

Nanofiltration system ion selector NANO-X

Intended use

The nanofiltration system ion selector NANO-X is designed for the partial demineralisation of raw water whose composition complies with the quality requirements of the German TrinkwV (German Drinking Water Ordinance).

Function

The nanofiltration system ion selector NANO-X works according to the membrane process. In the selection process, aqueous solutions of different concentrations are separated by a nanofiltration membrane. The special feature of the nanofiltration process is that a distinction between monovalent and multivalent ions can be made, i.e. monovalent ions can pass through the membrane to a high extent while salts with multivalent ions are retained.

A particular advantage of the nanofiltration technology is the fact that - apart from the removal of dissolved salts - bacteria, germs and dissolved organic substances are reduced as well.

Via a drinking water 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 nanofiltration membrane(s) 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 nanofiltration membrane(s) and increases the economic efficiency of the nanofiltration. 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 subject to the temperature. The recovery (concentrate to drain) as well as the concentrate recirculation are adapted to the modified permeate output.

Option: Antiscalant

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

Application limits

- Total hardness < 0.1 °dH¹⁾ (0.18 °f; 0.018 mol/l)
- 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
- Silt density index < 3
- pH range 3 - 9

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

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"

Product Data Sheet

Nanofiltration system ion selector NANO-X

- 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)
- Logging 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 central feeding point for power supply provided by others on site.
- High-pressure centrifugal pump made of stainless steel to supply the nanofiltration membrane(s)
- Ultra-low pressure nanofiltration 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 nanofiltration 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 for installation onto the concentrate pipe provided by others on site.
- Drinking water filter incl. pressure reducer, completely pre-assembled in system inlet
- Pure water tank (optional) for intermediate storage of the permeate flowing unpressurised from the nanofiltration system

Scope of supply

- Nanofiltration system ion selector NANO-X pre-assembled on a system rack
- Operation Manual
- At the factory, the following optional components can be included in the nanofiltration system ion selector NANO-X: Antiscalant dosing or softening

Technical specifications I

Connection data		300	600	900	1200	1800	2400
Nominal connection diameter (male thread) of feed water inlet pipe		1"	1"	1"	1"	1 ¼"	1 ¼"
Nominal connection diameter (male thread) of permeate outlet		1"	1"	1"	1"	1"	1"
Nominal connection diameter (male thread) of concentrate outlet		1"	1"	1"	1"	1"	1"
Min. drain connection	[DN]	50	50	50	50	50	50
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 75 %	[kW]	0.87	0.94	1.40	1.74	2.10	2.30
Order no.		142 400	142 410	142 420	142 430	142 440	142 450

Technical specifications II

Performance data		300	600	900	1200	1800	2400
Permeate output at a							
feed water temperature of 10 °C	[l/h]	255	510	765	1020	1530	2040
feed water temperature of 15 °C	[l/h]	300	600	900	1200	1800	2400
Permeate output at a							
feed water temperature of 15 °C	[m³/d]	7.2	14.4	21.6	28.8	43.2	57.6
Min. inlet flow pressure of feed water	[bar]	2.5					
Min. outlet pressure of permeate	[bar]	0.5					
Nominal pressure		PN 16					
Salt rejection		89 – 95%					
Total salt concentration in the feed water as NaCl, max.	[ppm]	1000					
Recovery min./max.	[%]	50 - 75 (adjustable)				65 - 75 (adjustable)	
Concentrate to drain volume flow, at a recovery of 75 % (at 15 °C)	[l/h]	100	200	300	400	600	800
Feed water volume flow (15 °C) at a recovery of 75 %	[l/h]	400	800	1200	1600	2400	3200
Number of modules (size 4")	[pcs]	1	2	3	4	6	8

Dimensions and weights		300	600	900	1200	1800	2400
System width	[mm]	900	1035	1035	1170	1170	1170
System height	[mm]	1700	1700	1700	1700	1700	1700
System depth	[mm]	675	675	675	675	675	675
Min. room/installation height required	[mm]	1800	1800	1800	1800	1800	1800
Operating weight, approx.	[kg]	115	145	170	195	240	290

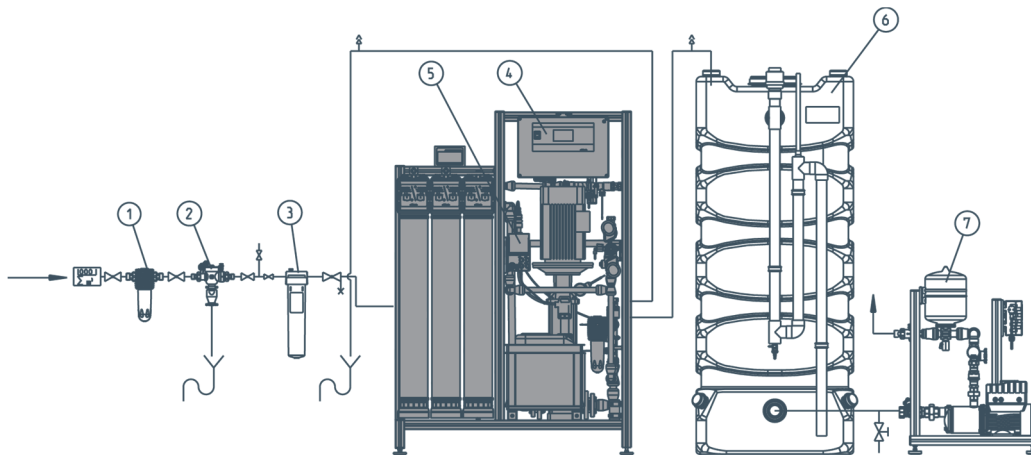
General		300	600	900	1200	1800	2400
Temperature of feed water, min./max.	[°C]	10/30					
Ambient temperature, min./max.	[°C]	5/35					
Order no.		142 400	142 410	142 420	142 430	142 440	142 450

Technical specifications II

Option 1 Antiscalant dosing, dosing agents not included		300	600	900	1200	1800	2400
Operating weight, approx.	[kg]	130	160	185	210	255	305
System recovery, max.	[%]	75					
Order no.		750 346					

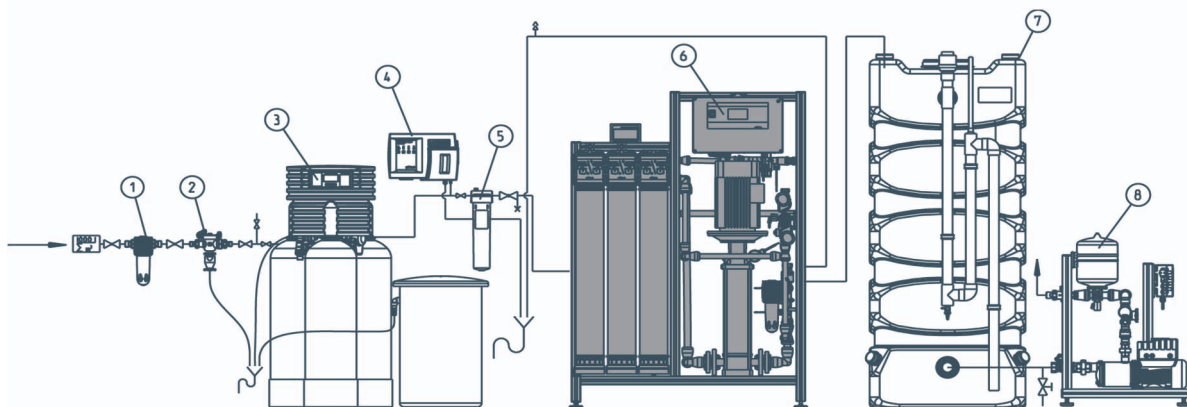
Installation example

Option: Antiscalant dosing



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

Option: Softening



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

Installation requirements

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 (50 or 80 µm) and a pressure reducer, if required (e.g. BOXER® KD)
- A Euro-system separator GENO® DK 2 ½ "

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).

A drain connection (at least DN 50) to discharge the concentrate must be available.

The installation room must have a floor drain. If no floor drain is available, an appropriate safety device (e.g. GENO-STOP®) has to be installed.

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

The installation of a nanofiltration 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 observed.

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 observed.

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

The concentrate pipe provided by others on site must feature a provision to separate the pipe (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 pre-filtration 80 µm
(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)

**Antiscalant dosing for ion selector
NANO-X**
Order no. 750 346

Complete dosing system for the dosing-monitored addition of hardness stabilisers in proportion to the volume in order to prevent scaling.

**Dosing agent MT 4010, 10 kg
Order no. 160 674**

Liquid antiscalant based on organophosphate, with dispersing effect, applicable in ion selectors NANO-X 300 – NANO-X 1200.

**Dosing agent MT 4000, 23.5 kg
Order no. 160 680**

Liquid antiscalant based on organophosphate, with dispersing effect, applicable starting from ion selectors NANO-X 1800 – NANO-X 2400.

**Water softener Delta-p®
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).

**Blending unit
Order no. 750 765**

To blend raw water and permeate in the pure water tank. Blending volume 20 - 250 l/h (for other blending units, please inquire)

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

To reduce the chlorine concentration in the water. Only suitable for ion selector NANO-X 300. For other nanofiltration systems, different activated carbon filters are required (for larger activated carbon filters, please inquire).

• Product Data Sheet

Nanofiltration system ion selector NANO-X

GENO-STOP® 1“

Order no. 126 875

Safety device for reliable and comprehensive protection from water damage (for additional versions, please inquire).

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

Order no. 712 480

Net volume approx. 840 litres,
Dimensions (w x h x d)
780 x 2000 x 1000 mm
Tank height incl. connection pieces.

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

Order no. 712 490

Net volume approx. 850 litres,
Dimensions (w x h x d)
780 x 2000 x 1000 mm
Tank height incl. connection pieces.

Additional tank RT 1000 with sterile filter, as add-on tank to basic pure water tank

Order no. 712 405

Net volume approx. 850 litres,
Dimensions (w x h x d)

780 x 2050 x 780 mm
Tank height incl. connection pieces.

Additional tank RT 1000, sterile filter not included, as add-on tank to basic pure water tank

Order no. 712 435

For technical specifications, 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 supply of small or medium-sized water distribution networks in buildings with raw water, softened water and partially demineralised water (permeate) originating from nanofiltration systems.

Pressure booster system

GENO®-FU-X 2/40-2 N

Order no. 730 641

Description as for single pressure booster, however, with provision for time or load switch-over as well as cascade connection. The control unit can be interconnected with the ion selector NANO-X (for larger pressure booster systems, please inquire).

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