

Reverse osmosis systems GENO-OSMO-X

Designated application

The reverse osmosis system GENO-OSMO-X is designed for the demineralisation of raw water whose composition complies with the quality requirements of the TrinkwV (German Drinking Water Ordinance).

Option - Antiscalant

Protection of the reverse osmosis membranes by dosing a hardness stabiliser.

Option - AVRO

Protection of the reverse osmosis membranes by means of the treatment module(s) installed in the system.

Option - Online skid

For online supply of connected consumers such as humidifiers, air-conditioning systems, etc.

Function

The GENO-OSMO-X reverse osmosis system works according to the reverse osmosis principle. In the osmosis process, watery solutions of different concentrations are separated by a semi-permeable reverse osmosis membrane.

In keeping with the law of nature, the concentrations try to equalise. On

the side of the higher original concentration, the so-called "osmotic" pressure is generated. In case of reverse osmosis, this osmotic pressure is countered by a higher pressure. The consequence: the process proceeds in the reverse direction.

A particular advantage of the reverse osmosis technology compared to other water treatment processes is the fact that - apart from the removal of dissolved salts - bacteria, germs and dissolved organic substances are also reduced.

Via the fine filter incl. pressure reducer, the water is directed to the inlet of the feed water section. The water flows to the high-pressure pump via the feed water solenoid valve with a pressure switch for minimum pressure installed downstream. By means of a frequency converter, the pump's rotation speed is set in a way that the system-specific permeate output is reached.

The water is directed to the reverse osmosis membranes and is divided into the partial flows permeate and concentrate. Via a control valve (motor-driven), a partial flow of the concentrate is returned to the feed water again and thus ensures a steady flow over the reverse osmosis membrane(s) and increases the economic efficiency of the reverse osmosis system. The remaining concentrate is directed to the drain via a control valve (motor-driven).

The permeate output is subject to the temperature and was defined at 15 °C. It decreases by < 3 % per °C of the feed water temperature. The permeate output is automatically adjusted to the temperature. The recovery (concentrate to drain) as well as the concentrate recirculation are adapted to the modified permeate capacity.

Option - Antiscalant

A dosing monitored diaphragm dosing pump adds the hardness stabilising agent in proportion to the volume. Depending on the system size, different antiscalants are used.

Option - AVRO

In the treatment module(s) seed crystals are generated which are washed out together with the concentrate. Thus, the reverse osmosis membrane is protected from scaling. Depending on the feed water, a recovery of up to 75 % can be achieved.

Option - Online skid

Via a pressure sensor, the supply pressure can be set to up to 4 bar at the control unit. For an optimum permeate quality, an initial rejection of the permeate can be set.

Application limits

- Total hardness < 0.1 °dH¹⁾ (0.18 °f; 0.018 mol/m³)
- Free chlorine not detectable
- Iron < 0.10 mg/l
- Manganese < 0.05 mg/l
- Silicate < 15 mg/l
- Chlorine dioxide: not detectable
- Turbidity < 1 NTU
- Colloid index < 3
- pH range 3 - 9

¹⁾Except for the optional AVRO unit and antiscalant dosing where individual limits of supply do apply.

Option - Antiscalant

- Total hardness not limited

Option - AVRO

- Total hardness < 22 °dH (39.2 °f; 3,96 mol/m³) without water analysis
- A water analysis is required in case of:
total hardness > 22 °dH
or
sulphate > 250 mg/l

Design

- Control unit with 4.3" graphic touch panel to indicate the operating mode and system values.
- Voltage-free contacts to relay advance warnings and safety shut-downs.
- Digital input for priority permeate production at times when electricity tariffs are low (smart metering).
- Fully automatic monitoring and controlling of the system parameter permeate flow

- Monitoring of the permeate conductivity by setting a threshold value in the control unit
- Recovery, concentrate recirculation and pump frequency (subject to the water temperature)
- Recording of measured data on integrated SD card
- Possibility to interconnect systems installed upstream or downstream (water softener, dosing system, permeate tank, pressure booster) and to operate them by remote control.
- Power distribution with mains switch and automatic circuit breakers as feeding point for power supply provided by others on site.
- High-pressure centrifugal pump made of stainless steel 1.4401 to supply the reverse osmosis membrane(s)
- Ultra-low pressure reverse osmosis membrane(s), installed in pressure pipe made of high-strength PE.
- Three-part hydro module made of red bronze, chemically nickel-plated, featuring pressure gauges, adjusting resp. solenoid valves and sampling valves
- Flow sensors integrated in the hydro module, volume measurement of the system flows permeate, concentrate and concentrate recirculation. The permeate hydro module features a conductivity measuring cell (temperature-compensated)
- Pipework between pump and reverse osmosis membrane made of high-pressure resistant PE pipes and PP compression fittings

- High-quality system rack made of anodised aluminium to house all system components
- Ventilation device to be mounted onto the concentrate pipe provided by others on site
- Fine filter incl. pressure reducer, completely pre-assembled in system inlet
- Pure water tank (optional) for intermediate storage of the permeate flowing unpressurised from reverse osmosis systems

Option - Antiscalant

- Step motor pump with suction lance incl. pre-alarm, empty signal, pressure maintaining system, injection valve

Option - AVRO

- Treatment modules


Option - Online skid

- Pressure sensor for supply pressure
- Membrane expansion vessels approved for drinking water on the permeate side

Scope of supply

- Reverse osmosis system GENO-OSMO-X mounted on a system rack
- Operation manual
- At the factory, the following options can be installed in the GENO OSMO-X:
Antiscalant, AVRO, Online skid

Technical specifications I

Connection data		200	400	800	1200	1600	2200	3000
Nominal connection diameter (male thread) of feed water inlet pipe		1"	1"	1"	1"	1"	1 ¼"	1 ¼"
Nominal connection diameter (male thread) of permeate outlet		1"	1"	1"	1"	1"	1"	1"
Nominal connection diameter (male thread) of concentrate outlet		1"	1"	1"	1"	1"	1"	1"
Min. drain connection without optional AVRO unit		DN 50	DN 50	DN 50	DN 50	DN 50	DN 50	DN 50
with optional AVRO unit		DN 50	DN 50	DN 50	DN 100	DN 100	-	-
Power supply	[V]/[Hz]	3/N/PE400 V/50...60 Hz						
Power outlet provided by others on site, min.		5.5 kW / C 20 A / 2.5 mm ²						
Protection/protection class		IP 54/I 						
Power input at an unpressurised delivery of the permeate into a tank, at a switching frequency of the frequency converter of 8 kHz and a primary pressure in the feed water of 4 bar.								
Recovery 80 %	[kW]	0.53	0.87	0.94	1.40	1.74	2.10	2.30
Recovery 50 %	[kW]	0.53	0.88	0.94	1.30	1.60	-	-
Power input in case the permeate is directly delivered to the consumers at a supply pressure of 3.8 bar, at a switching frequency of the frequency converter of 8 kHz and a primary pressure in the feed water of 4 bar.								
Recovery 80 %	[kW]	0.86	1.44	1.60	2.00	2.31	2.30	2.80
Recovery 50 %	[kW]	0.81	1.20	1.41	1.90	2.11	-	-

Technical specifications II

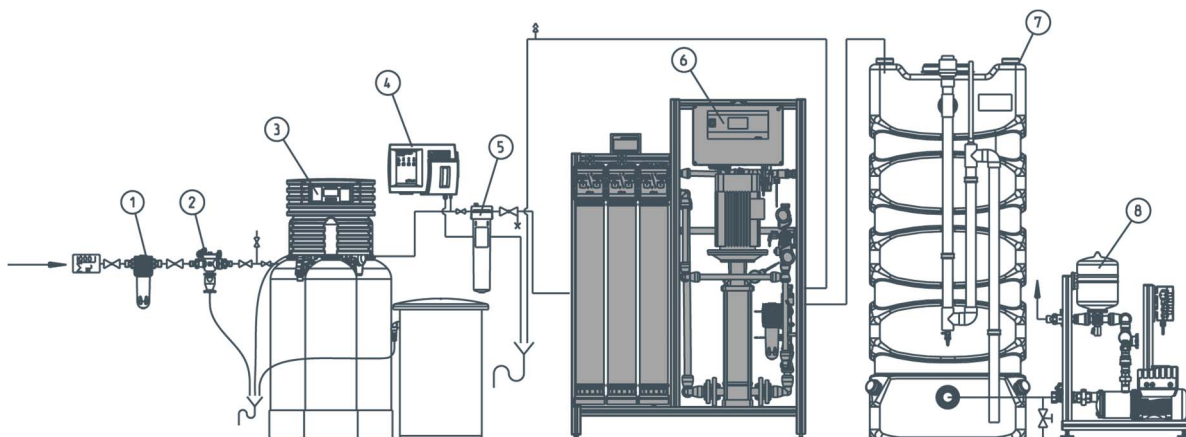
Performance data		200	400	800	1200	1600	2200	3000	
Permeate output at a									
feed water temperature of 10 °C	[l/h]	170	340	680	1020	1360	1870	2550	
feed water temperature of 15 °C	[l/h]	200	400	800	1200	1600	2200	3000	
feed water temperature of 15 °C	[m ³ /d]	4.8	9.6	19.2	28.8	38.4	52.8	72.0	
Inlet flow pressure of feed water, min.	[bar]	2.5							
Min. outlet pressure of permeate	[bar]	0.5							
Nominal pressure		PN 16							
Salt rejection		95 - 99 %							
Total salt concentration in the feed water as NaCl, max.	[ppm]	1000							
Recovery min./max.	[%]	50 - 80 (adjustable)					65 - 80 (adjustable)		
Concentrate to drain volume flow, at a recovery of 80 % (at 15 °C)	[l/h]	50	100	200	300	400	550	750	
Feed water volume flow (15 °C) at a recovery of 80 %	[l/h]	250	500	1000	1500	2000	2750	3750	
Filling volumes and consumption data									
Number of modules (size 4")	[pcs]	½	1	2	3	4	6	8	

Dimensions and weights		200	400	800	1200	1600	2200	3000
System width	[mm]	900	900	1035	1035	1170	1170	1170
System height	[mm]	1700	1700	1700	1700	1700	1700	1700
System depth	[mm]	675	675	675	675	675	675	675
Min. room/installation height required	[mm]	1800	1800	1800	1800	1800	1800	1800
Operating weight, approx.	[kg]	100	115	145	170	195	240	290
Performance data								
General								
Temperature of feed water, min./max.	[°C]					10/30 ¹⁾		
Ambient temperature, min./max.	[°C]					5/35		
Order no.		750 200	750 210	750 220	750 230	750 240	750 250	750 260

¹⁾ For temperatures of feed water > 20 °C a separate configuration of the system is required.

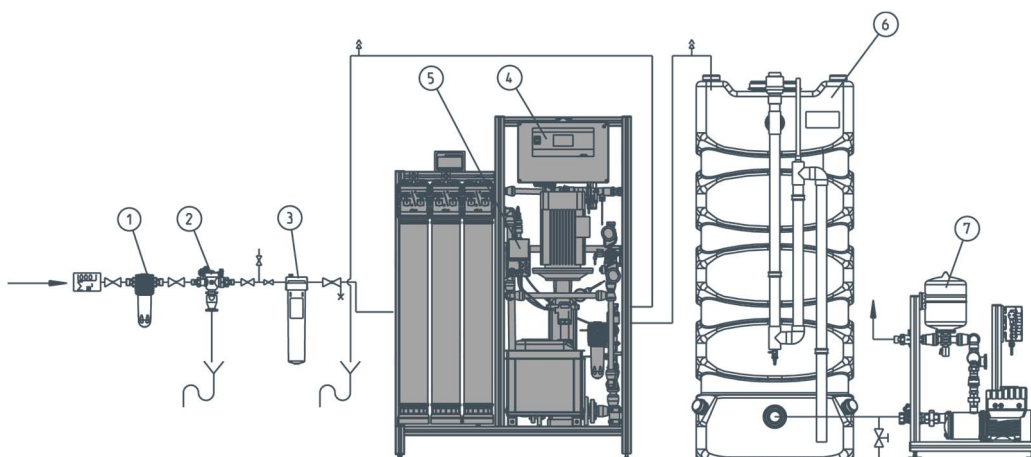
Technical specifications III

Option 1 Antiscalant without dosing agent		200	400	800	1200	1600	2200	3000
Operating weight, approx.	[kg]	115	130	160	185	210	255	305
System recovery, max.	[%]				75			
Order no.					750 346			
Option 2 AVRO for GENO-OSMO-X		200	400	800	1200	1600	2200	3000
Operating weight, approx.	[kg]	115	145	190	215	255		
System recovery, max.	[%]				50 - 75 (standard setting 50 %)			
Order no.		750 341	750 342	750 343	750 344	750 345	-	-
Option 3 Online skid		200	400	800	1200	1600	2200	3000
Useful capacity	[l/h]	1 x 33	1 x 33	1 x 33	2 x 33	2 x 33	3 x 33	3 x 33
System width	[mm]	1280	1280	1415	1415	1550	1550	1550
Operating weight, approx.	[kg]	140	155	185	240	265	305	355
Order no.		750 351	750 351	750 351	750 352	750 352	750 353	750 353



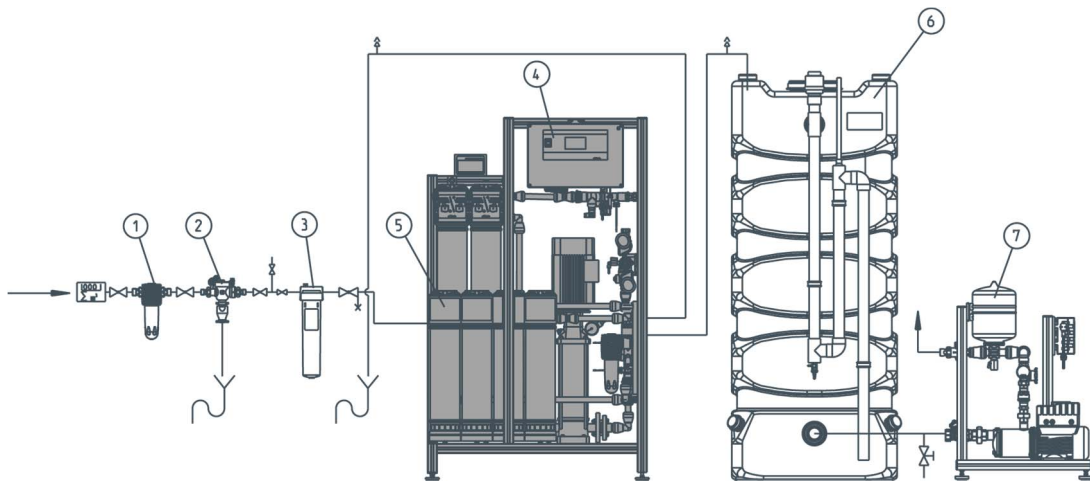
Item	Designation	Item	Designation
1	Drinking water filter (e.g. BOXER KD)	5	Activated carbon filter AKF
2	System separator GENO-DK 2	6	Reverse osmosis system GENO-OSMO-X
3	Delta-p water softener	7	Permeate tank with sterile air filter and level sensor
4	GENO-softwatch Komfort	8	Pressure booster system GENO FU-X 2/40-1 N

Fig. 1: Reverse osmosis system GENO-OSMO-X



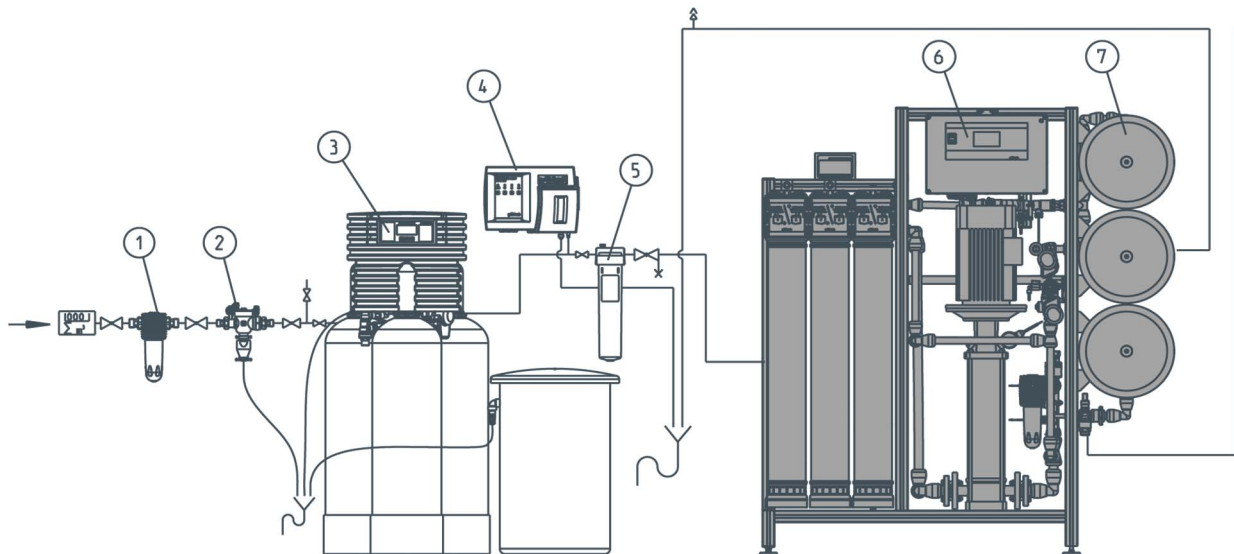
Item	Designation	Item	Designation
1	Drinking water filter (e.g. BOXER KD)	5	Antiscalant dosing
2	System separator GENO-DK 2	6	Permeate tank with sterile air filter and level sensor
3	Activated carbon filter AKF	7	Pressure booster system GENO FU-X 2/40-1 N
4	Reverse osmosis system GENO-OSMO-X		

Fig. 2: Installation example: Option - Antiscalant



Item	Designation	Item	Designation
1	Drinking water filter (e.g. BOXER KD)	5	AVRO
2	System separator GENO-DK 2	6	Permeate tank with sterile air filter and level sensor
3	Activated carbon filter AKF	7	Pressure booster system GENO FU-X 2/40-1 N
4	Reverse osmosis system GENO-OSMO-X		

Fig. 3: Installation example: Option - AVRO



Item	Designation	Item	Designation
1	Drinking water filter (e.g. BOXER KD)	5	Activated carbon filter AKF
2	System separator GENO-DK 2	6	Reverse osmosis system GENO-OSMO-X
3	Delta-p water softener	7	Online skid
4	GENU-softwatch Komfort		

Fig. 4: Installation example: Option - Online skid

Installation requirements

Please observe local installation directives, general guidelines and technical specifications.

The installation site must be frost-proof. The system, must be protected from chemicals, dyes, solvents and vapours.

In general, the following must be installed upstream:

- A drinking water filter and a pressure reducer, if required (e.g. BOXER KD)
- A Euro-system separator GENO DK 2 ½ "
- An activated carbon filter
- A water softener or
- An antiscalant dosing

In order to prevent scaling, it is possible to integrate the patented AVRO technology as an alternative process.

For the electrical connection, a supply line to the system must be provided by others acc. to the wiring diagram. This line must be dimensioned according to the system type.

Regarding the power supply on site, we recommend a power outlet that has its own AC/DC sensitive ground fault circuit interrupter (30 mA).

For the discharge of the concentrate, a drain connection (at least DN 50) must be available.

The installation room must have a floor drain. If no floor drain is available, an appropriate safety device has to be installed.

Floor drains leading to a lifting system do not work in case of a power failure.

The installation of a reverse osmosis system represents a major interference with the drinking water system. Therefore, only authorised experts may install such systems.

A foundation has to be provided.

An adequate distance (> 50 cm) for installation and service work must be kept.

Only the left side (pressure pipes) of the system may be placed flush to the wall.

On all other sides, a distance > 50 cm has to be kept.

The required connections must be provided before the system is installed. For dimensions and connection data, please refer to the tables "Technical specifications I, II and III".

The concentrate resp. permeate pipe provided by others on site must feature a provision to separate the pipes (e.g. a screw connection).

Accessories

**Drinking water filter
BOXER K 1"**
Order no. 101 210

**Drinking water filter
BOXER KD 1"**
with pressure reducer
Order no. 101 260

For prefiltration
For larger filters, please inquire.

**Euro-system separator
GENO DK 2 ½ "**
Order no. 132 510

To secure devices and systems endangering the drinking water according to DIN 1988, part 4
For larger system separators, please inquire.

**Delta-p water softener
Order no. 185 100**

Fully automatic triple water softener based on the ion exchange principle for the generation of fully/partially softened water with volume-controlled regeneration
For larger systems, please inquire.

**GENO-softwatch Komfort
Order no. 172 500**

For automatic monitoring of the residual/total hardness (water hardness).

**GENO-activated carbon filter
AKF 600**
Order no. 109 160

To reduce the chlorine concentration contained in the water. Only suitable for GENO-OSMO-X 400. For different reverse osmosis systems, different activated carbon filters are required
For larger activated carbon filters, please inquire.

**Safety device
protectliQ:A20**
Order no. 126 400

Safety device for protection from water damage in one and two-family homes.

For additional versions, please inquire.

**Basic pure water tank RT-X 1000
with sterile air filter and level
sensor**

Order no. 712 480

Useful capacity approx. 840 litres
l 780 / w 1000 / total height 2000 mm
tank height incl. connecting piece

**Basic pure water tank RT-X 1000
with level sensor, sterile overflow
not included**

Order no. 712 490

Useful capacity approx. 850 litres
l 780 / w 1000 / total height 2000 mm
tank height incl. connecting piece

**Additional tank RT 1000
with sterile filter as add-on tank to
basic pure water tank**
Order no. 712 405

Useful capacity approx. 850 litres
l 780 / w 780 / total height 2050 mm
tank height incl. connecting piece

**Additional tank RT 1000, sterile filter
not included, as add-on tank to
basic pure water tank**
Order no. 712 435

For technical specifications, please refer to order no. 712 405.

For larger tanks, please inquire.

Additional tank without level control and overflow loop, incl. 2 connecting lines, id = 36 mm.

A maximum of four supply tanks can be combined.

**Pressure booster system
GENO FU-X 2/40-1 N**
Order no. 730 640

For low-noise water supply of small or medium-sized water distribution networks in buildings with raw water, softened water and partially demineralised water (permeate) originating from reverse osmosis systems.

• Product data sheet

Reverse osmosis systems GENO-OSMO-X

Pressure booster system

GENO FU-X 2/40-2 N

Order no. 730 641

Description as for single pressure booster system, however, with the possibility for time-load switch-over and cascade connection. The control unit can be interconnected with the GENO-OSMO-X

For larger pressure booster systems, please inquire.

Communication module

Profibus DP

Order no. 750 160

for the connection to a Profibus DP "Master".

Communication module

BACnet IP

Order no. 750 170

for the connection to a BACnet IP „Master“.

Communication module

Modbus RTU

Order no. 750 175

for the connection to a Modbus RTU „Master“.

Voltage-free signals

Order no. 750 180

for the connection to a BMS/CMS.

Analogue signals 4-20-mA

Bestell-Nr. 750 185

for the connection to a BMS/CMS.

Contact

Grünbeck Wasseraufbereitung GmbH
Josef-Grünbeck-Str. 1
89420 Hoechstädt
GERMANY

☎ +49 9074 41-0

☎ +49 9074 41-100

✉ info@gruenbeck.com

www.gruenbeck.com

