Fresenius
Umwelttechnik

User Manual

BioBasic

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1. Preliminary Note

The gas analyzer BioBasic is used to analyze biogas. Various measuring methods are used to measure and then analyze the biogas.

The device features an integrated fresh air measuring unit to regenerate the electrochemical sensors. The regeneration cycles depend on the duration of the respective measurement.

This manual consists of operating and maintenance instructions. The "Faults and Warnings" chapter provides information about possible operating faults and warning or error messages as well as remedial measures and actions.

The analyzer must be properly maintained and services as outlined in chapter 9 to ensure reliable operation and full functionality.

The complete and comprehensive maintenance and service chain must be proven by the operator with the respective documentation. This is possible by making the corresponding entries into the maintenance log provided at the end of this manual.

2. Technical Data

Model	BioBasic
Measuring points	1 (standard), can be retrofitted with up to four measuring points
Measuring components	CO_2 (IR), CH_4 (IR), O_2 (EC), H_2S (EC)
Measurement technique	IR: NDIR single-beam; cuvette heated to 60°C
	EC: Electrochemical reaction process
Measuring ranges	CH_4: 0 - 100 vol%
	CO_2: 0 - 65 vol% (optionally up to 100 vol%)
	O_2: 0 - 30 vol%
	H_2S: 0 - 2000 ppm
Measuring accuracy	CH_4 < 3% of measured value
	CO_2 < 3% of measured value 0 - 65 vol%; CO_2 < 5% of measured value 0 - 100 vol%
	O_2 < 1% of measured value as well as < 1% of MBE
	H_2S < 2% of measured value as well as < 2% of MBE
Pressure compatibility	Compensated, default 0.9 to 1.1 bar
Gas flow rate	Approx. 3 l/min
Gas treatment	Flame protection barrier (ATEX) per measuring point
	Condensate trap incl. level monitor
	Option = tube pump to drain condensate automatically
	Option = integrated external gas treatment (gas cooler)
Tube connections	8 mm, outer diameter
	6 mm, inner diameter
	Tube length: inlet max. 50 m, outlet max. 20 m
Enclosure	Wall enclosure IP54 with vent 400 x 400 x 220 approx. 18 kg
Climatic conditions	Ambient temperature 5° - 45°C / relative humidity ~ 90%, free of condensation
Operating voltage	~230 V / 50 Hz, 0.8 A / 184 VA; without mains switch ~115 V / 60 Hz, 1.6 A / 184 VA; without mains switch Option with switch disconnector
Display	128 x 64 pixel matrix, white / blue
Operation	Touchpanel
Electrical inputs	4 digital inputs 24 AC/DC; individually programmable
Electrical outputs	2 digital outputs (relays) max. 48 V/500 mA; ready / reserve
	4 digital outputs (relays) max. 48 V/500 mA; individually programmable
	4 analog outputs (gal. isol.) 4 to 20 mA; individually programmable
Interfaces	Default: RS232
	Option: GSM modem integrated (remote access)
	Option: ProfibusDP
	Option: Ethernet/IP
	Option: CANopen
Operational readiness	Max. 5 min. (at 20°C)

3. Intended use

The gas analyzer may only be operated in compliance with the operating data listed in chapter 2 "Technical Data." This applies especially to the components to be measured.

The gas analyzer may only be used to measure biogas of regenerative products.

Any additional or other use is considered "noncompliance with the intended use." Any resulting risks cannot be estimated or foreseen by the manufacturer **Fresenius Umwelttechnik GmbH**. The operator is therefore solely responsible for all damages due to "noncompliance with the intended use." The same applies if the equipment is changed or modified without prior notification of and approval by **Fresenius Umwelttechnik GmbH**.

Important:
Condensate Trap

Please note that the intended use is only ensured if a properly functioning condensate separator is used. The operator is still responsible for checking the function of the condensate separator if this separator or trap was included in conjunction with an automatic drainage or discharge system.

Operation of the analyzer is subject to different statutes, rules and regulations, and requirements depending on installation location and region. The operator is solely responsible for complying with these requirements. Please find out which requirements apply before installing the equipment.

The Fresenius Umwelttechnik GmbH team gladly assists you with this task. Please do not hesitate to contact us if you have questions about relevant rules and regulations, safety, or permits.

4. Important Safety Information

4.1 General Safety Information

This manual provides important safety information. Compliance with this information helps you to safely use and operate the gas analyzer. The safety information in this manual serves to warn the operator of residual hazards and consequences due to improper use or operator error. The safety information describes safety-relevant components and protective equipment installed by the manufacturer to avoid personal injuries and damage to equipment as well as to the environment. Careful compliance with this information helps you to operate the equipment safely and reliably.

Please read this manual carefully and make sure that all persons instructed to operate and use the equipment have easy access to this manual at all times. This is the prerequisite for the safe and reliable use of the gas analyzer.

Compliance with the maintenance and service instructions in chapter 8 is mandatory for the safe and reliable operation of the equipment.

Please comply with the local rules and regulations, laws, and requirement for setting up and operating the equipment. The gas analyzer must be integrated into the safety concept of the workplace or workstation at the installation site. The safety officer or safety representative on-site is solely responsible for this integration.

Competencies

The operator must clearly define and comply with the responsibilities for installation, connection, startup, operating, maintaining, and repairing of the equipment. Uncertain or unclear competencies pertaining to the aspect of safety may not occur.

The person(s) responsible for the safety of the workstation and its environment must ensure the following:

- Only persons qualified and trained (experts) for the corresponding activities are assigned to work with or on the equipment.
- This manual and all remaining documents of the product documentation are available to these persons.
- Compliance with these documents is mandatory.
- Unqualified persons are not permitted to work on or with the equipment.

Qualified personnel are persons who have been trained and instructed and have experience with and knowledge of the relevant standards, regulations, rules of accident prevention and operating instructions. They must be authorized by the person responsible for the safety of the equipment to carry out the respective work. They must be able to recognize and avoid possible risks and hazards.

4.2 Safe and Correct Handling of Gas and Tools

To avoid personal injury and property damage, compliance with the following important information about handling biogas is mandatory:

- Shut off the additional gas supply using the shutoff valve at the sampling point before disconnecting the measuring gas tube of the respective measuring point.
- Make sure the room in which the analyzer is located is sufficiently ventilated while working on or with the equipment.
- The gas analyzer must be turned off anytime the measuring gas path is blocked or interrupted (e.g. emptying the condensate trap).
- Comply with the information on the safety data sheets in case of contact with biogas substances, especially methane, carbon dioxide, and hydrogen sulfide.

4.3 Equipment-specific Safety Notes

The gas analyzer can only be operated safely and reliably if the potential users of the equipment are aware of the possible risks and hazards and know in detail about the safety measures integrated by the manufacturer. This manual provides safety information that must be known to the users to operate the equipment safely and reliably.

Danger!

Wires or cables of the equipment's current lines may become overheated, smolder, or burn.

Risk of electrical shock or burns! Danger to life and limb!

Protective tape covers the current lines to avoid such dangers. Make sure the protective tape is not damaged.

Danger!

The gas analyzer may become electrically charged (static electricity).

Risk of electrical shock upon contact. Slight concussion injuries to arms or legs may occur.

All components of the gas analyzer are grounded.

4.4 Operating Safety

The BioBasic system is designed for the measurement of process gases in biogas plants. This results in different installation sites that require different safety systems.
We recommend compliance with the technical information No. 4 "Safety rules for biogas plants" of the Agricultural Trade Association.

The process analysis system "BioBasic" is suitable for the area outside of an EX zone. Below is a description of various points, allowing the safe operation of process analysis in such areas.

The manufacturer may change specifications without notification to adapt to the development of technical progress. Information on possible supplements to this assessment is available from Fresenius Umwelttechnik GmbH.

Points for safe operation:

- The utilized flame arresters serve to prevent flame transmission with stable detonations and deflagrations of flammable gas or vapor-air mixtures of the explosion group IIA, standard gap width of >0.90mm with atmospheric conditions. PTB 04 ATEX 4003; EX II G II B3; manufacturer: Flammer GmbH
- The internal tubing established with Teflon tubes features a clamp screw connection and thus can be considered technically sealed to be leak-proof. It is not possible for process gas to escape inside the process analysis system.
- The utilized valves are installed as NC (Normal Closed) so that the flow is stopped at the first valve in case of power failure, defective electronics, or uncontrolled process gas.
- Should a leak be detected in the condensate separator, the upstream valve is closed and a fresh air measurement is triggered.
- If a gas concentration of > 20% LEL methane is detected in the ambient air, the process analysis system is stopped and all consumers (valves, heating, IR emitters, chopper motor, pump) are stopped.
  IMPORTANT! If a "20% LEL fault" is transmitted to the control center, the operator wearing personal protection equipment must ventilate the room and take the unit back into operation.
- Should process gas leak into the interior of the process analysis, this gas is diluted safely with fresh air with the fan to prevent explosive gas mixtures from forming.

5. Description of the Gas Analyzer

5.1 Overview

The BioBasic unit is a so-called multicomponent gas analyzer. A gas feed pump routes the measuring gas from the respective measuring points to the gas analyzer. The measuring gas flows through Teflon tubes to the cuvette and then to the EC sensors. Once the individual components have been analyzed, the results are indicated directly on the display and made available to the additional interfaces.

The gas analyzer features the following primary operating modes:

Operating Modes

- Measuring operation (purging, filling, analyzing, pumping, referencing)
- Interval pause (waiting)

Function Groups

These operating modes are realized with the following function groups:

- Control card incl. power supply
- Control unit
- Internal pneumatic measuring gas path
- IR measuring system
- EC measuring system
- Condensate trap with level monitor
- Terminals

5.1.1 Measuring Operation

System Purging / Filling / Measuring with Measuring Gas

First, the solenoid valve of the measuring point to be analyzed opens. The measuring gas is pumped by the gas feed pump and flows through the pneumatic system. After a predefined time, the measuring signals of the respective component are determined.

Pumping

The solenoid valve then closes and the measuring gas is suctioned in the pneumatic system until a negative pressure exists.

Reference Measurement

After a predefined time, the measuring signals of the respective component are determined one again.

Calculating Concentrations

Both measuring signals of the respective component are then calculated with our patented method and forwarded via different interfaces.

Purging EC Sensors

After measuring with electrochemical sensors, the pneumatic system is purged for at least 5 minutes with a fresh air measuring point inside of the gas analyzer. The equipment is then ready for the next measurement.

The system then switches to "automatic" mode and enters the interval pause.

5.1.2 Interval Pause

Waiting

All solenoid valves are closed during the interval pause. This protects the system from measuring gas penetration. After a predefined time, a measurement is started with the next measuring point.

2 Function Groups and Associated Components

2.1 Control Circuit Card Incl. Power Supply

The BioBasic unit is equipped with a control card containing all functions to measure IR/EC signals as well as to control valves, pumps, etc. This board is positioned directly in the upper section of the base plate inside of the enclosure.

All parameters required for the measuring are here stored centrally and can be configured with the standard RS232 interface.

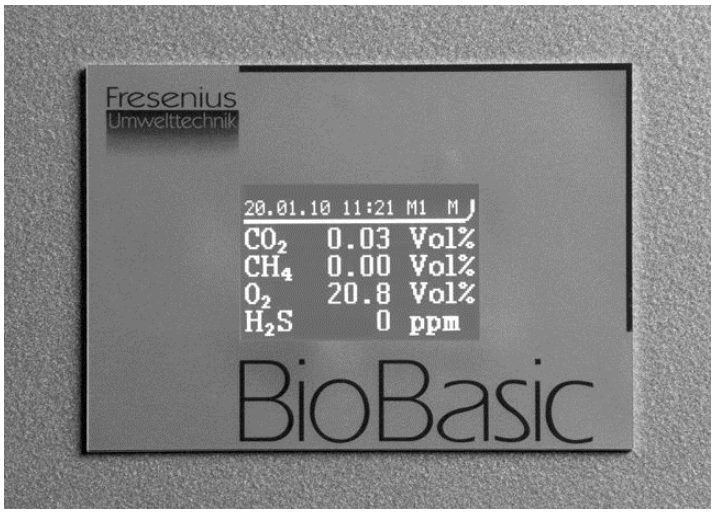
The power supply provides power to the control card. The internal 24 VDC are generated on the lower DIN rail. This voltage is used to actuate the solenoid valves as well as the emitter. The power supply unit is in operation if the indicator LED is lit.

All work inside of the BioBasic enclosure must only be carried out by qualified and authorized personnel. The gas analyzer must be switched off before connecting the unit to the mains power supply or other signals.

5.2.2 Control Unit

The control unit is permanently attached to the door of the BioBasic gas analyzer. All data required to operate the gas analyzer are depicted here.

A 10-pin patch cable to the control card is used to send the information to a display with 128 x 64 pixels. A touchpanel across the display is used to enter information.



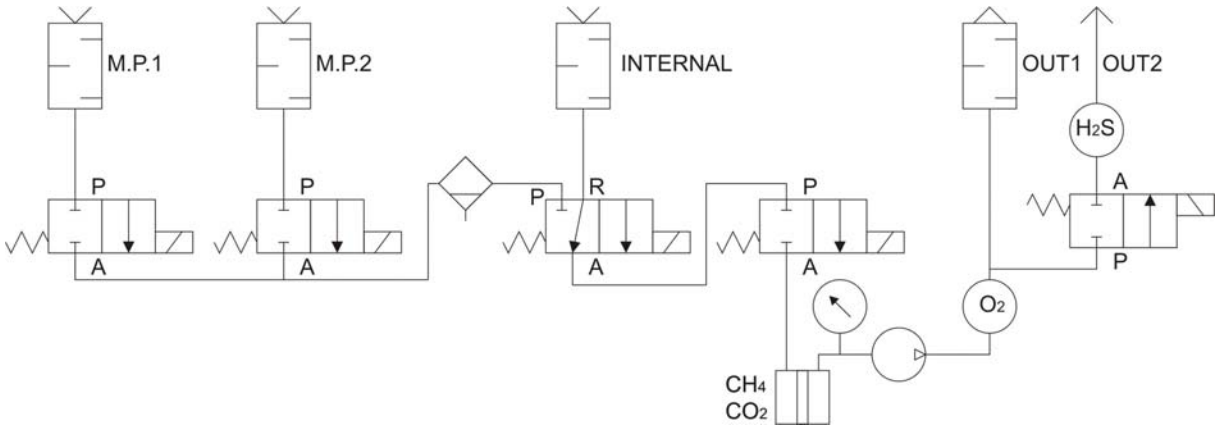
5.2.3 Internal Pneumatic Measuring Gas Path

The pneumatic measuring gas path is installed inside of the enclosure with a 6/4 mm Teflon tube. Each process gas inlet is equipped with a separate flame barrier with ATEX certification. The process gas is routed first through the 2/2-way valves downstream of every flame barrier and to the condensate trap with level monitor. The level monitor checks the fluid level in the condensate trap and, if necessary, immediately stops the measuring gas pump to prevent fluid from being aspired into the system.

The internal 3/2-way valve serves to switch from process gas to fresh air. The gas flows through the 2/2-way reference valve into the IR measuring system and then to the measuring gas pump. The reference valve is used to generate a negative pressure in the IR measuring system that is measured with the pressure measuring cuvette.

The O_2 sensor is installed in the measuring gas path downstream of the measuring gas pump. A flame barrier with ATEX certification is used to pump the measuring as through outlet OUT1 into an unpressurized environment (optionally also main gas line).

The H_2S sensor is actuated with a separate 2/2-valve and added to the measuring gas; it also has its own outlet OUT2. Since the H_2S sensor is supplied with process gas for only a short time (to fill the measuring chamber), the separate outlet must remain open.



The system must be purged with fresh air after each measurement. The internal measuring point handles several associated tasks:

- Purging of EC sensors with oxygen-rich gas to regenerate the sensors
- Calibrating the O_2 sensor with ambient air 20.9 vol%
- Internal monitoring at 20% LEL CH_4 in ambient air

5.2.4 IR Measuring System

The IR measuring system is installed in the center of the enclosure on the upper DIN rail. Here, broadband IR radiation is modeled by a time-controlled aperture wheel and routed to the detectors through the cuvette. The measuring components absorb part of the radiation at specific spectral lines (wavelength regions) in a substance-specific manner. The amount of absorption is a measure of the concentration of the respective measuring component.

Our patented IR measuring method makes it possible to use the measuring gas as reference gas at the same time. The absorption of the respective measuring component is measured at normal pressure and negative pressure. Since the ratio between absorption and pressure is constant, the system looks for two points on the calibration curve that represent a unique and pressure-corrected gas concentration. This continuously equalizes the zero point and drift of the sensor systems.

This method directly eliminates many of the negative external factors, especially those caused by long-term changes of the measuring system. A gradual dirt accumulation on the panels as well as the cuvette itself and temperature changes due to exterior changes and changes over time to emitter and detector are irrelevant.

5.2.4 EC Measuring System

The EC measuring system is installed along the left edge of the enclosure on the upper DIN rail. Different EC sensors may be installed here. The H_2S measuring chamber features an additional 2/2-valve and to reduce sensor load to a minimum. The chamber is only briefly filled with process gas and is otherwise purged with fresh air. The individual sensors are wired to and analyzed on the control card. The measuring gas outlets must be **unpressurized**.

5.2.5 Condensate Trap with Level Monitor

The condensate trap at the right side of the enclosure wall serves as a collection container for any possible condensate. The level monitor check wired here detects the liquid level in the container and, if necessary, immediately stops any activity of the measuring gas pump to prevent fluid from reaching the inside of the system.

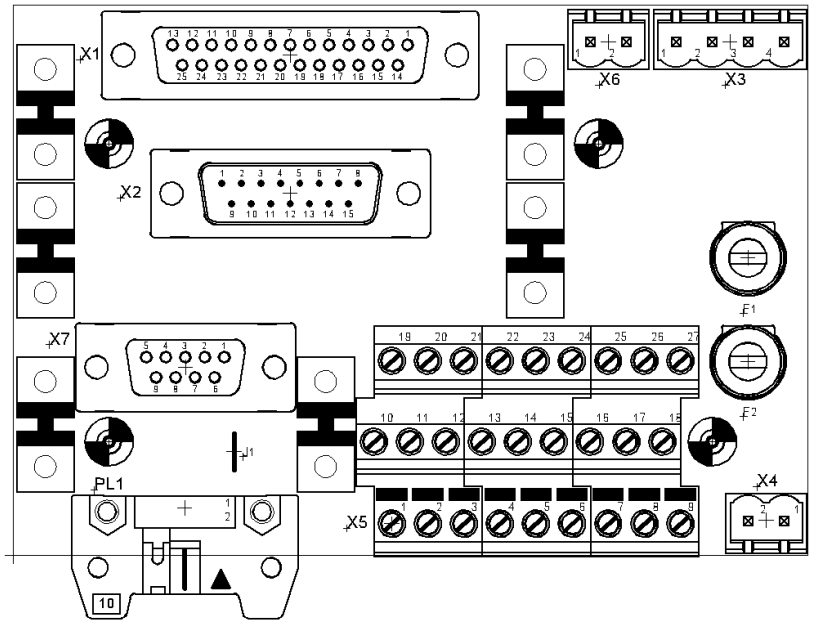
IMPORTANT!

The system is unable to detect the fill level if the contacts are not connected to the system, i.e. after a service call on the condensate trap. If this is the case and fluid penetrates the gas analyzer, damages to the sensors may occur as well.

5.2.6 Terminals

The terminals are mounted on a circuit board in the enclosure on the bottom left. This is also where the supply voltage (~230 V / ~115 V) is connected. This connection must be fused with its own external cut-out (16 A). We recommend placing a power switch in-between to be able to switch the gas analyzer off and on. Two internal fusible cut-outs (~230 V/1 A average) or (~115 V/2.5 A average) are installed at a short distance above the supply voltage connection, which separately protect L1 and N.

It is possible to connect the system in a customized manner to the process control station using the 27-pin terminals. The factory default consists of three programmable inputs and four outputs. Depending on configuration, up to four analog outputs with 4 to 20 mA is possible.



Voltage Supply

Plug contact: (MVSTBR 2.5 HC/2-ST-5.08 by Phoenix Contact)

Contact	Designation	Cable (color)
X4-1	N	Blue
X4-2	L1	Brown

The ground is connected on the grounding terminal on the DIN rail.

Analog Outputs

Shielded cable (LIYCY 0.25 mm² 7-pin) ground on terminal

Contact	Description	Cable (color)
X5-1	ANA1 analog output 1 (4..20 mA source)	Brown
X5-2	ANA2 analog output 2 (4..20 mA source)	Green
X5-3	ANA3 analog output 3 (4..20 mA source)	Yellow
X5-4	ANA4 analog output 4 (4..20 mA source)	Blue
X5-5	GND ANA ground for analog outputs	Gray + white

Relay Outputs / Digital Inputs

Shielded cable (LIYCY 0.25 mm² 16-pin) ground on terminal

Contact	Description	Cable (color)
X5-6	K1-1 REL1 (48 V AC/DC / 0.5 A)	Blue
X5-7	K1-2 REL1 (48 V AC/DC / 0.5 A)	Red
X5-8	K2-1 REL2 (48 V AC/DC / 0.5 A)	Purple
X5-9	K2-2 REL2 (48 V AC/DC / 0.5 A)	Gray/pink
X5-10	K3-1 REL3 (48 V AC/DC / 0.5 A)	Red/blue
X5-11	K3-2 REL3 (48 V AC/DC / 0.5 A)	White/green
X5-12	K4-1 REL4 (48 V AC/DC / 0.5 A)	Brown/green
X5-13	K4-2 REL4 (48 V AC/DC / 0.5 A)	White/yellow
X5-14	K5-1 READY (48 V AC/DC / 0.5 A)	Gray
X5-15	K5-2 READY (48 V AC/DC / 0.5 A)	Pink
X5-19	IN1 for X5-23 (24 V AC/DC)	Brown
X5-20	IN2 for X5-23 (24 V AC/DC)	Green
X5-22	IN4 for X5-23 (24 V AC/DC)	White
X5-23	Reference ground for X5-19; X5-20; X5-22	Black

5.2.7 Condensate Pump

The condensate pump is mounted on the right side next to the condensate trap. A special tube is used to drain any existing condensate before each measurement.

IMPORTANT!

If the tube is defective, the process gas is mixed with the atmosphere. This is the reason a new tube is installed every 12 months.

6. Installation and Initial Startup

6.1 Transport and Set-Up

Transporting with Corresponding Packaging

The gas analyzer must be transported in the packaging provided for this purpose. Transport packaging is part of the delivery scope.

Compliance with the following is especially important when setting up the gas analyzer:

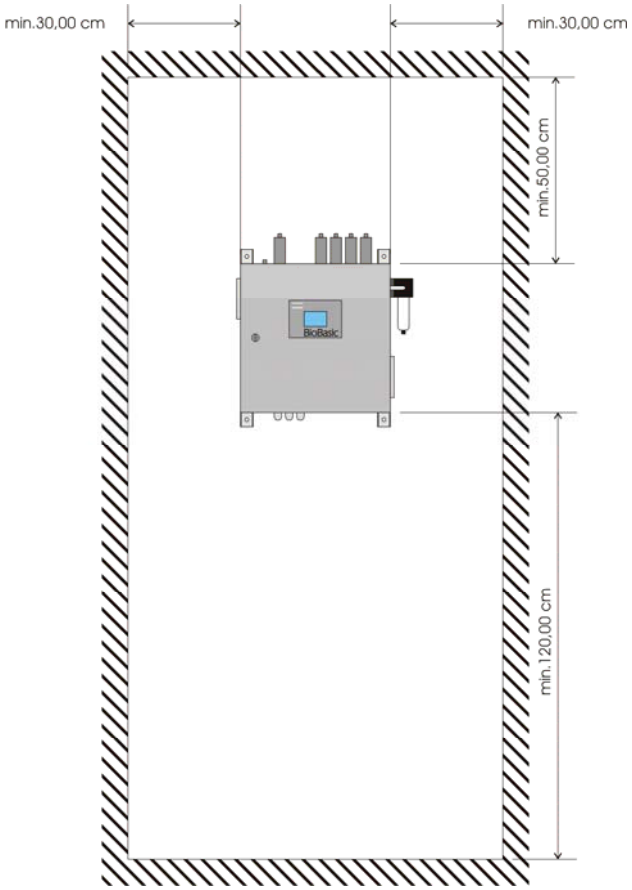
- Remove packaging materials and carefully check the equipment for transport damage.
- Transport damages must be reported immediately to **Fresenius Umwelttechnik GmbH**.
- Remove the transport locks inside of the gas analyzer.

Setting up the Equipment

- Check the installation location for the gas analyzer for temperature and ventilation.
- Certain safety clearances to adjoining walls are necessary to provide enough space for maintenance and service tasks. The drawing below.
- Always use the enclosed brackets to mount the gas analyzer on the wall.

IMPORTANT:
Do not install in explosion zones (EX-Zone)

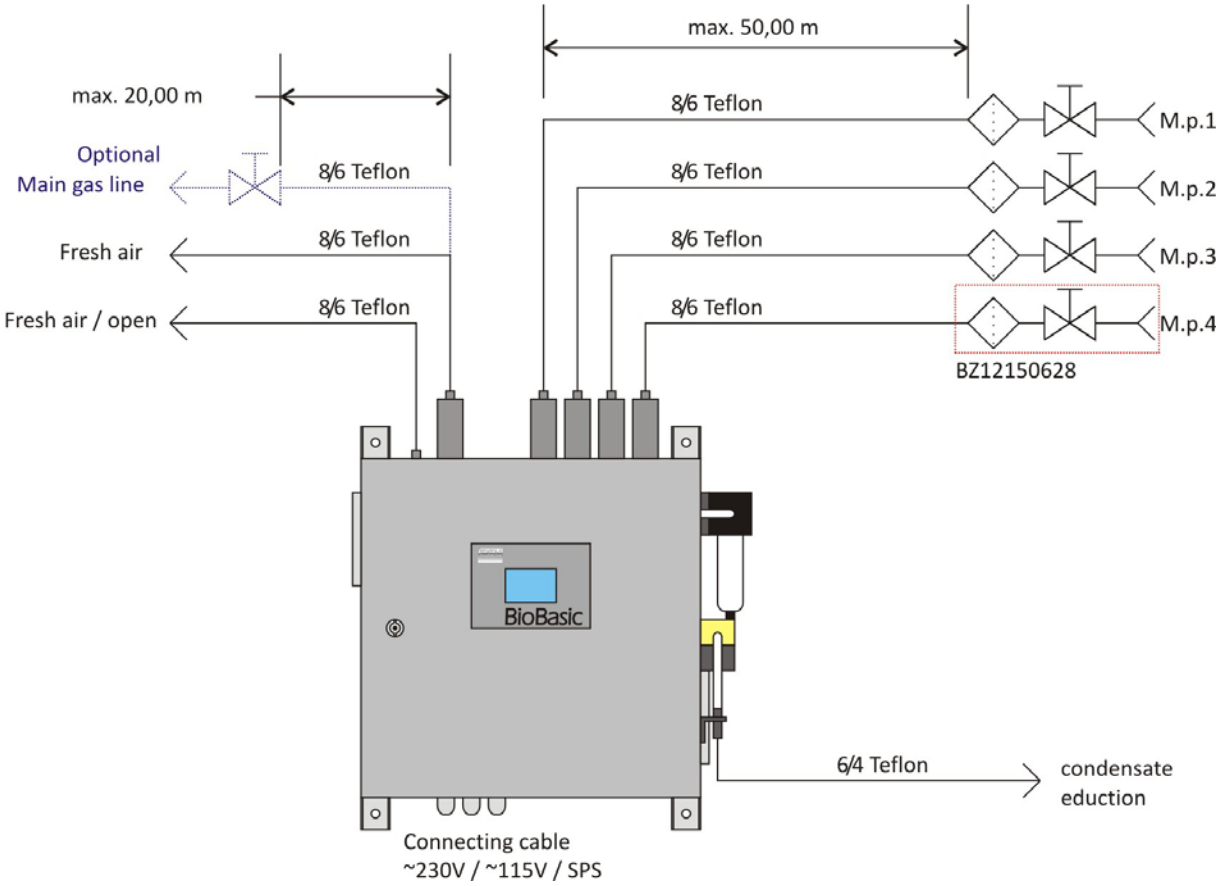
- Do not install in EX-Zone!



6.2 Connecting the Pneumatics

All connection possibilities and additional options compatible with the gas analyzer are depicted in the pneumatic schematic.

- Number of measuring points
- Condensate pump with drainage
- Measuring gas return line to main gas line



Important Installation Information

Comply with condensate flow direction!

The supply lines may collect increased volumes of condensate, which is why these lines must always be installed with a gradient to the gas analyzer. The installed level monitor automatically stops the system if too much condensate starts to accumulate.

Condensate may not flow back to the gas analyzer through the return lines. The lines must be installed at an incline to the outlet.

Monitor the temperature!

The outlets of the return lines must be frost-free or temperatures around the freezing point may block the outlet!

An additional heater must be installed if the end of the Teflon line should freeze.

6.3 Electrical Supply

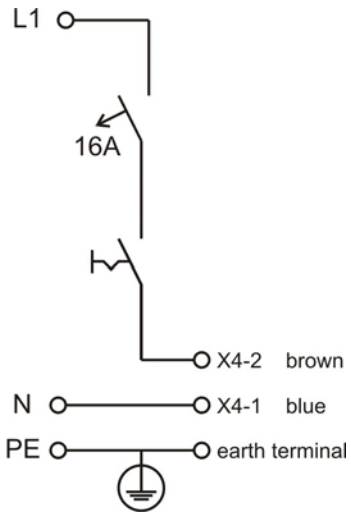
Competency

Comply with VDE requirements and specifications and local safety rules and regulations.

All work on the connection contacts of the electrical supply to the gas analyzer must be carried out by authorized and qualified personnel.

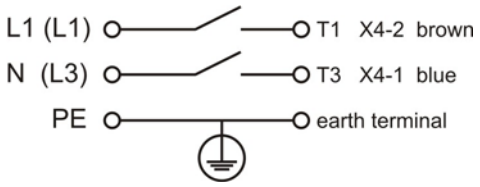
Please pay special attention to the following:

- Check the different connection values. These values are listed on the inside of the door.
- The ground of the electrical lines for the power connection must be connected with the ground terminal first.
- The current lines L1 and N must be connected with a suitable connector.
- The gas analyzer must be equipped with its own 16 A fused cut-out. A separate switch is used to switch the system off and on.



- Optionally, the BioBasic can also be a switch disconnector be fitted, then the connection lines with L1 and N are connected directly to the switch disconnector.

  Contacts: L1 to 1, N to 5



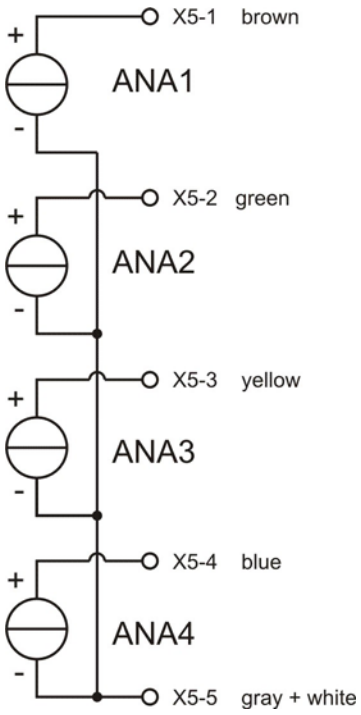
6.4 Analog Outputs

The following connection cable must be installed separately for the analog outputs (4 to 20 mA):

Shielded cable (LIYCY 0.25 mm² 7-pin)

Contact	Description	Cable (color)
X5-1	ANA1 analog output 1 (4..20 mA source)	brown
X5-2	ANA2 analog output 2 (4..20 mA source)	green
X5-3	ANA3 analog output 3 (4..20 mA source)	yellow
X5-4	ANA4 analog output 4 (4..20 mA source)	blue
X5-5	GND ANA ground for analog outputs	gray + white

The shield must be connected on a grounding terminal on the DIN rail.



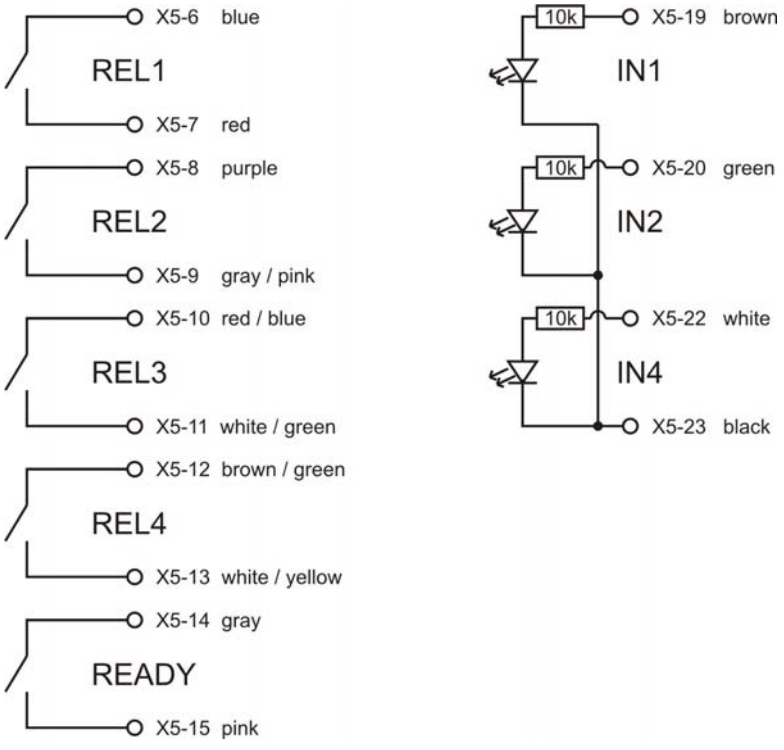
6.5 Relay Outputs / Digital Inputs

The following connection cable must be installed separately for the relay outputs and digital inputs:

Shielded cable (LIYCY 0.25 mm² 16-pin) ground on terminal

Contact	Description	Cable (color)
X5-6	K1-1 REL1 (48 V AC/DC / 0.5 A)	blue
X5-7	K1-2 REL1 (48 V AC/DC / 0.5 A)	red
X5-8	K2-1 REL2 (48 V AC/DC / 0.5 A)	purple
X5-9	K2-2 REL2 (48 V AC/DC / 0.5 A)	gray/pink
X5-10	K3-1 REL3 (48 V AC/DC / 0.5 A)	red/blue
X5-11	K3-2 REL3 (48 V AC/DC / 0.5 A)	white/green
X5-12	K4-1 REL4 (48 V AC/DC / 0.5 A)	brown/green
X5-13	K4-2 REL4 (48 V AC/DC / 0.5 A)	white/yellow
X5-14	K5-1 READY (48 V AC/DC / 0.5 A)	gray
X5-15	K5-2 READY (48 V AC/DC / 0.5 A)	pink
X5-19	IN1 for X5-23 (24 V AC/DC)	brown
X5-20	IN2 for X5-23 (24 V AC/DC)	green
X5-22	IN4 for X5-23 (24 V AC/DC)	white
X5-23	Ref. ground for X5-19; X5-20; X5-22	black

The shield must be connected on a grounding terminal on the DIN rail.



6.6 Fieldbus Connection

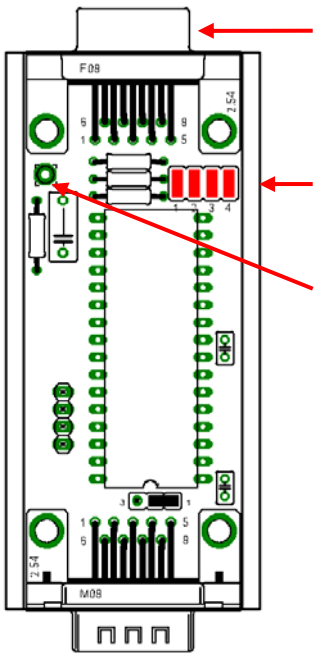
The BioBasic unit supports different fieldbuses to transfer input and output data. The following is a detailed description of the ProfibusDP and the EtherNet/IP connection.

6.6.1 ProfibusDP

The ProfibusDP connection is attached on the contact module on an additional circuit board. This is also where the bus termination resistances can be set with four jumpers.

Connection: 9-pin D-SUB (female)

PIN	Signal
1	-
2	-
3	B-Line
4	RTS
5	GND BUS (isolated)
6	+5 V BUS (output, isolated, 100 mA max.)
7	-
8	A-Line
9	-
Enclosure	Cable shielding

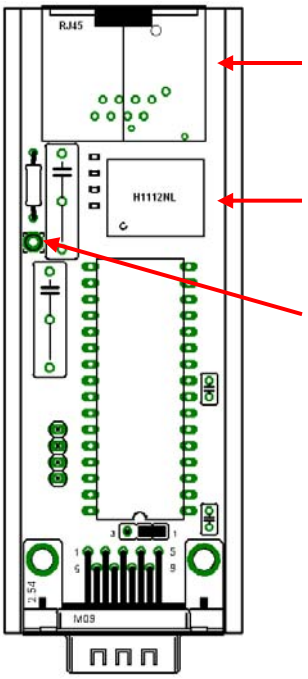


6.6.2 EtherNet/IP

The Ethernet/IP connection is attached on the contact module on an additional circuit board.

Connection: RJ45

PIN	Signal
1	TX+
2	TX-
3	RX+
4	-
5	-
6	RX-
7	-
8	-
Enclosure	Cable shielding



Connection: EtherNet/IP (RJ45)

Signal transformer 10/100 Base H1112NL

Grounding

Matching RJ45 cable housing by:
NEUTRIK (NE8MC)
RS order number:
426-2404

6.7 Measures before the Initial Startup

The following control and inspection measures must be implemented before the initial startup to ensure the safe and reliable operation of the BioBasic gas analyzer.

- Make sure all transport locks inside of the gas analyzer are removed.
- Check all connection lines and the associated connection elements and adapters and re-tighten if necessary.

6.8 Checking the Gas Supply Lines

Gas lines must be checked for leaks to ensure the aspirated measuring gas reaching the gas analyzer is unadulterated. Please follow these steps:

- Close shutoff valve at sampling or extraction points.
- Use the diagnostic menu of the gas analyzer to select measuring points and activate pump. (SFK 2 1)

IMPORTANT!

- Lines have no leaks if a negative pressure of 0.400 bar can be reached.
- Reset SFK 0 0 00 in the menu after the respective tests.

6.9 Checking the Gas Flow

Depending on the length of the supply line, aspirating the current process gas and routing it into the gas analyzer takes different lengths of time. The pressure drop in the measuring gas line while pump is running is checked to monitor the gas flow. Please follow these steps:

- Close shutoff valve at sampling or extraction points.
- Use the diagnostic menu of the gas analyzer to select measuring point and activate pump. (Chapter 7.4.2)
- Lines are problem-free if a negative pressure of >0.800 bar can be reached.

6.10 Required Controller Settings

Once all lines are connected, it may be necessary to specify additional settings as global settings for the long-term operation at the gas analyzer:

- Controlling the measuring points (chapter 7.5)
- Setting the inputs and outputs to control and pass the signal of the BioBasic (chapter 7.7)

7. Operating the Gas Analyzer with the System Software

7.1 General Overview

All functions of the gas analyzer are controlled by a system featuring a microcontroller. A touchpanel is used for all operations. Various menus and submenus are available and can be controlled by tapping icons to affect and specify the different sequence of operations of the gas analyzer. Please consult the correspond drawing for information about the basic control options. Chapters 7.4 to 7.7 provide details about the individual main and submenus and their functions.

Competency

Some areas of the operating software is only accessible with passwords. Please note that changes and configurations in these areas must be made by qualified technicians. Incorrect settings in these operating levels may lead to faults and unsafe operation of the equipment. **Fresenius Umwelttechnik GmbH** is not liable for any damages caused by improper or incorrect programming in password-protected areas.

7.1.1 Displaying Faults

Any detected fault is depicted as a single page on the display. This is done automatically only if the main page is active. Every fault or error must be acknowledged by the user and is available for review in the log (chapter 7.6) together with additional information.

7.1.2 Configuring the Gas Analyzer

The software program to control the gas analyzer features the following different configurations described below. Different access authorizations are required for the configuration!

7.2 Explanation of the Icons and Menus

The screen is divided into three sections. The upper section (I) indicates the menu currently opened. The left section (II) below on the left of the upper section is comprised of additional menu or setting options that can be controlled with the buttons/icons in the third section (III) on the right edge.

I

II

III

Basic operation is possible with only four buttons wi ays the same meaning. A pressed button is then displa verted. Releasing the button at the same position triggers unction associated with the button.

Pressing the ESC button ends the last step or returns you to the previous menu.

Pressing the ENTER button opens the next menu or a menu setting for editing. This button also confirms your input when editing a setting.

Pressing the UP button opens the next higher menu or increases a value of a setting.

Pressing the DOWN button opens the next lower menu or decreases a value of a setting.

7.3 Main Page

The logo and the serial number as well as the software version is displayed after switching on the gas analyzer. A warming up period is counted down in seconds after an internal memory check. The main page of the gas analyzer then opens. The main page usually depicts the measured values with time stamp and measuring point. The display is updated with the current values after each measurement.

Tapping the touchpanel opens the main menu. Submenus are accessible from the main menu.

7.3.1 Status Display

The current status is always indicated in the upper right of the main page. The meaning of the individual letters is explained below:

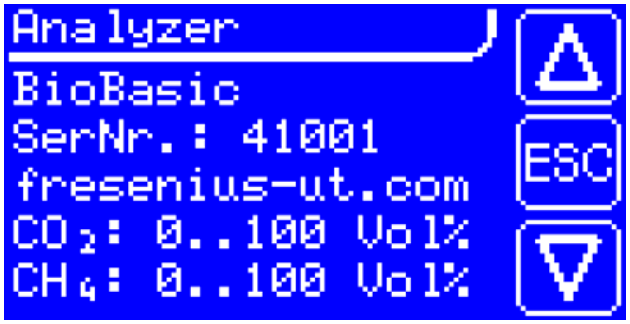
Character	Explanation
W	Waiting
S	Purging measuring chamber with measuring gas
F	Filling measuring chamber with measuring gas
M	Measuring the measuring gas
P	Pump creates negative pressure in measuring chamber
R	Measuring the measuring gas at negative pressure
Ip	Interval pause
Se	Service function switched on
St	Fan nonfunctional or condensate trap full

7.4 Info Menu

The info menu has two submenus described below.

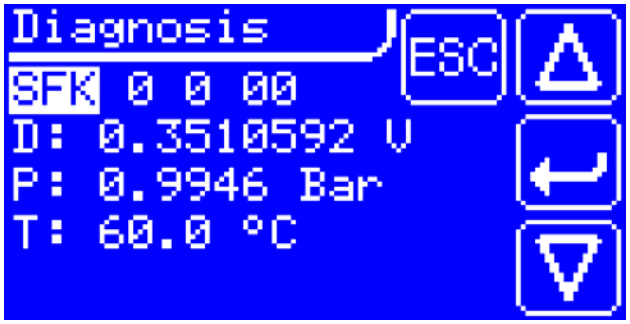
7.4.1 Analyzer

Use Main Menu -> Info -> Analyzer to depict the key information about the equipment. Use UP and DOWN to scroll the field up and down.



7.4.2 Diagnosis

Use Main Menu -> Info -> Diagnosis to open the diagnosis menu and view all key measured values. A service function makes it possible to operate the gas analyzer in different modes.



The numbers behind "SFK" indicate the type of service function. All numbers can be set separately and together constitute the currently set service function. If a character is being edited, the service function is not applied until the next input (ENTER).

The following is an explanation of the individual characters

SFK X Y ZZ

X	Function
0	No function (automatic)
1	Valve Y is being opened and pump is at a standstill
2	Valve Y is being opened and pump is running
3	Valve Y is being closed and pump is running
4	Valve Y is being closed and pump is at a standstill

Y	Function
0	No function (automatic)
1 to 4	Valve actuation with function X

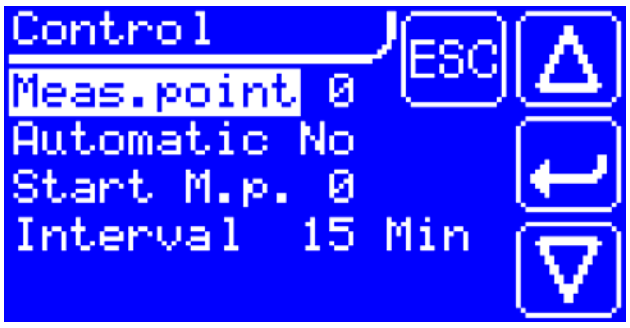
ZZ	Function
0 to 15	Analog value 0 to 15 at D: displayed

7.5 Control Menu

The control menu includes the individual functions to control the gas analyzer. This is where the basic, global settings for continuous operation are specified.

7.5.1 Measuring Point

Use Main Menu -> Control -> Measuring Point to select a manual measuring point. If a number greater than 0 is entered, only the one specified measuring point is continuously measured.



IMPORTANT!

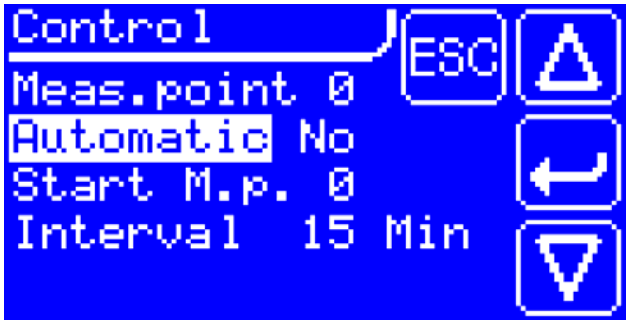
Continuously measuring process gas may destroy the EC sensors. This mode is intended only for a manual control measurement.

7.5.2 Automatic

Use Main Menu -> Control -> Automatic to select an automatic measuring point sequence. If a manual measuring point is not specified, the individual measuring points are accessed one after the other. An interval pause is applied between each measuring point.

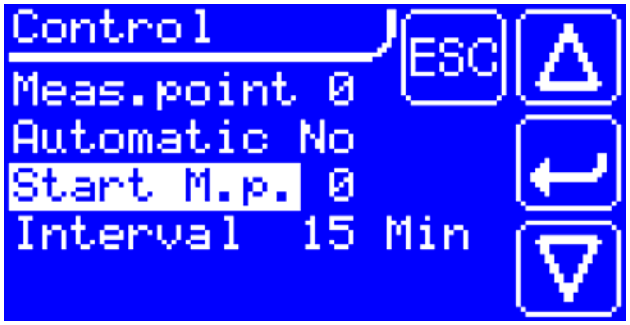
IMPORTANT!

If the system also features EC sensors, an internal fresh air measurement is carried out as well!



7.5.3 Starting Measuring Point

Use Main Menu -> Control -> Start Meas. Pt. to set a starting measuring point. This measuring point is accessed and measured after the start. Is automatic mode enabled as well, a fresh air measurement is carried out first followed by measuring the next higher measuring point.

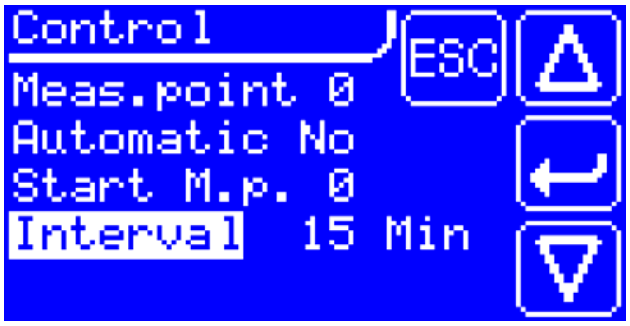


7.5.4 Interval Pause

Use Main Menu -> Control -> Interval to set the interval pause duration. The interval pause describes the delay between two measurements while in automatic mode. A time between 15 to 999 minutes can be specified.

If the system also features EC sensors, changing this time increases the downtime of the EC sensors!

The already measured measuring points are consecutively depicted with the basic display during the interval pause!

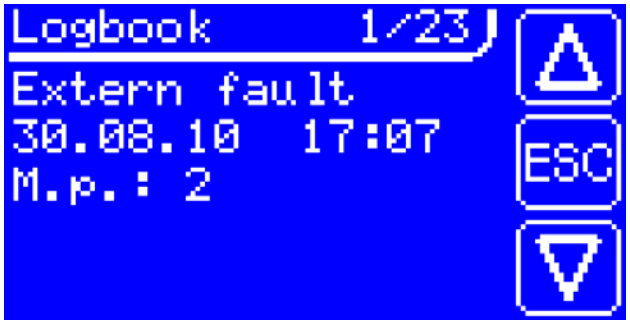


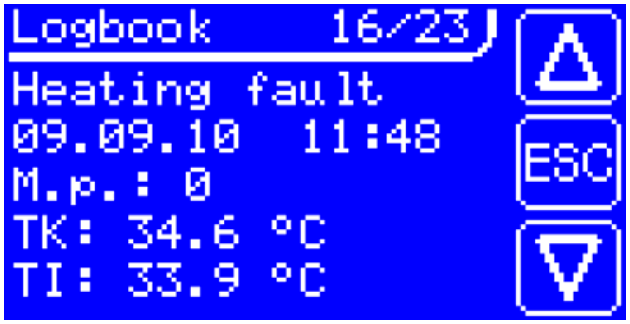
7.6 Logbook

IMPORTANT!

Use Main Menu -> Logbook to view any recorded faults. Every fault or error logged has associated detail information.

The log consists of a ring or circular buffer where the last 23 messages are stored.





7.7 Settings

Various functions can be configured with settings. These are described below.

7.7.1 General

Use Main Menu -> Settings -> General to make changes to basic functions.

7.7.1.1 PIN Input

IMPORTANT!

An individual PIN code can be assigned here. The factory setting of this code is "1111" but should be changed during the initial startup process.

After changing the PIN code, settings can be saved only after entering the new code.

7.7.1.2 Date Input

The date is depicted using the European format and is saved in a real time clock in the system. The format is as follows:

DD.MM.YY

D: Day

M: Month

Y: Year

7.7.1.3 Time Input

The time is depicted using the European format and is saved in a real time clock in the system. The format is as follows:

HH:MM:SS

H: Hour

M: Minute

S: Second

7.7.1.4 Language Input

Scroll up and down to select a language from the depicted options.

7.7.2 Inputs

The gas analyzer has up to 4 binary, galvanically isolated inputs, which can be configured for different functions.

7.7.2.1 Selecting the Digital Input

Select inputs IN1 to IN4 here. The respective function is updated after the making and confirming the selection.

7.7.2.2 Selecting the Function

Select the function for the respective input. A total of six functions are possible, each explained below:

Function	Explanation
None	No function when controlled
MPC Bit1	Binary measuring point control Bit1
MPC Bit2	Binary measuring point control Bit2
MPC Bit3	Binary measuring point control Bit3
MPC Bit4	Binary measuring point control Bit4
Ext. Err.	Ext. Error is triggered (e.g. level monitor)

IMPORTANT!

If an input does not have a function, this input should also be configured accordingly!

7.7.3 Outputs

The gas analyzer is able to use different outputs to transfer the measured values to a controller. This involves using the relay contacts as measuring point identifier and the current outputs to transfer the values. Each relay as well as the analog output can be configured individually.

7.7.3.1 Relay Outputs

Use Main Menu -> Settings -> Outputs -> Relays to assign individual relays to your functions. Every individual relay from REL1 to REL4 can be selected.

The respective functions are as follows:

Function	Explanation
None	No function
MPI Bit1	Binary measuring point identifier Bit1
MPI Bit2	Binary measuring point identifier Bit2
MPI Bit3	Binary measuring point identifier Bit3

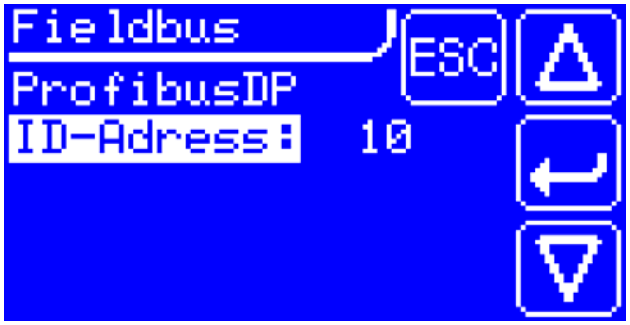
7.7.3.2 Analog Outputs

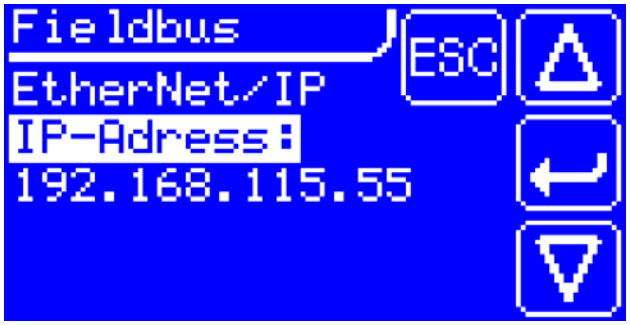
Use Main Menu -> Settings -> Outputs -> Analog to configure the individual analog outputs with their substances, measuring points, and max. values. Only the number of physically existing analog outputs is also displayed.

If a number greater than 0 is entered for the measuring point, only the value for this measuring point is updated on the analog output!

7.7.4 Fieldbus

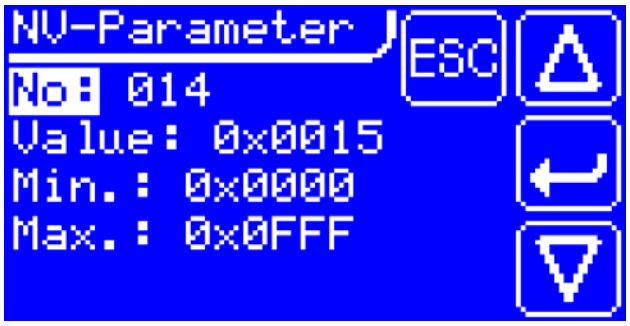
Use Main Menu -> Settings -> Fieldbus to select the respective addresses for addressing the fieldbus. The system supports ProfibusDP and EtherNet/IP interfaces.





7.7.5 NV Parameters

The LV parameters represent the non-volatile parameters. Changing the parameters has the corresponding consequences. The individual parameters are depicted decimally or hexadecimally. The value is not applied until confirmed.



8. Integration into a Control System

The BioBasic unit is utilized as a standalone system. The individual measuring points are independently pre-aspirated and measured consecutively. The system is purged with fresh air between each measurement (internally) and then enters a waiting position for at least 15 minutes (interval pause).

The READY relay signals whether the gas analyzer is ready or an error or fault is detected.

The respective measuring point is depicted as a binary value using relays 1 to 3 when the gas analyzer is ready and has carried out a measurement. The measured gas concentrations are output via the analog interface at the same time.

In case of an error or fault, relays REL1 to REL4 output an error code.

The tables below list the different signals.

8.1.1 Transferring Measured Values

With READY relay closed (ready)

Changing the measuring point identifier with REL1 to REL3 identifies the new measured data.

Measuring point	REL1	REL2	REL3
Meas. pt.1	Closed	Open	Open
Meas. pt.2	Open	Closed	Open
Meas. pt.3	Closed	Closed	Open
Meas. pt.4	Open	Open	Closed
Meas. pt.5	Closed	Open	Closed
Internal	Closed	Closed	Closed

With READY relay closed (ready)

Analog outputs 4...20 mA as source

Substance	Analog output	Scaling (typical)
CO_2	ANA1	0...65 vol%
CH_4	ANA2	0...100 vol%
O_2	ANA3	0...30 vol%
H_2S	ANA4	0...2000 ppm

Setting Information

Please consult chapter 7.7.3. for setting details.

8.2 Transferring Fault Message

With READY relay open (fault)

Please consult chapter 10 for details about the individual faults (messages).

REL1	REL2	REL3	REL4	Message
Open	Open	Open	Open	Heating analyzer
Closed	Open	Open	Open	Pneumatics fault 1
Open	Closed	Open	Open	Pneumatics fault 2
Closed	Closed	Open	Open	Pneumatics fault 3
Open	Open	Closed	Open	Optical system fault 1
Closed	Open	Closed	Open	Optical system fault 2
Open	Closed	Closed	Open	Calibr. fault
Closed	Closed	Closed	Open	Chopper -fault 1
Open	Open	Open	Closed	Chopper -fault 2
Closed	Open	Open	Closed	Heater fault
Open	Closed	Open	Closed	RAM error
Closed	Closed	Open	Closed	ROM error
Open	Open	Closed	Closed	LV error
Closed	Open	Closed	Closed	EXT fault
Open	Closed	Closed	Closed	Fan fault
Closed	Closed	Closed	Closed	LEL fault

8.3 Manual Reference Measurement

Use the digital inputs for a "Manual Measurement" to carry out a reference measurement with the BioBasic unit. The measuring point to be measured can be binary-controlled with the digital inputs IN1, IN2, and IN4. The measured data are output on the respective outputs after the measurement (see chapter 8.1 for details).

The table lists the control of the respective measuring point:

Measuring point	IN1	IN2	IN4
Meas. pt.1	ON	OFF	OFF
Meas. pt.2	OFF	ON	OFF
Meas. pt.3	ON	ON	OFF
Meas. pt.4	OFF	OFF	ON
Meas. pt.5	ON	OFF	ON
Internal	ON	ON	ON

Important:
Damage to the EC sensors

Important Information!

The EC sensors are continuously exposed to the process gas during the measurement, which may damage them. The measuring time on a measuring point may not exceed 10 minutes. The internal measuring point must be measured for at least 5 minutes after each manual measurement to preserve functionality.

8.4 Integrating a Fieldbus Interface

The gas analyzer is able to use a fieldbus to transfer digital output, relay, output, and analog output data. These are made available as I/O data. The functionality of the individual bits is linked directly with the description of the usual interfaces. The respective addressing of the interface is described below.

8.4.1 ProfibusDP Integration

Use the display menu to address the ProfibusDP interface (see chapter 7.7.4). The ID range is freely selectable from 0 to 126. Bus termination is set with jumpers on the ProfibusDP board (see chapter 6.6.1). The GDS file helps with integrating the interface directly into the control.

8.4.2 EtherNet/IP Integration

Use the display menu to address the EtherNet/IP interface (see chapter 7.7.4). The IP address is freely selectable from 0.0.0.0 -> 255.255.255.255.
The following are permanently assigned:

- Subnet mask: 255.255.255.0
- Default gateway: 0.0.0.0

The EDS file helps with integrating the interface directly into the control.

8.4.3 I/O Data Distribution

The distribution of the I/O data for the fieldbuses is always the same as described below.

Digital inputs:

Fieldbus output WORD 1 (16-bit)

Bit	15 … 3	2	1	0
	-	IN4	IN2	IN1

Relay outputs:

Fieldbus input WORD 1 (16-bit)

Bit	15 … 5	4	3	2	1	0
	-	READY	REL4	REL3	REL2	REL1

Analog Outputs

Fieldbus input WORD 2 (16-bit)

Bit	15	0
	ANA1	

Fieldbus input WORD 3 (16-bit)

Bit	15	0
	ANA2	

Fieldbus input WORD 4 (16-bit)

Bit	15	0
	ANA3	

Fieldbus input WORD 5 (16-bit)

Bit	15	0
	ANA4	

8.4.4 Scaling Analog Outputs

Scaling the individual measured values (substances) must be derived from the analog settings of the BioBasic. The 16-bit value for analog outputs refers to 0 to 24 mA while the measured value of 4 to 20 mA is output. The distribution always refers to 0 to 100% of the upper range value (URV). This output WORD is passed to ANA1...4.

16-bit Distribution Analog WORD

Fault	Measured values between 0 and 100% URV	> 100% URV
0 10921	10922 54613	54614 65535

The lower and upper ranges are used as measured values with ±5% URV. WORD is set to 0 in case of a fault.

Calculating Measured Values

Measured value = ((WORD – 10922) / 43691) * URV

Example: WORD = 18222

Measured value = ((18222 – 10922) / 43691) * 100 Vol%

Measured value = 16.708 Vol%

Min. WORD = 10923 -> 0.00228 Vol%

Max. WORD = 54612 -> 99.9977 Vol%

9. Maintenance Information

9.1 Basic

The BioBasic gas analyzer must be maintained and serviced at specific intervals. The associated task must be carried out extremely carefully. Compliance with these specific maintenance tasks is essential to ensure the gas analyzer runs safely, reliably and without malfunctions. Regular maintenance also protects the analyzer components from failure, thereby extending the service life of the gas analyzer.

The maintenance and service tasks must be carried out by trained technicians based on these maintenance instructions. Please do not hesitate to contact your Fresenius Umwelttechnik Service Team if you have any questions.

Please contact the Fresenius Umwelttechnik Service Team if you are interested in training for your technicians.

9.2 Maintenance Plan

The schedule of this maintenance plan refers to normal operation of 24 hrs with four measurements (up to four measuring points max. 16 measurements). In case the measurement is increased per day or if increased dirt accumulations are a problem, maintenance and service tasks must be carried out in shorter intervals.

9.2.1 Regular Maintenance Tasks

Component	Task	Item/ Photo
Weekly Maintenance Tasks		
Condensate trap	Empty + clean	4
Filter at sampling point	Empty + clean	
Monthly Maintenance Tasks		
Fan filter mats	Clean	6, 13
H_2S sensor	Check with span gas and adjust as needed	12

Component	Task	Item/ Photo
Annual Maintenance Tasks		
EC sensors	Check with span gas and adjust as needed/replace	12
IR sensors	Check with span gas and adjust as needed	10
Solenoid valves	Clean	2
Pneumatic paths	Clean + replace if necessary	
Flame barriers	Clean	1
Check supply lines	Clean + replace if necessary	
Fan filter mats	Clean + replace if necessary	6,13
Level monitor	Check	3
Pump diaphragm	Replace	7
Valve plates of diaphragm pump	Replace	7
Filter at sampling point	Replace	
Tube pump	Replace Marprene tube	4
Software update	If available	

Important:
Test
acc. to DIN VDE 0701/0702

Since the gas analyzer is subject to DIN VDE 0701 / 0702, the corresponding measurements must be carried out. This requires measuring the ground conductor resistance and the ground conductor or differential current acc. to the test directive.

10. Faults and Warnings

10.1 List of Possible Faults

Fault	Description	Possible Cause
Pneumatics f ault 1	Pressure in meas. phase too low (p<0.7 bar)	Blocked gas path
Pneumatics f ault 2	Pressure in ref. phase too high (p>0.5 bar)	System leaks, polluted valves, defective pump diaphragm
Pneumatics f ault 3	Leakage between Input and reference valve Nonsensical pressure values (p>1.5 or p<0.05 bar)	Leakage at condensate, Inlet valve dirty Defective pressure sensor, electronic fault
Optical system fault 1	Detector signals insufficient	Defective IR -emitter, defective detector, dirty or fluted cuvette
Optical system fault 2	Nonsensical calibration values	Defective IR -emitter, defective detector, dirty or fluted cuvette
CAL fault	O_2 sensor with insufficient signal	O2 sensor defect, diminished by too much biogas
Heater defect	(Actual-nominal)> 10°C and increase < 0.02°C in 8s	Defective heater, device not within permissible ambient temperature range
Chopper -fau lt 1	Chopper loses position	Mechanical impact
Chopper -fau lt 2	Chopper not running or light barrier defective	Possibly mech. blockage
RAM error	Error in RAM memory	Electronic error
ROM error	Error in flash memory	Electronic error
NV error	Error in EEPROM memory	Electronic error
External fault	Level monitor triggered	Condensate trap filled with condensate
Fan fault	Fan not running	Fan blocked, cable break to fan
LEL fault	20% LEL methane in analyzer	Leak inside or at analyzer

11. Maintenance and Service Log

Year 1

Month 1 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 2 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 3 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 4 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 5 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 6 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 7 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 8 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 9 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 10 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 11 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 12 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 2

Month 13 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 14 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 15 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 16 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 17 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 18 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 19 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 20 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 21 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 22 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 23 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 24 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 3

Month 25 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 26 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 27 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 28 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 29 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 30 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 31 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 32 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 33 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 34 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 35 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 36 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 4

Month 37 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 38 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 39 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 40 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 41 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 42 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 43 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 44 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 45 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 46 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 47 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 48 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 5

Month 49 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 50 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 51 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 52 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 53 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 54 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 55 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 56 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 57 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 58 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 59 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 60 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 6

Month 61 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 62 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 63 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 64 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 65 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 66 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 67 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 68 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 69 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 70 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 71 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 72 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 7

Month 73 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 74 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 75 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 76 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 77 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 78 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 79 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 80 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 81 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 82 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 83 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 84 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 8

Month 85 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 86 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 87 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 88 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 89 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 90 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 91 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 92 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 93 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 94 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 95 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 96 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 9

Month 97 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 98 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 99 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 100 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 101 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 102 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 103 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 104 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 105 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 106 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 107 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 108 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

Year 10

Month 109 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 110 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 111 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 112 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 113 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 114 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 115 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 116 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 117 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 118 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature
Month 119 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature	Month 120 after installation All maintenance and service tasks for this month have been carried out properly and in compliance with the corresponding specifications. Date, Customer Signature

Annual Service by Service Technician Authorized by Fresenius Umwelttechnik

Operating hours	
Annual maintenance was carried out as specified.	
Date: Customer signature:	

12. Spare Parts List

Fig. No.	Item No.	Designation
2	13120051	2/2-way valve VA 6011 flange plate
2	13120053	3/2-way valve VA 6012 1/8“ connections with M5 sinter filter
3	13310405	Level monitor
4	BM13150070	Condensate trap BioBasic with shutoff switch
4	13110040	Tube pump 114FD/D
4	14130007	Marprene tube 3.2 x 1.6
5	BP13463158	BioBasic display board
6	BE13463150	Fan 24 V/DC 80 x 80 x 25 with tacho signal
8	13435200	SMPS power supply DIN rail 60W 24/2, 5A
9	13302962	MVSTBR HC/2-ST-5 2.5, 08
	BE13463151	Heating element (BioBasic)
	BE13463152	Temperature fuse (BioBasic)
12	BE13463157	O_2 sensor 0-30 vol%
12	13400038	H_2 sensor 0-2000 ppm
12	13400038	H2S sensor
13	13520114	Outlet filter PFA 10.000
	13150007	Filter for sampling point
4	13150065	BioBasic condensate filter (5µm)
	13150056	BioBasic filter sampling point
	13540425	Plastic cable bushing M12 4-7mm