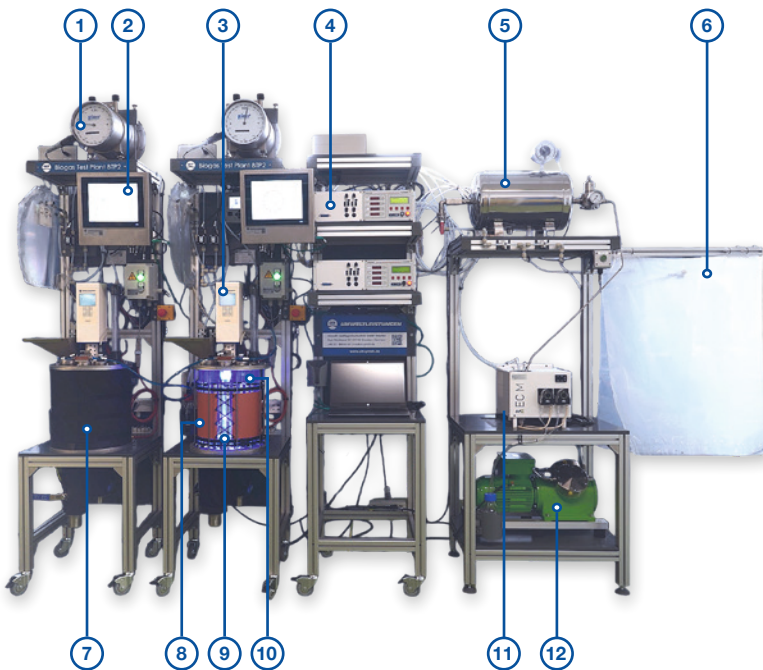




## DARK FERMENTATION PLANT

Dark fermentation is a biological process in which organic material is converted by anaerobic bacteria into hydrogen ( $H_2$ ), organic acids,  $CO_2$  and other intermediate products - without light. An additional process step may be the connection to a photobioreactor, which allows for greater utilization of the substrate. Umwelt- und Ingenieurtechnik GmbH Dresden offers such research equipment. The equipment features will be realized customer specific.



### Components overview

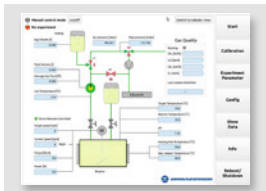
- ① Gas amount meter
- ② SENSOcontrol
- ③ Mixer unit
- ④ Gas quality measurement system
- ⑤ Gas storage tank
- ⑥ Gas bag
- ⑦ Dark fermentation reactor
- ⑧ Heating system
- ⑨ Sparkling system
- ⑩ Photobioreactor with lighting system
- ⑪ Measurement gas cooler
- ⑫ Compressor

### Features and options

- ✓ Up to 10 bioreactors on one gas quality measurement system
- ✓ Reactor with different working volumes
- ✓ Continuous operation with feeding
- ✓ Electrical heating / cooling
- ✓ SENSOcontrol with touch panel
- ✓ Sparkling system with MFC (mass flow controller)
- ✓ Dosage pumps for pH-control
- ✓ Advanced lighting system
- ✓ Measurement equipment: Gas quantity, pH, redox, temperature, gas quality and more



# DARK FERMENTATION PLANT



## SENSOcontrol

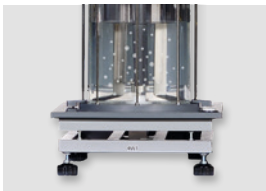
The universal automation system SENSOcontrol is used for data acquisition applications and control of units (pumps, mixer) of the test plant. A touch panel for intuitive operation is integrated for user-friendly parameter set-up and real time visualization of measured data.



## Gas quality measurement system

**Analyzer 1:** CH<sub>4</sub> 0-100 vol% with IR sensor; CO<sub>2</sub> 0-100 vol% with IR sensor; O<sub>2</sub> 0-100 vol% with EC sensor; H<sub>2</sub>S 0-5000 ppm with EC sensor

**Analyzer 2:** H<sub>2</sub> 0-20.000 ppm with EC sensor - protection system against excessive H<sub>2</sub> concentration; H<sub>2</sub> 0-100 vol% with thermal conductivity sensor



## Sparkling systems

The additional sparkling system with a mass flow controller allows the defined sparkling of gases. Gas mixing systems are also available.



## LED lighting system

**Red wavelength:** 670 nm, each with 15 LEDs; total power per module up to 1.5 W

**IR wavelength:** 740 nm, each with 15 LEDs with integrated visible control LEDs; total power per module up to 1.5 W

**Green wavelength:** 570 nm, each with 15 LEDs; total output per module up to 1,200 lm/2 W

**Blue wavelength:** 480 nm, each with 15 LEDs; total output per module up to 270 lm/3.6 W

**White color:** 2,700 K with 15 LEDs each; total output per module up to 825 lm

**Dimension:** Lighting module: 300 x 15 mm – others on request

Information on dark fermentation



The equipment features will be defined with the quotation.

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