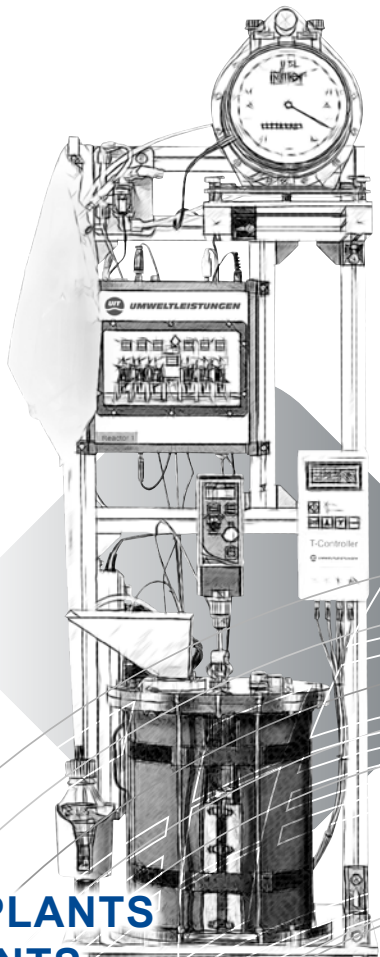
UMWELTLEISTUNGEN



We have what it takes for

BIOREACTOR PLANTS & BIOGAS TEST PLANTS

UMWELTLEISTUNGEN

INNOVATIVE BIOREACTORS AND BIOGAS TEST EQUIPMENT

Umwelt- und Ingenieurtechnik GmbH Dresden (UIT) is a German manufacturer and supplier of Bioreactors and Biogas Test Equipment and provides also various environmental monitoring solutions.

With the focus to provide ***high quality*** and reliable equipment we are helping to ***optimize processes*** for biogas plant operations and provide useful tools for ***biogas analysis, research and development*** with the goal to optimize digester operation and maximize methane production.

As a classic engineering company with own production facilities we are in position to provide standard equipment, but also custom-made bioreactors and biogas test systems that is specific to your technical require- ments and within your budget and your timeline.

UIT Bioreactors and Biogas Test Equipment is made in Dresden, Germany. We produce all systems according to highest level of quality and ship it to our customers worldwide.

DETERMINATION OF BIOGAS POTENTIAL

Our laboratory-based Test Plants determine the potential biogas output of fermentation substrates in several modes. Depending on the design the test plant comes with a ***bioreactor made of glass*** in a cylindrical shape and ***different working volumes***.

Sensors for temperature control and measurement of pH as well as gas amount, speed and torque of mixer (other parameters on request) provide important information to the ***Data Acquisition System SENSOcontrol***.

The plastic top cover provides ports in different sizes to take all standard electrodes and fittings for sampling or feeding.

The gas quantity is measured through a high quality gas drum meter.

In addition to our basic systems we provide a more complex version which additionally includes a ***central gas analysis module.***

With this add on module we supply an option for the ***online analysis*** of gas composition of ***methane, carbon dioxide, oxygen, hydrosulfide and hydrogen.***

Because of its ***modular design*** the number of reactors and therefore the total working volume is flexible and, optionally, it can be upgraded with further sensors to monitor other parameters.

Almost any measurable probe can be added at a later time. Our Biogas Test Equipment provides a tailored solution with ***integrated gas analysis module*** combined with the ***flexibility of a rack-mounted modular system***.

PRODUCTS

- BTP 2 basic
- BTP 2
- BTP 2 analyzer
- BTP 2 control
- BTP 2 control with pump modules
- BTP 2 sterile
- MRE 3
- Gas quality measurement technology
- Pilot container

E-Mail Support
info@uit-gmbh.de

Telefon Support
+49 351 88646-00

BIOGAS TEST PLANT

Standard and customized solutions
combined with the flexibility of a modular system

BTP 2

Standardized and customized lab test facilities for biogas research, product development (enzymes, nutrients), process optimization and biotechnology.

We deliver test plants of 2.5 liter reactor volume up to 1,500 liter reactor volume with different range of measurement and control equipment.

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BTP 2

The perfect entry model

The biogas pilot plant BTP2 is the base system for substrate testing and gas potential tests.

Furthermore, this system is ideally suited for product development (enzymes, nutrients) or for process optimization.

This system is characterized by an extensive basic equipment, e.g. SENSOcontrol or optional pumps for feeding or control of pH.

BTP 2

FEATURES

- Glass reactor with different working volume
- Continuous operation with AUTO feeding
- Electrical heating
- Two level stirrer with gastight shaft
- Dosage pumps for pH-control
- Gas bag to collect gas samples
- Measurement equipment
  - Gas quantity
  - pH/ Redox / temperature
- SENSOcontrol with touch panel

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info@uit-gmbh.de

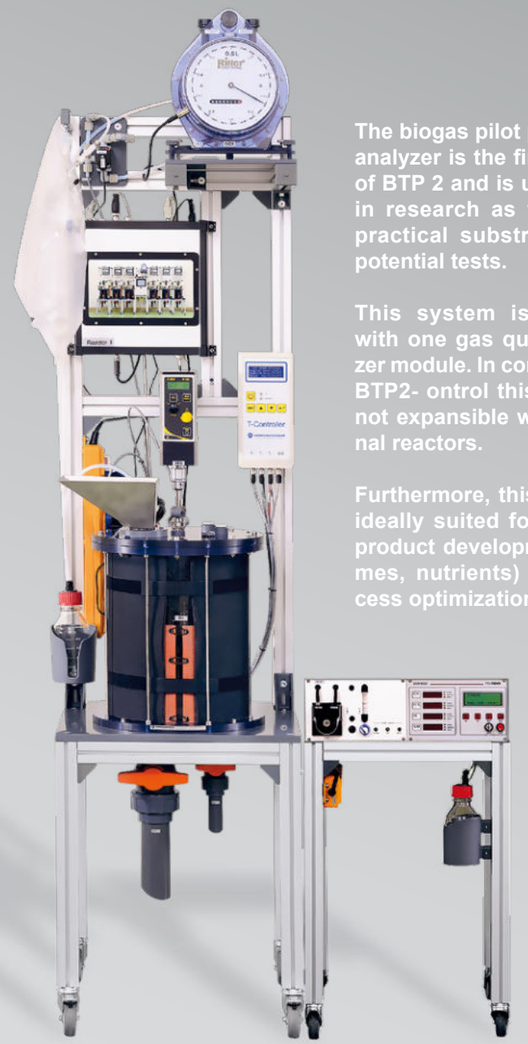
Telefon Support
+49 351 88646-00

BTP 2 analyzer

Combining a basic plant with gas analyses module

FEATURES

- Glass reactor with different working volume
- Continuous operation with AUTO feeding
- Electrical heating
- Two level stirrer with gastight shaft
- Dosage pumps for pH-control
- Gas bag to collect gas samples
- Measurement equipment
  - Gas quantity
  - pH / Redox / temperature
  - gas quality measurement system
- SENSOcontrol with touch panel



BTP 2 analyzer

The biogas pilot plant BTP2-analyzer is the first upgrade of BTP 2 and is used mainly in research as well as for practical substrate or gas potential tests.

This system is equipped with one gas quality analyzer module. In contrast to the BTP2- ontrol this system is not expansible with additional reactors.

Furthermore, this system is ideally suited for research, product development (enzymes, nutrients) or for process optimization.

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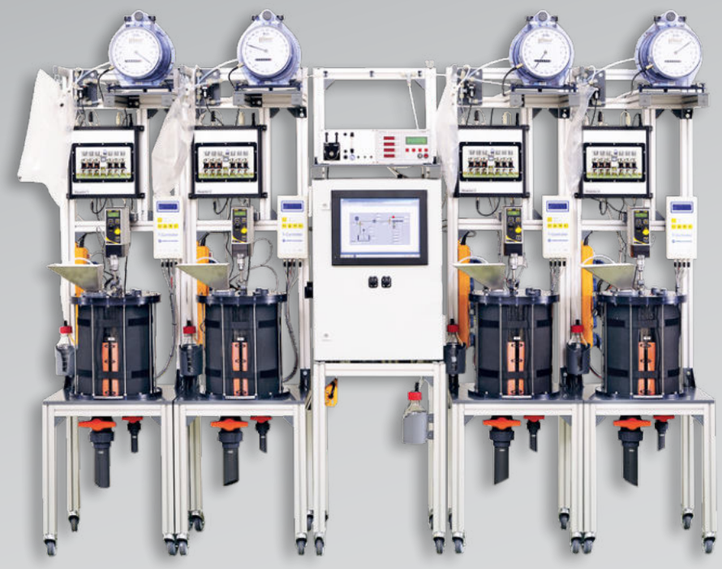
BTP 2 control



BTP 2 control

Standardized and customized bioreactors lab test facilities for biogas research, product development (enzymes, nutrients), process optimization and biotechnology application (research and piloting).

We deliver reactor test plants of 2.5 liter reactor volume up to 1,500 liter reactor volume with different range of measurement and control equipment.

FEATURES

- Up to 10 bioreactors on one gas quality measurement system
- Glass reactor with differentworking volume
- Continuous operation with AUTO feeding
- Electrical heating and optional cooling
- Two level stirrer with gastight shaft
- Dosage pumps for pH-control
- Gas bag to collect gas samples
- Measurement equipment:
  - Gas quantity
  - pH/ Redox/ LDO/ temperature
  - gas quality measurement system
- SENSOcontrol with touch panel

FEATURES

- Display of the actual values
- Storage of data
- Control of
  - Mixer
  - Pump for pH-control
  - Pump for feed and discharge
- Calibration support for sensors
- Calculation of Nm^3 of produced biogas
- Touch panel functionality
- Ethernet interface

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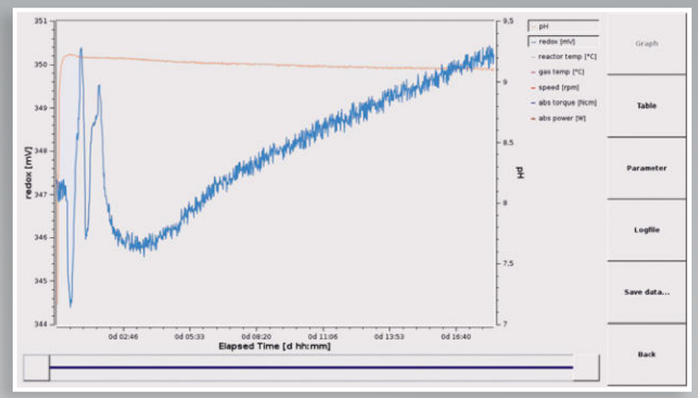
SENSOcontrol

Data acquisition and control unit



Screenshots

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.

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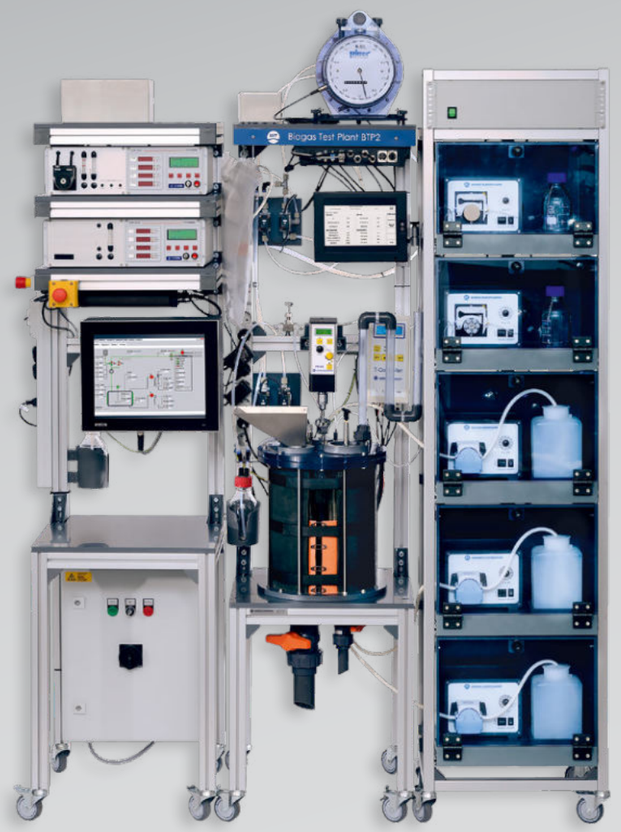
BTP2-control with pump modules

for feed, discharge and pH-control



BTP2-control with pump modules

The individual BTP modules can also be equipped with pump modules. The pump modules are controlled by the SENSOcontrol units.

FEATURES

- Tube pumps for feeding, discharge and pH-control
- High quality tube pumps with 3 rolls
- Available tube inner diameter: 0.8 mm; 1.6 mm; 3.2 mm; 4.8 mm; 6.3 mm and 8 mm
- Minimum flow rate 0.5 ml/min and max. flow rate 840 ml/min with different tube inner diameters and revolutions per minute
- Control of tube pumps via SENSOcontrol:
  - Asynchronous time control for feeding and discharge
  - PID control system for pH-control
- Basic pump cabinet with doors and individual vessels
- Useable as transfer-pumps for two-stage fermentation tests

FEATURES

- pH-control software with the possibility to define the wished pH-value and the control parameters
- feeding control software with the possibility to define the pumping time and the break time (asynchronous time control)
- discharge control software with the possibility to define the pumping time and the break time (asynchronous time control)
- storage of the pumping sequences and vizualization

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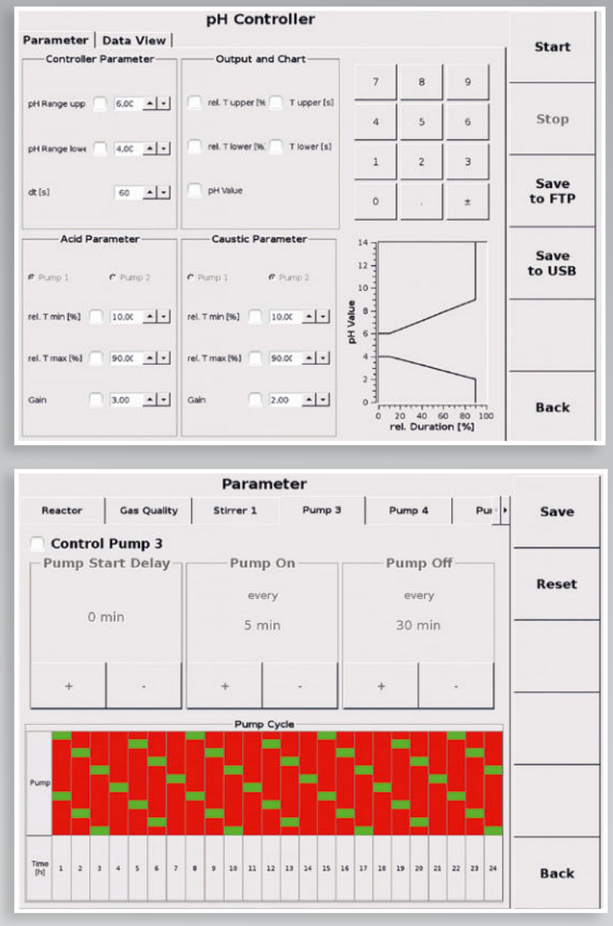
+49 351 88646-00

SENSOcontrol

for pump modules



Screenshots

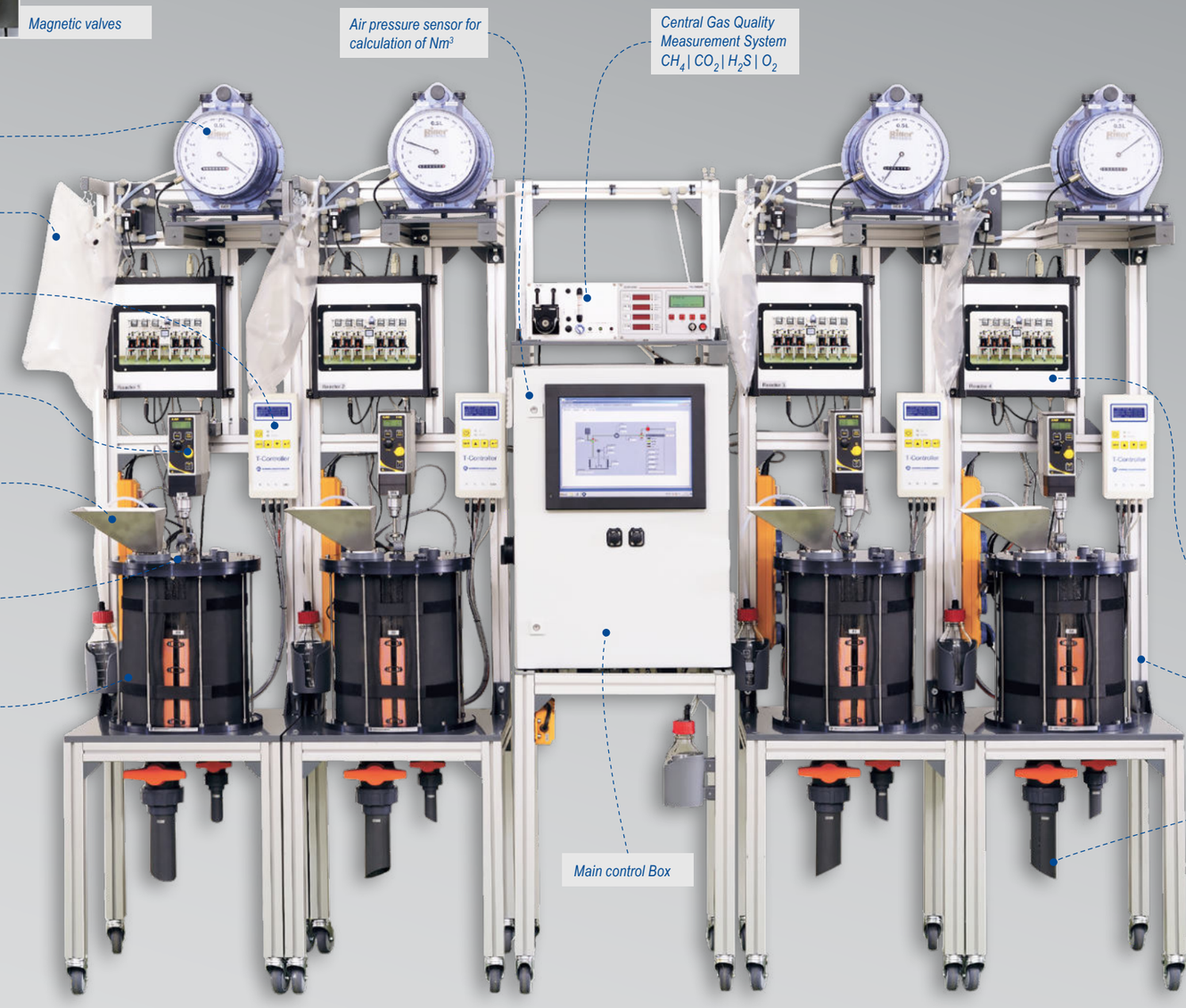
The universal automation system SENSOcontrol is also used for control of pumps of the test plant. A touch panel for intuitive operation is integrated for user friendly parameter set-up and real time visualization of measured data.

UMWELTLEISTUNGEN

FEATURES

- Up to 10 bioreactors on one gas quality measurement system
- Glass reactor with differentworking volume
- Continuous operation with AUTO feeding
- Electrical heating and optional cooling
- Two level stirrer with gastight shaft
- Dosage pumps for pH-control
- Gas bag to collect gas samples
- Measurement equipment:
  - Gas quantity
  - pH/ Redox / temperature
  - gas quality measurement system
- SENSOcontrol with touch panel

Magnetic valves



BTP 2 control

BTP 2 control

Combining up to 10 basic plants with only one gas analyses module

The fully automated bioreactor plant BTP2-control is mainly used in research as well as for practical substrate or gas potential tests. This system is modular and equipped with one gas quality analyzer module.

For expansion it is possible to connect up to ten reactors with only one gas quality analyzer. One central computer in combination with a multiplexer unit enables the independent test procedure of each individual reactor.

Gas volume and gas quality is simultaneously and automatically measured for each reactor. Furthermore, this system is ideally suited for research, product development (enzymes, nutrients) or for process optimization.

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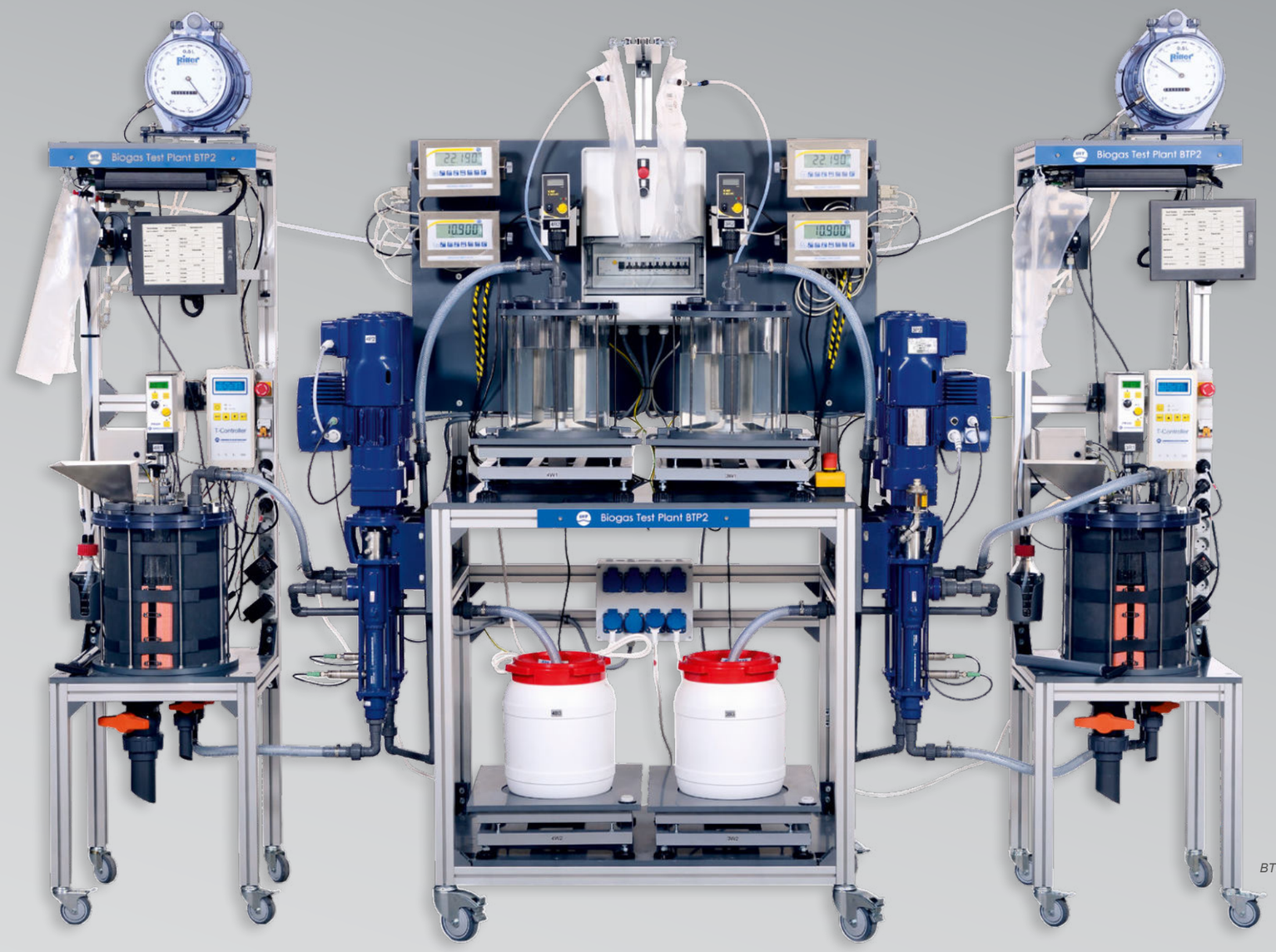
+49 351 88646-00

UMWELTLEISTUNGEN

FEATURES

- Eccentric screw pumps suitable for larger quantities and particle sizes
- Size of solids content: 6 mm – max. ball passage cross section - other max. sizes of solid on request
- Max. fiber length: 30 mm -other max. fibre lenghth on request
- Nominal flow rate: 51 l/h with additional frequency converter for change of the flow rate (minimum 20 l/h)
- external ventilation of frequency converter – necessary for use of minimum range (5 l/h) of the pumps
- Control of pumps via SENSOcontrol:
  - Asynchronous time control for feeding and discharge
  - Monitor of scales
- SENSOcontrol with touch panel



BTP 2 control with feeding

BTP 2 with feeding

Use of eccentric screw pumps and scales for accurate feeding

The individual BTP modules can also be equipped with eccentric screw pumps.

Additionally, the system is equipped with scales for an exact feeding result.

The pumps modules and the scale modules are controlled by the SENSO-control units.

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info@uit-gmbh.de

Telefon Support
+49 351 88646-00

UMWELTLEISTUNGEN

BTP sterile

Test plants for experiments under sterile conditions

BTP sterile

In contrast to basic units (BTP), the BTP sterile reactor is produced of stainless steel and glass. This offers the possibilities to sterilize the bioreactor before the start of the experiment. It is equipped with an advanced gastight shaft.

The biogas pilot plant BTP sterile is the upgraded base system for substrate testing and gas potential tests.

Furthermore, this system is ideally suited for product development (enzymes, nutrients), process optimization and biotechnology applications. This system is characterized by an extensive basic equipment, e.g. SENSOcontrol and optional pumps for feeding or control of pH.

FEATURES

- Bioreactor sterilisable
- Glass reactor with different working volume
- Electrical heating
- Two level stirrer with gastight shaft
- Dosage pumps for pH-control
- Gas bag to collect gas samples
- Measurement equipment:
  - Gas quantity
  - pH/ Redox / temperature
  - gas quality measurement system
- SENSOcontrol with touch panel

FEATURES

- Bioreactor sterilisable
- Glass reactor with different working volume 2/5/10/20 Litre
- Double wall reactor
- Two level stirrer with gastight shaft
- Heating optional cooling of reactor
- Dosage pumps for pH-control/ feeding/ discharge
- Gas inlet for 3 gases with mixing unit plus one Mass Flow Controller
- Measurement equipment:
  - pH/ LDO/ Redox/ temperature
  - Gas quality measurement system
- SENSOcontrol with touch panel

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info@uit-gmbh.de

Telefon Support
+49 351 88646-00

BTP-sterile-control

Test plants for experiments under sterile conditions

BTP-sterile-control

In contrast to basic units (BTP), the BTP-sterile-control reactor is produced of stainless steel and glass. This offers the possibilities to sterilize (autoclave) the bioreactor before the start of the experiment. It is equipped with an advanced gastight shaft.

The reactors are available in the following sizes: 2/5/10/15/20 litre.

Furthermore, this system is ideally suited for product development (enzymes, nutrients), process optimization and biotechnology applications. This system is characterized by an extensive basic equipment, e.g. SENSOcontrol and optional pumps for feeding, discharge or control of pH.

Additional it is possible to inlet 3 gases in the bioreactor. These gases can be mixed before. A valve matrix is used for this purpose. The whole volume flow is controlled by a mass flow controller.

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Gas quality measurement technology

for BTP modules

Handheld gas quality measurement device

Stationary gas quality measurement system

FEATURES

- Possible Measurment parameter (handheld or stationary gas quality measurement system):
  - CH_4 0…100 vol % IR sensor
  - CO_2 0…100 vol % IR sensor
  - O_2 0…25 vol % electrochemical sensor
  - H_2S 0…5000 ppm electrochemical sensor
  - H_2 0…2000 ppm[1)] electrochemical sensor
  - H_2 0…50 vol%[1)] thermal conductivity sensor

- Equipping status:
  - Measurment gas cooler[1)]
  - Internal membrane pump
  - Pressure sensor for control of emp tying of gas bag[1)<<]

[1)]*… only valid for stationary gas quality measur menet system not avaible for hand held gas quality measurement device*

FEATURES

- Reactor size up to 1000 litre; steel reactors
- Electrical heating for bioreactors
- Feeding and discharge pumps
- Dosage pumps for pH-control
- Measurement equipment:
  - Gas quality
  - Gas quantity
  - Mass flow controller
  - pH/redox/ temperature
- SENSOcontrol with touch panel

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info@uit-gmbh.de

Telefon Support
+49 351 88646-00

BTP-1000
Pilot plant/ pilot container

Pilot plant

Pilot plants for biotechnology application will be produced fully customized. Biotechnology pilot plants offers innovative, high-performing and safe biological process solutions for several applications.

Equipment for pre- and post-fermentation treatment, as well as storage solution can be realized within the container.

The reactors are available in the different sizes up to 1000 litre

This system is characterized by an extensive basic equipment, e.g. SENSOcontrol and optional pumps for feeding, discharge or control of pH. The pilot plants can be equipped with an additional gas quality measurement equipment.

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Pilot container - Biogas

Customized pilot container

Pilot container - Biogas

Pilot containers will be produced fully customized. Pilot containers are offered for wet/dry fermentation and also for percolator requirements and can be used under continuous or batch operation.

For this test facility we offer the whole working package incorporating the complete planning procedure incl. HAZOP (hazard and operability study) analysis up to delivery turn-key solutions.

The equipment features of the pilot container (measurement devices, control equipment, feeding devices) will be realized according to the customer requirements. The bio reactor including electrical heating and mixing system is made of stainless steel.

For health and safety compliance the test facility is equipped with a gas warning system.

Depending on the design the test plant is mounted in a 20 ft. maritime container which is CSC compliant.

FEATURES

- Available for wet/dry fermentation also for percolator requirements
- Container fully equipped (air condition, electrical installation, etc.)
- Bioreactor, stainless steel with different working volume
- Automatically feed and discharge
- Electrical heating
- Dosage pumps for pH-control
- Measurement equipment:
  - Gas quantity
  - pH/ Redox / temperature
  - gas quality measurement system
- SENSOcontrol with touch panel

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info@uit-gmbh.de

Telefon Support
+49 351 88646-00

Pilot container - Biotechnology

FEATURES

- Sterile bio reactors with agitator
- Container full equipped (air condition, electrical installation, gas warning system
- Electrical heating for bio reactors
- Dosage pumps
- Measurment equipment:
  - Gas quality
  - Mass flow controller
  - Gas quantity
  - pH/redox/ temperature
- SENSOcontrol with touch panel

Internal view of a Pilot container – Biotechnology

Pilotcontainer for biotechnology application will be produced fully customized. Biotechnology pilot container offers innovative, high-performing and safe biological process solutions for several applications.

Equipment for pre- and post-fermantation treatment, as well as storage solution can be realized within the container.

Overview

	BTP 2 basic	BTP 2	BTP 2 analyzer	BTP 2 control	BTP sterile	sterile-control	Pilot plant
Reactor volumes							
2.5/6 liter	●	●	●	●	●	●	
15/20/30/60 liter	●	●	●	●		❍	
200-1,500 liter							●
Electrical heating system incl. temperature controller	●	●	●	●	●	●	●
Suitable to be sterilized					●	●	
Mixer incl. gas-tight shaft feedthrough							
Gas-tight shaft feedthrough	●	●	●	●	●	●	●
Shaft feedthrough suitable to be sterilized					●	●	
Mixer suitable to operate asynchronous		●	●	●	●	●	●
Measuring instrumentation							
Gas quantity (gas drum counter or Milli gas counter)	●	●	●	●	●	❍	●
Automatic gas quality measurement (CH4, CO2, H2S, O2)			●	●	❍	❍	●
Use of measuring instrumentation for up to 8 reactor units				●		❍	●
Measuring of H2 in gas phase			❍	❍		❍	❍
Air pressure sensor			●	●		❍	
pH-measurement in substrate	●	●	●	●	●	●	●
ORP-measurement in substrate		❍	❍	❍	❍	●	❍
Dissolved CO2 - measurement in substrate		❍	❍	❍	❍	❍	❍
Temperature in reactor	●	●	●	●	●	●	●
Temperature of gas	●	●	●	●	●	❍	●
Speed and torque of mixer	●	●	●	●	❍	●	❍
Feed and discharge pumps							
Tube pump	❍	❍	❍	❍	❍	❍	❍
Eccentric screw pump	❍	❍	❍	❍			❍
SENSOcontrol - data storage, visualization and control							
SENSOcontrol incl. touch-display		●	●	●	●	●	●
pH-control - automatic pH setting		❍	❍	❍	❍	●	❍
Control of ORP						●	
Automatic time-triggered feeding		❍	❍	❍	❍	●	❍
Control of additional pumps		❍	❍	❍	❍	●	❍
Explanation	❍ *means option*						

The equipment features of the test plants will be defined by individual quotations!

UMWELTLEISTUNGEN

Umwelt- und Ingenieurtechnik GmbH Dresden
Zum Windkanal 21
D-01109 Dresden
Germany

+49 351 88646-00
info@uit-gmbh.de
www.uit-gmbh.de

E-Mail Support
info@uit-gmbh.de

Telefon Support
+49 351 88646-00