

## CE 310.01

### Continuous stirred tank reactor



#### Description

- stirred tank reactor for connection to supply unit CE 310
- transparent materials to observe the process
- isothermal operation
- adjustable reactor volume
- determination of the conversion in a saponification reaction

Stirred tank reactors can be operated continuously or discontinuously. Discontinuously operated stirred tank reactors are mostly used if the product quantities to be produced are small or the reactions are slow. Continuous stirred tank reactors enable the reliable production of large product quantities with a consistent quality.

CE 310.01 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 stirred tank reactor in continuous and discontinuous operation. 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 310.01 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.

In continuous operation, two pumps on the supply unit deliver the reactants into the reactor. A stirrer ensures a homogeneous mixture and thus increases the direct contact of the reactants. The product is formed by reaction of the reactants. The mixture of product and unconverted reactants leaves the reactor through an overflow and is delivered into a tank of the supply unit.

The height of the overflow is variable. The reactor volume is therefore adjustable. The retention time of the reactants in the reactor is adjusted via the speed of the pumps on the supply unit. A chambered bottom in the stirred tank reactor serves as the heat exchanger to examine the influence of the temperature on the reaction.

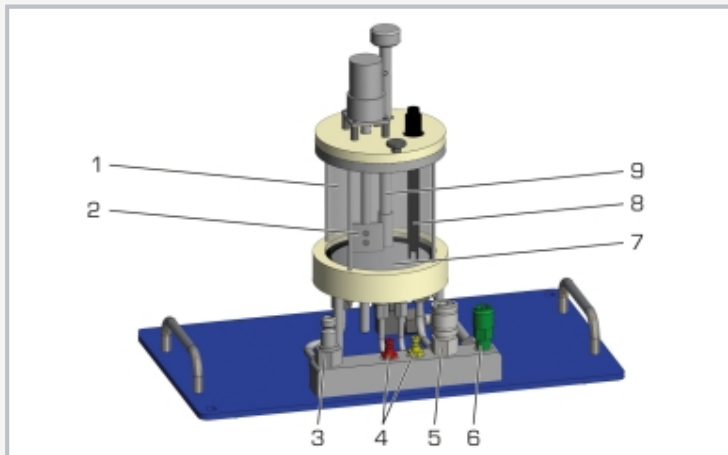
The conversion in the stirred tank reactor is determined by measuring the conductivity. A combined conductivity/temperature sensor is included in CE 310. Conductivity and temperature are digitally displayed on the switch cabinet of the supply unit. In addition, the measured values can be captured and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

#### Learning objectives/experiments

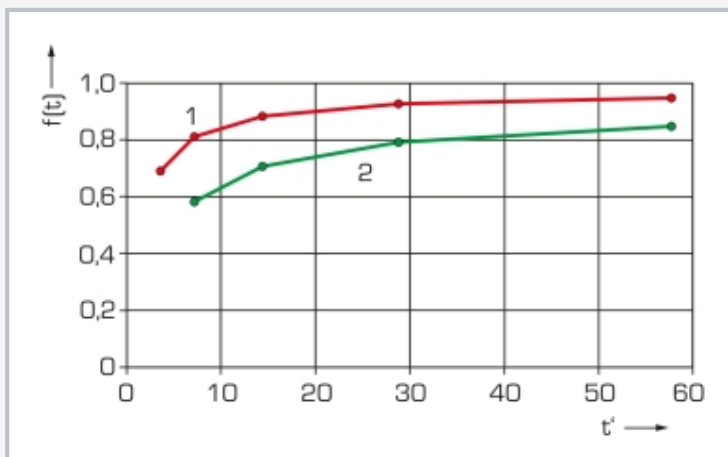
- fundamentals of a saponification reaction
- conversion depending on
  - ▶ retention time
  - ▶ temperature
  - ▶ concentration

# CE 310.01

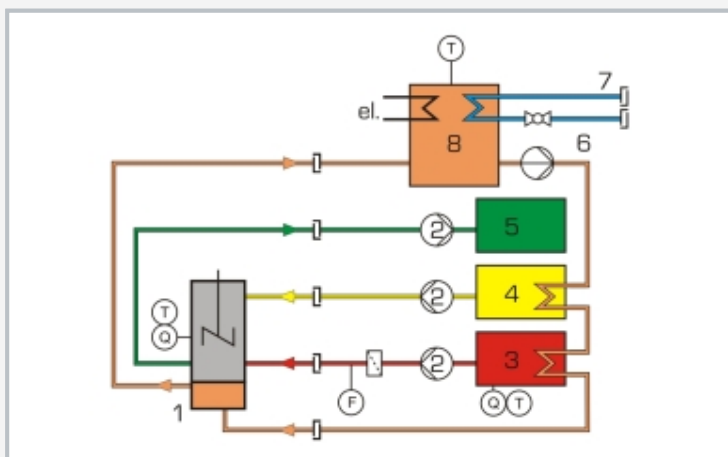
## Continuous stirred tank reactor



1 stirred tank reactor, 2 stirrer, 3 water supply, 4 reactants A/B supply, 5 water drain, 6 product drain, 7 chambered bottom as heat exchanger, 8 sensor for conductivity and temperature (included in CE 310), 9 height-adjustable overflow



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 stirred tank 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] continuous stirred tank reactor for connection to supply unit CE 310
- [2] glass tank
- [3] height-adjustable overflow for changing the reactor volume
- [4] reactor with stirrer
- [5] chambered bottom made of stainless steel as heat exchanger for connection to CE 310
- [6] sensor for measuring the conductivity and temperature via CE 310
- [7] temperature control in the reactor via CE 310

### Technical data

#### Stirred tank reactor

- outer diameter: 110mm
- inside diameter: 100mm
- height: 120mm
- adjustable volume: 270...750mL

#### Speed stirrer

- approx.  $330\text{min}^{-1}$

LxWxH: 440x250x320mm

Weight: approx. 10kg

### Scope of delivery

- 1 continuous stirred tank reactor

# **CE 310.01**

## **Continuous stirred tank reactor**

Required accessories

CE 310                    Supply unit for chemical reactors