

Fig. 1: Mobile reverse osmosis system AVRO-flex 400

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Designated application

The reverse osmosis system AVRO-flex 400 is designed for the demineralisation of drinking water and for the filling of heating systems / district heating networks with fully demineralised water. According to the stipulations of the VDI 2035, pages 1 and 2, the fully demineralised water as per VDI 2035 is used for the filling of systems < 0.11 °dH (0.196 °f; 0.0196 mmol/l). Depending on the composition of the feed water, it might be necessary to install a GENO-therm mixed-bed cartridge downstream.

Function

The mobile reverse osmosis system AVRO-flex 400 works according to the reverse osmosis principle. In the osmosis process, watery solutions of different concentrations are separated by a semi-permeable 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.

Application limits

- < 22 °dH (39.2 °f; 3.92 mmol/l) without water analysis
- Free chlorine not detectable
- Iron < 0.10 mg/l
- Manganese < 0.05 mg/l
- Silica < 15 mg/l
- Chlorine dioxide not detectable
- Turbidity < 1 FTU
- Colloid index < 3
- pH range 3 - 9

In case of a total hardness > 22 °dH (39.2 °f; 3.92 mmol/l) or sulphate > 250 mg/l, a water analysis is required.

Function

Via the fine filter, the water is directed to the inlet of the feed water section. The water flows to the high-pressure pump via the inlet solenoid valve with a downstream pressure switch for minimum pressure. By means of an adjusting valve, the pressure generated by the pump is reduced to the required operating pressure and the water is directed to the membrane. The membrane separates the water into the partial flows permeate (demi water) and concentrate. A partial flow of the concentrate is returned to the feed water via an orifice regulating independently of pressure and thus ensures a steady flow over the reverse osmosis membrane and increases the economic efficiency of the reverse osmosis system. At the same time the concentrate volume flow is directed through an AVRO treatment module where seed crystals are formed at a cathode due to the application of direct current. These seed crystals are then washed out with the residual concentrate and thus the reverse osmosis membrane is protected from clogging. Whenever the system is switched off or in case of disturbances, the substances retained on the membrane are flushed off by means of the inlet solenoid valve and a solenoid valve switched in parallel to the adjusting valve for concentrate.

The hydraulic set-up of the system is designed in a way that the concentrate volume and the permeate volume are registered by means of flow sensors and are displayed in the control unit. The system recovery can also be called up in the control unit.

In order to fill in fully demineralised water into the heating system, a centrifugal pump made of high-performance plastics including pressure switch and diaphragm expansion tank is integrated in the system as pressure booster system.

Design

- Mobile, stand-alone aluminium rack to house all aggregates and control elements.
- Microprocessor controller with LC display, voltage-free collective fault signal and voltage-free signal contact (maintenance interval, various pre-warnings), installed in a switch cabinet. Selector switch for operating modes - filling operation - shop operation.
- Centrifugal pump made of stainless steel with motor as high-pressure pump to supply the membrane, incl. adjusting valve for operating pressure and pressure gauge.
- Adjustable pressure switch and diaphragm expansion tank to supply consumers downstream.
- Hydro distributor block for the water supply within the membrane system. Integrated valves and measuring instruments for easier system calibration.
- Fine filter with integrated pressure reducer, preset to 2.5 bar.
- Ultra-low pressure reverse osmosis membranes incl. pressure pipe.
- AVRO treatment unit, installed in a pressure pipe made of high-strength PE.
- Flow sensor to measure the volume of the system flows permeate and concentrate.
- Two pressure-resistant, metal fabric hoses and GEKA couplings.
- ¾" double nipple for connection to a reusable GENO-therm cartridge (order no. 707 124)
- Operation manual.

Scope of supply

AVRO-flex 400, ready for operation, with mobile aluminium rack and hoses.

Accessories

Safety device protectliQ:A20

The protectliQ safety device is a product to protect against water damage in single and two-family homes.

- For additional versions, please inquire -
Order no. 126 400

Filling section thermaliQ:FB13i

For full demineralisation of water of drinking water quality for easy and quick initial filling and make-up water feed of closed heating systems.

Order no. 707 120

Filling group thermaliQ:SB13

To secure the drinking water according to DIN EN 1717 during initial filling or make-up water feed of closed heating systems.

Order no. 707 750

Mixed bed cartridge desaliQ:BA 12

Mixed bed cartridge for full demineralisation by means of ion exchange, installed downstream of the AVRO-flex system.

Order no. 707 460

For larger capacities, please inquire.

Filling cartridge desaliQ:HB4

Full demineralisation cartridge for full demineralisation by means of ion exchange, installed downstream of the AVRO-flex system.

Order no. 707 155

Drain connection DN 50 acc. to DIN EN 1717

Connection material for DIN-compatible waste water connection DN 50

Order no. 187 875

Installation requirements

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

The installation site must provide adequate space. A foundation of a sufficient size and adequate load carrying capacity must be provided. The required connections must be provided prior to the installation.

The system may only be operated if all components are installed properly. Safety devices must NEVER be removed, bridged or otherwise tampered with.

Appropriate application of the device also implies that the information contained in this operation manual and all safety guidelines applying at the installation site be observed. Furthermore, the maintenance and inspection intervals have to be observed.

With regard to the application of the mobile reverse osmosis system AVRO-flex 400, the limit value for admissible substances contained in the water which is stipulated in the German Drinking Water Ordinance does apply.

If the fully demineralised water acc. to VDI 2035 is used to fill systems > 0.11 °dH (0.196 °f; 0.0196 mmol/l), it might be necessary to install a GENO-therm mixed-bed cartridge downstream - depending on the composition of the feed water. According to DIN EN 1988, part 4, a system separator (e.g. GENO-therm filling device Basic, GENO-DK 2-Mini,) must be installed upstream of the reverse osmosis system AVRO-flex 400.

In order to protect the membrane from impurities, a drinking water filter must be installed upstream.

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

In case of a power failure, floor drains with a discharge to a lifting system will be out of operation.

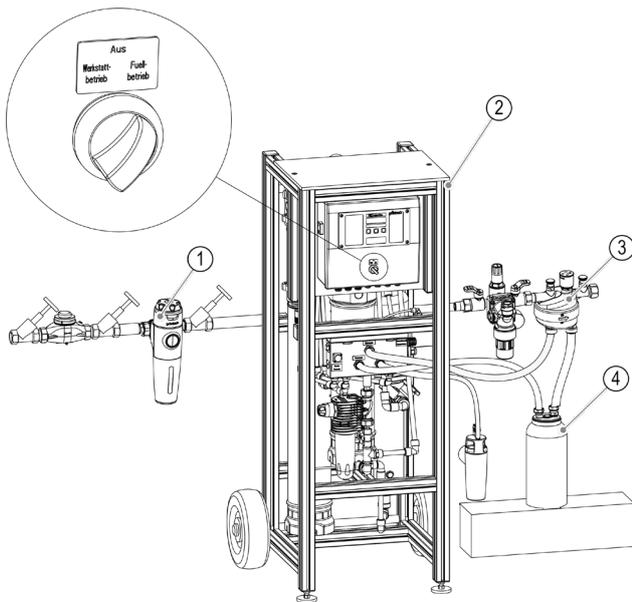
Technical specifications/Dimensions

Mobile reverse osmosis system		AVRO-flex 400
Connection data		
Nominal connection diameter of feed water pipe		3/4" (DN 20) male thread
Nominal connection diameter of permeate outlet		3/4" (DN 20) male thread
Nominal connection diameter of concentrate outlet		3/4" (DN 20) male thread
Min. drain connection required		DN 50
Connected load, approx.	[kW]	1.8
Power supply	[V/Hz]	230/50
Protection/protection class		IP 54/Ⓢ
Performance data		
Permeate capacity at a feed water temperature of 10 °C / 15 °C	[l/h]	340/400
Inlet flow pressure of feed water, min.	[bar]	2.5
Nominal pressure		PN 16
Salt rejection		95-99%
Total salt concentration of the feed water as NaCl, max.	[ppm]	1000
Concentrate volume flow (at 15 °C)	[l/h]	400 ¹⁾
Feed water volume flow (fresh water 15 °C) at a recovery of 50 %, max.	[l/h]	800
Recovery	[%]	50
Max. permeate pressure into the heating system	[bar]	3.5
Dimensions and weights		
Dimensions (w x d x h)	[mm]	700 x 600 x 1450
Empty weight, approx.	[kg]	70
Operating weight, approx.	[kg]	80
Ambient data		
Temperature of feed water, min./max.	[°C]	10/30 ²⁾
Ambient temperature, min./max.	[°C]	5/35
Order no.		752 250

- 1) Following a water analysis, a higher recovery may be set by the Grünbeck's technical service.
- 2) For feed water temperatures > 20 °C, a separate design of the system is required.



Note: Based on the permeate capacity of a reverse osmosis a max. pressure of 3.5 bar can be reached. With an increasing counter-pressure in the system, the continuous permeate capacity will decrease.



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| ① Drinking water filter pureIQ:KD (option) | ③ Filling section thermalIQ:FB (option) |
| ② Mobile reverse osmosis system AVRO-flex 400 | ④ Filling cartridge desaliIQ:HB (option) ¹⁾ |

Fig. 2: Installation drawing of mobile reverse osmosis system AVRO-flex 400 - filling operation