feature universal fittings for PE (or other) tubing 6 to 12 mm inside.



When filling the filter, so when starting the filtration keep the filter with the OUTLET UPWARD. This counts for ALL models. Adjust the pump to a slow speed so that water is injected. The air, being much lighter than water will not be trapped since it can escape through the still dry section of the membrane (see the first image). When water is escaping from the outlet without air bubbles you can put the filter in any position to make the filtered water flow into the sample bottle.

Venting the filter:

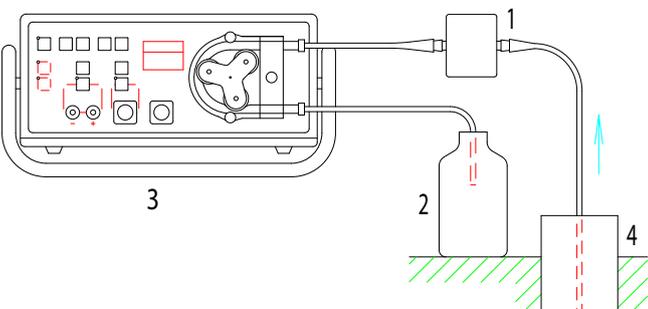
- When filling the filter, so when starting the filtration keep the filter with the OUTLET UPWARD. This counts for ALL models. Adjust the pump to a slow speed so that water is injected. The air, being much lighter than water will not be trapped since it can escape through the still dry section of the membrane (see the first image). When water is escaping from the outlet without air bubbles you can put the filter in any position to make the filtered water flow into the sample bottle.

Tips:

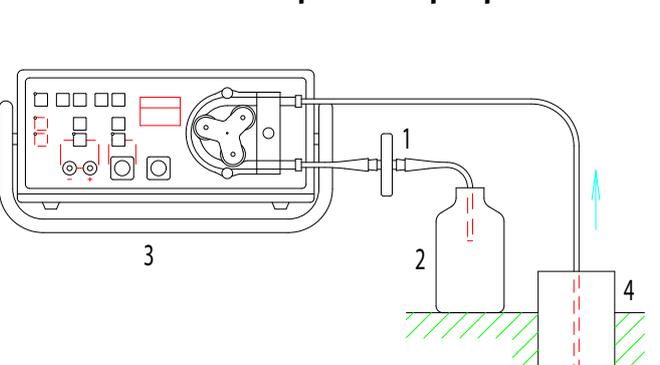
- By applying a low overpressure you will optimize the lifetime of the filter. The higher the pressure you use; the quicker the filter cake developing on the membrane will become plugged.
- The peristaltic pump we suggest does not give pressures above 2.5 bars. Do not use a pump developing > 3.4 bars since this will overstretch or even break the membrane.
- Filters cannot be cleaned in any way. The membrane is insufficiently supported when applying back pressure. Again, this will overstretch the membrane so that the pores become larger than 0.45 microns! Of course you can never de-contaminate a used membrane.
 - Use a filter that fits the required quantity of filtered water compared to the turbidity of the groundwater. Using filters that are too small will cost a lot of time, results in unpermitted overheating of the sample and is not in conformity with e.g. the Dutch NEN 5745 standard for groundwater sampling.
 - Although it makes no sense to use these filters in the suction line it is possible. The efficiency of the filtration will become a fraction of a pressurized filtration since a part of the suction (max 0.95 bar) is used to get the water up in the well (e.g. 0.5 bar with water at -5 m).

Vacuum filtration with a peristaltic pump 12 Vdc

1. Disposable filter



Pressure filtration with peristaltic pump 12 Vdc



2. Sample bottle
3. Peristaltic pump 12 Vdc
4. Monitoring well