HYDRO **MOS**®
Reverse Osmosis Unit
Type: 2000 – 3500 S

Application

HYDRO **MOS**® reverse osmosis unit used for environmental friendly desalination of cold drinking and industrial water, well water, boiler water, process water, cooling water and climatic water.

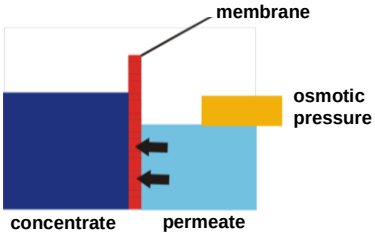
Process

HYDRO **MOS**® reverse osmosis units equipped and working with semi-permeable membranes allowing the water ((H_2o) to penetrate the pores but not allowing dissolved materials (ions) to penetrate.

If a salt solution and clear water are separated by a membrane (semi-permeable), clear water penetrates the membrane without any influence of exterior forces and gets to the salt solution, whereby it is diluted.

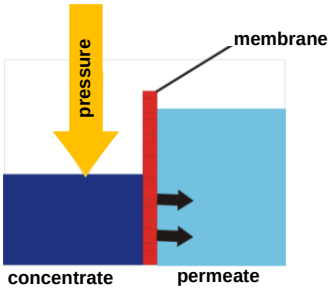
Such process known from nature is called osmosis (metabolism of cells). The process is stopped once the osmotic pressure of the corresponding solution is reached – an osmotic balance is given.

Osmosis



If the sequence is reversed by applying pressure on the higher concentrated solution, clear water penetrates the membrane in reverse direction after the osmotic pressure has been overcome. Dissolved salt is retained. Such process is called reverse osmosis.

Reverse osmosis



Advantage of reverse osmosis technology compared with other water treatment systems

- Removal of dissolved salts
- Removal of bacteria and germs
- Retention of particles
- Reduction of dissolved organic substances

Pre-treatment

Pre-treatment of water is dependent on the raw water quality that has to be determined by a water analysis. Normally, such pre-treatment is limited to water softening or scale dosing, whereby the membrane life is substantially extended and a significant save of water achieved. An additional treatment is necessary in case of increased content of iron, manganese and free chlorine.

Function

The feed water is passing the inlet safety filter (5µm), solenoid valve with pressure switch (recognition of lack of water pressure) to the pressure increase pump.

The produced pump pressure is reduced to the necessary operating pressure by means of a regulating valve. The water is subsequently guided through the membrane installed in pressure pipes. Clear water (permeate) penetrates the membrane that can be continuously removed. Retained salt is direct fed into drain as concentrated solution (concentrate). Part of the concentrate is fed to the raw water (setting of volume by the regulating valve). Such concentrate return guarantees a good overflow of the membrane surface and reduces the waste water volume (operational cost saving).

System designed as compact unit. All important operating parameters such as concentrate and permeate volume, operating pressure and permeate quality are shown on the corresponding sensors or in the control.

Notes / Installation conditions

- Required water quality to be fed to the reverse osmosis unit
  - Total (permanent) hardness < 0.1 °dH
  - Salt volume max. 1000 mg/l
  - Oxidant (chlorine, chlorine dioxide etc.) not detectable
  - Iron: < 0.1 mg/l
  - Manganese: < 0.05 mg/l
  - Silicate (SiO_2): < 15 mg/l
  - Colloidal index < 3
  - Turbidity < 1 NTU
  - pH-range: 3 – 9
- Technical data and general technical regulations as well as local installation rules shall be considered.
- A system separation to prevent return flow shall be guaranteed according to DIN 1988 part 4.
- A fine filter shall be installed before the RO unit to protect the system against particle contamination from the pipework.
- The ambient temperature shall not exceed 40 °C. Possible radiation heat shall not exceed a temperature of 40 °C.
- The installation site must be frost free.
- The installation site shall be free from solvent, colour, lacquer and chemical vapour.
- The electric installation shall be in accordance with the actual regulations and the electric switching diagram. Local connections shall be dimensioned dependent on and according to the plant efficiency.
- A drain connection of min. DN50 shall be provided for the discharge of wash water.
- The RO unit shall be installed on even floor with sufficient bearing capacity.
- Any lifting appliance shall be resistant to salt water.
- Permeate from an RO unit is no drinking water. Any use as drinking water necessitates a treatment such as blending or hardening

Design

HYDRO **MOS**® reverse osmosis unit consisting of:

Micro processor control with connection cable (3 m) with 16 A – 6 h CEE plug, three-pole.
System piped and wired ready for connection.
Electric structure in compliance with VDE 0100 part 600, VDE 113 part 1.
Stainless steel base frame with plastic front panel housing the control and monitoring elements
Special inlet filter with 5µm filter cartridge and 2 pressure gauges,
High pressure pump designed as multi-stage silent circulation pump,
high-efficient wound module(s) with PA/PS-composite membranes in GRP pressure vessels with inliner
Fittings such as feedwater sampling valve, solenoid inlet valve, pressure switches to control feedwater pressure, flow volume meter for permeate and concentrate, vibration-resistant pressure gauges for pump and concentrate pressure, stainless steel valves for adjustment of permeate and concentrate flow rate as well as concentrate return.

HYDRO **MOS**® - control with integrated SPS
Micro processor control as described below, unit ready wired.

HYDRO **MOS**® - control for fully automated monitoring and control of HYDRO **MOS**® reverse osmosis unit with text display (16 characters each) for display of operational status and monitoring of all
Operating parameters: permeate conductivity (temperature compensation), permeate temperature, operating hours,

Failure record: low pressure, hard water, motor overload, high conductivity pre-alarm, limit value conductivity exceeded.
Status signals: permeate reject, permeate return and recycling, concentrate displacement, concentrate rinse, intermittent rinse during shut-down, shut-down by external signal (forced stop, regeneration),
LEDs for operation, failure, regeneration, reject, disinfection, tank full
Inputs (low voltage 24 V DC) for level control for 1 or 2 float switches, hardness control device, shut-down by external signal (forced stop, regeneration), 2 universal inputs

Outputs for softener (230 V / 50 Hz),
2 solenoid valves for feedwater and concentrate, permeate reject or return, universal output, analogous output for permeate conductivity (4-20mA) and ZLT/DDC (collective failure record as volt-free alternator)

HYDRO **MOS**® reverse osmosis unit delivered including detailed operation manual and wiring diagram.

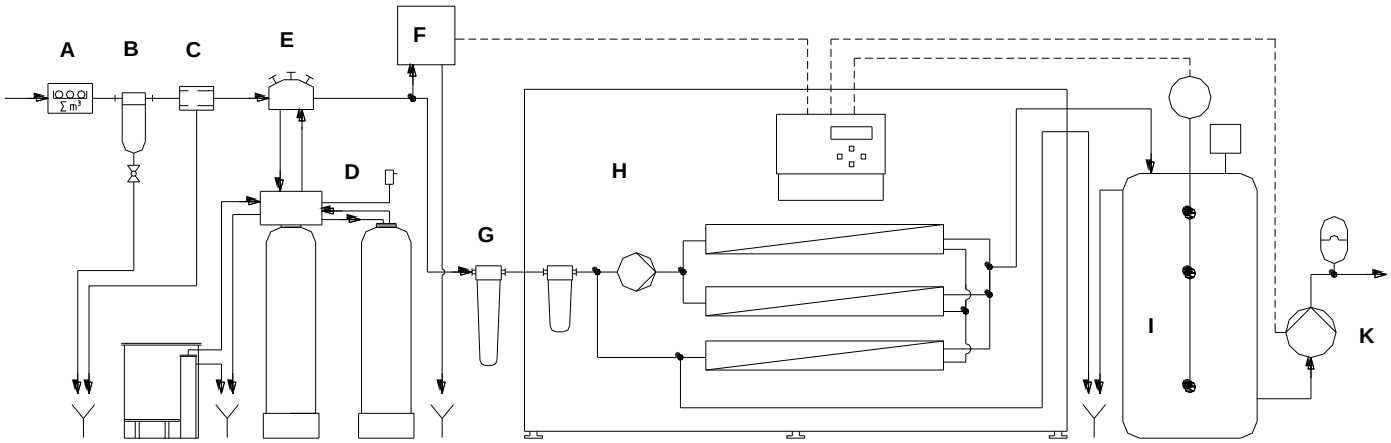
Accessories

- HYDRO **FIL**® fine filter for pre-filtration
- System separator to protect drinking water systems
- HYDRO **ION**® water softener for pre-treatment or HYDRO **DOS**® dosing units suited to dose hardness stabilizer
- Control of water quality by hardness monitoring unit
- HYDRO **FIL**® active carbon filter to reduce the chlorine content
- Permeate store for the permeate coming pressureless from the HYDRO **MOS**® reverse osmosis unit, different sizes incl. accessories (e.g. sterile fan).
- Pressure boosting units of different sizes and used to convey permeate to the consumers. High-quality single or duplex pressure increase units on request with frequency converter for most efficient permeate conveyance

Technical Data:

HYDRO **MOS**®	Type	**2000 S**	**2500 S**	**3000 S**	**3500 S**
Daily permeate flow (24h)	m³/d	48	60	72	84
Permeate flow at 15 °C	l/h	2000	2500	3000	3500
Min. salt rejection	%	97			
Recovery	%	75			
Operating pressure	bar	14	14	11	10
Membrane elements /number		4040/6	4040/8	4040/9	4040/11
Feed water volume flow (15 °C) at 75% recovery	l/h	2667	3333	4000	4667
Concentrate volume flow (waste water) at 75% recovery	l/h	667	833	1000	1167
Electrical connection	V/Hz	3 x 400 / 50			
Connected load	kW	3.0	3.0	4.0	4.0
Pre-fuse	A	16			
Type of protection		IP 54			
Max. total salt contents feed water as NaCl	mg/l	1000			
Blocking index / SDI		< 3			
pH-value		3 - 9			
Feed water connection	DN	32			
Connection permeate	DN	25			
Connection concentrate	DN	25			
Min. required drain dia.	DN	50			
Conductivity measuring range	µS/cm	1 - 200			
Min./max. feed water pressure	bar	2 / 6			
Discharge pressure permeate	bar	ca. 0.5			
Min./max. feed water temperature	°C	5 / 35			
Max. ambient temperature	°C	40			
Height	mm	1650			
Width	mm	2450	2450	3450	3450
Depth	mm	700			
Weight	ca. kg	240	320	340	380

Installation example HYDRO **MOS**®:



A Domestic water meter
B Fine filter HYDRO **FIL**®
C System separator
D Softener HYDRO **ION**®
E Assembly block / blending
F Hardness monitoring unit (Option)
G Active carbon filtration (Option)
H Reverse osmosis unit HYDRO **MOS**®
I Permeate vessel
K Pressure increase unit