

## CE 300

### Ion exchange



#### Description

- softening and desalination of water by ion exchange
- regeneration of ion exchangers
- cation and anion exchanger

Ion exchangers are used in water treatment primarily for desalination and softening. CE 300 enables these processes to be demonstrated with the aid of cation and anion exchangers.

The raw water is pumped from the tank into the cation exchanger. In the softening process the water flows from there back into the collecting tank. To desalinate the raw water, it is then additionally routed through the anion exchanger.

From there the treated water passes into the collecting tank. In the regeneration process, acid or caustic is fed into the ion exchangers using the same pump. The acid and caustic used is collected in the collecting tank.

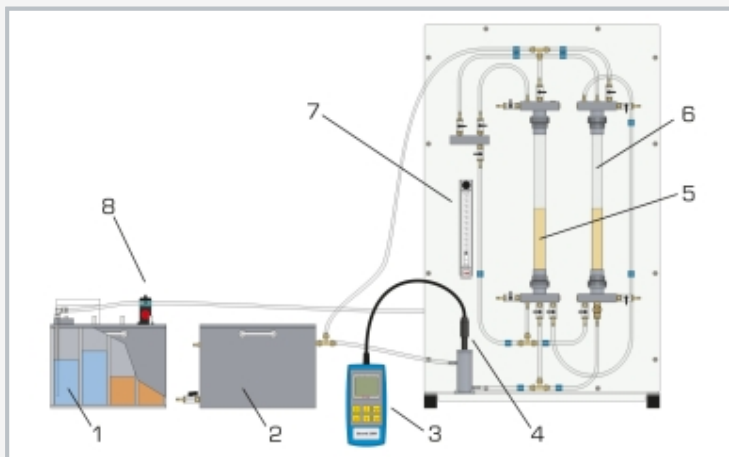
The flow rate of the pump is adjustable, and can be read from a flow meter before it enters the first ion exchanger. For continuous evaluation of the process, a conductivity sensor is installed upstream of the inlet into the collecting tank. The measured values can be read from a conductivity meter. Samples can be taken at all relevant points. Tap water can be used as raw water.

#### Learning objectives/experiments

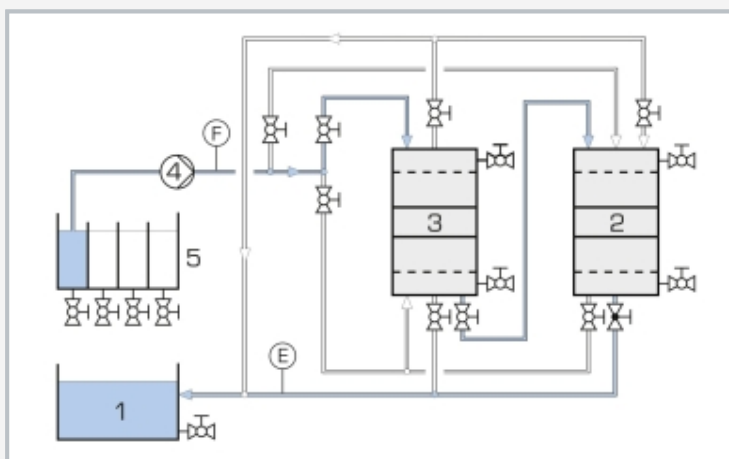
- learning the fundamental principle of softening and desalination by ion exchange
- identification of the different modes of operation of cation and anion exchangers
- combined use of cation and anion exchangers for desalination
- exchanging capacities and regeneration
- verification of the theoretically calculated regeneration time

# CE 300

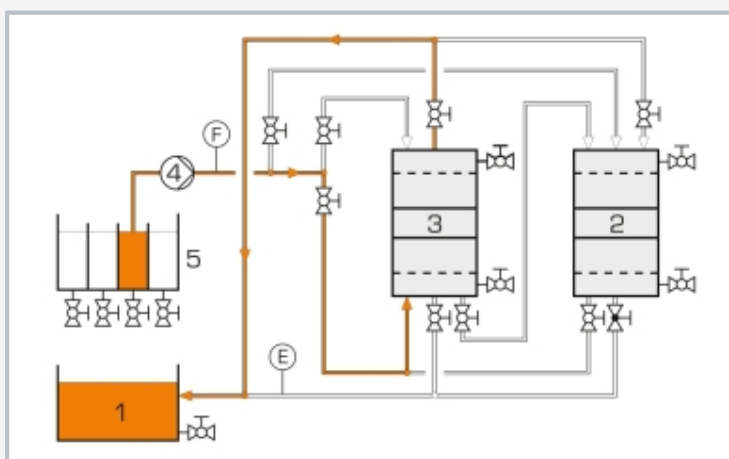
## Ion exchange



1 tank for raw water, rinsing water, acid and caustic, 2 collecting tank, 3 conductivity meter, 4 conductivity sensor, 5 cation exchanger, 6 anion exchanger, 7 flow meter, 8 pump



Flow path with the two ion exchangers configured in series (desalination): 1 collecting tank, 2 anion exchanger, 3 cation exchanger, 4 pump, 5 raw water tank; E conductivity, F flow rate



Flow path with cation exchanger regeneration: 1 collecting tank, 2 anion exchanger, 3 cation exchanger, 4 pump, 5 acid tank

### Specification

- [1] softening and desalination with ion exchange
- [2] cation and anion exchangers usable separately and in combination
- [3] regeneration of ion exchangers
- [4] tank with 4 chambers for raw water, rinsing water, acid and caustic
- [5] diaphragm pump to transport raw water, rinsing water, acid and caustic
- [6] collecting tank for treated water, rinsing water, acid and caustic
- [7] continuous measurement of conductivity and flow rate

### Technical data

#### Ion exchanger

- material: network polymer
- 2x cation exchanger: H<sup>+</sup> form
- 2x anion exchanger: OH<sup>-</sup> form

#### Diaphragm pump

- max. flow rate: 300mL/min
- max. head: 10m

#### Tank

- 4 chambers
- capacity: each approx. 5L
- material: PVC

#### Collecting tank

- capacity: approx. 20L
- material: PVC

#### Measuring ranges

- flow rate: 1,6...16L/h
- conductivity: 0...2000µS/cm

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase

120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 610x510x1010mm (experimental unit)

LxWxH: 350x480x310mm (tank)

LxWxH: 440x540x230mm (collecting tank)

Total weight: approx. 46kg

### Required for operation

caustic soda, hydrochloric acid, distilled water

### Scope of delivery

- 1 experimental unit
- 2 tanks
- 1 conductivity meter
- 2 packing units of cation exchanger
- 2 packing units of anion exchanger
- 1 set of accessories
- 1 set of instructional material

# **CE 300**

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Optional accessories

020.30009      WP 300.09      Laboratory trolley