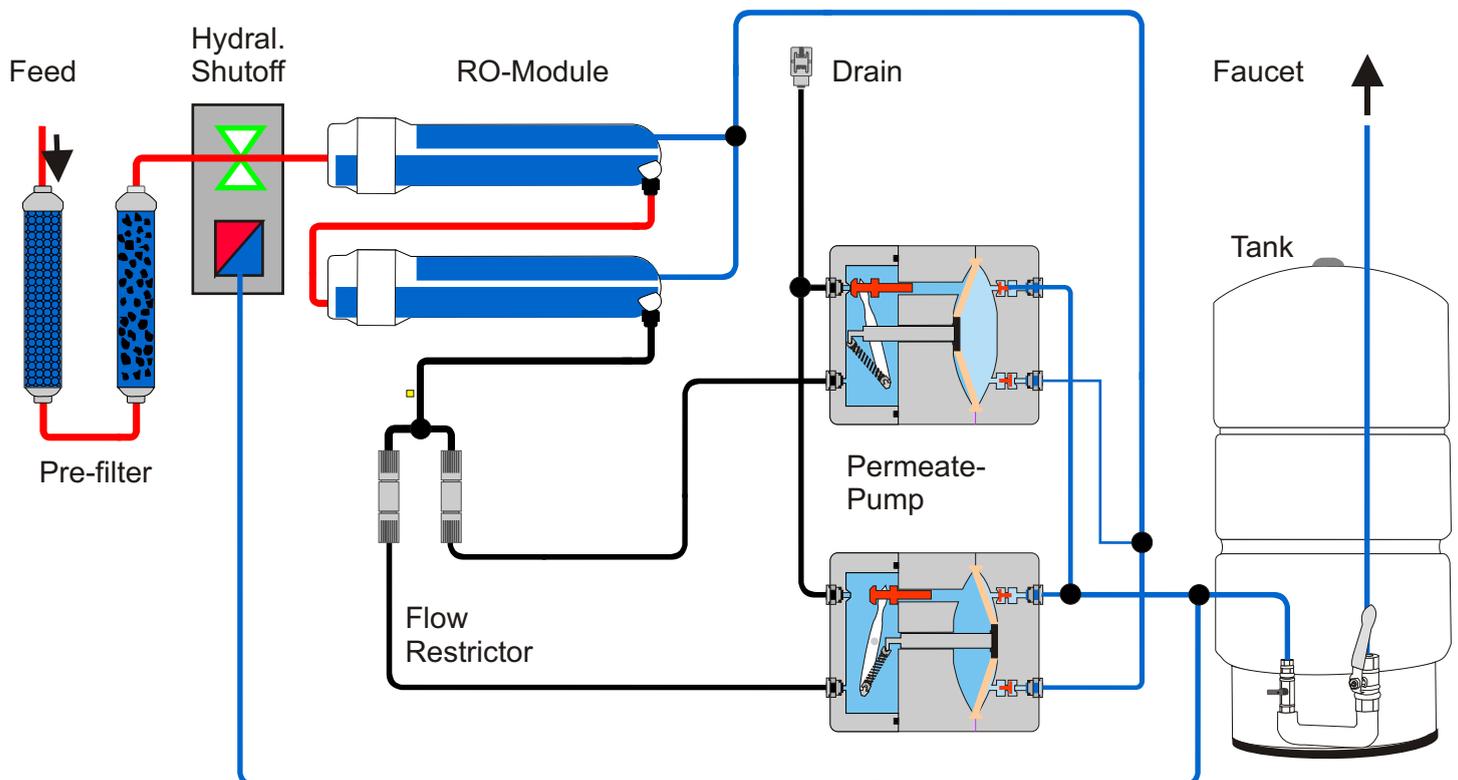


## The new Double Permeate Pump Technology for Systems reaching more than 1000 Liters per day even against high Tank Pressure

As described earlier the use of pressure tank RO- systems without permeate pumps has a general problem. If you run equipment like coffee makers, dish washers or ice cube machines on a pressure tank these machines have relative high minimum pressure requirements. To allow discharge of the complete tank above this minimum pressure it is necessary to have this minimum pressure as pre charge on the tank. If you start at 2 bars and only have 4 bars line pressure the system would run at 50% performance right from the start and it would be hard to get a reasonable charge into the tank.

A 100 GPD Membrane using normal permeate pump technology would allow you to charge the tank up to line pressure almost without losing differential pressure on the membrane which keeps the performance up. In the typical light commercial application the use of an hydraulic shutoff is not recommended like in residential systems where we would see TDS- creep. Leaving out the shut off valve would get the tank up to full line pressure before the flows stops and it will restart the system as soon as the tank is below line pressure.

A slight loss in performance takes place during the power stroke of the pump. During that stroke the RO Membrane sees back pressure for a short time. This phase is longer the closer the tank pressure is to line pressure and the more recovery the unit is set for.



This problem can be solved if two permeate pumps are used like in the above schematic. A special setup offsets the pumps during operation. This way one pump is always able to take product water if the other one is on its power stroke. This is achieved by a slight restriction in the permeate feed line of one pump. You can insert a piece of thinner tubing into that line. On the drawing it is shown by the thinner line on the permeate inlet of the upper pump.

The flow restrictors should be of same size. The total flow should be calculated for three to four times permeate flow.

Performance wise these systems were tested running two 100 GPD membranes. Also the new 150 GPD 1,8" elements should work. It is important to use 3/8" tubing to feed the system. Otherwise you will get significant pressure drop on the Membranes. From the concentrate outlet of the second membrane the tubing can be 1/4" until you reach the concentrate outlet of the permeate pumps. The drain line should be 3/8" again to prevent unnecessary backpressure on the pump concentrate outlets.

## And if this is still not enough water...

pressurize the system with up to 8,5 bars and improve the recovery with concentrate feedback. The Result will be a system that makes more than 900 liters per day and allows you to reach 7 bars of tank pressure easy. The feed to concentrate ratio can be as high as 2 to 1.

This setup was also tested with one 4" X 14" or with a 2,5" X 21".

