CE 400
Gas absorption

Description

- separating a CO₂/air mixture by absorption in counterflow
- DURAN glass column with packed bed
- safe operation due to use of water as the solvent and non-hazardous gases
- regeneration of solvent by vacuum
- gas analysis with hand-held measuring unit

Absorption is used to remove one or more gaseous components from a gas flow using a solvent.

First of all, a CO₂ and air gas mixture is produced. It is possible to adjust the mixing ratio using valves. The flow rates of the gas components are displayed.

A compressor delivers the gas mixture into the lower section of the absorption column. In the column, part of the CO₂ is separated in the counterflow with the solvent. Water is used as the solvent. The CO₂ is absorbed by the downward flowing water. To separate the absorbed CO₂, the charged water is then fed from the lower section of the absorption column into a desorption column. As the pressure is reduced and the temperature is increased, the solubility of the CO₂ falls. A heater heats the water. A water jet pump generates negative pressure in the desorption column and causes the CO₂ gas to be emitted from the water. A pump then delivers the regenerated solvent back into the absorption column.

The water temperature can be controlled. Flow rate, temperature and pressure are continuously measured. The two-section column is equipped with connections to determine the pressure losses. The pressure loss in the respective sections can be displayed via two U-tube manometers. To evaluate the success of the process, the trainer includes outlets for taking gas and liquid samples. The gas samples can be analysed using the hand-held measuring unit supplied.

Learning objectives/experiments

- investigation of the absorption process when separating gas mixtures in a packed column
- determination of pressure losses in the column
- representation of the absorption process in an operating diagram
- investigation of the variables influencing the effectiveness of absorption

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**CE 400**
Gas absorption

### Specification

1. Separation of CO₂/air mixture by absorption in countercurrent with water
2. Production of gas mixture using CO₂ from compressed gas cylinder and ambient air
3. Adjustment of mixing ratio using valves
4. Compressor for delivering the gas mixture into the absorption column
5. DURAN glass absorption column (packed bed) and desorption column
6. Continuous solvent regeneration in circuit with desorption column under vacuum
7. 1 pump for desorption column and 1 pump for returning solvent to absorption column
8. Water temperature control with heater and refrigeration system

### Technical data

**Absorption column**
- Height: 2x 750mm, Inner diameter: 80mm

**Desorption column**
- Height: 750mm, Inner diameter: 80mm
- 2 pumps (absorption/desorption)
  - Max. flow rate: 17.5L/min
  - Max. head: 47m
  - 1 pump (cooling)
  - Max. flow rate: 29L/min
  - Max. head: 1.4m

**Compressor**
- Max. positive pressure: 2bar
- Max. flow rate: 39L/min

**Refrigeration capacity**
- 1432W at 5/32°C
- Refrigerant: R513A
- GWP: 631

**Measuring ranges**
- Flow rate:
  - 0.2…2.4Nm³/h (air)
  - 50…600L/h (solvent)
  - 0.4…5.4L/min (CO₂)
- Temperature: 1x 0…80°C, 2x 0…60°C
- Pressure: 1x 0…2.5bar, 1x -1…0.6bar
- Differential pressure: 2x 0…250mmWC
- CO₂-content: 0…100vol%

**Power requirements**
- 230V, 50Hz, 1 phase
- 230V, 60Hz, 1 phase; 230V, 60Hz, 3 phases
- UL/CSA optional
- LxWxH: 1920x790x2300mm
- Weight: approx. 290kg

### Required for operation

- CO₂ gas cylinder with pressure reducing valve
- Water connection, drain

### Scope of delivery

1. Trainer
1. Hand-held measuring unit for gas analysis
1. Set of hoses
1. Set of instructional material