

# CE 581

## Water treatment plant 1



The illustration shows: trainer (left) and supply unit (right).

### Description

- **example of a water treatment plant**
- **depth filtration: removal of undissolved substances**
- **adsorption: removal of dissolved substances**
- **ion exchange: softening and desalination**

Depth filtration, adsorption and ion exchange are key unit operations in water treatment. CE 581 enables these three operations to be demonstrated.

The raw water is pumped from above into a gravel filter and then routed into a sand filter. In the process, suspended solids are removed from the raw water. The filtered water then flows into the second treatment stage. There dissolved substances are removed by adsorption on aluminium oxide and on activated carbon. Then the water passes on to the third treatment stage. In this stage unwanted ions are removed from the water by ion exchange.

First the water is softened by cation exchange. The water is then desalinated in a mixed bed ion exchanger containing cation and anion exchangers.

The separate supply unit includes pumps and tanks for the raw water and treated water. The raw water tank can be aerated. This ensures the raw water is mixed through. It also enables dissolved substances (such as iron) to be precipitated so as to then filter them. A connection to backwash the sand filters is provided.

The flow rate, temperature, conductivity, differential pressure and system pressure are measured. Samples can be taken at all relevant points.

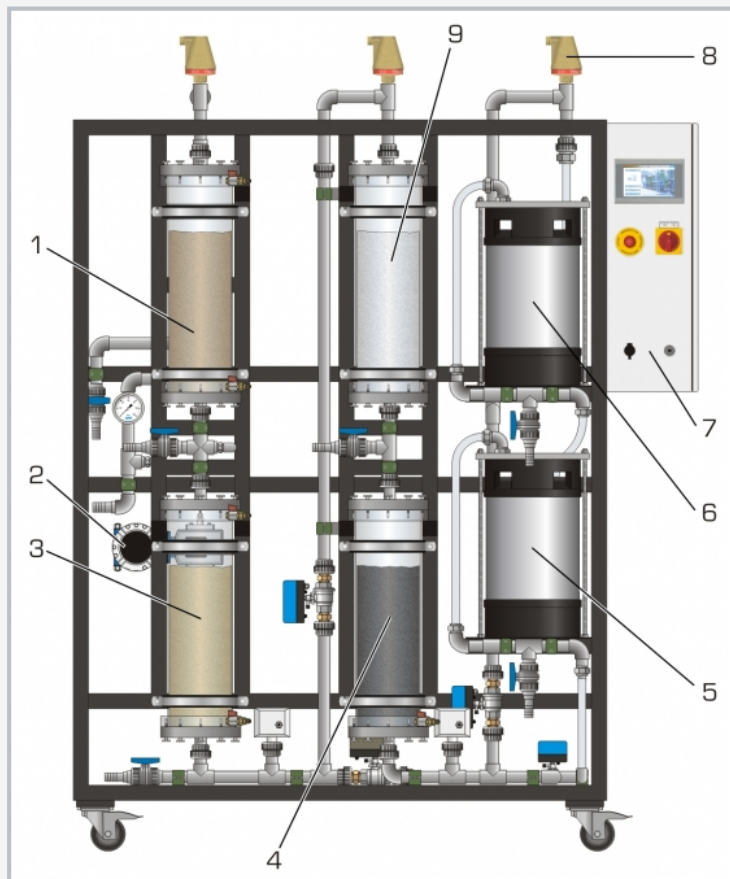
The experimental plant is equipped with a comprehensive range of functions for measurement, control and operation that are controlled by a PLC. A touch panel displays the measured values and operating states and can be used to control the plant. At the same time, the measured values can be transmitted directly to a PC via USB where they can be analysed with the software.

### Learning objectives/experiments

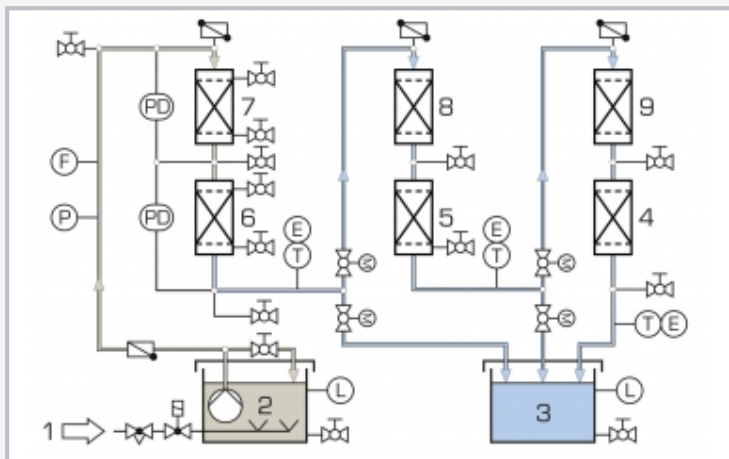
- learning the fundamental principle of the unit operations depth filtration, adsorption and ion exchange
- observation and determination of the pressure loss in depth filtration
- plotting of breakthrough curves (adsorption)
- comparison of various adsorption materials
- familiarisation with the fundamental principle of ion exchange

# CE 581

## Water treatment plant 1



1 gravel filter, 2 electromagnetic flow rate sensor, 3 sand filter, 4 adsorber (activated carbon), 5 cation exchanger, 6 mixed bed ion exchanger, 7 switch cabinet, 8 bleed valve, 9 adsorber (aluminium oxide)



1 external compressed air supply, 2 raw water, 3 treated water, 4 mixed bed ion exchanger, 5 adsorber (activated carbon), 6 sand filter, 7 gravel filter, 8 adsorber (aluminium oxide), 9 cation exchanger; E conductivity, F flow rate, L level, P system pressure, PD differential pressure, T temperature

### Specification

- [1] 3 unit operations in water treatment: depth filtration, adsorption, ion exchange
- [2] gravel filter, sand filter, aluminium oxide adsorber, activated carbon adsorber, cation exchanger, mixed bed ion exchanger
- [3] separate supply unit with tanks for raw water and treated water
- [4] raw water tank with possibility of aeration
- [5] gravel filter and sand filter with differential pressure measurement
- [6] flow rate measurement of raw water
- [7] measurement of conductivity and temperature after each treatment stage
- [8] PLC with touch panel for control of the plant
- [9] GUNT software for data acquisition via USB under Windows 7, 8.1, 10

### Technical data

#### Raw water pump

- max. flow rate: 25m<sup>3</sup>/h
- max. head: 20m

#### Gravel filter, sand filter and adsorbers

- inner diameter: each 150mm
- height: each 650mm

#### Ion exchanger tank

- diameter: each 240mm
- height: each 410mm

#### Tanks for raw water and treated water

- capacity: each approx. 180L

#### Measuring ranges

- flow rate: 0...1300L/h
- pressure: 0...4bar
- differential pressure: 0...2,5bar
- conductivity: 0...600µS/cm
- temperature: 0...100°C

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase, 230V, 60Hz, 3 phases

UL/CSA optional

LxWxH: 1300x800x950mm (supply unit)

LxWxH: 1680x800x2140mm (trainer)

Total weight: approx. 330kg

### Required for operation

water connection, drain, compressed air (min. 1 bar), substances for preparation of the raw water  
PC with Windows recommended

### Scope of delivery

trainer, 1 supply unit, 1 packing unit of sand, 1 packing unit of gravel, 1 packing unit of aluminium oxide, 1 packing unit of activated carbon, 1 set of hoses, 1 GUNT software CD + USB cable, 1 set of instructional material