

# Tools for efficient biogas processes





Are you looking for professional tools to increase yields and decrease work?

- ✓ determine the best substrate
- ✓ decide if additives are needed or not
- ✓ optimize biogas production

## Key facts BlueSens



### No sampling – real-time measurements

Avoid manual sampling.  
Minimize errors and lab work.



### Gain scale up and down parameters

Measure accurately no matter if benchtop or biogas plant scale.



### Quality made in Germany

All BlueSens sensors are developed, produced, calibrated and assembled in Germany.

## Facts about BlueSens products

- Continuous real-time measurement
- Automated sampling and calculations
- No hidden costs
- Easy handling – no need for training and workshops
- Standardized procedures



BCP series BCP CH<sub>4</sub>

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YM Yieldmaster

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BlueVCount

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## In-situ real-time determination of methane concentrations

### Key facts BCP-CH<sub>4</sub>



#### Fits on every scale

Gain important parameters and measure accurately – no matter if benchtop or production scale.



#### Wide choice

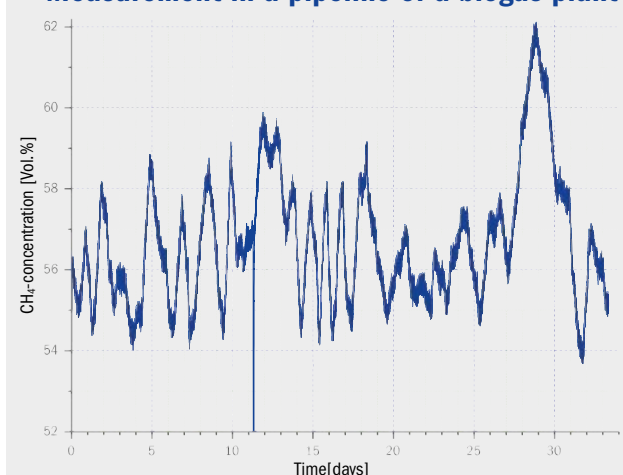
Each sensor is for a single gas: H<sub>2</sub>, CO<sub>2</sub>, CO, O<sub>2</sub>, CH<sub>4</sub>.



#### Different housing

All BCP sensors are available with PA or Aluminium housing (IP65).

### Measurement in a pipeline of a biogas plant



### Technical Short Facts

- **Measuring principle**  
infrared, dual wavelength
- Measuring range 0...100 Vol.% CH<sub>4</sub>
- Drift < ± 2% reading/year
- Accuracy <0,2% FS (full scale) ± 3% value
- **Mechanical connections**  
G 1¼", GL 45, Tri-Clamp SMS38, hose connection 4-12 mm etc.
- Output RS232, 4-20mA, Ethernet, USB
- **Pressure range**  
0.8 – 1.3 bar absolute pressure; 11.6 – 18.85 psi absolute pressure
- Other pressure ranges on request
- **Pressure dependence**  
compensated max. ± 3% reading (range)

## Optimize your output

- Reasonably and priced continuous measurement
- Direct integration in gas pipes (no extra installations)
- Wide variety of connections



Yieldmaster 2.0 Starter



Yieldmaster 2.0 Pro



Yieldmaster 2.0 All-in

## For people who like to do it right – measuring gas formation potential

To ensure effective biogas production determining the biochemical methane potential (BMP) of the input material is necessary. Yieldmaster simplifies BMP comparison of different substrates and helps to optimize biogas yields. Using Yieldmaster you don't have to consider minimal gas productions. After starting the experiment, data for gas volume being produced and/or CH<sub>4</sub> concentrations are logged automatically with BlueVis software. During fermentation in lab scale Yieldmaster can measure directly in the fermentation vessel. Like this, there will be no loss of data, headspace, as well as errors caused by gas leakage, will be minimized. Treatment or filtering the gas is not necessary. Combining methane sensors and BlueVCount results in continuous parallel biogas measurement. Gas volume produced as well as methane (biogas) concentration values measured are available online at any time.

### Key facts Yieldmaster



#### Modular bio-methane potential (BMP) evaluation system

Microprocessor controlled infrared-gas sensors, precision volumetric flow-meters BlueVCount and BlueVIS software.



#### No gas treatment/filtering needed

The analyzers can be installed directly at the headspace or in the off-gas line of any fermenter.



#### Maximum flexibility

Detection of other important gases besides CH<sub>4</sub> possible.

### Technical Short Facts

- Compliant to VDI 4630 and ISO 15985
- No minimal gas flow needed
- Automatic data acquisition

## Make lab life easier

	Yieldmaster	Eudiometer
Real-time gas analysis in the process: no sampling	✓	✗
Detection of other important gases besides CH <sub>4</sub> possible	✓	✗ <sup>1</sup>
Optional pH probes connectable	✓	✗ <sup>1</sup>
Flexible scale	✓	✓
No gas treatment/filtering needed	✓	✗
Software for automated logging and managing of the process	✓	✗
Automated data acquisition of all values	✓	✗
No hazardous substances needed	✓	✗

<sup>1</sup> additional equipment needed





## Assemble Yieldmaster 2.0 modules just as you need them

Yieldmaster 2.0 The bio-methane potential test system		Yieldmaster 2.0 Starter	Yieldmaster 2.0 Pro	Yieldmaster 2.0 All-in
!	Min./max. Temperature (gas/environment) whole experiment	15 to 55 °C		
	BlueVCount gas volume measurement	✓	✓	✓
	Software BlueVIS Biogas edition, incl. calculations according to VDI 4630	✓	✓	✓
	Gas sensors dual wavelength infrared sensor, 15-55°C, GL45 for bottle connection			
	BCP-CH <sub>4</sub> for up to 100 Vol.% CH <sub>4</sub>	✗	✓	✓
	BCP-CO <sub>2</sub> for up to 10, 20 or 50 Vol.% CO <sub>2</sub>	✗	optional	optional
	Waterbath	optional	optional	✓
	Stirrer	optional	optional	✓
	Rack	optional	optional	✓
	CO <sub>2</sub> absorption bottles	optional	optional	optional

## Inexpensive measurement of biogas in the laboratory

Especially for use in the Yieldmaster systems there is a special “flow” adapter for use along with inexpensive preserving jars to choose from now. The “flow” adapter can be easily connected to round jars with a volume of up to five liters and provides two connectors for BCP-sensors. In most cases the set-up consists of a CH<sub>4</sub> and a CO<sub>2</sub> sensor, but for other types of experiments there are other possible installations. In addition, the flow adapter has a standardized PG13.5 port.

The experiments for the production of bio-methane often last for several days. It is recommended to run a larger number of experiments at the same time to have enough variations and comparison tests in a manageable timeframe. The use of inexpensive jars in this case represents an attractive alternative to traditional fermentation vessels and small fermenters.

**low budget application**



High quality gas volume measurement:  
professional and precise

### Key facts BlueVCount



#### More process information

Leads to less number of experiments and optimized yields.



#### Auto compensation

Shows standard volume because of integrated pressure and temperature compensation.



#### Less maintenance

No water or oil refill necessary.



#### No hazardous substances!

### Technical Short Facts

- More process information for a better process understanding
- Leads to less number of experiments and optimized yields
- No water or oil refill necessary
- Shows normalized volume because of integrated pressure and temperature sensors
- Integrated display for data information at any time
- Combinable devices (daisy chain) for less cable tangle
- BlueVIS ready via Modbus RTU for higher grade of automation

## What is it for?

BlueVCount measures **gas volumes** in reactions of all kind. It is applicable for fermentation, degradation studies, substrate comparison studies, wastewater treatment, bioethanol or hydrogen production and is especially helpful in **bio-methane potential (BMP) determinations** in industry and academia. Gas volume measurement delivers important information about the process and **helps to optimize yields** and process procedures.

## How does it work?

BlueVCount is a volume measuring unit with a 1 ml cylinder that is equipped with an oil (special) sealed magnetic piston. It counts how often 1 ml gas comes through the cylinder and reports it to the integrated display or via Modbus RTU to a software (e.g. BlueVIS). To achieve this you do not need a minimum flow.

## What do you need?

Your demands	BlueVCount	Gas Endeavour*	Milligas-counter**
Minimum flow	<b>No need</b>	$\geq 2$ (9) ml/min	1 ml/h
Maximum flow	<b>80 ml/min</b>	24 (110) ml/min	20 ml/min
Accuracy	<b><math>\pm 2\%</math></b>	n.a.	$\pm 3\%$
Resolution	<b>1 ml</b>	2 (9) ml	3 ml
Absorber possible	✓	✓	✓
Limit of data logging	<b>unlimited</b>	$2 \times 10^4$	unlimited
Ethernet interface	✗	✓	✗
Modbus (RS485)	✓	✗	✗
Single device available	✓	✗	✓
Gas tank/bag connectable	✓	✓	✓
Auto-compensation of humidity, pressure, temperature to display $I_N$	✓	✓	✗

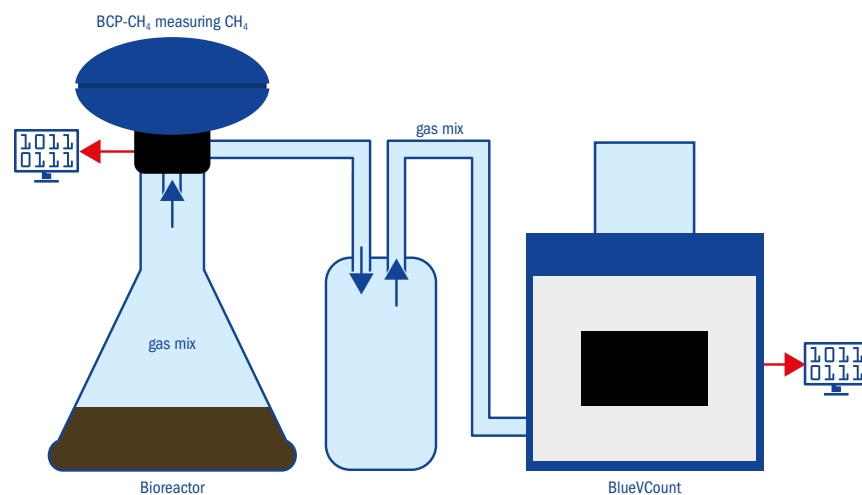
\* BioProcessControl AB \*\* Dr.-Ing. RITTER Apparatebau GmbH & Co.KG

### “New method” simultaneous $\text{CH}_4$ and volume measurement

Gas flow measurement using BlueVCount. BlueVCount is directly connected to the gas mix.

#### Advantages:

- Kinetic data are available
- No chemicals



### “Traditional” $\text{CH}_4$ measurement with $\text{CO}_2$ absorption and volume measurement

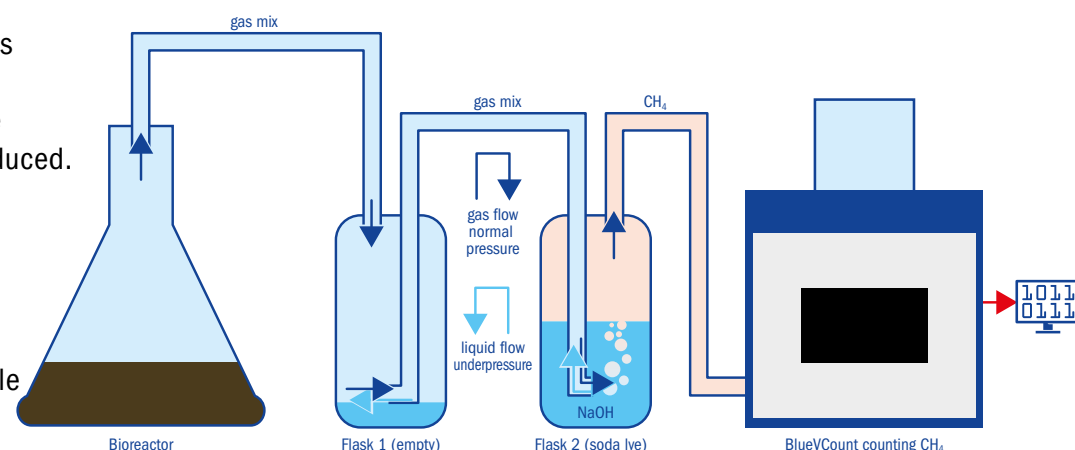
$\text{CH}_4$  measurement using BlueVCount. The gas mix is led through soda lye and BlueVCount measures the amount of  $\text{CH}_4$  being produced.

#### Advantage:

- Less cost

#### Disadvantages:

- Use of chemicals
- No kinetic data available
- Only total  $\text{CH}_4$  volume



## BlueVary – maintenance free gas analyzer adapting to your needs

BlueVary consists of a basis station with three plug-in positions for gas sensor cartridges. Two different gases can be measured at once. The third plug-in position holds a pressure or pressure/humidity sensor cartridge. Gas sensor cartridges are selectable according to your application and can be changed easily as required.

### Technical Short Facts

- Cartridge plug-in positions
  - 1 for pressure/humidity
  - 2 for two various gas cartridges
- Variable connections and data output options
- Light but robust plastic housing
- Cartridges for  $\text{CO}_2$ ,  $\text{O}_2$ ,  $\text{CH}_4$  and  $\text{H}_2$  available now

### BlueVary increases your efficiency

- **One device to cover different measurement tasks**  
Choose a suitable gas sensor cartridge for your application.
- **Maintenance free**  
No need for offsite annual maintenance – minimizes your downtime.
- **Auto compensated pressure and/or humidity**  
No gas cooler, pumps, valves or other gas pretreatment needed.
- **Connectable to any hose/tube or pipe**  
Use it on your fermenter of choice.
- **Integrated status display**  
See all sensor information and measurement data at a glance.

### Key facts BlueVary



#### Maintenance free

No need for annual maintenance. Performing our established one-point calibration regularly is all you have to do.



#### No specific training – easy to install and handle

Install and calibrate it yourself. PC housing and various connections guarantee easy handling.



#### Maximum flexibility

Combine two gases for parallel measuring ( $\text{CO}_2$ ,  $\text{O}_2$ ,  $\text{H}_2$ ,  $\text{CH}_4$ ). Use it also for biogas applications.

### Simplify process optimization

- Continuous online fermentation monitoring for cell culture, microbial, algae, fungi or biogas processes.
- Identify metabolic phenomena and obtain vital process parameters.
- Applicable from lab to industrial scale.





Connect what you want!

#### Key facts BlueVIS software



##### Parallel tracking of important process parameters

Monitoring, acquisition and integration of data from all components and for process control in real-time.



##### Digital and analog data input implemented

Analog devices can be connected via analog/digital converter.



##### Open to other systems and brands

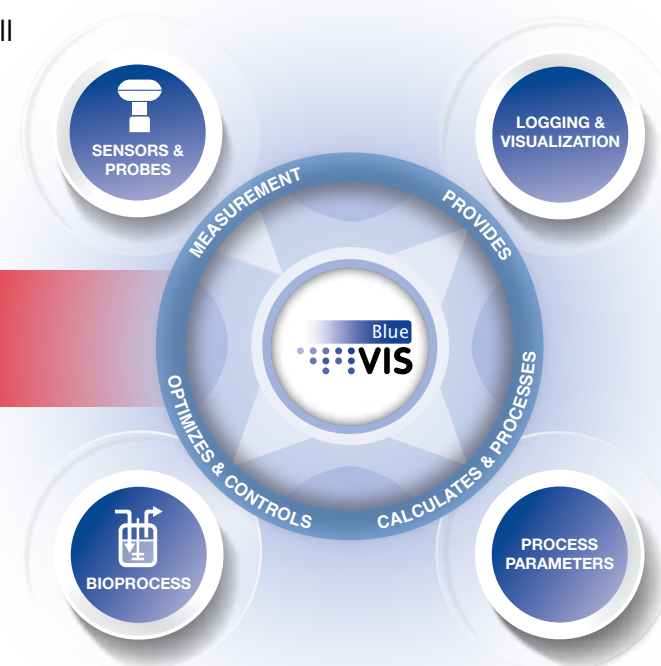
Integrated OPC server/client for data exchange to other systems and programs.



##### BlueVIS

Calculates OUR, CER, RQ, growth rate and biomass\*, offers math sensors and connects to MATLAB.

\* by EXPUDEC®soft sensors



## Features of BlueVIS

- Independent from brand
- Open software
- Comes with OPC server/client
- Important process parameters
- Setup your own PID controller
- Integrated Calculation modules to avoid Excel calculation after the experiment

#### Products



##### Gas Sensors and Analysis Systems

- BlueVary
- BlueInOne
- Yieldmaster
- BlueVCount
- BCpreFerm
- BCP sensors



##### Software

- BlueVIS

#### BlueSens gas analyzers and more

Market leader BlueSens offers a wide variety of gas analyzers and additional equipment for bioprocess industry. For many years process engineers and scientists all around the world count on the incomparably quality, longevity and simple handling of the analyzers. Beside single gas analyzers available for five different gas types BlueSens offers parallel gas analyzers which enable the measurement of two gases at the same time. Gas counter as well as the open bioprocess software BlueVIS round off the product portfolio.



## Instructions for maintenance and service

Each measuring device needs calibration and maintenance.

We recommend an annual maintenance plan for the sensors to ensure both, proper function and best accuracy. Here, we offer the service package Blue4Care. It offers a warranty extension for one year. As part of this package, we change all spare parts and components that are needed to maintain a mint condition. Lastly, a factory calibration and quality control of the sensors is done. Of course, you can order a repair service on demand. The cost of such a service depends on the work required and can be requested by estimate.

If you'd like to send us your sensor for service or annual maintenance please download the pdf on our website ([www.bluesens.com/service/maintenance](http://www.bluesens.com/service/maintenance)).



Please complete the form and mail it to our service team:

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