

## CE 310.02

### Tubular reactor



#### Description

- tubular reactor for connection to supply unit CE 310
- transparent materials to observe the process
- determination of the conversion in a saponification reaction

Tubular reactors are continuously operated reactors. They enable economic production of large product quantities with a consistent quality.

CE 310.02 is part of a device series that enables experiments with different reactor types. In conjunction with the supply unit CE 310, it is possible to examine the function and behaviour of a tubular reactor. The supply unit CE 310 has a heating water circuit as well as all necessary connections, pumps, tanks for reactants and a product tank.

CE 310.02 is mounted onto the supply unit and held by two pins in position. Quick-release couplings enable easy connection of the reactor to the supply unit.

The two pumps of the supply unit deliver the reactants separately through each nozzle into the reactor.

The nozzle outlets are located in a T-piece in such a way that the two reactants are mixed in the centre of the T-piece. The mixture enters into the helical tube in which the two reactants react. The mixture of product and unconverted reactants leaves the tube and is transported into a tank of the supply unit.

The retention time of the reactants in the tubular reactor is adjusted via the speed of the pumps on the supply unit. The tube is also located in the water bath. The water bath is connected to the heating water circuit of the supply unit, which enables the user to examine the influence of the temperature on the reaction.

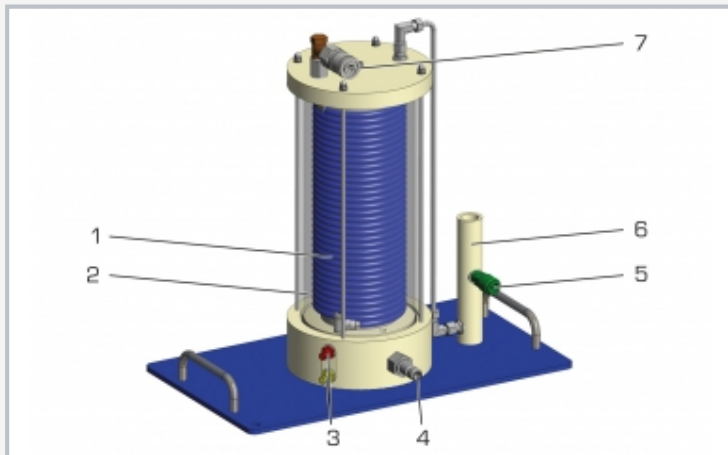
The conversion in the tubular reactor is determined by measuring the conductivity. A combined conductivity/temperature sensor is included in CE 310. Conductivity and temperature are digitally displayed on the switch cabinet of the supply unit. In addition, the measured values can be captured and processed with data acquisition software (included in CE 310).

#### Learning objectives/experiments

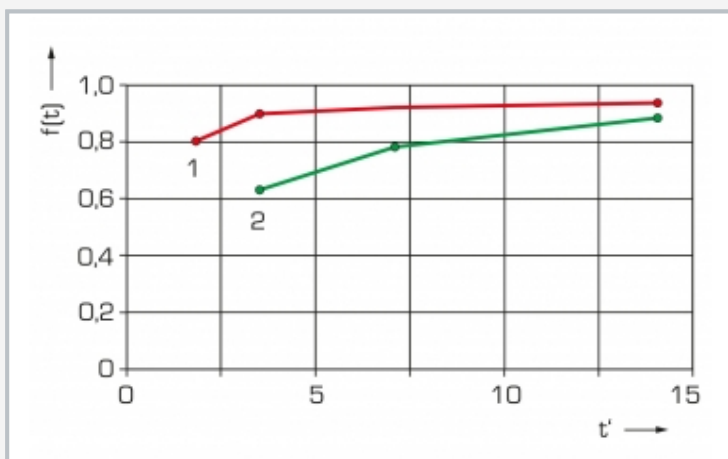
- fundamentals of a saponification reaction
- conversion depending on
  - ▶ retention time
  - ▶ temperature
  - ▶ concentration

# CE 310.02

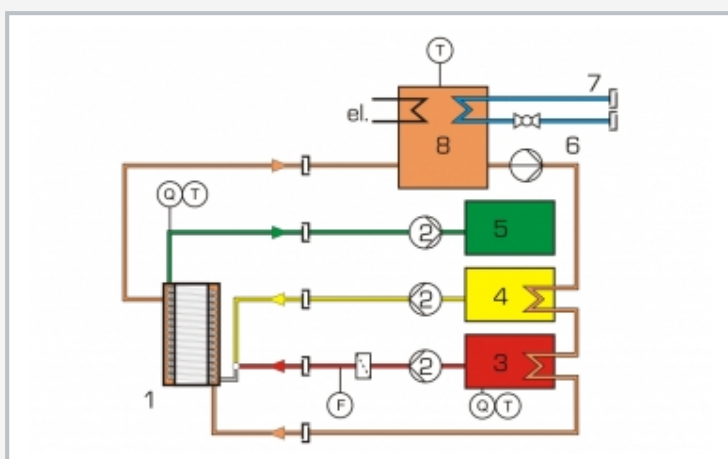
## Tubular reactor



1 tubular reactor, 2 double jacket, 3 reactants A/B supply, 4 water supply, 5 product drain, 6 sleeve for sensor for conductivity and temperature (included in CE 310), 7 water drain



Conversions for different retention times and temperatures  
1 high temperature, 2 low temperature;  $f(t)$  conversion,  $t'$  retention time



Process schematic with supply unit CE 310  
1 tubular reactor, 2 peristaltic pump, 3 reactant A tank, 4 reactant B tank, 5 product tank, 6 water pump, 7 water connection, 8 water tank; Q conductivity, F flow rate, T temperature

### Specification

- [1] tubular reactor for connection to supply unit CE 310
- [2] helical plastic tube as reactor
- [3] T-piece with 2 nozzles for mixing the preheated reactants
- [4] transparent PMMA tank as water bath for the reactor and for connection to the heating water circuit of CE 310
- [5] sensor for measuring the conductivity and temperature via CE 310
- [6] temperature control in the reactor via CE 310

### Technical data

#### Tubular reactor

- inside diameter: 6mm
- reactor capacity: approx. 280mL
- material: PA

#### Water bath

- inside diameter: 132mm
- outer diameter: 140mm
- capacity: 2L
- material: PMMA

LxWxH: 440x250x430mm

Weight: approx. 11,5kg

### Scope of delivery

- 1 tubular reactor

## **CE 310.02**

### **Tubular reactor**

Required accessories

083.31000      CE 310      Supply unit for chemical reactors