



## Operating Instructions

# BCP-CO



BCP X-large  
Aluminium IP65



BCP regular with  
PA 6 housing

Rev. 071214001

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## 1 About this document


### 1.1 Function


This operating instructions manual has all the information you need for quick set-up and save operation of BCP-CO. Please read this manual before you start setup.

### 1.2 Target Group

This operating instructions manual is directed to trained personnel. The contents of this manual should be made available to these personnel and put into practise by them.

### 1.3 Symbolism used

	<b>Caution, warning, danger!</b> This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.
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	<b>Information, tip, note!</b> This symbol indicates helpful additional information.
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➤ **List!** This symbol in front indicates a list with no implied sequence.

1 **Sequence!** Numbers set in front indicate successive steps in a procedure.

## 2 For your safety

### 2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained and authorised specialist personnel. For safety and warranty reasons, any internal work on the instruments must be carried out only by BLUESENS personnel.

## 2.2 Appropriate use

BCP-CO is a gas sensor for the measurement of gas concentrations of carbon monoxide in the concentration range and under the conditions described in chapter 7.2.

## 2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. oxygen limitation or damage to system components through incorrect mounting or adjustment.

## 2.4 General safety instructions

BCP-CO is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

## 2.5 CE conformity

BCP-CO is in CE conformity with

EMC guideline (89/336/EEC, 92/31/EEC and 93/68/EEC)


Low voltage guidelines (72/23/EEC and 93/68/EEC) is not applied because no voltage higher than 24 V is used.

Applied harmonized standards, in particular: **EN50081–1, EN61000**

### 3 Product description

#### 3.1 Configuration

The sensor consists of the **sensor head** and the **measuring cap** (chap. 3.3). The head contains the electrical and optical components.


	<p><b>Caution!</b></p> <ul style="list-style-type: none"> <li>➤ Do not touch the optical components like detector, light source or windows with your fingers.</li> <li>➤ If the optical components are dirty they could be cleaned carefully with cotton swabs and isopropyl or ethyl alcohol.</li> </ul>
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The measuring cap is used to seal the vessel with the probe or to connect to an exhaust pipe. Therefore the measuring of gas atmosphere is possible without a contact between head and gas atmosphere.

The measuring cap consists of steel. The top of the measuring cap is sealed by a sapphire window (that's the point where the head measures the gas concentrations). The cap is pressure proofed up to 6 bar overpressure. At the bottom of the cap there is an aseptic filter that protects the inside of the measuring cap from microorganisms.



*Fig. 1. Steel measuring cap. The drilling in the measuring cap is for holding a defined position between cap and pin in the head. The cap number in the measuring cap has to be concordant with the two last numbers of the head-ID.*

	<p><b>Caution!</b> The aseptic filter is not made to keep fluid out of the inside of the cap. Therefore do not rotate the cap downwards and beware the cap of the contact with fluid.</p>
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The drilling in the measuring adapter serves for the positioning of the head, which possesses a suitable pin. This must fit in the drilling when putting the head on the measuring.

The cap number, which is punched into the top side, serves for the identification and must match the last two digits of the head-ID, because these are calibrated together.

If the measuring cap should be confounded, the possibility exists that the measured values deviate from the specifications.



**Caution!** Cap number must match the last two digits of the head-ID

A teflon filter is placed at the bottom of the cap to protect the sensor element for a short time against water under normal pressure. In the case of over pressure this could not be guaranteed. If foam or dust pollutes the filter it has to be changed.

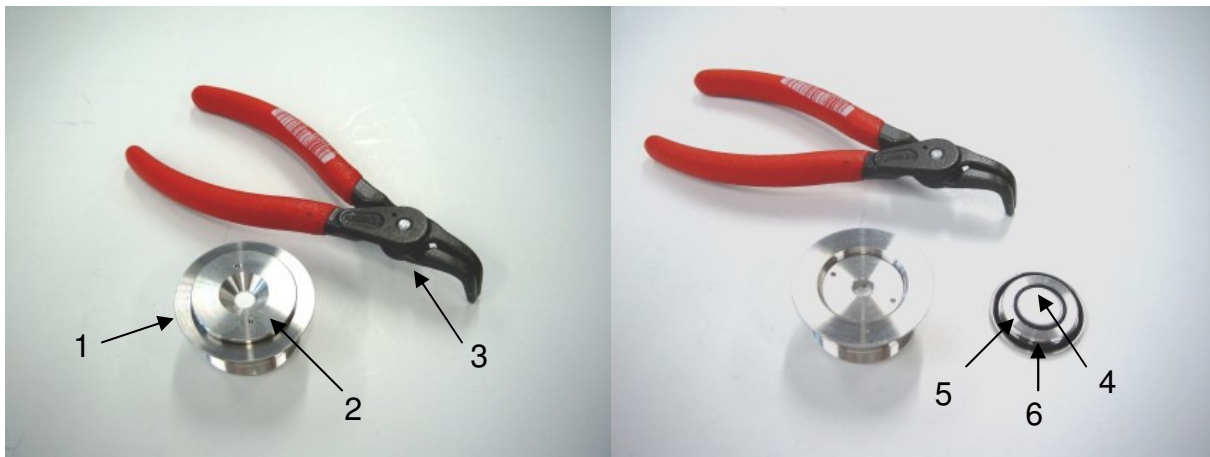


**Caution!**

- The filter does not serve to protect the sensor against water under overpressure.

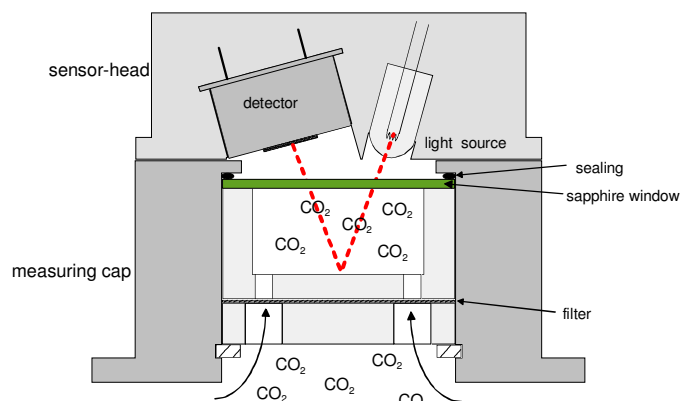
### 3.2 Filter change - Large-pored filter

1. Disconnect measuring cap and sensor head
2. Unscrew the bottom enclosure (2) anticlockwise under use of an internal circlip pliers and a water pump pliers.
3. Replace the large-pored filter (4) (Article-No. F-PTFE-13-050).
4. Test sealings (5,6) (Article-No. S-S1425) for a damage. If required, replace them.
5. Tighten the bottom enclosure (2) with the internal circlip pliers and the water pump pliers clockwise at the Measuring cap. The resulting gap between enclosure and measuring cap should not be wider than 0,5 mm.



### 3.3 Principle of operation

The light beam is reflected in the measuring cap and the detector measures the attenuated luminous intensity which depends on the amount of gas (e.g. CO) in the atmosphere of the probe. The translucent pane prevents that the sample atmosphere arrives outward. Thereby the sensor head does not need to be autoclaved.



To prevent the measuring cap from condensing moisture the head is heated. That requires about one hour for the first time.

### 3.4 Safety instructions

When delivered the instrument has been tested to meet all functions described. Before installing the instrument please read the mounting and servicing instructions. We have no liability or responsibility to customer or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by equipment or software sold or furnished by us. Read the installation instruction carefully. No liability will be assumed for any damage caused by improper installation.


Inspect the instrument module carton for obvious damage. Be sure there are no shipping and handling damages on the module before processing. Do not apply power to the instrument if it has been damaged.

BlueSens's warranty does not apply to defects resulting from action of the buyer, such as mishandling, improper interfacing, operation outside of design limits, improper repair, improper adjustment or unauthorized modifications.



### 3.5 Adjustment

After the first mounting, once a month or after each disconnecting of the probe head the sensor has to be adjusted with fresh air. Therefore the sensor has to be exposed e.g. to ambient air ( 0,04 Vol.% CO) for at least 30 minutes. Afterwards you have to use the switch (chapter 5.2, 5.3 or 5.4) for 5 seconds or use the software BACVis (see manual BACvis)..

	<b>Information!</b> To minimize dilution effects see chapter 6.2.
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### 3.6 Storage and transport

Your instrument was protected by packing during transport to assure normal loads during transport.


The packing of standard instruments consists of environment-friendly, recyclable cardboard. For special versions PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Storage conditions see data sheet.

## 4 Mounting

### 4.1 General instructions

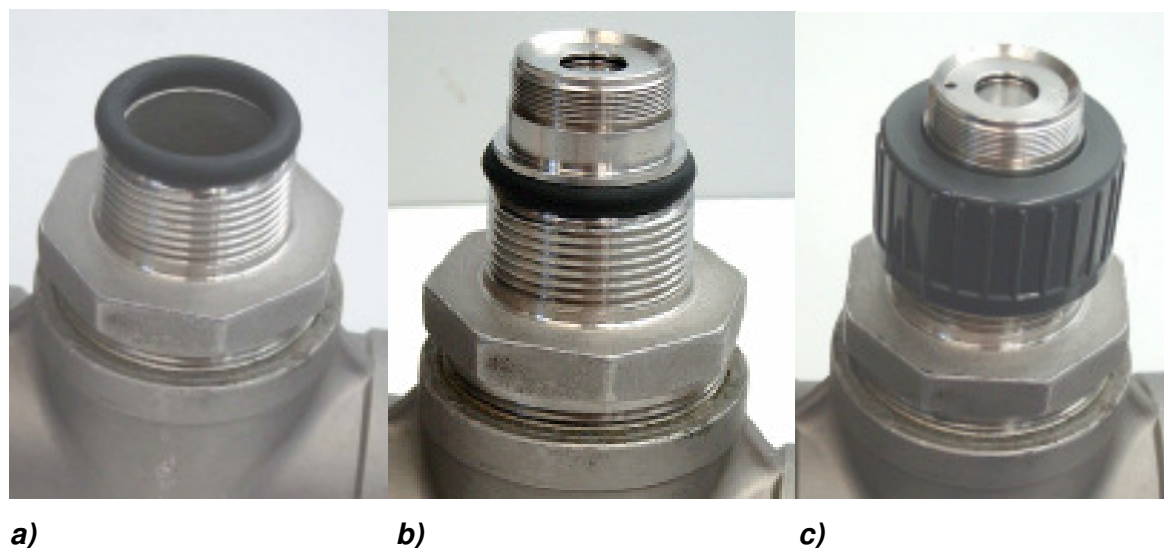
Check, if the added materials such as seal, fittings and screw caps etc. are suitable for process conditions such as products, temperature etc.

	<p><b>Caution!</b></p> <ul style="list-style-type: none"> <li>➤ The mounting should be done by authorized personnel under consideration of accepted rules for safety at work.</li> <li>➤ Take care of the right position of head and measuring cap!</li> <li>➤ Prevent the measuring cap from ingressing liquid.</li> <li>➤ Check after mounting if the connection is gas tight.</li> </ul>
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### 4.2 Mounting steps

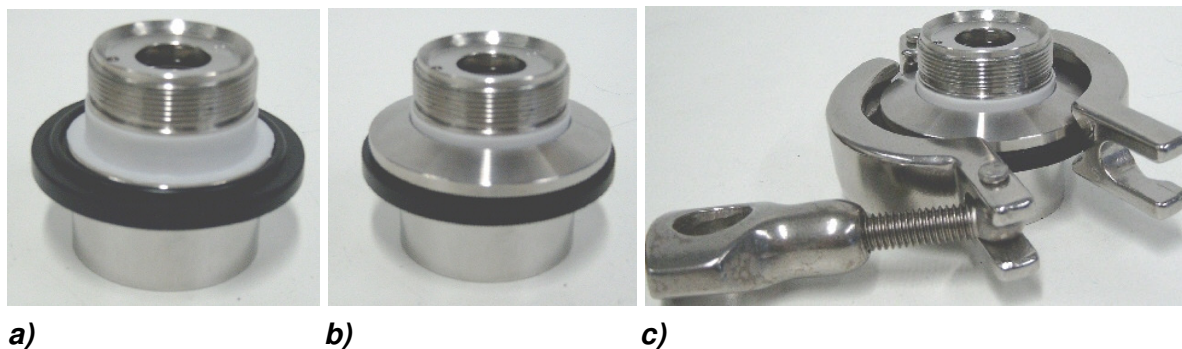
#### 4.2.1 Normal pipe connection

To connect the sensor to a normal steel pipe a sealing ring (a) is placed on the adapter fitting (1 ¼"). Afterwards the measuring cap (b) is fixed with screw cap (c), made of PVC, in that way that this connection is gas tight. **Do not use metal screw caps to avoid a thermal contact between pipe and measuring adapter.**



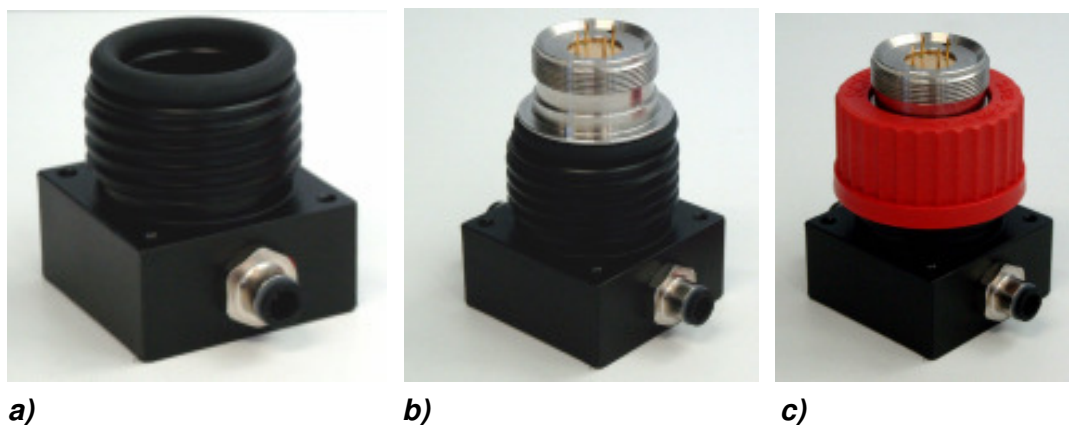
### 4.2.2 TriClamp

Using a triclamp connection a PTFE-ring is placed on the measuring cap to avoid a thermal contact between cap and fitting. Afterwards a sealing is placed on the adapter fitting. The measuring cap with the PTFE-ring is placed on the sealing (a) and fixed with the triclamp plate (b). The two parts are fixed with the metal clamp (c).



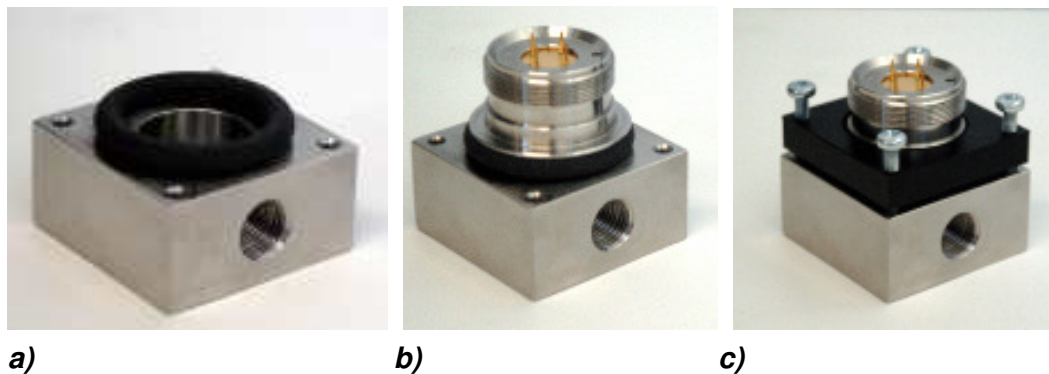
### 4.2.3 Flowadapter POM

To connect the sensor to a flow adapter made of POM a sealing ring (a) is placed on the adapter. Afterwards the measuring cap (b) is fixed with screw cap (c) so that this connection is gas tight.



#### 4.2.4 Flowadapter Steel

The sealing ring is placed on the adapter fitting (a) made of steel. Afterwards the measuring cap (b) is placed on the sealing ring. Then both parts are fixed with the plate (c) and four screws so that this connection is gas tight.



## 5 Electrical connections

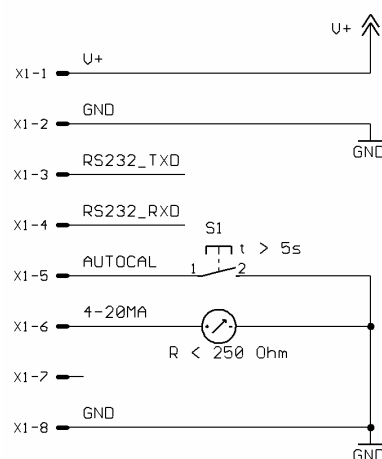
### 5.1 General instructions

- Use only the original cables and connectors
- It is forbidden to plug or unplug connectors with voltage applied
- Attach input and output wires to the connectors only without voltages applied
- Cords must be provided with sleeves
- Attention must be paid that the power supply voltage applied will agree with voltage noticed at the name plate.
- The instrument has no power-on switch, so it will be in operation as soon as the power is connected.

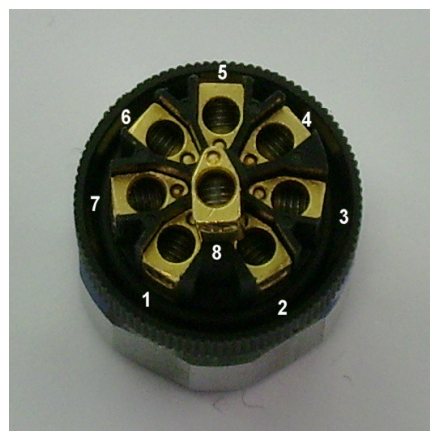
### 5.2 Version 4 – 20 mA Aluminium housing

#### 1. Pin assignment

1	V <sub>+</sub> = 12V – 24 V
2	GND
3	RS232_TXD
4	RS232_RXD
5	1-point calibration
6	4-20mA, R <sub>L</sub> < 250 Ohm
7	Only for internal use!
8	GND



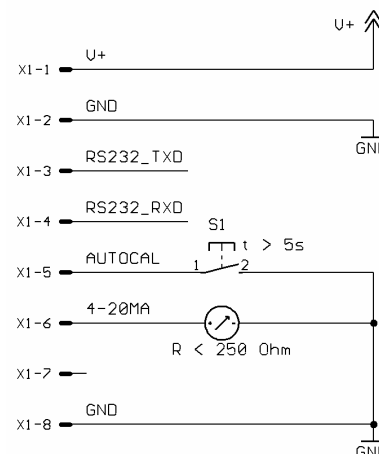
2. Connect sensor to 24V DC power supply and ground (pin 2)
3. Connect pin 6 to your meter; the working resistance has to be 250 Ohm or smaller
4. During the first initialization you have to wait for one hour because of the warm-up phase of the probe head.
5. After the warm-up time (1 hour) an 1-point calibration has to be done. Therefore the sensor has to be exposed to ambient air or process gas without any biological activity in the reactor (0,0 Vol.% CO) for at least 30 minutes (see also *1-point calibration*). Completing the adjustment pin 5 has to be connected to pin 8 (Gnd) for 5 seconds.



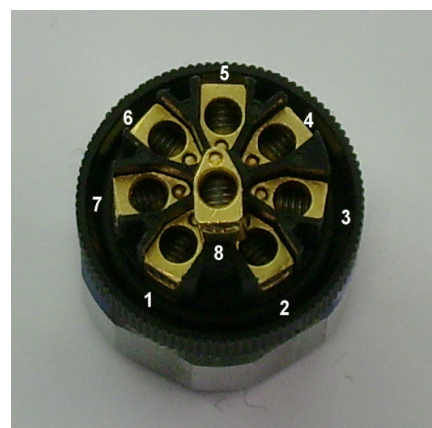
### 5.3 Version 4 – 20 mA PA6 housing

1. Pin assignment

1	V+ = 12V
2	GND
3	RS232_TXD
4	RS232_RXD
5	1-point calibration
6	4-20mA, RL < 250 Ohm
7	Only for internal use!
8	GND



2. Connect sensor to 12V DC power supply and ground (pin 2)
3. Connect **pin 6** to your meter; the working resistance has to be 250 Ohm or smaller
4. During the first initialization you have to wait for one hour because of the warm-up phase of the probe head.
5. After the warm-up time (1 hour) an 1-point calibration has to be done. Therefore the sensor has to be exposed to ambient air or process gas without any biological activity in the reactor (0,00 Vol.% CO) for at least 30 minutes (see also *1-point calibration*). Completing the adjustment **pin 5** has to be connected to ground (Gnd) **pin 8** for 5 seconds.



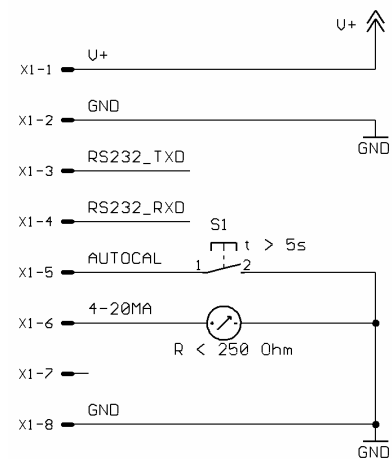


## 5.4 4 – 20 mA for BAC2S

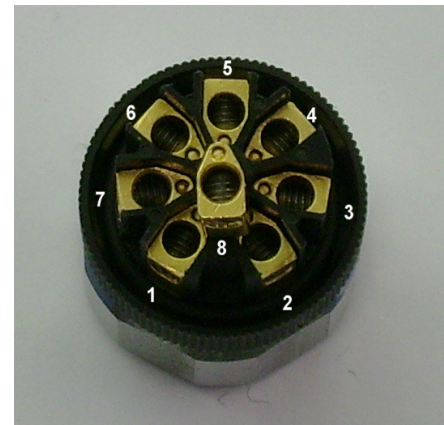
BAC2S is a junction box for two sensors with 4 – 20 mA output. BAC2S is equipped with a power connector and a switch for the 1-point calibration for both sensors. The signals are directly looped through.

### 1. Pin assignment

1	+12 – 24 V, Caution! Don't connect additional power supply to this port when BAC2S is in use
2	GND
3	RS232_TXD
4	RS232_RXD
5	1-point calibration
6	4-20mA, RL < 250 Ohm
7	For internal use only!
8	GND



2. Connect sensors to BAC2S
3. Connect BAC2S to 12V – 24V DC power supply
4. Connect pin 6 to your meter; the working resistance has to be 250 Ohm or smaller
5. During the first initialization you have to wait for one hour because of the warm-up phase of the probe head.
6. After the warm-up time (1 hour) an 1-point calibration has to be done. Therefore the sensor has to be exposed to ambient air or process gas without any biological activity in the reactor (0,00 Vol.% CO) for at least 30 minutes (see also *1-point calibration*). Completing the adjustment the blue switch has to be pressed for 5 seconds.



## 5.5 Version RS 232 Aluminium housing

1. Connect sensor to rated power supply
2. Connect serial plug to computer
3. During the first initialization you have to wait for one hour because of the warm-up phase of the probe head.
4. After the warm-up time (1 hour) an 1-point calibration has to be done. Therefore the sensor has to be exposed to ambient air or process gas without any biological activity in the reactor (0,00 Vol.% CO) for at least 30 minutes (see also *1-point calibration*). Start software BACVisSingle and use the "1-point calibration". For further information about the software read the corresponding manual.

### Pin assignment

**1 = +12 ...+ 24 V**

**2 = 0V**

**3 = RS232\_RxD**

**4 = RS232\_TxD**

**5 = RS232\_GND = PE**

PE = protective earth

## 5.6 Version RS 232 PA6 housing

1. Connect sensor to rated power supply
2. Connect serial plug to computer
3. During the first initialization you have to wait for one hour because of the warm-up phase of the probe head.
4. After the warm-up time (1 hour) an 1-point calibration has to be done. Therefore the sensor has to be exposed to ambient air or process gas without any biological activity in the reactor (0,00 Vol.% CO) for at least 30 minutes (see also *1-point calibration*). Start software BACVisSingle and use the "1-point calibration". For further information about the software read the corresponding manual.



## 5.7 Version BACCom

The visible communication box BACCom12 is used to connect up to 12 heads.

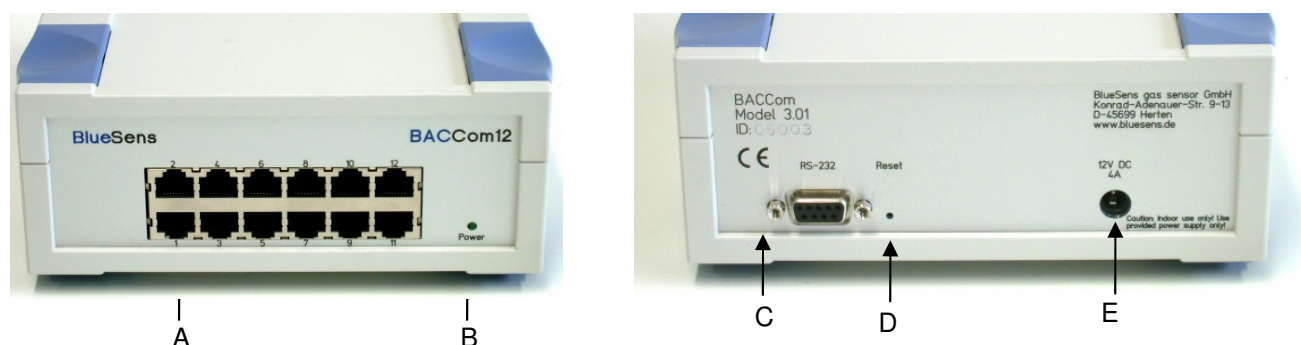


Fig. 2. Front and rear of BACCom12

Description of the ports:

A	RJ45 connector	For connecting the gas sensors
B	LED „Power“	Operating mode display
C	Sub D 9 pol „RS232“	RS232 interface to PC
D	Boxreset	Reset of the BACCom12, gas sensors are not influenced
E	Power supply	12 V 4A, use only delivered power supply
F	RJ 45 connector (without picture)	For connecting BACCom12 to Ethernet
G	Other connectors (without picture)	For other apparatus (e.g. BACCom12 CB)

### Installation

1. connect all heads with BACCom12
2. plug in the **provided** power supply to the female power connector of BACCom12
3. connect power supply to power socket
4. **never connect or disconnect heads while BACCom12 is connected to power supply!!!!**
5. connect BACCom12 with the **enclosed** cable to the serial interface of your computer. Afterwards you could use BACVis/FermVis or other software to visualize your measurements online.
6. After the warm-up time (1 hour) an 1-point calibration has to be done. Therefore the sensor has to be exposed to ambient air or process gas without any biological activity in the reactor (0,00 Vol.% CO) for at least 30 minutes (see also *1-point calibration*). Start software BACVis/FermVis and use the “1-point calibration”. For further information about the software read the corresponding manual.

after the first-time installation the system should stay online, whereby no additional warm-up time is necessary.

## 6 Maintenance

In general it is not allowed to open the housing of the head by the user.

If the sensor is not used under power no aging occurs. In this case it has to be stored under conditions of ambient air (humidity smaller than 75%). For the yearly maintenance we suggest to send the sensor to the manufacturer.

### 6.1 1 - Point calibration

Once a month or after each disconnecting of the probe head the sensor has to be adjusted. Therefore the sensor has to be exposed e.g. to ambient air ( 0,00 Vol.% CO) for at least 30 minutes. Afterwards you have to use the switch (chapter 5.2, 5.3 or 5.4) for 5 seconds or use the software BACVis/FermVis/BACVsSingle (see manual)

### 6.2 Minimization of dilution effects through humidity

The dilution effect of the CO-sensor could be calculated by dividing the shown concentration through the values in the following table. If you don't use a gas or reflux cooler you have to know the temperature of your process. Otherwise you use the temperature of your gas or reflux cooler. Use this temperature to get the dilution factor.

Temperature [°C]	Dilution factor
-10	0,9972
0	0,9940
5	0,9914
10	0,9879
15	0,9831
20	0,9769
25	0,9687
30	0,9580
35	0,9444
40	0,9270
45	0,9052
50	0,8779

### 6.3 Complete Calibration

The complete calibration could be done by the manufacturer or a certified dealer.



## 7.2 Technical data

<b>Sensor head</b>	BCPCO
Gas	CO
Measuring principle	Infrared: dual wavelength
Concentration range	0 – 30 Vol. %
Accuracy	< 0,2% FS* ± 3% reading
Longterm stability	< ± 2% reading / year
Temperatue range	30 - 55 °C
Pressure range	0,8 - 1,3 bar
Pressure compensation	internal pressure sensor
Housing	Aluminium
Dimensions/ weight	80 x 80 x 100 mm (W x L x H) / 750 g
<b>Measurung adapter</b>	
Used materials	Steel 1.4571, Viton, Sapphire
Used Filters	PTFE 0,22 µm, PTFE 5 µm
Lifetime	approximately 3 years
Internal sensor temperature	3 °C more than max. temperature
Mechanical connection	Triclamp SMS38
Dimensions/ weight	40 x 20 (D x H) / 105g
Power Supply	12 - 24V, 1A
Electric connection	8pin M12 connector (Binder 713)
Electric Output	Load resistor up to 250 Ohm
	4mA = 0,0 Vol. %
	20mA = 32,0 Vol. %
	slope 0,5 mA / Vol. %
Storage	0 - +60 °C; < 75% RH not condensing
Maintenance	1 point calibration once per month
	full calibration once a year
CE	EN61326-1:1997 +A2:1998

## **EG-Konformitätserklärung EC Declaration of conformity**

Hiermit erklären wir, dass unser Produkt, Typ:

We hereby declare that our product, type;

### **BCP-CO**

folgenden einschlägigen Bestimmungen entspricht:

complies with the following relevant provisions:

Niederspannungsrichtlinie (72/23/EWG und 93/68/EWG) findet keine Anwendung, da keine Spannung größer 24V genutzt wird.

Low voltage guidelines (72/23/EEC and 93/68/EEC) is not applied because no voltage higher than 24 V is used.

EMV-Richtlinie (89/336/EWG, 92/31/EWG und 93/68/EWG)

EMC guideline (89/336/EEC, 92/31/EEC and 93/68/EEC)

Angewendete harmonisierte Normen, insbesondere:

Applied harmonized standards, in particular:

**EN50081–1**

**EN61000**



Sensor	CO <sub>2</sub>	CH <sub>4</sub>	CO	EtOH
Measuring range	0 ... 10 Vol. %	0 ... 100 Vol. %	0 ... 30 Vol. %	0.2 ... 25 Vol. % <sup>1</sup>
	0 ... 25 Vol. %		0 ... 100 Vol. %	
	0 ... 50 Vol. % <sup>1</sup>			
Measuring Principle	Infrared, dual wavelengths			
Accuracy	< ± 0.2 % FS* ± 3% reading			
Long-term stability <sup>2</sup>	< ± 2% reading / year			
Lifetime sensor element	> 3 years			
<b>Housing Aluminum, IP 65</b>				
Dimension (WxDxH) mm	100 x 131 x 118	100 x 131 x 118	100 x 131 x 118	100 x 131 x 118
Dimension (WxDxH) inch	3.94 x 5.16 x 4.64	3.94 x 5.16 x 4.64	3.94 x 5.16 x 4.64	3.94 x 5.16 x 4.64
Weight	900 g (1.98 lb)	900 g (1.98 lb)	900 g (1.98 lb)	3000 g (6.61 lb)
<b>Housing PA6</b>				
Dimension (DxDH) mm	80 x 130	80 x 130	80 x 130	80 x 130
Dimension (DxDH) inch	3.15 x 5.12	3.15 x 5.12	3.15 x 5.12	3.15 x 5.12
Weight	350 g (0.77 lb)	350 g (0.77 lb)	350 g (0.77 lb)	350 g (0.77 lb)
Material in contact with gas	Steel 1.4404 / Sapphire / Viton / PTFE			
Connection <sup>6</sup>	G 1/4", GL 45, Tri-Clamp, hose connection 4-12mm etc.			
<b>General</b>				
Operating temperature	Max. -25 - 55 °C / -13 - 131 °F <sup>3</sup>			
Storage temperature	0 - 60 °C / 32 - 140 °F			
Pressure range (absolute):	0.8 - 1.3 bar / 11.6 - 18.85 psi <sup>5</sup> absolute pressure			
Storage humidity	75% RH noncondensing			
Operating humidity	0 ... 100% RH <sup>3</sup>			
Power supply (max.)	12 or 24 VDC, 1-2 A			
Output	RS232, 4-20mA, USB, Ethernet <sup>4</sup>			
Maintenance once a month	1-point calibration with ambient air or nitrogen (other conditions on request)			
Maintenance yearly	Optional factory calibration with certified gases			
CE	EN61326-1:1997 +A2:1998			

\*full scale <sup>1</sup> accuracy < ± 0.5 % FS\* ± 5% reading <sup>2</sup> with monthly 1-point calibration <sup>3</sup> not compensated <sup>4</sup> Ethernet with BACCom

# Data sheet

Gas	CO
Measuring principle	Infrared: dual wavelength
Concentration range	0 – 30 Vol.%
Accuracy	< 0,2% FS* ± 3% reading
Longterm stability	< ± 2% reading / year
Temperatue range	-25 - 55°C
Pressure range	Druck eingeben
Pressure compensation	external pressure sensor
Housing	Aluminium with cap: wide temperature
Dimensions/ weight	80 x 80 x 100 mm (W x L x H) / 750 g
<b>Measuring adapter</b>	
Used materials	Steel 1.4571, Viton, Sapphire
Used Filters	PTFE 0,22 µm, PTFE 5 µm
Lifetime of optical components	approximately 3 years
Internal sensor temperature	3°C more than max. temperature
<b>General</b>	
Mechanical connection	GL 45 for flow adapter POM
Power Supply	12 - 24V, 1A
Electric connection	8pin M12 connector (Binder 713)
Electric Output	4mA = 0,0 Vol.%
	20mA = 30,0 Vol.%
	Load resistor up to 250 Ohm
	slope 0,53 mA / Vol.%
Storage	<b>0 - +60 °C; &lt; 75% RH not condensing</b>
Maintenance	<b>1-point calibration w. 0,00 Vol.% Gas (100 Vol.% N2) once per month</b>
	<b>full factory calibration once a year</b>
CE	EN61326-1:1997 +A2:1998

Keep data sheet safe!